Lower Willow Creek Restoration Project: Phase 2

Final Report

Prepared for:
Water Supply Reserve Account Rio Grande Basin Account
Attn: Chris Sturm

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Lower Willow Creek Restoration Company
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Prepared by: Guinevere Nelson Freer

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Introduction

The Colorado Water Conservation Board 's Water Supply Reserve Account funds were used to complete Phase II of the Lower Willow Creek Restoration Project (project). The Soil Conservation Service first identified the project in the late 1960's due to the lack of fish along Willow Creek and the degraded terrestrial and riparian habitat. When the WCRC (WCRC) formed in 1998, they identified the project as one of their founding goals and started characterizing the site's water and soils. In 2010, the Lower Willow Creek Restoration Company (an IRS designated 501 c 3) was formed with the primary focus of getting this project accomplished. In 2012, the Lower Willow Creek Restoration Company (LWCRCO) entered into a Voluntary Cleanup Plan with the Colorado Department of Public Health and the Environment to cleanup this heavy metal polluted site. Since then the LWCRCo has been successful in securing funding and partnerships as well as implementing the phased work. Phase II of the project will be fully completed in the spring of 2017 when hydro-mulch work will be completed. Despite the necessary future vegetation work, the Lower Willow Creek Restoration Company will apply to the CDPHE for a No Action Determination in 2017 to acknowledge the cleanup of the site to state standards.

The Lower Willow Creek Restoration Project is a project to transform the physical, chemical and biological integrity of the Lower Willow Creek floodplain. It is also a project to transform the gateway to the City of Creede. Creede is a town of 239 people and relies on 70% of their economy to come from tourism of the region from May to October (DOLA, 2013). Creede moved away from a mining economy in 1985 when the last mine closed. Since then the impacts of historic mining practices has been at the center of reclamation work. The Lower Willow Creek Restoration Project has been discussed for fifty years although remedies have varied; in 2007 a preliminary plan was created by NRCS and in 2012, a three phase final plan engineered by Casey Resources, Inc. was created as the optimal remedy to this complex and expansive project.

Descriptions of the three phases devised to complete the Lower Willow Creek Restoration Project are provided in the bullets below.

- **Phase I** accomplishments, completed in 2014, include the creation of a new creek channel to restore the function of Willow Creek to the floodplain. The previous channel had long served as conveyance for water to downstream water users, without consideration to the ecological function of the water and the floodplain itself. This was due to the perpetually degraded terrestrial ecosystem that had persisted since mining began in the area during the 1890's and the very senior water right of downstream users. The activities completed as part of this phase included creating a sinuous channel that increased the creek length from 5,290 lineal feet to 7,200 lineal feet and the relocation of nearly 15,000 cubic yards of onsite soil. The installation of 15 rock vanes and two water diversion structures, the creation of a boulder bank rock wall, and a new ditch for diversion water delivery were tasks completed in this phase of the Lower Willow Creek Restoration Project.

Figure 1: Photograph depicting the change in the Lower Willow Creek channel as part of Phase I. The photo on the left is the condition of the channel from 1939 to 2012. The photo on the left is the channel after Phase II was completed (photos courtesy of Google Earth).

- **Phase II** was selected as a complimentary component of stream restoration to assure that the allochthonous input to and water chemistry of Willow Creek was improved. The primary goal of Phase II was to cap the project site with at least 6 inches of clean soil and provide a growth medium for plants to repopulate the long degraded site. These BMPs were designed to protect groundwater and surface water by preventing the interaction of lead and arsenic with precipitation and the mobilization of these metals into the groundwater as it passed through the highly porous cobble on the floodplain. Groundwater and surface water interact regularly on the floodplain due to high water tables across the site. This capping remedy was also designed to disrupt the exposure pathways of lead and arsenic that adversely affect human and wildlife health.

- **Phase III** of the project will be implementing the community's desires to have passive open space opportunities on site. In partnership with GOCO, funding for a loop trail, bridges and interpretive signage was secured through the 2016 Inspire Initiative. Phase III will also focus on large scale revegetation work. In addition to the hydro-mulching mentioned before, there are many acres that need to be planted to secure the cap and assist nature in the recovery of the site. Phase III will focus on revegetation needs around the

recreation infrastructure so that vegetation efforts are not disturbed by trails and other recreation components.

Background

The Lower Willow Creek Floodplain is 107.8 acres of land located directly south of the City of Creede. The current use of the site is open vacant land. During Phase I and Phase II the site was transformed drastically. From the 1890's to 1985, Willow Creek was dammed onsite to create flotation mill tailings ponds to manage mining material from the Humphries and Emperius Mills. In the 1980's, the ponds were drained and the wastes consolidated into the Emperius Tailings Pile. After this activity, the site was largely left vacant and unused, except for utilities easements and the creation of multi-use trail that runs north-south on the western portion of the site. The floodplain is bound on the east by the Rio Grande Railroad, on the west by State Highway 149 and to the north City of Creede property and to the south by Mineral County Fairgrounds and Wason Ranch. In 2012, the land was annexed into the City of Creede and transferred ownership from Creede Resources, Inc. to the Lower Willow Creek Restoration Company.

Meaningful planning for this project began in 2000 when the City of Creede created the 3 Mile Planning Area within their Comprehensive Plan (City of Creede, 2000). Within the plan, the floodplain was identified as an essential component of city planning efforts. The 3 Mile Plan called for restoration of the area to benefit the community. In 2007, the Natural Resources Conservation Service produced the *Willow Creek Stream Restoration: Summary of Conditions*, which extensively characterized the existing physical, chemical, and biological conditions of the site. The report also provided five design alternatives of restoration, which were incorporated into the final implemented designs of Phase I and Phase II. In 2008, the City concurrently worked to integrate the findings of the NRCS document into the Creede Sub-Area plan and queried the community on their desired use of the project area with a survey. The overwhelming response to the survey was a desire for passive open space (City of Creede, 2010). This community support and characterization of the floodplain was the basis for the Voluntary Cleanup Plan (LWCRCo, 2012) to guide restoration activities to open space standards and then incorporate recreation infrastructure.

The overarching goal for the Lower Willow Creek Restoration Project is to reclaim the Lower Willow Creek Floodplain by restoring the physical, chemical, biological and aesthetic qualities as an integral part of the Creede Community. The LWCRCo will achieve this goal by creating a phased approach to implement portions of the extensive project as funding opportunities arise. The LWCRCo will oversee the floodplain property and continue stewardship/reclamation activities until a No Action Determination Letter is received from the State of Colorado. The LWCRCo will transfer the restored property to the City of Creede after the project is completed. The phases for this project and their associated objectives and tasks are discussed below.

