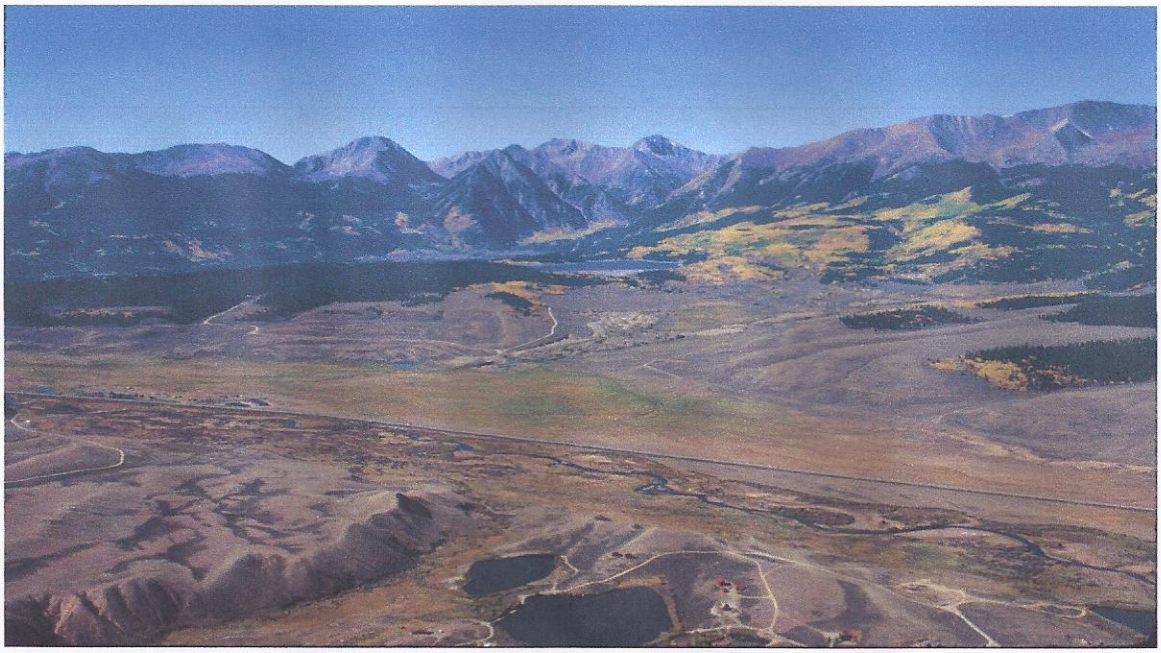
Arkansas River Ranch Trail
Phase I Construction Layout



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Introduction

Colorado State Parks (Parks) / Arkansas Headwaters Recreation Area (AHRA) acquired the parcel of land referred to as the Arkansas River Ranch on March 31, 2000, through a cooperative effort that included the Lake County Open Space Initiative (LCOSI), Colorado Division of Wildlife (CDOW), and U.S. Fish and Wildlife Service (FWS). The parcel is located on the east side of the Arkansas River between the Hayden Meadows Recreation Site to the north, and the Kobe Recreation Site to the south (see Photo Plate 1, Trail Alignment), and was secured through a combination of fee simple acquisition and conservation easements. Funding was provided through grants from the U.S. Fish and Wildlife Foundation and the Wetlands Initiative, for the purpose of habitat improvement, and enhancement of public fishing and recreational access. The acquisition further expanded the Arkansas Headwaters Recreation Area into Lake County.

The Public Review Draft of the Lake County Open Space Initiative Ecosystem Management Plan, distributed in January of 2003, mapped the Arkansas River Ranch as a *Recreation Management Emphasis Area*, and identified the Management Objective of improving non-motorized access to the Arkansas Headwaters Recreation Area. The underlying principal stated that "*Recreation is an important element of the local economy, as well as the financial stability and tourism draw of the State of Colorado*."[1] Proposed Management Actions included "*Work with the EPA and the Arkansas River Restoration Team to make adaptive reuse of haul roads, built to remediate fluvial tailings sites, as sustainable trails paralleling the river*."[2]

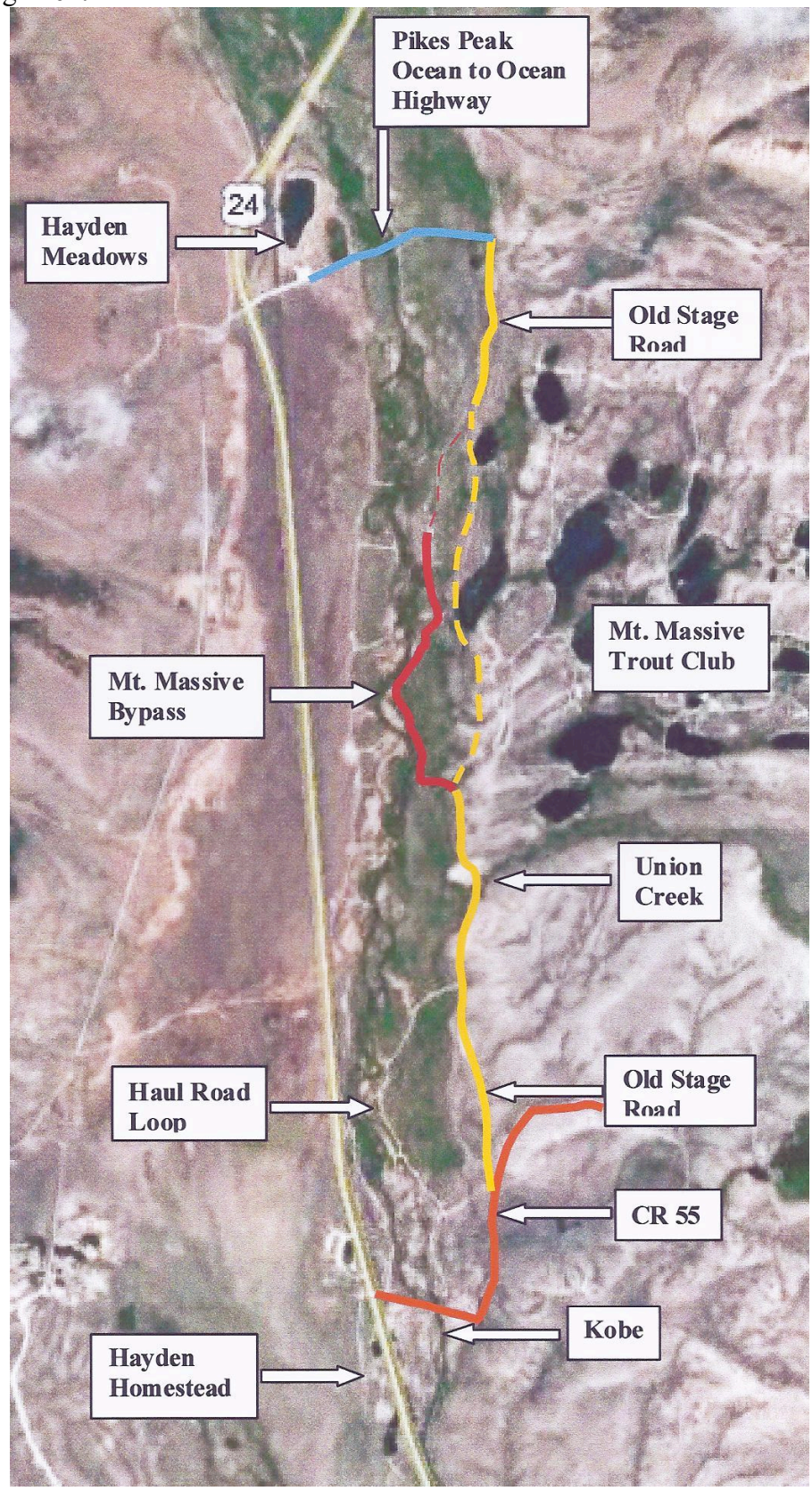
With regard to mechanized use of trails, the plan acknowledges that "*Mechanized recreational vehicles, most specifically mountain bikes, provide great recreation, and a low impact, non-polluting method of transportation.*" The Management Action Plan further provides direction to "*Plan and locate mountain biking and mechanized trails away from wetlands, riparian zones and areas of sensitive soils. Where avoidance is not possible, concentrate use on hardened, sustainable surfaces, boardwalks or bridges*."[3]

The proposed Arkansas River Ranch Trail makes extensive use of existing roads located on the ancestral terrace of the Arkansas River, including the historic alignment of the "Old Stage Road to Leadville". (See Photo Plate 1 – Trail Alignment) The exception is that section of the Old Stage Road passing through the private land holdings of the Mount Massive Trout Club (indicated on Photo Plate 1 by the dashed yellow line). To avoid trespass issues, and to access the fluvial tailings deposits located along the banks of the Arkansas River, the EPA constructed a section of haul road through the floodplain to support the weight of heavy equipment and deliver soil amendments to the remediation sites. This section of the trail is referred to as the Mount Massive Bypass, and is represented by the solid red line on Photo Plate 1.

