Draft Construction Quality Assurance Project Plan (CQAPP) Reach A, Phase 2

Clark Fork River Operable Unit
Milltown Reservoir / Clark Fork River NPL Site
Deer Lodge County, Montana

Prepared for:

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1.0 INTRODUCTION

This Construction Quality Assurance Project Plan (CQAPP) details construction Quality Assurance (QA) procedures and responsibilities for Remedial Action (RA) of the Clark Fork River Operable Unit (CFROU) Milltown Reservoir/Clark Fork River Superfund Site (CFR), Reach A, Phase 2. The CFROU is located along the Clark Fork River in southwestern Montana.

DEQ as lead agency will oversee, manage, coordinate, design, and implement the Remedial Action for the Clark Fork Site, in consultation with the Environmental Protection Agency (EPA). DEQ will coordinate with the NRDP for the implementation and integration of Restoration components into the Work.

The Clark Fork River Operable Unit ("CFROU" or "Clark Fork Site") is part of the Milltown Reservoir/Clark Fork River Superfund Site. Heavy metals originating from historic mining activities, milling and smelting processes associated with the Anaconda Company operations in Butte and Anaconda have accumulated on the Clark Fork River stream banks and floodplain over a period of at least 100 years. The primary sources of contamination are tailings and contaminated sediments mixed with soils in the stream banks and floodplains, which erode during high flow events and enter the river and other surface waters. In addition to erosion, heavy metals are leached from the contaminated sediments and tailings directly into the groundwater and eventually to surface water. These contaminant transport pathways result in impacts to terrestrial and aquatic life along the Clark Fork River as described in the Record of Decision (ROD) for the site (EPA, 2004).

The Clark Fork Site is located within four counties, Deer Lodge, Powell, Granite, and Missoula Counties. The upstream boundary of the Site is located at the confluence of the old Silver Bow Creek channel with the reconstructed lower Mill-Willow bypass just downstream of the Warm Springs Ponds. The original channel of the river upstream of this point was obliterated when the Warm Springs Ponds were built. The downstream boundary is the maximum high pool reservoir level (elevation 3265.5, NAVD 88) of the former Milltown Reservoir that was eliminated by the removal of the Milltown Dam just east of Missoula, Montana.

Phase 2 of Reach A consists of 1.9 river miles between the downstream boundary of the former ARCO property and Perkins Lane. The Phase 2 area, shown on Figure 1, consists of the river and its floodplain within these boundaries. The Phase 2 constituent properties are owned by the State of Montana, Logan Ranch, LLC, and Lampert Ranch LP. The Site contains floodplain tailings and impacted soils which support plant growth to varying degrees. The vegetated areas consist of grasslands, shrub lands (including dead and living willows as well as water birch) and scattered aspen and cottonwood. In 1990 the Governor's Demonstration Project implemented lime amendment and revegetation techniques in slickens in the Clark Fork River floodplain and reconstructed some eroding banks in the Phase 2 area (Schafer, 1991). The lime amended areas currently support grassland vegetation. Shrubs are beginning to establish in some of the lower elevation portions of these areas.

Under the Phase 2 Remedial Action the Contractor shall excavate contaminated tailings / impacted soils from the banks and floodplain in the Phase 2 area; transport these materials to and place them in the BP/ARCO Waste Management Area at Opportunity Ponds, backfill excavations in the floodplain with clean fill, and reconstruct portions of the streambanks using bioengineering techniques. All work will be conducted in accordance with the Drawings, Special Provisions and Technical Specifications as described in the Reach A, Phase 2 Remedial Action

contract documents. Planting other than in streambanks shall be performed by others in coordination with the remediation Contractor.

1.1 Purpose and Objectives

DEQ, as Lead Agency, is implementing and directly oversees the remedial construction (i.e., referred to as the "Work") under a Remedial Action Work Plan (RAWP). The RAWP takes the form of a construction bid package which will result in a remedial construction contract. Under this remedial construction contract, DEQ is designated the "Owner" of the Project. DEQ's Project Officer for the Clark Fork Site is vested with the authority of a Remedial Project Manager (RPM) and an On Scene Coordinator (OSC) as those terms are defined by the National Contingency Plan (NCP). The "Engineer" (acting either directly or through its staff of resident project representatives) is DEQ's primary representative on the site and oversees the details of the Work. The "Contractor" procured through the state procurement process is responsible for "Quality Control" to ensure that construction complies with the requirements of the Contract Documents. Contractor will submit a Construction Quality Control Plan to Engineer for review and approval prior to the start of construction. DEQ's Engineer will perform Quality Assurance in the form of construction oversight and additional testing as necessary to ensure that the remedial construction contract performed by Contractor meets the requirements for the Work.

This Construction Quality Assurance Plan ("CQAPP") outlines the Quality Assurance ("QA") procedures by which Engineer determines the Work meets the requirements for this Project.

The specific objectives of the CQAPP are:

- Define the QA Team organization and responsibilities.
- Define the interaction between the QA program and Contractor's QC plan.
- Describe project communication, documentation, and record keeping protocols; on-site communications, progress meetings, and preparation of progress reports and construction files.
- Detail the role of the QA Team in reviewing and approving certification and calibration submittals; verifying construction grade and alignment; conducting verification testing, sampling, and analyses; and monitoring during RA construction activities. These QA efforts are in addition to the contractor QC program testing and analyses.
- Define independent testing to be conducted by the QA Team.

