Winter 12-2-2022

2022 Draft Final Blacktail Creek Groundwater Hydraulic Control System Remedial Design Work Plan

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Atlantic Richfield Company

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December 2, 2022

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RE: Draft Final Blacktail Creek Groundwater Hydraulic Control System (BTC GWHC) Remedial Design Work Plan (RDWP)

Agency Representatives:

I am writing you on behalf of Atlantic Richfield Company (Atlantic Richfield) to submit the Draft Final Blacktail Creek Groundwater Hydraulic Control System (BTC GWHC) Remedial Design Work Plan (RDWP) and a response to Agency comments to the Draft BTC GWHC RDWP received on September 29, 2022 for your review and approval. These documents are required as outlined within the BPSOU Consent Decree (CD).

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

Sincerely,

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An affiliate of **Atlantic Richfield Company**

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Response to Agency Comments to the
Butte Priority Soils Operable Unit (BPSOU) Draft Blacktail Groundwater Hydraulic Control System Remedial Design Work Plan

Date of Comments: September 29, 2022

Specific Comments

EPA Specific Comment 1a (Table of Contents): Design Support Activities. Please consider moving Schedule to its own section.

> **Atlantic Richfield Company Response:** Schedule has been moved to its own section (Section 6). In addition, the schedule has been updated to reflect actual dates of submittal and revised based on current schedule projections.

EPA Specific Comment 1b (Table of Contents): Remedial Design Deliverables. Please consider moving Construction Documentation and Records, Record Maintenance, and Final Reporting to their own sections.

> **Atlantic Richfield Company Response:** Section 5 has been renamed to "Remedial Design and Remedial Action Deliverables" to clarify the inclusion of Construction Documentation and Records, Record Maintenance, and Final Reporting.

EPA Specific Comment 2a (Figures): Please consider adding a National Wetlands Inventory figure.

> **Atlantic Richfield Company Response:** A National Wetlands Inventory has been added as Figure 3. Reference to Figure 3 has been included in Section 1.3.5 Surface Water of this work plan.

EPA Specific Comment 2b (Figures): Please consider adding a FEMA Flood Insurance Rate Map panel figure (FIRMette) figure.

> **Atlantic Richfield Company Response:** We appreciate the suggestion. AR will consider adding this information in the design documents referenced in Section 5 and will be considered during the design phase of the groundwater hydraulic control system (e.g. where to locate equipment, staging areas, etc.). As a reference, the requested figure can be found on the FEMA website: FEMA's National Flood Hazard Layer (NFHL) Viewer (arcgis.com)

EPA Specific Comment 2c (Figures): Please consider moving the Schedule up to the Figures section so that it's not buried at the back of the document.

Atlantic Richfield Company Response: The Schedule has been relabeled as Figure 5 and added to the Figures section. Figure and Appendix references have been updated.

EPA Specific Comment 3 (Acronyms/Abbreviations): Please check this list for completeness. There are missing acronyms (e.g., DPP, SAP, PDI WP) that would be helpful to include. Also, please define (spell out) the first use of every acronym and abbreviation used in the document. For example, the abbreviation "Atlantic Richfield" is undefined in the last sentence of the first paragraph of the introduction on page 1 of the RDWP. Atlantic Richfield Company should be spelled out followed by Atlantic Richfield in parentheses to define the first use of the abbreviation.

Atlantic Richfield Company Response: Additional acronyms and definitions have been added to the list of Acronyms/Abbreviations, and every acronym and abbreviation is defined in the first use in the text of the document.

EPA Specific Comment 4 (Section 1.3 Site Description): Please consider adding a subsection 1.3.7 that describes the tailings, mine waste and contaminated soils at the Site. This would be a valuable lead-in to the PDI.

Atlantic Richfield Company Response: A brief description of the tailings, mine waste, and contaminated soils at the BTC RA Area has been added as Section 1.3.7.

EPA Specific Comment 5a (Section 2 Design Support Activities): As with the comment above, please consider adding some text about the potential characterization, removal and remediation of contaminated soils, tailings, mining and smelter wastes and contaminated stream sediments at the Site and requisite work plans and sampling.

Atlantic Richfield Company Response: Potential characterization, removal and remediation of contaminated soils, tailings, mining and smelter wastes, and contaminated stream sediments are to be conducted by the State through the Montana Department of Environmental Quality (MDEQ) as a separate FRESOW component. Therefore these activities are outside the scope of this BTC GWHC RDWP, which is for controlling discharge of contaminated groundwater to surface water and sediments in the BTC RA Area. The requested work plans, sampling, and reporting is expected to be provided in relevant documents prepared by the MDEQ for implementing this FRESOW component.

EPA Specific Comment 5b (Section 2 Design Support Activities): Please add a subsection 2.9 that describes data gaps for the BTC Groundwater Hydraulic Control System (GHCS) remedial element. A detailed description of data gaps is a requirement for all RDWPs. See Appendix D, Section 3.1 of the BPSOU Statement of Work.

Atlantic Richfield Company Response: A separate subsection that describes data gaps has been added. However, it is Subsection 2.1 rather than 2.9.

EPA Specific Comment 6 (Section 2.5 Proposed Treatability Study): Please list out related and/or supporting pre-design plans/efforts associated with potential treatability studies at the Site. For example, items that may be included: construction SWPPP development, wetland delineation, PDI report, accompanying reports/plans, restoration/grading plans, waste management plan, basis of design/design criteria report, construction AQ/AC plan, and O&M manuals/plans.

Atlantic Richfield Company Response: This section has been renamed "Potential Treatability Studies." Depending on the findings of the BTC Pumping Test and other PDI activities described in the BTC GWHC RDWP, alternative groundwater control technologies may be needed, such as permeable reactive barriers (PRB) or drains to intercept or treat contaminated groundwater in-situ. If it is determined that alternatives to hydraulic capture (e.g., PRB) must be considered, and if treatability studies are needed to fully evaluate an alternative method, the related plans and supporting efforts would be detailed in relevant pre-design work plans and QAPP(s)

EPA Specific Comment 7 (Section 2.7 Permitting and Regulatory Requirements): The text states that "The requirements will be detailed in the 30% design documents." Please add text after "30% design documents" stating that these requirements will also be included in the basis of design/design criteria report.

Atlantic Richfield Company Response: The text has been revised as requested.

EPA Specific Comment 8 (Section 2.7 Access Plan): The text states that "If Atlantic Richfield needs access to adjacent publicly or privately owned property to complete the RA-related activities (including sampling and monitoring), Atlantic Richfield will request that the property owners grant access to their properties for all RA-related activities." What is the plan if property owners do not grant the access?

Atlantic Richfield Company Response: This section has been clarified to indicate that currently all RA-related activities will be conducted on properties owned by Butte-Silver Bow (BSB). Pursuant to the 2006 Allocation and Settlement Agreement between BSB and Atlantic Richfield, BSB shall provide Atlantic Richfield access to properties owned by BSB for the purposes of conducting RA-related activities.

EPA Specific Comment 9a (Section 3.2 Remedial Design): The text states that "The design documents will include the design drawings and technical specifications." Please add characterizing text after "design documents" to define these documents (i.e., basis of design/design criteria report).

Atlantic Richfield Company Response: The text has been revised as requested.

EPA Specific Comment 9b (Section 3.2 Remedial Design): The text states that "The RD will include, at a minimum, the following elements:" Please add text after "elements" stating that each element will be progressed to the required level of detail for each design submittal.

Atlantic Richfield Company Response: text has been revised as requested.

EPA Specific Comment 10 (Section 3.3 Management Strategy): Please consider adding some overview text describing this section, such as, "This section describes the approach taken by Atlantic Richfield during the RD process, including the management strategy and approach to contracting. Detailed design documents are being developed with input from EPA, DEQ, and BSB; therefore, only a high-level overview is provided in this RDWP."

Atlantic Richfield Company Response: The text has been revised as requested.

EPA Specific Comment 11 (Section 4.0 Project Organization): Please consider adding a hierarchy chart (hierarchy diagram) to portray the key organizations involved with developing/implementing the RD. This would help the reader to quickly visualize the top-down modular breakdown of the entire system.

Atlantic Richfield Company Response: A project organizational chart with key personnel's roles and responsibilities has been included as Figure 4.

EPA Specific Comment 12 (Section 4.1.3 Atlantic Richfield Company): The text states that "Atlantic Richfield will administer the contract and monitor the overall progress of RD and RA activities conducted under the project and will be the primary authority regarding interpretation of the project requirements." Please consider providing better clarification that these are contract requirements, and not regulatory requirements.

Atlantic Richfield Company Response: The text has been revised to clarify Atlantic Richfield's authority regarding interpretation of contracted project requirements.

EPA Specific Comment 13 (Section 4.1.5 Stantec Consulting Services, Inc): The text states that "Stantec is the Atlantic Richfield engineer for investigation and preliminary design activities at the Site." It also states at the end of the paragraph, "Stantec will also develop the associated Preliminary (30%), Intermediate (60%), Pre-Final (95%), and Final (100%) RDs, the RAWP, and bid documents." These statements contradict each other; one says investigation and preliminary design activities and the other says to final design. Please clarify.

Atlantic Richfield Company Response: The text has been revised to clarify Stantec's role.

EPA Specific Comment 14 (Section 4.1.7 Contract Laboratory): The text states that "The Contract Laboratory will ensure that the laboratory QA personnel are familiar with the QAPPs (refer to Section 1.2) and any associated Request for Changes (RFCs) and are available to perform the work as specified." Who is the laboratory contracted with? Is it AR? Please clarify in the document.

Atlantic Richfield Company Response: The text has been revised to clarify the laboratory is contracted with AR.

EPA Specific Comment 15 (Section 4.2 Key Personnel): As with the comment above, please consider adding a hierarchy chart (hierarchy diagram) to portray the key personnel involved based on their roles and responsibilities. This would help the reader to quickly visualize the top-down modular breakdown of the entire system.

Atlantic Richfield Company Response: A project organizational chart with key personnel's roles and responsibilities has been included as Figure 4.

EPA Specific Comment 16 (Section 4.2.5 Stantec Project Manager): The text states that "Atlantic Richfield will contract directly with Stantec who will serve as the Atlantic Richfield Representative for the investigation and predesign phases of the project." Please add "and remedial design" after "pre-design".

Atlantic Richfield Company Response: The text has been revised as requested.

EPA Specific Comment 17 (Section 4.2.6 Quality Assurance Manager): Please add Stantec to this section heading.

Atlantic Richfield Company Response: The text has been revised as requested.

EPA Specific Comment 18 (Section 5.0 Remedial Design Deliverables): The text states that "This section describes the major reporting deliverables for the RD and construction." Please add "and RA" after "RD".

Atlantic Richfield Company Response: The text has been revised as requested.

EPA Specific Comment 19a (Section 5.1 Remedial Design Deliverables): Please add text stating that the RD will be accomplished in five main stages. List the components in the BPSOU CD. Also, list the pre-design submittals here.

Atlantic Richfield Company Response: Text stating the RD will be accomplished in five main stages has been added. The RD components in the BPSOU CD are listed in Section 5.1. The pre-design submittals are listed in Section 2.

