Fall 9-4-2024

RE: Approved Silver Bow Creek Conservation Area Repository Data Gap Quality Assurance Project Plan Request for Change to Install Additional Test Pits and Perform Material Characterization

Josh Bryson

Atlantic Richfield Company

317 Anaconda Road
Butte MT 59701

Josh Bryson
Liability Manager

Direct (406) 782-9964
Fax (406) 782-9980

September 4, 2024

Emma Rott
Remedial Project Manager
US EPA – Montana Office
10 W. 15th Street, Suite 3200
Helena, MT 59626

Erin Agee, Senior Assistant Regional Counsel
Office of Regional Counsel – CERCLA
1595 Wynkoop Street
Denver, CO 80202
Mail Code: 8ORC-C

Daryl Reed
DEQ Project Officer
P.O. Box 200901
Helena, Montana 59620-0901

Jonathan Morgan, Esq.
DEQ, Legal Counsel
P.O. Box 200901
Helena, Montana 59620-0901

RE: Approved Silver Bow Creek Conservation Area Repository Data Gap Quality Assurance Project Plan Request for Change to Install Additional Test Pits and Perform Material Characterization

Agency Representatives:

I am writing to you on behalf of Atlantic Richfield Company to distribute the approved Request for Change (RFC) to the *Silver Bow Creek Conservation Area (SBCCA) Repository Data Gap Quality Assurance Project Plan (QAPP)* (RFC-SBCCA Data Gap QAPP-2024-1). The Agencies' approval was received on August 30, 2024.

If you have any questions or comments, please call me at (406) 723-1834.

Sincerely,

Josh Bryson, PE, PMP
Liability Manager
Remediation Management Services Company
An affiliate of **Atlantic Richfield Company**

Atlantic Richfield Company

317 Anaconda Road
Butte MT 59701
Direct (406) 782-9964
Fax (406) 782-9980

cc (email only):

Chris Greco / Atlantic Richfield
Mike Mc Anulty / Atlantic Richfield
Tim Hilmo / Atlantic Richfield
Loren Burmeister / Atlantic Richfield
Dave Griffis / Atlantic Richfield
Jean Martin / Atlantic Richfield
Irene Montero / Atlantic Richfield
David A. Gratson / Environmental Standards
Mave Gasaway / DGS
Adam Cohen / DGS
Lucas Satterlee / DGS
Brianne McClafferty / Holland & Hart
Carolina Balliew / EPA
Molly Roby / EPA
David Shanight / CDM
Curt Coover / CDM
James Freeman / DOJ
Amy Steinmetz / DEQ
Logan Dudding / DEQ
Katie Garcin-Forba / DEQ
Doug Martin / NRDP
Jim Ford / NRDP
Pat Cunneen / NRDP
Katherine Hausrath / NRDP
Ted Duaime / MBMG
Gary Icopini / MBMG
Becky Summerville / MR
John DeJong / UP
Robert Bylsma / UP
John Gilmour / Kelley Drye
Leo Berry / BNSF
Robert Lowry / BNSF
Brooke Kuhl / BNSF
Lauren Knickrehm / BNSF
Doug Brannan / Kennedy Jenks
Matthew Mavrinac / RARUS
Harrison Roughton / RARUS
Brad Gordon / RARUS
Mark Neary / BSB
Eric Hassler / BSB
Brandon Warner / BSB
Abigail Peltomaa / BSB
Aaron Rains / BSB
Sean Peterson/BSB
Josh Vincent / WET
Kevin Bethke / W&C
Scott Bradshaw / W&C
Emily Evans / W&C
Paddy Stoy / W&C
Joe McElroy / Pioneer
Troy Colvin / Pioneer
Mark Meyer / Pioneer
Pat Sampson / Pioneer
Karen Helfrich / Pioneer
Brad Hollamon / Pioneer
Randa Colling / Pioneer
Rich Keeland / Aspect
Andy White / Aspect
Ian Magruder/ CTEC
CTEC of Butte
Scott Juskiewicz / Montana Tech

File: RMO – upload
BPSOU SharePoint – upload

REGION 8
DENVER, CO 80202

August 30, 2024

Mr. Josh Bryson
Liability Manager
Atlantic Richfield Company
317 Anaconda Road
Butte, Montana 59701

Re: Conditional approval letter for the Butte Priority Soils Operable Unit (BPSOU) Silver Bow Creek Conservation Area Repository Data Gap Quality Assurance Project Plan Request for Change to Install Additional Test Pits and Perform Material Characterization (dated August 28, 2024)

Dear Mr. Bryson:

The U. S. Environmental Protection Agency (EPA), in consultation with the Montana Department of Environmental Quality (DEQ), has reviewed and is providing approval of the *Silver Bow Creek Conservation Area Repository Data Gap Quality Assurance Project Plan Request for Change (RFC) to Install Additional Test Pits and Perform Material Characterization (dated August 28, 2024).* Please attach the signature page to the RFC and distribute as final.

If you have any questions or concerns, please call me at (406) 438-0823.