Phase 1: Construct a new single threaded channel: Construct a new channel that reduces creek contact with mine waste and associated heavy metals to improve water quality as Willow Creek passes through the Lower Willow Creek Floodplain.

OBJECTIVE 1: Improve physical and chemical conditions of the lower Willow Creek Floodplain.
OBJECTIVE 2: Improve ecological function of the site by increasing sinuosity, installing stabilization structures, and improving sediment transportation.

Phase 2: Implement Best Management Practices for Revegetation: Improve outcome for revegetation success on the Lower Willow Creek Floodplain by importing soil and planting/seeding appropriate species.

OBJECTIVE: Improve biological and aesthetic conditions on the Lower Willow Creek Floodplain.
Tasks:
1. Develop a comprehensive revegetation plan
2. Develop vegetation cover definitions to fulfill revegetation requirements under the VCUP.
3. Secure funding for all aspects of the project, including cash and in-kind.
4. Select qualified and appropriate contractor(s) to implement importation/re-vegetation activities
5. Implement revegetation plan.

Phase 3: Create Open Space and Foster Passive Recreation Opportunities for the Creede Community:

OBJECTIVE: Promote the use of the Floodplain Property by the Creede Community
Tasks:
1. Work with adjacent landowners, stakeholders and public to create interconnectedness of trails and recreation opportunities
2. Develop a comprehensive use plan to provide necessary infrastructure for recreation opportunities on the floodplain.
3. Secure grants and in-kind commitments to implement planned activities
4. Continue to implement restoration activities that improve the quality of the open space and nurture habitat for aquatic and terrestrial habitat.

These goals were developed from the data collected on the floodplain, intentional planning of the end use of the site, and community input. The findings of monitoring efforts identified a degradation of water quality, poor soil conditions, and very little habitat. In the Planning Study, NRCS identified that ground water pH in the project area ranged from 2.6 to neutral (2007). Data from groundwater monitoring wells indicate a range of dissolved metals:

- Cadmium concentrations from <0.1 to 1539 ug/l,
- Zinc concentrations range from <5 to 679,250 ug/l and,
- Lead concentrations range from <1 to 149 ug/l.

Surface water quality monitoring (NRCS, 2007) demonstrated a similar trend in concentrations of metals along the floodplain of these metals of concern:

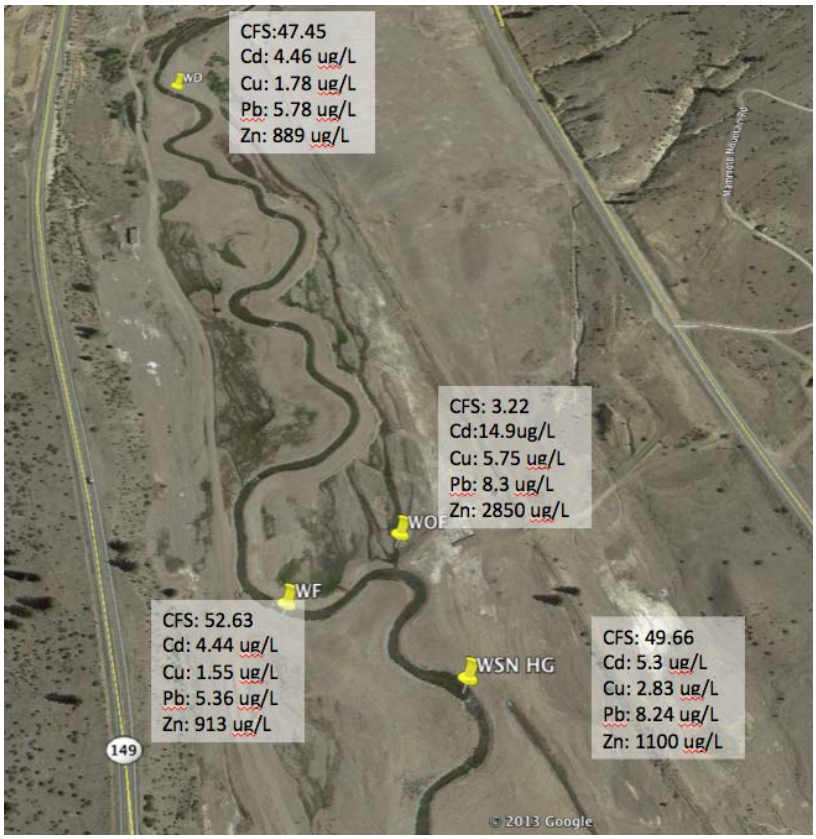
- Cadmium from 1 to 20 ug/l,
- Zinc 54 to 6000 ug/l and,
- Lead 1 to 60 ug/l.

Water quality is highly influenced by the input of the Nelson Tunnel, a draining adit and Superfund site, which contributes 11% to 55% of the load of cadmium and zinc to Willow Creek (EPA, 2011). Other legacy mine inputs throughout the Creede Mining District contribute heavy metals to water quality, but WCRC monitoring shows a loading from the floodplain to Willow Creek as measured above and below the project site (WCRC, 2003).

Similarly, conditions of soil are influenced by historic onsite storage of mill tailings and long term alluvial input sourced from the Creede Mining District. The NRCS conducted soil paste pH measurements to indicate the relative metals concentrations, due to the inverse relationship between metals concentrations and pH. They identified a wide range of soil pH on the project site from 4.6 to 6.8. This range of pH correlates with soil analysis identifying a range of cadmium concentrations from 3.1 mg/l to 47 mg/l. Concentrations of zinc range from 100 mg/l to 2,200 mg/l on the floodplain project site (NRCS, 2007).

The WCRC has monitored water quality since 1999 on a biannual cycle to coincide with high and low flow of the creek. After Phase I of the project, WCRC identified a new trend in water quality on the floodplain. Data indicated that the historic channel that is still being sourced from groundwater, was contributing significant loading of heavy metals. In Figure 2, a snapshot of the new trend in water quality results is depicted from data that was collected on the project site. The yellow tacks are permanent sampling locations established and continually monitored by the WCRC. Sites W-D and W-OF bracket the old channel, whereas W-D and W-F bracket the new channel. Sample site WSN-HG is downstream from both channels in a well-mixed area and demonstrates the impact of the historic site conditions on the creek. The marked improvement to water quality within the new channel, a decrease in all metals, and a 1,937 ug/l decrease of zinc is what we hope to see in coming years, since the largest source of discernable metals loading has been addressed in Phase II. Phase II mitigated the impact of the old channel on water quality by covering the channel with soil and reducing the water that returns to the mainstem of Willow Creek. The concentrations are elevated due to the background of the Nelson Tunnel input. Averages of concentrations of cadmium, copper, lead and zinc exceed table value standards for chronic impairments and negatively impact the composition of aquatic life. This segment of creek is listed on the 303 d list for impaired waters for cadmium, zinc, and pH. However, in the fall low flows of the creek fish have been spotted in the upper reaches of the creek since the new channel was created.