EPA Specific Comment 19b (Section 5.1 Preliminary 30% RD): The text states that "The BOD and design criteria as described in the Remedial Design/Remedial Action Handbook, EPA 540/R-95/059 (EA, 1995)." Please replace"BOD" with "RD report/Design report".

Atlantic Richfield Company Response: The text "The BOD and design criteria" has been replaced by "A design criteria report" to be consistent with the BPSOU CD.

EPA Specific Comment 19c (Section 5.1 Preliminary 30% RD): The text states that "Preliminary drawings, including but not limited to the following:" Please add "(based on PDI)" after "Preliminary drawings".

Atlantic Richfield Company Response: The text has been revised as requested.

EPA Specific Comment 19d (Section 5.1 Preliminary 30% RD): Please consider adding drawing sheets containing any Site photos that may be applicable/helpful to the design.

Atlantic Richfield Company Response: Site photos will be included in design submittals as applicable.

EPA Specific Comment 19e (Section 5.1 Preliminary 30% RD): The text states that "Updates of all supporting deliverables required to accompany the RDWP." Ensure these are all listed in the RDWP.

Atlantic Richfield Company Response: Supporting deliverables have been listed in text.

EPA Specific Comment 20a (Section 5.1 Intermediate 60% RD): The text states that "Revised RD Report that includes revisions from EPA/State/Stakeholder comments to the preliminary (30%) RD and updates to 4 components where additional data have been collected as part of the Site investigations." Please add "/Design report" after "RD report".

Atlantic Richfield Company Response: To be consistent with the response to EPA Specific Comment 19b, "RD Report" was replaced with "Design Criteria Report".

EPA Specific Comment 20b (Section 5.1 Intermediate 60% RD): Please add a bullet stating, "Updates of all supporting deliverables required to accompany the RDWP."

Atlantic Richfield Company Response: The text has been revised as requested.

EPA Specific Comment 21a (Section 5.1 Final 95% RD): The text states that "A complete set of construction drawings and specifications that are (1) certified by a registered professional

engineer; (2) suitable for procurement; and (3) follow the current Construction Specifications Institute's Master Format." Who will be the registered professional engineer certifying the drawings?

Atlantic Richfield Company Response: A Stantec professional engineer registered and licensed in the state of Montana will be certifying the drawings, as listed in Section 4.2.6.

EPA Specific Comment 21b (Section 5.1 Final 95% RD): Please add a bullet stating, "Updates of all supporting deliverables required to accompany the RDWP."

Atlantic Richfield Company Response: The text has been revised as requested.

EPA Specific Comment 22 (Section 5.2 Construction Documentation and Records): Please consider making this a separate section from the design.

Atlantic Richfield Company Response: Acknowledged. Section 5 has been renamed to "Remedial Design and Remedial Action Deliverables" to accommodate the inclusion of Construction Documentation and Records, Record Maintenance, and Final Reporting.

EPA Specific Comment 23a (Figure 1): Site Location Map. Compared to other RDWPs, the projection/zone, datum, units, and source differ from figure to figure. Is there a way to be consistent between figures, both in what datums are listed and in naming convention?

Atlantic Richfield Company Response: All maps have been updated with consistent projection/zone, datum, units, and source.

EPA Specific Comment 23b (Figure 1): The state location inset map does not provide great value to the figure, as it does not do a good job of specifying the project location. Please consider highlighting Butte in the inset map to help clarify the project location.

Atlantic Richfield Company Response: Butte is now highlighted in the inset map.

EPA Specific Comment 23c (Figure 1): Please define TI Zone in Acronyms list.

Atlantic Richfield Company Response: "TI Zone" has been added to Acronyms list as requested.

EPA Specific Comment 24 (Figure 2): Site Overview and Blacktail Creek GHCS Conceptual Remedial Design. There are no projection/zone, datum, units, or source listed. Please be consistent with *Figure 1*.

Atlantic Richfield Company Response: All maps have been updated with consistent projection/zone, datum, units, and source.

EPA Specific Comment 25 (Appendix B – Draft BTC GHCS RD/RA Project Schedule): Acronyms at the top of the project schedule (Appendix B) are incorrect. GCS should be changed to GHCS for Groundwater Hydraulic Control System and the acronym "AR" is undefined.

Atlantic Richfield Company Response: Edits have been made as requested.

End of Comments.

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

2022

Draft Final

Blacktail Creek Groundwater Hydraulic Control System Remedial Design Work Plan

Atlantic Richfield Company
317 Anaconda Road
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December 2022

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

2022

Draft Final

Blacktail Creek Groundwater Hydraulic Control System Remedial Design Work Plan

Prepared for:

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Prepared by:

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December 2022

APPROVAL PAGE

Silver Bow Creek/Butte Area NPL Site Butte Priority Soils Operable Unit
Blacktail Creek Groundwater Hydraulic Control System Remedial Design Work Plan

Approved: _____ Date: _____
Nikia Greene, Site Project Manager, EPA, Region 8

Approved: _____ Date: _____
Daryl Reed, Project Officer, Montana DEQ

Approved: _____ Date: _____
Josh Bryson, Liability Manager
Atlantic Richfield Company

Approved: _____ Date: _____
David Gratson, Quality Assurance Manager
Atlantic Richfield Company

Plan is effective on date of approval.

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Silver Bow Creek/Butte Area NPL Site Butte Priority Soils Operable Unit
Blacktail Creek Groundwater Hydraulic Control System Remedial Design Work Plan

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Table of Contents

LIST OF FIGURES

Acronyms / Abbreviations

ARAR	Applicable or Relevant and Appropriate Requirements
Atlantic Richfield	Atlantic Richfield Company
BG	Buffalo Gulch
bgs	below ground surface
BPFOU	Butte Mine Flooding Operable Unit
BPSOU	Butte Priority Soils Operable Unit
BRW	Butte Reduction Works
BSB	Butte-Silver Bow
BTC	Blacktail Creek
BTL	Butte Treatment Lagoons
CCR	Construction Completion Report
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cfs	cubic feet per second
COC	Contaminant of Concern
CTSPE	Capture and Treatment System Performance Evaluation
cy	cubic yards
DE	Diggings East
DPP	BPMFOU Polishing Plant
EPA	U.S. Environmental Protection Agency
FRE	Further Remedial Element
GHCS	Groundwater Hydraulic Control System
HCC	Hydraulic Control Channel
I-15	Interstate 15
I-90	Interstate 90
LAO	Lower Area One
MBMG	Montana Bureau of Mining and Geology
MDEQ	Montana Department of Environmental Quality
NPL	National Priorities List
NRDP	Natural Resource Damage Program
NST	Northside Tailings
O&M	Operation and Maintenance
ORE	Ongoing Remedial Element
PDI	Pre-Design Investigation

PDI ER	Pre-Design Investigation Evaluation Report
PDI WP	Pre-Design Investigation Work Plan
PE	Professional Engineer
QA	Quality Assurance
QAM	Quality Assurance Manager
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	Quality Control
RA	Remedial Action
RAO	Remedial Action Objective
RAWP	Remedial Action Work Plan
RD	Remedial Design
RDWP	Remedial Design Work Plan
RFC	Request for Change
SBC	Silver Bow Creek
Stantec	Stantec Consulting Services Inc.
SWMP	Surface Water Management Plan
TI Zone	Technical Impracticability Zone
USGS	U.S. Geological Survey
WP	Work Plan

1 INTRODUCTION

This Blacktail Creek (BTC) Groundwater Hydraulic Control System (GHCS) Remedial Design (RD) Work Plan (WP) (referred to as the RDWP) provides the framework for developing the remedial design for the proposed contaminated groundwater control remedy as a part of the further remedial elements (FREs) for the Butte Priority Soils Operable Unit (BPSOU) at the BTC Remedial Action Area (BTC RA Area). The anticipated location of the BTC GHCS is within the BTC RA Area and is anticipated to parallel BTC between George Street and the south end of the KOA campground (the Site) shown in **Figure 1**. The FRE for the Site, to be implemented by Atlantic Richfield Company (Atlantic Richfield), includes the following component:

1. Control discharge of contaminated groundwater to surface water and sediments in the BTC RA Area.

Remaining remedy components, as described within the Blacktail Creek Remediation and Contaminated Groundwater Hydraulic Control FRE are the responsibilities of the Montana Department of Environmental Quality (MDEQ).

This RDWP has been developed consistent with applicable EPA guidance and decision documents, including the following:

- Consent Decree for the Butte Priority Soils Operable Unit. Partial Remedial Design/Remedial Action and Operation and Maintenance (EPA, 2020), referred to herein as BPSOU CD.
- Remedial Design/Remedial Action Handbook, EPA 540/R-95/059 (EPA, 1995).

This RDWP includes the following items:

1. Descriptions of any areas requiring clarification and/or anticipated problems (e.g., data gaps) (Sections 2.1 – 2.3).
2. Description of the proposed Pre-Design Investigation (PDI) activities (Sections 2.1 – 2.3).
3. Description of the high-level design data gaps and how the investigation activities detailed in the PDI WP will meet those data gaps (Sections 2.1 – 2.3 and **Appendix A**).
4. Description of the proposed treatability studies (Section 2.4).
5. Description of the applicable permitting requirements and other regulatory requirements (Section 2.5).
6. Description of the plans for obtaining access through property acquisition, leases, and/or easements (Section 2.6).
7. Plans for implementing all RD activities identified in the BPSOU CD for work that will be required to develop the RD (Section 3).
8. A description of the overall management strategy for performing the RD (Section 3).
9. A description of the proposed general approach to contracting, construction, operation, maintenance, and monitoring of the Remedial Action (RA) as necessary to implement the RD (Section 3).
10. A description of the responsibility and authority of all the organizations and key personnel involved with the development of the RD (Section 4).

11. Appropriate reference to the following supporting deliverables: Site-Wide Health and Safety Plan; Site-Wide Emergency Response Plan; and Quality Assurance Project Plans (QAPPs) (Sections 2 and 4).

1.1 Interface With Other Remedial Elements

The interface between the BTC GHCS described in this RDWP and other remedial elements (ongoing remedial elements [OREs] and FREs) is described in the following subsections.

1.1.1 BPSOU GROUNDWATER CAPTURE AND TREATMENT SYSTEM

The BPSOU Groundwater Capture and Treatment System is an ORE that captures impacted groundwater from various sources of the BPSOU and conveys the captured groundwater to the Butte Treatment Lagoons (BTL) for treatment. Currently the BPSOU Groundwater Capture and Treatment System captures groundwater from the following sources:

- BPSOU subdrain groundwater collection system
- Hydraulic control channel (HCC) at Lower Area One (LAO)
- Butte Reduction Works (BRW) ponds
- "D" cells at BTL
- West Camp Pump Station
- Missoula Gulch base flow

At the BTL, captured groundwater is treated with hydrated lime followed by pH adjustment and chemical precipitation in a series of lagoon cells. Prior to effluent discharge, pH is adjusted by addition of carbon dioxide. The treated water is then discharged to SBC.