Sincerely,

Emma Rott, P.E.
Remedial Project Manager

ENCLOSURE
1. EPA and DEQ signature page

cc: (email only)
Butte File
Chris Greco / Atlantic Richfield
Mike Mcanulty / Atlantic Richfield
Loren Burmeister / Atlantic Richfield
Dave Griffis / Atlantic Richfield
Jean Martin / Atlantic Richfield
Irene Montero / Atlantic Richfield

David A. Gratson / Environmental Standards
Mave Gasaway / DGS
Adam Cohen / DGS
Brianne McClafferty / Holland & Hart
Daryl Reed / DEQ
Logan Dudding / DEQ
Jon Morgan / DEQ
Kevin Stone / DEQ
Amy Steinmetz / DEQ
Dave Bowers / DEQ
Katie Garcin-Forba / DEQ
Doug Martin / NRDP
Jim Ford / NRDP
Pat Cunneen / NRDP
Katherine Hausrath / NRDP
Ted Duaime / MBMG
Gary Icopini / MBMG
Becky Summerville / MR
John DeJong / UP
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Harrison Roughton / RARUS
Mark Neary / BSB
Eric Hassler / BSB
Chad Anderson / BSB
Brandon Warner / BSB
Abigail Peltomaa / BSB
Eileen Joyce / BSB
Sean Peterson/BSB
Josh Vincent / WET
Scott Bradshaw / W&C
Emily Evans / W&C
Pat Sampson / Pioneer
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Karen Helfrich / Pioneer
Randa Colling / Pioneer
Scott Sampson / Pioneer
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Ian Magruder/ CTEC
CTEC of Butte
Scott Juskiewicz / Montana Tech
David Shanight / CDM Smith
Curt Coover / CDM Smith
Chapin Storrar / CDM Smith
Erin Agee / EPA

Will Lindsey / EPA
Jamie Miller / EPA
Carolina Balliew / EPA
Charlie Partridge / EPA

ATLANTIC RICHFIELD COMPANY

RFC - REQUEST FOR CHANGE

DATE	RFC NO.	CONTRACTOR	RFP NO.
August 28, 2024	RFC-SBCCA Data Gap QAPP-2024-01	WSP Environment & Infrastructure Inc. and Pioneer Technical Services, Inc.	NA

CONTRACT DESCRIPTION:	ATTENTION OF:
Silver Bow Creek Conservation Area (SBCCA) Repository Siting Study	Emma Rott/Daryl Reed

SUBJECT: Additional Test Pit Soils Investigation and Material Characterization to Support a Soil-Water Slurry System Design

❍ ELECTRICAL ❍ MECHANICAL ⊗ CIVIL ❍STRUCTURAL/ARCHITECTURAL

❍ INSTRUMENTATION ❍ ENVIRONMENTAL

OPERABLE UNIT: Butte Priority Soils Operable Unit MAJOR WORK TASKS: Install Additional Test Pits for Material Characterization	REFERENCE DWG., P.O., TAG, SPECIFICATION NO. (FOR DEVIATIONS OR DEFICIENCIES) ETC.: SBCCA Repository Data Gap Quality Assurance Project Plan (QAPP).

PROBLEM DESCRIPTION:

This request for change (RFC) outlines additional site investigation procedures that will be incorporated into the *Silver Bow Creek Conservation Area Repository Data Gap Quality Assurance Project Plan (QAPP)* (SBCCA Repository Data Gap QAPP; Atlantic Richfield Company, 2024). This RFC provides the procedures and protocols necessary for Atlantic Richfield Company (Atlantic Richfield) to install additional test pits and perform additional material characterization to further classify the physical characteristics of the materials to be excavated at the Butte Reduction Works (BRW), Buffalo Gulch (BG), Diggings East (DE), and Northside Tailings (NST) Sites. The results of the material characterization will provide additional physical properties to support the design of a soil-water slurry system to transport waste to the Berkely Pit as part of the remedial actions (RAs) necessary for the Butte Priority Soils Operable Unit Consent Decree.

As described in SBCCA Repository Data Gap QAPP Section 1.1, additional site investigations were anticipated to support development of the Remedial Design Work Plan(s). An RFC to the SBCCA Repository Data Gap QAPP was identified as one of the anticipated methods for proposing these additional site investigations.

Objective of the Additional Test Pits

Additional material characterization is needed to define physical properties of materials that could be disposed of in the Berkeley Pit utilizing a soil-water slurry pumping system. Previous investigations have generally focused on the environmental characterization of the site material, and provided limited data related to soil particle size distribution, particularly regarding characterizing larger particle size materials. Characterization of larger particle size materials is necessary to support the design and evaluation of the soil-water slurry system. The additional test pits will provide necessary additional information on the particle distribution of full material bulk sample, including oversized materials.

Slurry Design Test Pit Locations

Atlantic Richfield plans to excavate a total of 13 test pits, with 2 to 5 test pits installed at each RA site (BRW, BG, DE, and NST). Material collected from test pits at each site will be composited into one representative bulk sample (approximately 10-cubic yards) for each RA site for material characterization testing and analysis (Table 5). The additional test pit locations are shown on revised Figures 2, 3, and 4. The locations shown on Figures 2, 3, and 4 are approximate, and the number of and pit locations may be modified as determined by the Field Team Leader in consultation with the Contractor Project Manager and Contractor Quality Assurance Officer. The test pits will be excavated to the depth of the proposed RA excavation (Table 6). The total depth of each test pit may vary depending on field conditions encountered and/or equipment limitations. Most specifically, test pits may be stopped in any scenario that may result in risk to the field team staff, equipment operators, or others associated with performance of the work.