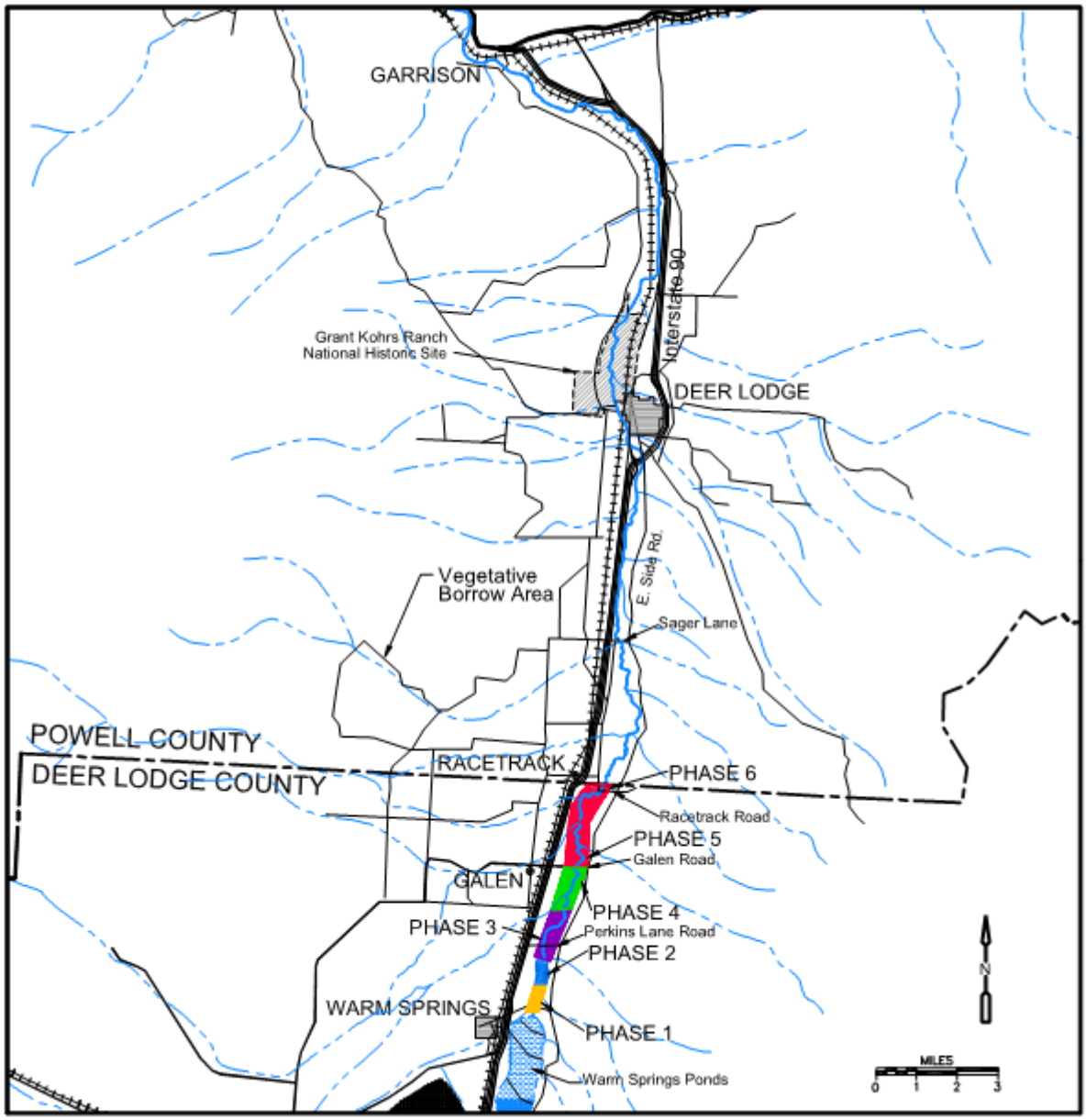

Figure 1-2. Reach A of the Clark Fork River Operable Unit

Figure 1: Reach A of the Clark Fork River Operable Unit

2.0 QUALITY ASSURANCE ORGANIZATION AND RESPONSIBILITIES

2.1 QA Organization

The Engineer is designated as the leader of the Quality Assurance ("QA") Team. The QA Team will be comprised of engineers, surveyors, scientists and technicians qualified and experienced in work similar to the CFR Reach A, Phase 2 Remedial Action. Specific personnel assignments will be established prior to the commencement of remedial construction. The QA Team Leader (Engineer) is the main point of contact for the QA Team. The QA Team will conduct both office and field work to verify that remedial construction is accomplished as specified. The QA Team will operate construction field activities from an on-site trailer or other field office. The Surveyor is retained by DEQ specifically to conduct QA surveying tasks beyond the routine surveying tasks required of the Contractor. Laboratory analysis and testing will be accomplished in DEQ-contracted facilities. Figure 2 shows the organization of quality assurance for RA of the CFR Reach A, Phase 2.