It is on this section of the proposed trail alignment, where avoidance of riparian zones is not possible for logistical or legal reasons, that Phase I planning is intended to maintain the standards of sustainable trail development, while limiting visual, environmental, and hydrologic impacts to the floodplain.

[1] Conlin, R, Michael, *Lake County Open Space Initiative Draft Ecosystem Management Plan*, 2003, Section IV
[2] ibid
[3] ibid

Photo Plate 1
Trail Alignment



Sustainable Trail Development

The Lake County Open Space Initiative Ecosystem Management Plan mandates the development of "sustainable" trails.

By definition, a sustainable trail:

1) Limits environmental impacts
2) Minimizes maintenance
3) Meets user expectations
4) Is distinguishable from its surroundings
5) Keeps people on, and water off of the trail surface

Accessibility Guidelines currently being proposed by the United States Access Board will require that trails to have a firm, well drained surface, stable enough to accommodate anticipated usage without degrading the trail surface.[4]

The Proposed Accessibility Guidelines will also require a minimum prepared tread width of 36". "The beaten path may be narrower, however, the prepared tread width should be at least 36" wide to allow for traffic that inevitably tends to push the edges of the beaten path due to passing trail users, group trail use, and inadvertent use of the fringes of the trail."[5]

The purpose of Phase I of the Construction Layout is to delineate techniques and methods of mitigating the potential impacts of the adaptive re-use of the EPA haul road alignments for sustainable trail development, and to respond to issues arising from public scoping held in conjunction with the May 10th, July 12th, and September 13th 2012 LCOSI meetings. Scoping issues and comments included, but were not limited to:

- Construct the trail to human scale - minimize visual impacts;
- Keep the trail out of riparian areas wherever possible. Where not possible, seek mitigation measures that limit impacts on floodplain hydrology, wildlife, and scenic values;
- Keep people on the prepared trail surface - make it visually distinguishable from the surroundings to limit the evolution of "social trails" through the riparian areas and on stream banks;
- Limit stream bank erosion by protecting stream crossings (preferably with low flow crossings and/or bridges);
- Keep water from collecting on and degrading the trail surface;
- Provide a sustainable trail surface that can be easily accessed and maintained;
- Limit constraints on wildlife movement;
- Limit constriction of floodplain hydrology;
- Meet user expectations;
- Limit barriers for use by individuals with disabilities;
- Retain emergency, monitoring, patrol, and maintenance vehicle access;
- Establish connectivity between trailheads at Hayden Meadows and Kobe; and,
- Consider seasonal closures to protect wildlife.

[4] Passo, Mike. Board of Directors, American Trails, *Comparing proposed Accessibility Guidelines with current recommendations for sustainable trail design*
[5] ibid

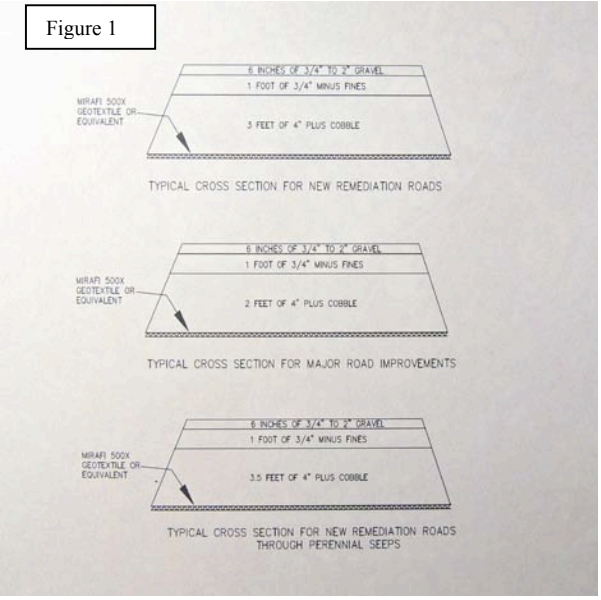
Background

In 2009, following years of study, the United States Environmental Protection Agency (EPA) began the remediation of fluvial tailings deposits within the 11-Mile Reach of the Arkansas River. The action was part of a CERCLA (Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. t 9601) response to contamination of the 11-Mile Reach of the California Gulch Superfund Site, caused by the release of acid mine drainage and heavy metals into the watershed from historic mining activities upstream in the Leadville Mining District.

Fluvial tailings deposits resulted from the deposition of water borne mine sediments onto the flood plain during periods of high flows, and represent a nonpoint source of contamination to surface and ground waters. The contaminated areas were characterized by highly acidic soils, barren of vegetation, that were being washed back into the river during high flow events and through the natural lateral meandering of the river channel. The result was re-contamination of the Arkansas River. The CERCLA response included soil amendments with a mixture of biosolids, beet pulp, compost, and lime or limestone, incorporating the mixture into surficial soils, and re-seeding the remediated areas.[6]

In order to remediate the contaminated sites within the floodplain, the EPA constructed a series of haul roads to provide access for heavy equipment to reach the points of contamination. The EPA worked cooperatively with LCOSI and Colorado State Parks to align and construct the haul roads in a manner that would allow for re-purposing of the alignments for use as a recreational trail after remediation was completed. The construction of a pedestrian, equestrian, and bicycle trail, allowing authorized emergency vehicular access on Parks lands the east side of the Arkansas River, was consistent with management goals in the 2006 Final LCOSI Ecosystem Management Plan.[7]

Figure 1



The haul roads were designed and engineered to carry the weight of 100,000 pound haul trucks, front end loaders and bulldozers over the unstable riparian soils of the floodplain to reach the remediation sites along the Arkansas River. Design and engineering of the roads was provided by Frontier Environmental Services.[8]

To carry the weight of heavy equipment, the roads were designed to bridge the unstable soils through the installation of geotextile fabric, covered with as much as 3.5 feet of 4" plus cobble, 1 foot of ¾ minus road base, and 6 inches of ¾" to 2" traction rock. (Figure 1)

[6] Walton-Day, Katie, *Effects of Fluvial Tailings Deposits on Receiving Waters in the Upper Arkansas River Basin, Lake County, Colorado*, USGS, Feb. 2009
[7] Conlin. Michael, *Lake County Open Space Initiative Ecosystem Management Plan, Final, 2006*
[8] Frontier Environmental Services, *CALIFORNIA GULCH CERCLA SITE. OPERABLE UNIT (OU) 11 ,REMEDIAL ACTION PROJECT. REMEDIATION ROAD DESIGN AND CONSTRUCTION PLAN* , 2009

Photo Plate 2

Haul road construction was completed during the winter of 2009/10, to take advantage of the additional bearing strength of the frozen soils. Roads were constructed to the specifications provided by Frontier Environmental, along alignments collaboratively established by the EPA, Parks, and LCOSI to allow for their adaptive re-use as the foundation for the trail system identified in the LCOSI Ecosystem Management Plan. (Photo Plate 2).

Construction of haul road, Mount Massive Bypass section, 1/13/09

The EPA offered two alternatives for the disposition of the haul roads following completion of the remedial action. The first was complete removal of the roads down to native soil, followed by re-seeding. Parks selected this alternative for the south loop of the haul road system in response to wildlife, environmental, and hydrologic concerns. The EPA deconstructed that section of roadway in the winter of 2011/12.

Photo Plate 3

Photo Plate 4

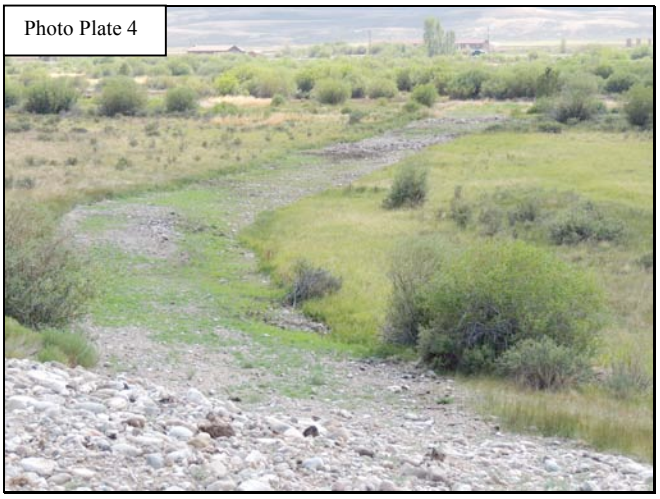


Photo Plate 3 South Loop Haul Road during construction

Photo Plate 4 South Loop Haul Road following deconstruction

The second alternative was to narrow and lower the road grade to a nominal thickness of one foot, and a crest width of 10 feet, to reduce the visual impact, decrease impacts on wildlife movement, limit constriction on the floodplain hydrology, allow for monitoring and repair of remediation sites, provide access for emergency and patrol vehicles, and leave a foundation for sustainable trail development. State Parks selected this alternative for the Mount Massive Bypass, where the EPA haul road diverges from the Old Stage Road alignment to access the fluvial tailings deposits within the floodplain, and to avoid trespass onto the private lands of the Mount Massive Trout Club. (see Photo Plate 1)