General Procedures

The test pits will be excavated following the general procedures described in the SBCCA Repository Data Gap QAPP, SOP-S-06 (Appendix A), and as described below. Material collected from the test pits at each RA site will be composited into one representative bulk sample (approximately 10-cubic yards) for further material characterization testing and analysis as described in the following sections.

Test Pits and Bulk Sample Collection and Testing

- Test pit locations will be marked and surveyed.
- Test pits will be excavated using a track-mounted or rubber-tired excavator. The type of excavation equipment used for each test pit will be documented.
- Two to five test pits will be excavated at each RA site as shown on revised Figures 2, 3, and 4.
- Each test pit will be excavated to the depth identified in Table 6. All excavated material will be placed at least 3 feet from the excavated test pit's edge.
- Once the total depth is achieved, approximately 5 cubic yards of material will be scraped from the wall to characterize the entire test pit profile and stockpiled. The stockpiled material will then be homogenized and approximately 3 to 4 cubic yards of a representative sample will be loaded into a dump truck.
- Once material has been collected from all test pits and loaded into the dump truck, for an approximate bulk sample size of 10 cubic yards, a tare and gross weight will be measured on the dump truck and the sample will be unloaded at Pioneer's geotechnical laboratory for material testing.
- A representative moisture content sample will be collected from the bulk RA location sample. The moisture content sample will be used to account for water weight in the bulk sample.
- The greater than 3-inch material will be screened from the bulk RA location sample using a skid steer and skeletal bucket attachment. The greater than 3-inch material will be reloaded into a dump truck to collect a gross weight. The net weight of the greater than 3-inch material will be used to adjust the laboratory gradation to characterize the entire bulk sample.
- A representative sample will be collected from the greater than 3-inch material for abrasion and specific gravity testing.
- A representative sample will be collected from the remaining less than 3-inch material for laboratory gradation, abrasion, specific gravity, slurry consolidation, and column settling testing as described in Table 5.
- An abrasion test will be conducted on the slag material, if recovered from the BRW test pits.
- The laboratory gradation curve will be adjusted based on the weight of the greater than 3-inch material to generate a gradation curve for the total, bulk sample. The total gradation curve will be used to identify the D50 and D85 at each RA site.

Test Pit Logging

- Test pit logs will be completed at each location.
- Test pit logging will be completed as described in the Repository Data Gap QAPP.

Test Pit Material Disposal

- Test pits will be backfilled with excavated materials not sampled and supplemented with backfill material as necessary.
- Disturbed areas will be seeded with an upland seed mix.
- Materials from the bulk RA location sample will be disposed of in the Butte Mine Waste Repository.
- There is a chance that hazardous wastes could be encountered during test pit excavation. Any hazardous wastes encountered during test pit excavation will be handled as detailed in the SBCCA Repository Data Gap QAPP.

Equipment

- Field logbook and pens.
- Field forms and references (Appendix C).
- Measuring tape.
- Unified Soil Classification System chart (American Society for Testing and Materials International [ASTM] D-2488) (Appendix C).
- Munsell color chart.
- Chain of custody forms.
- Decontamination equipment (pressure washer, tap water, dilute nitric acid, Liquinox soap, decontamination containers, paper towels, scrub brushes, and spray bottles). Refer to SOP-DE-02 in Appendix A.
- Digital camera.
- Survey-grade Global Positioning System unit.
- Appropriate safety Personal Protective Equipment.

Sampling and Analysis Procedures

Additional sampling and analysis procedures have been added in Table 5 and include the following.

- Moisture Content: ASTM D2216
- Gradation Testing: ASTM C117 and ASTM C136.
- Abrasion Testing: ASTM C131
- Specific Gravity: ASTM C127 and ASTM C128

- Column Settling Test
- Slurry Consolidation Test

Project Team
WSP, Jordan Contracting, Inc. (JCI), Pioneer's geotechnical laboratory(s) and personnel, and WSP's Lakewood, Colorado geotechnical laboratory will complete the described excavation and material testing.

Proposed Schedule
The test pits will be installed as soon as practical upon approval from Agencies.

Revised Figures (Attached)
Figure 2 BG Site Map
Figure 3 BRW Site Map
Figure 4 DE/NST Site Map

Revised Tables (Attached)
Table 5: Sample Collection, Preservation, and Holding Times
Table 6: BPSOU Site Investigation Locations

References
Atlantic Richfield Company, 2024. Silver Bow Creek Conservation Area Repository Data Gap Quality Assurance Project Plan (QAPP). Prepared by Pioneer Technical Services, Inc. May 2024.

	❍Design Deficiency ❍ Engineering Change Request ❍ Agency Directive ❍ Construction Deficiency ❍ Schedule	❍ Material Substitution ❍ Vendor Material Deficiency ⊗ Scope ⊗ Additional Data Collection ❍ Clarification/Information ❍ Other

RESPONSE/DIRECTIVE

1. Approve the excavation of test pits and collection of additional material characterization data.

Project Manager _____ on behalf of Alan Erickson Date 08/28/2024 .

