



# **Middle North Empire Creek Stream Restoration Project**

## **Final Construction Report**



**By**

**J. David Holm, Executive Director  
Clear Creek Watershed Foundation**

**December 2016**

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| <b>Project Title</b>                      | <b>Middle North Empire Creek Stream Corridor Restoration Project</b>   |
|   | <p><b>Implementing Organization: Clear Creek Watershed Foundation-</b> a Not-for-profit 501c(3) watershed organization.<br/>         Project Manager: J. David Holm,<br/>         Title: Executive Director<br/>         Address: P.O. Box 1963 Idaho Springs, CO, 80452<br/>         Phone: Office 303-567-2699; Cell 303-601-6320<br/>         E-mail: jdavidholm@gmail.com</p>  |
| <b>Direct Project Funding</b>             | <p><b>CDPHE NPS Contract # CT FAAA201700001997. Amount: \$196,204.00</b><br/> <b>CDRMS PO # _GG1 PKAA 201700000519. Amount \$39,000.00</b></p>   |
| <b>Contractor</b>                         | <b>Frontier Environmental Services, LLC (FESI)</b>   |
| <b>Geographical Area Served</b>           | North Empire Creek discharges into Lion Creek, which is a tributary to West Clear Creek within the Town of Empire, Colorado. West Clear Creek joins the main stem of Clear Creek, 1 mile downstream of Empire. Therefore, all of the communities- be they fish or people- that are found within the Clear Creek Watershed downstream of Georgetown and Empire, will experience an environmental benefit from this project.   |
| <b>Gold Dirt Mining District Features</b> | <p>A map of the middle reach of North Empire Creek, which is also known as the Gold Dirt Mining District is shown in Figure 1, below. The mining features addressed as part of this project include:</p> <ol style="list-style-type: none"> <li>1. Two mine waste piles (3,500 CY) that have split into four piles (N-S and E-W) by the active channel of North Empire Creek.</li> <li>2. A fluvial fan behind a remnant water impoundment containing 4,400 CY of highly mineralized sediment deposited from the two uppermost waste piles in the middle reach and from the upper reach of North Empire Creek.</li> <li>3. The large (0.5 surface acre) Gold Dirt mine waste pile, which is adjacent and eroding into the creek.</li> <li>4. The steep Equator mine waste pile (0.45 surface acre) with its toe in the actual creek channel.</li> <li>5. The existing channel of North Empire Creek (approximately 750 Lineal Feet), which has been destabilized and contaminated by mining activities.</li> </ol> |

