CFRTAC
CLARK FORK RIVER
Technical Assistance Committee

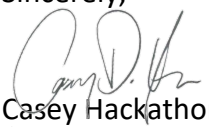
May 17, 2024

To: MT Department of Environmental Quality and MT Natural Resource Damage Program

Re: Upper Clark Fork River Operable Unit Phase 7 Design Comments

Thank you for including CFRTAC in the Phase 7 Design Review Team process. We offer the attached comments on the draft design and look forward to continued engagement in implementation of remedy and restoration on the UCFROU. Please let us know if you have any questions or would like to discuss any of the comments further.

Sincerely,



Casey Hackathorn
President
www.cfrtac.org

Overall Design Approach (Not Specific to Phase 7)

Use of Channel Migration Zone

Comment 1: The use of CMZ mapping is a great tool for planning remediation and restoration activities near the river channel. The current methodology creates vectors for channel migration measured over 64 years of aerial imagery, then projects those vectors out over a span of 100 years and averages the lengths of all vectors to derive an average 100-year channel migration zone. The average 100-year migration zone is applied uniformly to Phase 7 and adjusted to improve constructability and tailings removal. This approach to CMZ mapping may be appropriate for managing an uncontaminated floodplain but may not be appropriate for the CFROU.

As the channel migration vector mapping shows (Figure 1), rivers do not erode uniformly. They tend to erode and migrate on outside meanders and in a down-valley direction. In addition, river channels occasionally avulse and erode new channels or reoccupy old ones. Using the average 100-year migration corridor would tend to reduce the amount of predicted erosion on outside bends and increase it on point bars.

The TAC recommends taking a different approach to channel migration zone mapping. Start by dividing the individual lengths of the mapped vectors by the 64-year period of record, then multiplying by 100 to yield an approximate 100-year migration corridor, just as was done for in the current mapping method. Then, those individual vectors could be adjusted by a constant factor (e.g. 75% or 50%) if needed to reduce the size of the migration zone for cleanup purposes. That would provide a more probabilistic map of expected channel migration. The migration zone map could then be augmented by using the HEC RAS 2-D model to evaluate floodplain shear stresses at, say, a 25-year discharge to evaluate the potential for historic channels to reactivate. Similarly, the avulsion risk analysis already performed by the design team would inform the final channel migration zone and tailings removal prioritization.

The avulsion risk analysis already performed by the design team could also inform the final channel migration zone and tailings removal prioritization. Under the current approach, many areas identified as avulsion pathways are outside of the identified 100-year CMZ (Figure 2). This presents a clear contradiction and reveals limitations of the average migration rate approach currently used to determine the CMZ.

