Arkansas River Ranch Trail
Phase I Construction Layout
As Built Photo Plates and Figures

Prepared for:
Arkansas Headwaters Recreation Area
Colorado Parks and Wildlife
307 W. Sackett Ave.
Salida, Colorado
81201

Prepared by:
Michael Conlin
875 Mtn. View Dr.
Leadville, Colo. 80461

December, 2012

Arkansas River Ranch Trail
Phase I Construction Layout
As-Built Illustrations

Table of Contents:

List of Figures

List of Photo Plates

Arkansas River Ranch Trail
Phase I Construction Layout
As-Built Illustrations

Introduction

The Arkansas Headwaters Recreation Area (AHRA) secured the Arkansas River Ranch through a combination of fee simple acquisition and conservation easements for the purpose of conserving its natural resources and scenic viewsheds, improving recreational opportunities, and providing increased public access to the Arkansas River in Lake County, Colorado.

In October of 2012, Parks consigned preparation of the ***Arkansas River Ranch Trail, Phase I Construction Layout*** (Layout) to define the sustainable trail guidelines for a bicycle/pedestrian trail through their properties on the east side of the Arkansas River, connecting the established trailheads at Kobe and the Hayden Meadows Recreation Area. Parameters for the development of the trail were collaboratively established through a series of public meetings facilitated by the Lake County Open Space Initiative (LCOSI), and follow nationally accepted principals for sustainable trail development. The final Layout was presented to the public at the November, 2012 LCOSI meeting, and posted on the Initiative's website (www.LCOSI.com).

The Layout was generated through a cooperative effort of Colorado Parks and Wildlife (CPW), LCOSI, the U.S. Environmental Protection Agency (EPA), and the U.S. Army Corps of Engineers (Corps). Permitting for impacts to waters of the United States, not specific to, or covered under the EPA's Nationwide 38 Permit for cleanup of hazardous and toxic waste, were authorized under an Army Corps Nationwide 42 Permit issued to CPW to allow for construction of recreational facilities. The Phase I Construction Layout was prepared by Michael Conlin, LCOSI Director, and reviewed by Shaun Gordon, CPW Landscape Architect.

Qualified local contractors were solicited by AHRA to provide cost estimates for construction of the elements described in the Layout, and invited to participate in on-site examination of the alignment with representatives of AHRA and LCOSI. In all, four local construction firms viewed the site and provided cost estimates based on site review and the tasks outlined in the Layout.

The resulting estimates for compliance with the full menu of tasks delineated in the Phase I Construction Layout exceeded available 2012 AHRA funding. The decision was made to prioritize just those identified Phase I tasks for 2012 construction that: secured hydraulogic connectivity between the river and the floodplain; removed culverts over ephemeral water courses that flow only for a short period following precipitation or snowmelt; supported vehicular access to allow continued EPA monitoring of remediation sites; created a sustainable travel surface consistent with connecting primitive road segments for future construction, emergency, maintenance, and enforcement vehicle access, (if and when necessary); reduced visual impacts of the trail base and impediments to wildlife movement; kept people on, and water off the travel surface; and enhanced the potential for successful revegetation of disturbed areas.

This report has been prepared for the purpose of documenting the work completed during the 2012 construction season, and any changes or revisions to the Arkansas River Ranch Trail, Phase I Construction Layout as originally written. All reference to mapping locations, figures, stations along the horizontal alignment etc. are based on, and contained within the Layout document, which is incorporated herein by reference, and available on the LCOSI website.

Selection of the Contractor

Based on qualifications, availability, and cost, Miles Construction (Miles) of Buena Vista Colorado was selected to perform the prioritized construction tasks as defined in the Layout. Miles Construction has specialized in commercial, industrial, and residential excavating services in the Upper Arkansas River Basin since 1975, has a track record working with AHRA, and is bonded and insured. Miles agreed to perform the prioritized Phase I tasks for a figure not to exceed the available funding.

As Built Instructions

CPW instructed Miles Construction to perform all of the tasks, as specified within the Phase I Construction Layout, with the following exceptions:

1) The Layout (Photo Plate 14 and Figure 3) calls for installation of a 4' wide by 4" deep trail tread, centered on the prepared trail base to: limit the width of the travel surface to pedestrian scale; elevate and differentiate the trail surface from surroundings to keep people on, and water off of the travel surface; allow the wheels of maintenance, monitoring, and emergency vehicles to span the pedestrian travel surface to limit trail damage resulting from authorized motorized travel; provide adjacent "soft surface recovery zones" to allow time and space to recover from inadvertently dropping a bicycle wheel off of the edge of the prepared trail tread: and allowing trail users, such as horses and bicyclists, adequate space adjacent to the 4' trail tread to safely pass in opposing directions.