Figure 2: Summary of data collected on the Lower Willow Creek Floodplain since Phase I of the Lower Willow Creek Restoration Project occurred in 2014.



To implement Phase II, the consulting engineer, Casey Resources, Inc. created the Voluntary Cleanup Plan (VCUP) in 2011. The VCUP was created to discuss the activities of three phases of the project. This document also established a soil action level for lead of 1500 mg/l in the floodplain, which acknowledged the highly mineralized native soils of the region. Due to the complexity of the project a companion document, the Lower Willow Creek Materials Management Plan, was also created. This document specified how soils that contained high levels of lead would be handled, dust control plan, and specific protocol for testing of soils brought onsite. In 2015, the LWCRCo was awarded an EPA Brownfields Grant. The grant required further discussion of alternatives for site restoration. This document, the LWCRCo Analysis of Brownfields Cleanup Alternatives (ABCA), identified four cleanup alternatives:

1. No Action
2. Excavate and Export Impacted Soil and Import Clean Replacement Fill
3. Cap the entire 108 acre site
4. Implement a partial cap and amend the soils.

The most cost effective and impactful alternative was number 4 and selected for implementation through a community input session and EPA review. The goal of Alternative 4 was to identify the most highly contaminated soils and provide a cap and revegetation for those areas. This guided the LWCRCo to use existing knowledge to create the capping plan. X-ray fluorescence readings of depth samples on the site prior to Phase I were used as an indicator of contamination. The northern most areas of the channel were the most highly contaminated, concurring with the historic location of the

mill tailings ponds. All of the previously discussed information gathered by WCRC, the City of Creede, NRCS, LWCRCo and Casey Resources, Inc. guided the development of the following methods.

Methods

The plan to cap the Lower Willow Creek Floodplain was guided by the extensive research completed on the site, the VCUP and Materials Management Plan, and the ABCA. The methods described below correspond to the tasks in the LWCRCo application for CWCB for Water Supply Reserve Account funding.

Task 1: Soil Excavation Total Cost: $323,630 CWCB Cost Share: $43,500

Description: The LWCRCo secured a donation of 40,000 cubic yards of soil from Navajo Development Company in 2012. This borrow site is less than one mile away from the project site and contains soil that fall below the 1,500 mg/l action level as determined by laboratory analysis. The site was surveyed for verification of soil volumes and all agreements with the landowner were meet, as further discussed in Task 5. LWCRCo negotiated a Colorado Department of Transportation (CDOT) Special Use permit to access and cross the CDOT rights of way (ROW) and State Highway 149. This permit was also used to excavate soil within the CDOT ROW to improve visibility for drivers along 'airport corner' a nearly 90-degree curve. Colorado Division of Reclamation Mining and Safety (CDRMS) performed an onsite meeting of the borrow source with LWCRCo and approved the project activities under the 110 permit Navajo Development held on the site. The LWCRCo has retained the Floodplain SWMP and 404 d Permit since Phase I. All permits were secured prior to initiating the work under Phase II.

In 2016, LWCRCo retained RMC Consultants, Inc. as the earthwork contractor through an open bid process. RMC first created a Stormwater Management Plan for the borrow site that was approved by Colorado Department of Public Health and Environemtn (CDPHE). RMC mobilized onsite and installed SWMP BMPs on both the borrow site and the floodplain site. RMC prepped the highway access with track pads and hired local flaggers to control traffic. RMC mobilized a Kobelco 210 Excavator, two John Deer 300E articulated dumpe trucks, a John Deere 700 Bulldozer, a 2,000 gallon water truck, job trailer, and a sheep's foot. Gradation samples were collected at two sites from the borrow source and submitted to the engineer.

Soil was excavated from the borrow site and loaded into the 30 ton haul trucks and placed into 18 areas to track and control quantities of soil. The soil was then bulldozed into place and compacted by the sheep's foot. A total of 26,334 loose cubic yards were transported from the borrow site to the floodplain site and indicated in Figure 3. An additional 1,191 loose cubic yards were transported by RMC from stockpiled soil on the floodplain from a previous donation of soil. Six stream crossings were created in accordance with the 404 permit to transport soil across the creek as needed. These stream crossings were repaired after hauling, placing, and grading were complete. RMC used 114,300 gallons of water donated to the project by the City of Creede to mitigate dust, per the Material Management Plan. LWCRCo identified an area of 1.87 acres where white precipitate persisted, north of the Creede Sewer lagoons. In Phase I a cobble berm was created adjacent to this

white area. Under direction of LWCRCo, RMC knocked over this berm and spread the cobble across the white area to a depth of 8 inches. Capping material was then placed on top of the cobble and compacted. This method was described by Stuart Jennings (2014) to disrupt the interaction of plants with the subsurface material, preventing capillary action from bringing the salts to the surface again.

The borrow site was excavated during construction to a 2H:1V slope that ties into the remaining hillside. The CDOT ROW was excavated and backfilled into the hillside and created a sloping drainage that directed water toward the existing CDOT culverts. Upon completion of this work, 375 linear feet of straw wattles for SWMP control were installed.

RMC demobilized heavy equipment and will return in the spring of 2017 to complete revegetation activities as described in task 2.

Task 2: Soil Excavation Total Cost: $37,900 CWCB Cost Share: $3,000
Description: The borrow site required 5 acres of revegetation and the engineer's specification for revegetation on the floodplain was 16 acres.

To complete revegetation requirements on the donated land, CDOT ROW, and the floodplain, a seed mix was established to use on all three sites. CDOT, CDRMS and LWCRCo agreed to use to following grass mix in tandem with hydro-mulch.

- Western wheatgrass 8.0 PLS 4.0 PLS/acre
- Blue gramma 1.5 PLS 0.2 PLS/acre
- Arizona fescue 2.5 PLS 0.5 PLS/acre
- Crested Wheatgrass 3.0 PLS 0.5 PLS/acre

The disturbed CDOT ROW and borrow source, totaling 5 acres, were seeded with an ATV equipped with a seed hopper. Seeded areas were then hydromulched with Nilex MulchMax 200 at a rate of 2,500 to 3,500 kg/ha. A fifty-foot swath along both sides of Willow Creek, totaling 16 acres following the same methods mentioned above was planned for revegetation. Due to sudden and permanent snow on the site only 3 acres of the floodplain were seeded and hydromulched. The remainder of the revegetation activities will occur in the spring of 2017.