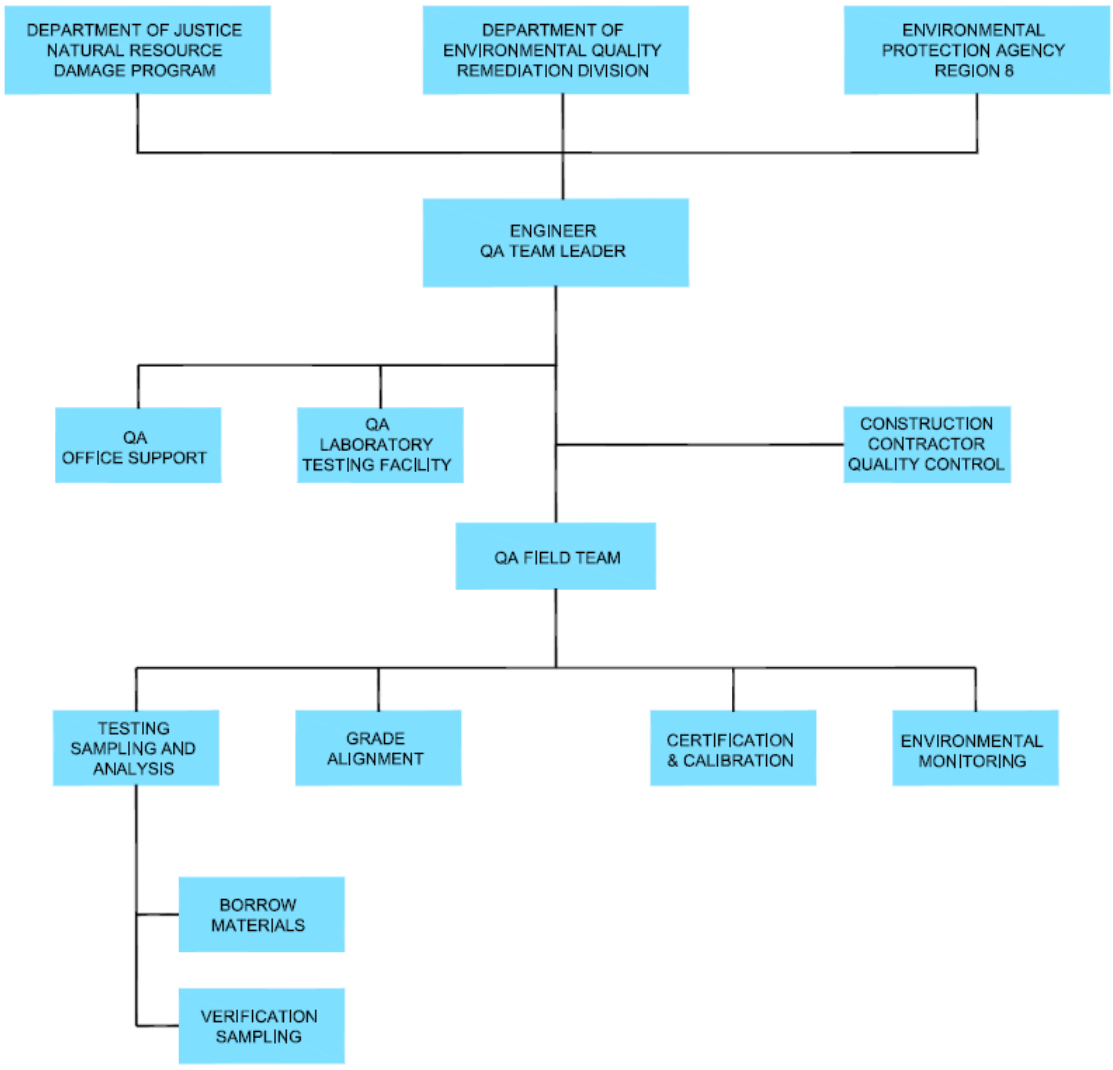

Figure 2: Organization of Quality Assurance for Remedial Action of CFR Reach A, Phase.

2.2 QA Team Responsibilities

In general, the QA Team will be responsible during remedial construction activities for:

- Promoting and implementing remedial construction QA reporting, record keeping, meetings, and inspections;
- Reviewing and approving submittals for material certifications, equipment calibration and various construction plans;
- Conducting verification field tests, sampling, and material analyses;
- Observing and monitoring surface water quality, air quality, verifying removal of tailings/impacted soils; and
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- Verifying removal of tailings/impacted soils; and
- Verifying that the remedial construction complies in all other ways with the Contract Documents; as outlined in the Drawings, Special Provisions and Technical Specifications.

2.3 Control of Work

Neither the Engineer nor other members of the QA Team may direct Contractor's work. Contractor is an independent contractor. Any changes to the remedial construction contract will be approved by Contractor, Engineer and DEQ, in accordance with the terms and conditions of the Contract Documents, and utilizing mechanisms such as a work change directive or a change order.

3.0 PROJECT COMMUNICATION

3.1 Reporting

Engineer (with input from QA Team) will prepare and submit to DEQ a Monthly Progress Report. These reports will present summaries of the important information relating to the monthly remedial construction activities gathered from the various records described below in Section 3.2. The Monthly Progress Report will include, if necessary, any proposed or field-approved modifications and justifications to the Work, this CQAPP, the Drawings, the Special Provisions, Technical Specifications, or Site-Specific Health and Safety Plans, Contractor's Stormwater Pollution Prevention Plan (SWPPP) or other submittals. Engineer will obtain from Contractor updated information on construction activities, including percent completion and any scheduling modifications. The Monthly Progress Report will include Contractor collected information as well as a summary of the laboratory analytical results.

3.2 Record Keeping

Members of the QA Team will perform various record keeping duties under the supervision of Engineer. The QA Team is responsible for maintaining a complete and accurate record of all significant observations and inspections of all field or laboratory testing. These records will be kept on-site for review. The record keeping activities of the QA Team will include the following:

- *Daily Project Logs* -- All field members of the QA Team will keep daily project logs which will be reviewed by Engineer. Logs will be submitted to Engineer on a weekly basis. Log entries will document significant activities, abnormal observations, weather, deviations from the Drawings, Special Provisions and Technical Specifications or other standard procedures, health and safety meetings, important information and summaries regarding field sampling, measurements, observations or testing, equipment calibration and operation results, any photographs taken and topics/results of any significant meetings or discussions. Recording on the logs will generally be in accordance with the methods and procedures specified in Clark Fork River Superfund Site Investigation (CFRSSI) Standard Operating Procedure (SOP) G-4 (ARCO, 1992).
- *Photographs* -- Construction photographs, videos and associated logs will be recorded on a periodic basis to visually document significant construction activities and to provide visual reference material.
- *QA Testing Documents* -- Instrument calibration forms, field and laboratory measurement and sampling forms, sample logs, documentation forms, sample analysis requests, chain-of-custody forms, and any other documents related to QA testing will be kept on-site.
- *Other Documentation* -- Other documentation required, but not limited to, includes shop drawings, material compliance certifications, Material Safety Data Sheets (MSDS) forms, health and safety and construction meeting summaries, inspection records, relevant construction files, material samples and manufacturer's recommended installation or operating instructions.

All records collected by the QA Team will be saved in an electronic database developed by the QA Team.