   Due to fiscal constraints and the limitations on the amount of screened ¾" minus native soil material available to the project in this phase, it was decided to place the installation of the trail tread into a potential future phase of construction. Miles Construction was instructed not to install the trail tread as part of the agreed upon scope of work for 2012 construction.

2) Upon field inspection, AHRA decided to increase the amount of screened ¾" minus native soil to cover the cobble surface of the trail base segments in order to: soften the transition between the trail and surrounding topography; reduce erosion potential; limit the visual impact of the elevated trail grade by sinuously blending it into its surroundings; and to increase the amount of growing medium to support revegetation and establishment of soil stabilizing root mass adjacent to the trail's wear surface.

   Miles was instructed in the field to taper the trail surface to the surrounding topography at an approximate 4:1 slope wherever possible, and ensure growing medium coverage over all areas of exposed cobble, without exceeding the total amount of fines allocated to and authorized for use on the trail project.

3) AHRA has deferred re-seeding of impacted areas of the trail until the spring of 2013, due in part to a lack of available funding. AHRA is exploring a collaborate effort with the U.S. EPA to seed the disturbance footprint of the converted haul road/trail segment in the spring of 2013.

   Miles was instructed not to re-seed the project area as part of their site restoration following construction.

The accompanying figures and photo plates provide documentation of the process and product of the 2012 construction effort, as well as a comparison of conditions prior to, and following construction.

Area of Avoidance 1: Transition

Figure 1 provides a Typical Section of a soil bridge proposed for spanning a riparian area transition between upland soils and the EPA haul road, as described in the Phase I Construction Layout. Winter removal of the EPA haul road spanning the riparian area resulted in interception of groundwater from a perched pond on the Mount Massive Trout Club to the east. The Typical Section (Figure 1) delineates an underlayment of geotextile fabric and a 6" course of 4" minus cobble to provide a foundation for pedestrian and authorized motor vehicle travel, and a covering of ¾" minus material to provide a smooth, sustainable travel surface and growing medium for re-vegetation and soil stabilization.

Photo Plate 1 illustrates the pre-construction condition of the transition zone with standing water and a muddy, heavily rutted travel surface, incapable of supporting sustainable trail development. Photo Plates 2 and 3 illustrate the proposed realignment of the trail onto upland soils to circumvent the seep area and the short transition through wetland soils to re-connect the trail alignment to the existing EPA Haul Road. Plates 2 and 3 were taken prior to the start of construction. The construction of the trail base through the transition zone impacts a riparian area that was not disturbed under the EPA's Nation Wide Permit 38, and is subject to the CPW Nation Wide Permit 42.

Photo Plates 4 and 5 provide a "before and after" comparison illustrating the application of the soil bridge, as prescribed in Figure 1, including the low flow crossing at the low point at the base of the transition.. The low flow crossing, illustrated in greater detail on Photo Plate 6, provides a stable, hard surface crossing at the same grade as a historic flood channel to allow passage of water between the river and floodplain during high flow events.

The transition and low flow crossing were installed in compliance with the direction provided in the Phase I Construction Layout.

Culvert Removal

Two culverts, originally installed to allow heavy equipment to cross over water channels to access the fluvial tailings deposits remediated by the EPA, were determined to cross ephemeral streams or seeps which only carry water during storm events and snowmelt. In these locations, the volume, timing, and duration of flows were considered to present only a minimal impact on trail usage, which could be accommodated by replacement of the culverts with low flow crossings. The replacement of culverts with low flow crossings is intended to support vehicular, mechanized, and pedestrian travel through shallow water crossings during high flow events, and eliminate the elevated profile of the culverts to reduce visual impact, cut down high maintenance costs associated with beaver activity, and decrease potential impediments to wildlife movement.

Figure 2 illustrates the direction provided in the Layout for the removal of Culvert # 1, located at Station 33+45, and its replacement with a low flow crossing. Culvert # 1 directed water from a seasonal flood channel off of the Arkansas River, under the elevated grade of the EPA haul road.

Photo Plate 7 shows AHRA personnel consulting with Miles Construction prior to the removal of Culvert #1. Photo Plates 8 and 9 provide a "before and after" comparison, clearly demonstrating the high profile of the elevated haul road grade over the culvert prior to its removal, and the resultant lowering of the trail profile following culvert removal and replacement with a low flow crossing. Photo Plates 10 and 11 provide greater detail of the low flow crossing following installation.

Figure 3 illustrates the direction provided in the Layout for the removal of Culvert # 6 at Station 2+23, and its replacement with a low flow crossing. The culvert directed water from a hillside seep under the elevated grade of the haul road during snowmelt and storm events.