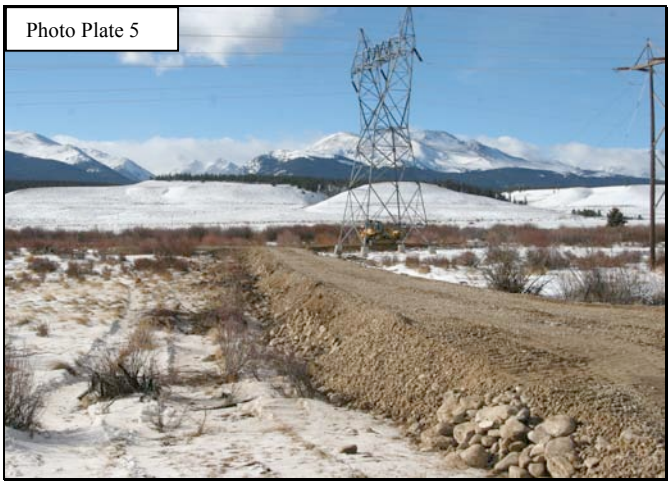


Photo Plate 5 Mt Massive Bypass during construction
Note: High profile and cobble foundation

Photo Plate 6 Mt. Massive Bypass post-deconstruction
Note: Reduced profile & width, exposed cobble at surface

Work to reduce the profile of the Mount Massive Bypass haul road was performed during the winter of 2011/12 to take advantage of the additional bearing strength of working over frozen ground, and to reduce damage to the surrounding riparian zone. Reduction of the haul road thickness required removal of the upper traction rock and road base layers, exposing the underlying cobble. The exposed cobble layer reduces revegetation potential and vertical migration of water (wicking) to the root zones.

Working in frozen ground also left an uneven surface on some areas, where frozen dirt came up in large chunks leaving ruts and voids that trap water, while preventing final grading to provide a suitable travel surface (see: Photo Plate 7). Phase I anticipates selective addition of fines and re-grading of the surface to provide a growing medium for revegetation and a smooth travel surface.

Photo Plate 7 Rutted surface left behind following winter excavation

Construction Layout

Photo Plate 8 illustrates the spatial relationship of key planning elements along the Phase I trail alignment, including the locations of existing culverts and proposed low flow crossings.

Stations were established using a cloth tape, following the approximate centerline of the haul road. Neither the alignment nor the stake locations have been surveyed, consequently, all locations and measurements should be considered approximate. Flagged and numbered stakes were set at 100 foot intervals starting at a Point of Beginning (POB) where the southern end of the Mount Massive Bypass intersects the Old Stage Road. The POB is approximately 100 feet south of the gated entrance to the Mount Massive Trout Club, on properties acquired by Colorado State Parks / Arkansas Headwaters Recreation Area.

Stakes were flagged and sequentially marked to indicate their distance from the point of beginning. Where elements such as culverts are encountered, their distance from the POB was noted on the stake and in survey notes. The alignment was flagged from south to north by Mike Conlin and Rob White. Because the culverts were assigned numbers starting from north to south in previous documentation, the north to south culvert numbering sequence has been retained.

The Point of Terminus (POT) is located approximately 3,725 linear feet to the north of the POB, where the EPA haul road intercepts a two track road used to access earlier remediation sites. No work is anticipated on the section of road beyond Station 37+25 in Phase I planning.

All other sections of the trail alignment utilize the existing "Old Stage Road," County Road 55, and the historic Pikes Peak Ocean to Ocean Highway, and will be used without modification in Phase I, other than the application of standard maintenance practices. The exception will be the section of the "Old Stage Road" immediately south of Union Creek, (see Photo Plate I) where the stream channel is undercutting the toe of the slope supporting the road. In this location, a collaborative LCOSI effort, led by Colorado Mountain College, will be working to protect the infrastructure using bio-engineering techniques to stabilize sections of the toe, while moving the stream channel away from the base of the slope to eliminate the over-steepening that would eventually lead to slope failure and loss of the road. That Union Creek Pilot Project is independent of the work described in the current Phase I Construction Layout.

Locations for the installation of low flow crossings, which are intended to allow flood waters to flow across the trail between the river and the flood plain during runoff, were collaboratively established and marked in the field during an August 28, 2012 site visit attended by Tracey Kittell, Jamie Anthony, and Rob White of Colorado Parks and Wildlife, and Mike Conlin.

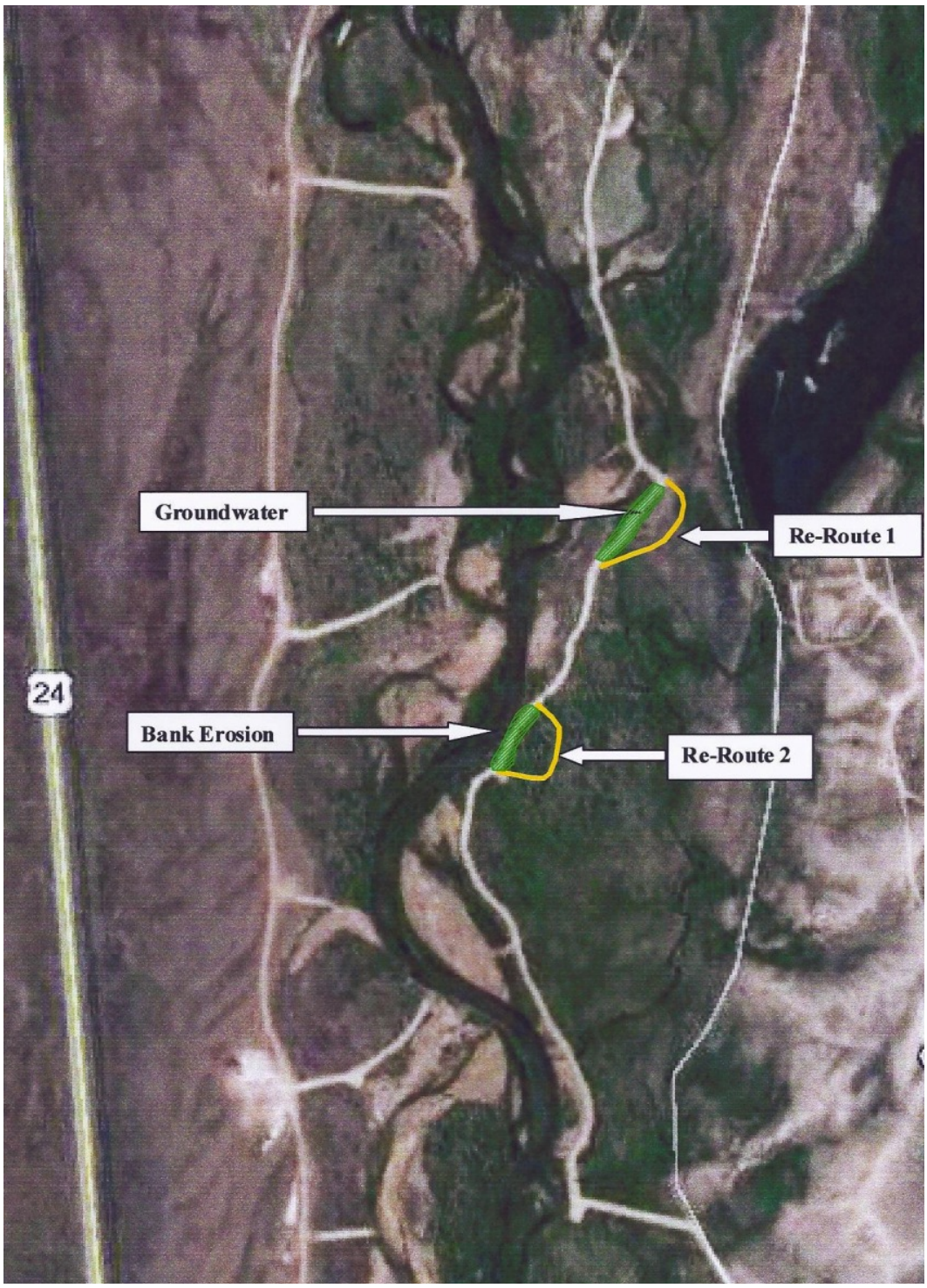
All treatments described in this document are displayed in tabular form on Table 1, including their relative location along the alignment, type of treatment proposed, unit of measurement (cubic yards, square feet, linear feet etc.), special instructions, and compilation of material volumes, lengths, or square footages.