Atlantic Richfield Co. Representative _____ Date 08/28/2024 .

EPA Representative _____ Date 8/30/2024 .

DEQ Representative _____ Date 8/30/2024 .

CC: See Cover Letter

Proposed Sample Areas	Borehole ID
(1)	BG24-BH01
(2)	BG24-BH02
(3)	BG24-BH03
(4)	BG24-BH04
(5)	BG24-BH05
(6)	BG24-BH06
(7)	BG24-BH07
(8)	BG24-BH08
(9)	BG24-BH09

Utility Legend

- FIB — FIBER OPTIC LINE
- SS — SANITARY SEWER LINE
- GAS — GAS LINE
- OE — OVERHEAD ELECTRICAL LINE
- UE — UNDERGROUND ELECTRICAL LINE
- SD — STORM DRAIN
- COM — TELEPHONE LINE
- EFF — HORSESHOE BEND EFFLUENT LINE
- BSD — PFM — BPSOU SUBDRAIN PRIMARY FORCE MAIN
- WTR — WATER LINE
- SLW — SILVER LAKE WATER LINE
- UKN — UNKNOWN UTILITY

W FRONT ST
HOLLAND ST
S DAKOTA ST
S MAIN ST
S MONTANA ST
CASEY ST
KAW AVE
GEORGE ST
BG24-BH01
BG24-BH02
BG24-BH03
BG24-BH04
BG24-TP01
BG24-BH05
BG24-BH06
BG24-BH07
BG24-BH08
BG24-TP02
BG24-BH09
1
2
3
4
5
6
7
8
9

- SBCCA DATA GAP QAPP - FALL 2024 TEST PITS
- SBCCA DATA GAP QAPP - SPRING 2024 BOREHOLES
- PREVIOUS INVESTIGATION LOCATIONS
- BG PROPOSED EXCAVATION BOUNDARY
- PROPOSED SAMPLE AREAS

Note:
1. Samples are planned to be collected near proposed sample locations. However, sample locations may be adjusted within the sample area based on field conditions.
2. Spring 2024 sample locations were updated for installed locations.

N

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FIGURE 2

BG
SITE MAP

PIONEER TECHNICAL SERVICES, INC.

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Proposed Sample Areas	Borehole ID
(1)	BRW24-BH01
(2)	BRW24-BH02
(3)	BRW24-BH03
(4)	BRW24-BH04
(5)	BRW24-BH05
(6)	BRW24-BH06
(7)	BRW24-BH07
(8)	BRW24-BH08

Utility Legend

UE	UNDERGROUND ELECTRIC LINE
OE	OVERHEAD POWER LINE
SLW	SILVER LAKE WATER LINE
WTR	WATER L INE
GAS	GAS LINE
TEL	TELEPHONE LINE
SD	STORMDRAIN LINE
SS	SANITARY SEWER LINE
SL	SLUDGE LINE
BSD PFM	BPSOU SUBDRAIN PRIMARY FORCE MAIN
BSD ADL	BPSOU SUBDRAIN ALTERNATE DISCHARGE LINE
EFF	EFFLUENT LINE
FIB	FIBER OPTICS LINE

BRW24-TP01
BRW18-PZ05
BRW24-BH04
BRW19-HCW38
BRW18-BH27
BRW24-BH03
BRW19-PZ27
BRW24-BH02
BRW18-PZ02
BRW24-TP02
BRW19-PZ32
BRW21-BH43
BRW24-TP03
BRW24-BH01
BRW24-BH08
BRW24-TP05
BRW24-BH07
BRW24-BH06
BRW24-TP04
BRW24-BH05
1
2
3
4
5
6
7
8
MONTANA ST
GEORGE ST

- SBCCA DATA GAP QAPP - FALL 2024 TEST PIT
- SBCCA DATA GAP QAPP - SPRING 2024 BOREHOLE
- SBCCA DATA GAP QAPP - SPRING 2024 TEST PIT
- ARCHIVED CORE SAMPLE LOCATIONS
- PREVIOUS INVESTIGATION LOCATIONS
- BRW PROPOSED EXCAVATION BOUNDARY
- PROPOSED SAMPLE AREAS

Note:
1. Samples are planned to be collected near proposed sample locations. However, sample locations may be adjusted within the sample area based on field conditions.
2. Spring 2024 sample locations were updated for installed locations.

N

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FIGURE 3

BRW
SITE MAP

PIONEER TECHNICAL SERVICES, INC.