Photo Plate 12 shows the excavated Culvert #6, prior to its removal from the site, per direction provided in the Layout. Photo Plates 13 and 14 provide a "before and after" comparison of the trail profile prior to Culvert #6 removal, and following its replacement with a low flow crossing, reducing the visual impact of the trail and its potential to impede wildlife movement, while maintaining historic floodplain connectivity.

Photo Plates 15 and 16 document the construction of the low flow crossing at station 2+23 following removal of Culvert #6. The surface elevation of the sandstone pan is set to the same elevation as the historic flood channel to maintain historic flow patterns within the floodplain. Removal of Culverts 1 and 6, and their replacement with low flow crossings serve to modify the EPA work done under their NWP 38 Permit, and are addressed in CPW's NWP 42 Permit.

Removal of Culverts #1 and 6, and their replacement with low flow crossings was completed in compliance with the direction provided in the Phase I Construction Layout.

Low Flow Crossings

Low flow crossings, as described in the Phase I Construction Layout, are intended to provide a smooth, stable platform for shallow water crossings on the trail surface during high flow events, while allowing water to flow across an armored surface, through the elevated grade of the trail, to maintain hydrologic connectivity between the river and the surrounding floodplain. Locations for placement of the low flow crossings were determined by CPW engineering personnel.

Figure 4 illustrates the direction provided in the Layout for the construction of low flow crossings. The typical cross section calls for excavation of the foundation below existing grade, lining of the excavation with geotextile fabric and filling it to grade with 6" minus cobble to form a foundation for the trail base.

Pea gravel is then used to bed 3-4” thick sandstone slabs, set to the grade of the floodplain to allow water to flow naturally in historic flood channels connecting the river to the floodplain.

Photo Plate 17 illustrates the excavation of the foundation, and the presence of frozen ground due to the timing of the late fall construction season. The frozen ground provided additional bearing strength to support the weight of construction equipment over unstable soils and reduce damage to surrounding floodplain geomorphology and vegetation.

Plates 18 and 19 demonstrate the excavation of the foundation and removal of surplus materials for stockpiling off-site, per instructions. Plates 20 and 21 show the placement of the geotextile fabric in the foundation excavation, and the delivery of 6” minus cobble. Plate 22 shows the placement and grading of the cobble within the lined excavation.

Photo Plate 23 documents the delivery of the 3/8” minus pea gravel for bedding of the sandstone slabs. Plates 24 through 28 document preparation of the bedding, fitting of the sandstone slabs, and filling of the interstitial spaces between the slabs with pea gravel to provide an even riding surface.

Photo Plates 29 and 30 illustrate the backfilling and grading of the approaches to the low flow crossing to a maximum 10:1 slope to accommodate a smooth transition through the crossing and provide a wider profile for water passage through the elevated grade in extreme high flow events.

Photo Plate 31 illustrates a completed low flow crossing (LFC 2, Station 11+23). Including the low flow crossings replacing Culvert’s 1 and 6, a total of 9 low flow crossings were delineated and installed over the 3,725 linear feet of the subject trail section. Installation of low flow crossings serve to modify the EPA work done under their NWP 38 Permit, and is addressed in CPW’s NWP 42 Permit.

All low flow crossings were installed in compliance with direction provided in the Phase I Construction Layout.

Revegetation

The desired end product of the trail design would be a pedestrian scale corridor that is distinguishable enough from its surroundings to provide the visual queuing necessary to keep people on the riding surface and discourage development of “social trails”, with an underlying trail base that can support limited emergency, monitoring, and maintenance vehicle traffic, and which blends topographically and vegetatively into the surrounding landscape of the floodplain.

The genesis and construction of the EPA haul roads is described in the Layout, and started with a base course of as much as 3.5 feet of 6” plus cobble over a geotextile fabric to support the weight of heavy construction equipment. The result was an elevated profile through the relatively flat terrain of the floodplain as much as 5’ high, which was aesthetically obtrusive and posed potential movement impediments to wildlife and historic water flow regimes.

The reduction in height and width of the haul roads to a nominal thickness of 1 foot, and an average width of 10 feet, by the EPA following remediation, stripped away the upper road base and traction rock courses, exposing the cobble foundation. (Photo below)

The composition of the remaining cobble road limited growing medium for root development and water wicking potential to irrigate the surface layers, limiting re-vegetation success. The abrupt edges in some segments also posed a potential safety hazard to trail riders, and further limited revegetation potential. (Photo left)

Figure 5 provides the Phase I Construction Layout direction for preparing the reduced road grades for revegetation, and includes: reducing the height of the platform by feathering out the edges to eliminate abrupt changes and blend the platform more gently into the surrounding landscape; crowning the platform to allow it to shed water; and, adding a top course of ¾" minus native material to provide a smooth riding surface and establish a growing medium to support re-seeding success. While this modification lies within the footprint of the EPA haul road constructed under its NWP 38 Permit, it does represent a modification that is covered under CPW's NWP 42 Permit.