Photo Plate 8 – Reference Stations: Mount Massive Bypass

Areas of Avoidance

Two locations along the EPA haul road alignment have been identified as places where avoidance of physical or environmental constraints and re-routing of the trail alignment, to a position off of the original EPA haul road, are considered to be the appropriate planning response. (See Photo Plate 9: Areas of Avoidance)

Photo Plate 9: Areas of Avoidance



Area of Avoidance 1

Re-route I (see: Photo Plate 9) avoids an area where the complete removal of the soil bridge and underlying geotextile fabric have resulted in the interception of groundwater seeping from the perched pond in the adjacent Mount Massive Trout Club (see: Photo Plate 10). The saturated organic soils exposed by the removal of the haul road are not capable of supporting equestrian, foot, or bicycle traffic throughout much of the spring and summer seasons without degrading the trail surface, and would not be capable of supporting emergency, monitoring, patrol or maintenance vehicles without significant damage to the underlying trail base.

Photo Plate 10
Area of Avoidance 1

Immediately to the east of the current road alignment is an area of upland soils capable of supporting trail development (see: Photo Plate 11.) The upland soils transition through a short section of the riparian area before intersecting with the stable section of the EPA haul road at Station 23+50 (see: Photo Plate 12).

State Parks made the decision to go around the problem area, rather than reconstructing the soil bridging to decrease environmental and hydrologic concerns. At the southern transition between the new and old alignments, a low flow crossing (LFC-5) will be installed to allow natural flows between the river and the floodplain to pass over the trail surface during periods of high flow.

Photo Plate – 11 Re-route 1

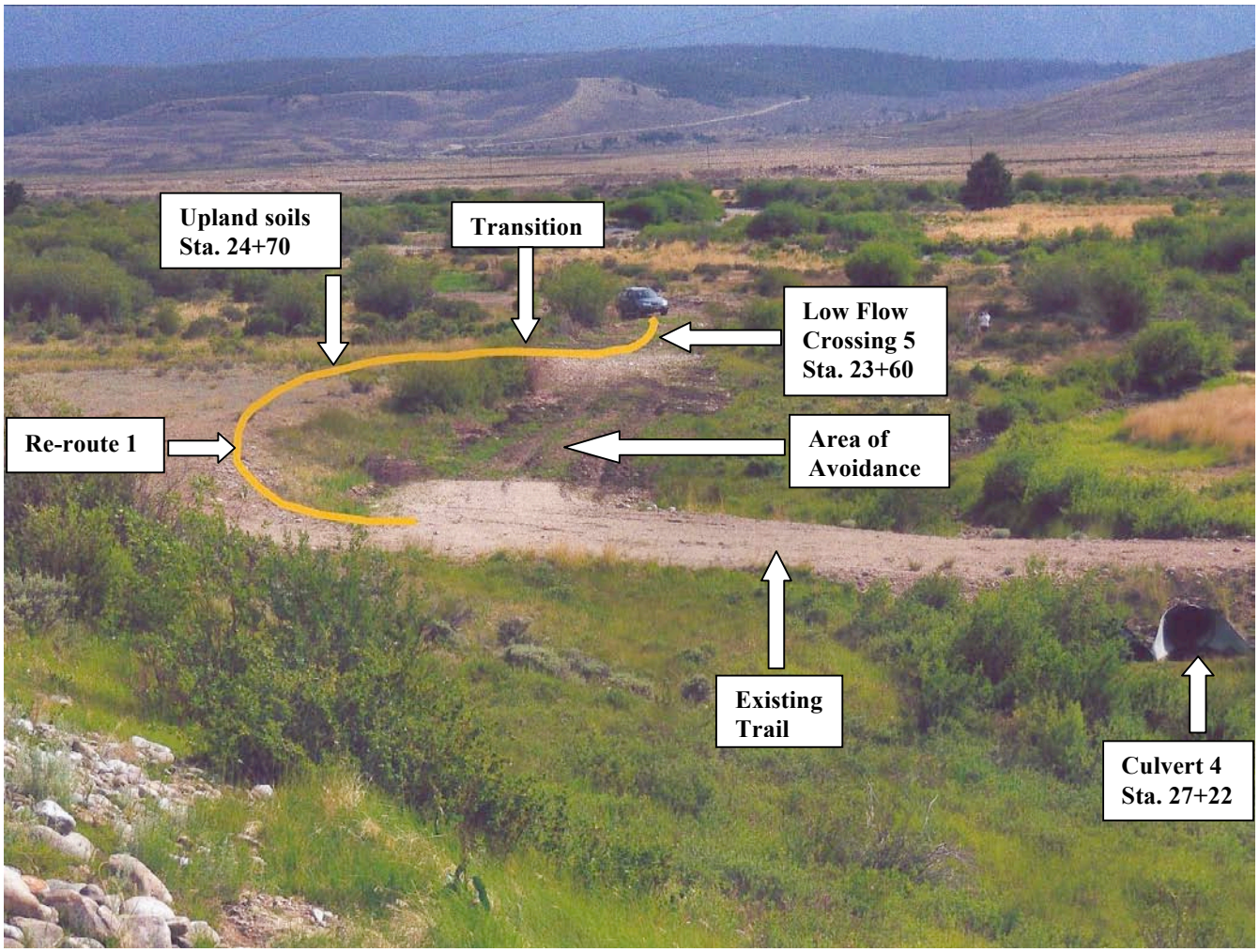


Photo Plate 11 illustrates the proposed re-route around the saturated soils exposed by de-construction of the EPA haul road. The proposed treatment for the area passing over the upland soils would be the addition of a 4' wide by 4" thick on-grade application of compacted ¾" minus road base, to distinguish the trail from its surroundings, and to elevate the trail tread above ground level surface flows and allow it to shed water. Drainage on the 4' wide trail tread will be accomplished by cross sloping the trail tread to the down slope side. Cross sloping will be at a minimum 2% grade, but in no circumstance will exceed 5%.

Treatment of the transition from upland soils at Station 24+70 through the riparian area to the low flow crossing at Station 23+60 (see: Photo Plate 12) will consist of soil bridging as depicted in Figure 2. The treatment will consist of a 12' wide application of geotextile cloth (Mirafi 500x or equivalent), 6 inches of 4" minus cobble, covered with a 3" layer of compacted ¾" minus fines. On top of the soil bridge, a 4' wide by 4" thick compacted trail tread will be installed to differentiate the trail tread from its surroundings and to shed water. All covered surfaces will be reseeded by CPW personnel. A typical cross section of a low flow crossing is depicted on Figure 6, and would be installed at Station 23+60.

