Summer 8-3-2022

Draft Final 2021 Unreclaimed Sites Sampling UR-03 Site Evaluation Summary Report

Pioneer Technical Services, Inc.

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RE: Butte Priority Soils Operable Unit (BPSOU) Draft Final 2021 Unreclaimed Sites Sampling UR-03 Site Evaluation Summary Report

Agency Representatives:

I am writing to you on behalf of Atlantic Richfield Company to submit the Draft Final 2021 Unreclaimed Sites Sampling UR-03 Site Evaluation Summary Report, which summarizes sampling and site evaluation activities. The evaluation summary includes the data summary report (DSR) as Appendix A and the data validation report as an attachment (Attachment A) to the DSR.

The report, appendices, and related files may be downloaded at the following link:

https://pioneertechnicalservices.sharepoint.com/:f:/s/submitted/Eowz1KvbTz5GmqXrd2oTV4QBt_bsHwz2YAE2MUvYdyyYZw.

If you have any questions or comments, please call me at (907) 355-3914.

Sincerely,

Mike McAnulty

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Remediation Management Services Company
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SILVER BOW CREEK/BUTTE AREA NPL SITE
BUTTE PRIORITY SOILS OPERABLE UNIT

Draft Final

2021 Unreclaimed Sites Sampling UR-03
Site Evaluation Summary Report

Atlantic Richfield Company

2022

SILVER BOW CREEK/BUTTE AREA NPL SITE
BUTTE PRIORITY SOILS OPERABLE UNIT

Draft Final

2021 Unreclaimed Sites Sampling UR-03
Site Evaluation Summary Report

Prepared for:

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Prepared by:

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2022

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

ABBREVIATIONS AND ACRONYMS

Acronym	Definition	Acronym	Definition
BHRS	Butte Hill Revegetation Specifications	**O&M**	Operation and Maintenance
BPSOU	Butte Priority Soils Operable Unit	**QA**	Quality Assurance
BSB	Butte-Silver Bow	**QAPP**	Quality Assurance Project Plan
BTC	Blacktail Creek	**QC**	Quality Control
CB	Catch Basin	**ROD**	Record of Decision
CD	Consent Decree	**SBC**	Silver Bow Creek
CY	Cubic Yards	**SD**	Settling Defendants
DSR	Data Summary Report	**SOP**	Standard Operating Procedures
FRESOW	Further Remedial Elements Scope of Work	**UR**	Unreclaimed
mg/kg	milligram per kilogram	**XRF**	X-ray Fluorescence

1.0 INTRODUCTION

This Butte Priority Soils Operable Unit (BPSOU) Unreclaimed (UR) Site Evaluation Summary presents the declarations of the subsurface soil sampling conducted on October 28, 2021, at the UR source area UR-03 within the BPSOU (referred to herein as UR-03 Site or Site).

Unreclaimed solid media sites located within the BPSOU may have potentially been impacted by historical mining. These sites must be evaluated to determine if remedial action is required. Site evaluations are completed to determine if a specific site poses a threat to human health, contributes metals-impacted sediments to existing or planned wet weather control features, or contributes to the degradation of surface water quality as described in the BPSOU Consent Decree (CD), Appendix D, Attachment C Further Remedial Elements Scope of Work (FRESOW) (EPA, 2020).

Source areas within the BPSOU may include upland soil waste, mine waste, and floodplain soil and waste. These source areas have the potential to act as direct or indirect pathways for human exposure, contribute metal inputs to the alluvial and bedrock aquifers, and act as metals sources to surface water (to Blacktail Creek [BTC] and Silver Bow Creek [SBC]) via storm water runoff.

Means and methods used to characterize UR sites and make remediation recommendations are described in the 2021 *UR Sites Quality Assurance Project Plan* (QAPP) (Atlantic Richfield Company, 2021) (referred to herein as the QAPP). Results from site sampling/inspection activities will be used to make site declarations and drive remedial action requirements that will be completed by the Settling Defendants (SDs). Contaminated solid media identified within the BPSOU will be addressed through a combination of source removal, capping, and/or land reclamation, as appropriate, to meet the Butte Hill Revegetation Specifications (BHRS) (EPA, 2020). The specific Remedial Action Work Plans will be prepared by the SDs and approved by Agencies prior to implementation.

1.1 Objectives

This Site Evaluation Summary Report presents all Site data and declarations, as required in the FRESOW (EPA, 2020), from the UR-03 Site investigation. Results from the 2021 investigation are summarized in the Data Summary Report (DSR) in Appendix A, which includes a Data Validation Report. General Site and sample station photographs are included in Appendix B.

This Evaluation Summary Report includes information within each related report as described below:

Site Evaluation Summary:

- A summary of all Site data (historical and new).
- A declaration as to whether the Site contains concentrations at or above human health action levels and/or the Waste Identification Criteria in Table 1 in Appendix 1 of the BPSOU CD (EPA, 2020).
- A declaration as to whether historical mine waste at the Site is contributing to the degradation of surface water quality.
- A declaration as to whether the Site contributes metals-impacted sediment to existing or planned wet weather control features.

DSR (Appendix A):

- Investigation objectives.
- Data quality assessment.
- Project objectives and sampling design review.
- Preliminary data review.
- Conclusions on the quality of the data.
- Sampling and analysis summary.

Data Validation Report (Attachment A of the DSR):

- Quality assurance (QA) and quality control (QC) review of inorganic data.
- Level A/B Assessment.
- Assessment of precision, accuracy, representativeness, comparability, completeness, and sensitivity between X-ray fluorescence (XRF) and laboratory data.
- Overall data summary.

The following sections provide details about the items bulleted above.

The land use at the UR-03 Site is residential per professional judgment by the field team lead, informed by current county zoning and guidance listed in the 2006 Record of Decision (ROD) requirements (Appendix A.3 of the QAPP). Human health action levels and storm water criteria for residential space were referenced to prepare this declaration. The action levels are listed in Table 1.

2.0 SITE DESCRIPTION AND BACKGROUND

Site UR-03 is approximately 0.3 acre and is located in the northwest part of Walkerville, Montana. The Site is southwest of the intersection of Rising Star Road and Harrison Street (or Dewey Point Road) (Figure 1). Atlantic Richfield Company (Atlantic Richfield) owns most of Site UR-03; a private, third-party resident owns a small portion in the south part of Site UR-03. Site UR-03 is vacant land consisting mostly of several lobes of waste rock dumps. The Site is mostly bare ground. On top of the piles, there are approximately 3-foot diameter depressions or small excavation activity. A residential area in Walkerville is located about 400 feet to the southeast of UR-03. Site UR-03 is in the Missoula Gulch drainage basin.

3.0 SITE EVALUATION

The Site was evaluated following the Unreclaimed Area Logic Diagram (Appendix A.3 of the QAPP) to determine if reclamation was warranted. The 2021 Site investigation was completed on October 28, 2021. Sampling activities were performed according to specified standard operating procedures (SOPs) as outlined in the QAPP. The DSR in Appendix A includes a description of the 2021 investigation. Composite samples were collected from each location at the specified depth intervals of 0 to 2 inches, 2 to 6 inches, and 6 to 12 inches. Photographs of the sampling events are included in Appendix B.

3.1 Data Summary

The 2021 sampling event consisted of collecting 3-point composite samples at 3 depth intervals from 5 sample stations. Each sample was collected and analyzed by XRF for arsenic, cadmium, copper, lead, zinc, and mercury. Out of the 15 collected soil samples, 11 were submitted to Pace Analytic Services, LLC for laboratory confirmation (per Section 3.2.4, Table 5 of the QAPP), and 1 sample was submitted for laboratory QA and QC. The DSR in Appendix A details the total XRF samples collected, confirmation laboratory samples submitted, and the QA and QC laboratory samples submitted. Based on the data quality conclusions in the DSR, the data analyzed in the 2021 sampling event were deemed usable.

For samples analyzed by both XRF and laboratory, the laboratory results were used for the evaluation of the Site. For samples analyzed only by XRF, the XRF results were used for the evaluation of the Site.

3.2 Human Health Action Levels

Table 2 lists the new data, and Table 3 describes the exceedances related to the following findings of the 2021 investigation:

- Four arsenic results from 2 sample stations (UR-03-SS-01 and UR-03-SS-04) slightly exceeded the human health action level (250 milligrams per kilogram [mg/kg]) ranging from 255 mg/kg to 294 mg/kg.

3.3 Screening Criteria for Storm Water

Table 2 lists the new data, and Table 3 describes the exceedances related to the following findings of the 2021 investigation:

No samples collected in 2021 exceeded 3 of the 6 contaminant screening level criteria listed in Table 1. No samples exceeded 5,000 mg/kg; therefore, it is recommended the Site not be analyzed further to determine the possible contribution to the degradation of surface water per the requirements of the QAPP (Section 2.4, Step 5, page 8).

3.4 Sedimentation Analysis

Contribution to degradation of surface water quality or metals-impacted sediment is determined by evaluating the presence of rills, concentrated outflow, and metals-impacted sediment in downstream infrastructure; determining sediment contribution loading upgradient of the Site; and linkage to surface water features (Figure 2).

Presence of Rills:
Rills have been identified at the UR-03 Site. Larger rills extend from a high point on the eastern portion of the Site and extend north, northwest, west, and south. Smaller rills extend from the mine waste pile on the southern portion of the Site and smaller waste piles on the northern portion. Rills from this waste pile appear to extend from the southeastern portion of the pile approximately 125 feet due southwest. Slopes consist of very loose material, and the vegetation is very poor at UR-03. There are established grasses and weeds around the perimeter of the Site; however, the southern mine waste pile appears to outflow sediment deposits outside of the Site to the south. This outflow likely occurred from a runoff event.

Concentrated Outflow:
A small sedimentary basin exists approximately 700 feet south of UR-03 and captures storm water and sediment from the Site. Storm water and sediment arrives at the basin via an unnamed open drainage ditch. The low point of this small basin is located at the intersection of Ryan Road and Garfield Street. In 2016, Butte Silver Bow (BSB) placed drainage rock at the low point and along the ditches of this basin to mitigate storm water and sediment transfer to surrounding areas. An unmarked inlet also exists in the low point of this area where BSB removes sediment via a vacuum-truck (BSB, 2016). This inlet directs storm water from the sedimentary basin east along the north side of Ryan Road to the storm water inlet MG-I-5293, located at the northeastern intersection of Walkerville Drive and Ryan Road. Inlet MG-I-5293 was deemed functional when inspected, and it carries water via 12-inch concrete pipes downgradient across Ryan Road to the Missoula Gulch drainage via Superfund structure Upper Missoula Gulch Channels "West" (open concrete channel).

Evaluate Metals-Impacted Sediment in Downstream Infrastructure:
Metals-impacted sediment is present at the UR-03 Site. However, no sediment accumulation has been documented in the inspection[1] of the inlets or storm water structures described in the section above. From the Upper Missoula Gulch Channels "West," storm water and sediment is routed downgradient south to the Upper Missoula Gulch Channels "East," then to the Centerville Channels to the Syndicate Pit where it reaches Catch Basin (CB) 1 (Syndicate Pit). Sediment is captured within CB-1, and surface water continues through the Missoula Gulch storm water system.

CB-1, CB-8, and CB-9 are maintained under the *Missoula Gulch Catch Basins (CB-1, CB-8, and CB-9) Operations and Maintenance* (O&M) *Plan* (Atlantic Richfield Company, 2018). Butte-Silver Bow Reclamation and Environmental Services personnel monitor conditions of CB-1, CB-8, and CB-9 on a year-round basis and perform maintenance unless severe winter weather

[1] Inspection notes were obtained from a Butte Silver Bow Utilities geodatabase. Access to the database can be provided upon request.

prevents access. Based on estimated accumulation models in the Missoula Gulch Catch Basins O&M Plan (Atlantic Richfield Company, 2018), approximately 53 cubic yards (CY) of sediment is expected to accumulate annually in CB-1 as provided by the BSB Department of Reclamation and Environmental Services. The infrastructure is in good condition, and sediment buildup does not impede flow rates (Atlantic Richfield Company, 2018).

Evaluate Contributing Sediment Loading Above the Site:
There does not appear to be any sediment loading contributed by sites upslope of the UR-03 Site. All storm water and sediment transfer appear to be directed to the small basin south of the Site.

Direct Linkage to Surface Water Features:
A potential complete pathway exists from UR-03 to SBC as shown on Figure 2 under the conditions of a 100-year storm event through the Missoula Gulch drainage. Surface water leaving the Site is routed to CB-1 and through the Missoula Gulch drainage and storm water capture and control system designed to route the 100-year storm event. The three primary Missoula Gulch catch basins (CB-1, CB-8, and CB-9) were designed to route a 100-year storm event through the Missoula Gulch drainage and retain a 10-year, 24-hour storm event. These catch basins reduce peak storm water runoff rates and sediment discharge to SBC when properly operated and maintained. Based on the Missoula Gulch O&M Plan (Atlantic Richfield Company, 2018), the maximum designed storage capacity of CB-1 is approximately 9 acre-feet at an adjustable depth (maximum of 8 feet) with orifice plates set at the maximum elevation. This catch basin includes an outlet structure connected to a 24-inch reinforced concrete pipe outfall that can accommodate a 25-year storm event. The discharge pipe leads to the Missoula Gulch storm water system.

The stored runoff water in the catch basins is then dissipated by infiltration and evaporation and rarely flows to SBC. Retained storm water discharges to SBC only when surface water levels in the final catch basin of the system (CB-9) rise above the discharge level of the outlet structure and surface water within the discharge channel cannot be infiltrated into groundwater. As provided in the Missoula Gulch Catch Basin O&M Plan (Atlantic Richfield Company, 2018), discharge from the catch basins is managed to prevent unmitigated discharge to SBC. Water discharged from CB-9 enters a grass-lined channel and is diverted around the Butte Reduction Works area at Lower Area One until it is eventually discharged into SBC west of the existing slag tunnel. This channel is the primary discharge point from the Missoula Gulch storm water catch basins to SBC. Due to the low gradient and length of the ditch, discharge from CB-9 typically infiltrates fully prior to reaching the discharge point.

Infiltrated water is captured via the Hydraulic Control Channel along the northern perimeter of the Butte Treatment Lagoons and treated prior to discharge to SBC.

4.0 DECLARATION CONCLUSION

There are 2 sample stations that exceeded human health action levels.

From the soil samples collected in 2021 (Table 2), no samples exceeded 3 of the 6 contaminant screening level criteria listed in Table 1. No samples exceeded 5,000 mg/kg. The Site exceeded arsenic human health action levels at two sample locations.

The sedimentation analysis (Section 3.4) indicates the following:

- Documentation of rills and soil loss from the Site.
- No evidence of current metals-impacted sediment that met the storm water criteria within the UR Site boundary.
- Existing Superfund storm water infrastructure and downstream infrastructure at CB-1, CB-8, and CB-9 captures potentially impacted surface water and is designed to retain sediment migration from the Missoula Gulch drainage, mitigating potential surface water degradation.

As stated previously, a potentially complete pathway exists from UR-03 to SBC through the Missoula Gulch drainage; however, it does not contribute to SBC degradation or contain evidence of contributing storm water metals-impacted sediment.

Based on the criteria identified in the QAPP and established qualifying data, further actions are recommended to assess the corrective actions to address human health exceedances.

5.0 REFERENCES

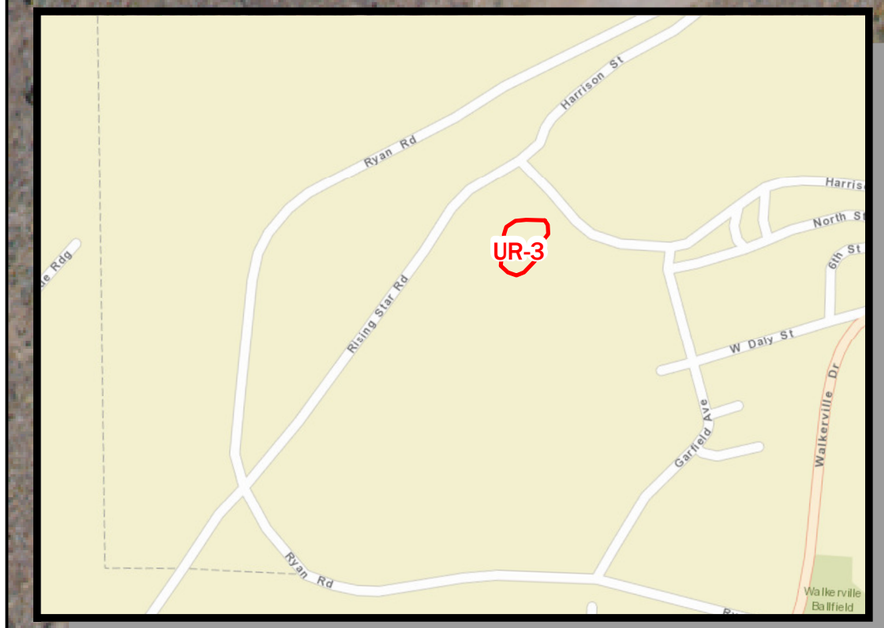
Atlantic Richfield Company, 2018. Butte Priority Soils Operable Unit (BPSOU) Final Missoula Gulch Catch Basins (CB-1, CB-8, and CB-9) Operations and Maintenance Plan. Atlantic Richfield Company, July 24, 2018.

Atlantic Richfield Company, 2021. Unreclaimed Sites Quality Assurance Project Plan. Atlantic Richfield Company, June 2021.

BSB, 2016. Butte-Silver Bow Monthly Report. November 2016

EPA, 2020. Consent Decree for the Butte Priority Soils Operable Unit. Partial Remedial Design/Remedial Action and Operation and Maintenance. U.S. Environmental Protection Agency. February 13, 2020. Available at https://www.co.silverbow.mt.us/2161/ButtePriority-Soils-Operable-Unit-Conse. Appendix A of the Consent Decree contains the 2006 Record of Decision.

Figures



HUMAN HEALTH EXCEEDANCE

NO EXCEEDANCE

UNRECLAIMED SITE BOUNDARY

N

DISPLAYED AS:
PROJECTION/ZONE: MSP
DATUM: NAD 83
UNITS: INT'L FT
SOURCE: PIONEER/QSI 2020

0 15 30 60
Feet

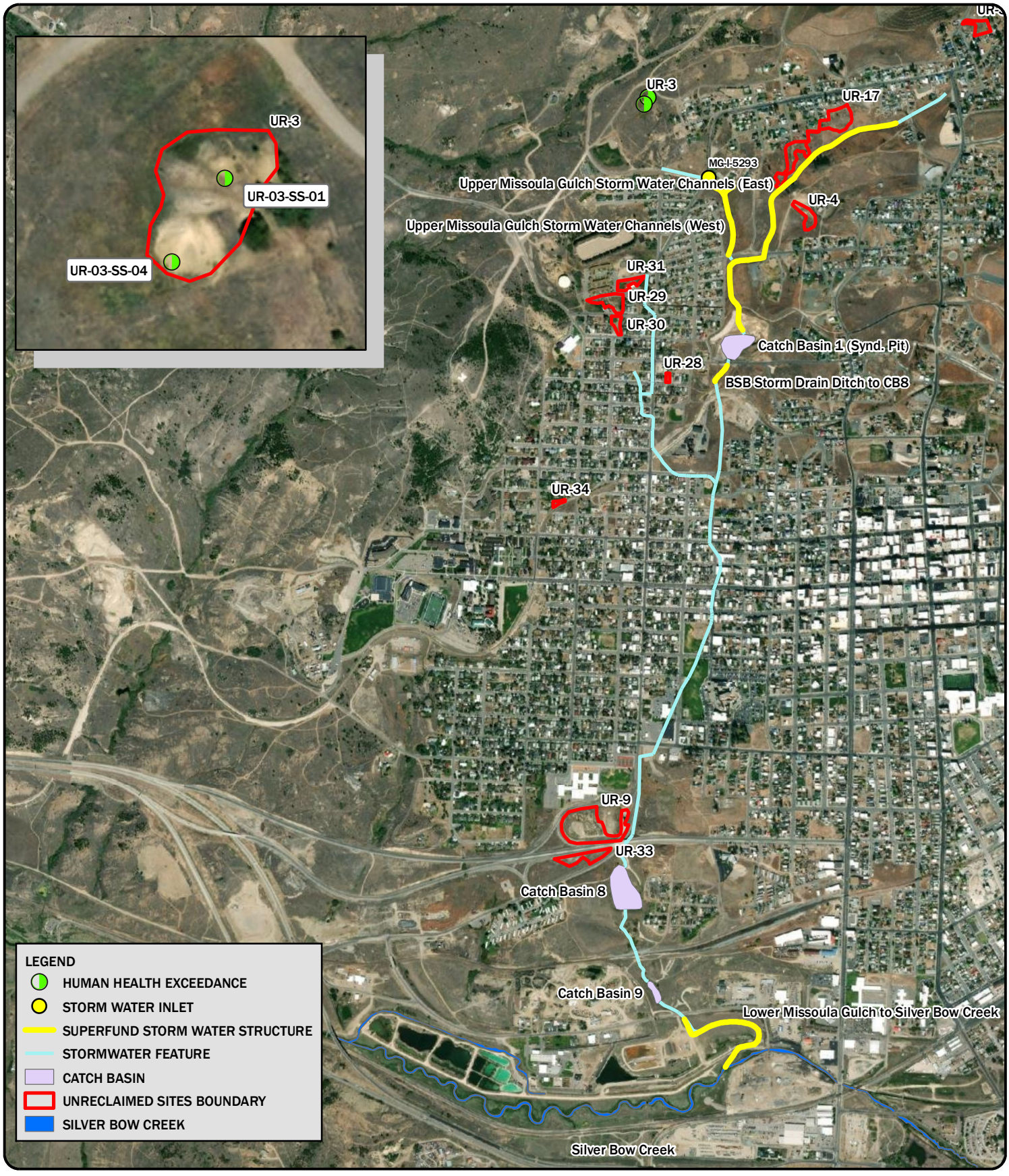
FIGURE 1

PIONEER TECHNICAL SERVICES, INC.

DATE: 3/14/2022

UR-03
2021 UR SITES
SAMPLING AND
EXCEEDANCES

Path: Z:\Shared\Active Projects\ARCO\BPSOU\LandSupport\SolidMedia\Insufficiently_Unreclaimed\SamplingResults\UR_Sampling\UR_Res_UR03_22.mxd



N

DISPLAYED AS:
PROJECTION/ZONE: MSP
DATUM: NAD 83
UNITS: INT'L FT
SOURCE: PIONEER/BSB/QSI 2020

0 800 1,600 3,200
Feet

FIGURE 2

PIONEER TECHNICAL SERVICES, INC.