Photo Plate 32 provides a visual reference to the appearance and construction of the original EPA haul road during construction, illustrating the distinct layers and high profile of the structure.

Plate 33 shows the same section of the haul road following reduction to a nominal 10'wide, 1 foot thick platform. The cobble surface of the platform is almost completely devoid of vegetation. Culvert # 6 is visible at the far end of the road section.

Plate 34 was taken of the same segment following the removal of culvert, addition of a low flow crossing, and the preparation of the surface for re-vegetation. The cobble surface has been covered with a 3 - 4" course of screened native soils and the edges of the travel surface have been tapered at a 4:1 slope with ¾" minus native material to blend into the surrounding landscape in order to: enhance re-seeding success; support soil stabilizing root development; limit erosion potential; lessen visual impact; create a smooth riding surface; and promote rider safety.

Photo Plates 35 and 36 demonstrate the same process at the corner where the trail curves around the power stanchion near station 4+00. Plate 36 demonstrates the visual effect of lowering and crowning the profile, adding growing medium, and feathering of the edges to the surrounding landscape to provide a smooth riding surface, reduce the visual impact, and provide the growing medium to support revegetation.

Plates 37 and 38 provide a comparison of the road segment north of station 4+00, before and after the feathering of the edges and addition of growing medium. Plate 37 demonstrates the lack of vegetative recruitment despite successful seeding of the remediation site adjacent to the left side of the roadway.

A secondary issue arising from the winter deconstruction of the EPA haul Roads was the inability to final grade sections of the road that came up in huge frozen chunks. The result was sections of rough road surface (Plate 38) that were not conducive to sustainable trail development or the passage of monitoring and emergency vehicles. Plate 40 demonstrates the addition of a thin veneer of ¾" minus road base, graded to fill in the ruts and crown the travel surface to allow it to shed water.

Plate 41 shows the area identified in the Phase I Construction Layout as Area of Avoidance 2, where the EPA constructed a cobble bypass around a section of stream bank erosion that had taken out the original road alignment. The composition of the material used to construct the road in order to accommodate heavy equipment travel failed to re-vegetate, due to the high cobble content and lack of organic soils, and was inconsistent with the visual appearance of its surroundings. Photo Plate 42 illustrates the same curve following feathering of the edges to the surrounding topography and addition of growing medium to support re-seeding and stabilizing root production.

Photo Plate 43 illustrates an area where winter deconstruction of the EPA haul road left an abrupt cut-bank along the right shoulder of the roadway. At the instruction of AHRA the cut-bank was re-contoured to soften its appearance into the surrounding landscape (Plate 44), and a layer of native material was applied to increase revegetation potential.

All work preparatory to re-vegetation is in compliance with the direction provided by the Arkansas River Ranch Trail, Phase I Construction Layout, and direction provided in the field by staff or representatives of CPW.

De-mobilization and clean-up of stockpile areas, river crossings, and staging areas was completed to the satisfaction of CPW.

Summary

With the exception of the previously noted items, excluded from the first phase of trail development as the result of fiscal constraints, all elements of the Arkansas River Ranch, Phase I Construction Layout have been successfully and satisfactorily completed. Items identified in the Phase I Construction Layout, but not completed during the 2012 construction season, will potentially be deferred to future construction phases.

In all, some 3,725 feet of contiguous trail surface have been prepared for vehicular and pedestrian travel, including the removal of two culverts, the installation of 9 low flow crossings to allow connectivity of the river and floodplain, and the addition of approximately 430 cubic yards of native soils to blend the trail surface into the surrounding landscape and promote re-vegetation of native plant species.