3.3 Construction Meetings

A series of meetings will be conducted during the implementation of each phase of the remedial construction contract. The meetings and inspections mentioned in this section are in addition to the daily construction oversight inspections to be conducted by the QA Team. The following are inspections and meetings anticipated for each phase of RA construction:

- *Pre-construction Meeting* – The pre-construction meeting is a requirement of the remedial construction contract. Its primary purpose is to develop a working relationship between the parties to the Work, the requirements of the Contract Documents, schedules for the submittal of documents, applications for payment and proposed schedule(s) for the remedial construction. Engineer (and other members of the QA team) and DEQ will initiate and conduct the pre-construction meeting with Contractor personnel prior to the start of Reach A, Phase 2 remedial construction. The goals of the meeting includes familiarizing all parties with the requirements of the project; safety concerns and hazards; relevant land access issues and verifying that the details of the design specified in the Drawings, Special Provisions and Technical Specifications are understood. EPA and NRDP will be invited to the pre-construction meeting.
- *Weekly Progress Meetings* -- Weekly progress meetings will be conducted by Engineer (and other members of the QA team) and DEQ with Contractor to inform participants to the remedial contract of scheduling changes, overall progress of remedial construction and any other relevant construction issues, as necessary. EPA and NRDP will be invited to the weekly progress meetings.
- *Monthly Progress Meetings* – Monthly progress meeting will be conducted to inform all parties and stakeholders of overall remedial progress implementation. EPA, NRDP and other members of the QA team and the Design Review Team (DRT) will be invited to the Monthly Progress Meetings.
- *Final Inspection and Meeting* -- This meeting will be conducted by Engineer and DEQ in accordance with the Supplementary Conditions to identify the completion or resolution of any outstanding issues at the point of completion of remedial construction. EPA and NRDP will be invited to the final inspection and meeting.

Following completion of construction activities, a QA Construction Summary will be prepared and will include the results of the construction monitoring and testing. The summary will contain descriptions of the quality assurance activities, summary of results, any notable events that have occurred and supporting data (i.e., construction logs, supporting photos, laboratory results, etc.) The QA Construction Summary will be submitted to DEQ as part of the Construction Completion Report.

4.0 CONSTRUCTION QUALITY ASSURANCE ACTIVITIES

4.1 Certification and Calibration

Certain specialized materials have been specified in the Drawings, Special Provisions and Technical Specifications. It is imperative that the correct materials are used during remedial construction to maintain the functionality of the design. It will be the responsibility of the Engineer (with input from other members of the QA Team) to review and approve all certifications required as specified in the Special Provisions. Equipment used in special construction or material testing are to be calibrated on a regular basis. The Engineer (and other members of the QA Team) will have the responsibility to ensure that calibration is completed and documented. Table 1 lists the materials and equipment anticipated for certification and calibration submittal and review.

Table 1: Material and Equipment Certification Requirements for Remedial Action of CFR, Reach A, Phase 2

Material/Equipment	Specific Certifications Required
Rock and Sand Material	Point Bar Material Channel Bed Material Floodplain/Bank Toe Material Alluvial Backfill Material Vegetative Backfill Material
Geotextiles	Filter Fabric Erosion Control Mat
Streambank Materials	Coir Outer Fabric Coir Inner Fabric Coir Logs Wooden Stakes
Temporary Bridge	Engineer Bridge Certification
Pipe	Culverts Drain Pipes Irrigation Line
Fence	Posts Wire Fabric
Dewatering Pumps	Pump Capacity and Lift Design
Dust Control	Magnesium Chloride

4.2 Construction QA Activities

Construction QA activities will be conducted both on- and off-site by Engineer (and other members of the QA Team). Engineer shall be responsible for ensuring the Work is implemented in compliance with all the Contract Documents including the requirements of the Drawings, Special Provisions and Technical Specifications, Contractor Quality Control Plan, Health and Safety Plan, SWPPP, and other submittals required by the Contract Documents.
Key QA activities are to: 1) Execute QA activities in accordance with the Contract Documents, and 2) Confirm terms of Contractor's CQC Plan and/or manufacturer's recommendations are met including:

- Review and approve of all Contractor submittals;
- Verify aggregate and manufactured material certifications;

- Verify aggregate materials' and manufactured products' on-going validation;
- Review and approve material testing results including gradations and layer thickness;
- Verify that the remedial construction complies in all other ways with the approved Drawings, Special Provisions and Technical Specifications.
- Measure pay items;
- Oversee the observation of site functions such as Best Management Practices (BMPs), site housekeeping, traffic control, access, weed control, road maintenance, project boundary, clear/grub, staging area, stream diversion, road reclamation, and site cleanup;
- Track construction progress against project schedule;
- Review laboratory sample results, compare to specifications, and determine if specifications have been achieved;
- Prepare daily and weekly project progress reports;
- Assist in preparation for the monthly progress meetings;
- Preparation of QA Construction Summary; and,
- Preparation for and participation in Final Inspection and Meeting.

Engineer (and other members of the QA Team) shall review Contractor's testing equipment calibration documentation and qualifications of Contractor's testing operator prior to any material testing. Surveyor will furnish all primary control and establish control coordinates for locating the principal components of the project with a suitable number of control points adjacent to the project. A limited number of control points will be provided. Earthwork design surfaces will be provided to the Contractor by Engineer in the form of a Digital Terrain Model (DTM) consisting of three dimensional surfaces. The DTM will be provided in a format supported by AutoCAD.

Surveyor will perform all quantity surveys, and Engineer shall perform calculation using the methods described in the Special Provisions. Copies of the Surveyor's notes and Engineer's calculations will be supplied to Contractor upon request for submittal of pay requests for the measured item. Contractor will note any discrepancies between Engineer's calculation and Contractor's calculation within 10 days of receipt. Any discrepancies will be resolved to both parties' satisfaction or if the discrepancies cannot be reconciled, will be resolved through the Dispute Resolution provisions of the Contract Documents.

Surveyor/Engineer shall provide requested survey information to Contractor so he can implement his own survey needs according to his ways and means. Contractor shall be responsible for the preservation of all primary and other control coordinate stakes and or maintaining and replacing all construction stakes as needed for construction.

The following sections of this plan describe the anticipated features of the remedial construction which will need to be surveyed.

Table 2 lists the tolerances for each component of construction for the Work.