The BTC GHCS, as part of the FREs, will be incorporated into the BPSOU Groundwater Capture and Treatment System, as necessary. As outlined in the OREs Scope of Work (Attachment B.1 to Appendix D of the BPSOU CD), following implementation of the FREs, an evaluation of the BPSOU Groundwater Capture and Treatment System will be conducted to determine if any further upgrades or optimization to the existing systems are needed. Evaluation of BTL treatment capacities and potential upgrades or optimization to the existing system is being conducted separate from this RDWP but will support the BTC GHCS design.

1.1.2 BTC REMEDIATION ACTIVITIES

As outlined in the FREs Scope of Work (Attachment C to Appendix D of the BPSOU CD), MDEQ is responsible for remediation activities at the BTC RA Area. The remediation activities are hydraulically downgradient of the proposed BTC GHCS alignment (**Figure 2**) and are therefore not expected to affect the overall design of the BTC GHCS. However, it is anticipated that the BTC GHCS will be designed and installed prior to MDEQ remediation activities to reduce ongoing and potential future groundwater loading of contaminants of concern (COCs) to sediments and surface water. The results of investigations by both the MDEQ and Atlantic Richfield may be used to refine the MDEQ remediation activities or BTC GHCS.

1.1.3 OTHER FURTHER REMEDIAL ELEMENTS

The remedial actions of other FREs, including construction of stormwater basins; tailings, waste, and contaminated soils excavation and disposal; and construction of cover systems at the Diggings East (DE), Buffalo Gulch (BG), and Northside Tailings (NST) areas upgradient of the BTC GHCS alignment (**Figure 2**) may affect the RD of the BTC GHCS due to source removal, potential impacts to groundwater flow, and reduced COC loading. Design of the BTC GHCS will consider these variables and potential interferences with, or enhancement of the BPSOU subdrain.

Also, elements from Butte Mine Flooding Operable Unit (BPFOU) will also be considered. For example, discharge from the BPMFOU Polishing Plant (DPP) is expected to decrease near the end of 2023 and may alter the backwater conditions at the BTC.

1.2 Supporting Documents and Activities

This RDWP provides an overview of the RD work and is supported by documents and the ongoing groundwater control modeling study described in the following subsections.

1.2.1 BTC PUMPING TEST QAPP

The BTC Pumping Test Quality Assurance Project Plan (BTC Pumping Test QAPP) provides the procedures and protocols necessary to conduct a groundwater pumping test to gain necessary data related to the physical and chemical characteristics of the aquifer. Additionally, the BTC Pumping Test QAPP lists the quality assurance/quality control (QA/QC) protocols to be followed during field data collection and laboratory analytical efforts. The final BTC Pumping Test QAPP was submitted to the EPA on July 5, 2022. The pumping test field work was conducted in summer/fall 2022. Results of the BTC Pumping Test will be summarized in the Pre-Design Investigation Evaluation Report (PDI ER).

1.2.2 GROUNDWATER CONTROL MODELING STUDY

The basis of design for the BTC GHCS will require estimations of key design elements including means of control, location, and installation depths. Additionally, the quantity of groundwater controlled by the BTC GHCS needs to be estimated to: 1) support design, 2) evaluate effectiveness of the remedy, and 3) assure that the Butte Treatment Lagoons (BTL) have sufficient treatment capacity for the additional flow and chemical load, if required.

The BTC groundwater control modeling study will focus on developing the Model to evaluate the alternatives and estimate the design elements for the BTC GHCS. The Model will incorporate results from the BTC Pumping Test to guide model construction, as appropriate. The results of the groundwater control modeling study will be presented in the PDI ER. Development of the model will be coordinated with the EPA through monthly progress meetings.

1.3 Site Description

The Site is located within the BPSOU located within the city of Butte, Montana (**Figure 1**). The Site is located southeast of the confluence of SBC and BTC (**Figure 1**). It is generally bound on the north by George Street, the west by Blacktail Creek, the south by Interstate 90 (I-90), the east by the KOA campground area, and the north by the Chamber of Commerce visitor's center. The BTC flows southeast to northwest adjacent to the Site to the confluence with SBC near George and Montana Streets.

1.3.1 SITE HISTORY

The BTC RA Area includes the likely historic location of the confluence of BTC and SBC. Historical maps of the area (Baker and Harper, 1889) suggest that the confluence of BTC and SBC was located to the southeast of the current confluence location. Later maps (Weed, 1897) suggest that water from SBC was impounded in the area near present day Montana Street. Although the BTC drainage experienced less historical disturbance than SBC, the area was adversely affected by the 1908 flood, which likely led to extensive scour and deposition of mine tailings from upgradient impoundments. Additionally, when BTC was rerouted and confined by the berms on both sides of the creek, the COCs contained in the berms likely impacted the nearby soil and groundwater (Atlantic Richfield, 2022).

As smelters were constructed along SBC in the 1870s and 1880s, water demands increased and at least three dams were constructed on SBC for tailings impoundment and water clarification (Weed, 1904). The dams and accumulation of waste exacerbated frequent and serious flooding (Meinzer, 1914). Berms were constructed of local materials throughout the confluence area in an attempt to mitigate flooding (Quivik, 1998). The berms were later found to contain tailings and other fill materials impacted by COCs (Natural Resource Damage Program [NRDP], 2014).

Just east of the confluence of SBC and BTC are the NST and DE areas (**Figure 2**). Due to milling and smelting activities in Butte, significant quantities of tailings were impounded adjacent to the realigned SBC above the confluence stream corridor. At the NST and DE areas, most of the tailings were deposited through retention ponds, which clarified suspended tailings prior to discharge of water back into SBC. After these smelting activities ceased, the tailings were covered with non-native fill material and unauthorized dumping of construction debris and general waste (NRDP, 2014).

1.3.2 CLIMATE

The Butte area climate is characterized by short, cool, dry summers and long, cold winters. The annual precipitation in Butte generally varies from 8 to 20 inches per year, with an average of 13 inches. The greatest amount of precipitation, approximately one third, occurs during the months of May and June (obtained from the National Oceanic and Atmospheric Administration website at www.noaa.gov/climate.html for 1990 to 2019, excluding 2014 for which there was insufficient data).

1.3.3 TOPOGRAPHY

The Site is relatively flat with multiple structures scattered throughout. Surface topography generally slopes towards BTC.

1.3.4 GEOLOGY

The Butte, Montana, area lies within the Summit Valley of southwest Montana and is characterized by Quaternary alluvium surrounded by the Butte granite of the Cretaceous Boulder Batholith (U.S. Geological Survey [USGS], 2012).

Alluvium

The primary source of the alluvial material existing at the BTC RA Area is the granitic bedrock (i.e., Butte granite) surrounding most of the Summit Valley. The alluvial material at the BTC RA Area consists of

various mixtures of clays, silts, sands, and gravels. Generally, the upper portion of the alluvium is more finely grained with prevalent clay and silt. With increasing depth, the alluvium gets coarser with sand and gravel becoming more predominant.

Bedrock

Depth to bedrock is approximately 80 to 90 feet below ground surface (bgs) at the BTC RA Area. While interactions with groundwater in bedrock are not expected to be an important component of the Investigation, the depth to bedrock is greater than 200 feet bgs where BTC crosses underneath Lexington Avenue and is approximately 25 to 30 feet bgs where SBC crosses underneath Montana Street (**Figure 2**). Bedrock depth shallowing from east to west in the area is inferred to result in groundwater discharging to the surface.

1.3.5 SURFACE WATER

Surface water near the Site consists of BTC, SBC, and a series of natural wetlands and tributaries located between Lexington Avenue and Montana Street (**Figure 2**). BTC flows adjacent to the Site from southeast to northwest, and the Site is located upstream of the confluence with SBC to the northwest.

Adjacent to BTC are wetland features recharged by locally upwelling groundwater, including a wetland located to the north of BTC and south of the Butte KOA, a wetland located to the south of BTC and north of Interstate 15 (I-15)/I-90, and a wetland located to the south of I-15/I-90 (Atlantic Richfield, 2022). A map from the National Wetlands Inventory showing wetland features adjacent to BTC is included as **Figure 3**.

Within the Site, BTC is a low gradient, low sinuosity, single-channel creek with a median annual flow of approximately 20 cubic feet per second (cfs). Peak flows (2- to 5-year return interval) range from 153-289 cfs (USGS, 2021).

1.3.6 GROUNDWATER

Depth to groundwater at the BTC RA Area ranges from 5 to 15 feet bgs. To the east of the BTC RA Area, a groundwater divide occurs within the upper alluvial unit and is created by the groundwater capture of the subdrain and groundwater gaining to BTC. On the north side of the groundwater divide, the direction of groundwater flow is to the north/northwest toward the subdrain, and on the south side of the groundwater divide, the direction of groundwater flow is to the southwest toward BTC.

An understanding of how the existing and proposed groundwater remedy components may affect groundwater elevations and chemistry in the area between BTC and SBC above the confluence with BTC will be critical to the success of future groundwater remedy optimization efforts.

Groundwater at the BTC RA Area travels through an aquifer comprised of alternating layers of material ranging from fine silts and clays to medium gravel (alluvial aquifer). Further upgradient along SBC, the horizons between the aquifer units (lower alluvial unit, middle alluvial unit, and upper alluvial unit) are identifiable laterally within the lithologic logs. Within the BTC RA Area, the horizons between the aquifer units are less clear. Interbedded silts and clays result in areas of lower hydraulic conductivity, whereas sands, gravels, and possibly buried fluvial sediments from historic channels provide areas of higher hydraulic conductivity.

1.3.7 TAILINGS, MINE WASTE, AND CONTAMINATED SOILS

Investigations to characterize the extent and volume of mine wastes and impacted sediments at the BTC RA Area were conducted in 2013 (MBMG, 2014a) and 2016 (Tetra Tech, 2016). Results of these investigations indicated that tailings in the BTC RA Area are not underlain by thick units of fill material and are close to the surface or surficial at times. Some of the soil samples with metal concentrations exceeding the Waste Identification Criteria were collected from alluvium approximately 10 to 11.5 feet below ground surface.

Potential characterization, removal and remediation of contaminated soils, tailings, mining and smelter wastes, and contaminated stream sediments are to be conducted by the State through the Montana Department of Environmental Quality (MDEQ) as a separate FRESOW component.

1.4 Relevant Previous Investigations

Several previous investigations in the BPSOU area are relevant to the GHCS RD. Investigations relevant to the Site are summarized in the following subsections.

1.4.1 BPSOU SUBDRAIN MID-LEVEL AQUIFER PUMPING TEST

The pumping test, conducted near the Butte Civic Center, characterized the mid-level portion of the aquifer located to the east of the Site. The average transmissivity of the mid-level portion of the aquifer in the upper portion of the SBC drainage basin was estimated to be approximately 9,000 square feet per day and the average hydraulic conductivity was approximately 600 feet per day (Atlantic Richfield, 2010). These parameters were used as a basis for the preliminary forward modeling analysis to determine pumping rates for the BTC hydraulic control pumping test (Atlantic Richfield, 2021).