Transition

Figure 1: Area of Avoidance 1 – Transition through wetland

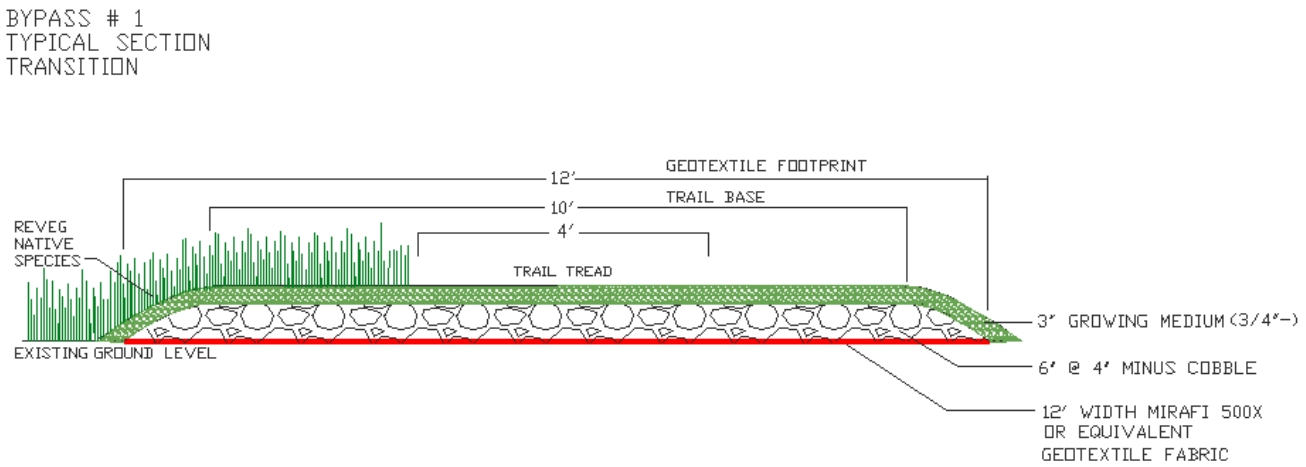

Photo Plate 1

Before: Area of Avoidance 1 - Station 23+60 to 27+20. Winter excavation stripped away the entire soil bridge, including fabric, cobble, fines and traction rock layers, and resulted in the interception of ground water from a perched pond on the hillside above, making the section of the trail corridor impassible for vehicular or bicycle/pedestrian travel.

Photo Plate 2

Plan: The Phase I Construction Layout called for bypassing the area of constraint by re-routing the trail to upland soils south of the seep area, and transitioning through a short section of riparian area to connect to the stable section of the EPA haul road.

Photo Plate 3

Before: "Transition" area between upland soils (upper half of photo) and stable road section (Photographer's location), crossing through a riparian area for a distance of approximately 110 feet.

Photo Plate 4

Before: Station 23+50 looking east through the wetland transition area to the upland soils. Area of wetland disturbance is approximately 110 feet in length, and is covered under a CPW Nationwide 42 Permit from the Army Corps of Engineers.

Photo Plat 5

As Built: Completed bypass around seep area including reconstruction of the soil bridge over a riparian area and installation of a Low Flow Crossing at the low point at base of transition to allow cross flow of flood waters between the river and the surrounding floodplain.

As Built: Low Flow Crossing #5, Station 23+60 at the base of the transition to support emergency and maintenance vehicle passage, and accommodate bicycle/pedestrian traffic on a hard surfaced, shallow water crossing during high flow events.

The Low Flow Crossings provide relief through the otherwise elevated trail grade to maintain connections to historic flood channels, allowing passage of high water flows to irrigate the surrounding flood plain.