UNRECLAIMED SITES
UR-03
STORM WATER FEATURES

DATE: 8/3/2022

Path: Z:\Shared\Active Projects\ARCO\BPSOU\LandSupport\SolidMedia\Insufficiently_Unreclaimed\UR_Sampling\DRAINAGE\UR03_SW.mxd

Tables

Table 1. BPSOU Soil Screening Criteria

Analyte	Solid Media	Action/Screening Levels
Lead[1]	Residential	1,200 mg/kg
Arsenic[1]	Residential	250 mg/kg
Mercury[1]	Residential	147 mg/kg
Cadmium [2]		20 mg/kg
Copper [2]		1,000 mg/kg
Zinc [2]		1,000 mg/kg
Lead [2]		1,000 mg/kg
Arsenic [2]		200 mg/kg
Mercury [2]		10 mg/kg

1. From EPA Record of Decision (ROD) BPSOU, Table 12-1 (EPA, 2006a).

2. Waste Identification Criteria in Table 1 in Appendix 1 of the BPSOU Consent Decree (EPA, 2020).

mg/kg: milligrams per kilogram

Table 2: New Data Summary

Station	FieldSampleID	Result Type	Arsenic (mg/kg)	Cadmium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Zinc (mg/kg)	1+ >HH std	3+ >SW std	1+ >5000	Exceed SW	Exceed
UR-03-SS-01	BPSOU-UR03SS01-102821-1	Lab	255.00	1.70 J	199.00 J-	177.00 J-	0.47	270.00 J	**TRUE**				**TRUE**
UR-03-SS-01	BPSOU-UR03SS01-102821-2	Lab	294.00	2.40	223.00	230.00	0.32	352.00	**TRUE**				**TRUE**
UR-03-SS-01	BPSOU-UR03SS01-102821-3	Lab	216.00	1.20	170.00	523.00	0.51	359.00					
UR-03-SS-02	BPSOU-UR03SS02-102821-1	Lab	184.00	0.25	45.70	70.10	0.12	114.00					
UR-03-SS-02	BPSOU-UR03SS02-102821-2	XRF	114.92	7.45 U	127.73	108.16	6.70 UJ	210.34					
UR-03-SS-02	BPSOU-UR03SS02-102821-3	Lab	118.00	0.40	127.00	126.00	0.10	211.00					
UR-03-SS-03	BPSOU-UR03SS03-102821-1	Lab	159.00	0.22	135.00	127.00	0.19	72.40					
UR-03-SS-03	BPSOU-UR03SS03-102821-2	Lab	184.00	0.15	97.50	126.00	0.16	54.30					
UR-03-SS-03	BPSOU-UR03SS03-102821-3	Lab	172.00	0.16	100.00	147.00	0.21	82.50					
UR-03-SS-04	BPSOU-UR03SS04-102821-1	Lab	229.00	0.12 A	81.30	225.00	0.08	55.00					
UR-03-SS-04	BPSOU-UR03SS04-102821-2	Lab	266.00	0.15	95.00	361.00	0.10	72.20	**TRUE**				**TRUE**
UR-03-SS-04	BPSOU-UR03SS04-102821-3	Lab	288.00	0.37	110.00	634.00	0.22	127.00	**TRUE**				**TRUE**
UR-03-SS-05	BPSOU-UR03SS05-102821-1	XRF	150.31	7.72 U	205.90	282.27	7.38 UJ	422.25					
UR-03-SS-05	BPSOU-UR03SS05-102821-2	XRF	108.32	8.23	140.75	159.02	7.02 UJ	533.05					
UR-03-SS-05	BPSOU-UR03SS05-102821-3	XRF	105.00	7.34 U	137.13	158.95	6.89 UJ	279.76					

Storm Water Screening Criteria Exceedance
Human Health Action Level Exceedance

Table 3: Exceedances									
Station	Arsenic (mg/kg)	Cadmium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Zinc (mg/kg)	1+ >HH std	3+ >SW std	1+ >5000
UR-03-SS-01	255.00	1.70 J	199.00 J-	177.00 J-	0.47	270.00 J	TRUE		
UR-03-SS-01	294.00	2.40	223.00	230.00	0.32	352.00	TRUE		
UR-03-SS-04	266.00	0.15	95.00	361.00	0.10	72.20	TRUE		
UR-03-SS-04	288.00	0.37	110.00	634.00	0.22	127.00	TRUE		

Human Health Action Level Exceedance

Appendix A
Data Summary Report
(includes Data Validation Report)

SILVER BOW CREEK/BUTTE AREA NPL SITE
BUTTE PRIORITY SOILS OPERABLE UNIT

Draft Final

2021 Unreclaimed Sites Sampling
UR-03 Data Summary Report (DSR)

Atlantic Richfield Company

August 2022

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BUTTE PRIORITY SOILS OPERABLE UNIT

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2021 Unreclaimed Sites Sampling
UR-03 Data Summary Report (DSR)

Prepared for:

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Prepared by:

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August 2022

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ATTACHMENTS

ABBREVIATIONS AND ACRONYMS

ACRONYM	DEFINITION	ACRONYM	DEFINITION
Atlantic Richfield	Atlantic Richfield Company	**NFG**	National Functional Guidelines
BPSOU	Butte Priority Soils Operable Unit	**NPL**	National Priorities List
CD	Consent Decree	**Pace**	Pace Analytical Services
CFRSSI	Clark Fork River Superfund Site Investigation	**Pioneer**	Pioneer Technical Services, Inc.
DI	Deionized	**QA**	Quality Assurance
DM/DV	Data Management/Data Validation	**QAPP**	Quality Assurance Project Plan
DQA	Data Quality Assessment	**QC**	Quality Control
DSR	Data Summary Report	**SOP**	Standard Operation Procedures
DVR	Data Validation Report	**UR**	Unreclaimed
EPA	Environmental Protection Agency	**XRF**	X-ray Fluorescence
FSP	Field Sampling Plan		

ABSTRACT

This Butte Priority Soils Operable Unit (BPSOU) Unreclaimed (UR) Sites Data Summary Report (DSR) presents results of the subsurface soil sampling conducted on October 28, 2021, at the UR source area UR-03 within the BPSOU.

For the event, 5 sample stations were sampled by collecting 3-point composite samples at 3 depth intervals. Each sample was analyzed in the field for pH and by X-ray fluorescence (XRF) for arsenic, cadmium, copper, lead, mercury, and zinc; 11 soil samples of the 15 collected were analyzed by the laboratory for arsenic, cadmium, copper, lead, mercury, zinc, and percent moisture. One field duplicate was submitted to the laboratory for the sampling event.

This DSR was prepared by Pioneer Technical Services, Inc. (Pioneer), 1101 S. Montana Street, Butte, Montana, 59701 for:

Atlantic Richfield Company
317 Anaconda Road
Butte, Montana 59701

The information presented in this DSR includes laboratory analytical results from the sampling events.

STATEMENT OF AUTHENTICITY

Consistent with the provisions described in the 2020 U.S. Environmental Protection Agency (EPA) *BPSOU Consent Decree* (CD) (EPA, 2020a), the data sets referenced in this document are considered to be final data generated or evaluated. Data have been designated as enforcement quality and screening quality as described in the *Clark Fork River Superfund Site Investigations* (CFRSSI) *Quality Assurance Project Plan* (QAPP) (ARCO, 1992a) and the *CFRSSI Data Management/Data Validation* (DM/DV) *Plan* (ARCO, 1992b), as supplemented by the *CFRSSI DM/DV Plan Addendum* (AERL, 2000a). Consistent with the aforementioned orders, the signatories below hereby stipulate the authenticity and accuracy of the data and hereby waive any evidentiary or other objection as to the authenticity and accuracy of reference in endangerment assessments, public health evaluations, feasibility studies, and remedial design/remedial action documents.

Approved by: _____ _____
Mike Mc Anulty — Date
Liability Manager
Atlantic Richfield Company

Approved by: _____ _____
Nikia Greene — Date
Remedial Project Manager
U.S. Environmental Protection Agency
Region VIII

Approved by: _____ _____
Daryl Reed — Date
State Project Officer
Montana Department of Environmental Quality

Approved by: _____ _____
Scott Sampson — Date
Project Manager
Pioneer Technical Services, Inc.

EXECUTIVE SUMMARY

This BPSOU UR Sites DSR presents the results of the subsurface soil sampling conducted on October 28, 2021, at the UR source area UR-03 within the BPSOU.

Sampling was conducted under the guidelines of the *BPSOU UR Sites Final Field Sampling Plan (FSP) #7: UR-01, UR-02, UR-03, UR-04, UR-15, and UR-17* (Atlantic Richfield Company, 2021a) (referred to herein as FSP) and the 2021 *Final UR Sites QAPP* (Atlantic Richfield Company, 2021b) (referred to herein as QAPP). Information and data from the sampling efforts will be used to characterize the potential contamination at the Site and evaluate potential human health and ecological risks.

This DSR includes all field XRF and soil pH data, laboratory analytical data, and data validation packages. This DSR does not include any analysis or interpretation of the data by Atlantic Richfield Company (Atlantic Richfield).

Paste pH and natural soil samples were collected from 5 sample stations (Figure 1). Each sample station was determined based on preliminary Site investigations and Agency approval.

In total, 5 sample stations were sampled by collecting 3-point composite samples at 3 depth intervals. Each sample was analyzed in the field for pH and by XRF for arsenic, cadmium, copper, lead, mercury, and zinc; 11 soil samples of the 15 collected were analyzed by the laboratory for arsenic, cadmium, copper, lead, mercury, zinc, and percent moisture. One field duplicate was submitted to the laboratory for the sampling event. Pioneer submitted soil samples to Pace Analytical Services, LLC (Pace) in Minneapolis, Minnesota.

Analytical results were reported in a standard data package.

A data validation system was implemented consistent with the procedures described in the CFRSSI DM/DV Plan (ARCO, 1992b) and subsequent addendum (AERL, 2000a). The format for this DSR is consistent with the format established in the *CFRSSI Pilot Data Report Addendum* (AERL, 2000b).

1.0 INTRODUCTION

This report presents the results of soil sampling and analysis for the UR Site investigation conducted on October 28, 2021, at the UR source area UR-03 within the Silver Bow Creek/Butte Area National Priorities List (NPL) Site BPSOU area. Activities were consistent with the provisions described in Appendix D of the BPSOU CD (EPA, 2020a). Historical results from previous investigations are summarized in the FSP. The information contained in this report was gathered according to objectives and procedures documented in the FSP and according to the overall soil sampling, analysis objectives, and requirements outlined in the QAPP.

Information referenced throughout this DSR is included in the appendices below:

- Attachment A Data Validation Report (DVR).
- Attachment B Field Forms and Related Documents.
- Attachment C Laboratory Data Packages.
- Attachment D Electronic Data Deliverable File (included separately).

This investigation's field notebook and datasheets are located at the Atlantic Richfield Contractor (Pioneer) office in Butte, Montana.

All characterization activities and procedures in 2021 followed the QAPP. Sample stations were determined based on preliminary Site investigations and Agency approval. The QAPP describes the quality assurance (QA) and quality control (QC) policies and procedures used during sample collection and analysis. Samples were obtained from the sample stations identified in Table 1 and listed below, following the FSP.

Station Field Identification	Sample Identification
UR-03-SS-01	BPSOU-UR03SS01-102821-X
UR-03-SS-02	BPSOU-UR03SS02-102821-X
UR-03-SS-03	BPSOU-UR03SS03-102821-X
UR-03-SS-04	BPSOU-UR03SS04-102821-X
UR-03-SS-05	BPSOU-UR03SS05-102821-X

*X indicates sample depth interval.

The collected samples were analyzed by XRF. A subset of the samples was sent to Pace in Minneapolis, Minnesota, for laboratory analyses as listed in Section 3.1.4, Table 5 of the QAPP. The data verification and validation for the XRF and laboratory results are included in Attachment A. All data included in this report are provided as final.

Personnel from Pioneer completed the soil sampling activities. The collected soil data had to undergo rigorous sampling and analysis procedures and meet QA/QC protocols and documentation requirements to be designated as enforcement quality. All data underwent a Stage 2A verification and validation according to EPA *National Functional Guidelines* (NFG) *for Inorganic Superfund Data Review* (EPA, 2020b) and EPA *Guidance for Labeling Externally Validated Laboratory*

Analytical Data for Superfund Use (EPA, 2009). All data presented herein have undergone data validation according to the CFRSSI DM/DV Plan Addendum (AERL, 2000a). Section 3.0 and Attachment A provide information about data quality and validation.

This DSR contains the following information:

- Investigation objectives (Section 1.1).
- Site description and background (Sections 1.2 and 1.3).
- Data quality assessment (Section 2.0).
- Project objectives and sampling design review (Section 2.1).
- Preliminary data review (Section 2.2).
- Conclusions on the quality of the data (Section 2.3).
- Sampling and analysis summary (Section 3.0).
- Deviations (Section 4.0).

Pioneer developed the Standard Operating Procedures (SOPs) that were followed according to the *CFRSSI SOPs* (ARCO, 1992c), and they are included in the QAPP. The SOPs were followed for sampling, data collection, and field/office protocols.

1.1 Investigation Objectives

The QAPP listed the following two objectives:

- The Site will be sampled at three depth intervals: (1) 0 to 2 inches, (2) 2 to 6 inches, and (3) 6 to 12 inches at the Site-specific approved sample stations.
- Opportunistic samples may be obtained in the field at the discretion of field sampling personnel or Agency oversight representative(s). The field team leader will be responsible for determining the appropriate sampling protocol as dictated by the location of the opportunistic sample(s).

The results of the investigation will supplement existing data contained within the Atlantic Richfield Geocortex historical database cited in the FSP. This data will be used to make a Site declaration specifying any areas that do not meet the human health or storm water criteria per Table 1 and Table 2 in the QAPP.

1.2 Investigation Site Description

The UR sites within the BPSOU could pose a threat to human health or surface water quality due to the presence of historical mine waste. Although many source areas have been previously reclaimed, areas still exist in which soil has not yet been evaluated; such sites may provide a pathway for human exposure or impact surface water quality via storm water runoff. The UR-03 Site was assessed per the QAPP.

This DSR describes the activities conducted for soil sampling and characterization at the UR-03 Site. Supplemental information provided in the FSP described the 2021 investigation. Sample stations were determined based on preliminary Site investigations and Agency approval to quantify

the potential for human health impacts and/or storm water impacts at depth intervals of 6 to 12 inches, 2 to 6 inches, and 0 to 2 inches.

The following figure summarizes the 2021 sampling effort:

- Figure 1 displays proposed and sampled stations for the 2021 sampling event.

1.3 Background

Site UR-03 is approximately 0.3 acre and is located in the northwestern part of Walkerville, Montana. The Site is southwest of the intersection of Rising Star Road and Harrison Street (or Dewey Point Road) (Figure 1). Atlantic Richfield Company owns most of the Site. A private third-party resident owns a small portion in the southern part of the Site. Site UR-03 is vacant land, consisting of several waste rock dumps across most of the Site. The Site is mostly bare ground. On top of the piles, there are approximately 3-foot diameter depressions from the ground settling or small excavation activities. A residential area in Walkerville is located approximately 400 feet to the southeast. The Site is in the Missoula Gulch drainage basin.

2.0 DATA QUALITY OBJECTIVES AND ASSESSMENT

The objective of the Data Quality Assessment (DQA) process (EPA, 2000) is used to determine whether the project-specific objectives have been satisfied and if the analytical results are acceptable for project decision making. The DQA process consists of five steps that relate the quality of the results to the intended use of the data:

Step 1: Review sampling design (Section 2.1).
Step 2: Conduct preliminary data review (Section 2.2).
Step 3: Select statistical test(s), as appropriate, to evaluate data quality (not applicable).
Step 4: Verify assumptions (not applicable).
Step 5: Draw conclusions about the quality of the data (Section 2.3).

2.1 Project Objectives and Sampling Design Review

Project-specific objectives were defined in the FSP to cover the sampling design requirements outlined in the QAPP.

2.2 Preliminary Data Review

A preliminary data review was conducted to determine if any problems or anomalies were present in the sample collection and analysis procedures. This was completed by evaluating data quality indicators (Section 2.2.1) followed by data verification and validation (Attachment A).

2.2.1 Data Quality Indicators

The DQA process evaluates the results against data quality indicators of precision, accuracy, representativeness, comparability, completeness, and sensitivity. An evaluation of each data quality indicator is included in the DVR (Attachment A).

2.3 Data Quality Conclusions

The laboratory samples were collected using standard sampling methods and relevant Pioneer SOPs. The sampling design, SOPs, and laboratory analytical methods were based on EPA and other industry-standard practices. Laboratory analytical methods are provided in Table 5 of the QAPP. Sample collection was completed by professionals properly trained in following SOPs and using the equipment. Proper chain of custody and sample handling activities were observed during sample collection, delivery to the laboratory, and analysis. The analytical laboratories performed the sample analyses using industry-standard methods. The validation checklists are included in the DVR (Attachment A), and all data met the Level A and Level B criteria.

Data generated from the samples were examined to ensure that project objectives were met. The data quality objectives for the investigation are listed in the QAPP, Section 2.4. A data QA/QC review was completed for the sampling event.

For the 2021 Site sampling event, a total of 15 natural soil samples were collected. All samples were analyzed by XRF, and 11 samples were sent to Pace for laboratory analysis. This resulted in a total of 90 natural data points generated by the XRF analyses and 77 natural data points generated by the laboratory analysis. Of the data points, 15 (17%) XRF natural data points were designated screening quality, and 75 (83%) XRF natural data points were designated as enforcement quality. For the laboratory natural data points, 5 (6%) were designated screening quality, and 72 (94%) laboratory natural data points were designated as enforcement quality. No data were rejected. The DVR (Attachment A) includes a summary of the analysis. Please note that 15 of the 15 (100%) screening quality XRF data points were qualifications made to the mercury results due to the lack of a calibration check sample (Section 2.2.3 of the DVR). Based on the data quality conclusions in the DSR, the data analyzed in the 2021 sampling event were deemed usable.

3.0 SAMPLING AND ANALYSIS SUMMARY

This section summarizes completed tasks that addressed the monitoring objectives described in the QAPP, including sampling methods, field analysis methods, and analytical results for the UR soil sampling.

3.1 Soil Sample Collection

Samples were collected following procedures detailed in the QAPPs referenced in Section 1.0, except where modifications of the sampling design or procedures were required. Any modifications are listed in Section 4.0. Sample station locations were selected in cooperation and agreement with Agency oversight personnel.

The general sampling approach consisted of hand-dug pits. The UR Site sampling proceeded as follows.

Sample stations were determined based on preliminary Site investigations and the Agency-approved FSP. Field personnel and representatives from the Agencies (when present) made decisions regarding collection of additional "opportunistic" samples to characterize the Site conditions and characteristics accurately. A minimum of 3 combination samples (9 subsamples) were collected in a 3-point (triangular) pattern. At each point, a subsample of predetermined depth was collected. As a rule, the diagonal distance between the points was 10 feet, depending on the area of soil homogeneity. The diagonal distance could be adjusted in the field to account for soil differences and the presence of obstacles. Three discrete aliquots of equal amounts of soil from each designated subsample location were composited into 1 sample. Materials such as plant matter, debris, and large rocks were removed, to a reasonable extent, prior to placing the sample in the sample container for laboratory analysis. A portion of the natural sample was placed into a #10 (2 millimeter) disposable sieve screen prior to running the XRF analyses, and a portion was used for pH analysis. After XRF analyses were complete, the sample was archived in the Pioneer Butte, Montana, office. Samples were collected from the 0- to 12-inch depth at 0- to 2-inch, 2- to 6-inch, and 6 to 12-inch intervals.

3.1.1 Sample Analysis

3.1.1.1 pH

The general UR Site pH analysis proceeded as follows per SOP-SFM-01 in Attachment B of the QAPP:

Composite paste pH samples were collected using disposable trowel scoops, plastic cups, and deionized (DI) water. Approximately 1 inch of fine material was scooped from the sieved material into the bottom of the cup. The DI water was added to the sample, and the cup was swirled until a paste was made. Soil pH results are included in Attachment B. The Hanna Instruments HI 99121 meter was used to measure the paste pH sample. The meter was decontaminated with DI water after each use. The collected soil was returned to the area where the sample was collected, and the tools were discarded.

3.1.1.2 XRF

The general XRF analyses proceeded as follows per SOP-SFM-02 in Attachment B of the QAPP:

Field personnel thoroughly homogenized the natural sample in the bag by kneading the soil, split approximately 1 disposable trowel scoop from the natural sample, and placed the split sample into a #10 sieve inside a gallon resealable plastic bag (i.e., Ziploc®). The sieved sample was transferred into an additional 1-quart resealable plastic bag so that it fit in the analyzer measurement stand. The material was compacted so that there was a flat surface on the area to be analyzed and visually inspected to ensure that only fines were present. The sample bag was placed on the XRF stand and analyzed. The results were recorded for the selected metals on the XRF field datasheet. Field

personnel completed duplicate and replicate XRF analyses on at least 5% of the samples analyzed in the XRF unit.

Soil samples for arsenic, cadmium, copper, mercury, lead, zinc, percent moisture, and associated QA/QC samples were packaged and shipped to Pace for analysis. Field forms are in Attachment B, analytical reports are in Attachment C, data deliverable files are in Attachment D, and soil results (including QA/QC samples), applicable laboratory flags, data validation qualifiers, and reason codes are included in the tables in the DVR in Attachment A.

3.1.1.3 Laboratory Samples

The general laboratory sampling proceeded as follows per SOP-S-01 and SOP-SA-01 in Attachment B of the QAPP:

Composite soil samples were collected in a labeled plastic bag and homogenized after each subsample was collected. After the sample was collected from the 3-point composite, a portion of the sample was removed and placed in a #10 sieve within a separate resealable plastic bag (XRF analysis described in Section 3.1.1.2 above). Field personnel then sent every 1 per 10 samples, with additional samples sent to the laboratory for confirmation if the field results were within the contaminant of concern action/screening levels (Table 1 and Table 2 within the QAPP) at 35% above and 35% below. Lab samples were analyzed for arsenic, cadmium, copper, lead, mercury, zinc, and percent moisture.

4.0 DEVIATIONS

During the sampling event, there were no deviations to the QAPP or FSP.

5.0 REFERENCES

AERL, 2000a. Clark Fork River Superfund Site Investigations Data Management/Data Validation Plan Addendum. June 2000.

AERL, 2000b. Clark Fork River Superfund Site Pilot Data Report Addendum. July 2000.

ARCO, 1992a. Clark Fork River Superfund Site Investigations Quality Assurance Project Plan. May 1992. Prepared by PTI Environmental Services.

ARCO, 1992b. Clark Fork River Superfund Site Investigations Data Management/Data Validation Plan. May 1992. PTI Environmental Services, Contract C 117-06-64, April 1992.

ARCO, 1992c. Clark Fork River Superfund Site Investigations Standard Operating Procedures. September 1992.

Atlantic Richfield Company, 2021a. BPSOU Unreclaimed Sites Final Field Sampling Plan Package #7: UR-01, UR-02, UR-03, UR-04, UR-15, and UR-17. October 2021.

Atlantic Richfield Company, 2021b. Final Unreclaimed Sites Quality Assurance Project Plan. June 2021.

EPA, 2000. Guidance for Data Quality Assessment: Practical Methods for Data Analysis. EPA QA/G-9. U.S. Environmental Protection Agency, July 2000.

EPA, 2009. Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use. U.S. Environmental Protection Agency, January 2009.

EPA, 2020a. Consent Decree for the Butte Priority Soils Operable Unit. Partial Remedial Design/Remedial Action and Operation and Maintenance. U.S. Environmental Protection Agency. February 13, 2020. (Appendix A of the CD contains the EPA 2006 Record of Decision, 2011 Explanation of Significant Differences to the 2006 Record of Decision, and the 2020 Record of Decision Amendment). Available at https://www.co.silverbow.mt.us/2161/ButtePriority-Soils-Operable-Unit-Conse.

EPA, 2020b. U.S. Environmental Protection Agency National Functional Guidelines for Inorganic Superfund Data Review. January 2017.

Figures

Figure 1. Unreclaimed Sites UR-03 Sample Stations

2021 SAMPLED STATIONS

PROPOSED SAMPLE STATIONS

UNRECLAIMED SITES BOUNDARY

N

DISPLAYED AS:
PROJECTION/ZONE: MSP
DATUM: NAD 83
UNITS: INT'L FT
SOURCE: PIONEER/QSI 2020

0 12.5 25 50
Feet

FIGURE 1

PIONEER TECHNICAL SERVICES, INC.