1.4.2 BTC AND SBC RADON TRACING AND THERMAL IMAGING SURVEY

In 2011, a thermal imaging and radon tracing investigation (Radon Tracing Study) was conducted along BTC and SBC. The study was intended to identify the loss and/or gain reaches of BTC and SBC and evaluate if losses were due to interception of the historic channel or were the result of the gain or loss of flow to the groundwater aquifer. The investigation also identified the origin of stream COC load gain as either upwelling groundwater, tributary flow, pore water from within the bed sediment, or mobilization of bed sediment (Atlantic Richfield, 2015). The Radon Tracing Study identified two sub-reaches within BTC with gains of flow and dissolved load. The thermal imaging survey did not detect any groundwater gains to BTC adjacent to the Site.

1.4.3 STREAM CHARACTERIZATION OF BTC AND SBC

A bromide tracer study was completed to investigate areas of groundwater reporting to surface water at the Site. Results of the tracer study indicated that BTC, in the vicinity of the Site, contains both gaining and net losing reaches and that adjacent wetland areas receive most gains from groundwater (Montana Bureau of Mining and Geology [MBMG], 2014b).

1.4.4 GROUNDWATER AND SURFACE WATER INTERACTION STUDY

Surface water, sediment pore water, groundwater, sediment, and soil samples collected in a 2016 sampling effort were analyzed to determine the interaction of groundwater and surface water in the area in and around the Site (EPA, 2018). The investigation aimed to determine if impacted groundwater sources were contributing to surface water loads (as opposed to wet weather sediment loading events) using a combination of analytical sample analysis and geochemical modeling. In the study area relevant to this effort (the reach from sample station [SS] SS-01 to SS-04), important findings from the report included the following:

- Increased concentrations of dissolved arsenic, copper, and zinc between SS-01 and SS-04 in surface water samples (SS-01 and SS-04 are shown on **Figure 1**).
- Positive sediment pore water gradients, indicating contribution of groundwater to surface water.
- Lower concentrations of COCs in groundwater samples than in sediment pore water samples.

The study concluded that impacted sediment and localized impacted groundwater may be affecting surface water quality in the Site area (EPA, 2018).

2 DESIGN SUPPORT ACTIVITIES

This section describes the design support activities including the BTC pumping test, PDI WP, PDI ER with groundwater modeling, and additional PDI activities that may be needed to fill data gaps, proposed treatability studies (as needed), permitting, and access plans.

2.1 Data Gaps

The data gaps needed to support RD for the BTC RA Area are as follows:

1. Alluvial aquifer properties including potentiometric surfaces, hydraulic conductivity, transmissivity, aquifer geometry, etc. to estimate the quantity of groundwater discharge.
2. The configuration, location(s), installation depth(s), size, and potential groundwater extraction rates of the BTC GHCS that would optimize efficiency, effectiveness, and flexibility.
3. Groundwater and surface water quality and chemistry data, including seasonal changes, to estimate COC loading and evaluate the effect of BTC GHCS operation on the treatment performance of BTL.
4. The effect of surface flow conditions on BTC GHCS operation.
5. The effect of BTC GHCS operation on other remedial elements (e.g., the BPSOU Subdrain).
6. Utility locations to determine underground conveyance line locations.

2.2 BTC Pumping Test

The BTC pumping test as described in the BTC Pumping Test QAPP (**Appendix A**) will be conducted to fill data gaps related to the BTC GHCS, including potentiometric surfaces, hydraulic conductivity, transmissivity, aquifer geometry, etc. to estimate quantity of groundwater discharge.

2.3 BTC PDI WP and QAPP(s)

The BTC PDI WP is forthcoming and will evaluate existing data and address remaining data gaps that are necessary for completing the RD. Additional PDI activities, such as collection of groundwater samples for COC and groundwater chemistry analyses, monitoring of potentiometric surfaces for seasonal changes, utility locations, and data collection to determine underground conveyance line locations may be warranted depending on results of the BTC Pumping Test, the groundwater modeling study, and potential design considerations for the selected GHCS. Details of additional PDI activities will be described in a PDI WP and QAPP(s) as necessary.

The associated PDI QAPP(s) will be developed to describe the procedures and protocols necessary for field data collection and laboratory analytical efforts. The PDI WP and associated QAPP(s) will be developed following the BTC pumping test.

2.4 BTC PDI Evaluation Report

The PDI ER will summarize results of the BTC Pumping Test, the BTC groundwater control modeling study, and the results of any other PDI investigation activities. The BTC groundwater model will incorporate data collected from the BTC Pumping Test and relevant data collected previously to provide information to support evaluation of alternatives and propose the preferred method for the BTC GHCS. The PDI ER will include the conclusions and recommendations for design parameters and criteria for the proposed alternative (location, configuration, preliminary quantities, etc.).

2.5 Remedial Design Reports

The BTC GHCS Preliminary (30%), Intermediate (60%), Pre-Final (95%), and Final (100%) RD Reports are forthcoming and will provide an iterative approach to developing the final design. Conceptual details on the BTC GHCS will be provided in the Preliminary (30%) RD Report, with a complete design of the BTC GHCS provided in the Intermediate (60%) and (95%) RD reports. Additional design elements identified in Section 3 of this report will be presented initially in the Preliminary (30%) RD Report with additional detail provided in subsequent RD reports (i.e., 60% and 95%).

2.6 Potential Treatability Studies

As outlined in the FREs Scope of Work (Attachment C to Appendix D of the BPSOU CD), the exact method of groundwater control cannot be determined based on existing available data. Depending on the findings of the BTC Pumping Test and other PDI activities as needed, control of groundwater may be accomplished by hydraulic capture and/or other methods. Other groundwater control alternatives such as permeable reactive barriers (PRB) or drains to intercept or treat contaminated groundwater in-situ may be considered. If it is determined that alternatives to hydraulic capture (e.g., PRB) must be considered, and if

treatability studies are needed to fully evaluate an alternative method, the related plans and supporting efforts would be detailed in relevant pre-design work plans and QAPP(s) as needed.

2.7 Permitting and Regulatory Requirements

Only the substantive requirements (i.e., compliance with numerical standards, use of control/containment equipment, etc.) associated with the Applicable or Relevant and Appropriate Requirements (ARARs) apply to Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) on-site activities. According to CERCLA Section 121[e][1], ARARs associated with administrative requirements, such as permitting, are not applicable to CERCLA on-site activities. The RD for the BTC GHCS will incorporate the intent of the substantive environmental permitting/regulatory requirements; in particular, the action specific ARARs identified in the BPSOU CD. The requirements will be detailed in the 30% design documents and in a design criteria report.

2.8 Access Plan

Currently all BTC RA-related activities will be conducted on properties owned by Butte-Silver Bow (BSB), and Atlantic Richfield has access to BSB properties pursuant to the 2006 Allocation and Settlement Agreement. While it is not anticipated that access will be required to adjacent publicly or privately owned property to complete the RA-related activities (including sampling and monitoring), Atlantic Richfield will request that the property owners grant access to their properties for all RA-related activities. Atlantic Richfield and/or its representatives will maintain copies of completed access agreements received from property owners. Hard copy documentation of the completed agreements will be archived, and electronic versions stored on a network server.

3 REMEDIAL DESIGN OVERVIEW

This section summarizes the RD and outlines the overall management strategy to perform the RD and the approach to contracting (as outlined in the BPSOU CD and Items 7 through 9 in Section 1).

3.1 Remedial Design Objectives

The identified design objectives for the BTC GHCS are as follows:

- Design the location and configuration for the BTC GHCS to prevent exceedances of performance standards under normal flow conditions in surface water identified in the Surface Water Compliance Determination Plan (Attachment A to Appendix D of the BPSOU CD).
- Limit loading of COCs from groundwater to sediments in BTC within the BPSOU generally and within the Site specifically.
- Evaluate quantity and quality of captured groundwater.

3.2 Remedial Design

The design will be detailed in the Preliminary (30%), Intermediate (60%), Pre-Final (95%; if needed), and Final (100%) RD documents. These design documents will be supported by the results of the PDI to fill data gaps. The design documents (e.g., design criteria report, 30%, 60%, and 100% RD documents) will include the design drawings and technical specifications. Because the RD construction design documents will be developed with input from EPA, MDEQ, Butte-Silver Bow (BSB), and the public through an iterative process, only a high-level overview is provided in this RDWP.

Figure 2 shows a conceptual RD location for controlling COC-impacted groundwater from the Site to prevent exceedances of Performance Standards (EPA, 2020) under normal flow conditions in surface water and to limit loading of COCs from groundwater to sediments in BTC within the BPSOU generally and within the Site specifically.

The RD will include, at a minimum, the following elements with each element progressed to the required level of detail for each design submittal:

1. Site Controls (plot plans, existing topography and survey control, construction fencing, temporary traffic control, construction staging and field office areas, construction stormwater management, etc.).
2. Waste Disposal (repository location and associated haul routes), if necessary.
3. GHCS for COC-impacted groundwater (alignment, groundwater modeling, construction details, etc.). The groundwater modeling will be used to design the BTC GHCS to meet the defined objective, which is to reduce ongoing and potential future groundwater loading of COCs to sediments and surface water as outlined in the Surface Water Management Plan (SWMP).
4. Instrumentation and Controls (piping and instrumentation, logic, controls, etc.), if necessary.
5. Civil Infrastructure (water, sanitary sewer, storm sewer, Site electrical and lighting, curb and gutter, parking lots, access roads, etc.), as necessary.
6. Planting and Vegetation (wetland protection/mitigation requirements, seeding and fertilizer, and erosion control), as necessary.
7. Irrigation (initial establishment, repair or replacement of damaged systems), if necessary.
8. Institutional and Engineered Controls (e.g., signage, fencing, and maintenance agreements), if necessary.
9. Consideration of preservation, documentation, and/or mitigation activities for historical or cultural significant features, if necessary.

3.3 Management Strategy

This section describes the approach taken by Atlantic Richfield during the RD process, including the management strategy and approach to contracting. Detailed design documents are being developed with input from EPA, MDEQ, and BSB; therefore, only a high-level overview is provided in this RDWP. The

general management strategy for the Site's RD is for Atlantic Richfield to manage the project design using one design engineer for the RD and one contractor for implementation of the RA. All design documents will be submitted to and reviewed and approved by EPA, in consultation with MDEQ. Atlantic Richfield will implement the Site RD and RA. Details on the organizational structure, roles, and responsibilities are provided in Section 4. Data management procedures are provided in the respective QAPPs listed in Section 1.2.

4 PROJECT ORGANIZATION

This section provides descriptions of the responsibility and authority of key organizations and personnel involved with the development of the RD.

4.1 Key Organizations

The key organizations and their roles and responsibilities are detailed in the following subsections.