Photo Plate – 12 Re-route 1: Transition

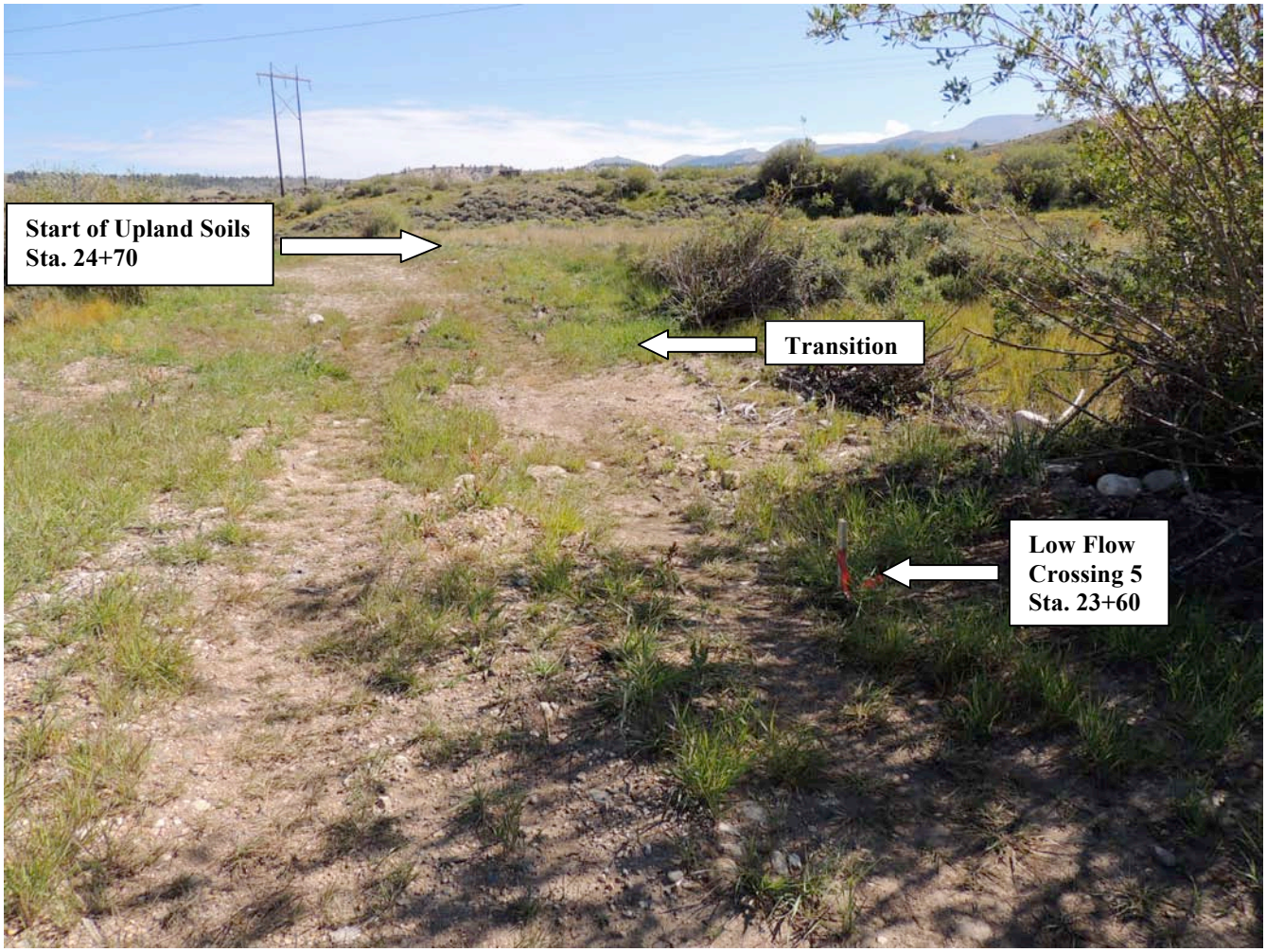
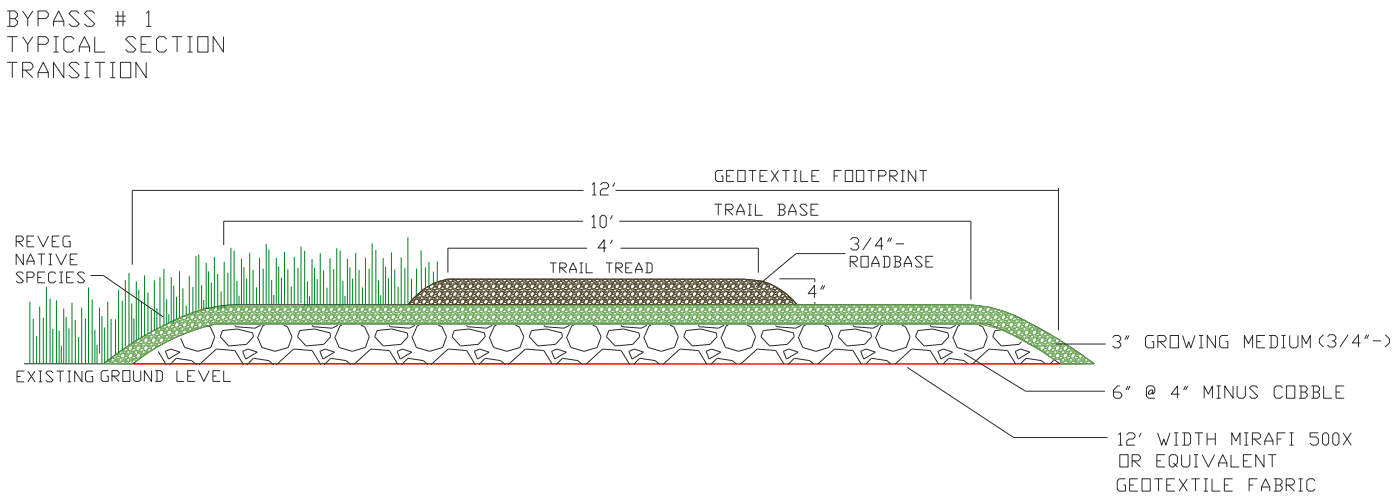


Figure 2
Re-route 1



Area of Avoidance 2

Re-route 2 occurs in an area where natural lateral migration of the Arkansas River has undercut the EPA haul road (see: Photo Plate 13.) Past efforts to halt the migration of the river channel failed, and the current attempt has not been challenged by high runoff to determine whether it will function as designed. The decision was made that it would be easier to move the road than the river, and the EPA installed a bypass route around the area of stream bank erosion where the original haul road was established. (See Photo Plate 9)

Photo Plate 13 - Area of Avoidance 2

Photo Plate 13 Erosion of the EPA Haul Road caused by lateral migration of the river – October 2011 photo.

Addition of 4' Trail Tread

Photo plate 14 illustrates a section of trail looking north from Station 11+50, where sufficient cobble and fabric have been left on grade to support light vehicle traffic, and where revegetation has been successful to the point where the trail base is virtually indistinguishable from the surrounding topography and vegetation. Successful revegetation also masks irregularities in the trail base surface left by winter removal of the frozen ground, that present a less than desirable travel surface.

Photo Plate 14

Addition of four foot wide trail tread
Distinguish trail tread from surroundings – allow surface drainage

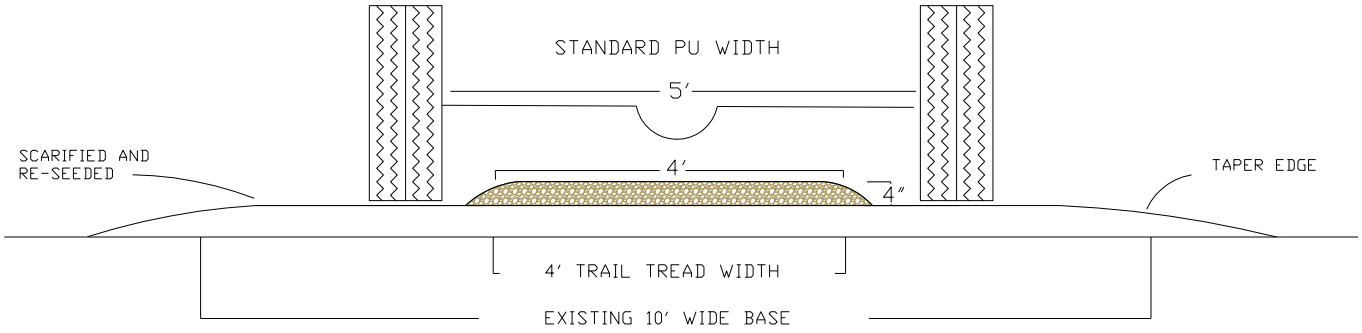
On-grade section of the reduced haul road where visual queuing and water control measures are not in place

The trail lacks visual queuing and the ability to shed water. The proposed treatment is to re-grade the trail base to accommodate vehicular travel, adding additional ¾" minus road base material as necessary to fill voids and ruts, and to add a 4' wide by 4" thick compacted trail tread on top of the trail base to differentiate it from its surroundings and allow it to shed water. The edges of the trail base will be tapered to match the existing topography, and to allow water to be diverted away from the trail tread to maintain a stable trail platform. CPW will re-seed the trail base following trail construction.

The 4' wide trail tread can also be spanned by the wheel base of a standard pickup truck, (See: Figure 3) so that construction, maintenance, monitoring, or emergency vehicles can drive on the trail base without damaging the trail tread, Standard pickup clearance will also allow the

passage of light vehicles over the 4" thickness without dragging the under-carriage and damaging the vehicle or the trail surface.

Figure 3
Typical Section – 4' Trail Tread



NOTES:

STANDARD PICKUP CAN SPAN THE 4' TREAD WIDTH WITHOUT DAMAGEING IT
STANDARD PICKUP CLEARANCE WILL CLEAR 4" DEEP TRAIL TREAD
EXISTING TRAIL BASE SCARIFIED, TAPERED AND SEEDED
ELEVATED TRAIL TREAD DISTINGUISHES TRAIL FROM SURROUNDINGS
KEEPS PEOPLE ON, AND WATER OFF TRAIL TREAD
TRAIL TREAD CONSTRUCTED WITH 4" OF 3/4" MINUS ROAD BASE(COMPACTED)

Culvert Removal

Six culverts currently allow the passage of water under the haul roads on the Mount Massive Bypass section. The culverts are 36" diameter tubes with flairs at the inlet and outlet ends.

Culverts 1 and 6 (see Photo Plate 8) cross seeps that only flow seasonally, and even then, at very low rates of flow. These culverts were covered with as much as 3 feet of cobble and fines to handle the weight of the heavy equipment required for the remediation work. The resultant high profile of the culverts appears as un-natural looking humps above the existing ground level (see: Photo Plates 15 and 16).

The treatment of culverts 1 and 6 will be to remove the overlying earthen materials and extract the culverts, and to replace them with low flow crossings. Low flow crossings are designed to place a flat surface of rock at the existing ground level to allow water to pass unimpeded through the elevated trail base in areas where it would naturally flow during seasonal inundation. The flow is spread out over the width of the rock surface to limit its depth and velocity, allowing bicyclists and emergency vehicles to cross the shallow seeps and ephemeral streams on a solid base without damaging the trail surface or impeding natural flow regimes. A typical Section of a low flow crossing is illustrated in Figure 6.

Photo Plate 15 illustrates the current positioning and profile of Culvert #1, located at Station 33+37. Removal of the culvert and re-contouring of the slope to descend from Culvert # 2 to the low flow crossing will require the removal of approximately 120 cubic yards of material. Figure 4 illustrates the current and desired profile following culvert removal.