Unreclaimed Sites
UR-03
2021 Sample Stations

DATE: 3/14/2022

Path: Z:\Shared\Active Projects\ARCO\BPSOU\LandSupport\SolidMedia\Insufficiently_Unreclaimed\UR_Sampling\Unreclaimed_Samplelocations_UR03.mxd

Tables

Table 1. Coordinates for Sample Stations and Identification

Table 1. Coordinates for Sample Stations and Identification			
Station Field Identification	Sample Identification	Northing	Easting
UR-03-SS-01	BPSOU-UR03SS01-102821-X	663642.009	1194262.715
UR-03-SS-02	BPSOU-UR03SS02-102821-X	663603.988	1194234.851
UR-03-SS-03	BPSOU-UR03SS03-102821-X	663579.509	1194267.403
UR-03-SS-04	BPSOU-UR03SS04-102821-X	663561.28	1194211.153
UR-03-SS-05	BPSOU-UR03SS05-102821-X	663649.301	1194237.715

Attachment A
Data Validation Report (DVR)

SILVER BOW CREEK/BUTTE AREA NPL SITE
BUTTE PRIORITY SOILS OPERABLE UNIT

Draft Final

2021 Unreclaimed Sites Sampling UR-03
Data Validation Report

Atlantic Richfield Company

August 2022

SILVER BOW CREEK/BUTTE AREA NPL SITE
BUTTE PRIORITY SOILS OPERABLE UNIT

Draft Final

2021 Unreclaimed Sites Sampling UR-03
Data Validation Report

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August 2022

TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF ATTACHMENTS

ACRONYMS AND ABBREVIATIONS

Acronym	Definition
%R	Percent Recovery
BPSOU	Butte Priority Soils Operable Unit
CCS	Calibration Check Sample
CFRSSI	Clark Fork River Superfund Site Investigation
COC	Contaminants Of Concern
DM/DV	Data Management/Data Validation
DV	Data Validation
DVR	Data Validation Report
EPA	U.S. Environmental Protection Agency
FSP	Field Sampling Plan
GFAA	Graphite Furnace Atomic Absorption Spectrometry
ICP	Inductively Coupled Plasma
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LDS	Laboratory Duplicate Sample
LMS	Laboratory Matrix Spike
LMSD	Laboratory Matrix Spike Duplicate
LOD	Limit of Detection
MB	Method Blank
MDL	Method Detection Limit
mg/kg	milligram per kilogram
NFG	National Functional Guidelines
Pace	Pace Analytical Services, LLC
Pioneer	Pioneer Technical Services, Inc.
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RL	Reporting Limit
RPD	Relative Percent Difference
SDG	Sample Delivery Group
SiO_2	Silicon Dioxide
SOP	Standard Operating Procedure
SRM	Standard Reference Materials
UR	Unreclaimed
XRF	X-Ray Fluorescence

DOCUMENT MODIFICATION SUMMARY

Revision No.	Author	Version	Description	Date
Rev 0	Sara Ward	Draft	Issued for Internal Review	3/16/2022
Rev 1	Sara Ward	Draft Final	Issued for Agency Review	8/03/2022

1.0 DATA VALIDATION REPORT SUMMARY

This Data Validation Report (DVR) summarizes the X-ray fluorescence (XRF) and laboratory analytical results from samples collected from the Unreclaimed (UR) UR-03 Site (referred to as Site). The samples were collected per the *Final Butte Priority Soils Operable Unit (BPSOU) Unreclaimed Sites Field Sampling Plan (FSP) Package #7: UR-01, UR-12, UR-03, UR-04, UR-15, and UR-17* (Atlantic Richfield Company, 2021a) (referred to herein as the FSP). The 2021 UR-03 sampling event included samples collected under the 2021 *Unreclaimed Sites Quality Assurance Project Plan* (QAPP) (Atlantic Richfield, 2021b) (referred to herein as the QAPP).

All data have undergone a Stage 2A data validation as defined in the U.S. Environmental Protection Agency (EPA) *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use* (EPA, 2009). Data validation was conducted in accordance with the QAPP, the *Clark Fork River Superfund Site Investigation* (CFRSSI) *Data Management/Data Validation* (DM/DV) *Plan* (ARCO, 1992a) and *CFRSSI DM/DV Plan Addendum* (AERL, 2000), the *CFRSSI QAPP* (ARCO, 1992b), *EPA National Functional Guidelines* (NFG) *for Inorganic Methods Superfund Data Review* (EPA, 2020), analytical methods, and laboratory standard operating procedures (SOPs). The 2020 EPA NFG for Inorganic Methods Superfund Data Review was followed since it is the most current version. This report details the evaluation of field XRF and laboratory data for the purpose of usability.

This document refers to the tables and attachments below.

- Table A1 contains the natural sample results with laboratory qualifiers; data validation qualifiers; enforcement, screening, and rejected classifications; and data validation reason codes.
- Table A2 contains the field duplicate pair samples with results, laboratory qualifiers, data validation qualifiers, data validation reason codes, and quality control (QC) criteria assessment.
- Table A3 contains sample identification information including the field sample name, sample type, sample location, laboratory sample name, sample date, analytical methods, and analytes.
- Table A4 contains the definitions for the laboratory qualifiers; data validation qualifiers; enforcement, screening, and rejected classification codes; and data validation reason codes.
- Table A5 contains the XRF Silicon Dioxide (SiO_2) Standard and Calibration Check Sample (CCS) results.
- Table A6 contains the XRF duplicate and replicate sample results and QC criteria assessment.
- Attachment 1 contains the data validation checklists. Attachment 1.1 and Attachment 1.2 contain the checklists for XRF analysis and laboratory analysis, respectively.

- Attachment 2 contains the Level A/B Assessment Checklist.
- Attachment 3 contains the QC criteria used in the data validation process.

The instrument output for XRF data, produced by Pioneer Technical Services, Inc. (Pioneer), was used to perform the data validation of the XRF results, and the standard data packages received from Pace Analytical Services, LLC (Pace) were used to perform the data validation of the laboratory results.

All data met the Level A and B criteria. Based on the validation process outlined in the CFRSSI DM/DV Plan (ARCO, 1992a), the quality of the data is ranked as enforcement quality, screening quality, or it is rejected. Enforcement quality data are defined in the CFRSSI DM/DV Plan as data that meet the Level A and B criteria (Attachment 2) and are not qualified as estimated or rejected after the data validation process. For sample results qualified as estimated "J" by the laboratory because the reported result is between the method detection limit (MDL) and analytical reporting limit (RL), values are considered enforcement data if no other qualifiers were required during validation. Enforcement quality data may be used for all purposes under the Superfund program including the following: site characterization, health and safety, engineering evaluation/cost analysis, remedial investigation/feasibility studies, evaluation of alternatives, confirmational purposes, risk assessments, and engineering design. As all samples met the Level A and B documentation criteria, the results that were not qualified as estimated (e.g., J, J+, J-, or UJ) or rejected for some exceedance of quality assurance (QA)/QC criteria were considered "enforcement" quality data and were assigned an "E" in Table A1. Screening quality data, as defined in the CFRSSI DM/DV Plan, are those samples that do not meet the Level B criteria and/or were qualified as estimated (e.g., J, J+, J-, or UJ) during the data validation process. Potential uses of screening quality data, depending on their quality, include site characterization, determining the presence or absence of contaminants, developing or refining sampling and analysis techniques, determining relative concentrations, scoping and planning for future studies, engineering studies and engineering design, and monitoring during implementation of the response action. Sample results that were qualified as estimated during the validation process were considered "screening" quality data and assigned an "S" in Table A1.

Data rejected during data validation cannot be used for any Superfund activities. No results were rejected.

The summary of data points in this DVR includes only the natural samples and does not include the field QC samples (the field duplicate). Note that the field QC samples underwent the same data validation procedures as the natural samples, and the results are included on the data validation checklists in Attachment 1. The qualifications made to field QC samples are listed in Table A2; however, the qualifications made to these samples are not included in the summary of qualifications made to natural data points, and the field QC samples are not included in Table A1.

For the 2021 Site sampling event, a total of 15 natural soil samples were collected. All samples were analyzed in the field by XRF, and 11 samples were sent to Pace for laboratory analysis of metals. This resulted in a total of 90 natural data points generated by the XRF analyses and 77

natural data points generated by the laboratory analysis. A summary by analysis type is shown below:

Analysis Type	Natural Samples	Data Points	Enforcement Quality Data Points (% of total)	Screening Quality Data Points (% of total)	Rejected Data Points (% of total)
XRF	15	90	75 (83%)	15 (17%)	0 (0%)
Pace	11	77	72 (94%)	5 (6%)	0 (0%)

Please note that 15 of the 15 (100%) screening quality XRF data points were qualifications made to the mercury results due to the lack of a CCS with a known amount of mercury, as discussed in Section 2.2.3.

Table A1 shows the laboratory qualifiers, data validation qualifiers, enforcement or screening designators, and the reason code for the qualification for each natural data point.

2.0 QUALITY ASSURANCE/QUALITY CONTROL REVIEW OF INORGANIC DATA

The QC criteria used during the data validation process are listed in Attachment 3.

For XRF data, the QC criteria were derived from the QAPP, the CFRSSI DM/DV Plan (ARCO, 1992a) and DM/DV Plan Addendum (AERL, 2000), the CFRSSI QAPP (ARCO, 1992b), the Niton XL3 Mining QC Sheet (ThermoFisher Scientific, 2014), and the Pioneer SOP for operating the XL3 XRF analyzer (SOP-SFM-02) (included in the QAPP).

For laboratory data, the QC criteria were derived from the QAPP, CFRSSI DM/DV Plan Addendum (AERL, 2000), the NFG for Inorganic Superfund Data Review (EPA, 2020), analytical methods, and method-specific laboratory SOPs.

Data validation checklists derived from the CFRSSI DM/DV Addendum (AERL, 2000) were completed for the XRF data and each laboratory report (Attachment 1). Below are the deviations made to the checklists provided in the CFRSSI DM/DV Addendum guidance document:

- The Laboratory Data Validation Checklist for Metals Analysis by Spectrace XRF was revised slightly to more accurately reflect the information provided by the XRF Analyzer (Niton XL3). The checklist is included in Attachment 1.1. The guidelines for XRF QA and QC are listed in Section 3.6 (QA/QC) of the QAPP.
- The Laboratory Data Validation Checklist for Metals Analysis by Inductively Coupled Plasma (ICP) or Graphite Furnace Atomic Absorption Spectrometry (GFAA) was revised slightly to more accurately reflect the information provided in the full data packages provided by Pace and the requirements listed in the NFG (EPA, 2020). The checklist is included in Attachment 1.2.
- The Data Validation Checklist for Field Quality Control was not filled out for each data package. Sections on field duplicates were added to each Laboratory Data Validation Checklist worksheet.

The relevant data validation checklists were completed for each sample delivery group (SDG) and included the data validation performed for the methods and analytes listed below:

Data Validation Checklist	Method	Analyte(s)
XRF	XRF	Arsenic, Cadmium, Copper, Lead, Mercury, and Zinc
Laboratory: Pace	EPA 6010D	Arsenic, Cadmium, Copper, Lead, and Zinc
	EPA 7471B	Mercury
	ASTM D2974	Percent Moisture

One Level A/B Assessment was completed for the Site (Attachment 2).

2.1 Field Quality Control Samples

The QAPP requirement for field duplicate collection frequency is 1 field duplicate sample per 20 natural samples or once per sampling event, whichever is more frequent. Disposable sampling equipment was used to collect soil samples; therefore, equipment rinsate blanks were not collected.

Any qualifications required based on the field QC sample results are detailed in the data validation checklists (Attachment 1) and are listed in Table A1 and Table A2.

Please note that although the field QC samples (field duplicate samples) may receive a qualifier during the data validation process, the enforcement and screening quality summaries and the precision and accuracy assessment summaries do not include the field QC sample results. Only the results of the natural samples are included in the data quality assessment summaries.

2.1.1 Field Duplicate

During the sampling event, 1 field duplicate sample was collected for the 11 natural samples submitted to Pace for analysis (9.1%); therefore, the collection frequency requirement for field duplicates (5%) was met.

The analytical RLs presented in the laboratory reports were used to evaluate the field duplicates. The field duplicate QC criteria assessments are listed in Table A2.

For the 15 natural XRF samples collected at the Site, 1 field duplicate sample (6.7%) was analyzed; therefore, the collection frequency requirement for field duplicates (5%) was met.

The QC criteria used to assess field duplicate pair results during data validation are listed in Attachment 3. The field duplicate sample pairs and QC criteria assessments are listed in Table A2. If a field duplicate result was outside the control limit, the parent sample and any samples considered sufficiently similar were qualified as specified in Attachment 3. Any qualifications made to natural samples based on the field duplicate sample results are detailed in the data validation checklists (Attachment 1) and are listed in Table A1 and Section 4.1.

2.1.2 Equipment Rinsate Blank

Disposable sampling equipment was used to collect soil samples; therefore, equipment rinsate blanks were not collected.

2.2 XRF Quality Control Samples

This section summarizes the XRF QC samples evaluated during the data validation of the XRF results.

2.2.1 Energy Calibration Check

The energy calibration check determines whether the characteristic X-ray lines are shifting, which would indicate drift within the instrument. The requirement set forth in the QAPP was the performance of the preprogrammed energy calibration check on the equipment at the beginning of each working day. During the sampling event, the energy calibration check was performed at the beginning of each working day.

2.2.2 Silicon Dioxide Standard

The SiO_2 standard, as provided by Niton, is a "clean" quartz or silicon dioxide matrix that contains concentrations of selected analytes near or below the machine's lower limit of detection. Analysis results with the XRF instrument of this SiO_2 standard are used to monitor for cross contamination. The frequency requirement for SiO_2 standard sample analysis set forth in the QAPP is to complete analysis of this sample at the beginning of each day, once per every 20 samples, and at the end of each day's run sequence.

During the sampling event, the frequency requirement for SiO_2 standard samples was met. Results are listed in Table A5.

The SiO_2 standard sample results were within the control limits.

2.2.3 Calibration Check Samples

The CCSs help check the accuracy of the XRF instrument and assess the stability and consistency of the analysis for the analytes of interest. The CCSs used were the Niton-provided Standard Reference Materials (SRMs): NIST 2709a-Joaquin Soil (NIST 2709a) sample and a Resource Conservation and Recovery Act (RCRA) sample.

The frequency requirement for CCS analysis set forth in the QAPP is to complete analysis of at least 1 CCS at the start of each day, once per every 20 samples, and as the last analysis each day. The frequency requirement for CCS analyses was met. Results are listed in Table A5.

The CCS results were within the control limits. However, there was no CCS that had a known amount of mercury greater than the limit of detection (LOD) for mercury. Therefore, all detected mercury results have been qualified "J" and all non-detected mercury results have been qualified

"UJ." This resulted in 1 mercury result qualified "J" and 14 mercury results qualified "UJ" due to the lack of an appropriate CCS.

Qualification due to lack of an appropriate CCS standard are listed in Table A1.

2.2.4 XRF Duplicate and XRF Replicate Samples

The XRF duplicate and XRF replicate samples help check the precision of the XRF sampling method and instrument. The XRF duplicate sample was analyzed by removing the sample bag from the analytical stand, kneading it once or twice, and analyzing it a second time. The XRF replicate sample was analyzed immediately following the primary sample analysis by restarting the XRF to analyze the same sample a second time with the same soil in the XRF aperture.

The frequency requirement for XRF duplicate and XRF replicate samples set forth in the QAPP is the analysis of 1 sample per every 20 samples (5%).

For the 15 natural XRF samples collected at the Site, 1 duplicate sample (6.7%) and 1 replicate sample (6.7%) were analyzed. Therefore, the frequency requirement for XRF duplicate and XRF replicate samples (5%) was met for the Site.

Table A6 contains the XRF duplicate and XRF replicate sample pair results with the parent sample results and the QC criteria assessment. If the results were outside the control limit, the parent sample and any sample considered sufficiently similar were qualified "J" if the result was detected and "UJ" if the result was not detected.

The XRF duplicate and XRF replicate sample results were within the control limits.

2.3 Laboratory Quality Control Samples

The laboratory QC sample types vary depending on analytical method. The QC criteria used during data validation to evaluate the applicable laboratory QC samples are listed in Attachment 3 and Section 3.6 of the QAPP.

The Stage 2A data validation includes the evaluation of the following laboratory QC items as applicable per analytical method:

- Holding Times.
- Preservation.
- Method Blanks (MB).
- Laboratory Control Sample (LCS) and LCS Duplicates (LCSD).
- Laboratory Duplicate Samples (LDS).
- Laboratory Matrix Spike (LMS) and LMS Duplicates (LMSD).

The analytical RLs produced by each laboratory were used to evaluate the laboratory duplicates. The laboratory MDLs were used for the data review and validation of laboratory MB samples.

The appropriate laboratory QC samples were analyzed with each sample group. Any qualifications required based on the laboratory QC sample results are detailed in the data validation checklists (Attachment 1) and are listed in Table A1. Also refer to Section 4.1 and Section 4.2.

3.0 LEVEL A/B ASSESSMENT SUMMARY

Data that meet the Level A and Level B criteria and are not qualified as estimated or rejected are assessed as enforcement quality data and can be used for all Superfund purposes and activities. Data that meet only the Level A criteria and are not rejected can be assessed as screening quality data.

Screening quality data can be used only for certain activities, which include engineering studies and design. Data that do not meet both the Level A and B criteria are designated as unusable. The Level A/B Assessment Checklist for all samples collected for the Site is included as Attachment 2. Sample collection information was recorded in the field logbook, including sample collection date, location, and collection method. This information was reviewed for the Level A/B criteria.

As shown in Attachment 2, all the samples met both Level A and Level B criteria. No data were designated screening quality or rejected based on the results of the Level A/B assessment.

4.0 PRECISION, ACCURACY, REPRESENTATIVENESS, COMPARABILITY, COMPLETENESS, AND SENSITIVITY DATA SUMMARY

This section provides the precision, accuracy, representativeness, comparability, completeness, and sensitivity assessment for the XRF and laboratory data generated from samples collected during the 2021 Site sampling event.

4.1 Precision

Precision is the amount of scatter or variance that occurs in repeated measurements of a particular analyte.

4.1.1 XRF Precision

The precision control limit used for XRF soil samples was a relative percent difference (RPD) less than 35% when both sample results were detections. For XRF data, the precision assessment is based on the RPD of XRF duplicate, XRF replicate, and field duplicate sample pairs. If an RPD was outside the control limit, the parent sample and samples considered sufficiently similar to the parent sample were qualified. No natural samples were considered sufficiently similar enough to each other to require additional qualifications based on the variability of soil matrices. If the parent sample was a duplicate sample, the duplicate sample's parent sample was considered sufficiently similar and was qualified when applicable.

There were no qualifications made to the natural data points because the XRF duplicate, XRF replicate, or field duplicate pair results did not meet the control limit.

For the XRF results, 90 (100%) of the 90 natural XRF data points did meet the precision requirements.

4.1.2 Laboratory Precision

Acceptance or rejection of precision measurements is based on the RPD of the laboratory and field duplicates. For example, perfect precision would be a 0% RPD between duplicate samples (both samples have the same analytical result) for results that are greater than 5 times the laboratory RL. For total metals analysis, when both results are greater than 5 times the RL, acceptable precision is an RPD of plus or minus 35% in soil samples. For samples with 1 or both results less than 5 times the RL (including non-detect), acceptable precision is met if the absolute difference between the 2 sample results is less than 2 times the RL. This precision requirement is from Section 2.4.1 of the CFRSSI QAPP (ARCO, 1992b).

There were 3 instances where the field duplicate pair results from Pace did not meet the control limit. There was 1 instance where the laboratory duplicate pair results did not meet the control limit. This resulted in the qualification of 3 natural data points due to field duplicate and laboratory duplicate precision.

The natural samples qualified for poor field duplicate precision (Data Validation [DV] Reason Code = FD) and poor laboratory duplicate precision (DV Reason Code = D%) are listed below:

Field Sample ID	Method	Analyte	DV Qualifier	DV Reason Code
BPSOU-UR03SS01-102821-1	SW-846 6010D	Cadmium	J	FD
BPSOU-UR03SS01-102821-1	SW-846 6010D	Zinc	J	D%, FD
BPSOU-UR03SS01-102821-1	ASTM D2974	Moisture, Percent	J	FD

This resulted in 3 (4%) of the 77 natural laboratory data points that did not meet the precision requirements, and 74 (96%) of the 77 natural laboratory data points that did meet the precision requirements.

4.2 Accuracy

Accuracy is the ability of the analytical procedure to determine the actual or known quantity of a particular substance in a sample.

4.2.1 XRF Accuracy

For the XRF data, the SiO_2 standard and CCS are used to assess accuracy. The control limit for these samples is summarized in Attachment 3. If a SiO_2 standard or CCS result was outside the control limit, the natural sample results analyzed in the same run sequence were qualified.

If a SiO_2 standard had a detected result greater than the control limit, the natural sample results analyzed in the same analytical run were qualified "J+" if the natural sample result was a detected result less than 10 times the SiO_2 standard result.

All SiO_2 standard results were within control limits.

If the CCS result was outside the control limits summarized in Attachment 3, the natural sample results in the same analytical run as these CCS results were qualified as "J" for detected results or "UJ" for non-detected results.

All CCS analysis results were within the control limit.

For the XRF results, 90 (100%) of the 90 natural XRF data points met the accuracy requirements.

4.2.2 Laboratory Accuracy

For the laboratory data, MB, LCS, LCSD, LMS, and LMSD were used to assess accuracy. The QC criteria used during data validation for each QC sample are summarized in Attachment 3.

Laboratory blanks were analyzed to assess artifacts introduced during analyses that may affect the accuracy of the data. In accordance with the CFRSSI QAPP (ARCO, 1992b), a data point is qualified as "U" if it is less than 5 times an associated blank result (MB) that does not meet the control limit.

The percent recoveries (%R) of the LCS, LCSD, LMS, and LMSD are used to measure accuracy. The LCS and LCSD measure sample preparation and analysis accuracy. The LMS and LMSD measure the effect that the sample matrix has on accuracy. Perfect %R would be 100% (the analysis result is exactly the known concentration of the spike amount in the LMS, LMSD, LCS, or LCSD).

For the 2021 Site sampling event, qualifications were made to natural samples due to LMS and/or LMSD results from Pace exceeding control limits. These qualifications are detailed in the data validation checklists for each SDG in Attachment 1.2. There were no qualifications made due to the remaining indicators of accuracy.

There were 2 natural data points qualified due to an exceedance of the %R for the LMS and/or LMSD (DV Reason Code = S%) as listed below:

Field Sample ID	Method	Analyte	DV Qualifier	DV Reason Code
BPSOU-UR03SS01-102821-1	SW-846 6010D	Lead	J-	S%
BPSOU-UR03SS01-102821-1	SW-846 6010D	Copper	J-	S%

This resulted in 2 (3%) of the 77 natural laboratory data points that did not meet the accuracy requirements, and 75 (97%) of the 77 natural laboratory data points that did meet the accuracy requirements.

4.3 Representativeness

Representativeness is a qualitative parameter that is addressed through proper design of the sampling program. Samples for XRF analysis and laboratory analysis were collected in accordance with the QAPP and FSP.

The XRF and laboratory results were reviewed, and a Stage 2A data validation completed. Based on information provided by Pace, the chain of custody requirements were met for the sample event. Preservation requirements were met for all samples and all samples were analyzed within the appropriate holding times.

The representativeness goals were met.