4.1.1 ENVIRONMENTAL PROTECTION AGENCY

EPA is the lead agency for RD/RA efforts by Atlantic Richfield and BSB in the SBC/Butte Area National Priorities List (NPL) Site. EPA will lead communications with Atlantic Richfield, MDEQ, and BSB. EPA will review and authorize this RDWP and the associated Preliminary (30%), Intermediate (60%), Pre-Final (95%), and Final (100%) RDs and RA work plan (RAWP). During construction, EPA may participate in preconstruction Site walks and pre-final and final inspections. EPA will attend the weekly progress meetings and review daily construction reports provided by Atlantic Richfield via email and will communicate any concerns or questions to Atlantic Richfield. EPA will also provide oversight to ensure the RD is being implemented as designed and approved. EPA will also review and approve the final project RA construction completion report (CCR).

4.1.2 MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

The MDEQ is the state agency for review of RD/RA efforts by Atlantic Richfield and BSB in the SBC/Butte Area NPL Site. The MDEQ will review and provide comments to EPA on the associated Preliminary (30%), Intermediate (60%), Pre-Final (95%), and Final (100%) RDs and RAWPs. During construction, the MDEQ may participate in technical meetings, pre-construction Site walks, and pre-final and final inspections. The MDEQ will attend the weekly progress meetings and review daily construction reports provided by Atlantic Richfield via email and will communicate any concerns or questions to EPA.

4.1.3 ATLANTIC RICHFIELD COMPANY

Atlantic Richfield will manage the project RD and RA construction. Atlantic Richfield will administer the contract and monitor the overall progress of RD and RA activities conducted under the project and will be the primary authority regarding interpretation of the contracted project requirements.

4.1.4 BUTTE-SILVER BOW

BSB is the local agency for coordination and review of RD and RA efforts conducted in the SBC/Butte Area NPL Site. A BSB representative will review and provide comments to Atlantic Richfield on the associated Preliminary (30%), Intermediate (60%), Pre-Final (95%), and Final (100%) RDs and RAWP.

4.1.5 STANTEC CONSULTING SERVICES INC.

Stantec is the Atlantic Richfield engineer for investigation, preliminary design, final design, and bid document preparation activities at the Site. Stantec will be responsible for administering subcontracts for the remaining professional services, as necessary. Stantec will also develop the associated Preliminary (30%), Intermediate (60%), Pre-Final (95%), and Final (100%) RDs, the RAWP, and bid documents.

4.1.6 CONSTRUCTION CONTRACTOR

The selected contractor will be responsible for executing the project in strict compliance with the RD, RAWP, and technical specifications. The contractor will have primary responsibility for project safety, construction activities, subcontractor management, daily project documentation, and reporting, and the construction QC measures associated with implementing the RA. Atlantic Richfield will select an independent QA contractor to oversee construction activities. Atlantic Richfield will select the contractor and inform EPA of its choice prior to starting the project.

4.1.7 CONTRACT LABORATORY

The Contract Laboratory contracted with Atlantic Richfield will ensure that the laboratory QA personnel are familiar with the QAPPs (refer to Section 1.2) and any associated Request for Changes (RFCs) and are available to perform the work as specified. Contract Laboratory personnel will be responsible for reviewing final analytical reports produced by the laboratory, scheduling laboratory analyses, and supervising in-house chain of custody procedures.

4.2 Key Personnel

Key personnel and their roles and responsibilities for the Site are listed below. During construction activities, EPA, MDEQ, Atlantic Richfield, and the contractor(s) will be coordinating or attending (as necessary) technical meetings, pre-construction Site walks, weekly progress meetings, and pre-final and final inspections. A project organizational chart with roles and responsibilities of key personnel is included as **Figure 4**.

4.2.1 EPA REMEDIAL PROJECT MANAGER

Mr. Nikia Greene is the EPA remedial project manager for this work. Mr. Greene is based in the EPA Region 8 office in Helena, Montana. He will be the primary contact for EPA and ensure that RDs and RAs comply with the Agency RD/RA Scope of Work. Mr. Greene will be responsible for review and approval of this RDWP and the Preliminary (30%), Intermediate (60%), Pre-Final (95%), and Final (100%) RDs and RAWPs. During construction, Mr. Greene will be responsible for providing construction oversight on behalf of EPA.

4.2.2 MDEQ PROJECT OFFICER

Mr. Daryl Reed is the MDEQ project officer for this work. Mr. Reed is based in the MDEQ Remediation Division office located in Helena, Montana. He will be the primary contact for MDEQ and ensure that RDs and RAs comply with the Agency RD/RA Scope of Work. In consultation with EPA, Mr. Reed will be responsible for MDEQ review and concurrence of this RDWP and the Preliminary (30%), Intermediate (60%), Pre-Final (95%), and Final (100%) RDs and RAWPs on behalf of the MDEQ.

4.2.3 ATLANTIC RICHFIELD LIABILITY MANAGER

The Atlantic Richfield liability manager is Mr. Josh Bryson, who is responsible for overall programmatic planning for technical and administrative components of RD and RA work completed by Atlantic Richfield. Mr. Bryson will be the primary technical point of contact for EPA, MDEQ, BSB, and the project engineer and contractor.

4.2.4 ATLANTIC RICHFIELD QUALITY ASSURANCE MANAGER

The Atlantic Richfield QA Manager (QAM) for the project is Mr. David Gratson. Mr. Gratson will interface with the Atlantic Richfield liability manager on company policies regarding quality and has the authority and responsibility to approve QA documents specific to the project.

4.2.5 STANTEC PROJECT MANAGER

Atlantic Richfield will contract directly with Stantec who will serve as the Atlantic Richfield Representative for the investigation, pre-design, and remedial design phases of the project. Stantec's project manager for Atlantic Richfield is Brent Lucyk. Mr. Lucyk will be responsible for ensuring the PDI WP is implemented and coordinate all project-specific assignments and provide overall project direction to the Stantec team. Mr. Lucyk will be the primary contact for Atlantic Richfield. Responsible for developing this RDWP, he will also be responsible for the Preliminary (30%), Intermediate (60%), Pre-Final (95%; if needed), and Final (100%) RDs and RAWPs.

4.2.6 STANTEC PROFESSIONAL ENGINEER

The Stantec professional engineer, registered and licensed in the State of Montana, is Mr. Paul Kos, P.E. Mr. Kos will be certifying construction drawings and specifications.

4.2.7 STANTEC QUALITY ASSURANCE MANAGER

The QA Officer (QAO), Ms. Christie Kuhlmann, P.G. from Stantec, will be responsible for reviewing field and laboratory data and evaluating data quality during PDI activities.

4.2.8 FIELD AND HEALTH AND SAFETY PERSONNEL

Identification of field and health and safety resources will be determined based on the need and type of additional data collection necessary for the BTC GHCS design.

5 Remedial Design and Remedial Action Deliverables

This section describes the major reporting deliverables for the RD and RA and construction (EPA Guidance Item 11 [Section 1]).

5.1 Remedial Design Documentation

The remedial design will be accomplished in five main stages: PDI, 30% RD, 60% RD, 95% RD, and 100% RD. The PDI submittals are described in Section 2.0. For the RD submittals, Atlantic Richfield will submit a Preliminary (30%), Intermediate (60%), Pre-Final (95%), and Final (100%) RD for EPA's comment, in consultation with MDEQ. Each RD submittal will contain the components listed in the BPSOU CD. The following sections detail what each of the RD submittal will contain.

Preliminary (30%) RD. The Preliminary RD will include the following:

1. A Design Criteria Report, as described in the Remedial Design/Remedial Action Handbook, EPA 540/R-95/059 (EPA, 1995).
2. In addition to the Design Criteria Report, the 30% design will include, but not be limited to, the following:
    a. Project description.
    b. Evaluation of how ARARs will be met.
    c. Design requirements including, but not limited to, BPSOU Statement of Work requirements (BPSOU CD), remedial action objectives (RAOs), and Remedial Action Levels.
    d. Design assumptions including, but not limited to, waste removal extents, utility construction/preservation, waste disposal methods and location, dewatering design, and end land use for the Site.
    e. Design approach including, but not limited to, groundwater control management of soil and groundwater impacted with COCs above Site-specific action levels.
    f. Description of permit requirements, if applicable, and plans to address substantial requirements of permits.
    g. Easement/access agreements.
    h. Description of monitoring and control measures to protect human health and the environment, such as air monitoring and dust suppression, during the RA.
    i. Description of how the RA will be implemented in a manner that minimizes environmental impacts in accordance with EPA's Principles for Greener Cleanups (EPA, 2009).
3. Preliminary drawings (based on PDI), including but not limited to the following:
    a. GHCS alignment in plan and profile view.
    b. Plan view of other construction elements: existing conditions map, Site utilities, ownership, Site plan, etc.

c. Site photos as applicable.

4. Any proposed revisions to the RA schedule.

5. Updates of all supporting deliverables, including Site-Wide Health and Safety Plan, Site-Wide Emergency Response Plan, and Quality Assurance Project Plans, required to accompany the RDWP.

Intermediate (60%) RD. The Intermediate RD is a continuation and expansion of the Preliminary (30%) RD and will include the following:

1. Revised Design Criteria Report that includes revisions from EPA / State / Stakeholder comments on the Preliminary (30%) RD and updates to components where additional data have been collected as part of the Site investigations.

2. Intermediate drawings, including, but not limited to the following:

    a. Updated/revised drawings from the Preliminary (30%) RD based on EPA / State / Stakeholder comments and updates to components where additional data have been collected as part of the Site investigations.

    b. Additional Site-wide plans including, but not limited to, traffic control, temporary fencing, staging and stockpile management, demolition, erosion control, utility plan and profiles, lighting, revegetation, and irrigation.

    c. Draft or schematic details, where applicable. Structure detailing to be submitted with the Pre-Final (95%) RD.

3. Any proposed revisions to the RA schedule.

4. Updates of all supporting deliverables required to accompany the RDWP.

Pre-Final (95%; if needed) RD. The Pre-Final RD must be a continuation and expansion of the previous design submittal and address EPA's comments regarding the Intermediate (60%) RD. The Pre-Final RD will serve as the approved Final (100%) RD if EPA approves it without comments. The Pre-Final RD must include a continuation of deliverables identified above for the Intermediate (60%) RD in addition to the following:

1. A complete set of construction drawings and specifications that are: (1) certified by a registered professional engineer; (2) suitable for procurement; and (3) follow the current Construction Specifications Institute's Master Format.

2. Additional Site-wide plans including, but not limited to, instrumentation and controls, performance monitoring, and electrical.

3. Additional detail including, but not limited to, structural, mechanical, electrical, lighting, revegetation, and irrigation.

4. Any proposed revisions to the RA schedule.

5. Updates of all supporting deliverables required to accompany the RDWP.

Final (100%) RD. Atlantic Richfield will submit the Final (100%) RD for EPA approval, in consultation with MDEQ. The Final RD must address EPA and MDEQ comments on the Pre-Final (95%) RD and must include final versions of all Pre-Final (95%) RD deliverables finalized for construction.