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Proposed Sample Areas	Borehole ID
(1)	NST24-BH01
(2)	NST24-BH02
(3)	NST24-BH03
(4)	NST24-BH04
(5)	NST24-BH05
(6)	NST24-BH06
(7)	NST24-BH07

Utility Legend

UE	UNDERGROUND ELECTRIC LINE
OE	OVERHEAD POWER LINE
SLW	SILVER LAKE WATER LINE
WTR	WATER L INE
GAS	GAS LINE
TEL	TELEPHONE LINE
SD	STORMDRAIN LINE
SS	SANITARY SEWER LINE
SL	SLUDGE LINE
BSD PFM	BPSOU SUBDRAIN PRIMARY FORCE MAIN
BSD ADL	BPSOU SUBDRAIN ALTERNATE DISCHARGE LINE
EFF	EFFLUENT LINE
FIB	FIBER OPTICS LINE

Proposed Sample Areas	Borehole ID	Test Pit ID
(1)	DE24-BH01	DE24-TP01
(2)	DE24-BH02	DE24-TP02
(3)	DE24-BH03	DE24-TP03
(4)	DE24-BH04	DE24-TP04
(5)	DE24-BH05	DE24-TP05
(6)	DE24-BH06	DE24-TP06
(7)	DE24-BH07	DE24-TP07
(8)	DE24-BH08	DE24-TP08
(9)	DE24-BH09	DE24-TP09
(10)	DE24-BH10	DE24-TP10
(11)	DE24-BH11	DE24-TP11
(12)	DE24-BH12	DE24-TP12
(13)	DE24-BH13	DE24-TP13
(14)	DE24-BH14	DE24-TP14
(15)	DE24-BH15	DE24-TP15
(16)	DE24-BH16	DE24-TP16
(17)	DE24-BH17	DE24-TP17
(18)	DE24-BH18	DE24-TP18
(19)	DE24-BH19	DE24-TP19
(20)	DE24-BH20	DE24-TP20
(21)	DE24-BH21	DE24-TP21
(22)	DE24-BH22	DE24-TP22

Note:
1. Samples are planned to be collected near proposed sample locations. However, sample locations may be adjusted within the sample area based on field conditions.
2. Grayed out locations represent grid where Atlantic Richfield does not currentyly have access for sampling. See Section 4.2 of main text for further information.
3. Spring 2024 sample locations were updated for installed locations.

- SBCCA DATA GAP QAPP - FALL 2024 TEST PIT
- SBCCA DATA GAP QAPP - SPRING 2024 BOREHOLE
- SBCCA DATA GAP QAPP - SPRING 2024 TEST PIT
- ARCHIVED CORE SAMPLE LOCATIONS
- PREVIOUS INVESTIGATION LOCATIONS
- NST PROPOSED EXCAVATION BOUNDARY
- DE PROPOSED EXCAVATION BOUNDARY
- PROPOSED SAMPLE AREAS

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FIGURE 4

PIONEER TECHNICAL SERVICES, INC.

DE/NST SITE MAP

DATE: 8/26/2024

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Table 5. Sample Collection, Preservation, and Holding Times