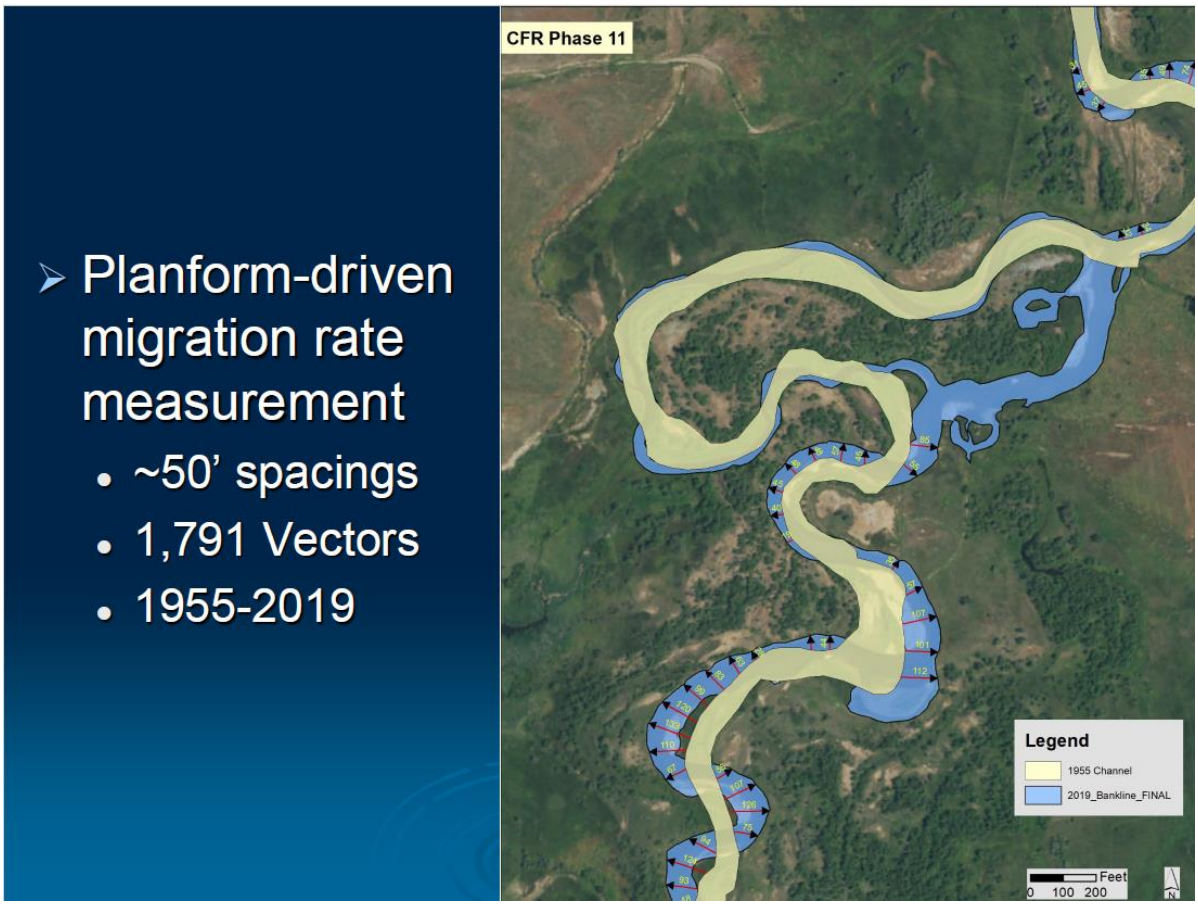


Figure 1. Clark Fork River channel migration zone map prepared by Applied Geomorphology, Inc.