Photo Plate 16 illustrates the current positioning and profile of Culvert #6, located at Station 2+23. Removal of the culvert and re-contouring the slope for installation of a low flow crossing will require the removal of approximately 12 cubic yards of material. Figure 5 illustrates the current and desired profile following culvert removal.

A location for disposal of any surplus soils from excavation will be provided by CPW.

Culverts 2 through 5 cross tributaries and distributaries to the Arkansas River that typically flow year round, at volumes too great to provide safe pedestrian and bicycle crossing using low flow crossings. These culverts will remain in place throughout Phase I to allow construction equipment access to the entire trail length of the Mount Elbert Bypass, for the delivery of trail building materials (cobble, geotextile cloth, fines etc.), to facilitate grading and compaction, and to accommodate emergency, patrol, monitoring and fire protection vehicle passage. These culverts will be reviewed in future trail development phases, and replacement with bridges will be considered to reduce maintenance resulting from beaver activity and natural plugging of the culvert tubes with debris and sediment.

Photo Plate 15 - Culvert Removal
Culvert # 1
Station 33+37

Figure 4

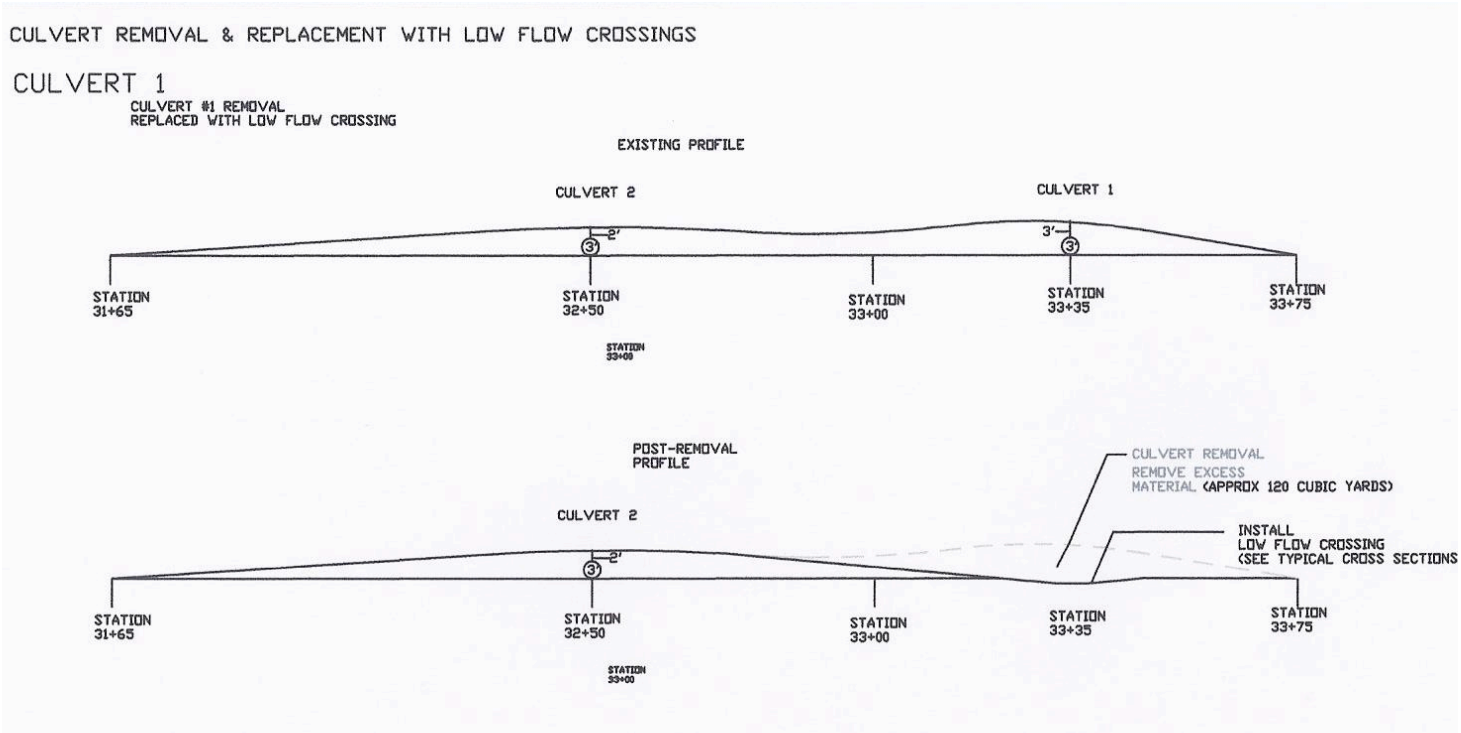
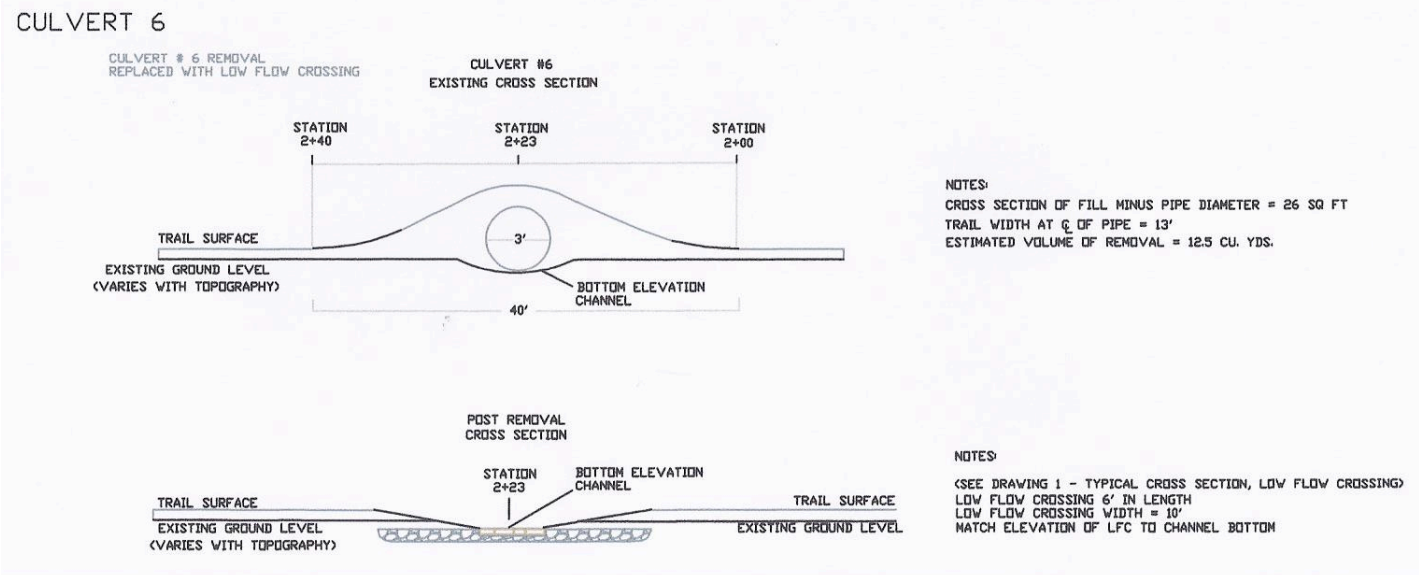


Photo Plate 16 - Culvert Removal
Culvert # 6
Station 2+23

Figure 5



Low Flow Crossings

Low flow crossings are intended to provide two basic functions. The first is to allow flood waters to disperse through perennial seeps, natural low lying swales, and overflow channels (see: Photo Plate 17) to hydrate the habitats and vegetation in the surrounding flood plain. The trail surface, by necessity, must be elevated above the natural ground surface to bridge unstable soils, provide the visual queuing to keep people on the trail, and to provide a trail surface that is elevated above sheet flows and can shed water in order to maintain a sustainable surface. The elevated nature of the trail base and tread, however, can create inadvertent dams that prevent the natural flow of surface water back and forth between the river and the floodplain. The low flow crossing sets the top of the rock surface at the historic elevation of the channel or swale to allow water to flow unimpeded as it has done historically (see Figure 6).

The second function is to provide a shallow water, hardened surface to support the weight of construction, monitoring, patrol, and emergency vehicles across unstable wetland soils on those occasions when they are needed, and to allow bike riders and pedestrians a shallow water crossing through seeps and flooded swales on a hardened, stable surface, rather than creating a series of ruts in saturated organic soils that future users tend to circumvent, resulting in new ruts, until a 4 foot wide trail turns into a 20 foot wide mud hole.