4.4 Comparability

Comparability is assessed to determine if one set of data can be compared to another set of data. Comparisons are made by examining and comparing the laboratory and field methods used to acquire sample data for different distinct data sets. The data summarized in this report includes soil samples collected and analyzed by Pioneer and Pace.

4.4.1 XRF Comparability

The soil samples were collected using standard sampling methods and Pioneer SOPs. The sampling design, SOPs, and XRF methods are based on EPA and other industry standard practices and were documented in the field logbook. Sample collection was completed by professionals who were properly trained in using the SOPs and equipment. Proper sample handling was observed during sample collection and analysis.

Consequently, data from past and future soil sampling events at the Site using comparable sampling and XRF analysis may be used in concert with this data set.

4.4.2 Laboratory Comparability

The samples were collected using standard sampling methods and Pioneer SOPs. The sampling design, SOPs, and laboratory analytical methods are based on EPA and other industry standard practices and were documented in the field logbook. Sample collection was completed by professionals who were properly trained in using the SOPs and equipment. Proper chain of custody and sample handling were observed during sample collection, delivery to the laboratory, and analysis. The analytical laboratories performed the sample analysis using industry standard methods.

Consequently, data from past and future sampling events at the Site using comparable sampling and analytical methods may be used in concert with this data set.

4.5 Completeness

Completeness is assessed to determine if enough valid data have been collected to meet the investigation needs. Completeness is assessed by comparing the number of valid sample results to the number of sample results planned for the investigation. The completeness target for this investigation was 95% or greater as designated in the CFRSSI QAPP (ARCO, 1992b).

The completeness for XRF and laboratory samples and results is summarized below:

Analysis Type	Collected Samples vs Planned Samples	Valid Data Points vs Total Data Points
XRF	100%	100%
Laboratory	100%	100%

4.5.1 XRF Completeness

The QAPP and FSP include the planned soil sample locations and list the planned analytical techniques including XRF analysis.

Samples were collected at 5 sample locations during the 2021 Site sampling event as specified in the FSP. All samples that were outlined in the FSP were collected for the Site. The completeness for XRF data based on sample collection was 100%, and the completeness goal was met.

In total, 90 XRF data points were generated. All data points are considered usable because no results were rejected. The 15 XRF samples collected were analyzed by XRF for arsenic, cadmium, copper, lead, mercury, and zinc. Therefore, the completeness for XRF data based on sample analysis was 100% and the completeness goal was met.

4.5.2 Laboratory Completeness

The requirement for confirmation samples sent to the laboratory per the QAPP is at a rate of 1 per 10 natural XRF samples (10%), with additional samples sent to the laboratory for confirmation if the field results show the contaminant of concern (COC) levels at 35% above or 35% below established action/screening levels to limit decision errors.

For the 2021 Site sampling event, 11 of the 15 natural samples collected and analyzed by XRF were sent to Pace for analysis (73%). All natural samples collected with XRF results requiring confirmation were sent to Pace for analysis. The frequency requirement for the confirmation samples sent to the lab for analysis was met. Therefore, the completeness for laboratory samples based on sample collection was 100%, and the completeness goal was met.

In total, 77 natural laboratory data points were generated by the sampling event. The 11 laboratory samples were analyzed for arsenic, cadmium, copper, lead, mercury, zinc, and percent moisture. All the natural data points were usable since no sample results were rejected. Therefore, the completeness for laboratory data based on sample analysis was 100%, and the completeness goal was met.

4.6 Sensitivity

Sensitivity is a quantitative measure and is evaluated by comparing the detection limit to the project-specific sensitivity requirements.

4.6.1 XRF Sensitivity

The non-detected XRF results were reported as less than the LOD associated with each result.

The QAPP does not specify sensitivity requirements for XRF analyses; therefore, the action/screening levels in the QAPP were used to evaluate sensitivity for each analyte. The QAPP specified that samples must be sent to the laboratory for confirmation if the field results show the COC levels at 35% above or 35% below established action/screening levels to limit decision errors. Therefore, values of 35% below the BPSOU Soil Screening Criteria for Storm Water COCs listed on Table 2 of the QAPP were used to evaluate sensitivity because they are less than the BPSOU Soil Action Level for Human Health listed in Table 1 of the QAPP. The required detection limit for XRF results is summarized below:

Analyte	Criteria	Units	Action/Screening Level	35% below
Arsenic	Storm Water	mg/kg	200	130
Cadmium	Storm Water	mg/kg	20	13
Copper	Storm Water	mg/kg	1,000	650
Lead	Storm Water	mg/kg	1,000	650
Mercury	Storm Water	mg/kg	10	6.5
Zinc	Storm Water	mg/kg	1,000	650

mg/kg: milligrams per kilogram.

The detection limit for the non-detected XRF results was less than 35% below the minimum action/screening level for each analyte except for the following results:

Field Sample ID	Method	Analyte	Units	Result (<LOD)
BPSOU-UR03SS01-102821-2	XRF	Mercury	mg/kg	<7.37
BPSOU-UR03SS01-102821-3	XRF	Mercury	mg/kg	<7.08
BPSOU-UR03SS02-102821-1	XRF	Mercury	mg/kg	<6.61
BPSOU-UR03SS02-102821-2	XRF	Mercury	mg/kg	<6.7
BPSOU-UR03SS02-102821-3	XRF	Mercury	mg/kg	<6.63
BPSOU-UR03SS03-102821-3	XRF	Mercury	mg/kg	<6.89
BPSOU-UR03SS04-102821-1	XRF	Mercury	mg/kg	<6.73
BPSOU-UR03SS04-102821-2	XRF	Mercury	mg/kg	<7
BPSOU-UR03SS04-102821-3	XRF	Mercury	mg/kg	<6.9
BPSOU-UR03SS05-102821-1	XRF	Mercury	mg/kg	<7.38
BPSOU-UR03SS05-102821-2	XRF	Mercury	mg/kg	<7.02
BPSOU-UR03SS05-102821-3	XRF	Mercury	mg/kg	<6.89

mg/kg: milligrams per kilogram. LOD: limit of detection.

These data points are considered usable with the recognition that the LOD for the non-detected results is higher than 35% below the lowest action/screening level.

4.6.2 Laboratory Sensitivity

All sample results from Pace had detections for all analytes.

4.7 Overall Data Summary

The following list shows an overall summary of the validation performed on the data generated by Pioneer for the samples collected during the 2021 Site sampling event.

Analysis Type	Total Natural		Level A/B	DV Qual J, J+, J-, or UJ	DV Qual R	DV Qual U or A	Enforcement Quality	Screening Quality	Rejected
	Samples	Data Points	A/B	Data Points	Data Points	Data Points	Data Points (% of total)	Data Points (% of Total)	Data Points (% of Total)
XRF	15	90	B	15	0	0	75 (83%)	15 (17%)	0 (0%)
Pace	11	77	B	5	0	1	72 (94%)	5 (6%)	0 (0%)

5.0 REFERENCES

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EPA, 2020. U.S. Environmental Protection Agency National Functional Guidelines for Inorganic Superfund Data Review. November 2020.

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TABLES

Table A1. Natural Sample Results with Laboratory Qualifiers; Data Validation Qualifiers; Enforcement, Screening, and Rejected Classifications; and Data Validation Reason Codes

Station (Depth Interval)			UR-03-SS-01(0-2)					UR-03-SS-01(2-6)					UR-03-SS-01(6-12)					UR-03-SS-02(0-2)					UR-03-SS-02(2-6)					UR-03-SS-02(6-12)					UR-03-SS-03(0-2)				
Field Sample ID			BPSOU-UR03SS01-102821-1					BPSOU-UR03SS01-102821-2					BPSOU-UR03SS01-102821-3					BPSOU-UR03SS02-102821-1					BPSOU-UR03SS02-102821-2					BPSOU-UR03SS02-102821-3					BPSOU-UR03SS03-102821-1				
Lab Sample ID			10585806001					10585806003					10585806004					10585806005					N/A					10585806006					10585806007				
Sample Date			10/28/2021					10/28/2021					10/28/2021					10/28/2021					10/28/2021					10/28/2021					10/28/2021				
Sample Type			Natural					Natural					Natural					Natural					Natural					Natural					Natural				
Method	Analyte	Units	Result	Lab Qual	DV Qual	S/E	Reason Code	Result	Lab Qual	DV Qual	S/E	Reason Code	Result	Lab Qual	DV Qual	S/E	Reason Code	Result	Lab Qual	DV Qual	S/E	Reason Code	Result	Lab Qual	DV Qual	S/E	Reason Code	Result	Lab Qual	DV Qual	S/E	Reason Code	Result	Lab Qual	DV Qual	S/E	Reason Code
XRF	Arsenic	mg/kg	295.01			E		344.7			E		230.44			E		231.66			E		114.92			E		196.23			E		167.61			E	
XRF	Cadmium	mg/kg	<7.68	<LOD		E		<7.42	<LOD		E		<7.8	<LOD		E		<7.29	<LOD		E		<7.45	<LOD		E		<7.28	<LOD		E		<7.03	<LOD		E	
XRF	Copper	mg/kg	228.15			E		201.86			E		144.15			E		81.27			E		127.73			E		111.65			E		102.08			E	
XRF	Lead	mg/kg	211.30			E		215.04			E		232.66			E		97.75			E		108.16			E		101.49			E		122.31			E	
XRF	Mercury	mg/kg	7.36		J	S	CX	<7.37	<LOD	UJ	S	CX	<7.08	<LOD	UJ	S	CX	<6.61	<LOD	UJ	S	CX	<6.7	<LOD	UJ	S	CX	<6.63	<LOD	UJ	S	CX	<6.36	<LOD	UJ	S	CX
XRF	Zinc	mg/kg	196.94			E		320.45			E		302.84			E		180.50			E		210.34			E		227.12			E		81.28			E	
ASTM D2974	Moisture, Percent	%	7.5	N2	J	S	FD	16.6	N2		E		14.4	N2		E		1.7	N2		E							1.1	N2		E		25.7	N2		E	
SW-846 6010D	Arsenic	mg/kg	255	P6		E		294			E		216			E		184			E							118			E		159			E	
SW-846 6010D	Cadmium	mg/kg	1.7		J	S	FD	2.4			E		1.2			E		0.25			E							0.40			E		0.22			E	
SW-846 6010D	Copper	mg/kg	199	M1	J-	S	S%	223			E		170			E		45.7			E							127			E		135			E	
SW-846 6010D	Lead	mg/kg	177	M1	J-	S	S%	230			E		523			E		70.1			E							126			E		127			E	
SW-846 6010D	Zinc	mg/kg	270	R1,P6	J	S	D%, FD	352			E		359			E		114			E							211			E		72.4			E	
SW-846 7471B	Mercury	mg/kg	0.47			E		0.32			E		0.51			E		0.12			E							0.1			E		0.19			E	

Notes:
Depth intervals are inches below ground surface.

Qualification (Qual) and Reason Codes are
defined in Table A4.

< - Not detected at the detection limit.

Abbreviations:
mg/kg - milligram per kilogram

Table A1. Natural Sample Results with Laboratory Qualifiers; Data Validation Qualifiers; Enforcement, Screening, and Rejected Classifications; and Data Validation Reason Codes

Station (Depth Interval)			UR-03-SS-03(2-6)					UR-03-SS-03(6-12)					UR-03-SS-04(0-2)					UR-03-SS-04(2-6)					UR-03-SS-04(6-12)					UR-03-SS-05(0-2)					UR-03-SS-05(2-6)				
Field Sample ID			BPSOU-UR03SS03-102821-2					BPSOU-UR03SS03-102821-3					BPSOU-UR03SS04-102821-1					BPSOU-UR03SS04-102821-2					BPSOU-UR03SS04-102821-3					BPSOU-UR03SS05-102821-1					BPSOU-UR03SS05-102821-2				
Lab Sample ID			10585806008					10585806009					10585806010					10585806011					10585806012					N/A					N/A				
Sample Date			10/28/2021					10/28/2021					10/28/2021					10/28/2021					10/28/2021					10/28/2021					10/28/2021				
Sample Type			Natural					Natural					Natural					Natural					Natural					Natural					Natural				
Method	Analyte	Units	Result	Lab Qual	DV Qual	S/E	Reason Code	Result	Lab Qual	DV Qual	S/E	Reason Code	Result	Lab Qual	DV Qual	S/E	Reason Code	Result	Lab Qual	DV Qual	S/E	Reason Code	Result	Lab Qual	DV Qual	S/E	Reason Code	Result	Lab Qual	DV Qual	S/E	Reason Code	Result	Lab Qual	DV Qual	S/E	Reason Code
XRF	Arsenic	mg/kg	269.03			E		289.15			E		373.71			E		398.11			E		393.78			E		150.31			E		108.32			E	
XRF	Cadmium	mg/kg	<7.09	<LOD		E		8.86			E		9.45			E		<7.44	<LOD		E		8.49			E		<7.72	<LOD		E		8.23			E	
XRF	Copper	mg/kg	115.28			E		136.46			E		112.52			E		119.28			E		135.99			E		205.90			E		140.75			E	
XRF	Lead	mg/kg	149.69			E		206.85			E		299.80			E		513.93			E		685.56			E		282.27			E		159.02			E	
XRF	Mercury	mg/kg	<6.41	<LOD	UJ	S	CX	<6.89	<LOD	UJ	S	CX	<6.73	<LOD	UJ	S	CX	<7	<LOD	UJ	S	CX	<6.9	<LOD	UJ	S	CX	<7.38	<LOD	UJ	S	CX	<7.02	<LOD	UJ	S	CX
XRF	Zinc	mg/kg	82.62			E		123.73			E		91.98			E		110.38			E		125.58			E		422.25			E		533.05			E	
ASTM D2974	Moisture, Percent	%	5.4	N2		E		10.9	N2		E		7.5	N2		E		6.3	N2		E		6.5	N2		E											
SW-846 6010D	Arsenic	mg/kg	184			E		172			E		229			E		266			E		288			E											
SW-846 6010D	Cadmium	mg/kg	0.15			E		0.16			E		0.12	J	A	E	<RL	0.15			E		0.37			E											
SW-846 6010D	Copper	mg/kg	97.5			E		100			E		81.3			E		95.0			E		110			E											
SW-846 6010D	Lead	mg/kg	126			E		147			E		225			E		361			E		634			E											
SW-846 6010D	Zinc	mg/kg	54.3			E		82.5			E		55.0			E		72.2			E		127			E											
SW-846 7471B	Mercury	mg/kg	0.16			E		0.21			E		0.075			E		0.098			E		0.22			E											

Notes:
Depth intervals are inches below ground surface.

Qualification (Qual) and Reason Codes are
defined in Table A4.

< - Not detected at the detection limit.

Abbreviations:
mg/kg - milligram per kilogram

Table A1. Natural Sample Results with Laboratory Qualifiers; Data Validation Qualifiers; Enforcement, Screening, and Rejected Classifications; and Data Validation Reason Codes

Station (Depth Interval)			UR-03-SS-05(6-12)				
Field Sample ID			BPSOU-UR03SS05-102821-3				
Lab Sample ID			N/A				
Sample Date			10/28/2021				
Sample Type			Natural				
Method	Analyte	Units	Result	Lab Qual	DV Qual	S/E	Reason Code
XRF	Arsenic	mg/kg	105.00			E	
XRF	Cadmium	mg/kg	<7.34	<LOD		E	
XRF	Copper	mg/kg	137.13			E	
XRF	Lead	mg/kg	158.95			E	
XRF	Mercury	mg/kg	<6.89	<LOD	UJ	S	CX
XRF	Zinc	mg/kg	279.76			E	
ASTM D2974	Moisture, Percent	%					
SW-846 6010D	Arsenic	mg/kg					
SW-846 6010D	Cadmium	mg/kg					
SW-846 6010D	Copper	mg/kg					
SW-846 6010D	Lead	mg/kg					
SW-846 6010D	Zinc	mg/kg					
SW-846 7471B	Mercury	mg/kg					

Notes:
Depth intervals are inches below ground surface.

Qualification (Qual) and Reason Codes are
defined in Table A4.

< - Not detected at the detection limit.

Abbreviations:
mg/kg - milligram per kilogram

Table A2. Field Duplicate Pair Samples with Results, Laboratory Qualifiers, Data Validation Qualifiers, Data Validation Reason Codes, and QC Criteria Assessment

Station (Depth Interval)			UR-03-SS-01(0-2)						UR-03-SS-01(0-2)-FD									
Field Sample ID			BPSOU-UR03SS01-102821-1						BPSOU-UR03SS01-102821-1-FD									
Lab Sample ID			10585806001						10585806002									
Sample Date			10/28/2021						10/28/2021									
Sample Type			Natural Sample						Field Duplicate									
Method	Analyte	Units	Result	Lab Qual	DV Qual	Reason Code	DF	RL	Result	Lab Qual	DV Qual	Reason Code	DF	RL	Control Limit[1]	ABS DIF	RPD	Meets Control Limit?
XRF	Arsenic	mg/kg	295.01				1	N/A	297.61				1	N/A	RPD≤35%		1%	Yes
XRF	Cadmium	mg/kg	<7.68	<LOD			1	N/A	8.00				1	N/A	N/A		-	-
XRF	Copper	mg/kg	228.15				1	N/A	164.93				1	N/A	RPD≤35%		32%	Yes
XRF	Lead	mg/kg	211.30				1	N/A	206.76				1	N/A	RPD≤35%		2%	Yes
XRF	Mercury	mg/kg	7.36		J	CX	1	N/A	<7.08	<LOD	UJ	CX	1	N/A	N/A		-	-
XRF	Zinc	mg/kg	196.94				1	N/A	180.56				1	N/A	RPD≤35%		9%	Yes
ASTM D2974	Moisture, Percent	%	7.5	N2	J	FD	1	0.1	0.27	N2	J	FD	1	0.1	ABS DIF≤2xRL	7.2		ABS DIFF>2xRL
SW-846 6010D	Arsenic	mg/kg	255	P6			2	2.0	229				2	1.9	RPD≤35%		11%	Yes
SW-846 6010D	Cadmium	mg/kg	1.7		J	FD	2	0.30	0.44		J	FD	2	0.28	ABS DIF≤2xRL	1.26		ABS DIFF>2xRL
SW-846 6010D	Copper	mg/kg	199	M1	J-	S%	2	1.0	161		J-	S%	2	0.93	RPD≤35%		21%	Yes
SW-846 6010D	Lead	mg/kg	177	M1	J-	S%	2	1.0	161		J-	S%	2	0.93	RPD≤35%		9%	Yes
SW-846 6010D	Zinc	mg/kg	270	R1,P6	J	D%, FD	2	4.0	171		J	D%, FD	2	3.7	RPD≤35%		45%	RPD>35%
SW-846 7471B	Mercury	mg/kg	0.47				1	0.020	0.38				1	0.018	RPD≤35%		21%	Yes

Notes:

Qualification (Qual) and Reason Codes are defined in Table A4.

< - Not detected at the detection limit.

The qualifications made to the field duplicate samples (DV Qual/Reason Code) are not included in the summary of qualifications made to natural samples discussed in the Data Validation Report.

Depth intervals are inches below ground surface.

Abbreviations:

DF - dilution factor

RL - reporting limit

ABS DIF - absolute difference

RPD - relative percent difference

mg/kg - milligram per kilogram

Footnotes:

1. If the control limit is an absolute difference less than 2 times the reporting limit, the minimum adjusted reporting limit will be used.

Table A3. Sample Identification

Station ID	Field Sample ID	Sample Type	Depth Interval (in bgs)	Sample Date	XRF	Lab ID	ASTM D2974	SW-846 6010D	SW-846 7471B
UR-03-SS-01	BPSOU-UR03SS01-102821-1	Natural	0 - 2	10/28/2021	As, Cd, Cu, Pb, Hg, Zn	10585806001	moisture	As, Cd, Cu, Pb, Zn	Hg
UR-03-SS-01	BPSOU-UR03SS01-102821-1-FD	Field Duplicate	0 - 2	10/28/2021	As, Cd, Cu, Pb, Hg, Zn	10585806002	moisture	As, Cd, Cu, Pb, Zn	Hg
UR-03-SS-01	BPSOU-UR03SS01-102821-2	Natural	2 - 6	10/28/2021	As, Cd, Cu, Pb, Hg, Zn	10585806003	moisture	As, Cd, Cu, Pb, Zn	Hg
UR-03-SS-01	BPSOU-UR03SS01-102821-3	Natural	6 - 12	10/28/2021	As, Cd, Cu, Pb, Hg, Zn	10585806004	moisture	As, Cd, Cu, Pb, Zn	Hg
UR-03-SS-02	BPSOU-UR03SS02-102821-1	Natural	0 - 2	10/28/2021	As, Cd, Cu, Pb, Hg, Zn	10585806005	moisture	As, Cd, Cu, Pb, Zn	Hg
UR-03-SS-02	BPSOU-UR03SS02-102821-2	Natural	2 - 6	10/28/2021	As, Cd, Cu, Pb, Hg, Zn	N/A			
UR-03-SS-02	BPSOU-UR03SS02-102821-3	Natural	6 - 12	10/28/2021	As, Cd, Cu, Pb, Hg, Zn	10585806006	moisture	As, Cd, Cu, Pb, Zn	Hg
UR-03-SS-03	BPSOU-UR03SS03-102821-1	Natural	0 - 2	10/28/2021	As, Cd, Cu, Pb, Hg, Zn	10585806007	moisture	As, Cd, Cu, Pb, Zn	Hg
UR-03-SS-03	BPSOU-UR03SS03-102821-2	Natural	2 - 6	10/28/2021	As, Cd, Cu, Pb, Hg, Zn	10585806008	moisture	As, Cd, Cu, Pb, Zn	Hg
UR-03-SS-03	BPSOU-UR03SS03-102821-3	Natural	6 - 12	10/28/2021	As, Cd, Cu, Pb, Hg, Zn	10585806009	moisture	As, Cd, Cu, Pb, Zn	Hg
UR-03-SS-04	BPSOU-UR03SS04-102821-1	Natural	0 - 2	10/28/2021	As, Cd, Cu, Pb, Hg, Zn	10585806010	moisture	As, Cd, Cu, Pb, Zn	Hg
UR-03-SS-04	BPSOU-UR03SS04-102821-2	Natural	2 - 6	10/28/2021	As, Cd, Cu, Pb, Hg, Zn	10585806011	moisture	As, Cd, Cu, Pb, Zn	Hg
UR-03-SS-04	BPSOU-UR03SS04-102821-3	Natural	6 - 12	10/28/2021	As, Cd, Cu, Pb, Hg, Zn	10585806012	moisture	As, Cd, Cu, Pb, Zn	Hg
UR-03-SS-05	BPSOU-UR03SS05-102821-1	Natural	0 - 2	10/28/2021	As, Cd, Cu, Pb, Hg, Zn	N/A			
UR-03-SS-05	BPSOU-UR03SS05-102821-2	Natural	2 - 6	10/28/2021	As, Cd, Cu, Pb, Hg, Zn	N/A			
UR-03-SS-05	BPSOU-UR03SS05-102821-3	Natural	6 - 12	10/28/2021	As, Cd, Cu, Pb, Hg, Zn	N/A			

Abbreviations:

in bgs - inches below ground surface
As - arsenic
Cd - cadmium
Cu - copper
Pb - lead
Hg - mercury
Zn - zinc

Table A4. Laboratory Qualifiers; Data Validation Qualifiers; Enforcement, Screening, and Rejected Codes; and Reason Codes Definitions

Lab Qual (Pace Analytical Services [Pace] Qualifiers)

J = Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

M1 = Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

P6 = Matrix spike recovery was outside laboratory control limits due to a parent sample concentration notably higher than the spike level.