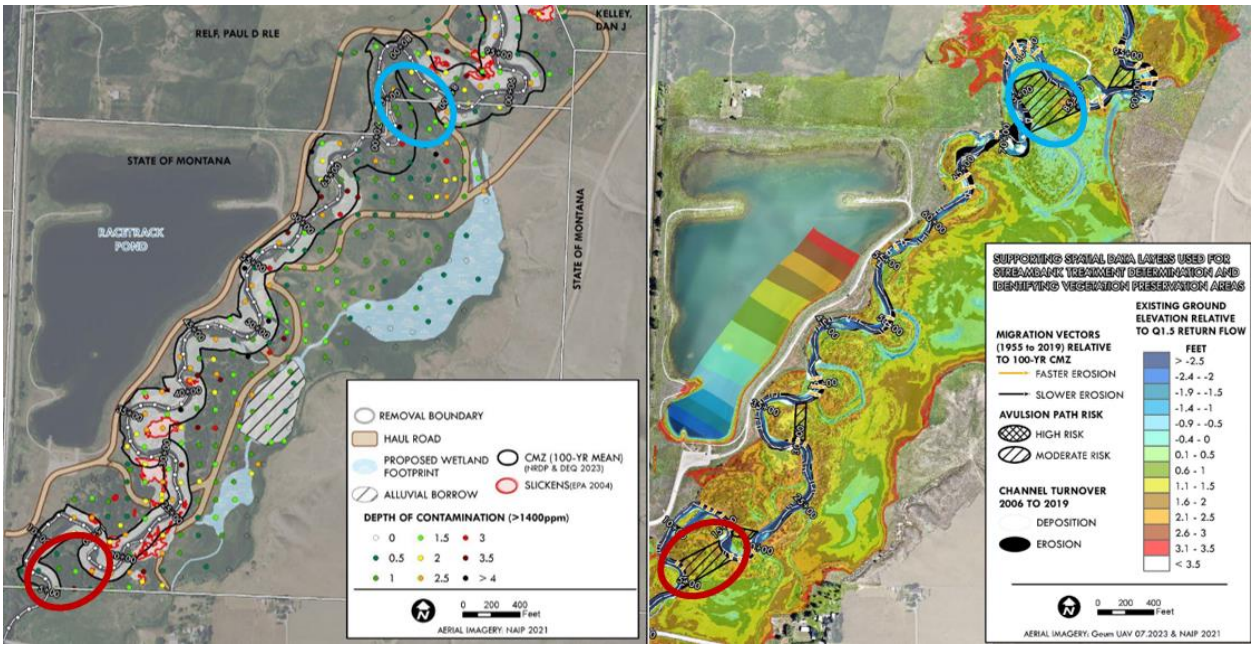


Figure 2. Composite of attachments 1 and 2 from the Phase 7 Design Memo, highlighting some areas where avulsion pathways extend beyond the calculated 100 year channel migration zone.

Section 4.2.1 Removals and Vegetation Preservation Within the Channel Migration Zone) (CMZ)

The Clark Fork River Technical Advisory Committee (TAC) identified potential discrepancies in the criteria used to determine Vegetation Preservation (VP) areas between the Strategic Plan and the Phase 7 Design Criteria Memo (DCM). The criteria used to define these areas within each document are compared below.

From the Strategic Plan Section 4.3.2:

Further, potential vegetation preservation areas must meet the following criteria:

- *Preservation areas are not more than 1 foot above design grade;*
- *Leaving patches of vegetation on slightly higher ground does not create channelized flow paths;*
- *Preservation areas do not occur near the channel on both sides of the river, which could result in concentration of flows on the floodplain; and*
- *Preservation areas do not create construction constraints.*

From Design Criteria Memo section 4.2.1:

Criteria used to determine Vegetation Preservation areas within the CMZ included:

- *Area is a maximum of 1.5 feet higher than the design Q1.5 discharge water surface elevation.*
- *Area has robust vegetation; and*
- *Area appears to be geomorphically stable.*

Comment 2: The TAC is concerned about the apparent use of two sets of criteria in establishing VP areas and requests clarification on the discrepancies. Of particular interest is the use of two different maximum elevations (1.0 and 1.5 feet, assuming $Q_{1.5}$ is equivalent to the design grade).

Comment 3: Additionally, the Strategic Plan states VP areas cannot occur near the channel on both sides of the river. VP areas occur on both sides of the river in several places in the current plans (see stations 66+50-81+50).

Comment 4: Although we understand all areas proposed for VP have been evaluated for geomorphic stability, we feel outside bends are inherently eroding faster than inside bends. As such, we suggest removing outside bends from the proposed VP areas to reduce the risk of contaminant exposure.

Comment 5: The TAC recommends investigating removing contaminated soil below sedge dominated VP areas. It is a common practice in wetland revegetation to remove the top 8-12 inches of sedge dominated vegetation (sedge mats) before excavation and then replace the sedge mats when excavation is finished. This practice is extremely successful because sedge mats rapidly reestablish over disturbed areas. By incorporating this method into sedge dominated VP areas, the contaminated soil below the sedge mats can be removed while maintaining high quality vegetation.

Even if the top 8-12 inches of soil are also contaminated, it would be beneficial to remove the underlying tailings, which are often greater than 24 inches deep.

Section 4.3: Design Removal Boundary

Comment 6: The TAC agrees with the Design Team's intent to prevent the river from threatening the Racetrack Pond's embankments by installing riprap along the left bank adjacent to the pond. However, preventing the channel from migrating westward toward the pond increases the chances of the channel migrating eastward in this area. The CMZ and proposed removal boundary does not reflect the altered ability of the channel to migrate as a result of permanent armoring. We suggest the Design Team consider adjusting the CMZ and contaminant removal boundary further east along the proposed armored reach to reflect a greater chance of the river migrating in that direction. We acknowledge adjusting the removal boundary should also consider whether contaminant removal criteria are met in these areas.