Table 2: Construction Grade and Alignment Tolerances for Remedial Action of CFR Reach A, Phase 2

Remediation Component	Tolerance (Feet)
Groundwater Dewatering Trenches	
Horizontal Alignment	± 1.0
Vertical Grade	± 0.2
Groundwater Dewatering Sediment Ponds	
Horizontal Alignment	± 1.0
Vertical Grade	± 0.2
Tailings/Impacted Soils Removal	
Horizontal Alignment	± 1.0
Vertical Grade of Base of Tailings / Impacted Soils	± 0.2
Mine Waste Relocation Repositories	
Horizontal Alignment	± 10
Vertical Grade of Compacted Tailings/ Impacted Soils	± 0.5
Reconstructed Channel	
Horizontal Alignment	± 0.5
Vertical Grade	± 0.2
Streambanks	
Horizontal Alignment	± 0.5
Vertical Grade	0.0 to +0.2
Floodplain Final Grade	
Horizontal Alignment	± 1.0
Vertical Grade (may vary locally by 0.5 ft. but average of measurements shall be 0.0 to +0.2)	0.0 to +0.2

4.2.1 Tailings Removal

The staked grade of the base of tailings/impacted soils will be spot checked by Surveyor prior to excavation. Elevations of the existing ground will also be verified to ensure proper payment for tailings/impacted soil removal. During excavation, spot elevation checks on the base of tailings grade will be conducted by Contractor with GPS survey measurements. The frequency of the grade checks shall be a 25-foot grid maximum spacing.

4.2.2 Haul Roads

Construction of the haul roads are the responsibility of Contractor. Engineer (and other members of the QA Team) will coordinate with Contractor to verify that the roads will be located on or near the alignment shown on the Drawings. Contractor shall provide construction staking to meet the lines and grades shown in the contract documents.

4.2.3 Borrow Areas

The final grade of the borrow areas will be checked and verified by Surveyor to ensure that the grading is approximately as shown on the Drawings, Special Provisions and Technical Specifications. At some locations, Engineer (and other members of the QA Team) may need to conduct an initial and final topographic survey of the borrow areas for volume determinations.

4.2.4 Floodplain Reconstruction and Backfill

Engineer (and other members of the QA Team) shall use Digital Terrain Models to verify compliance with the grades and alignments specified for the Work. Additional QA spot elevation checks may be conducted with GPS survey or other survey instruments.

4.3 Testing, Sampling, and Analyses

During remedial construction activities, QA verification testing, sampling, and analyses will be conducted to maintain construction integrity and fulfill the intent of the design. Testing, sampling, and analyses will be accomplished by Engineer (and other members of the QA Team) in accordance with the provisions of this Plan. The Contractor will be required to conduct QC testing, sampling, and analyses in accordance with the special provisions and technical specifications. The following sections of this plan describe the anticipated features of the RA which will need verification testing, sampling, and analyses. The requirements for this section of the Plan will be specific for each type of construction activity.

4.3.1 Tailings Removal Verification Sampling and Analyses

Removal of tailings will be verified through QA sampling by Engineer and other members of the QA Team. The tailings / impacted soils material removal verification will include the sum of total metals criteria (the sum of arsenic, cadmium, copper, lead, and zinc must be less than 1,400 mg/kg). Prior to verification sampling, the following steps shall be taken:

1. Contractor shall excavate material in a designated removal area to the Base of Excavation (BOE) on the design plans and verify that that elevation has been obtained through a QC survey. Once QC survey has been completed, contractor shall notify Engineer.
2. Engineer (or another QA team member) shall perform an initial field screening with field X-ray fluorescence (XRF) instrument to determine if additional excavation is needed. Areas exceeding the removal criterion shall be clearly marked in the field by Engineer to assist additional required.
3. Contractor shall excavate a minimum of 6-inches of additional material at locations designated by Engineer.
4. Engineer (or another QA team member) shall repeat verification with field XRF and Contractor shall excavate additional material if required by Engineer.
5. When a designated removal area has been cleared by the Engineer, Surveyor shall stake and identify confirmation samples locations and Engineer shall collect a composite sample for laboratory analysis at the 250 foot sampling grid points within the removal area and submit the sample for laboratory analysis.
6. At the time the Engineer has cleared the designated area with field XRF, Surveyor shall measure the surface and contractor may commence backfill activities.

4.3.1.1 Sampling Protocol

Samples will be collected on a systematic grid established by Surveyor prior to backfilling. Samples will be collected on a 250 feet by 250 feet grid within the removal boundaries. After the tailings / impacted soils material have been removed but before the area is backfilled and regraded to final contours, a 5 point composite soil sample will be taken at each sampling location at a depth of 0 to 4 inches. All samples shall be collected in accordance with CFRSSI SOP SS-1.

Field quality controls samples will be collected in accordance with Table 3 below as outlined in the Sampling and Analysis Plan (SAP) Soils and Wastes Chemical Characterization for Remedial Design/Remedial Action (CDM, 2009).

Table 3: Field Quality Control

Sample Type	Purpose	Frequency	QA Objective
Verification Sample	Tailings/impacted soils removal verification based on sum of total metals criteria.	Sampled based 250 foot sampling grid.	
Field Duplicate	Evaluate sample and laboratory precision.	1 per every 20 natural samples submitted to laboratory.	Target analytes within 50% RPD for soil.
Matrix Spike / Matrix Spike Duplicate	Evaluate sample and laboratory accuracy and precision.	1 per every 20 natural samples submitted to laboratory.	Target analytes within laboratory-specified target levels.
Equipment Rinsate Blanks	Quantify artifacts introduced during sampling and sample handling, decontamination, transport, from ambient air, in decontamination water supply, or analysis of samples – measure of accuracy and representativeness	1 per every 50 samples submitted to laboratory.	Target analytes not detected
Field Blank	Quantify artifacts introduced during sampling, transport, from ambient air	1 per every 20 samples submitted to laboratory	Target analytes not detected.

4.3.1.2 Sample Analysis

Samples will be analyzed for parameters as presented in Table 4. Table 4 displays the parameters and the respective method of analysis. The samples will be submitted to a DEQ contracted analytical laboratory for analysis of saturated paste pH, arsenic, cadmium, copper, lead, and zinc.