Task 3: Monitoring Total Cost: $5,000 CWCB Cost Share: $0
Description: Monitoring activities will include final XRF sampling of the capping material and qualitative and quantitative monitoring of vegetation on the floodplain and borrow site.

Preparations for sampling of the surface soil concentrations of arsenic and lead were created during earthwork activities between the engineer firm, Casey Resources, Inc. and LWCRCo. Methods to document the final surface concentrations included laying out a GIS generated grid of the capped areas on a 100 ft by 100 ft grid. Each square was assigned a number and a letter. Numbers were assigned to each square on a west to east orientation, beginning with 1 and ending with 27. Letters were assigned on a south to north orientation, beginning with A and ending with ZZ. Casey Resources, Inc. has identified 49 samples for sampling with the XRF. The method for

sampling will include taking readings of the RCRA 8 metals (As, Ba, Cd, Cr, Pb, Hg, Se and Ag) concentrations from the four corners of the selected square as well as one reading from the center. The readings will be averaged to determine the total concentrations of that 100 x 100 ft area. In addition, 20% of these grids will be selected for laboratory confirmation sampling using standard method 6010 C for all RCRA 8 metals excluding mercury, which will be analyzed using standard method 7471 A.

Monitoring will be accomplished by using both quantitative and qualitative data. Monitoring will be used to document the change of the floodplain vegetation over time. Data will also be used to monitor the effectiveness of soil capping in areas hydro-mulched versus non hydromulched. It is anticipated that future work may include soil amendments, perennial plantings, sowings, and other accelerants of vegetation establishment. These permanent monitoring sites will be established to document those changes. Regular review of these data will assist in management practices. Data that is collected will be stored in an excel file on the LWCRCo computer. The following methods have been selected for monitoring of vegetation re-establishment on the project site:

Qualitative:

- 20 photo-data points will be established to document the vegetation growth on the newly placed soil. These will be generated from a random number generator in Excel that will be paired with coordinates on the project area. 10 data points already exist to document the change in vegetation in undisturbed areas, and serve as a reference for growth. These existing points will be monitored along with the new data sets. Monitoring will occur annually for the first five years.

Quantitative:

- 30-1m x 1m plots will be established and monitored to document change in percent cover and associated with the location of photo-data points. Monitoring will occur annually for the first five years.
- 30-50-meter transects will be implemented at the photo-data point location on an east to west trend. The 25-meter mark will be placed on the established coordinate so that the samples point is bound on either side by 25 feet of intercepts. Monitoring will occur annually for the first five years.

Task 4: Grant Management Total Cost: $28,500 CWCB Cost Share: $2,500

Description: Grant management is described as regular communication with CWCB staff to ensure successful completion of the grant. This includes the submittal of reimbursement requests, reporting and final reporting to CWCB.

During contract negotiations with RMC and Casey Resources, LWCRCo requested invoices no more than monthly. Both contractors agreed and submitted invoices on the 20th of each month. LWCRCO reviewed these invoices for accuracy and then aligned the contractor's activities with a task number within the grants. The project manager then ensured the contractor's total was accounted for and

prepared an invoice reimbursement request for the LWCRCo board of directors to review and approve. Once the board approval came through, the project manager forwarded the reimbursement request to the bookkeeper that reviewed the expenses, charged the books, and verified the fund balances. The project manager would then transpose the requests to the specific grantors and submit to them for approval. The bookkeeper issued checks to the contractors once the LWCRCo bank verified that the funds were in the account. The project manager also completed progress reporting for the restoration project. She prepares progress reports to the funding entities as described in the grant agreements.

Task 5: Professional Services Total Cost: $40,000 CWCB Cost Share: $6,000
Description**:** Donation of the soil for capping was contingent on paying for legal fees associated with the agreement between Navajo Development and LWCRCo. Other professional services included the engineering planning and oversight.

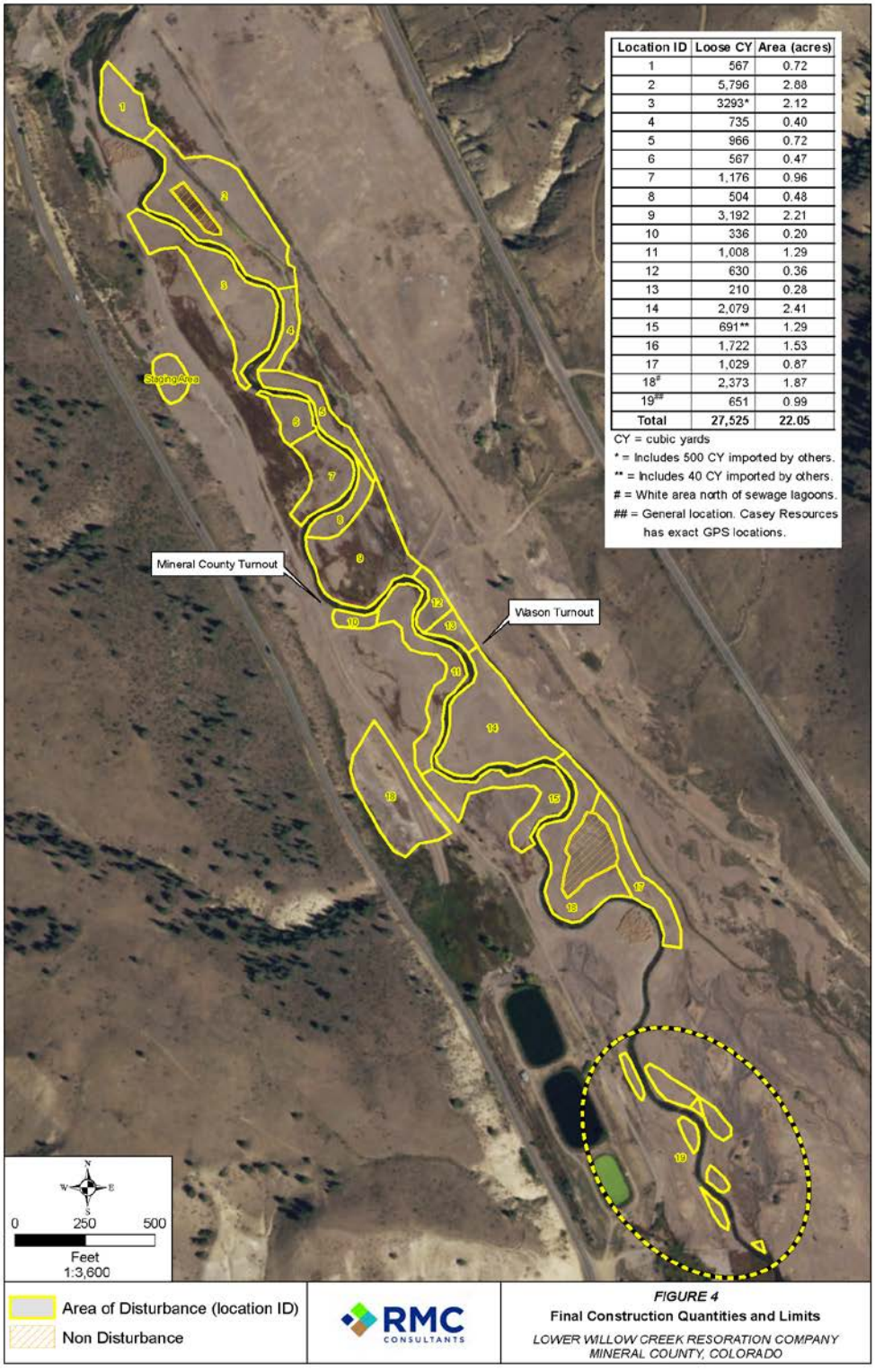
Navajo Development Company's legal representative drafted a soil donation agreement that outlined specific conditions of the donation. LWCRCo paid for these legal fees to move the project forward, and is documented in the legal agreement.