Comment 7: Floodplain grading features include depressions that mimic areas formed naturally due to flood scour. Recognizing that natural scour occurs within the floodplain, shouldn't contaminant removal be extended beyond the CMZ where the 100-year floodplain is wider? For example, there are several large oxbow sloughs that extend beyond the CMZ. These sloughs have some of the deepest tailings in Phase 7 but have been excluded from excavation. The sloughs have relatively low elevations and are very likely to flow during overbank discharges, making them vulnerable to being reoccupied by the river. The TAC recommends including these sloughs within the tailings removal plans.

Section 6.1: Floodplain Hydraulic Design

Comment 8: The DCR indicates the entire CMZ will be inundated between 0.1 and 0.5 feet at the $Q_{1.5}$ discharge, which suggests flooding will begin to occur at discharges below the 1.5-year flood interval. We understand and agree with the design team's intent to encourage riparian vegetation establishment by allowing water to access the floodplain more frequently and acknowledge the TAC previously recommended lowering the floodplain following documentation of riparian vegetation establishment in earlier phases. We encourage the design team to investigate whether lowering the floodplain to an elevation at or below the 1.5-year flood has consequences on channel-forming processes. We are concerned the emphasis on vegetation establishment may come at the cost of sediment transport and aquatic habitat development and maintenance due to the reduced in-channel energy resulting from frequent overbank flooding.

Specifically, we suggest performing a sediment transport study to analyze:

1. Whether incoming sediment loads will be transported through Phase 7 during frequent flood events,
2. Whether avulsions are more likely due to the reduced sediment competency resulting from a lower floodplain elevation,
3. Whether sediment competency of the channel during bankfull events is sufficient to adequately scour bedform features such as pools and runs. Our concern here is partially

based on DEQ's suggestion during the May 1st Design Team Meeting that the channel bed in Phase 7 has potentially become armored over time due to the lack of fine sediment delivery stemming from construction of Warm Springs Ponds.

Comment 9: Related to previous comment, the TAC is curious whether Montana Fish, Wildlife & Parks is concerned over the potential for reduced sediment transport capacity of the channel in the upper end of Reach 7 given the documented spawning habitat available in this area. Could the reduced transport capacity of the channel result in fine sediment deposition and compromised spawning habitat suitability in Phase 7?

Comment 10: If lowering the floodplain to the extent proposed is found to compromise in-channel habitat processes, we are curious whether specific, in-channel habitat mitigation opportunities may exist? We are aware large woody debris is lacking in the channel and wonder if NRDP might consider funding installation of woody debris complexes to compensate for reduced habitat-forming processes. We acknowledge a response to this question may not be possible with the information currently available.

Comment: We strongly recommend monitoring the geomorphic response of the channel to the lowered floodplain elevation and using the results to inform future phase designs. (see geomorphic monitoring plan prepared by K. Boyd).

Section 7.3: Log Structure Streambank Treatments

Comment 11: The TAC supports the addition of log structure streambank treatments to outside meanders as an excellent improvement to the designs that will benefit habitat while reducing costs by eliminating fabric encapsulated soil lifts. It would further benefit fish habitat if large wood could also be installed periodically in pool tailouts, where brown trout tend to use it as escape cover while feeding in shallower water.

Comment 12: It is unclear whether large wood will be equally beneficial if installed on point bars because wood tends to accumulate there naturally. The TAC recommends eliminating large wood from point bars except as buried matrix material.

Comment 13: As shown on Design Sheet D103, it appears the log structures will be installed above the base flow elevation, rendering them less useful as aquatic habitat features as compared to structures installed below the base flow elevation. If habitat complexity during all flows is desired, we recommend lowering the position of the exposed logs below the base flow elevation to keep them submerged during low flows.

Comment / Question 14: The log structure detail on Sheet D103 suggests the footer log should be placed at or near the "Current Water Level". What flow or elevation does the current water level correspond to?

Comment 15: An example of the log stability analysis was to be included in Attachment 7, however, Attachment 7 only contains an example for the Brush Matrix treatment. Please provide a stability analysis for large wood.