R1 = RPD value was outside control limits.

N2 = The lab does not hold NELAC/TNI accreditation for this parameter but other accreditations/certifications may apply.

XRF Qual (XRF Qualifiers)

<LOD = Not detected at the reporting limit.

DV Qual (Data Validation Qualifiers)

A = results between the MDL and RL with no other qualifiers required are considered enforcement quality data.

J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

J- = The result is an estimated quantity, but the result may be biased low

UJ = The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.

S/E (Screening/Enforcement Quality Designation)

E = Enforcement quality.

S = Screening quality.

R = Unusable (Rejected) quality.

Reason Code (Data Validation Reason Codes)

<RL = Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

D% = Qualified due to laboratory duplicate results outside control limits.

FD = Qualified due to field duplicate results outside of control limits.

S% = Qualified due to percent recovery of the matrix spike outside of control limits.

CX = Qualified because frequency of check samples was not satisfied.

Table A5. XRF SiO2 Standard and Calibration Check Sample Results

		Analyte	Arsenic		Cadmium		Copper		Lead		Mercury		Zinc	
Standard Type	Sample ID	Analysis Date	Result (mg/kg)	Meets Control Limit (<10 mg/kg)	Result (mg/kg)	Meets Control Limit (<50 mg/kg)	Result (mg/kg)	Meets Control Limit (<20 mg/kg)	Result (mg/kg)	Meets Control Limit (<10 mg/kg)	Result (mg/kg)	Meets Control Limit (<10 mg/kg)	Result (mg/kg)	Meets Control Limit (<10 mg/kg)
SiO2	P_20211028_98052_112	10/28/2021	5.26	Yes	11.34	Yes	<11.88	Yes	<3.4	Yes	<4.96	Yes	<5.84	Yes
SiO2	P_20211028_98052_134	10/28/2021	6.93	Yes	13.87	Yes	<11.27	Yes	<3.62	Yes	<4.57	Yes	<5.59	Yes

		Analyte	Arsenic		Cadmium		Copper		Lead		Mercury		Zinc	
Standard Type	Sample ID	Analysis Date	Result (mg/kg)	Meets Control Limit (0-35 mg/kg)	Result (mg/kg)	Meets Control Limit (0-60 mg/kg)	Result (mg/kg)	Meets Control Limit (0-60 mg/kg)	Result (mg/kg)	Meets Control Limit (0-35 mg/kg)	Result (mg/kg)	Meets Control Limit (0-12 mg/kg)	Result (mg/kg)	Meets Control Limit (50-160 mg/kg)
NIST 2709a	P_20211028_98052_113	10/28/2021	15.32	Yes	12.38	Yes	33.21	Yes	15.44	Yes	<6.35	Yes	89.39	Yes
NIST 2709a	P_20211028_98052_135	10/28/2021	18.59	Yes	12.98	Yes	36.96	Yes	15.53	Yes	<6.34	Yes	89.78	Yes

		Analyte	Arsenic		Cadmium		Copper		Lead		Mercury		Zinc	
Standard Type	Sample ID	Analysis Date	Result (mg/kg)	Meets Control Limit (400-600 mg/kg)	Result (mg/kg)	Meets Control Limit (400-600 mg/kg)	Result (mg/kg)	Meets Control Limit (N/A)	Result (mg/kg)	Meets Control Limit (400-600 mg/kg)	Result (mg/kg)	Meets Control Limit (N/A)	Result (mg/kg)	Meets Control Limit (N/A)
RCRA	P_20211028_98052_114	10/28/2021	504.18	Yes	509.67	Yes	22.79	N/A	460.57	Yes	<7.08	N/A	44.96	N/A
RCRA	P_20211028_98052_136	10/28/2021	487.77	Yes	512.26	Yes	<15.53	N/A	460.80	Yes	<7.04	N/A	47.24	N/A

Notes:

< - Not detected value is the XRF error for analysis.

Abbreviations:

mg/kg - milligram per kilogram

SiO2 - Silicon Dioxide standard

NIST 2709a - NIST 2709a- Joaquin Soil sample

RCRA - Resource Conservation and Recovery Act Sample

Table A6. XRF Duplicate and Replicate Sample Results and QC Criteria Assessment

				Analyte	Arsenic		Cadmium		Copper		Lead		Mercury		Zinc	
Standard Type	Sample ID	Sample Name	Parent Sample	Analysis Date	Result (mg/kg)	RPD	Result (mg/kg)	RPD	Result (mg/kg)	RPD	Result (mg/kg)	RPD	Result (mg/kg)	RPD	Result (mg/kg)	RPD
Natural	P_20211028_98052_131	BPSOU-UR03SS05-102821-3		10/28/2021	105.00		<7.34		137.13		158.95		<6.89		279.76	
XRF Replicate	P_20211028_98052_133	BPSOU-UR03SS05-102821-3-R	BPSOU-UR03SS05-102821-3	10/28/2021	116.96	10.8%	<7.18	ND	121.88	11.8%	133.96	17.1%	<6.9	ND	272.48	2.6%
XRF Duplicate	P_20211028_98052_132	BPSOU-UR03SS05-102821-3-D	BPSOU-UR03SS05-102821-3	10/28/2021	102.81	2.1%	<7.21	ND	131.65	4.1%	142.08	11.2%	<6.8	ND	276.41	1.2%

Notes:

< - Not detected value is the XRF error for analysis.

Abbreviations:

mg/kg - milligram per kilogram

ND = non-detected

RPD = relative percent differnce

Attachment 1
Data Validation Checklists

Attachment 1.1
Data Validation Checklists for XRF Analyses

Data Validation Checklist XRF Sample Analysis

Site: Butte Priority Soils Operable Unit
Project: Unreclaimed Sites 2021
Sample Date: 10/28/2021
Data Validator: Josie McElroy

Case No: P_20211028
Sample Matrix: Soil
Analysis Dates: 10/28/2021
Validation Dates: 12/13/2021

Laboratory: Pioneer Technical Services, Inc.
Analyses: Arsenic; Cadmium; Copper; Lead; Mercury; Zinc

1. Holding Times

Analyte	Laboratory	Matrix	Method	Holding Times	Collection Date	Analysis Date(s)	Holding Time Met (Y/N)	Affected Data Flagged (Y/N)
As, Cd, Cu, Pb, Hg, Zn	Pioneer	Soil	XRF	N/A	10/28/2021	10/28/2021	N/A	N/A

Were any data flagged because of holding time? Y [ ] N [X]

What sample preparation steps were performed (i.e. drying, sieving etc.)? Drying and sieving

Were the samples prepped according to the SAP/QAPP? Y [X] N [ ]

Describe Any Actions Taken: None required

Comments:

2. Energy Calibration (System Check)

Was the energy calibration performed at the frequency of once per day?	Y [X]	N [ ]
Was the energy calibration Resolution below 195?	Y [X]	N [ ]
Did the energy calibration run for at least 50 seconds?	Y [X]	N [ ]

Describe Any Actions Taken: None required

Comments:

3. SiO_2 Standards

Was the SiO_2 Standard analyzed at the beginning of analysis?	Y [X]	N [ ]
Was the SiO_2 Standard analyzed at the frequency of 1 per 20 samples?	Y [X]	N [ ]
Were the SiO_2 Standard results within the control limits?	Y [X]	N [ ]
Were any data flagged because of the SiO_2 Standard results?	Y [ ]	N [X]

Describe Any Actions Taken: None required

Comments:

4. Calibration Check Samples

Were the appropriate Calibration Check Samples (CCS) analyzed at the beginning of analysis?	Y [X]	N [ ]
Were the appropriate CCS analyzed at the frequency of 1 per 20 natural samples?	Y [X]	N [ ]
Were CCS results within the control limits?	Y [X]	N [ ]
Were any data flagged because of CCS problems?	Y [X]	N [ ]

Describe Any Actions Taken: There were no calibration check samples that had a known amount (true value) of mercury greater than the limit of detection (LOD). Therefore, all mercury results have been qualified "J" for detects and "UJ" for non-detected.

Comments:

5. Duplicate Sample Results

Were Duplicate Samples analyzed at the frequency of 1 per 20 natural samples?	Y	X	N	
Were Duplicate Sample results within the control window?	Y	X	N	
Were any data flagged because of duplicate sample results?	Y		N	X

Describe Any Actions Taken: None required

Comments: The following XRF duplicate sample was analyzed on 10/28/2021:

XRF Duplicate Sample	Primary Sample
BPSOU-UR03SS05-102821-3-D	BPSOU-UR03SS05-102821-3

The following XRF field duplicate sample was analyzed on 10/28/2021:

XRF Field Duplicate Sample	Primary Sample
BPSOU-UR03SS01-102821-1-FD	BPSOU-UR03SS01-102821-1

6. Replicate Sample Results

Were Replicate Samples analyzed at the frequency of 1 per 20 natural samples?	Y	X	N	
Were replicate sample results within the control window?	Y	X	N	
Were any data flagged because of replicate sample results?	Y		N	X

Describe Any Actions Taken: None required

Comments: The following XRF replicate sample was analyzed on 10/28/2021:

XRF Replicate Sample	Primary Sample
BPSOU-UR03SS05-102821-3-R	BPSOU-UR03SS05-102821-3

7. Overall Assessment

Are there analytical limitations of the data that users should be aware of?	Y	X	N	

If so, explain: On this WO P_20211028, the following qualifications were made:

One (1) mercury result was qualified "J" due to the lack of an appropriate calibration check sample.
Fourteen (14) mercury results have been qualified "UJ" due to the lack of an appropriate calibration check sample.

Comments: No qualifications were required.

8. Authorization of Data Validation

Data Validator
Name: Josie McElroy

Signature: Josie McElroy **Date:** 12/13/2021

Reviewed by: Sara Ward **Date**: 12/20/2021

Attachment 1.2
Data Validation Checklists for Laboratory Analyses

Stage 2A Data Validation Checklist for Sample Analysis

Site: Butte Priority Soils Operable Unit
Project: Unreclaimed Sites 2021
Sample Date(s): 10/28/2021
Data Validator: Sara Ward

Case No: 10585806
Sample Matrix: Soil
Analysis Date(s): 11/03/2021, 11/11/2021
Validation Date(s): 11/29/2021

Laboratory: Pace Analytical
Analyses: As, Cd, Cu, Pb, Zn (EPA 6010D), Hg (EPA 7471B), and Percent Moisture (ASTM D2974)

1. Holding Times

Analyte	Laboratory	Matrix	Method	Holding Times	Collection Date(s):	Analysis Date(s)	Holding Time Met (Y/N)	Affected Data Flagged (Y/N)
As, Cd, Cu, Pb, and Zn	Pace	Soil	EPA 6010D	6 months	10/28/2021	11/11/2021	Y	N/A
Hg			EPA 7471B	28 days		11/11/2021	Y	N/A
Percent Moisture			ASTM D2974	N/A		11/03/2021	Y	N/A

Were any data flagged because of holding time? Y [ ] N [X]
Were any data flagged because of preservation problems? Y [ ] N [X]

Describe Any Actions Taken: None Required.

Comments: The receiving temperature as reported by the laboratory was 3.7°C. The samples were shipped on ice and analyzed within holding time.

2. Blanks

Were Method Blanks (MBs) analyzed at the frequency of 1 per analytical batch? Y [X] N [ ]
Were MBs within the control window? Y [X] N [ ]
Were any data flagged because of blank problems? Y [ ] N [X]

Describe Any Actions Taken: None Required.

Comments: MB for EPA 7471B was non-detect.

For EPA 6010D, there was a detection of zinc (0.25 mg/kg) in the MB at a level less than ½ the reporting limit (0.95 mg/kg). No qualifications were warranted since the detections were less than ½ the reporting limits. All other analytes were non-detect.

A MB was not analyzed for ASTM D2974.

3. Laboratory Control Samples

Were Laboratory Control Samples (LCS) analyzed at the frequency of 1 per batch? Y [X] N [ ]
Were LCS results within the control window? Y [X] N [ ]
Were any data flagged because of LCS problems? Y [ ] N [X]

Describe Any Actions Taken: None Required.

Comments: The LCS %R were within limits for EPA 6010D and EPA 7471B. An LCS was not analyzed for ASTM D2974.

Work Order: 10585806

4. Duplicate Sample Results

Were Laboratory Duplicate Samples (LDS) analyzed at the frequency of 1 per batch?	Y	X	N	
Were LDS results within the control window?	Y		N	X
Were any data flagged because of LDS problems?	Y	X	N	

Describe Any Actions Taken: For method EPA 6010D batch 781168, an LMS/LMS Duplicate (LMSD) generated from BPSOU-UR03SS01-102821-1 was used for the LDS calculations. The RPD for zinc (21%) was outside control limits (20%). BPSOU-UR03SS01-102821-1 was qualified "J" for zinc. Per the NFG, "*For a duplicate sample analysis that does not meet the technical criteria, apply the action to all samples of the same matrix if the samples are considered sufficiently similar"* (EPA, 2017). BPSOU-UR03SS01-102821-1-FD is considered sufficiently similar; therefore, the zinc results were qualified "J". The remaining RPDs were within control limits.

Comments: For method EPA 7471B batch 781169, an LMS/LMS Duplicate (LMSD) generated from BPSOU-UR03SS01-102821-1 was used for the LDS calculation. The RPD was within control limits.

For ASTM D2974, a duplicate generated from BPSOU-UR03SS01-102821-1 and a duplicate generated from BPSOU-UR03SS04-102821-2 were used for the LDS calculations. The RPDs were within control limits.

5. Matrix Spike Sample Results

Were Laboratory Matrix Spike Samples (LMS) analyzed at the frequency of 1 per batch?	Y	X	N	
Were LMS results within the control window?	Y		N	X
Were any data flagged because of LMS problems?	Y	X	N	

Describe Any Actions Taken: For method EPA 6010D batch 781168, an LMS/LMSD was generated from BPSOU-UR03SS01-102821-1. The %R of the LMS/LMSD for copper (16% and 41%, respectively) and lead (41% and 61%, respectively) were outside control limits (75-125%); therefore, BPSOU-UR03SS01-102821-1 was qualified "J-" for copper and lead. Per the NFG, "*For a spike sample analysis that does not meet the technical criteria, apply the action to all samples of the same matrix if the samples are considered sufficiently similar"* (EPA, 2017). BPSOU-UR03SS01-102821-1-FD is considered sufficiently similar; therefore, the copper and lead results were qualified "J-".

Comments: For method EPA 7471B batch 781169, an LMS/LMSD was generated from BPSOU-UR03SS01-102821-1. The %R of the LMS/MSD for mercury were within control limits (80-120%).

For method EPA 6010D batch 781668, an LMS/LMSD was generated from BPSOU-UR03SS01-102821-1. The %R of the LMSD for arsenic (40%) and the LMS/LMSD for zinc (-140% and -51%, respectively) were outside control limits. Per the NFG, "*Spike recovery limits do not apply when the original sample concentration is ≥ 4 times the spike added. In such an event, the data shall be reported unflagged, even if the %R does not meet acceptance criteria*" (EPA, 2017). The original sample concentrations of arsenic and zinc were greater than 4 times the spike added for these analytes; therefore, no qualifications were warranted. The %R of the LMS/LMSD for cadmium were within limits.

An LMS was not analyzed for ASTM D2974.

6. Field Blanks

Were field blanks submitted as specified in the QAPP?	Y		N		N/A	X
Were field blanks within the control window?	Y		N		N/A	X
Were any data qualified because of field blank problems?	Y		N		N/A	X

Describe Any Actions Taken: None Required.

Comments: Field blanks were not required as there is no sampling equipment re-used.

7. Field Duplicates

Were field duplicates submitted as specified in the QAPP?	Y	X	N		N/A	
Were results for field duplicates within the control window?	Y		N	X	N/A	
Were any data qualified because of field duplicate problems?	Y	X	N		N/A	

Describe Any Actions Taken:

One field duplicate pair was submitted on this work order, BPSOU-UR03SS01-102821-1 and BPSOU-UR03SS01-102821-1-FD. The cadmium results for the duplicate sample were less than 5 times the reporting limit, but the absolute difference between the natural sample and field duplicate was greater than the reporting limit. The zinc results for the field duplicate and natural sample were greater than 5 times the reporting limits, but the RPD was greater than 35%. The percent moisture results for the duplicate sample were less than 5 times the reporting limit, but the absolute difference between the natural sample and field duplicate was greater than the reporting limit. The results for cadmium, zinc, and percent moisture for BPSOU-UR03SS01-102821-1 and BPSOU-UR03SS01-102821-1-FD were qualified "J". Zinc had a previous qualification of "J" due to laboratory duplicate precision; therefore, the final qualification for zinc is "J". Per the NFG, "*For a duplicate sample analysis that does not meet the technical criteria, apply the action to all samples of the same matrix if the samples are considered sufficiently similar"* (EPA, 2017). No samples were considered sufficiently similar; therefore, no additional qualifications were warranted.

Comments: The precision for all remaining analytes was within control limits.

8. Overall Assessment

Are there analytical limitations of the data that users should be aware of? Y [X] N [ ]

If so, explain: On this WO 10585806, the following qualifications were made:

In addition to the qualifications outlined in the sections above, results which were reported between the method detection limit (MDL) and the reporting limit (RL) were qualified "A" when no additional qualifications were warranted.

The table below lists the qualifications on the natural samples:

Field ID	**Analyte**	Final Qualification	Reason Code
BPSOU-UR03SS01-102821-1	Zinc	J	D%, FD
BPSOU-UR03SS01-102821-1	Copper	J-	S%
BPSOU-UR03SS01-102821-1	Lead	J-	S%
BPSOU-UR03SS01-102821-1	Cadmium	J	FD
BPSOU-UR03SS04-102821-1	Cadmium	A	<RL
BPSOU-UR03SS01-102821-1	Percent Moisture	J	FD

The table below lists the qualifications on the field quality control sample:

Field ID	**Analyte**	Final Qualification	Reason Code
BPSOU-UR03SS01-102821-1-FD	Zinc	J	D%, FD
BPSOU-UR03SS01-102821-1-FD	Copper	J-	S%
BPSOU-UR03SS01-102821-1-FD	Lead	J-	S%
BPSOU-UR03SS01-102821-1-FD	Cadmium	J	FD
BPSOU-UR03SS01-102821-1-FD	Percent Moisture	J	FD

Reason for qualification:
S% = Matrix Spike
FD = Field Duplicate
D% = Laboratory Duplicate Sample
<RL = The result is above the method detection limit and below the reporting limit.

Comments:

9. Authorization of Data Validation

Data Validator
Name: Sara Ward **Reviewed by:** Josie McElroy

Signature: Sara Ward Josie McElroy

Date: 11/29/2021 11/30/2021

Attachment 2
Level A/B Assessment Checklist

Level A/B Assessment Checklist

1. General Information

Site: Butte Priority Soils Operable Unit
Project: Unreclaimed Sites 2021
Client: Atlantic Richfield Company
Sample Matrix: Soil

2. Screening Result

Data are:

1. Unusable
2. Level A
3. Level B 10585806 and P_20211028_98052

I. **Level A**

Criteria – The following must be fully documented.	Yes/No	Comments
1. Sampling date	Yes	Logbook
2. Sampling team or leader	Yes	Logbook
3. Physical description of sampling location	Yes	Logbook
4. Sample depth (soils)	Yes	Logbook
5. Sample collection technique	Yes	Logbook
6. Field preparation technique	Yes	Logbook
7. Sample preservation technique	Yes	Logbook
8. Sample shipping records	Yes	Logbook and Chain of Custody (CoC)

II**. Level B**

Criteria – The following must be fully documented.	Yes/No	Comments
1. Field instrumentation methods and standardization complete	Yes	Logbook
2. Sample container preparation	Yes	Logbook
3. Collection of field replicates (1/20 minimum)	Yes	Logbook
4. Proper and decontaminated sampling equipment	Yes	Logbook
5. Field custody documentation	Yes	Logbook and CoC
6. Shipping custody documentation	Yes	Logbook and CoC
7. Traceable sample designation number	Yes	Logbook Lab Report, and CoC
8. Field notebook(s), custody records in secure repository	Yes	
9. Completed field forms	Yes	Logbook and Field Data Sheets

Attachment 3
Data Validation Quality Control Criteria

XRF							
Quality Control	**Frequency**	**Acceptance Criteria**	**Criteria**	**Action**			**Reference**
				Associated Sample Result Detected	**Associated Sample Result Non-Detected**	**Reason Code**	
System Check	Performed daily, prior to sample analysis	Performed daily, prior to sample analysis	System Check not performed	Professional Judgment J/R	Professional Judgment UJ/R	CX	SOP-SFM-02
		Resolution < 195	Resolution ≥ 195	Professional Judgment J/R	Professional Judgment UJ/R	SC	
SiO_2 Standard	Performed daily, prior to sample analysis, at least 1 for every 20 sample analyses, and at end of each day of analysis	Performed daily, prior to sample analysis, at least 1 for every 20 sample analyses, and at end of each day of analysis	Frequency criteria not met	J	UJ	CX	SOP-SFM-02 Niton XL3 Soil QC Sheet
		Arsenic ≤10 mg/kg Cadmium ≤50 mg/kg Copper ≤20 mg/kg Lead ≤10 mg/kg Mercury ≤10 mg/kg Zinc ≤10 mg/kg	>10 mg/kg >50 mg/kg >20 mg/kg >10 mg/kg >10 mg/kg >10 mg/kg	Results < 10x the SiO2 result - J+	No Qualification	B	
Calibration Check Samples	Performed daily, prior to sample analysis, at least 1 for every 20 sample analyses, and at end of each day of analysis	Performed daily, prior to sample analysis, at least 1 for every 20 sample analyses, and at end of each day of analysis	Frequency criteria not met	J	UJ	CX	SOP-SFM-02 Niton XL3 Soil QC Sheet
		NIST Standard: Arsenic 0 - 35 mg/kg Cadmium 0 - 60 mg/kg Copper 0 - 60 mg/kg Lead 0 - 35 mg/kg Mercury 0 - 12 mg/kg Zinc 50 - 160 mg/kg	< Lower Control Limit	J-	UJ	CSS	
		RCRA Standard: Arsenic 400 - 600 mg/kg Cadmium 400 - 600 mg/kg Lead 400 - 600 mg/kg	> Upper Control Limit	J+	No Qualification		
XRF Duplicate	1 per 20 samples	RPD ≤ 35% for detected results	Frequency criteria not met	J	UJ	DX	SOP-SFM-02 UR QAPP
			RPD ≤ 35%	No Qualification	No Qualification	D%	
			RPD > 35%	J	UJ		
XRF Replicate	1 per 20 samples	RPD ≤ 35% for detected results	Frequency criteria not met	J	UJ	RX	SOP-SFM-02 UR QAPP
			RPD ≤ 35%	No Qualification	No Qualification	R%	
			RPD > 35%	J	UJ		
Field Duplicate	1 per 20 samples	RPD ≤ 35% for detected results	Frequency criteria not met	J	UJ	FDX	UR QAPP
			RPD ≤ 35%	No Qualification	No Qualification	FD	
			RPD > 35%	J	UJ		