Table 4: Parameters for Laboratory Analysis, CFR Operable Unit

Parameter	Test	Method
Total Metals (As, Cu, Cd, Pb, ZN)	ICP-AES	EPA Contract Laboratory Program Statement of Work, Multi-Media, Multi Concentration, Inorganic Analytical Service for Superfund (ILM05.4)
pH	Saturated Paste Extract	USDA Handbook 60, Methods 2, 3a, CFRSSI SOP SS-09 modified[1]
[1] CFRSSI SOP-09 was modified: pH was determined using a minimum of 16-hour equilibration time and vacuum extraction of the saturated paste extract, rather than measuring the 1:1 soil:water dilution		

4.3.1.3 Data Evaluation

Field duplicate samples will be compared to natural samples and relative percent differences (RPD) will be calculated for each constituent. Although RPD will be documented and data will be flagged based on excessive RPD (greater than 30 percent for samples greater than 5 times the probable quantitation limit), all data will be used to determine compliance with the removal criteria. If RPD flags are encountered in a frequency greater than previously observed during sampling activities, sampling methods will be reevaluated to improve data precision.

Field Blank samples and Rinsate Blank samples will be evaluated to determine whether contamination is being entrained in the sample from the water used to decontaminate sample handling equipment or the field environment (i.e., windy and dusty conditions, sample handling

procedures, etc.). Data for corresponding metal results in associated natural samples will be qualified if the corresponding metal concentrations are greater than 5 times the blank result.

4.3.2 Opportunity Ponds Waste Management Area Repository

Contractor will transport excavated tailings/impacted soils material from CFR Reach A, Phase 2 to the BP/ARCO Waste Management Area near Opportunity, Montana. The waste material will be placed in the B2.12 Cell. Tailings/impacted soils material are expected to be placed in maximum two-foot lifts and compacted by running haul traffic uniformly over the waste surface.

Surveyor shall provide limits staking of the project's repository limits. Contractor is solely responsible for coordinating with other contractors utilizing the project area and developing plans to manage simultaneous operations within the BP/ARCO Waste Management Area.

The QA Team will inspect the B2.12 Cell to ensure the Phase 2 wastes are placed according to the Contract Documents. Visual observations of the waste material shall be recorded in the project field book.

4.3.3 Borrow Material Testing and Analysis

4.3.3.1 Vegetative Borrow

Two borrow area are designated for vegetative borrow to be used in Phase 2. The Beck Ranch Borrow Area is owned by the State of Montana and is located approximately 3 miles south-southwest of Deer Lodge. The Lampert Ranch borrow area is located immediately east of Phase 2. Vegetative borrow material for replacement of removed material will be obtained from these two sources. Although the borrow material has been previously sampled and tested for suitability, variations in borrow material characteristics within a borrow area are anticipated; therefore, it will be necessary to conduct field QA to verify the suitability of the borrow material. Material testing of the Beck Ranch Borrow Area will be conducted by Engineer (and other members of the QA Team) to verify compliance with Contract Documents. Contractor will not be involved in the borrow suitability sampling or testing. Table 5 displays the parameters and their respective criteria values.

4.3.3.2 Alluvial Material

Certain specialized materials have been specified in the RD and RA special provisions and technical specifications. It is imperative that the correct materials are used during RA construction to maintain the functionality of the design. It will be the responsibility of Engineer (and other members of QA Team) to verify compliance with Contract Documents. Samples will be submitted for analysis of saturated paste pH, electrical conductivity, arsenic, cadmium, copper, lead, and zinc as indicated from Table 6 below. Physical criteria will be evaluated for compliance with gradations presented in Table 7.

Table 5: Chemical and Physical Criteria for Vegetative Backfill

Parameter	Value
pH	6.5 to 8.5
Arsenic (As)	<30 ppm
Cadmium (Cd)	<4 ppm
Copper (Cu)	<100 ppm
Lead (Pb)	<100 ppm
Zinc (Zn)	<250 ppm
Texture:	Sandy loam or finer; no clay
Coarse fragments (>2 mm diameter)	< 45% by volume
Maximum size	6 in.
Specific conductance	<4.0 dS/m
No weeds or weed seeds	

Note: ppm – parts per million dS/m – deciSiemens per meter
mm = millimeters

Table 6: Parameters for Laboratory Analysis Alluvial Material

Parameter	Test	Method
Total Metals (As, Cu, Cd, Pb, ZN)	ICP-AES	EPA Contract Laboratory Program Statement of Work, Multi-Media, Multi Concentration, Inorganic Analytical Service for Superfund (ILM05.4)
pH	Saturated Paste	USAD Handbook 60, Methods 2, 3a, CFRSSI SOP SS-09 modified[1]
Electrical Conductivity	Saturated Paste	ASA Monograph #9, Part 2, Method 10-3.4

[1] CFRSSI SOP-09 will be modified: pH will be determined using a minimum of 16-hour equilibration time and vacuum extraction of the saturated paste extract, rather than a 1:1 soil:water dilution

Table 7: Alluvial Material Design Gradations

Size (inches) or Screen Size	Percent Passing		
	Floodplain (%)	Point Bar (%)	Channel Bed (%)
6	100		100
3	70-100	100	75-95
2	55-80	60-90	40-75
1	35-60	40-70	10-30
0.25	15-35	30-60	0-10
No. 10	10-25	10-30	0-5
No. 200	0-10	0-10	0-2

4.3.3.3 Sampling Frequency

Borrow materials will be sampled by the QA Team at a minimum frequency of one sample per 5,000 cubic yards (cy) or when visual observation indicates the appearance of the material may not meet the specifications in the Contract Documents. Samples may be collected from soil stock piles prepared for project area delivery or may be collected directly from the borrow area or the placement area. Composite samples shall be compiled from a minimum of 5 sub-samples representatively distributed throughout the anticipated 5,000 cy soil removal area or stockpile. Visual observations of borrow material and sampling shall be recorded in the project field book.

Documentation for each sample shall include the following:

- General visual observations of the borrow material;
- Description of sample location including depth and proximity within excavation site;
- Description of the sub-sample group including individual sub-sample locations and proximity within excavation site;
- Time and date of soil collection; and,
- US Department of Agriculture (USDA) soil texture.