Culvert Removal

Figure 2: Removal of Culvert 1

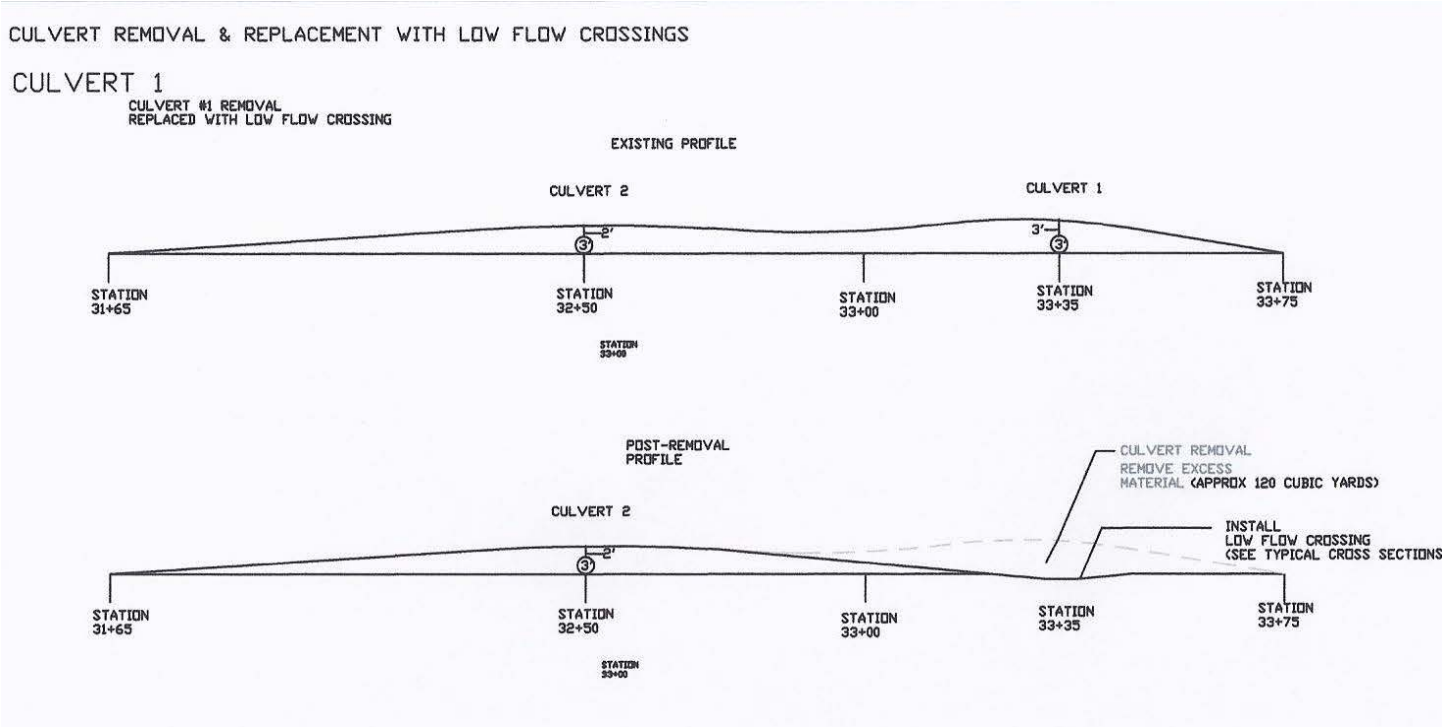

Photo Plate 7

As Built: Preparing to remove Culvert # 1, Station 33+35.

Photo Plate 8

Before: Station 33+37 - Culvert 1 prior to removal: 30” culvert with 2’ of cover material.

Photo Plate 9

As Built: Station 33+37- After removal of culvert and replacement with Low Flow Crossing.

Photo Plate 10

As Built: Culvert # 1 removed and replaced with a Low Flow Crossing.

Photo Plate 11

As Built: Low flow crossing in place of Culvert # 1.

Culvert Removal

Figure 3: Removal of Culvert 6

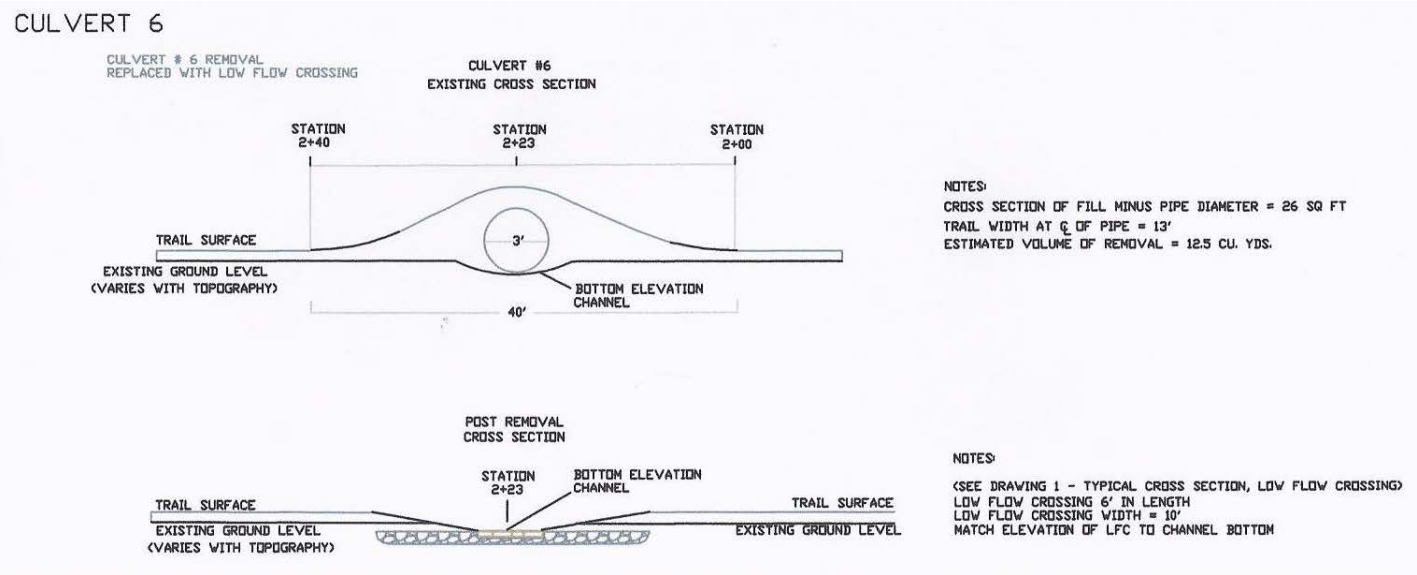

Photo Plate 12

As Built: Station 2+23 - Removal of Culvert # 6.