Laboratory							
Quality Control	**Frequency**	**Acceptance Criteria**	**Criteria**	**Data Validation Action**			**Reference**
				Associated Sample Result -Detected	**Associated Sample Result - Non-Detected**	**Reason Code**	
Laboratory Quality Control Samples							
Holding Time	Every Sample	EPA 6010D (metals/metalloids)	≤ 6 months	J-	Professional Judgement UJ or R	H	NFG
		EPA 7471B (mercury)	≤ 28 days	J-	Professional Judgement UJ or R		
Preservation	Every Sample	EPA 6010D (metals/metalloids)	N/A (solids)	No Qualification	No Qualification	Pres	NFG
		EPA 7471B (mercury)	≤ 6 ºC	No Qualification	No Qualification		
			≥ 6 ºC but ≤ 10 ºC	Professional Judgement J	Professional Judgement UJ		
			> 10 ºC	J-	Professional Judgement UJ or R		
Method Blank (MB)	One per batch of up to 20 samples.	≤ 1/2 RL (6010D) ≤ Absolute Value of RL (7471B)	≤ 1/2 RL (6010D) or Absolute Value of RL (7471B)	No Qualification	No Qualification	MB	CFRSSI QAPP Pace SOP
			> 1/2 RL (6010D) or Absolute Value of RL (7471B)	sample result < 10x blank detection: U	No Qualification		
Laboratory Control Sample (LCS)	One per batch of up to 20 samples.	%R 80-120% (all methods)	%R < 40%	J-	R	L%	CFRSSI QAPP NFG Pace SOP
			%R 40-79%	J-	UJ		
			%R 80-120%	No Qualification	No Qualification		
			%R > 120%	J+	No Qualification		
			%R > 150%	R	No Qualification		
Laboratory Duplicate Sample (LDS)[3]	One per batch of up to 20 samples.	All methods: 1. If both original sample and duplicate sample results are ≥ 5x the RL, then RPD ≤ 20% (LCSD/MSD), RPD ≤35% (soil); 2. If original sample or duplicate sample result < 5x the RL, then absolute difference between sample and duplicate ≤ 2x RL (soils)	Both original and duplicate sample results are ≥ 5x the RL and RPD ≤ 20% (LCSD/MSD), RPD ≤35% (soil).	No Qualification	No Qualification	D%	CFRSSI QAPP NFG Pace SOP
			Both original and duplicate sample results are ≥ 5x the RL and RPD is > 20% (LCSD/MSD), > 35% (soil).	J	UJ		
			RPD > 100%	Professional Judgement	Professional Judgement		
			Original sample or duplicate sample result < 5x the RL, and absolute difference between sample and duplicate ≤ 2x RL (soils)	No Qualification	No Qualification		
			Original sample or duplicate sample result is < 5x the RL and absolute difference between the sample and duplicate > 2x RL (soil).	J	UJ		
Laboratory Matrix Spike (LMS)	One per batch of up to 20 samples.	6010D - %R 75-125% 7471B - %R 80-120% if sample analyte concentration < 4x spike concentration	%R < 30%	J-	R	S%	CFRSSI QAPP NFG Pace SOP
			%R 30-74% (6010D) %R 30-79% (7471B)	J-	UJ		
			%R 75-125% (6010D) %R 80-120% (7471B)	No Qualification	No Qualification		
			%R >125% (6010D) %R >120% (7471B)	J+	No Qualification		
			sample analyte concentration ≥ 4x spike concentration	No Qualification	No Qualification		

Field Quality Control Samples							
Field Duplicate Sample	One per 20 samples collected.	All methods: 1. If both original sample and duplicate sample results are ≥ 5x the RL, RPD ≤ 35% (soil); 2. If original sample or duplicate sample result < 5x the RL, then absolute difference between sample and duplicate ≤ 2x RL (soils)	Both original and duplicate sample results are ≥ 5x the RL and RPD RPD ≤35% (soil).	No Qualification	No Qualification	FD	CFRSSI QAPP NFG
			Both original and duplicate sample results are ≥ 5x the RL and RPD is > 35% (soil).	J	UJ		
			RPD > 100%	Professional Judgement	Professional Judgement		
			Original sample or duplicate sample result < 5x the RL, and absolute difference between sample and duplicate ≤ 2xRL (soils)	No Qualification	No Qualification		
			Original sample or duplicate sample result is < 5x the RL and absolute difference between the sample and duplicate > 2xRL (soil).	J	UJ		

Notes:

1. Associated sample results:

For Field Blank results that do not meet technical criteria, apply action to all samples in the SDG.

For Field Duplicate results that do not meet technical criteria, apply action to field duplicate pair and any samples from the same sample location in the SDG.

For MB and LCS results that do not meet technical criteria, apply action to all samples in the analytical batch.

For LDS or LMS/MSD results that do not meet technical criteria, apply action to the parent sample and, per the NFG, "apply the action to all samples of the same matrix if the samples are considered sufficiently similar."

For holding time and preservation that do not meet technical criteria, apply action to sample.

2. For consistency in validations between validators, if a sample result is reported as non-detect, the MDL is used for the duplicate absolute difference calculations.

3. An LCS, an LMS, or an original sample may all be used to perform a laboratory duplicate. If a LCS Duplicate or LMS Duplicate is used, the QC sample must also meet the applicable %R technical criteria.

Qualifications:

U - Non-detect
UJ - Estimated non-detect
J - Estimated
J+ - Estimated high
J- - Estimated low
R - Rejected

Abbreviations:

MDL - method detection limit
RL - reporting limit
%R - percent recovery
RPD - relative percent difference

References:

CFRSSI QAPP - ARCO, 1992. Clark Fork River Superfund Site Investigations (CFRSSI) Quality Assurance Project Plan (QAPP). Prepared for ARCO by PTI Environmental Services, Bellevue, Washington. May 1992.

NFG - EPA, 2020. National Functional Guidelines for Inorganic Superfund Methods Data Review. November 2020.

-- Available at EPA's Superfund Analytical Services and Contract Laboratory Program website: https://www.epa.gov/clp/contract-laboratory-program-national-functional-guidelines-data-review

SOP-SFM-02 - Operating XL3-X-Ray Fluorescence Analyzer General. Pioneer Technical Services, Inc. January 2018.

UR QAPP - Silver Bow Creek/Butte Area NPL Site Butte Priority Soils Operable Unit 2022 Final Unrelaimed Sites Quality Assurance Project Plan (QAPP). Prepared for Atlantic Richfield Company by Pioneer Technical Services, Inc, Butte, Montana. June 2021.

Niton XL3 Soil QC Sheet - Niton XL3 Soil QC Certificate of Calibration. Thermo Fisher Scientific. June 2014.

Pace SOP -

EPA 6010D - ENV-SOP-MIN4-0052: Metals Analysis by ICP - Method 6010 and 200.7

EPA 7471B - ENV-SOP-MIN4-0054: Mercury in Liquid and Solid/Semi-Solid Waste by 7470A, 7471, 7471B, and 245.1

Attachment B
Field Forms and Related Documents

7 TM

UR-

BPSOU: Unreclaimed Sites Field XRF and Soil pH Results

Site Number: 03 Operator: JS, MS
Land Use: Residential XRF Unit #: 98052
pH probe #: 1

*Reference 2021 UR Confirmation Sample Decision Tree for more information on declaring the need for a confirmation sample.

Soil Action/Screening Levels (mg/kg)						
Residential	250			1,200		10
Non-Residential				2,300		
Recreational	1,000					
Commercial	500					
Storm Water	200	20	1000	1000	1000	10

XRF Reading #	Sample Name	Depth (inches)	Soil pH (s.u.)	Date Collected	Time Collected	Date Analysed	XRF Results (mg/kg)						Lab Sample
							As	Cd	Cu	Pb	Zn	Hg	
111	~~BPSOU-UR~~ System Check	—	—	10/28/21	~~10/26/21~~ 3	—	Time:	58.5	SEC	RES	177.9	—	—
112	~~BPSOU-UR~~ SIO2	—	—		—	—	5	11	<12	<3	<6	<5	—
113	~~BPSOU-UR~~ NIST	—	—		—	—	15	12	33	15	89	<6	—
114	~~BPSOU-UR~~ RCRA	—	—		—	—	504	510	23	461	45	<7	—
115	~~BPSOU-UR~~ USGS	—	—		—	—	101	20	189	774	705	<7	—
116	BPSOU-UR 03 ~~10~~ 03 5501-102821-1	0-2	4.02		12:30	10/26/21	295	<8	228	211	197	7	yes
117	BPSOU-UR 035501-102821-1-FD	0-2	4.05		12:35		298	8	165	207	181	<7	yes
118	BPSOU-UR 035501-102821-2	2-6	4.26		12:25		345	<7	202	215	320	<7	yes
119	BPSOU-UR 035501-102821-3	6-12	4.03		12:20		230	<8	144	233	303	<7	yes
120	BPSOU-UR 035502-102821-1	0-2	4.90		12:35		230	<7	81	98	181	<7	yes
121	BPSOU-UR 035502-102821-2	2-6	5.09		12:30		115	<7	128	108	210	<7	~~yes~~ 3
122	BPSOU-UR 035502-102821-3	6-12	4.61		12:25		196	<7	112	101	227	<7	yes
123	BPSOU-UR 035503-102821-1	0-2	4.10		12:50		168	<7	102	122	81	<6	yes
124	BPSOU-UR 035503-102821-2	2-6	4.15		12:45		269	<7	115	150	83	<6	yes
125	BPSOU-UR 035503-102821-3	6-12	4.11		12:40		289	9	136	207	124	<7	yes
126	BPSOU-UR 035504-102821-1	0-2	3.99		13:00		374	9	113	300	92	<7	yes
127	BPSOU-UR 035504-102821-2	2-6	4.09		12:55		398	<7	119	514	110	<7	yes
128	BPSOU-UR 035504-102821-3	6-12	4.20		12:50		394	8	136	686	126	<7	yes
129	BPSOU-UR 035505-102821-1	0-2	5.78		12:45		150	<8	206	282	422	<7	NO
130	BPSOU-UR 035505-102821-2	2-6	6.05		12:40		108	8	141	159	533	<7	NO
131	BPSOU-UR 035505-102821-3	6-12	6.31		12:35		105	<7	137	159	280	<7	NO

No exceedances compare with Hg standard

BPSOU: Unreclaimed Sites Field XRF and Soil pH Results

Site Number: UR03 Operator: JS, MS
Land Use: Residential XRF Unit #: 98052
pH probe #: 1

*Reference 2021 UR Confirmation Sample Decision Tree for more information on declaring the need for a confirmation sample.

Soil Action/Screening Levels (mg/kg)							
Residential	250			1,200		10	
Non-Residential				2,300			
Recreational	1,000						
Commercial	500						
Storm Water	200	20	1000	1000	1000	10	

XRF Reading #	Sample Name	Depth (inches)	Soil pH (s.u.)	Date Collected	Time Collected	Date Analysed	XRF Results (mg/kg)						Lab Sample
							As	Cd	Cu	Pb	Zn	Hg	
132	BPSOU-UR 035505-102821-3-D	6-12	6.31	10/28/21	12:35	10/28/21	103	<7	132	142	276	<7	—
133	BPSOU-UR 035505-102821-3-R	6-12	6.31		12:35		117	<7	122	134	272	<7	—
134	~~BPSOU-UR~~ SIO2						7	14	<11	<4	<6	<5	—
135	~~BPSOU-UR~~ NIST						19	13	37	16	90	<6	—
136	~~BPSOU-UR~~ RCRA						486	512	<16	461	47	<7	—
137	~~BPSOU-UR~~ USGS						89	20	210	785	658	10	—
	BPSOU-UR												
	BPSOU-UR												
	BPSOU-UR												
	BPSOU-UR												
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	BPSOU-UR												

10/20/21.

SS05 Sample location 5 XRF

Samples collected and analyzed on 7/1/21 @ Site UR-39

BPS0U-UR39-070121-6-12-15 @ 0855

BPS0U-UR39-070121-2-6-14 @ 0900

BPS0U-UR39-070121-0-2-13 @ 0905

* No lab Samples

OP01 Opportunistic Sample location 1

XRF Samples collected and analyzed on 7/1/21 @ Site UR-39

BPS0U-UR39-070121-6-12-18 @ 0930

BPS0U-UR39-070121-2-6-17 @ 0935

BPS0U-UR39-070121-0-2-16 @ 0940

* No lab Samples

OP02 Opportunistic Sample location 2

XRF Samples analyzed and collected on 7/1/21 @ Site UR-39

BPS0U-UR39-070121-2-6-20 @ 1020

BPS0U-UR39-070121-6-12-21 @ 1015

Lab Sample Listed on pg 14 for Sample 19.

Jesse Lu

10/26/21 Thurs UR03

On Site @ Butte office to Calibrate & collect equipment. Fill out FAF and go through Safety. Sampling Crew: Jesse S. Mathew S. Hanna pH Probe Calibration H1991121

Live Reading	Buffer
9.97 @ 16.1 °C	10.00
7.04 @ 16.3 °C	7.00
4.00 @ 16.0 °C	4.00

Cal within 0.1 deg.

11:45 on Site @ UR-03 to begin Sampling and Site Characterization. Sample locations were Staked out usin GPS for SS01 to SS05 Completed Sampling in chronological order. The following 5 Samples were collected per Procedures outlined on Page 273. Summarized by each Sample location below.

-SS01 Sample location 1

BPS0U-UR03SS01-102821-1 @ 12:30

Ran XRF, Lab Split Submitted for As ± 35% Residential Human Health Action level

BPS0U-UR03SS01-102821-2 @ 12:25

Ran XRF, Lab split Submitted for As ± 35% Residential Human Health Action level

Rite in the Rain

BP50U-UR035501-102821-3 @ 12:20
Ran XRF, Lab Split Submitted for ±35%
As Residential Human Health Action Level
BP50U-UR035501-102821-1-FD @ 12:35
Ran XRF, lab Submitted for Field duplicate
Per 1 Sample Site, Parent ID:
BP50U-UR035501-102821-1; 5502
BP50U-UR035502-102821-1 @ 12:35
Ran XRF, Lab Split Submitted for ±35%
As Residential Human Health Action Level
BP50U-UR035502-102821-2 @ 12:30
Ran XRF, No Lab
BP50U-UR035502-102821-3 @ 12:25
Ran XRF, Lab Split Submitted for ±35%
As Residential Human Health Action Level
BP50U-UR035503-102821-1 @ 12:50 5503
Ran XRF, Lab Split Submitted for ±35%
As Residential Human Health Action Level
BP50U-UR035503-102821-2 @ 12:45
Ran XRF, Lab Split Submitted for ±35%
As Residential Human Health Action Level
BP50U-UR035503-102821-3 @ 12:40
Ran XRF, Lab Split Submitted for ±35%
As Residential Human Health action Level
5504 Sample location 4!
BP50U-UR035504-102821-1 @ 13:00
Ran XRF, Lab Split Submitted for ±35%

As Residential Human Health action level
BP50U-UR035504-102821-2 @ 12:55
Ran XRF, Lab Split Submitted for ±35%
As Residential Human Health Action Level
BP50U-UR035504-102821-3 @ 12:50
Ran XRF, Lab ~~Split not Submitted~~ Split
Submitted for ± 35% As Residential
Human Health action level
5505 Sample location 5
BP50U-UR035505-102821-1 @ 12:45
Ran XRF, no Lab
BP50U-UR035505-102821-2 @ 12:40
Ran XRF, no Lab
BP50U-UR035505-102821-3 @ 12:35
Ran XRF, no Lab
Site Characterization and Sampling
@ Site UR-03 Completed. All
Lab Samples Submitted are 1 Qt
Ziplock bag for As, Cd, Cu, Pb, Zn
by 6010 & Hg by 7471. All data
Collected electronically + on Field data
Sheets. All decon per pg 3+4 and
Sample preservation per pg 4.
~~Off~~ 03 pH and XRF Ran in Butte
Office on 10/28/21. Off Site @ 1330

Jesse Lang
10/28/21

Rite in the Rain

Attachment C
Laboratory Data Packages

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

November 15, 2021

Scott Sampson
Pioneer Technical Services
1101 S. Montana Street
Butte, MT 59701

RE: Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10585806

Dear Scott Sampson:

Enclosed are the analytical results for sample(s) received by the laboratory on November 02, 2021. The results relate only to the samples included in this report. Results contained within this report conform to the most current version of the TNI standards, BP LaMP Technical Requirements Revision 12.1, and any applicable Quality Assurance Project Plan (QAPP), or Work Plan unless otherwise narrated in the body of this report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- Pace Analytical Services - Minneapolis

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Jennifer Anderson
jennifer.anderson@pacelabs.com
(612)607-6436
Project Manager

Enclosures

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

CERTIFICATIONS

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10585806

Pace Analytical Services, LLC - Minneapolis MN
1700 Elm Street SE, Minneapolis, MN 55414
1800 Elm Street SE, Minneapolis, MN 55414--Satellite Air Lab
A2LA Certification #: 2926.01*
Alabama Certification #: 40770
Alaska Contaminated Sites Certification #: 17-009*
Alaska DW Certification #: MN00064
Arizona Certification #: AZ0014*
Arkansas DW Certification #: MN00064
Arkansas WW Certification #: 88-0680
California Certification #: 2929
Colorado Certification #: MN00064
Connecticut Certification #: PH-0256
EPA Region 8 Tribal Water Systems+Wyoming DW Certification #: via MN 027-053-137
Florida Certification #: E87605*
Georgia Certification #: 959
Hawaii Certification #: MN00064
Idaho Certification #: MN00064
Illinois Certification #: 200011
Indiana Certification #: C-MN-01
Iowa Certification #: 368
Kansas Certification #: E-10167
Kentucky DW Certification #: 90062
Kentucky WW Certification #: 90062
Louisiana DEQ Certification #: AI-03086*
Louisiana DW Certification #: MN00064
Maine Certification #: MN00064*
Maryland Certification #: 322
Michigan Certification #: 9909
Minnesota Certification #: 027-053-137*
Minnesota Dept of Ag Approval: via MN 027-053-137
Minnesota Petrofund Registration #: 1240*
Mississippi Certification #: MN00064
Missouri Certification #: 10100
Montana Certification #: CERT0092
Nebraska Certification #: NE-OS-18-06
Nevada Certification #: MN00064
New Hampshire Certification #: 2081*
New Jersey Certification #: MN002
New York Certification #: 11647*
North Carolina DW Certification #: 27700
North Carolina WW Certification #: 530
North Dakota Certification #: R-036
Ohio DW Certification #: 41244
Ohio VAP Certification (1700) #: CL101
Ohio VAP Certification (1800) #: CL110*
Oklahoma Certification #: 9507*
Oregon Primary Certification #: MN300001
Oregon Secondary Certification #: MN200001*
Pennsylvania Certification #: 68-00563*
Puerto Rico Certification #: MN00064
South Carolina Certification #:74003001
Tennessee Certification #: TN02818
Texas Certification #: T104704192*
Utah Certification #: MN00064*
Vermont Certification #: VT-027053137
Virginia Certification #: 460163*
Washington Certification #: C486*
West Virginia DEP Certification #: 382
West Virginia DW Certification #: 9952 C
Wisconsin Certification #: 999407970
Wyoming UST Certification #: via A2LA 2926.01
USDA Permit #: P330-19-00208
*Please Note: Applicable air certifications are denoted with an asterisk (*).

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

SAMPLE SUMMARY

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10585806

Lab ID	Sample ID	Matrix	Date Collected	Date Received
10585806001	**BPSOU-UR03SS01-102821-1**	Solid	10/28/21 12:30	11/02/21 08:50
10585806002	**BPSOU-UR03SS01-102821-1-FD**	Solid	10/28/21 12:35	11/02/21 08:50
10585806003	**BPSOU-UR03SS01-102821-2**	Solid	10/28/21 12:25	11/02/21 08:50
10585806004	**BPSOU-UR03SS01-102821-3**	Solid	10/28/21 12:20	11/02/21 08:50
10585806005	**BPSOU-UR03SS02-102821-1**	Solid	10/28/21 12:35	11/02/21 08:50
10585806006	**BPSOU-UR03SS02-102821-3**	Solid	10/28/21 12:25	11/02/21 08:50
10585806007	**BPSOU-UR03SS03-102821-1**	Solid	10/28/21 12:50	11/02/21 08:50
10585806008	**BPSOU-UR03SS03-102821-2**	Solid	10/28/21 12:45	11/02/21 08:50
10585806009	**BPSOU-UR03SS03-102821-3**	Solid	10/28/21 12:40	11/02/21 08:50
10585806010	**BPSOU-UR03SS04-102821-1**	Solid	10/28/21 13:00	11/02/21 08:50
10585806011	**BPSOU-UR03SS04-102821-2**	Solid	10/28/21 12:55	11/02/21 08:50
10585806012	**BPSOU-UR03SS04-102821-3**	Solid	10/28/21 12:50	11/02/21 08:50

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
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SAMPLE ANALYTE COUNT

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10585806

Lab ID	Sample ID	Method	Analysts	Analytes Reported
10585806001	BPSOU-UR03SS01-102821-1	EPA 6010D	DM	5
		EPA 7471B	LMW	1
		ASTM D2974	JL5	1
10585806002	BPSOU-UR03SS01-102821-1-FD	EPA 6010D	DM	5
		EPA 7471B	LMW	1
		ASTM D2974	JL5	1
10585806003	BPSOU-UR03SS01-102821-2	EPA 6010D	DM	5
		EPA 7471B	LMW	1
		ASTM D2974	JL5	1
10585806004	BPSOU-UR03SS01-102821-3	EPA 6010D	DM	5
		EPA 7471B	LMW	1
		ASTM D2974	JL5	1
10585806005	BPSOU-UR03SS02-102821-1	EPA 6010D	DM	5
		EPA 7471B	LMW	1
		ASTM D2974	JL5	1
10585806006	BPSOU-UR03SS02-102821-3	EPA 6010D	DM	5
		EPA 7471B	LMW	1
		ASTM D2974	JL5	1
10585806007	BPSOU-UR03SS03-102821-1	EPA 6010D	DM	5
		EPA 7471B	LMW	1
		ASTM D2974	JL5	1
10585806008	BPSOU-UR03SS03-102821-2	EPA 6010D	DM	5
		EPA 7471B	LMW	1
		ASTM D2974	JL5	1
10585806009	BPSOU-UR03SS03-102821-3	EPA 6010D	DM	5
		EPA 7471B	LMW	1
		ASTM D2974	JL5	1
10585806010	BPSOU-UR03SS04-102821-1	EPA 6010D	DM	5
		EPA 7471B	LMW	1
		ASTM D2974	JL5	1
10585806011	BPSOU-UR03SS04-102821-2	EPA 6010D	DM	5
		EPA 7471B	LMW	1
		ASTM D2974	JL5	1
10585806012	BPSOU-UR03SS04-102821-3	EPA 6010D	DM	5
		EPA 7471B	LMW	1
		ASTM D2974	JL5	1

REPORT OF LABORATORY ANALYSIS

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SAMPLE ANALYTE COUNT

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10585806

Lab ID	Sample ID	Method	Analysts	Analytes Reported

PASI-M = Pace Analytical Services - Minneapolis

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PROJECT NARRATIVE

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10585806

Method: **EPA 6010D**
Description: 6010D MET ICP
Client: BPAR-PIONEER-MT
Date: November 15, 2021

General Information:
12 samples were analyzed for EPA 6010D by Pace Analytical Services Minneapolis. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:
The samples were prepared in accordance with EPA 3050B with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

QC Batch: 781168

A matrix spike and/or matrix spike duplicate (MS/MSD) were performed on the following sample(s): 10585806001

M1: Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

- MS (Lab ID: 4160338)
  - Copper
  - Lead
- MSD (Lab ID: 4160339)
  - Copper
  - Lead

P6: Matrix spike recovery was outside laboratory control limits due to a parent sample concentration notably higher than the spike level.

- MS (Lab ID: 4160338)
  - Zinc
- MSD (Lab ID: 4160339)
  - Arsenic
  - Zinc

R1: RPD value was outside control limits.