4.3.3.4 Imported Material Suitability Testing and Analysis

All imported material sources other than Beck Ranch Borrow and Lampert Borrow must be approved by Engineer (with input from the QA Team) and tested by Contractor for confirmation that it is in substantial conformance with the Contract Documents.

Engineer (and other members of the QA Team) will be present while import material grab samples are taken from the product pile and will visually inspect all imported material for consistency. Representative samples will be taken by Contractor from the proposed borrow source at a location agreed upon by both Contractor and Engineer (with input from the QA Team). The samples collected shall be representative of the entire import material source and shall be collected from a minimum of three locations within the material source. If substantial variability is noted in the source material or upon visual inspection at the site, additional samples shall be collected which represent the range or change in material. Engineer (and other members of the QA Team) will ensure samples shall be qualitatively described and the description included in the laboratory results for each sample such that the appropriate laboratory data may be applied for comparison of imported material at the site.

Engineer (and other members of the QA Team) will conduct the following procedures for verification of imported material suitability:

- Obtain material submittal;
- Review material testing results;
- Visually inspect the material sources;
- Collect copies of truck tickets to verify source of material and volume; and,
- Collect and analyze samples and preform visual inspections for compliance with contract documents using the criteria and frequency described in 4.3.3.1, 4.3.3.2, and 4.3.3.3 above.

4.3.3.5 Control of Work

Contractor is responsible for directing excavation activities within the vegetative borrow areas. Typically, Contractor will be allowed to excavate in the manner most efficient for conducting their work. Contractor will be required to alter or modify their excavation practice if unsuitable

material is encountered, particularly if soil texture or rock content fall outside acceptability criteria. If unsuitable material is encountered, the following actions will be completed:

- For relatively small quantities of unsuitable material, Contractor will be directed to blend the material with suitable material such that the blended materials meet suitability requirements. Material may also be used as General Fill at the approval of the Engineer.

- For larger quantities of unsuitable material that cannot be adequately blended or used as General Fill, the unsuitable material will be segregated from suitable material and stockpiled in a reject pile. On completion of the project all reject material will be placed by Contractor within the borrow area and integrated into the borrow pit reclamation.

5.0 ENVIRONMENTAL MONITORING

5.1 Water Quality Monitoring

5.1.1 Stream Water Quality Sampling and Analysis

Engineer with input from members of the QA Team shall review and approve the Erosion Control Plan and the BMPs it describes. During construction, the Contractor will inspect each new work area as construction in that work area begins to ensure the BMPs are in place before excavation begins, Engineer shall perform ongoing inspection and monitoring of all environmental issues. BMPs will be inspected in accordance with the frequencies presented in the approved Erosion Control Plan to ensure they are in place and functioning properly. During remedial construction, Engineer (and other members of the QA Team) will monitor Clark Fork River water quality upstream and downstream of remedial construction. The data collected during these monitoring activities will be used to evaluate the effectiveness of and the need for modifications to engineering controls or BMPs as described in Contractor's SWPPP. In the event that Contractor's Erosion Control Plan does not result in adequate water quality during remedial construction, Engineer will request changes in BMPs or additional BMPs be installed to correct the problem.

Based on the ARARs for surface water quality and on historical turbidity data for the CFR, a turbidity warning limit is chosen for Phase 2 as described below. This turbidity warning limit may be adjusted as Engineer (with input from the QA Team) determines necessary based on an evaluation of sampling and analysis during baseline sampling as described below. During construction the turbidity warning limit will be used to gauge the need for additional, extended water quality sampling. The results of such sampling shall be used by DEQ to evaluate whether additional steps are required to mitigate the effect of construction on water quality in the Clark Fork River.

5.1.1.1 Locations and Frequencies

In-stream monitoring of the Clark Fork River will be performed by Engineer (and other members of the QA Team) during and before remedial construction at locations upstream and downstream from the Work. One upstream site, immediately below the Phase 1 Project Area (WGS84 Latitude: 46.193916°. Longitude: -112.766398°), and one downstream location at the Perkins Lane Bridge (WGS84 Latitude: 46.208626°, Longitude: -112.767550°) shall be monitored daily. If an exceedance in noted at Perkins Lane Bridge, the downstream point of compliance station shall be resampled at a location 10 times the river width downstream from the remedial construction boundary (WGS84 Latitude: 46.209779°, Longitude: -112.767786°). The precise station location will be determined based on safety of ingress/egress from the river and general site access.

Prior to commencing earth disturbance, Engineer and other members of the QA Team will collect baseline samples. Baseline samples will be collected once per working day for three weeks prior to the beginning of construction.

After completing baseline sampling, turbidity measurements will then be obtained at a frequency of once a day during remedial construction activities. One an ongoing basis, the sampling data will be reviewed to determine if the monitoring frequency should be modified for the remaining construction period.

5.1.1.2 Sampling Methods and Procedures

Surface water samples will be collected in a manner that provides a generally representative sample of the stream cross section. Operation of the turbidity instrument will be in accordance with CFRSSI SOP HG-10 and will follow the manufacturer's instructions, including all necessary calibrations. Decontamination of equipment and materials will be performed as specified in CFRSSI SOP G-8. Also, field measurements and other applicable information will be recorded with permanent ink in the field log book consistent with CFRSSI SOP G-4.

Sample Handling

All surface water samples collected for analytical parameters will be packaged, labeled with sample designation and handled according to the handling procedures described by CFRSSI SOP G-5 and more specifically by CFRSSI SOP HG-4 for aqueous samples. Each sample collected will have a unique identification number that will indicate the site sample location and will be coded as follows:

- The first two numbers will identify the CFR, Reach A Phase identifier (i.e., 02 for Phase 2).
- The next four characters indicate sample location.
  - PC indicates a Point of Compliance location and will be followed by the numeric identifier of the location. Since only one Point of Compliance is anticipated for this plan, the following numeric identifier will always be 01.
  - US indicates an Upstream Location and will be followed by the numeric identifier of the upstream location (i.e., 01 or 02).
- The next three characters indicate the sample number (001, 002, etc.).
- Examples: 01-PC01-005 and 01-US02-004.