RAWP. Atlantic Richfield currently anticipates submittal of a RAWP specific to the Site. The following elements will be included in the RAWP:

1. Project Background
2. Summary of Data Collected
3. Team Organization
4. Pre-Construction Activities
5. Design Summary
6. Construction Meeting Description and Procedures
7. Design and Field Change Procedures
8. Post-Construction Activities Procedures
9. Construction QA
10. Construction Monitoring and Associated QAPPs
11. Construction Records and Reporting
12. Health and Safety Requirements
13. Construction Plans
14. Specifications
15. O&M Plan and Manual

Atlantic Richfield will submit the draft RAWP around the time of the Intermediate (60%) design.

5.2 Construction Documentation and Records

5.2.1 DAILY CONTRACTOR QUALITY CONTROL REPORTS

The contractor will prepare daily contractor QC reports. The reports will list a description of the trades working on the project, the number of personnel working, weather conditions encountered, and any delays encountered. The reports will cover both conforming and deficient features and will include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. The daily reports will include copies of test reports. The contractor must also take photographs documenting the day's major work activities and incorporate them into the reports. The Construction QC Manager must sign and date the reports. The contractor will provide the reports to the independent QA contractor daily within 24 hours after the date covered by the report, with one exception: reports need not be submitted for days on which no work is performed.

5.2.2 DAILY CONSTRUCTION ACTIVITY REPORT

An independent QA contractor will complete a daily construction activity report and submit it daily to Atlantic Richfield. The report will summarize the activities at the Site based on daily field notes. The report

will address weather, contractor/subcontractor personnel that are at the Site, equipment used, construction activities performed, samples collected, field test results, and any issues encountered.

5.2.3 MATERIAL RECEIPT INSPECTIONS

All materials, equipment, and/or supplies that arrive at the Site will be inspected by the independent QA contractor to ensure that the products are as ordered or as specified; any deviations will be relayed to the contractor and Atlantic Richfield immediately. Receiving checklists for critical materials will be completed and recorded in a suitable location on the Site. These checklists will be included with other inspection documentation as part of the final CCR.

5.2.4 INSPECTIONS AND TESTING RECORDS

All observations, field test results, and laboratory test results performed on the Site or off the Site will be recorded in a suitable manner. Recorded observations may take the form of notes, charts, sketches, photographs, or any combination of these. At a minimum, the inspection documentation will include the following information:

- Description or title of the inspection activity with the date activity was inspected.
- Location of the inspection activity or location from which the sample was obtained.
- Type of inspection activity and procedure used.
- Recorded observation or test data.
- Results of the inspection activity (e.g., pass/fail).
- Comparison with specification requirements.
- Personnel involved in the inspection besides the individual preparing the data sheet.
- Signature of the QAO accompanied by the date.

5.2.5 PHOTOGRAPHIC DOCUMENTATION

The contractor will obtain photographs that document existing Site conditions, progress activities, and completion conditions.

5.2.6 RECORD FIELD DATA

The contractor will keep at the Site two complete sets of as-built field data, one for the contractor's use and one for Atlantic Richfield construction oversight personnel. The as-built field data will consist of full size, blackline prints of the Contract Drawings marked by the contractor to show all deviations in actual construction from the original Contract Drawings. These working as-built drawings will be updated weekly.

5.2.7 RECORD DRAWINGS

Stantec will document the final Site construction through record drawings. The record drawings will be incorporated into the final RA CCR (Section 5.4).

5.3 Record Maintenance

The contractor will store and manage all project records and back up documents during construction activities. The contractor will maintain all current records and make those documents available at all times for inspection by the independent QA contractor. The contractor will submit all the deliverables to the independent QA contractor. The independent QA contractor will include these materials in the final RA CCR (Section 5.4).

5.4 Final Reporting

Atlantic Richfield expects to provide a RA CCR to EPA within 60 days of the successful completion of the final inspection. The RA CCR will contain all construction-related information and documented aspects of QA associated with the project. The RA CCR will include a summary of the project activities and document all aspects of the QA program performed during the project. In addition, a final O&M Plan and O&M Manual will be submitted to reflect any issues that may have been encountered during construction. In the report, the Design Engineer of record registered in the State of Montana will state that the project has been constructed consistent with the project Construction Drawings and Technical Specifications and that the discrete RD elements are complete.

6 Schedule

The proposed schedule for deliverables outlined in this RDWP is specified in **Figure 5**; this includes the PDI field activities and supporting documents as well as design documents and construction. The PDI field efforts are expected to be completed in 2023. At the conclusion of the PDI field efforts, which will be detailed in the respective QAPP(s), a PDI ER will be submitted. The PDI ER will be developed following the guidance provided by EPA in the BPSOU CD.

A Preliminary (30%) RD Report will be developed and submitted to the Agencies in 2023. Following submittal of the Preliminary (30%) RD Report, the Intermediate (60%), Pre-Final (95%; if needed), and Final (100%) RD reports will be completed and subsequently submitted for Agency review and approval. This iterative approach fosters collaboration between all parties involved.

Effective, open communications will be critical to achieving timely completion of the project. As such, periodic meetings between EPA and Atlantic Richfield will be scheduled to discuss the status of ongoing efforts, upcoming events, and deliverables; to resolve any issues that may arise; discuss additional PDI activities; and to achieve a consensus on how design activities will be divided into the individual design reports. Because of the uncertainty associated with the schedule for several tasks that are out of Atlantic Richfield's control (e.g., seasonal constraints, EPA review periods, the need to fill data gaps, etc.), the schedule outlined in **Figure 5** is considered tentative and open to change. Any schedule changes will be communicated to affected parties.

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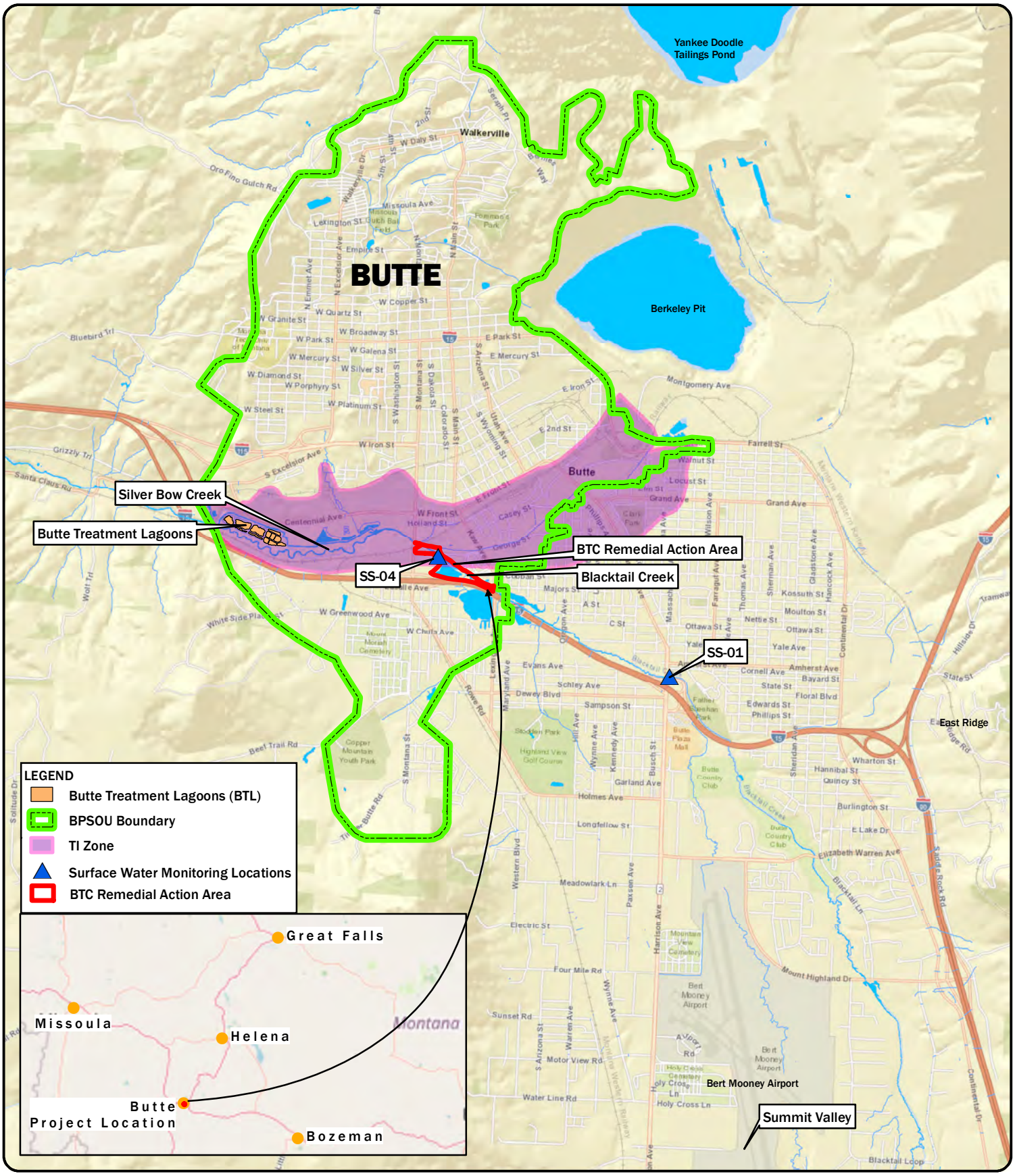
FIGURES



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Miles

FIGURE 1

SITE LOCATION MAP

PIONEER TECHNICAL SERVICES, INC.