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| <p><b>Project Goals</b></p>   | <p>This project was designed to result in significant reductions in toxic metal concentrations within North Empire Creek, including aluminum, copper and zinc as well as a reduction of acidity with a corresponding increase in pH. Clear Creek is a significant environmental and recreational resource and a major water supply serving mountain communities and major cities along the Front Range.</p> <p><u>Environmental Goals for the project include:</u></p> <ol style="list-style-type: none"> <li>1. Remove mine waste from the natural stream channel and its flood plain in order to establish a healthy riparian buffer area and a stable drainage channel with improved water quality, thus preventing contact between the stream and mine waste to significantly reduce pollution.</li> <li>2. Control run on and runoff from the repository, the Gold Dirt pile, the Equator pile and other previously mined areas that were not reclaimed as part of this project, about 480 LF alongside North Empire Creek below the Equator pile.</li> <li>3. Manage the removed mine waste in an onsite containment cell (repository), where exposure of the mine waste to surface and groundwater has been minimized to the maximum practicable degree.</li> <li>4. Perform in situ reclamation (i.e., reshaping, adding topsoil, soil amendments, a native seed mix and achieving 70% cover of <i>WoodStraw</i> as an erosion control blanket) for the Gold Dirt mine waste pile, the main repository and the residual portion of the Equator pile that was not removed and emplaced within the main repository.</li> <li>5. Perform in situ reclamation (as above) for the exposed footprint areas where mine waste was removed from the north and south piles, the fluvial fan containing highly mineralized sediment, the east and west piles and a large portion of the Equator pile.</li> </ol>   |
| <p><b>Project Summary</b></p> | <p>FESI reported that the actual volume of mine waste removed from the four (N-S and E-W) piles was 4000 CY. This was completely removed from the stream channel area and deposited in the repository, which is located well up gradient from the Creek. Approximately 4,450 CY of contaminated in-stream sediment was removed from behind the impoundment and deposited in the repository. An additional 4,500 CY of mine waste went to the repository from the Equator pile.</p> <p>The footprints of the mine waste piles and the fan deposit within the flood plan of the stream channel were amended with 75 tons of beet pulp lime and 240 cubic yards of compost. The repository area was capped with 12-18 inches of soil material and amended with compost. All areas were seeded with Colorado Division of Reclamation Mining &amp; Safety specified seed mix blanketed with <i>WoodStraw</i>. The stream channel was reconstructed through the reclaimed areas, using cascades and step pools in steeper areas and a sinuous pattern in “flatter” areas. Restored stream banks were stabilized using boulders and large woody debris harvested during clear and grub operations.</p> <p>The exposed surface of the Gold Dirt mine waste pile was capped with borrowed topsoil that was amended with lime and compost and then revegetated using a native seed mix broadcast at twice the specified application rate and copious amounts of <i>WoodStraw</i> to achieve at least a 70% coverage rate. This is functionally equivalent to using erosion control blankets on steep slopes, according to the USFS.