Casey Resources, Inc., an environmental engineering firm was contracted through an open bid process. They were selected in the spring of 2016 and assisted with the earthwork contractor bid documents, review of earthwork proposals and other pre-project planning tasks. The other pre-project tasks included the creation of final grading plans for the borrow site and the project site. The firm was present during the preconstruction meeting with RMC and available to them to answer questions. Casey Resources was onsite during the project to collect XRF readings of representative loads in the haul trucks and prepared the soil-sampling plan for future sampling work. Casey Resources reviewed the final as built survey for accuracy and will assist LWCRCo in completing the Environmental Compliance Report to submit to CDPHE as a precursor for the No Action Determination Letter that they will complete and submit to CDPHE.

Results

The current results demonstrate qualitative changes to the floodplain but the outcomes remain impressive. RMC was able to excavate, haul and grade 27,525 cubic yards of soil to meet the Lower Willow Creek Restoration Project goals. In Figure 3, the map indicates the areas covered during the project. Areas 1-9 received substantially more soil than the other areas, due to the need to get the project site to grade as well as meet capping requirements in the VCUP. Areas 1, 4, 5,8, and 9 covered the historic channel that has demonstrated additional loading to the creek, as demonstrated in Figure 2. Areas 10-19 covered with an average of 6 inches of soil in accordance with the VCUP specifications to meet open space standards. The targeted area of the cap was based on XRF readings that indicated an increased concentration of lead. The non-capped areas in the region next to area 19 met the action level of 1,500 mg/kg of lead in the soils. Although full-scale sampling of the new cap will occur in the spring, the LWCRCo sought to maximize the resources and prioritize the areas of high lead levels.

Figure 3: The final volumes of acres capped on the Lower Willow Creek Restoration Project site by RMC in 2016.



Conclusions and Discussion

Our objective to improve biological and aesthetic conditions on the Lower Willow Creek Floodplain was not fully met, however, we were able to accomplish a massive portion of this project, providing growth medium for the long term re-vegetation work. The site had long been devoid of any soil and to cover 22 acres with at least 6 inches of soil was a large accomplishment. We were unable to accomplish vegetation work due to the prioritization of soil import and the short construction season in Creede, CO. The LWCRCo feels that the presence of soil without any additional revegetation work will improve natural establishment of vegetation on the site, based on the changes seen in vegetation after Phase I that indicate water and soil were limiting factors to vegetation success. LWCRCo is committed to the long-term work of vegetation, and will implement these with the remaining match funding in the spring. The LWCRCo will implement vegetation and amendments based on the recommendations in the NRCS planning reports and Stuart Jenning's Memo (2014). Both of these reports call for seed and other plant sources of native plants. A variety of soil amendments are also recommended including Biosol and nitrogen fertilizer. LWCRCo will seek to implement these recommendations across the site through a combination of grant funded contractor work and volunteer work from the Willow Creek Reclamation Committee.

When the LWCRCo originally applied for the Voluntary Cleanup Plan it was anticipated that vegetation cover would be the determining step for receipt of the No Action Determination Letter from the CDPHE. However, due to the expansive nature of the project, the CDPHE deemed that XRF readings of the cap material would meet the criteria of our VCUP. However, the citizenry of Creede and other stakeholders are interested in a more natural condition of the site. The community has never known the site to be anything other than a mining site and vegetation success is a critical component of the transformation to an open space. The LWCRCo is committed to meeting the state requirements in addition to vegetation improvement for the benefit of all through monitoring and adaptive management. The combination of X-Ray Fluorescence readings (and 20% lab confirmation) of the cap will be the final step to monitoring the change in soil. No further monitoring of capped material is planned. To document the change in vegetation cover permanent monitoring sites paired with photo documentation as well percent cover and line intercept data will be used. LWCRCo will commit to annual monitoring of the site for the next five years to determine success and adjust amendments and species plantings based on the results. The unique partnership between the LWCRCo and WCRC will allow for the continuation of monitoring during these next five years. WCRC will support staff time to annually monitoring these sites.

The project will be maintained by the continual relationship between the City of Creede, Creede Resources, Inc. (who make up the LWCRCo), and the Willow Creek Reclamation Committee. In the planning for this project, it has been the intent of all parties involved to eventually donate the site to the City of Creede for perpetual stewardship of the site. Based on the monitoring objectives, the data collected from these sites will be a measureable result of our project. Since the WCRC will continue to monitor water quality in perpetuity, the combination of water quality and vegetation will be the ongoing metrics of the project's success. Qualitatively speaking, the site was historically an elk wintering area and so the increased use of ungulates, bird, and other species will be used to showcase the improvement of habitat. Other ideas of success include infrastructure enhancements

for passive open space opportunities. In 2016, GOCO awarded the Creede Hub of the SLV Inspire Team $150,000 for trail improvements on the project site for 3 miles of loop trails on the site. The community stakeholders have been requesting non-motorized trails off if the existing multi-use trail. The GOCO award demonstrates the desire of the community to recreate on the physical, chemical and biological improvements made to the site through Phase I and Phase II accomplishments.