DATE: 12/1/2022

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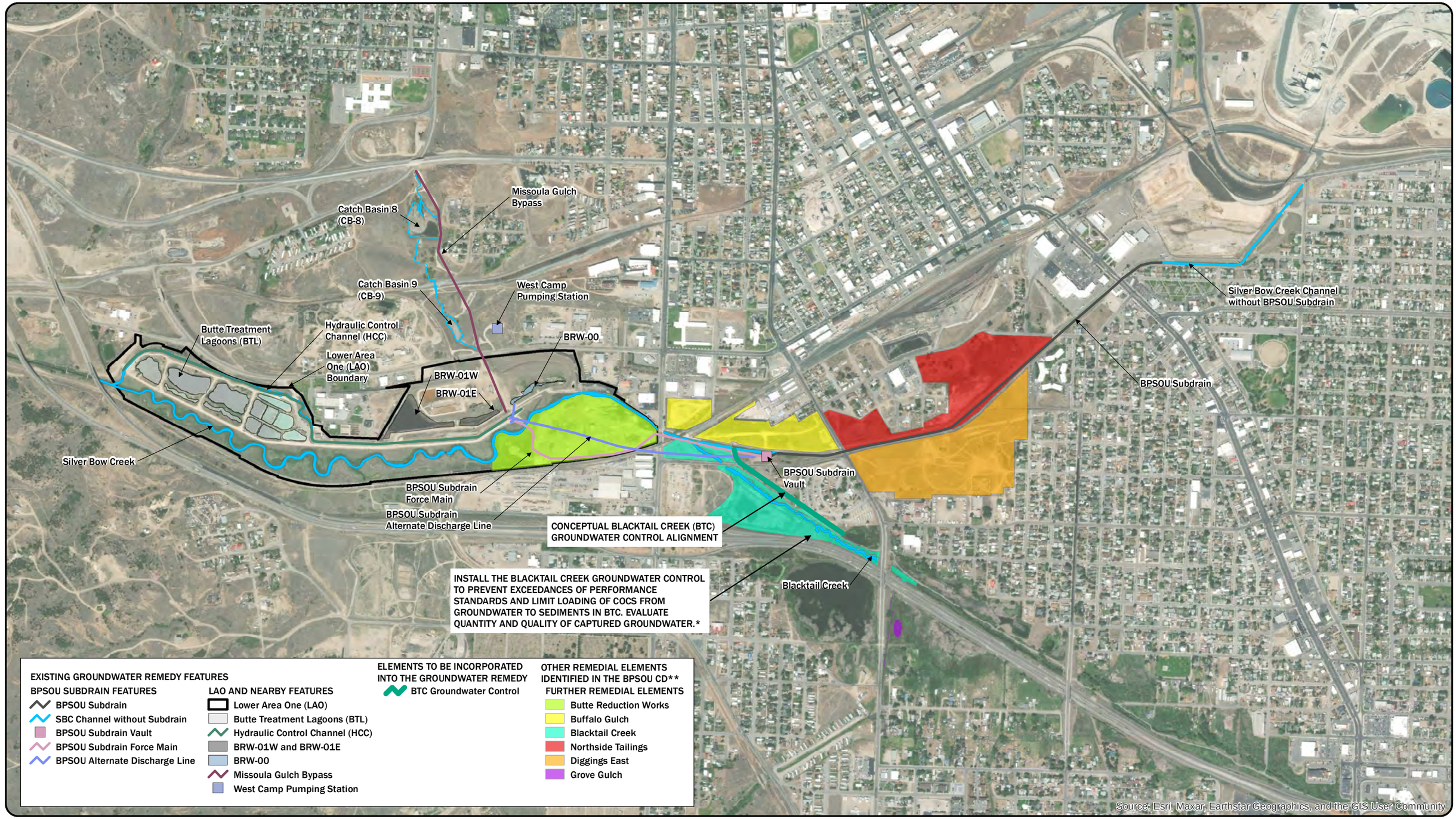

NOTES:
THE GROUNDWATER REMEDY REMEDIAL DESIGN IS LIMITED TO THE DESIGN OF THE GROUNDWATER CAPTURE AND TREATMENT SYSTEMS DESCRIBED ABOVE.
*AS OUTLINED IN THE FRESOW, THE FRE AT THE BTC REMEDIAL AREA ALSO INCLUDES REMOVAL OF TAILINGS, WASTE, AND CONTAMINATED SOILS, AND RECONSTRUCTION OF BTC AND SBC. THESE RECLAMATION ACTIVITIES ARE THE RESPONSIBILITIES OF MDEQ AND ARE NOT COVERED IN THE BTC GROUNDWATER CONTROL SYSTEM RDWP.
**DESIGN OF THE REMEDIAL ACTIONS FOR THE FURTHER REMEDIAL ELEMENTS, INCLUDING DESIGN OF THE CONSTRUCTION DEWATERING METHODS AND SYSTEMS, IS NOT INCLUDED IN THE GROUNDWATER REMEDY REMEDIAL DESIGN. THE FURTHER REMEDIAL ELEMENTS ARE SHOWN HERE FOR REFERENCE ONLY.

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DATUM: NAD 83
UNITS: INTN'L FEET
SOURCE: PIONEER/ESRI

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FIGURE 2

SITE OVERVIEW AND BLACKTAIL CREEK GROUNDWATER CONTROL SYSTEM CONCEPTUAL REMEDIAL DESIGN

PIONEER TECHNICAL SERVICES, INC.

DATE: 11/2/2022

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PSSA
R4SBC
PSSA
PABFh
PSSA
PEM1A
PSSA
PABFx
PABFx
PABFx
Butte Treatment Lagoons (BTL)
PABFx
BRW-00
PUBFx
R4SBC
PUBFx
PUBFx
PUBFx
PUBFx
PUBFx
PUBFx
PUBFx
PUBFx
PUBFx
PUBFx
BRW-01W
BRW-01E
PUBFx
PUBFx
PUBFx
PUBFx
PUBFx
PUBFx
PUBFx
PUBFx
Silver Bow Creek
R3UBH
PABFx
PABFx
PEM1A
PEM1C
PSSA
PEM1F
Blacktail Creek
PSSA
PSSA
PEM1A
PSSA
R4SBC
PEM1C
PUBFx
PABFx
PABF
PSSA
PABF
PEM1A
PABF
PSSA
PEM1A
PABF
PEM1C
PEM1A
PEM1C
PEM1F
PSSA
PEM1A
PEM1C
PSSA
PEM1F
PSSA
PEM1A
PSSA
PSSA
PSSA
PSSA
PEM1A
PSSA
PSSA
PEM1A
PEM1A
R4SBC
PEM1A
R4SBC
PSSA
PABF
R5UBH
PSSA
R4SBC

National Wetland Inventory
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine

NOTE:
U.S FISH AND WILDLIFE SERVICE, NATIONAL WETLANDS INVENTORY WETLAND CLASSIFICATION CODES ARE PROVIDED FOR EACH POLYGON TO DESCRIBE THE PARTICULAR WETLAND HABITAT.

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FIGURE 3

WETLANDS ADJACENT TO BLACKTAIL CREEK

PIONEER TECHNICAL SERVICES, INC.

DATE: 11/2/2022

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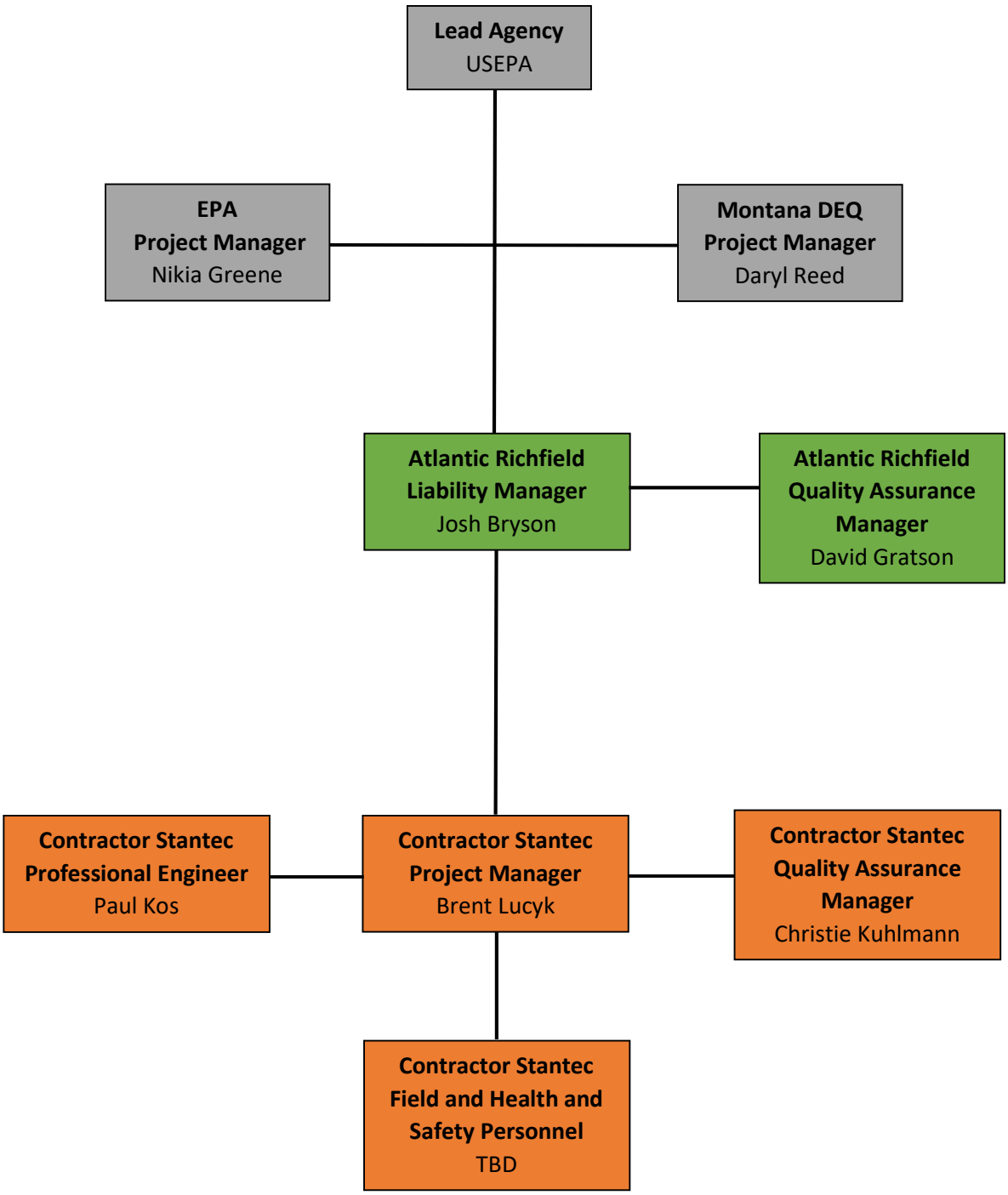