Photo Plate 13

Before: Station 2+23, Culvert #6 prior to removal.

Photo Plate 14

As Built: Station 2+23 following removal of Culvert #6 and replacement with Low Flow Crossing.

Photo Plate 15

As Built: Station 2+23, construction of Low Flow Crossing.

Photo Plate 16

As Built: Low Flow Crossing at Station 2+23.

Low Flow Crossing Installation

Phase I Construction Layout
Low Flow Crossings

Figure 4

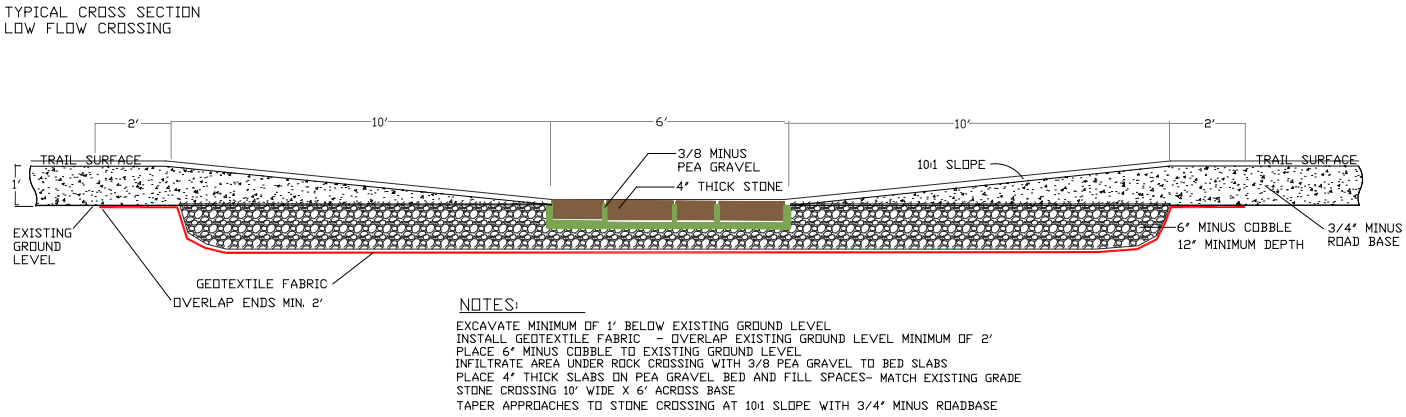

Photo Plate 17

As Built: Excavating in frozen ground to limit damage to surrounding floodplain soils and vegetation and support the weight of construction equipment.

Photo Plate 18

As Built: Excavating below existing ground level for Low Flow Crossing foundation installation.

Photo Plate 19

As Built: Hauling off surplus excavated material to stockpile on west side of river.

Photo Plate 20

As Built: Installation of geotextile fabric in excavation.

Photo Plate 21

As Built: Delivery of 6” minus cobble to lined excavation.

Photo Plate 22

As Built: Leveling cobble below ground level in lined excavation.

Photo Plate 23

As Built: Delivery and placement of 3/8” minus pea gravel bedding material to support sandstone pan.

Photo Plate 24

As Built: Preparing 3/8” minus pea gravel bedding for installation of sandstone slabs.

Photo Plate 25

As Built: Fitting sandstone slabs on bedding – orienting cracks perpendicular to direction of travel.

Photo Plate 26

As Built: Final fitting of 6’ x 10’ sandstone pan on 3/8” minus bedding.

Photo Plate 27

As Built: Filling in the spaces between the sandstone slabs with 3/8” minus pea gravel.

Photo Plate 28

As Built: Sweeping excess bedding material from surface of sandstone pad.

Photo Plate 29

As Built: Backfilling approaches to sandstone pads with ¾” minus road base.

Photo Plate 30

As Built: Grading approaches to sandstone pad with ¾” road base to 10:1 slope.

Photo Plate 31

As Built: Typical completed Low Flow Crossing (LFC 2).