Phase II was relatively straight forward compared to Phase I, and so the difficulties that did arise were few. We had difficulty getting the CDOT Special Use Permit for excavation of soil from the CDOT Rights of Way. LWCRCo tried to contact CDOT in the beginning of August and wasn't able to connect with anyone until the end of September. Fortunately, the project had been approved by CDOT previously to excavate the ROW, but it still took us three weeks to get approval to cross 149 with the excavated soil, and then an additional month to get the Special Use Permit. To solve the wait time on the special use permit, we over excavated the borrow pit and then backfilled the borrow site with the excavated CDOT ROW soils. The first lesson learned was to contact CDOT early for a Special Use Permit and supporting that lesson is to persistently check in with CDOT on the status of the permit.

An additional difficulty that arose was the determination of the extent of soil contamination. Casey Resources, Inc. had anticipated that the sampling performed in Phase I (depth XRF samples of the new creek channel) was indicative of the contamination across the whole site, with higher lead levels at the northern end of the site. Informal sampling occurred to verify the concept, and we found that the assumption was not true. As a result and in accordance with our CDPHE's guidance, we covered the entire 'disturbed' site with 6 inches of soil. As such, the lesson learned from this difficulty was to sample the entire site to determine the extent of contamination.

In both cases of difficulties, it was extremely important to have our amazing earthwork contractor, RMC Contractors, Inc. on the job. They were exemplary contractors who were able to assist in finding and implementing solutions. The difficulties did affect the end results, but in both cases, the outcome was positive. We were able to cover the southern portion of the site with more soil than originally anticipated and increase the use of our funds to make a broader impact. In the case of CDOT, it was beneficial to connect with our local CDOT personnel. Although we do not anticipate any projects that require a CDOT Special Use Permit, our contact with these people may help in some other instance that is not yet identified.

We still have some of the project site uncapped but well below our action level of lead. It is the LWCRCo's opinion that these areas are not impacting soil or water health and were created by the removal of topsoil when the tailings pile was created. If we are able to move forward on capping these areas, LWCRCo will implement XRF sampling of these areas to prioritize them appropriately.

With all these discussions, LWCRCo recognizes the impactful transformation of the site by the recently completed work and is exited about what we were able to accomplish with the resources and contractors that assisted in Phase II.

Phase III activities will continue revegetation efforts and implement recreation infrastructure on the site. LWCRCo recognizes the long-term commitment of revegetation on the site. LWCRCo will work to implement much of this work by seeking out private funds and grant funds to support large vegetation restoration efforts. In addition, the WCRC has committed 500 volunteer hours per year to the project. Although some of these hours are tied to watershed water quality sampling, the majority of the work to be completed by the WCRC is directly aimed at revegetation efforts. Planned activities for 2017 include seeding the site and mulching with unused straw wattles. Additionally, the WCRC has plans to implement willow wattle and willow brush mattress plantings along the riparian corridor of the new creek.

Recreation infrastructure will be implemented as well. It makes sense to implement the trail system during revegetation efforts so that resources are not wasted on removing established vegetation from planned trail locations. As discussed previously, the Phase III trail system is funded through GOCO's Inspire Initiative, and we anticipate 2017 to include ground truthing of the trail concepts this spring, so that in the summer, WCRC and LWCRCo can move forward on revegetation efforts. LWCRCo is hopeful that the public will be more engaged in Phase III based on the amazing feedback so far on the capping project. LWCRCO anticipates that more public workshops will be held to receive feedback on what the public wants to see down on the site. Although there was no room for continuance of this specific phase of the Lower Willow Creek Restoration Project, LWCRCo has always known that revegetation was going to be a long-term project due to the large acreage of the project site. LWCRCo feels that we have met our goals for this phase of the project despite the remaining vegetation component and low priority capping areas.

LWCRCo has thought about the impact of the project and how it may spur wide scale restoration of adjacent lands that appear to have been impacted by the historic impoundments. One theme that continues to resonate with the LWCRCo is reconnecting the people to Willow Creek. Mining has impacted the entire watershed for so long that people do not recreate on or near the creek. We seek to implement restoration of the entire lower Willow Creek valley to accomplish this community reconnection. The project has the potential to be a catalyst of widespread restoration in the area, and is an example of what can be accomplished by the LWCRCo and its stakeholders.

Actual Expense Budget

PHASE 2 PROJECT TASKS	CWCB WSRA	USEPA Brownfields	CDPHE 1306	SLVCCI	Creede Resources, Inc.	WCRC	John Parker	Total
Task1: Soil Excavation	CASH					IN-KIND		
Mobilization, Excavation and Hauling	$38,500.00	$103,319.00	$139,500.00	$ -	$ 5,500.00	$ -	$ 55,000.00	$341,819.00
Traffic Control on 149	$ 2,000.00	$ 8,000.00		$ -		$ -	$ -	$ 10,000.00
Reseeding Excavation Site	$ 3,000.00	$ -		$ -	$ -	$ -	$ -	$ 3,000.00
Task 1 Total	$43,500.00	$111,319.00	$139,500.00	$ -	$ 5,500.00	$ -	$ 55,000.00	$354,819.00
Task 2: Riparian Enahncements								
Planting/Seeding along Willow Creek *(*WCRC Contributions derived from previous activities)*	$ 3,000.00	$ 2,000.00	$ -	$ -	$ -	$ 2,500.00	$ -	$ 7,500.00
Task 2 Total	$ 3,000.00	$ 2,000.00	$ -	$ -	$ -	$ 2,500.00	$ -	$ 7,500.00
Task 3: Monitoring								
Field Personnel *WCRC personnel valued at $25/hour*	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Task 3 Total	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Task 4: Administration								
Grant Administration *LWCRCO personnel valued at $25/hour*	$ 2,500.00	$ 7,911.60		$ 4,000.00	$ -	$ -	$ -	$ 14,411.60
Office Support provided by the City of Creede to the WCRC for utilities and office space	$ -	$ -	$ -	$ -	$ -	$ 2,000.00	$ -	$ 2,000.00
Task 4 Total	$ 2,500.00	$ 7,911.60	$ -	$ 4,000.00	$ -	$ 2,000.00	$ -	$ 16,411.60
Task 5: Professional Fees								
Engineer Fees	$ 1,000.00	$ 16,490.00	$ -	$16,000.00	$ -	$ -	$ -	$ 33,490.00
Attorney Fees	$ 5,000.00	$ -			$ -	$ -	$ -	$ 5,000.00
Task 5 Total	$ 6,000.00	$ 16,490.00	$ -	$16,000.00	$ -	$ -	$ -	$ 38,490.00
TOTAL	$55,000.00	$137,720.60	$139,500.00	$20,000.00	$ 5,500.00	$ 4,500.00	$ 55,000.00	$417,220.60