Figure 4. Project Organizational Chart

ID	Task Mode	Task Name	Duration	Start
0		**Blacktail Creek (BTC) Groundwater Hydraulic Control System (GHCS)**	**976 days**	**Tue 5/3/22**
1		**REMEDIAL DESIGN**	**531 days**	**Tue 5/3/22**
2		Start RD	0 days	Tue 5/3/22
3		**BTC-GHCS Remedial Design Work Plan**	**198 days**	**Tue 5/3/22**
4		Atlantic Richfield (AR) Internal Development	59 days	Tue 5/3/22
5		Submit Draft Final to Agencies	0 days	Fri 7/22/22
6		Agency Review Period	49 days	Mon 7/25/22
7		Agency Comments Received on Draft Final	0 days	Thu 9/29/22
8		AR Response to Comments	45 days	Fri 9/30/22
9		Submit Final to Agencies	0 days	Thu 12/1/22
10		Agency Review Period	45 days	Fri 12/2/22
11		Agency Approval	0 days	Thu 2/2/23
12		**BTC-GHCS Pumping Test QAPP**	**76 days**	**Tue 5/3/22**
13		AR Internal Development	46 days	Tue 5/3/22
14		Submit Revised Final to Agencies	0 days	Tue 7/5/22
15		Agency Review Period	30 days	Wed 7/6/22
16		Agency Approval	0 days	Tue 8/16/22
17		**BTC-GHCS Monitoring Well Installation Work Plan**	**41 days**	**Tue 5/3/22**
18		AR Internal Development	24 days	Tue 5/3/22
19		Submit to Agencies	0 days	Fri 6/3/22
20		Agency Review and RTC	17 days	Mon 6/6/22
21		Agency Approval	0 days	Tue 6/28/22
22		**BTC-GHCS Pumping Test Field Work**	**115 days**	**Wed 6/29/22**
23		Well Installation	8 days	Wed 6/29/22
24		Setup Equipment	10 days	Wed 8/17/22
25		Conduct Pumping Test	20 days	Wed 8/31/22
26		Lab Analysis and Data Compilation	50 days	Wed 9/28/22
27		**BTC-GHCS Pre-Design Investigation Evaluation Report (Pumping Test)**	**195 days**	**Wed 12/7/22**
28		AR Internal Development	100 days	Wed 12/7/22
29		Remedy Alternatives/Selection Scrum	60 days	Wed 12/7/22
30		Data Gap Evaluation	10 days	Wed 3/1/23
31		Submit Draft to Agencies	0 days	Tue 4/25/23
32		Agency Review Period	45 days	Wed 4/26/23
33		AR Response to Comments	20 days	Wed 6/28/23
34		Submit Revised Draft Final to Agencies	0 days	Tue 7/25/23
35		Agency Review Period	30 days	Wed 7/26/23
36		Agency Approval	0 days	Tue 9/5/23
37		**BTC-Supplemental GHCS Pre-Design Investigation Work Plan and QAPP(s)**	**60 days**	**Wed 3/15/23**
38		AR Internal Development	30 days	Wed 3/15/23
39		Submit to Agencies	0 days	Tue 4/25/23
40		Agency Review and RTC	30 days	Wed 4/26/23
41		Agency Approval	0 days	Tue 6/6/23
42		**BTC-Supplemental GHCS Pre-Design Investigation Field Work (TBD)**	**31 days**	**Wed 6/7/23**
43		Setup	1 day	Wed 6/7/23
44		Perform Field Work (TBD)	10 days	Thu 6/8/23
45		Lab Analysis and Data Compilation (TBD)	20 days	Thu 6/22/23
46		**BTC-Supplemental GHCS Pre-Design Investigation Evaluation Report (TBD)**	**120 days**	**Thu 7/20/23**
47		AR Internal Development	30 days	Thu 7/20/23
48		Submit to Agencies	0 days	Wed 8/30/23
49		Agency Review Period	30 days	Thu 8/31/23
50		AR Response to Comments	30 days	Thu 10/12/23
51		Submit Revised Draft Final to Agencies	0 days	Wed 11/22/23
52		Agency Review Period	30 days	Thu 11/23/23
53		Agency Approval	0 days	Wed 1/3/24

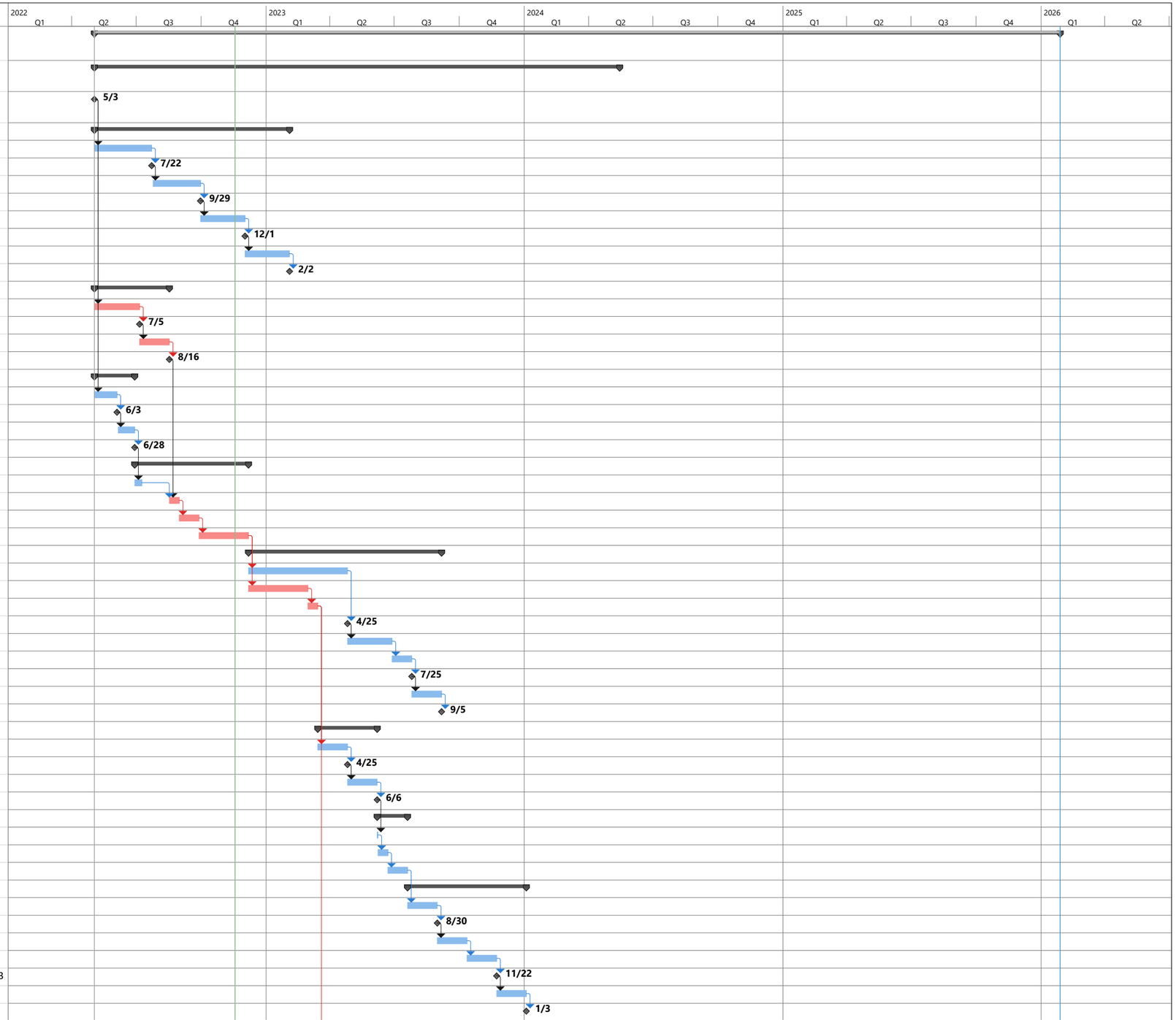

FIGURE 5 Draft BTC GHCS RD/RA Project Schedule
Project: Blacktail Creek (BTC) Groundwater Hydraulic Control System (GHCS)
Date: Fri 11/18/22

Task
Split
Milestone
Summary
Project Summary
Inactive Task
Inactive Milestone
Inactive Summary
Manual Task
Duration-only
Manual Summary Rollup
Manual Summary
Start-only
Finish-only
External Tasks
External Milestone
Deadline
Critical
Critical Split
Progress
Manual Progress

ID	Task Mode	Task Name	Duration	Start
54		**BTC-GHCS Preliminary (30%) Design Phase Submittals**	**120 days**	**Wed 3/15/23**
55		AR Internal Development (including BOD/Design Criteria Report)	90 days	Wed 3/15/23
56		AR Hazard Review	30 days	Wed 6/7/23
57		Submit to Agencies	0 days	Tue 7/18/23
58		Agency Review Period	30 days	Wed 7/19/23
59		Comment Letter Sent	0 days	Tue 8/29/23
60		**BTC-GHCS Intermediate (60%) Design Phase Submittals**	**90 days**	**Wed 8/30/23**
61		AR Internal Development	60 days	Wed 8/30/23
62		Submit to Agencies	0 days	Tue 11/21/23
63		Agency Review Period	30 days	Wed 11/22/23
64		Comment Letter Sent	0 days	Tue 1/2/24
65		**BTC-GHCS Pre-Final/Final (95%) Design Phase Submittals**	**60 days**	**Wed 1/3/24**
66		AR Internal Development (including Preliminary OM&M Plan and O&M Manual)	30 days	Wed 1/3/24
67		Submit to Agencies	0 days	Tue 2/13/24
68		Agency Review Period	30 days	Wed 2/14/24
69		Comment Letter Sent	0 days	Tue 3/26/24
70		**BTC-GHCS (100%) Pre-Construction Phase Submittals**	**35 days**	**Wed 3/27/24**
71		AR Internal Development	30 days	Wed 3/27/24
72		Submit Final to Agencies	0 days	Tue 5/7/24
73		Agency Review Period	5 days	Wed 5/8/24
74		Agency Approval	0 days	Tue 5/14/24
75		End RD	0 days	Tue 5/14/24
76		**REMEDIAL ACTION**	**630 days**	**Tue 8/29/23**
77		Start RA	0 days	Tue 8/29/23
78		**BTC-GHCS Remedial Action Work Plan**	**105 days**	**Wed 8/30/23**
79		AR Internal Development (including Permitting Plan)	45 days	Wed 8/30/23
80		Submit to Draft to Agencies	0 days	Tue 10/31/23
81		Agency Review Period	30 days	Wed 11/1/23
82		Agency Comments Received	0 days	Tue 12/12/23
83		AR Response to Comments	30 days	Wed 12/13/23
84		Submit Final to Agencies	0 days	Tue 1/23/24
85		Agency Approval	0 days	Tue 1/23/24
86		**Procurement**	**120 days**	**Wed 12/13/23**
87		Prepare Bid Documents	45 days	Wed 12/13/23
88		Bidding and Award Process	45 days	Wed 2/14/24
89		Award Work	0 days	Tue 4/16/24
90		Contracting	30 days	Wed 4/17/24
91		Notice to Proceed	0 days	Tue 5/28/24
92		**Permitting**	**90 days**	**Wed 2/14/24**
93		Prepare and Submit Permit Applications	60 days	Wed 2/14/24
94		Permit Application Review and Approval	30 days	Wed 5/8/24
95		Receive Permits	0 days	Tue 6/18/24
96		**Implementation and Construction (including Shakedown)**	**210 days**	**Tue 6/18/24**
97		Start Construction	0 days	Tue 6/18/24
98		Complete Construction	120 days	Wed 6/19/24
99		Shakedown Period	90 days	Wed 12/4/24
100		**RA Construction Completion Report**	**150 days**	**Wed 4/9/25**
101		AR Internal Development	90 days	Wed 4/9/25
102		Submit Draft to Agencies	0 days	Tue 8/12/25
103		Agency Review Period	60 days	Wed 8/13/25
104		Approval of Construction Completion	0 days	Tue 11/4/25
105		**RA Completion Report**	**60 days**	**Wed 11/5/25**
106		AR Internal Development	30 days	Wed 11/5/25
107		Agency Review Period	30 days	Wed 12/17/25
108		Certification of RA Completion	0 days	Tue 1/27/26
109		**End RA**	**0 days**	**Tue 1/27/26**

FIGURE 5 Draft BTC GHCS RD/RA Project Schedule
Project: Blacktail Creek (BTC) Groundwater Hydraulic Control System (GHCS)
Date: Fri 11/18/22

Task	Summary	Inactive Milestone	Duration-only	Start-only	External Milestone	Critical Split
Split	Project Summary	Inactive Summary	Manual Summary Rollup	Finish-only	Deadline	Progress
Milestone	Inactive Task	Manual Task	Manual Summary	External Tasks	Critical	Manual Progress