Analytical Parameters and Methods

Table 8 presents the analytical parameters and methods for water quality sampling.

Table 8: Water Quality Sampling Analytes and Analytical Methods

Analyte	Analytical Method	Sample Container and Preservation Method
Total Recoverable Metals (As, Cu, Cd, Pb, Zn)	E200.7/E200.8	250 mL polyethylene bottle, unfiltered and preserved with HNO_3
Total Dissolved Metals (As, Cu, Cd, Pb, Zn)	E200.7/E200.8	250 mL polyethylene bottle, filtered (0.45micron), and preserved with HNO_3
Total Suspended Solids (TSS)	A2540 D	500 mL polyethylene bottle, raw sample
Hardness	A2340 B	

Turbidity measurements require no analysis. Turbidity measurements are read directly from the instrument in Nephelometric Turbidity Units.

Sample Duplication

Duplicate samples will be collected and analyzed for TSS, total and dissolved metals, and hardness during the Baseline Sampling and Expanded Sampling, if initiated. These will consist of one field duplicate sample taken in the same location, with the same procedures, and as near the same time as the original natural sample as possible. One duplicate will be collected and submitted to the Laboratory at a frequency of 1 per 20 natural samples.

Baseline Sampling

Commencing three weeks prior to the start of construction, surface water quality sampling will be performed, referred to as baseline sampling. Baseline sampling will include measurement of turbidity one time each day at the upstream location and the downstream location. Additionally, two samples will be collected once from each sampling location which will be analyzed for TSS, hardness, and the following total and dissolved metals: arsenic, cadmium, copper, zinc, arsenic and lead. Sampling will be conducted and reported to DEQ such that the results are obtained and integrated into the water quality monitoring component of the CQAPP prior to the initiation of construction.

Turbidity Warning Limits

Turbidity warning limits are pre-established for Phase 2. According to ARARs, the maximum allowable increase above naturally occurring turbidity is 10 nephelometric units (NTU) for a C-2 class stream (i.e., the classification of the CFR at the Project site). Using this information and the historical turbidity data presented, a turbidity level of 10 NTU is established as the "turbidity warning limit". This warning limit is 80% of 12 NTU (the maximum allowable limit), calculated assuming an average baseline turbidity value of 2 NTU plus the 10 NTU allowable turbidity increase. If the results of baseline sampling for turbidity indicate that turbidity warning limits should be adjusted, DEQ shall adjust these limits to better accomplish the purposes of this monitoring.

Turbidity Monitoring

Engineer and other members of the QA Team will monitor turbidity with respect to the turbidity warning limits during construction. At the start of construction, samples will be taken a minimum of once per day at the upstream and downstream sampling locations according to the protocols and methods described in this document. Additional sampling will be performed at the discretion of Engineer (with input from other members of the QA Team) to monitor construction activities and changes in the conditions in the Clark Fork River. Groundwater dewatering discharges will also be visually monitored to ensure Contractor is not discharging turbid water.

If the turbidity at the downstream station does not exceed the NTU warning limit, no further action is required unless additional sampling or modifications to Contractor's BMPs are determined necessary by Engineer.

If the turbidity at the downstream sampling location exceeds the turbidity warning limit, then Engineer shall implement an expanded water quality sampling and analytical procedure. The expanded water quality sampling procedure is discussed in below. This expanded sampling and analytical procedure shall continue until turbidity at the downstream sampling location is once again below the turbidity warning limits or as otherwise directed by DEQ in writing.

Expanded Water Quality Sampling Plan

If the turbidity warning limit is exceeded, regardless of whether turbidity is deemed to have been added by remedial construction activities or not, the expanded water quality sampling and monitoring plan will be initiated. The expanded water quality sampling plan includes collection of daily grab samples at both upstream and downstream sampling locations immediately following the turbidity warning limit exceedance. These grab samples will be analyzed for TSS, hardness, and total recoverable and dissolved arsenic, cadmium, copper, zinc, and lead with a two-day turnaround for the results. The expanded water quality sampling and analysis methods are summarized in Table 8. One replicate will be collected and submitted to the Laboratory at a frequency of 20 natural samples.

If, after evaluation of the data collected during expanded water quality sampling, Engineer with input from the QA Team concludes that these exceedences are the result of remedial construction activities, Engineer may require additions or modifications to the BMPs or require other controls to reduce the impacts resulting from construction activity. A stop work order may be issued to stop construction activities if necessary until Contractor implements these modifications or additions to the BMPs or other controls to reduce the impacts resulting from construction activity.

If Engineer determines on the basis of expanded water quality sampling, that no contamination has been added by the remedial construction activities, then additional BMPs or other control evaluations will not be required. The expanded sampling will be discontinued after one set of expanded water quality sampling results are received without an exceedance of TSS or total or dissolved metals concentrations at the downstream monitoring station or as when directed by Engineer.

5.2 Air Quality Monitoring

Remedial actions involving the excavation and removal of earth materials often result in a decrease of local air quality because of increased airborne particulates generated from various construction activities. A dust control plan for haul roads will be implemented as part of Contractor's approved Transportation Plan. Contractor is required to apply water and/or magnesium chloride treatments for dust suppression. Contractor's dust control methods must be sufficient to eliminate visible emissions to the extent practical on-site as determined by Engineer (with input from other members of the QA Team) and eliminate dust migration beyond the limits of Work.

6.0 REFERENCES

ARCO. September 1992. Clark Fork River Superfund Site Investigations, Standard Operating Procedures (SOP). Compiled by Canonie Environmental Services, Inc.

CDM, May 2009. Final Sample and Analysis Plan Soils and Wastes Chemical Characterization for Remedial Design/Remedial Action.

Schafer and Associates, 1991. Final Report for the Clark Fork River Demonstration Project, Warm Springs Montana: Report submitted to the Office of the Governor, Helena Montana, April 30, 1991.

APPENDIX A
CFRSSI STANDARD OPERATING PROCEDURES