The construction principals of the low flow crossing are illustrated in Figure 6. Construction will begin with excavation under the full width of the trail base to a depth of 1' below existing ground level. The linear distance along the trail axis will vary with the depth of the existing trail base, but under no circumstances will the excavation be less than the distance required to underlay the full length of the 10:1 taper leading up to the elevation of the existing trail base. (see: Figure 6)

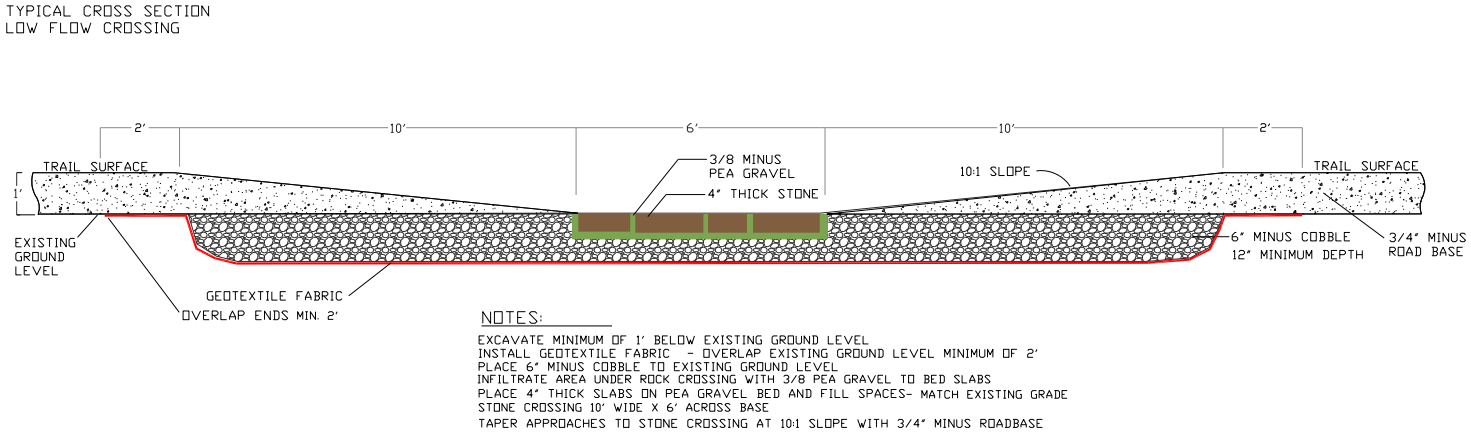
Following excavation, geotextile fabric (Mirafi 500x or equivalent) will be laid in the bottom of the excavation, extending a minimum of 2' beyond the ends of the excavation, as measured on the axis of the trail, and the resultant cavity will be filled with 4" minus cobble to form a rock bridge over the unstable soils. The interstitial spaces between the cobbles will also allow limited sub-surface flows below the trail surface.

Centered in the soil bridge, a 3" thick bed of 3/8" pea gravel will be laid down to a trail width of 10 feet, and a length of 6' as measured along the trail axis. The elevation of the top of the bed will be approximately 4" below final grade, to accommodate the placement of 3 to 4" thick sandstone slabs. Stone slabs will be placed in such a manner as to minimize the gap between the slabs that could trap or redirect a bicycle wheel. The surface elevation of the slabs will be at existing ground level to allow water to pass between and over the stone slabs at the historic grade. The downstream edge of the sandstone will be "day lighted" so that the water falls away to prevent ponding of water on the stone surface. Interstitial spaces between the slabs will be filled to surface level with 3/8" pea gravel.

The trail surface will be re-established by the placement of ¾" minus road base over the exposed cobble at a slope no less that 10:0 between the existing trail base and the sandstone surface. In the case of a 1 foot thick trail base (example: low flow crossing 1 at 2+23), this will allow a passageway for flood flows approximately 26 feet wide before topping the trail surface.

Photo Plate 17 - Low Flow Crossing
Typical Section
Low Flow Crossing #4, Station 22+17

Figure 6



Revegetation

The removal of the traction rock and road base layers from the haul road to lower the trail profile left the basement layer of 4" plus cobble exposed on some sections of the road. These areas lack the necessary soils to support rooting, moisture retention, and nutrient cycling required to support native vegetation, and reduce the "wicking" potential of the growing medium to draw water up through the substrate to nourish and hydrate the plants.

Photo Plate 18 illustrates the barren cobble surface of the reduced road profile on the Mount Massive Bypass, as viewed looking north from Station 4+50.

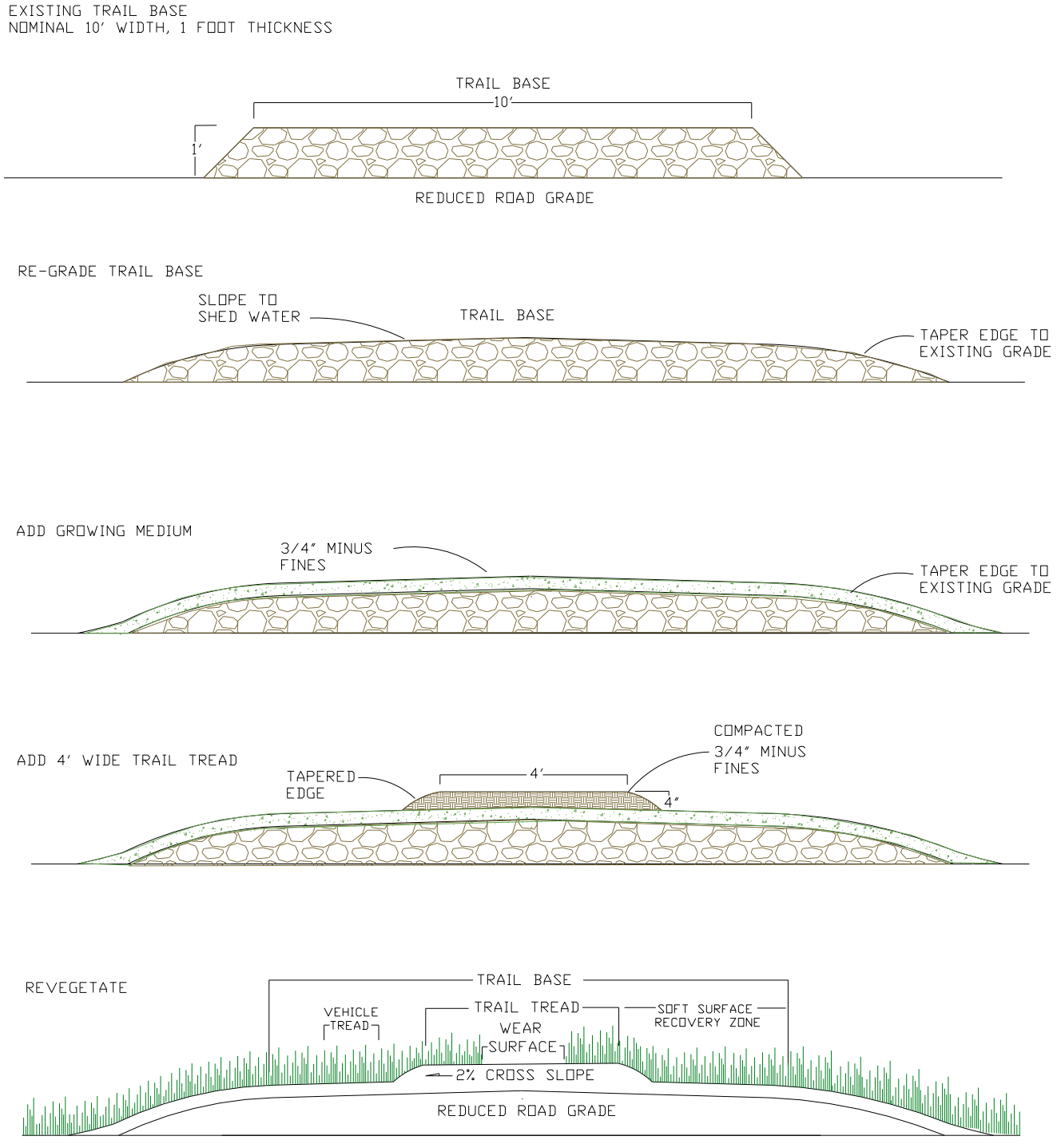
Figure 7 illustrates proposed treatment, including the addition of a nominal thickness of 3 inches of ¾" minus fines over the existing trail base to provide a growing medium and infiltrate the interstitial spaces between the cobbles to facilitate wicking of moisture to the root zone. The addition of fines will also facilitate the tapering of the edges of the trail into the surrounding topography to lower its visual impact. The trail base will be graded and compacted. Centered on the trail base, a 4' by 4" elevated and compacted trail tread will be installed to differentiate the trail from its surroundings for purposes of providing visual queuing, allowing it to shed water. CPW will be responsible for re-seeding the trail base.