Analytical Group	Analytical Lab/Company[1]	Analyte	Analytical Method	Lab Reporting Limit *(CRQL for Data Validation Purposes)*	Lab Method Detection Limit[2]	Holding Time	Container Size[3]
All Sites Soil Laboratory Samples							
(1) Required Data	Pace Analytical	Calcium Carbonate % (as CaCO3)	USDA 60-23	0.10%	0.10%	14 days after extraction	500 grams (approximately quart zip-lock baggie 1/2 full)
		Loss on Ignition - Organic Matter (LOI)	SSSA Part 3	0.10%	0.10%	14 days after extraction	
		Total Carbon (Mining Method)	ASA 929-2.2	0.10%	0.10%	NA	
		Total Organic Carbon - LECO Furnace	Calculation	-	-	NA	
(2) Additional Data - ABA and Nutrients	Pace Analytical	Acid Base Accounting	EPA 600/2-78-054	0.1 tons/1000 tons	0.1 tons/1000 tons	14 days after extraction	250 grams (approximately quart zip-lock baggie 1/4 full).
		Total Nitrogen	353.2	0.1 ppm	0.1 ppm	28 days after extraction	
		Total Phosphorous	EPA 6010	10 mg/kg	4.3 mg/kg	6 months	
		TKN, Nitrogen	EPA 351.2	1 mg/L	0.07 mg/L	28 days after extraction	
		Ortho-phosphate	SM4500-N-C	0.1 mg/L	0.05 mg/L	48 hours after extraction	
(3) Additional Data - Particle Size	Pioneer's Material Testing Laboratory	Particle Size Distribution	ASTM D6913	NA	NA	None	20000 grams. Approx. 3/4 of five gallon bucket.
(4) Split Sample	Split sample for Life Cycle Geo, LLC	NA	NA	NA	NA	NA	Approximately 100 grams.
(5) Additional Data - Mineralogy	Mineralogy, Inc. (Tulsa, OK)	Mineralogy (X-ray Diffraction)	NA	NA	NA	NA	Approximately 50 grams.
(6) Additional Data - Total Elemental Analysis	Pace Analytical	Total Elemental Analysis (Whole Rock Analysis) Total digestion using hydrofluoric acid.	EPA 6010	--	--	6 months	Approximately 100 grams.
		Aluminum (Al)		10 ppm	0.5 ppm		
		Antimony (Sb)		20 ppm	4 ppm		
		Arsenic (As)		3 ppm	0.5 ppm		
		Cadmium (Cd)		0.5 ppm	0.06 ppm		
		Calcium (Ca)		50 ppm	2 ppm		
		Copper (Cu)		1 ppm	0.2 ppm		
		Iron (Fe)		10 ppm	0.4 ppm		
		Lead (Pb)		15 ppm	0.2 ppm		
		Magnesium (Mg)		50 ppm	6 ppm		
		Manganese (Mn)		1ppm	0.02 ppm		
		Molybdenum (Mo)		5 ppm	0.3 ppm		
		Potassium (K)		50 ppm	10 ppm		
		Silicon (Si)		15 ppm	7.45 ppm		
		Sodium (Na)		50 ppm	3 ppm		
		Sulfur (S)		500 ppm	275.5 ppm		
		Zinc (Zn)		2 ppm	0.9 ppm		
(7) Additional Data - DE Fill	Pace Analytical	Toxicity Characteristics Leaching Procedure (TCLP)		--	--		2 1-L Glass Jars
		Arsenic	6010D TCLP	200 µg/L	9.08 µg/L	180 Days	
		Barium		100 µg/L	6.73 µg/L		
		Cadmium		30 µg/L	1.90 µg/L		
		Chromium		100 µg/L	4.27 µg/L		
		Copper		100 µg/L	14.3 µg/L		
		Lead		100 µg/L	9.99 µg/L		
		Nickel		200 µg/L	9.20 µg/L		
		Selenium		200 µg/L	6.86 µg/L		
		Silver		100 µg/L	4.13 µg/L		
		Zinc		200 µg/L	11.3 µg/L		
		Mercury	7470A TCLP	0.6 µg/L	0.286 µg/L	28 Days	
		Chlordane	8081B TCLP	5 µg/L	2.11 µg/L	14 Days	
		Endrin		1 µg/L	0.207 µg/L		
		Heptachlor (and its epoxide)		0.5 µg/L	0.0946 µg/L		
		Lindane		0.5 µg/L	0.0665 µg/L		
		Methoxychlor		5 µg/L	1.72 µg/L		
		Toxaphene		15 µg/L	3.90 µg/L		
		Benzene	8260D TCLP	25 µg/L	2.58 µg/L	14 Days	
		Carbon tetrachloride		25 µg/L	3.34 µg/L		
		Chlorobenzene		25 µg/L	3.33 µg/L		
		Chloroform		25 µg/L	5.8 µg/L		
		1,4-Dichlorobenzene		25 µg/L	3.66 µg/L		
		1,2-Dichloroethane		25 µg/L	4.24 µg/L		
		1,1-Dichloroethylene		25 µg/L	3.31 µg/L		
		Methyl ethyl ketone		250 µg/L	27.4 µg/L		
		Tetrachloroethylene		25 µg/L	2.62 µg/L		
		Trichloroethylene		25 µg/L	3.05 µg/L		
		Vinyl chloride		25 µg/L	1.15 µg/L		
		o-Cresol	8270E TCLP	100 µg/L	8.88 µg/L	14 Days	
		m-Cresol		100 µg/L	9.74 µg/L		
		p-Cresol		100 µg/L	9.74 µg/L		
		2,4-Dinitrotoluene		100 µg/L	9.15 µg/L		
		Hexachlorobenzene		100 µg/L	12.8 µg/L		
		Hexachloro-1,3-butadiene		100 µg/L	8.51 µg/L		
		Hexachloroethane		100 µg/L	7.19 µg/L		
		Nitrobenzene		100 µg/L	6.15 µg/L		
		Pentachlorophenol		200 µg/L	20.0 µg/L		
		Pyridine		500 µg/L	9.23 µg/L		
		2,4,5-Trichlorophenol		100 µg/L	11.3 µg/L		
		2,4,6-Trichlorophenol		100 µg/L	6.86 µg/L		
		2,4-D	8151A TCLP	5 µg/L	5 µg/L	14 Days	
		2,4,5-TP (Silvex)		5 µg/L	5 µg/L		
(8) Additional Data - Material Characterization	Pioneer's Material Testing Laboratory	Moisture Content	ASTM D2216	NA	NA	NA	Bulk Composite Sample: 10 cubic yards — Composite Subsample: 1,000 grams or approximately 1 quart zip-lock bag.
		Gradation	ASTM C117 ASTM C136	NA	NA	NA	Composite Subsample: 60,000 grams or approximately (2) 5-gallon buckets.
		Abrasion	ASTM C131	NA	NA	NA	Composite Subsample: Approximately (4) 5-gallon buckets.
		Specific Gravity	ASTM C127 ASTM C128	NA	NA	NA	
	WSP Material Testing Laboratory	Column Settling	NA	NA	NA	NA	Composite Subsample: Approximately (2) 5-gallon buckets.
		Slurry Consolidation	NA	NA	NA	NA	

[1]Atlantic Richfield may choose to use a different laboratory based on project needs. Regardless of the laboratory chosen, Atlantic Richfield will ensure the necessary reporting limits, required methodology, and the specified quality assurance/quality control and data validation requirements are followed as detailed in the SBCCA Repository Data Gap QAPP. Agencies will be informed of any changes in the reporting limits, methodology, or the quality assurance/quality control and data validation procedures.

[2] Pace Analytical will report results to the method detection limit. The analytical lab's reporting limits and detection limits are subject to change as these values are updated periodically to reflect analytical sensitivity and capability. Atlantic Richfield will ensure that any updates to the reporting limits or detection limits do not affect the ability for the Data Quality Objectives to be met and the updates will be specified in the Data Summary Report.