Section 7.5: Riprap Streambank Treatments

Comment 16: As shown on Design Sheet D103, the rock riprap bank stabilization treatment appears to use a "launchable toe" or ballast. This ballast does not appear to contain the recommended volume of material necessary for this type of application. Please provide calculations based on the USACE EM 1601 used to size the rock and estimate the dimensions for the ballast section.

Section 8.0 Revegetation Design

Comment 17: In general, the TAC is highly supportive of the revegetation design outlined in the design criteria memo. The overall goal of creating a floodplain surface that is frequently activated by high flows should promote the establishment of desirable native woody species and the creation and wetland habitats. Additionally, the proposed revegetation methods and placements for willow cuttings, containerized woody plantings, and seeding follow established norms and are likely to be successful.

Section 8.1.2 Woody Riparian

Comment 18: The TAC would like to promote the use of cottonwoods within appropriate hydrologic zones. Cottonwoods are a keystone pioneer species invaluable for wildlife and river function. Prior to settlement of the Clark Fork River valley the lower reaches of the valley were likely dominated by cottonwood galleries. However, due to historic mining, grazing, timber harvesting, river channelization, and the floods of 1908, cottonwood communities were largely extirpated from the valley. Phase 7 provides an excellent opportunity to reestablish cottonwood galleries based on the following:

- The designated land use is riparian floodplain.
- Conflicts with other land uses such as grazing should not compromise cottonwood establishment within this reach
- The designed Phase 7 floodplain elevation is lower than in previous phases, suggesting an improved opportunity for cottonwoods to establish.

Section 8.1.3 Floodplain Depression

Comment(s) 19: The TAC supports the general plan for floodplain depressions, including creating a diversity of habitats ranging from open water to seasonally saturated wetlands. The TAC would like to offer some design suggestions to support improved waterfowl habitat. The Upper Clark Fork Valley (UCFV) has extensive value for waterfowl in the Pacific Flyway. The Clark Fork Valley falls directly within a major migration corridor that includes critical nesting and overwintering habitat for migrating waterfowl. Therefore, waterfowl-friendly habitat designs can greatly impact these species given that the UCFV contains one of the largest wetland creation projects in Montana's history. Some important design considerations follow below:

Note these suggestions ideally would also be incorporated where possible into the wetland complex described in section 9.0.

1. Promote beneficial plant communities
    a. Aquatic Emergent Vegetation (AEV)
        i. AEV provides necessary food and crucial cover for newly hatched waterfowl offspring. It is essential for overwater nesting waterfowl and waterbirds.
        ii. Promote a ratio of 50% open water to 50% AEV
        iii. Suggested species include, but are not limited to, smartweed (*Persicaria amphibium*), duck potato (*Sagittaria cuneata*), hardstem bulrush (*Scirpus acutus*), small-fruited bulrush (*Scirpus microcarpus*), sedges (*Carex* spp.), spikerushes (*Eleocharis* spp.), and rushes (*Juncus* spp.)
    b. Submerged Aquatic Vegetation (SAV)
        i. SAV is an important food source for waterfowl. SAV provides habitat for aquatic macroinvertebrates, which are both desired wetland species and a food source for a large variety of waterfowl species.
        ii. Suggested species include, but are not limited to, common water-milfoil (*Myriophyllum sibiricum*) and native pondweed species (*Potamogeton* spp.)
2. Hydrology
    a. Promote seasonal, fluctuating water levels that mimic natural hydrologic conditions (filled in spring with levels decreasing through summer and fall) to build ecosystem resilience and allow germination of AEV. Since these depressions will be located within active floodplains this will likely be achieved but it is worth noting for other wetlands, such the vegetative borrow area.
3. Depth variability
    a. Ponds and wetlands with variable depths increase biodiversity by providing a mix of habitat types. Waterfowl and waterbirds can be broken up into two feeding groups; divers and dabblers. Divers obtain food by swimming below the surface in deeper waters (4-20 ft). Dabblers eat by tipping their bodies up and eating just below or on the water surface, typically in very shallow water (1 in. to 2 ft). Both feeding groups are reliant on a variety of vegetation, macroinvertebrates, crustaceans, and fish that also support a healthy overall ecosystem. A variety of depths within the wetlands support not only waterfowl but also enhances habitat for other species.
4. Wetland/ depression size
    a. Smaller wetlands are typically more successful than larger wetlands because small wetlands increase available habitat while limiting low-productive, open-water areas. While deep, lacustrine-style wetlands provide specific habitat for diving species and roosting waterfowl; smaller, pothole-style wetlands provide the highest quality habitats. A widely accepted rule in waterfowl habitat design is that 10 one-acre wetlands will hold 10 times as many waterfowl as one 10-acre wetland (known as the rule of ten).