- MSD (Lab ID: 4160339)

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PROJECT NARRATIVE

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10585806

Method: **EPA 6010D**
Description: 6010D MET ICP
Client: BPAR-PIONEER-MT
Date: November 15, 2021

QC Batch: 781168

A matrix spike and/or matrix spike duplicate (MS/MSD) were performed on the following sample(s): 10585806001

R1: RPD value was outside control limits.

- Zinc

Additional Comments:

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PROJECT NARRATIVE

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10585806

Method: **EPA 7471B**
Description: 7471B Mercury
Client: BPAR-PIONEER-MT
Date: November 15, 2021

General Information:
12 samples were analyzed for EPA 7471B by Pace Analytical Services Minneapolis. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:
The samples were prepared in accordance with EPA 7471B with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

Analyte Comments:

QC Batch: 781169

E: Analyte concentration exceeded the calibration range. The reported result is estimated.

- MSD (Lab ID: 4160343)
  - Mercury

This data package has been reviewed for quality and completeness and is approved for release.

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ANALYTICAL RESULTS

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10585806

Sample: BPSOU-UR03SS01-102821-1 **Lab ID: 10585806001** Collected: 10/28/21 12:30 Received: 11/02/21 08:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010D MET ICP	Analytical Method: EPA 6010D Preparation Method: EPA 3050B Pace Analytical Services - Minneapolis								
Arsenic	**255**	mg/kg	2.0	0.31	2	11/04/21 14:10	11/11/21 13:26	7440-38-2	P6
Cadmium	**1.7**	mg/kg	0.30	0.069	2	11/04/21 14:10	11/11/21 13:26	7440-43-9	
Copper	**199**	mg/kg	1.0	0.15	2	11/04/21 14:10	11/11/21 13:26	7440-50-8	M1
Lead	**177**	mg/kg	1.0	0.21	2	11/04/21 14:10	11/11/21 13:26	7439-92-1	M1
Zinc	**270**	mg/kg	4.0	0.45	2	11/04/21 14:10	11/11/21 13:26	7440-66-6	P6,R1
7471B Mercury	Analytical Method: EPA 7471B Preparation Method: EPA 7471B Pace Analytical Services - Minneapolis								
Mercury	**0.47**	mg/kg	0.020	0.0088	1	11/04/21 14:20	11/11/21 11:42	7439-97-6	
Dry Weight / %M by ASTM D2974	Analytical Method: ASTM D2974 Pace Analytical Services - Minneapolis								
Percent Moisture	**7.5**	%	0.10	0.10	1		11/03/21 14:19		N2

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10585806

Sample: BPSOU-UR03SS01-102821-1-FD **Lab ID: 10585806002** Collected: 10/28/21 12:35 Received: 11/02/21 08:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010D MET ICP	Analytical Method: EPA 6010D Preparation Method: EPA 3050B Pace Analytical Services - Minneapolis								
Arsenic	**229**	mg/kg	1.9	0.28	2	11/04/21 14:10	11/11/21 13:34	7440-38-2	
Cadmium	**0.44**	mg/kg	0.28	0.063	2	11/04/21 14:10	11/11/21 13:34	7440-43-9	
Copper	**161**	mg/kg	0.93	0.14	2	11/04/21 14:10	11/11/21 13:34	7440-50-8	
Lead	**161**	mg/kg	0.93	0.19	2	11/04/21 14:10	11/11/21 13:34	7439-92-1	
Zinc	**171**	mg/kg	3.7	0.41	2	11/04/21 14:10	11/11/21 13:34	7440-66-6	
7471B Mercury	Analytical Method: EPA 7471B Preparation Method: EPA 7471B Pace Analytical Services - Minneapolis								
Mercury	**0.38**	mg/kg	0.018	0.0079	1	11/04/21 14:20	11/11/21 11:47	7439-97-6	
Dry Weight / %M by ASTM D2974	Analytical Method: ASTM D2974 Pace Analytical Services - Minneapolis								
Percent Moisture	**0.27**	%	0.10	0.10	1		11/03/21 14:19		N2

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10585806

Sample: BPSOU-UR03SS01-102821-2 **Lab ID: 10585806003** Collected: 10/28/21 12:25 Received: 11/02/21 08:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010D MET ICP	Analytical Method: EPA 6010D Preparation Method: EPA 3050B Pace Analytical Services - Minneapolis								
Arsenic	**294**	mg/kg	2.3	0.35	2	11/04/21 14:10	11/11/21 13:36	7440-38-2	
Cadmium	**2.4**	mg/kg	0.35	0.079	2	11/04/21 14:10	11/11/21 13:36	7440-43-9	
Copper	**223**	mg/kg	1.2	0.17	2	11/04/21 14:10	11/11/21 13:36	7440-50-8	
Lead	**230**	mg/kg	1.2	0.24	2	11/04/21 14:10	11/11/21 13:36	7439-92-1	
Zinc	**352**	mg/kg	4.6	0.51	2	11/04/21 14:10	11/11/21 13:36	7440-66-6	
7471B Mercury	Analytical Method: EPA 7471B Preparation Method: EPA 7471B Pace Analytical Services - Minneapolis								
Mercury	**0.32**	mg/kg	0.021	0.0092	1	11/04/21 14:20	11/11/21 11:49	7439-97-6	
Dry Weight / %M by ASTM D2974	Analytical Method: ASTM D2974 Pace Analytical Services - Minneapolis								
Percent Moisture	**16.6**	%	0.10	0.10	1		11/03/21 14:19		N2

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10585806

Sample: BPSOU-UR03SS01-102821-3 **Lab ID: 10585806004** Collected: 10/28/21 12:20 Received: 11/02/21 08:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010D MET ICP	Analytical Method: EPA 6010D Preparation Method: EPA 3050B Pace Analytical Services - Minneapolis								
Arsenic	**216**	mg/kg	2.2	0.33	2	11/04/21 14:10	11/11/21 13:37	7440-38-2	
Cadmium	**1.2**	mg/kg	0.32	0.074	2	11/04/21 14:10	11/11/21 13:37	7440-43-9	
Copper	**170**	mg/kg	1.1	0.16	2	11/04/21 14:10	11/11/21 13:37	7440-50-8	
Lead	**523**	mg/kg	1.1	0.22	2	11/04/21 14:10	11/11/21 13:37	7439-92-1	
Zinc	**359**	mg/kg	4.3	0.48	2	11/04/21 14:10	11/11/21 13:37	7440-66-6	
7471B Mercury	Analytical Method: EPA 7471B Preparation Method: EPA 7471B Pace Analytical Services - Minneapolis								
Mercury	**0.51**	mg/kg	0.021	0.0092	1	11/04/21 14:20	11/11/21 11:50	7439-97-6	
Dry Weight / %M by ASTM D2974	Analytical Method: ASTM D2974 Pace Analytical Services - Minneapolis								
Percent Moisture	**14.4**	%	0.10	0.10	1		11/03/21 14:19		N2

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10585806

Sample: BPSOU-UR03SS02-102821-1 **Lab ID: 10585806005** Collected: 10/28/21 12:35 Received: 11/02/21 08:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010D MET ICP	Analytical Method: EPA 6010D Preparation Method: EPA 3050B Pace Analytical Services - Minneapolis								
Arsenic	**184**	mg/kg	0.94	0.14	1	11/04/21 14:10	11/11/21 14:01	7440-38-2	
Cadmium	**0.25**	mg/kg	0.14	0.032	1	11/04/21 14:10	11/11/21 14:01	7440-43-9	
Copper	**45.7**	mg/kg	0.47	0.069	1	11/04/21 14:10	11/11/21 14:01	7440-50-8	
Lead	**70.1**	mg/kg	0.47	0.097	1	11/04/21 14:10	11/11/21 14:01	7439-92-1	
Zinc	**114**	mg/kg	1.9	0.21	1	11/04/21 14:10	11/11/21 14:01	7440-66-6	
7471B Mercury	Analytical Method: EPA 7471B Preparation Method: EPA 7471B Pace Analytical Services - Minneapolis								
Mercury	**0.12**	mg/kg	0.017	0.0076	1	11/04/21 14:20	11/11/21 11:55	7439-97-6	
Dry Weight / %M by ASTM D2974	Analytical Method: ASTM D2974 Pace Analytical Services - Minneapolis								
Percent Moisture	**1.7**	%	0.10	0.10	1		11/03/21 14:20		N2

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10585806

Sample: BPSOU-UR03SS02-102821-3 **Lab ID: 10585806006** Collected: 10/28/21 12:25 Received: 11/02/21 08:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010D MET ICP	Analytical Method: EPA 6010D Preparation Method: EPA 3050B Pace Analytical Services - Minneapolis								
Arsenic	**118**	mg/kg	2.0	0.30	2	11/04/21 14:10	11/11/21 13:46	7440-38-2	
Cadmium	**0.40**	mg/kg	0.30	0.068	2	11/04/21 14:10	11/11/21 13:46	7440-43-9	
Copper	**127**	mg/kg	0.99	0.14	2	11/04/21 14:10	11/11/21 13:46	7440-50-8	
Lead	**126**	mg/kg	0.99	0.20	2	11/04/21 14:10	11/11/21 13:46	7439-92-1	
Zinc	**211**	mg/kg	4.0	0.44	2	11/04/21 14:10	11/11/21 13:46	7440-66-6	
7471B Mercury	Analytical Method: EPA 7471B Preparation Method: EPA 7471B Pace Analytical Services - Minneapolis								
Mercury	**0.10**	mg/kg	0.018	0.0077	1	11/04/21 14:20	11/11/21 11:57	7439-97-6	
Dry Weight / %M by ASTM D2974	Analytical Method: ASTM D2974 Pace Analytical Services - Minneapolis								
Percent Moisture	**1.1**	%	0.10	0.10	1		11/03/21 14:20		N2

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10585806

Sample: BPSOU-UR03SS03-102821-1 **Lab ID: 10585806007** Collected: 10/28/21 12:50 Received: 11/02/21 08:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010D MET ICP	Analytical Method: EPA 6010D Preparation Method: EPA 3050B Pace Analytical Services - Minneapolis								
Arsenic	**159**	mg/kg	1.3	0.20	1	11/04/21 14:10	11/11/21 14:03	7440-38-2	
Cadmium	**0.22**	mg/kg	0.20	0.045	1	11/04/21 14:10	11/11/21 14:03	7440-43-9	
Copper	**135**	mg/kg	0.65	0.096	1	11/04/21 14:10	11/11/21 14:03	7440-50-8	
Lead	**127**	mg/kg	0.65	0.13	1	11/04/21 14:10	11/11/21 14:03	7439-92-1	
Zinc	**72.4**	mg/kg	2.6	0.29	1	11/04/21 14:10	11/11/21 14:03	7440-66-6	
7471B Mercury	Analytical Method: EPA 7471B Preparation Method: EPA 7471B Pace Analytical Services - Minneapolis								
Mercury	**0.19**	mg/kg	0.024	0.010	1	11/04/21 14:20	11/11/21 11:58	7439-97-6	
Dry Weight / %M by ASTM D2974	Analytical Method: ASTM D2974 Pace Analytical Services - Minneapolis								
Percent Moisture	**25.7**	%	0.10	0.10	1		11/03/21 14:20		N2

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10585806

Sample: BPSOU-UR03SS03-102821-2 **Lab ID: 10585806008** Collected: 10/28/21 12:45 Received: 11/02/21 08:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010D MET ICP	Analytical Method: EPA 6010D Preparation Method: EPA 3050B Pace Analytical Services - Minneapolis								
Arsenic	**184**	mg/kg	1.0	0.16	1	11/04/21 14:10	11/11/21 14:08	7440-38-2	
Cadmium	**0.15**	mg/kg	0.15	0.035	1	11/04/21 14:10	11/11/21 14:08	7440-43-9	
Copper	**97.5**	mg/kg	0.51	0.075	1	11/04/21 14:10	11/11/21 14:08	7440-50-8	
Lead	**126**	mg/kg	0.51	0.11	1	11/04/21 14:10	11/11/21 14:08	7439-92-1	
Zinc	**54.3**	mg/kg	2.1	0.23	1	11/04/21 14:10	11/11/21 14:08	7440-66-6	
7471B Mercury	Analytical Method: EPA 7471B Preparation Method: EPA 7471B Pace Analytical Services - Minneapolis								
Mercury	**0.16**	mg/kg	0.018	0.0079	1	11/04/21 14:20	11/11/21 12:00	7439-97-6	
Dry Weight / %M by ASTM D2974	Analytical Method: ASTM D2974 Pace Analytical Services - Minneapolis								
Percent Moisture	**5.4**	%	0.10	0.10	1		11/03/21 14:20		N2

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10585806

Sample: BPSOU-UR03SS03-102821-3 **Lab ID: 10585806009** Collected: 10/28/21 12:40 Received: 11/02/21 08:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010D MET ICP	Analytical Method: EPA 6010D Preparation Method: EPA 3050B Pace Analytical Services - Minneapolis								
Arsenic	**172**	mg/kg	1.1	0.16	1	11/04/21 14:10	11/11/21 14:10	7440-38-2	
Cadmium	**0.16**	mg/kg	0.16	0.036	1	11/04/21 14:10	11/11/21 14:10	7440-43-9	
Copper	**100**	mg/kg	0.53	0.077	1	11/04/21 14:10	11/11/21 14:10	7440-50-8	
Lead	**147**	mg/kg	0.53	0.11	1	11/04/21 14:10	11/11/21 14:10	7439-92-1	
Zinc	**82.5**	mg/kg	2.1	0.24	1	11/04/21 14:10	11/11/21 14:10	7440-66-6	
7471B Mercury	Analytical Method: EPA 7471B Preparation Method: EPA 7471B Pace Analytical Services - Minneapolis								
Mercury	**0.21**	mg/kg	0.022	0.0094	1	11/04/21 14:20	11/11/21 12:02	7439-97-6	
Dry Weight / %M by ASTM D2974	Analytical Method: ASTM D2974 Pace Analytical Services - Minneapolis								
Percent Moisture	**10.9**	%	0.10	0.10	1		11/03/21 14:20		N2

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10585806

Sample: BPSOU-UR03SS04-102821-1 **Lab ID: 10585806010** Collected: 10/28/21 13:00 Received: 11/02/21 08:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010D MET ICP	Analytical Method: EPA 6010D Preparation Method: EPA 3050B Pace Analytical Services - Minneapolis								
Arsenic	**229**	mg/kg	1.0	0.16	1	11/04/21 14:10	11/11/21 14:11	7440-38-2	
Cadmium	**0.12J**	mg/kg	0.15	0.035	1	11/04/21 14:10	11/11/21 14:11	7440-43-9	
Copper	**81.3**	mg/kg	0.51	0.075	1	11/04/21 14:10	11/11/21 14:11	7440-50-8	
Lead	**225**	mg/kg	0.51	0.11	1	11/04/21 14:10	11/11/21 14:11	7439-92-1	
Zinc	**55.0**	mg/kg	2.1	0.23	1	11/04/21 14:10	11/11/21 14:11	7440-66-6	
7471B Mercury	Analytical Method: EPA 7471B Preparation Method: EPA 7471B Pace Analytical Services - Minneapolis								
Mercury	**0.075**	mg/kg	0.020	0.0088	1	11/04/21 14:20	11/11/21 12:03	7439-97-6	
Dry Weight / %M by ASTM D2974	Analytical Method: ASTM D2974 Pace Analytical Services - Minneapolis								
Percent Moisture	**7.5**	%	0.10	0.10	1		11/03/21 14:21		N2

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10585806

Sample: BPSOU-UR03SS04-102821-2 **Lab ID: 10585806011** Collected: 10/28/21 12:55 Received: 11/02/21 08:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010D MET ICP	Analytical Method: EPA 6010D Preparation Method: EPA 3050B Pace Analytical Services - Minneapolis								
Arsenic	**266**	mg/kg	0.99	0.15	1	11/04/21 14:10	11/11/21 14:13	7440-38-2	
Cadmium	**0.15**	mg/kg	0.15	0.034	1	11/04/21 14:10	11/11/21 14:13	7440-43-9	
Copper	**95.0**	mg/kg	0.49	0.072	1	11/04/21 14:10	11/11/21 14:13	7440-50-8	
Lead	**361**	mg/kg	0.49	0.10	1	11/04/21 14:10	11/11/21 14:13	7439-92-1	
Zinc	**72.2**	mg/kg	2.0	0.22	1	11/04/21 14:10	11/11/21 14:13	7440-66-6	
7471B Mercury	Analytical Method: EPA 7471B Preparation Method: EPA 7471B Pace Analytical Services - Minneapolis								
Mercury	**0.098**	mg/kg	0.020	0.0087	1	11/04/21 14:20	11/11/21 12:05	7439-97-6	
Dry Weight / %M by ASTM D2974	Analytical Method: ASTM D2974 Pace Analytical Services - Minneapolis								
Percent Moisture	**6.3**	%	0.10	0.10	1		11/03/21 14:21		N2

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10585806

Sample: BPSOU-UR03SS04-102821-3 **Lab ID: 10585806012** Collected: 10/28/21 12:50 Received: 11/02/21 08:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010D MET ICP	Analytical Method: EPA 6010D Preparation Method: EPA 3050B Pace Analytical Services - Minneapolis								
Arsenic	**288**	mg/kg	2.1	0.32	2	11/04/21 14:10	11/11/21 13:59	7440-38-2	
Cadmium	**0.37**	mg/kg	0.32	0.072	2	11/04/21 14:10	11/11/21 13:59	7440-43-9	
Copper	**110**	mg/kg	1.1	0.15	2	11/04/21 14:10	11/11/21 13:59	7440-50-8	
Lead	**634**	mg/kg	1.1	0.22	2	11/04/21 14:10	11/11/21 13:59	7439-92-1	
Zinc	**127**	mg/kg	4.2	0.47	2	11/04/21 14:10	11/11/21 13:59	7440-66-6	
7471B Mercury	Analytical Method: EPA 7471B Preparation Method: EPA 7471B Pace Analytical Services - Minneapolis								
Mercury	**0.22**	mg/kg	0.019	0.0082	1	11/04/21 14:20	11/11/21 12:07	7439-97-6	
Dry Weight / %M by ASTM D2974	Analytical Method: ASTM D2974 Pace Analytical Services - Minneapolis								
Percent Moisture	**6.5**	%	0.10	0.10	1		11/03/21 14:21		N2

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10585806

QC Batch: 781169 — Analysis Method: EPA 7471B
QC Batch Method: EPA 7471B — Analysis Description: 7471B Mercury Solids
Laboratory: Pace Analytical Services - Minneapolis
Associated Lab Samples: 10585806001, 10585806002, 10585806003, 10585806004, 10585806005, 10585806006, 10585806007, 10585806008, 10585806009, 10585806010, 10585806011, 10585806012

METHOD BLANK: 4160340 — Matrix: Solid
Associated Lab Samples: 10585806001, 10585806002, 10585806003, 10585806004, 10585806005, 10585806006, 10585806007, 10585806008, 10585806009, 10585806010, 10585806011, 10585806012

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Mercury	mg/kg	<0.0084	0.019	0.0084	11/11/21 11:39	

LABORATORY CONTROL SAMPLE: 4160341

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Mercury	mg/kg	0.48	0.49	101	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 4160342 4160343

Parameter	Units	10585806001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Mercury	mg/kg	0.47	0.51	0.45	0.90	0.87	85	89	80-120	3	20	E

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10585806

QC Batch: 781168
QC Batch Method: EPA 3050B
Analysis Method: EPA 6010D
Analysis Description: 6010D Solids
Laboratory: Pace Analytical Services - Minneapolis
Associated Lab Samples: 10585806001, 10585806002, 10585806003, 10585806004, 10585806005, 10585806006, 10585806007, 10585806008, 10585806009, 10585806010, 10585806011, 10585806012

METHOD BLANK: 4160336 Matrix: Solid
Associated Lab Samples: 10585806001, 10585806002, 10585806003, 10585806004, 10585806005, 10585806006, 10585806007, 10585806008, 10585806009, 10585806010, 10585806011, 10585806012

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Arsenic	mg/kg	<0.14	0.93	0.14	11/11/21 13:22	
Cadmium	mg/kg	<0.032	0.14	0.032	11/11/21 13:22	
Copper	mg/kg	<0.068	0.47	0.068	11/11/21 13:22	
Lead	mg/kg	<0.096	0.47	0.096	11/11/21 13:22	
Zinc	mg/kg	0.25J	1.9	0.21	11/11/21 13:22	

LABORATORY CONTROL SAMPLE: 4160337

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Arsenic	mg/kg	48.1	45.9	95	80-120	
Cadmium	mg/kg	48.1	48.7	101	80-120	
Copper	mg/kg	48.1	47.5	99	80-120	
Lead	mg/kg	48.1	47.9	100	80-120	
Zinc	mg/kg	48.1	48.1	100	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 4160338 4160339

Parameter	Units	10585806001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Arsenic	mg/kg	255	51.4	50.5	310	275	107	40	75-125	12	20	P6
Cadmium	mg/kg	1.7	51.4	50.5	49.3	47.2	92	90	75-125	4	20	
Copper	mg/kg	199	51.4	50.5	207	220	16	41	75-125	6	20	M1
Lead	mg/kg	177	51.4	50.5	198	208	41	61	75-125	5	20	M1
Zinc	mg/kg	270	51.4	50.5	198	244	-140	-51	75-125	21	20	P6,R1

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10585806

QC Batch: 781159
QC Batch Method: ASTM D2974
Analysis Method: ASTM D2974
Analysis Description: Dry Weight / %M by ASTM D2974
Laboratory: Pace Analytical Services - Minneapolis
Associated Lab Samples: 10585806001, 10585806002, 10585806003, 10585806004, 10585806005, 10585806006, 10585806007, 10585806008, 10585806009, 10585806010, 10585806011, 10585806012

SAMPLE DUPLICATE: 4160306

Parameter	Units	10585806001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	7.5	7.3	2	30	N2

SAMPLE DUPLICATE: 4160307

Parameter	Units	10585806011 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	6.3	6.0	5	30	N2

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALIFIERS

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10585806

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Reported results are not rounded until the final step prior to reporting. Therefore, calculated parameters that are typically reported as "Total" may vary slightly from the sum of the reported component parameters.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

ANALYTE QUALIFIERS

E	Analyte concentration exceeded the calibration range. The reported result is estimated.
M1	Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.
N2	The lab does not hold NELAC/TNI accreditation for this parameter but other accreditations/certifications may apply. A complete list of accreditations/certifications is available upon request.
P6	Matrix spike recovery was outside laboratory control limits due to a parent sample concentration notably higher than the spike level.
R1	RPD value was outside control limits.