Photo Plate 18 – Cobble surfaced road

Addition of Growing Medium and 4' wide trail tread

Area of exposed cobble surface adjacent to remediation site as viewed from Station 4+50

Figure 7: Construction Sequence
Conversion: Reduced cobble surfaced road to trail



Desired Final Profile

When fully revegetated, the desired end product would include a wear surface that visually resembles a single track trail, elevated above ground level on a 4' wide compacted trail tread, centered on a trail base capable of supporting the weight and configuration of construction, maintenance, monitoring, patrol and emergency vehicles without damaging the trail tread. The design would accommodate 3' of soft surface recovery zone on either side of the trail tread to allow time and space to recover if a bicycle or wheel chair meanders off of the compacted trail tread, and to allow trail users (e.g. a horse and bicyclist) traveling in opposing directions to safely pass each other. (See: Figure 7 – Construction Sequence)

The trail tread width would meet or exceed accessibility standards proposed by the United States Access Board, reduce the visual impact of the existing haul roads, and comply with criteria for sustainable trail development. Its elevated grade serves to present visual queuing to help keep people on the trail, while shedding water to maintain a sustainable trail surface. The compacted 4' trail width, shallow water crossings and minimal grade changes limit barriers to individuals with disabilities. The trail is suitable for the anticipated user groups, including recreational mountain bikers, hikers, wildlife watchers and photographers, fishermen, and equestrians.

The lowering of the haul road profile and conversion into a trail will also limit constraints on wildlife movement and reduce impacts upon the floodplain hydrology. In addition, the low flow crossings will help to maintain the movement of water between the river and the floodplain during periods of high flow, while providing a sustainable trail surface over seeps and overflow channels during periodic flooding to prevent the development of social trails and stream bank erosion around wet areas.

Trailheads, parking, pedestrian pass-through's, bridges, gates, and directional, informational and interpretive signage will be the subject of future development phases. Buck and Rail fencing or similar structures and locking gates will allow for seasonal trail closures as needed or desired to limit impacts on wildlife.

Quantifications and Specifications

Table 1 provides a station by station breakdown of the treatments to be applied along the alignment of the Mount Massive Bypass. Information includes the delineation of the identified station or reach, cross reference to the applicable treatment schematics, a physical description of the station or reach, the type and quantification (linear feet, square feet, cubic yards etc.) of the treatment as described within the text of this document, and any additional instructions as they apply to construction of the trail. Table 1 also summarizes the anticipated quantities of materials required, including compaction factors, for each treatment. Table 2 provides a summary of anticipated quantities by material type.

As used within the context of this document, the terms "fines" and "growing medium" refer to screened ¾" minus material located in stockpiles on the west side of the river and provided by CPW. The term cobble refers to clean, screened 4" minus rock that will be provided by the contractor. The term "stone slabs" refers to 3" to 4" thick, flat sandstone slabs, used in the construction of the rock pans of the low flow crossings and provided by the contractor. The term geotextile fabric refers to 12 foot wide rolls of Mirafi 500x or equivalent fabric.

Re-seeding of the trail base will be the responsibility of CPW. The native seed mix will be determined by CPW for the specific habitats in which seed will be applied.

Disposition of the culverts removed from the Mount Massive Bypass alignment shall be determined by CPW.

Upon completion of the task of work, contractors shall be responsible for returning the site to its pre-construction condition, including the removal of any surplus or construction materials.

CPW contact for the ascribed project shall be:

Rob White
AHRA Park Manager
Colorado Parks and Wildlife
307 West Sackett Ave
Salida, Colorado 81201
(719) 539-7289

Trail Management

The Arkansas Headwaters Recreation Area will manage the Arkansas River Ranch Trail for non-motorized trail use. The typical non-motorized trail use is expected to include pedestrian (hiking), wheelchair, horseback riding and bicycle use. The trail will also be able to be utilized by emergency type vehicles (CPW vehicles / Fire Trucks / Emergency Medical Vehicles) for emergency purposes which would typically include trail condition/maintenance work, fires and/or medical emergencies.

The Arkansas Headwaters Recreation Area may institute seasonal trail closures as part of the best management practices for the Arkansas River Ranch Trail for wildlife and/or trail condition purposes. If it is deemed necessary to close the Arkansas River Ranch Trail a gate type structure will be placed at appropriate locations by Arkansas Headwaters Recreation Area staff to ensure closure of the desired portion of the trail for a necessary time period.

Table 1

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Replace with Table 1 printed on Tabloid paper – 11x17" landscape orientation

Table 2
Arkansas River Ranch Trail
Material Take-offs

Task/Material	Unit	Quantity
Blade surface & feather edges	Lin. Ft.	3693 L.F.
Add ¾" minus growing medium (Includes 15% compaction factor)	Cu. Yd.	173 C. Y.
Culvert Removal	Unit	2
Install Low Flow Crossings	Unit	9
Mirafi 500x @ 12' wide Geotextile Cloth (or equivalent)	Lin. Ft.	390 L.F.
6" minus Cobble	Cu. Yd.	158 C.Y.
4' x 4" tread – ¾"minus roadbase (Includes 15% compaction factor)	Cu. Yd.	160 C.Y.
3-4" sandstone slabs	Sq. Ft.	540 S.F.
3/8" pea gravel bedding	Cu. Yd.	9 C.Y.
¾"minus leveling fines (Includes 15% compaction factor)	Cu Yd	80 C.Y.

Total: Material by classification

¾"- Roadbase (+ 15% for compaction)	413 C.Y
6" minus Cobble	158 C.Y.
3/8" Pea Gravel	9 C.Y
3-4" sandstone slabs	540 S.F.
Mirafi 500x (or equivalent) Geotextile fabric	390 L.F.
Surface prep – blade & feather	3693 L.F.

ACOE Nationwide 42 Permit: Area of Wetland Disturbance
(Separate from EPA Nationwide 38 roads)

New Trail at north bypass: 110 l.f. @12' base width	Sq. Ft.	1320 SF	
9 Low Flow Crossings @ 360 S.F. ea.	Sq. Ft.		3240 S.F.
Culvert Removal: 105 l.f. @12' base width	Sq. Ft.		1260 S.F
Total			5820 S.F or 0.134 acres

Table 1
Trail Description by Station

From Station	To Station	Description	No Modification	Blade Surface & Feather (L.F.)	Add growing Medium to 3" depth & seed (L.F.)	Remove Culvert (Unit) Material CY	Add Low Flow Xing (Unit) (See Section 2)	Add Geotextile Fabric (LF)	Add 6"-Cobble (Cu. Yd.)	Add 4' Tread (L.F.) (See Section 1)	4" Flat stone slabs (Sq. Ft.)	3/8"Pea Gravel (Cu. Yd.)	Add fines to level surface (3" depth) (Cu .Yd.)	Other Instructions
POB 0+00	2+00	Start of trail to culvert 6		200	200									
2+00	2+40	Re-grade after removal of Culvert 6		40	40								7.5	
2+23		Culvert # 6 - Remove add Low Flow Crossing				1 Culvert 15 CY Material (See Dwg 2)	1	30	12		60	1	2	
2+40	3+00	Culvert 6 to Point on Curve		60	60									
3+00		Widened turn around area – reduce width												Narrow to 10'
3+00	3+40	Point on Curve		40	40									
4+11		Culvert # 5	1											
3+00	7+80	On grade cobble surfaced trail section		480	480					480				
7+80	9+45	Revegetated trail section		165						165				
9+45	12+00	Rough trail base Surface		265						265			28	
11+23		Low Flow Crossing # 2					1	30	12		60	1		
12+00	15+30	On grade, vegetated section		330						330				
15+30	19+00	EPA Bypass around blown out road section		370	370					370				
19+95		Low Flow Crossing # 3					1	30	12		60	1	2	
19+00	22+20	On grade trail		320						320				
22+17		Low flow crossing # 4					1	30	12		60	1	2	
22+17	23+60	On grade trail		143						143				Cut down berm west side of trail
23+60		Low Flow Crossing # 5					1	30	12		60	1	2	
23+60	24+70	Seep – construct new trail section -fabric, cobble and fines		110				120	50	110			12	
24+70	27+22	Upland bypass around seep from perched pond to Culvert # 4		252						252				
27+22		Culvert # 4 CL of 3 barrel culvert	1											
27+22	30+60	Trail section between Culverts # 4 and # 3		338						338				
27+76		Low Flow Crossing # 6					1	30	12		60	1	2	
29+00		Low Flow Crossing # 7					1	30	12		60	1	2	
29+81		Low Flow Crossing # 8					1	30	12		60	1	2	
30+60		Culvert # 3 CL of 3 barrel culvert	1											
30+60	31+65	Start of ascent to Culvert # 2		105						105				
32+50		CL Culvert # 2	1											
32+50	33+75	Re-grade, following removal of Culvert # 1		125	125									
33+37		Culvert # 1 Remove and replace w/ Low Flow (Section 2)				1 Culvert 120 CY Material (See Dwg 2)	1	30	12		60	1	6	
33+75	37+25	Point of terminus, start of existing EPA road		350										
Totals	3,725 linear feet of trail	POB to POT	4 culverts Stay in place	3693 Linear feet	1315 L.F. @ 12'x3" 150 CY +15% compact 173 CY	2 culverts Remove 135 Cu Yd material	9 units	390 linear feet @ 12' wide Mirafi 500x or equivalent	158 Cubic Yards	2878 LFt @ 4'x4" 140 Cu Yd +15% compact 160 CY	540 Sq. Ft. 3-4" nominal flat Sandstone	9 CY	68 Cy +15% compact 80 cy	Unit Price