Comment 20: One or more additional floodplain depressions appear to be feasible at the west ends of cross-sections 8 and 9 (see sheets C109 and XS103). We believe similar opportunities may exist on the left bank between Station 82+00 and 84+50 and on the right bank between Stations

97+50 and 100+00. Adding wetland depressions to these areas would benefit wildlife and reduce backfill costs.

Section 8.1.4 Point Bars

Comment 21: The design document correctly observes that point bars are "areas where native riparian woody vegetation, such as black cottonwood and sandbar willow will naturally colonize through seed deposited during flood events. Herbaceous wetland vegetation also readily colonizes these surfaces after construction." Given point bars also tend to be areas where tailings have deposited, we recommend removing tailings from all point bars that meet the contaminant removal criteria (if any) and not including them in preservation areas, regardless of how well-established the vegetation may be.

Section 9: Restoration Components

We understand the onsite floodplain alluvium borrow source will be incorporated into a future riparian wetland complex that will be designed separately from the Phase 7 CFROU. We appreciate the design team's interest in having the TAC participate in the design of this wetland feature and offer the following pre-design comments:

Increased Risk of Contaminant Exposure

Comment 22: As presented during the May 1st Phase 7 Design Team Meeting, the conceptual design of the wetland complex routes more water through areas exhibiting contamination that will not be removed. We are concerned that routing additional water through contaminated materials may eventually increase the risk of elevated contaminants in surface and groundwater and recommend the design team consider either revising the removal boundary to include areas that may be more frequently inundated as a result of the future wetland complex or utilizing a portion of the restoration funds available to remove additional tailings in areas exposed to the re-routed water.

Avulsion Risk

Comment 23: The area where the wetland complex is proposed is the lowest part of the floodplain and is already a likely flow path during overbank discharges. Excavation of wetlands in that area may encourage channel formation during large flow events. This may be addressed by locating wetlands in other areas or by inclusion of topographic breaks such as BDAs to discourage formation of concentrated flow paths.

Wetland Complex Benefits

Comment 24: We support the desire to expand and enhance wetland habitat within Phase 7. As previously noted, the proposed wetland complex will occupy an area that is already lower than most of the floodplain. Presumably, that area is already wetlands, which calls into question the benefits relative to costs that may be realized by wetland enhancement in that area.

Water Temperature

Comment(s) 25: To improve resiliency to climate change, the designs for all phases should consider ways to conserve cold water. Design considerations should include:

- Routing all spring flows directly to the Clark Fork River rather than through ponds, open water wetlands, or swales.
- Eliminating or minimizing the discharge of warm surface water (e.g. from ponds or wetlands) directly to the river.
- If wetlands receive surface water, design them so the water surface elevation is above groundwater level to encourage recharge and cooling of water (e.g. add berms or beaver dam analogs to constructed wetlands).
- Consider installing bottom-release structures for ponds that will have a connection to the Clark Fork River.

Attachment 10: Draft Plan Sheets

Comment 26: The proposed Legend on Sheet G102 shows a "Preserve Vegetation" hatch and a separate "Vegetation Preservation" hatch. Is there a difference?

Comment 27: Sheet G102 assigns a nearly identical line weight and color to the "Brush Matrix" and "Rock Riprap Bank Stabilization" treatments, making it difficult to decipher the proposed location of these treatments on Sheets C122, C123, and C124. Similarly, the same line weight and color appears to be assigned to "Willow Trenches" and "New 4-wire Wildlife Friendly Fence". We suggest revising line types to allow reviewers to better distinguish between these design features.