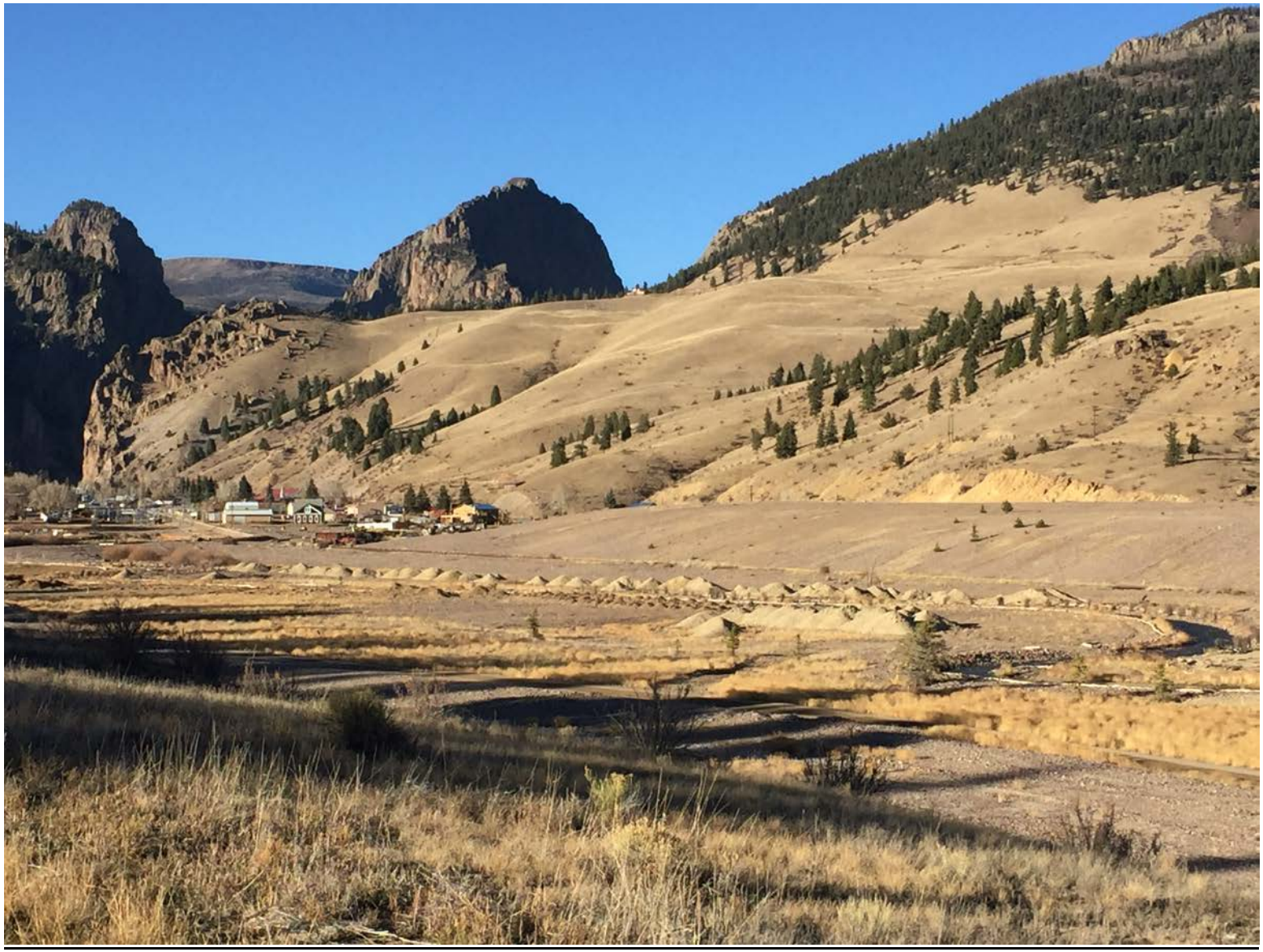
Appendix 1 Project Photos

Representative condition of the soils along Willow Creek within the Lower Willow Creek Restoration Project Site before Phase II.

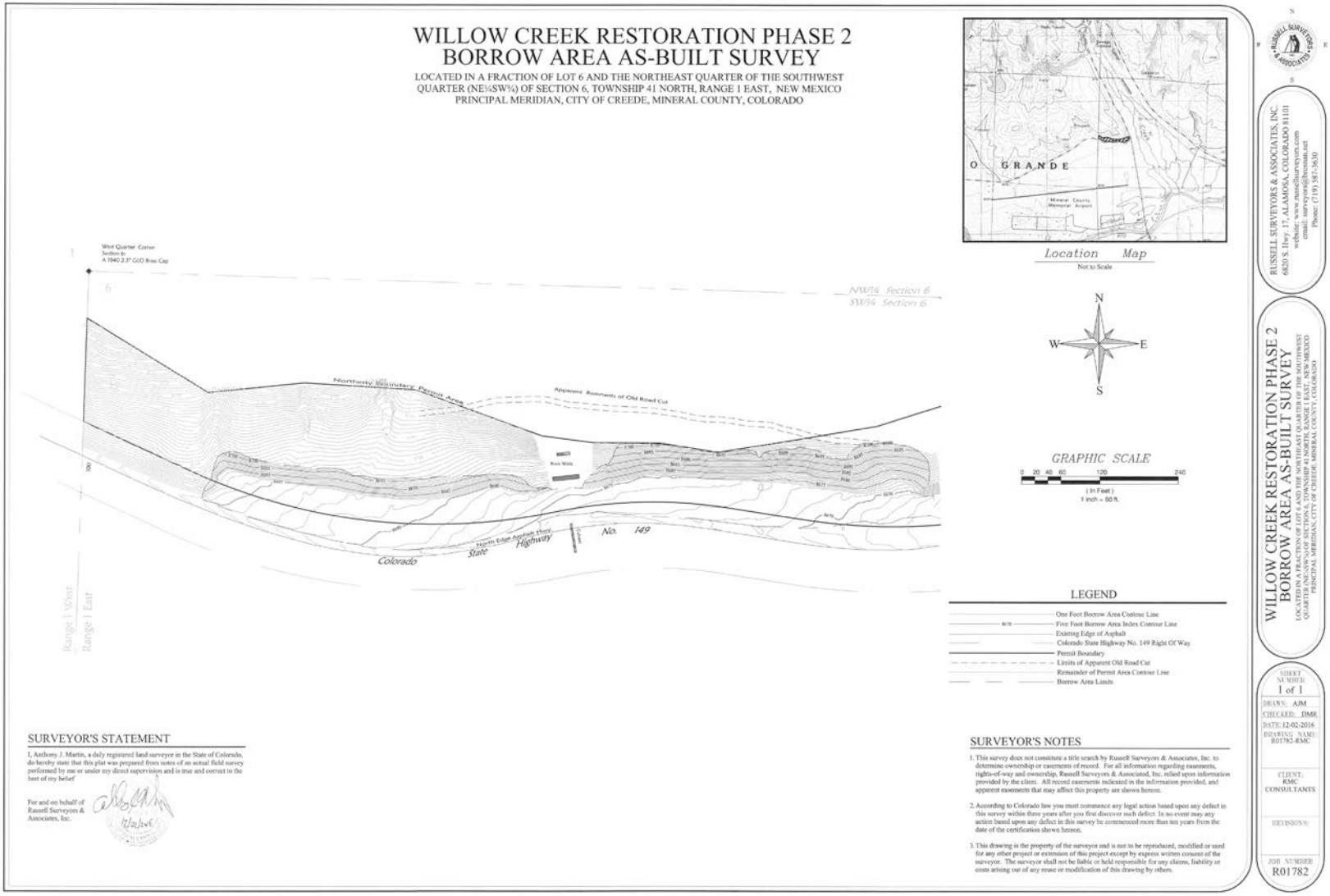
Representative condition of the soils along Willow Creek within the Lower Willow Creek Restoration Project Site before Phase II.