</p> <p>The Equator mine waste pile was removed from the creek and pulled back a minimum of 10 feet from the stream bank. Approximately 4,500 CY of the Equator Pile was removed and emplaced within the Repository. A toe buttress was constructed using rock boulders that were gathered and salvaged during other construction activities on the site. A runoff control ditch was constructed between the toe of the pile and North Empire Creek and extended another 480 LF downstream in order to control runoff from previously mined areas. The pile was reclaimed in place using beet pulp, lime, compost, native seed and <i>WoodStraw</i>. Finally, the channel of North Empire Creek was stabilized using 2-4’ sized boulders and shaped to control velocity.</p> |

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| <b>Budget<br/>Summary</b>   | <b><u>Direct Funding and Sources</u></b>  |   |                       |
|   | CDPHE Nonpoint Source Funding-  | \$196,204.00  |                       |
|   | CDRMS Cash Match funding  | \$39,000.00   |                       |
|   | <b>Subtotal-</b>  | <b>\$235,204.00</b>   |                       |
|   | <b><u>In-kind Donations:</u></b>  |   |                       |
|   | Compost from Clear Creek County valued at:  | \$13,750.00   |                       |
|   | Special Road Maintenance by Clear Creek County  | \$9,800.00  |                       |
|   | Rock Products Donation Clear Creek 32   | \$27,140.00   |                       |
|   | Colorado School of Mines (CSM) Environmental Intensive Synoptic Sampling & Laboratory Analysis          | \$25,300.00   |                       |
|   | TU and Mountain Pine Manufacturing <i>WoodStraw</i> Donation  | \$2,980.00  |                       |
|   | CSM Senior Design Team Plans & Specifications   | <u>\$18,000.00</u>  |                       |
|   | <b>Subtotal- In-kind Contributions</b>  | <b>\$93,990.00</b>  |                       |
|   | Federal Cooperator Contribution<br>Laboratory Analysis by EPA's ESAT Lab valued at: <u>\$ 38,960.00</u> |   |                       |
|   | <b>GRAND TOTAL--</b>  | <b>\$ 368,154.00</b>  |                       |
| <b>NPS<br/>Summary of<br/>Completed<br/>Construction<br/>Activities</b> | <b>Activity</b>   | <b>Description</b>  | <b>Date Completed</b> |
|   | Rights of Access; Design and Construction Documents; Project Permitting                                 | Negotiation with landowners, site surveying, drawings, permitting with County, State Stormwater, local BMP and Excavation permits | 5-31-16               |
|   | EPA comfort letter  | EPA Comfort Letter under CERCLA issued to CCWA  | 8-16-16               |
|   | NPS Contract Approval   | CDPHE NPS Contract # CT FAAA201700001997 final state execution  | 9-8-16                |
|   | Project Mobilization  | Project equipment, staging area and job site trailer  | 9-23-16               |
|   | CCC Access road improvements  | Road grading and erosion control check dams   | 9-24-16               |
|   | Establish Stream Bypass System  | Bypass the project construction area using 1000 feet of 8" d HDPE coupled agricultural drain pipe                                 | 9-27-16               |
|   | Clear and Grub  | Tree and shrub removal along access roads and in mine waste repository area   | 9-30-16               |
|   | North and South Pile Reclamation  | Removal of mine was down to undisturbed natural soil surface; placement and compaction in repository                              | 10-5-16               |
|   | Loading and transport of topsoil, compost and lime  | Trucking of materials to staging and hauling to reclamation areas   | 10-7-16               |
|   | Sprinkle Mine Stope Closure   | Backfill of 45' deep stope and regrading in front of the Sprinkle adit for visual barrier   | 10-7-16               |