Comment 28: The Vegetation Preservation layer is inconsistently shown throughout plan sheets. For example, Sheets G104 and G105 do not include the vegetation preservation areas downstream of Station 60+00 that are shown on Sheets C105 and C106.

Comment 29: Sheet C107 indicates a ~700' long rock riprap trench will be installed to the west of the channel between Stations 12+00 and 31+50. It is unclear what the purpose of this riprap trench is and question the alignment of the riprap trench relative to the channel at its northern end.

Comment 30: Sheet C109 shows two short segments of buried rock riprap near Station 110+00. It is unclear what the purpose of this riprap trench is.

Comment 31: We are unclear how the finish grade for Section 9 on Sheet XS103 can be approximately 2 feet lower than the bottom of excavation on the far left (east) side of the transect. This figure creates some uncertainty in how the excavation and final grade surfaces are generated and whether the flood inundation model correctly depicts the extent and depth of flooding.

Comment 32: It is difficult to compare elevations of the existing, excavated, and finished floodplain surfaces. Cross-sections provide the best way to visually understand what is being proposed but the plans include only nine cross-sections for the 2.28 mile length of Phase 7. Please include significantly more cross-sections to make it easier to interpret the proposed tailings removal and finish grading plans.

Comment 33: It would be helpful to have the 100-year floodplain and existing wetlands boundaries displayed on the plan maps.

Comment 34: The hatch for existing wetlands appears to be the same as proposed wetlands, making it difficult to decipher where existing wetlands may be disturbed and where new wetlands may be created.

Comment(s) 35: Sheets C119, D105-108 Fencing Plan and Specifications do not appear to be wildlife (or recreation) friendly. We suggest incorporating wildlife friendly fencing specifications wherever possible, especially on the State of Montana Property. The following FWP document for guidance on wildlife friendly fencing specifications provides some helpful guidance: https://fwp.mt.gov/binaries/content/assets/fwp/conservation/land-owner-wildlife-resources/a_landowners_guide_to_wildlife_friendly_fences.pdf

More specifically, we recommend that farm fences be 4 wire (smooth top and bottom) with the appropriate spacing for safe wildlife passage. We also suggest looking into alternatives to Jack Leg fencing, which can create formidable obstacles to wildlife, are expensive to install and require a high degree of maintenance. Another wildlife-friendly alternative is 3-wire high tensile electric fence with fiberglass posts. Incorporating walk through gates for recreationists to safely access the State of MT property is also recommended. It would be helpful to specify in future plan sheets which fence specifications are proposed in specific sections.

Potential Cost Saving Measures

Comment(s) 36: Several changes in the general approach to the CFROU cleanup are stipulated in the Strategic Plan and DCM, most of which involve reducing the amount of tailings that will be removed from the floodplain. To better understand the ramifications of these changes, it would be very helpful to know how many cubic yards of contaminated soils will be left in place for Phase 7 and future phases by:

- Vegetation preservation
- Reducing the CMZ to a 50-year buffer
- Leaving tailings >24" deep outside of the CMZ

See Comment #20 for potential cost reduction strategy of not replacing material removed from excavated swales and wetland depressions.

See Comment #35 for potential cost reduction strategy of considering alternatives to jack leg fencing.

Remaining Wetland Funding

Comment 37: The TAC understands the proposed wetland complex in Phase 7 will be funded through the 1999 Streamside Tailings CD (Silver Bow Creek) earmarking $3.2M for creation of 400 acres of wetlands in the UCF, and that approximately half of those funds remain as of last year. The TAC would appreciate the opportunity to weigh in on the utilization of remaining wetland funding as it relates to the CFROU.

CFRTAC Participation in Design and Monitoring

Comment 38: The CFRTAC very much appreciates the invitation to attend Design Team meetings and offer feedback on the CFROU Phases scheduled for future completion. We strongly believe the TAC's participation will help generate the best possible outcome for local communities and citizens utilizing the recreational amenities provided along the Clark Fork River. To that end, we would also appreciate the opportunity to review annual monitoring results and documentation of whether performance measures are being met within the various CFROU phases. In addition to our desire to help distribute this information to the communities affected by the cleanup, our intent is to consider the monitoring results as a means of informing future design phases and remedy / restoration actions.