Pre-project SWMP installation of straw wattles along Willow Creek

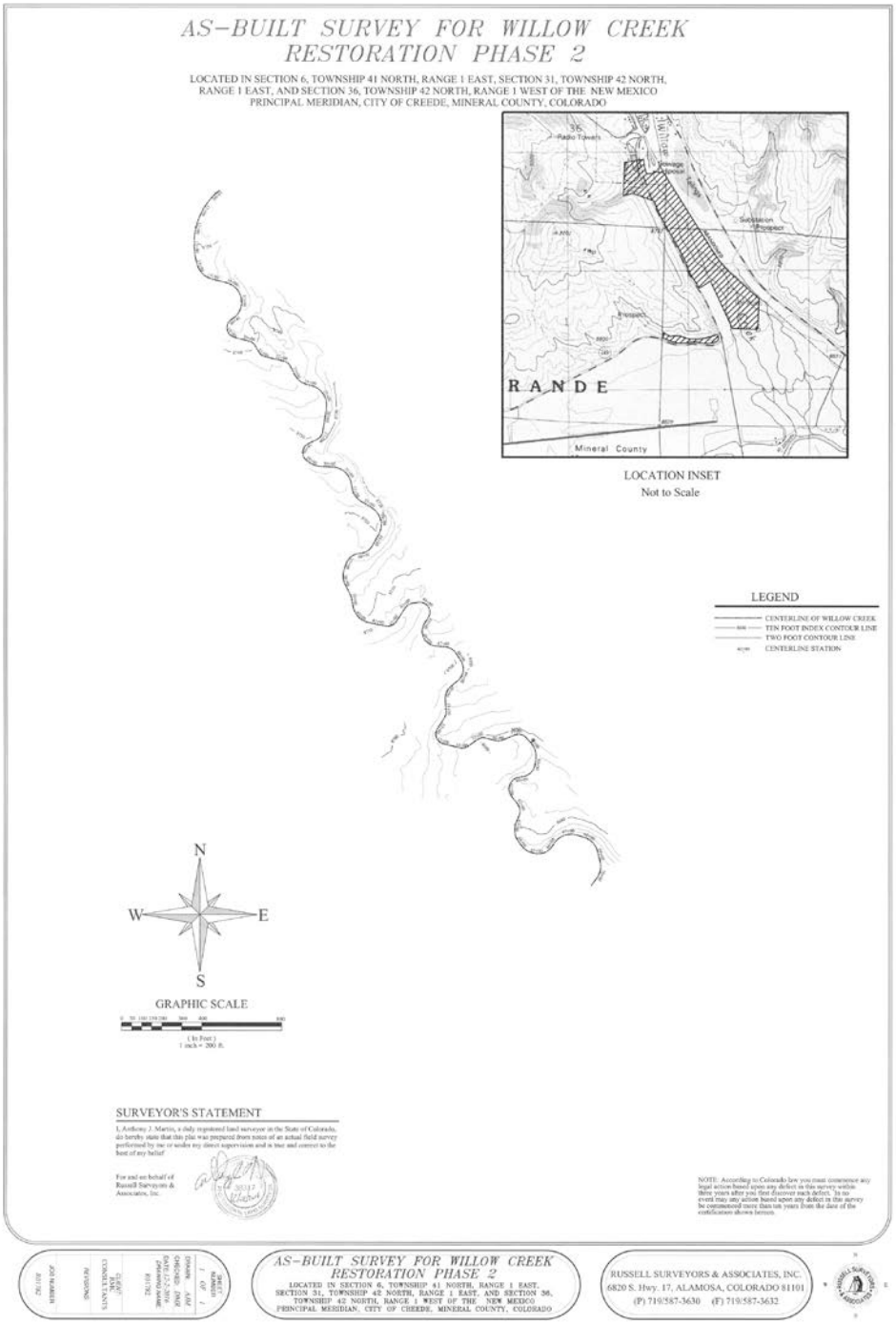
Staging of soil from the borrow site on the Lower Willow Creek Project site.



Appendix 2 As built survey of the Borrow Site



Appendix 3 As built survey of the Restoration project



References

City of Creede. 2000. Mineral County & the Town of Creede: Community Plan. Four Corners Planning & Design Group. Durango, Colorado. Retrieved from https://www.colorado.gov/pacific/sites/default/files/Creede%20Comprehensive%20Plan%202000.pdf

City of Creede. 2010. Sub-Area Plan for the Creede Resources, Inc. Properties: An amendment to the City of Creede Comprehensive Plan.

(DOLA) Department of Local Affairs. 2013. City of Creede town Demographic and Economic Profile. Colorado Department of Local Affairs.

(EPA) U.S. Environmental Protection Agency. 2011. Remedial Investigation: Nelson Tunnel/Commodore Waste Rock Pile, Creede, Colorado. HDR Engineering, Inc., Denver, CO. Retrieved from https://www.epa.gov/sites/production/files/documents/NT_RI_Nov2011.pdf

(LWCRCo) Lower Willow Creek Restoration Company. 2011. Part 1: Voluntary Cleanup Plan Application for the Lower Willow Creek Floodplain Property: Creede, Colorado. Casey Resources, Inc. Wheat Ridge, Colorado.

(NRCS) Natural Resources Conservation Service. 2007. Willow Creek Stream Restoration: Summary of Conditions, Mineral County, Colorado. NRCS Rocky Mountain Engineering Team. Monte Vista, Colorado.