[3]There are no preservation requirements for these analyses. Per the selected laboratories, the samples for Groups 1, 2, 3, 4, 5, and 6 are not required to be maintained at a certain temperature. Group 7 for TCLP analysis to be collected in an unpreserved container and cooled to <6ºC.

Units: mg/L - milligram per liter
mg/kg - milligram per kilogram
ppm = parts per million

Table 6. BPSOU Site Investigation Locations

Location	Northing (Approximate)	Easting (Approximate)	Proposed Excavation Depth (ft)	Total Depth (ft)	Installation Method	Archived Core Sampling (Analytical Groups from Table 5)		New Boreholes/Test Pits (Analytical Groups from Table 5)		
						Discrete Sample	Composite Sample	Discrete Sample	Composite Sample	Fill Sample
Buffalo Gulch Boreholes										
BG24-BH01	651539.78	1196809.92	6.7	15	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
BG24-BH02	651702.68	1197132.50	10.5	15	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
BG24-BH03	651444.39	1197256.65	7.4	15	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
BG24-BH04	651453.39	1197364.52	7.7	15	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
BG24-BH05	651428.28	1197683.70	9.4	15	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
BG24-BH06	651404.46	1197844.92	11.2	20	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
BG24-BH07	651411.19	1197995.42	12.2	20	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
BG24-BH08	651377.94	1198182.89	10.3	15	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
BG24-BH09	651397.98	1198377.62	10.8	15	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
BG24-TP01	651436.27	1197440.00	9.1	10	Excavator	-	-	-	8	-
BG24-TP02	651373.54	1198236.00	12.0	12	Excavator	-	-	-		-
Butte Reduction Works Boreholes and Piezometers										
BRW18-BH27	651313.45	1195016.77	9.9	15	Geoprobe	-	1, 2	-	-	-
BRW18-PZ02	651239.59	1195014.45	9.8	40	Geoprobe	1, 4	1, 2	-	-	-
BRW18-PZ05	651430.31	1195183.84	10.3	28	Geoprobe	1, 4	1, 2	-	-	-
BRW19-HCW38	651319.59	1195542.24	20	24.5	Sonic	1, 4	1, 2	-	-	-
BRW19-PZ27	651271.93	1194908.24	9.3	29	Geoprobe	1, 4	1, 2	-	-	-
BRW19-PZ32R	651238.96	1194999.89	12.5	25	Geoprobe	1, 4	1, 2	-	-	-
BRW21-BH43	651434.42	1196505.17	NA - Outside Excavation Boundary	30	Geoprobe	-	1, 2	-	-	-
BRW24-BH01	651166.14	1194947.88	11.1	20	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
BRW24-BH02	651301.03	1195120.82	12.3	20	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
BRW24-BH03	651310.15	1195297.79	21.7	25	Sonic	-	-	1, 4	1, 2, 3, 5, 6	-
BRW24-BH04	651389.63	1195441.91	16.0	25	Sonic	-	-	1, 4	1, 2, 3, 5, 6	-
BRW24-BH05	651212.23	1195686.04	10.0	15	Sonic	-	-	1, 4	1, 2, 3, 5, 6	-
BRW24-BH06	651288.07	1195923.41	13.2	20	Sonic	-	-	1, 4	1, 2, 3, 5, 6	-
BRW24-BH07	651367.23	1196235.05	11.8	20	Sonic	-	-	1, 4	1, 2, 3, 5, 6	-
BRW24-BH08	651425.21	1196453.18	13.3	20	Sonic	-	-	1, 4	1, 2, 3, 5, 6	-
BRW24-TP01	651493.80	1195316.00	28.6	29	Excavator	-	-	-		-
BRW24-TP02	651237.60	1195349.00	21.8	22	Excavator	-	-	-		-
BRW24-TP03	651189.10	1195475.00	16.2	17	Excavator	-	-	-	8	-
BRW24-TP04	651274.60	1195876.00	15.3	16	Excavator	-	-	-		-
BRW24-TP05	651368.90	1196110.00	14.0	14	Excavator	-	-	-		-
Diggings East Test Pits, Piezometers, and Boreholes										
DE-PZ-14A	651150.44	1199347.17	17.9	30	Geoprobe	1, 4	-	-	-	-
DE-TP-08	651601.91	1200297.47	8.5	15	Geoprobe	-	1, 2	-	-	-
DE-TP-12	651201.91	1199497.47	17.1	15	Geoprobe	-	1, 2	-	-	-
DE24-BH01	651118.02	1198906.29	7.6	15	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
DE24-BH02	651178.29	1199188.49	8.4	15	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
DE24-BH03	651249.08	1199432.43	8.6	15	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
DE24-BH04	651283.26	1199696.25	6.9	15	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
DE24-BH05	651450.33	1199985.47	6.1	15	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
DE24-BH06	651434.66	1200161.38	4.1	10	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
DE24-BH07	651442.31	1200339.31	14.3	20	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
DE24-BH08	651598.07	1200341.00	9.8	15	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
DE24-BH09	651640.34	1200500.02	8.4	15	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
DE24-BH10	651663.14	1200615.43	4.8	10	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
DE24-BH11	651898.62	1200633.00	10.1	15	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-