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|  | East and West Pile Reclamation   | Removal of mine waste from the east/west pile, disposal in repository, reconstruction of North Empire Creek      | 11-4-16  |
|  | Gold Dirt Pile reclamation   | Regrading, top-soiling, compost addition, seeding and WoodStraw application                                      | 11-18-16 |
|  | Reclamation of Sediment-filled Impoundment area                        | Removal of contaminated sediment from the impoundment area and reconstruction of North empire Creek.             | 11-26-16 |
|  | Equator Pile reclamation   | Removal of mine waste from the Equator pile, disposal in repository, reconstruction of North Empire Creek        | 11-28-16 |
|  | Repository area capping and soil amendments (topsoil, compost and lime | Placement of cap on repository, addition of soil amendments and WoodStraw application.                           | 11-30-16 |
|  | Final Run-On/Run-Off Controls  | Hydrological isolation of Gold Dirt pile, Repository, and Equator pile through runoff and runoff control systems | 11-30-16 |
|  | Demobilization   | Demobilization of construction equipment and removal of stream bypass system                                     | 12-6-16  |

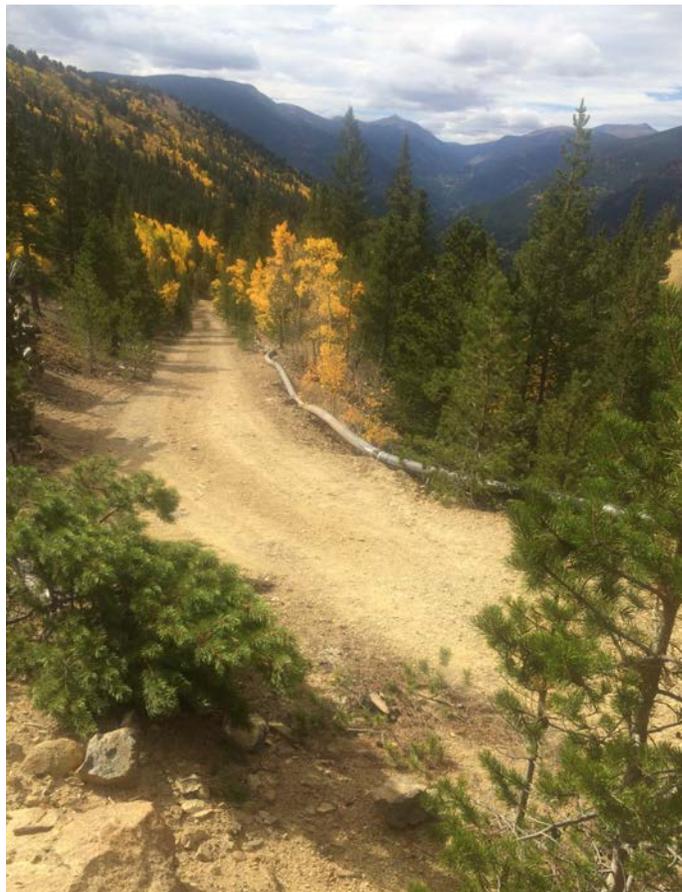


FESI mobilized personnel and equipment including the 5CY loader and the 325D excavator with thumb to the site on September 20, 2016. Also, all of the required bypass agricultural pipe had been delivered to the site and was being staged along the bypass route a CAT D6 Dozer and a CAT Backhoe were inbound to the North Empire Creek project site, as well.

Sediment and erosion controls were installed around the North and South piles, as the stream by pass system could not be extended up to the steep terrain where they were located. At the request of Clear Creek County, the private access road to the job site was re graded to ensure any drainage running onto this road would remain inside the borrow ditch and not flow over the out slope of the road. Access roads were improved via grading, rock removal and minor widening to allow for safe passage of mobile equipment. Clearing and grubbing consisted of vegetation removal, tree clearing and stripping and stockpiling of existing topsoil for replacement during final site grading. In general, these tasks were completed during the first week on site except for ongoing maintenance on sediment and erosion control BMP's.



**Figure 2-** Bypass Pipeline intake 9-20-16



**Figure 3-** Stream Bypass along Gold Dirt Rd. 9-21-16

The repository area enlargement resulted in the placement of topsoil stockpile material atop the northern section of the Gold Dirt waste pile. The repository was enlarged by approximately 1000 cubic yards. This material along with material from the impoundment embankment, was used to cover the Gold Dirt pile 12-18' in depth after it was reshaped with shallower slopes to promote successful revegetation. The topsoil stockpiling operation was completed on 10-10-16.

The following photographs show key milestones in the restoration of the middle reach of North Empire Creek. All of the construction goals of the project were accomplished. We benefitted from remarkably dry and warm weather during the construction period.

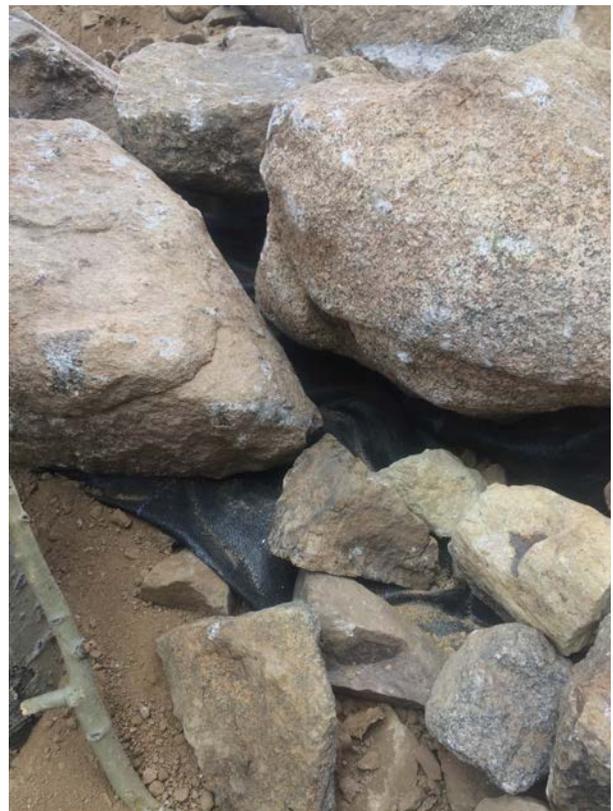
**Figure 4-** Topsoil Stockpile left side of Gold Dirt pile