Pace Analytical Services, LLC
1700 Elm Street
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: BPSOU Unreclaimed Sampling
Pace Project No.: 10585806

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
10585806001	BPSOU-UR03SS01-102821-1	EPA 3050B	781168	EPA 6010D	782093
10585806002	BPSOU-UR03SS01-102821-1-FD	EPA 3050B	781168	EPA 6010D	782093
10585806003	BPSOU-UR03SS01-102821-2	EPA 3050B	781168	EPA 6010D	782093
10585806004	BPSOU-UR03SS01-102821-3	EPA 3050B	781168	EPA 6010D	782093
10585806005	BPSOU-UR03SS02-102821-1	EPA 3050B	781168	EPA 6010D	782093
10585806006	BPSOU-UR03SS02-102821-3	EPA 3050B	781168	EPA 6010D	782093
10585806007	BPSOU-UR03SS03-102821-1	EPA 3050B	781168	EPA 6010D	782093
10585806008	BPSOU-UR03SS03-102821-2	EPA 3050B	781168	EPA 6010D	782093
10585806009	BPSOU-UR03SS03-102821-3	EPA 3050B	781168	EPA 6010D	782093
10585806010	BPSOU-UR03SS04-102821-1	EPA 3050B	781168	EPA 6010D	782093
10585806011	BPSOU-UR03SS04-102821-2	EPA 3050B	781168	EPA 6010D	782093
10585806012	BPSOU-UR03SS04-102821-3	EPA 3050B	781168	EPA 6010D	782093
10585806001	BPSOU-UR03SS01-102821-1	EPA 7471B	781169	EPA 7471B	782473
10585806002	BPSOU-UR03SS01-102821-1-FD	EPA 7471B	781169	EPA 7471B	782473
10585806003	BPSOU-UR03SS01-102821-2	EPA 7471B	781169	EPA 7471B	782473
10585806004	BPSOU-UR03SS01-102821-3	EPA 7471B	781169	EPA 7471B	782473
10585806005	BPSOU-UR03SS02-102821-1	EPA 7471B	781169	EPA 7471B	782473
10585806006	BPSOU-UR03SS02-102821-3	EPA 7471B	781169	EPA 7471B	782473
10585806007	BPSOU-UR03SS03-102821-1	EPA 7471B	781169	EPA 7471B	782473
10585806008	BPSOU-UR03SS03-102821-2	EPA 7471B	781169	EPA 7471B	782473
10585806009	BPSOU-UR03SS03-102821-3	EPA 7471B	781169	EPA 7471B	782473
10585806010	BPSOU-UR03SS04-102821-1	EPA 7471B	781169	EPA 7471B	782473
10585806011	BPSOU-UR03SS04-102821-2	EPA 7471B	781169	EPA 7471B	782473
10585806012	BPSOU-UR03SS04-102821-3	EPA 7471B	781169	EPA 7471B	782473
10585806001	BPSOU-UR03SS01-102821-1	ASTM D2974	781159		
10585806002	BPSOU-UR03SS01-102821-1-FD	ASTM D2974	781159		
10585806003	BPSOU-UR03SS01-102821-2	ASTM D2974	781159		
10585806004	BPSOU-UR03SS01-102821-3	ASTM D2974	781159		
10585806005	BPSOU-UR03SS02-102821-1	ASTM D2974	781159		
10585806006	BPSOU-UR03SS02-102821-3	ASTM D2974	781159		
10585806007	BPSOU-UR03SS03-102821-1	ASTM D2974	781159		
10585806008	BPSOU-UR03SS03-102821-2	ASTM D2974	781159		
10585806009	BPSOU-UR03SS03-102821-3	ASTM D2974	781159		
10585806010	BPSOU-UR03SS04-102821-1	ASTM D2974	781159		
10585806011	BPSOU-UR03SS04-102821-2	ASTM D2974	781159		
10585806012	BPSOU-UR03SS04-102821-3	ASTM D2974	781159		

Laboratory Management Program (LaMP) Chain of Custody Record
Soil, Sediment and Groundwater Samples

BP Site Node Path: _____ **Req Due Date (mm/dd/yy):** 11/15/21 Rush TAT Yes 14 day No _____

BP/RM Facility No: _____ **Lab Work Order Number:** _____

Lab Name: Pace Analytical	BP/ARC Facility Address:	Consultant/Contractor:	Pioneer Technical Services
Lab Address: 1700 Elm Street SE, Minneapolis, MN 55414	City, State, ZIP Code:	Consultant/Contractor Project No:	BPSOU Unreclaimed Sampling
Lab PM: Jennifer Anderson	Lead Regulatory Agency:	Address:	1101 S. Montana St.
Lab Phone: 612-607-6436	California Global ID No.:	Consultant/Contractor PM:	Scott Sampson
Lab Shipping Accnt:	Enfos Proposal No:	Phone: 406-697-0946 Email:	ssampson@pioneer-technical.com
Lab Bottle Order No:	Accounting Mode: Provision ____ OOC-BU ____ OOC-RM ____	Send/Submit EDD to:	Scott Sampson
Other Info:	Stage Activity	Invoice To:	BP-RM _____ BP-Other _____

BP/RM PM: Mike Mc Anulty

PM Phone: 406-723-1822

PM Email: mcanumc@bp.com

Requested Analyses

Report Type & QC Level

Limited (Standard) Package _____

Limited Plus Package _____

Full Package Level 2

WO# : 10585806

10585806

Lab No.	Unique Sample ID, must follow format of SAMPLENAMEYYYYMMDD Examples: MW01_20190101; BH01_3-5_20190101	Time	Depth Unit	Grab (G) or Composite (C)	Total Number of Containers	Matrix	Analysis: Total Metals 6010 As, Cd, Cu, Pb, Zn	Analysis: 7471 Mercury	Filtered (Y/N)	Preservation
	BPSOU-UR03SS01-102821-1	12:30	in	c	1	soil	x	x		
	BPSOU-UR03SS01-102821-1-FD	12:35	in	c	1	soil	x	x		
	BPSOU-UR03SS01-102821-2	12:25	in	c	1	soil	x	x		
	BPSOU-UR03SS01-102821-3	12:20	in	c	1	soil	x	x		
	BPSOU-UR03SS02-102821-1	12:35	in	c	1	soil	x	x		
	BPSOU-UR03SS02-102821-3	12:25	in	c	1	soil	x	x		
	BPSOU-UR03SS03-102821-1	12:50	in	c	1	soil	x	x		

UR1 UR2 UR3 UR4 UR5 UR6 UR7

		Relinquished By / Affiliation	Date	Time	Accepted By / Affiliation	Date	Time
Sampler's Name:	Jesse Sims						
Sampler's Company:	Pioneer Technical Services	Nathan Fenley / PTS	11/1/21	1500	B/PACE	11/2/21	850
Ship Method:	FedEx Overnight 11/1/2021						
Shipment Tracking No:	4278 9934 6391						

Special Instructions: *Maximum 14 day TAT

THIS LINE - LAB USE ONLY: Custody Seals In Place: (Yes) / No | Temp Blank: (Yes) / No | Cooler Temp on Receipt: 3.7 °F/(C) | Trip Blank: Yes / (No) | MS/MSD Sample Submitted: Yes / (No)

BP LaMP Soil/H2O COC March 2019

Laboratory Management Program (LaMP) Chain of Custody Record

Soil, Sediment and Groundwater Samples

BP Site Node Path: _____ **Req Due Date (mm/dd/yy):** 11/15/21 **Rush TAT** Yes 14 day No _____

BP/RM Facility No: _____ **Lab Work Order Number:** _____

Lab Name: Pace Analytical	BP/ARC Facility Address:	Consultant/Contractor:	Pioneer Technical Services
Lab Address: 1700 Elm Street SE, Minneapolis, MN 55414	City, State, ZIP Code:	Consultant/Contractor Project No:	BPSOU Unreclaimed Sampling
Lab PM: Jennifer Anderson	Lead Regulatory Agency:	Address:	1101 S. Montana St.
Lab Phone: 612-607-6436	California Global ID No.:	Consultant/Contractor PM:	Scott Sampson
Lab Shipping Accnt:	Enfos Proposal No:	Phone: 406-697-0946 Email:	ssampson@pioneer-technical.com
Lab Bottle Order No:	Accounting Mode: Provision ____ OOC-BU ____ OOC-RM ____	Send/Submit EDD to:	Scott Sampson
Other Info:	Stage Activity	Invoice To:	BP-RM _____ BP-Other _____

BP/RM PM: Mike Mc Anulty	
PM Phone: 406-723-1822	
PM Email: mcanumc@bp.com	

Requested Analyses

Report Type & QC Level

Limited (Standard) Package _____

Limited Plus Package _____

Full Package Level 2

Lab No.	Unique Sample ID, must follow format of SAMPLENAMEYYYYMMDD Examples: MW01_20190101; BH01_3-5_20190101	Time	Depth Unit	Grab (G) or Composite (C)	Total Number of Containers	Matrix	Analysis: Total Metals 6010 As, Cd, Cu, Pb, Zn	Analysis: 7471 Mercury	Filtered (Y/N)	Preservation	Comments
	BPSOU-UR03SS03-102821-2	12:45	in	c	1	soil	x	x			C08
	BPSOU-UR03SS03-102821-3	12:40	in	c	1	soil	x	x			C09
	BPSOU-UR03SS04-102821-1	13:00	in	c	1	soil	x	x			C10
	BPSOU-UR03SS04-102821-2	12:55	in	c	1	soil	x	x			C11
	BPSOU-UR03SS04-102821-3	12:50	in	c	1	soil	x	x			C12

Sampler's Name: Jesse Sims	**Relinquished By / Affiliation**	**Date**	**Time**	**Accepted By / Affiliation**	**Date**	**Time**
Sampler's Company: Pioneer Technical Services	Nathan Farley	11/1/21	1500	JB/PACE	11/2/21	850
Ship Method: FedEx Overnight 11/1/2021						
Shipment Tracking No: 4278 9934 6391						

Special Instructions: *Maximum 14 day TAT

THIS LINE - LAB USE ONLY: Custody Seals In Place: Yes / No | Temp Blank: Yes / No | Cooler Temp on Receipt: _____ °F/C | Trip Blank: Yes / No | MS/MSD Sample Submitted: Yes / No

BP LaMP Soil/H2O COC March 2019

Pace Analytical®	Document Name: **Sample Condition Upon Receipt (SCUR) - ESI**	Document Revised: 12Aug2020 **Page 1 of 1**
	Document No.: **ENV-FRM-MIN4-0149 Rev.01**	Pace Analytical Services - **Minneapolis**

Sample Condition Upon Receipt – ESI Tech Specs

Client Name: BP-Pioneer

Project #: WO#: 10585806 PM: JMA Due Date: 11/15/21 CLIENT: BP-PIONEER

Courier: ☒Fed Ex ☐UPS ☐USPS ☐Client ☐Pace ☐SpeeDee ☐Commercial

Tracking Number: 4278 9934 6391 See Exceptions ☐ ENV-FRM-MIN4-0142

Custody Seal on Cooler/Box Present? ☒Yes ☐No **Seals Intact?** ☒Yes ☐No **Biological Tissue Frozen?** ☐Yes ☐No ☒N/A

Packing Material: ☒Bubble Wrap ☐Bubble Bags ☐None ☐Other:_____ **Temp Blank?** ☒Yes ☐No

Thermometer: ☐T1(0461) ☐T2(1336) ☒T3(0459) ☐T4(0254) ☐T5(0489) **Type of Ice:** ☒Wet ☐Blue ☐None ☐Dry ☐Melted

Temp should be above freezing to 6°C **Cooler Temp Read w/temp blank:** 3.7 °C **Average Corrected Temp (no temp blank only):** _____°C ☐See Exceptions ENV-FRM-MIN4-0142 ☐1 Container

Correction Factor: true **Cooler Temp Corrected w/temp blank :** 3.7 °C

USDA Regulated Soil: (☐ N/A, water sample/Other:_____) **Date/Initials of Person Examining Contents:** AB 11/2/21

Did samples originate in a quarantine zone within the United States: AL, AR, CA, FL, GA, ID, LA. MS, NC, NM, NY, OK, OR, SC, TN, TX or VA (check maps)? ☐Yes ☒No

Did samples originate from a foreign source (internationally, including Hawaii and Puerto Rico)? ☐Yes ☒No

If Yes to either question, fill out a Regulated Soil Checklist (F-MN-Q-338) and include with SCUR/COC paperwork.

				COMMENTS:
Chain of Custody Present and Filled Out?	☒Yes	☐No		1.
Chain of Custody Relinquished?	☒Yes	☐No		2.
Sampler Name and/or Signature on COC?	☒Yes	☐No	☐N/A	3.
Samples Arrived within Hold Time?	☒Yes	☐No		4.
Short Hold Time Analysis (<72 hr)?	☐Yes	☒No		5. ☐Fecal Coliform ☐HPC ☐Total Coliform/E coli ☐BOD/cBOD ☐Hex Chrome ☐Turbidity ☐Nitrate ☐Nitrite ☐Orthophos ☐
Rush Turn Around Time Requested?	☐Yes	☒No		6. 14 day
Sufficient Sample Volume?	☒Yes	☐No		
Triple Volume Provided for MS/MSD (if more than 10 samples)?	☐Yes	☒No	☐N/A AB 11/2/21	7.
Correct Containers Used?	☒Yes	☐No		8.
-Pace Containers Used?	☐Yes	☒No		
Containers Intact?	☒Yes	☐No		9.
Field Filtered Volume Received for Dissolved Tests?	☐Yes	☐No	☒N/A	10. Is sediment visible in the dissolved container? ☐Yes ☐No
Is sufficient information available to reconcile the samples to the COC	☒Yes	☐No		11. **If no, write ID/ Date/Time on Container Below:** **See Exception** ☐ **ENV-FRM-MIN4-0142**
Matrix: ☐Water ☒Soil ☐Oil ☐Other_____				
All containers needing acid/base preservation have been checked?	☐Yes	☐No	☒N/A	12. Sample #
All containers needing preservation are found to be in compliance with EPA recommendation? (HNO_3, H_2SO_4, <2pH, NaOH >9 Sulfide, NaOH>10 Cyanide)	☐Yes	☐No	☒N/A	☐ NaOH ☐ HNO_3 ☐ H_2SO_4 ☐ Zinc Acetate
Exceptions: VOA, Coliform, TOC/DOC Oil and Grease, DRO/8015 (water) and Dioxin/PFAS *If adding preservative to a container it must be added to associated field and equipment blanks (verify with PM first)	☐Yes	☐No	☒N/A	Positive for Res. Chlorine? ☐Yes ☐No **pH Paper Lot#** **See Exception** ☐ **ENV-FRM-MIN4-0142**
				Res. Chlorine | 0-6 Roll | 0-6 Strip | 0-14 Strip
Extra labels present on soil VOA or WIDRO contaners?	☐Yes	☐No	☒N/A	13. **See Exception** ☐ **ENV-FRM-MIN4-0140**
Headspace in VOA Vials (greater than 6mm)?	☐Yes	☐No	☒N/A	
3 Trip Blanks Present?	☐Yes	☐No	☒N/A	14.
Trip Blank Custody Seals Present?	☐Yes	☐No	☒N/A	Pace Trip Blank Lot # (if purchased):_____

Temp Log: Temp must be maintained at <6°C during login, record temp every 20 mins		
Opened Time: 1050	Temp: 3.7	Corrected Temp: 3.7
Time:	put in cooler	
Time: 1105	Temp: 4.1	Corrected Temp: 4.1

CLIENT NOTIFICATION/RESOLUTION **Field Data Required?** ☐Yes ☐No

Person Contacted: Date/Time:

Comments/Resolution:

Project Manager Review: _____ **Date:** 11/04/2021

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers)

Labeled by: _____

Attachment C.2 - XRF Data

XRF Sample ID	Sample Type	Field Sample ID	Analysis Date	Units	Arsenic Result	Arsenic Error	Cadmium Result	Cadmium Error	Copper Result	Copper Error	Lead Result	Lead Error	Mercury Result	Mercury Error	Zinc Result	Zinc Error
P_20211028_98052_112	SiO2	SiO2	10/28/2021	mg/kg	5.26	1.95	11.34	3.57	<LOD	11.88	<LOD	3.40	<LOD	4.96	<LOD	5.84
P_20211028_98052_113	NIST 2709a	NIST 2709a	10/28/2021	mg/kg	15.32	3.88	12.38	5.24	33.21	11.29	15.44	4.29	<LOD	6.35	89.39	8.82
P_20211028_98052_114	RCRA	RCRA	10/28/2021	mg/kg	504.18	18.33	509.67	11.24	22.79	10.78	460.57	17.89	<LOD	7.08	44.96	7.12
P_20211028_98052_115	USGS SdAR-M2	USGS SdAR-M2	10/28/2021	mg/kg	100.82	17.20	19.95	5.39	188.66	16.43	773.71	20.51	<LOD	7.01	705.39	21.86
P_20211028_98052_116	Natural	BPSOU-UR03SS01-102821-1	10/28/2021	mg/kg	295.01	13.58	<LOD	7.68	228.15	18.23	211.30	11.65	7.36	4.77	196.94	12.88
P_20211028_98052_117	Field Duplicate	BPSOU-UR03SS01-102821-1-FD	10/28/2021	mg/kg	297.61	13.31	8.00	5.17	164.93	16.17	206.76	11.33	<LOD	7.08	180.56	12.25
P_20211028_98052_118	Natural	BPSOU-UR03SS01-102821-2	10/28/2021	mg/kg	344.70	14.11	<LOD	7.42	201.86	17.47	215.04	11.64	<LOD	7.37	320.45	15.84
P_20211028_98052_119	Natural	BPSOU-UR03SS01-102821-3	10/28/2021	mg/kg	230.44	12.96	<LOD	7.80	144.15	15.84	232.66	12.09	<LOD	7.08	302.84	15.40
P_20211028_98052_120	Natural	BPSOU-UR03SS02-102821-1	10/28/2021	mg/kg	231.66	10.57	<LOD	7.29	81.27	13.09	97.75	8.01	<LOD	6.61	180.50	11.82
P_20211028_98052_121	Natural	BPSOU-UR03SS02-102821-2	10/28/2021	mg/kg	114.92	8.75	<LOD	7.45	127.73	14.45	108.16	8.24	<LOD	6.70	210.34	12.56
P_20211028_98052_122	Natural	BPSOU-UR03SS02-102821-3	10/28/2021	mg/kg	196.23	9.97	<LOD	7.28	111.65	13.99	101.49	8.03	<LOD	6.63	227.12	12.93
P_20211028_98052_123	Natural	BPSOU-UR03SS03-102821-1	10/28/2021	mg/kg	167.61	9.67	<LOD	7.03	102.08	13.21	122.31	8.48	<LOD	6.36	81.28	8.55
P_20211028_98052_124	Natural	BPSOU-UR03SS03-102821-2	10/28/2021	mg/kg	269.03	11.61	<LOD	7.09	115.28	13.76	149.69	9.36	<LOD	6.41	82.62	8.59
P_20211028_98052_125	Natural	BPSOU-UR03SS03-102821-3	10/28/2021	mg/kg	289.15	13.04	8.86	4.96	136.46	14.98	206.85	11.18	<LOD	6.89	123.73	10.40
P_20211028_98052_126	Natural	BPSOU-UR03SS04-102821-1	10/28/2021	mg/kg	373.71	14.85	9.45	5.08	112.52	13.99	299.80	13.01	<LOD	6.73	91.98	9.06
P_20211028_98052_127	Natural	BPSOU-UR03SS04-102821-2	10/28/2021	mg/kg	398.11	17.83	<LOD	7.44	119.28	14.69	513.93	17.29	<LOD	7.00	110.38	10.07
P_20211028_98052_128	Natural	BPSOU-UR03SS04-102821-3	10/28/2021	mg/kg	393.78	19.12	8.49	5.01	135.99	14.93	685.56	19.56	<LOD	6.90	125.58	10.37
P_20211028_98052_129	Natural	BPSOU-UR03SS05-102821-1	10/28/2021	mg/kg	150.31	12.71	<LOD	7.72	205.90	17.79	282.27	13.32	<LOD	7.38	422.25	18.07
P_20211028_98052_130	Natural	BPSOU-UR03SS05-102821-2	10/28/2021	mg/kg	108.32	9.80	8.23	5.07	140.75	15.34	159.02	9.97	<LOD	7.02	533.05	19.47
P_20211028_98052_131	Natural	BPSOU-UR03SS05-102821-3	10/28/2021	mg/kg	105.00	9.65	<LOD	7.34	137.13	15.04	158.95	9.88	<LOD	6.89	279.76	14.43
P_20211028_98052_132	XRF Duplicate	BPSOU-UR03SS05-102821-3-D	10/28/2021	mg/kg	102.81	9.31	<LOD	7.21	131.65	14.89	142.08	9.38	<LOD	6.80	276.41	14.29
P_20211028_98052_133	XRF Replicate	BPSOU-UR03SS05-102821-3-R	10/28/2021	mg/kg	116.96	9.36	<LOD	7.18	121.88	14.52	133.96	9.11	<LOD	6.90	272.48	14.18
P_20211028_98052_134	SiO2	SiO2	10/28/2021	mg/kg	6.93	2.13	13.87	4.45	<LOD	11.27	<LOD	3.62	<LOD	4.57	<LOD	5.59
P_20211028_98052_135	NIST 2709a	NIST 2709a	10/28/2021	mg/kg	18.59	4.09	12.98	5.34	36.96	11.77	15.53	4.40	<LOD	6.34	89.78	8.95
P_20211028_98052_136	RCRA	RCRA	10/28/2021	mg/kg	487.77	18.14	512.26	11.43	<LOD	15.53	460.80	17.78	<LOD	7.04	47.24	7.23
P_20211028_98052_137	USGS SdAR-M2	USGS SdAR-M2	10/28/2021	mg/kg	89.18	17.39	20.21	5.38	209.79	17.25	784.96	20.88	10.42	4.97	657.84	21.39

Notes:

[1] XRF Sample ID is P_"Analysis Date"_"XRF Instrument Number"_"XRF Reading Number"

Abbreviations:

mg/kg - milligram per kilogram
SiO2 - Silicon Dioxide standard
NIST 2709a - NIST 2709a- Joaquin Soil sample
RCRA - Resource Conservation and Recovery Act Sample
<LOD - not detected (less than detection limit)

Attachment D
Electronic Data Deliverable File

Included separately

Appendix B
Site Photographs

Atlantic Richfield Company

PhotoNumber: UR03-1	Photographer:
Date: 10/28/2021 11:58	Photo Direction: North West
Description: High manganese staining.	
Project: BPSOU Unreclaimed and Insufficiently Reclaimed Sites 2021	

Atlantic Richfield Company

PhotoNumber: UR03-2	Photographer:
Date: 10/28/2021 12:03	Photo Direction: North West
Description: South east end of dump has active erosion rills.	
Project: BPSOU Unreclaimed and Insufficiently Reclaimed Sites 2021	

Atlantic Richfield Company

PhotoNumber: UR03-3	Photographer:
Date: 10/28/2021 12:04	Photo Direction: North
Description: South end of dump has active erosion.	
Project: BPSOU Unreclaimed and Insufficiently Reclaimed Sites 2021	

Atlantic Richfield Company

PhotoNumber: UR03-4	Photographer:
Date: 10/28/2021 12:04	Photo Direction: North
Description: SS04 spoils.	
Project: BPSOU Unreclaimed and Insufficiently Reclaimed Sites 2021	

Atlantic Richfield Company

PhotoNumber: UR03-5	Photographer:
Date: 10/28/2021 12:04	Photo Direction: South East
Description: Slopes on south end of dump. SS02.	
Project: BPSOU Unreclaimed and Insufficiently Reclaimed Sites 2021	

Atlantic Richfield Company

PhotoNumber: UR03-6	Photographer:
Date: 10/28/2021 12:05	Photo Direction: East
Description: Top of mining dump. SS01 and SS05.	
Project: BPSOU Unreclaimed and Insufficiently Reclaimed Sites 2021	

Atlantic Richfield Company

PhotoNumber: UR03-7	Photographer: JLS
Date: 10/28/2021 12:05	Photo Direction: North East
Description: Mining pile, possible mining waste. Not sample due to outside of boundary. Material can be characterized from sampled area.	
Project: BPSOU Unreclaimed and Insufficiently Reclaimed Sites 2021	

Atlantic Richfield Company

PhotoNumber: UR03-8	Photographer: JLS
Date: 11/01/2021 14:28	Photo Direction: South East
Description: Master utilities are ok	
Project: BPSOU Unreclaimed and Insufficiently Reclaimed Sites 2021	