Table 6. BPSOU Site Investigation Locations

Location	Northing (Approximate)	Easting (Approximate)	Proposed Excavation Depth (ft)	Total Depth (ft)	Installation Method	Archived Core Sampling (Analytical Groups from Table 5)		New Boreholes/Test Pits (Analytical Groups from Table 5)		
						Discrete Sample	Composite Sample	Discrete Sample	Composite Sample	Fill Sample
DE24-BH12	650909.46	1199008.93	7.3	15	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
DE24-BH13	650854.80	1199241.17	8.7	15	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
DE24-BH14	650908.51	1199371.65	7.4	15	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
DE24-BH15	650944.07	1199534.08	7.1	15	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
DE24-BH16	650954.25	1199660.42	5.1	10	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
DE24-BH17	651001.96	1199865.83	4.9	10	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
DE24-BH18	650980.43	1199952.66	5.5	10	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
DE24-BH19	651006.25	1200049.48	8.1	15	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
DE24-BH20	651013.56	1200219.33	6.7	15	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
DE24-BH21	651024.88	1200345.39	6.5	15	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
DE24-BH22	651072.87	1200507.62	7.7	15	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
DE24-TP01	651118.02	1198906.29	The excavation depth will be determined depending on field conditions encountered and fill material available.		Excavator	-	-	-	-	7
DE24-TP02	651178.29	1199188.49			Excavator	-	-	-	-	7
DE24-TP03	651249.08	1199432.43			Excavator	-	-	-	-	7
DE24-TP04	651283.26	1199696.25			Excavator	-	-	-	-	7
DE24-TP05	651450.33	1199985.47			Excavator	-	-	-	-	7
DE24-TP06	651434.66	1200161.38			Excavator	-	-	-	-	7
DE24-TP07	651442.31	1200339.31			Excavator	-	-	-	-	7
DE24-TP08	651598.07	1200341.00			Excavator	-	-	-	-	7
DE24-TP09	651640.34	1200500.02			Excavator	-	-	-	-	7
DE24-TP10	651663.14	1200615.43			Excavator	-	-	-	-	7
DE24-TP11	651898.62	1200633.00			Excavator	-	-	-	-	7
DE24-TP12	650909.46	1199008.93			Excavator	-	-	-	-	7
DE24-TP13	650854.80	1199241.17			Excavator	-	-	-	-	7
DE24-TP14	650908.51	1199371.65			Excavator	-	-	-	-	7
DE24-TP15	650944.07	1199534.08			Excavator	-	-	-	-	7
DE24-TP16	650954.25	1199660.42			Excavator	-	-	-	-	7
DE24-TP17	651001.96	1199865.83			Excavator	-	-	-	-	7
DE24-TP18	650980.43	1199952.66			Excavator	-	-	-	-	7
DE24-TP19	651006.25	1200049.48			Excavator	-	-	-	-	7
DE24-TP20	651013.56	1200219.33			Excavator	-	-	-	-	7
DE24-TP21	651024.88	1200345.39			Excavator	-	-	-	-	7
DE24-TP22	651072.87	1200507.62			Excavator	-	-	-	-	7
DE24-TP23	651492.18	1200276.00	6.5	7	Excavator	-	-	-	8	-
DE24-TP24	651162.40	1199112.00	6.6	7	Excavator	-	-	-		-
DE24-TP25	650938.62	1199463.00	5.9	6	Excavator	-	-	-		-
DE24-TP26	651076.03	1199940.00	12.4	13	Excavator	-	-	-		-

Table 6. BPSOU Site Investigation Locations

Location	Northing (Approximate)	Easting (Approximate)	Proposed Excavation Depth (ft)	Total Depth (ft)	Installation Method	Archived Core Sampling (Analytical Groups from Table 5)		New Boreholes/Test Pits (Analytical Groups from Table 5)		
						Discrete Sample	Composite Sample	Discrete Sample	Composite Sample	Fill Sample
Northside Tailings Pumping Wells, Test Pits, and Boreholes										
NST-TP-24 (NST-PZ-09)	651466.48	1199117.88	7.4	15	Geoprobe	-	1, 2	-	-	-
NST24-BH01	651480.50	1198701.88	14.6	20	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
NST24-BH02	651521.29	1198973.62	6.0	10	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
NST24-BH03	651779.31	1199905.75	3.9	10	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
NST24-BH04	651961.12	1200029.67	13.4	20	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
NST24-BH05	652128.62	1200192.87	2.9	10	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
NST24-BH06	652274.57	1200330.18	5.9	10	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
NST24-BH07	652386.72	1200481.88	3.6	10	Geoprobe	-	-	1, 4	1, 2, 3, 5, 6	-
NST24-TP01	651500.03	1198776.00	4.2	5	Excavator	-	-	-	8	-
NST24-TP02	652263.61	1200441.82	4.0	4	Excavator	-	-	-		-
Quality Assurance Samples										
Field Duplicate	Verify sampling procedures, 1 per 20 samples. No field duplicate needed for Particle Size Distribution and XRD analysis.		-		-	-	-	-	-	-