Revegetation

Figure 5: Phase I: Preparation of the reduced road grade for revegetation

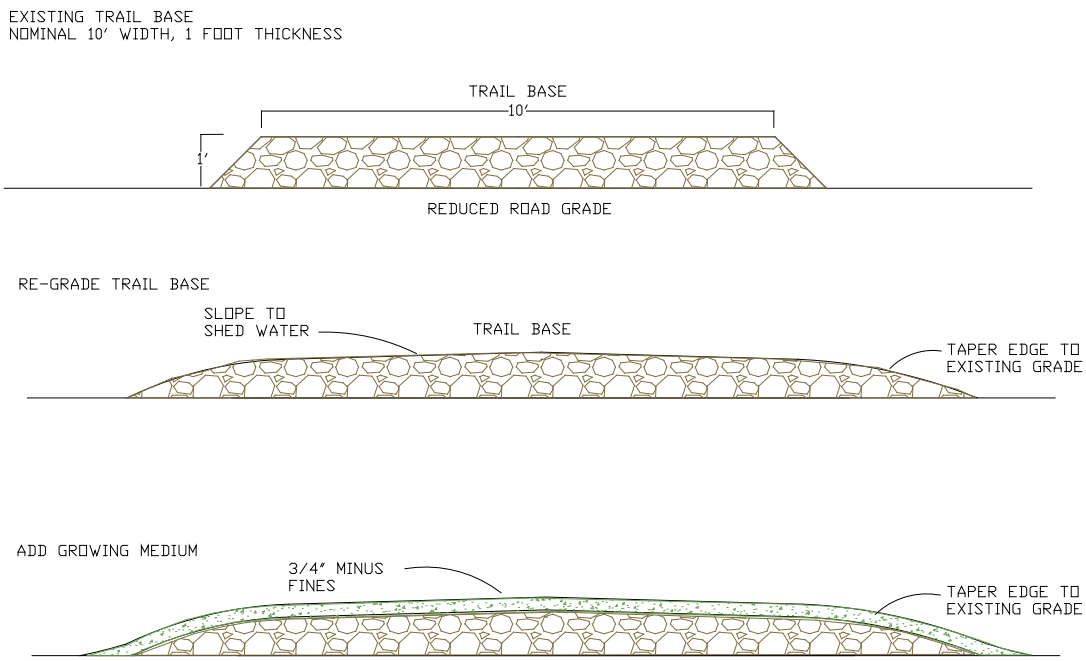

Photo Plate 32

Before: Typical EPA Haul Road Construction: Station 2+00 looking east to Point of Beginning (0+00) during EPA haul road construction. Note: 3 foot thick layer of 6”plus cobble, one foot layer of ¾” minus fines, and 6 inch layer of 2” minus traction rock to support heavy equipment.

Photo Plate 33

Before: View from Station 0+00 looking west to Culvert 6 (Station 2+23) following EPA reduction in road profile to nominal 1’ thick x 10’ wide travel surface. Note: Exposed cobble and absence of revegetation on travel surface.

Photo Plate 34

As Built: View from Station 0+00 looking west. Culvert #6 removed and replaced with Low Flow Crossing, edges of road tapered, then covered with ¾” minus fines to: shed water; facilitate revegetation and wicking of water to root zones; and to blend trail base into surroundings. Target travel width -10’, target side slope - 4:1.

Photo Plate 35

Before: EPA Haul Road at Station 4+00 looking south: following EPA lowering of profile but before re-grading and addition of growing medium.

Photo Plate 36

As Built: Station 4+00 looking south: following EPA lowering of the road profile, re-grading, and addition of growing medium. 10’ wide travel surface tapered to surrounding topography to provide a growing medium and reduce visual impact.

Photo Plate 37

Before: Station 4+50 looking north before regarding and addition of growing medium. Note: exposed cobble and lack of revegetation on travel surface.

Photo Plate 38

As Built: Station 4+50 looking north following re-grading, addition of growing medium, and blending edges to surrounding topography. 10’ travel surface with 4:1 side slopes.

Photo Plate 39

Before: Station 10+50 looking south, rough travel surface resulting from winter removal of frozen materials during EPA lowering of haul road profile.

Photo Plate 40

As Built: Station 10+50 looking north following re-grading and addition of ¾" minus material. Note: only enough ¾" minus material added to smooth travel surface and blend growing medium to surrounding ground.

Photo Plate 41

Before: Curve at approx. Station 18+50 looking north. Bypass around Area of Avoidance 2: "Stream bank failure", prior to re-grading and addition of growing medium. Note: exposed cobble and lack of vegetation.

Photo Plate 42

As Built: Same curve at approx. Station 18+50 looking south. Bypass around Area of Avoidance 2: "Stream bank failure", following re- grading, addition of growing medium, and blending the edge at a 4:1 slope to surrounding topography.

Photo Plate 43

Before: Station 23+50 looking south showing lower part of the cut bank on west side of travel surface left by winter removal of surplus road material.

Photo Plate 44

As Built: Station 23+70 looking south at same cut bank following re-grading and addition of fines.