**Figure 5-**Topsoil Salvage & Repository Enlargement



**Figure 6-** Rundown Structure for Gold Dirt Run-on control

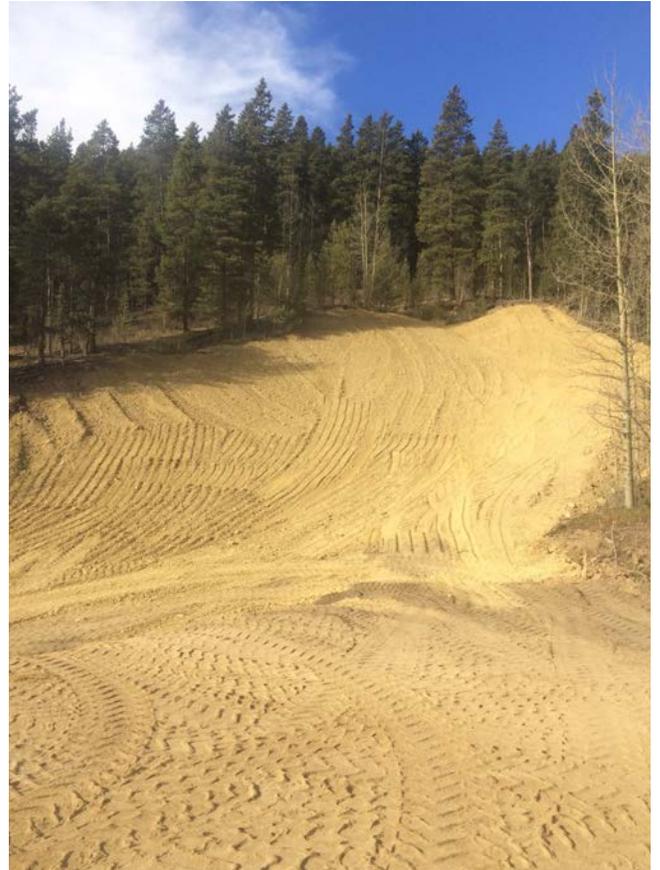


**Figure 7-** Heavy filter fabric beneath rundown

**Figure 8-** Mine Waste placement in repository



**Figure 9-** Final-graded Repository



**Figure 10-**Mine waste removal at the Equator pile



**Figure 11-**Runoff control construction for repository



**Figure 13-** Reclaimed Equator Pile

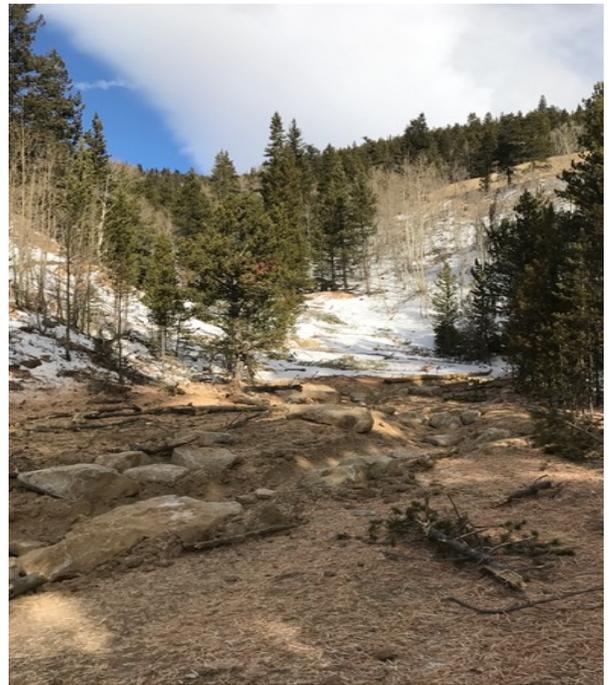




**Figure 14-** Reclaimed access to Equator/Sprinkle areas



**Figure 14-** Reclaimed East-West and Gold Dirt Piles



**Figure 15-** Reclaimed North-South Piles

**Figure 16**-Reclaimed Sediment Impoundment and North Empire Creek

