Swastika Mine and Dutchman Canyon Maintenance and Stream Restoration Project

Raton, New Mexico

SWASTIKA MINE AND DUTCHMAN CANYON MAINTENANCE AND STREAM RESTORATION PROJECT, RATON, NEW MEXICO

Submitted by:

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New Mexico Abandoned Mine Land Program

New Mexico Mining and Minerals Division

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Construction Start Date: September 1, 2020

Construction Completion Date: May 26, 2021

Total Construction Cost: $979,786.79

Responsible Organizations:

Construction: Sweatt Construction, Inc.

Design Engineer: Oxbow Ecological Engineering

NEPA Lead: Daniel B. Stephens and Associates, Inc.

Prior NEPA: Water & Earth Technologies, Parametrix, Ecosphere

AML Program Staff: Jerry Schoeppner, Mike Tompson, Lloyd Moiola, Laurence D'Alessandro, Joe Vinson, James Hollen, Rick Wessel, Yeny Maestas, Linda DeLay

Project Management: AML Program Staff, Oxbow Ecological Engineering

Land Ownership: Vermejo Park Ranch (Gus Holm)

Utilities: City of Raton Public Service, CenturyLink, Springer Electric Co-op

Public Outreach: Daniel B. Stephens and Associates, Inc.

Permitting: U.S. Army Corps of Engineers (Deanna Cummings/Forrest Luna)

SWASTIKA MINE AND DUTCHMAN CANYON MAINTENANCE AND STREAM RESTORATION PROJECT

Raton, New Mexico

Nominated for:

Western Region, Small Construction and National Awards

Date Submitted: May 12, 2023

SUMMARY OF THE SWASTIKA MINE AND DUTCHMAN CANYON MAINTENANCE AND STREAM RESTORATION PROJECT AND PROBLEM DESCRIPTION:

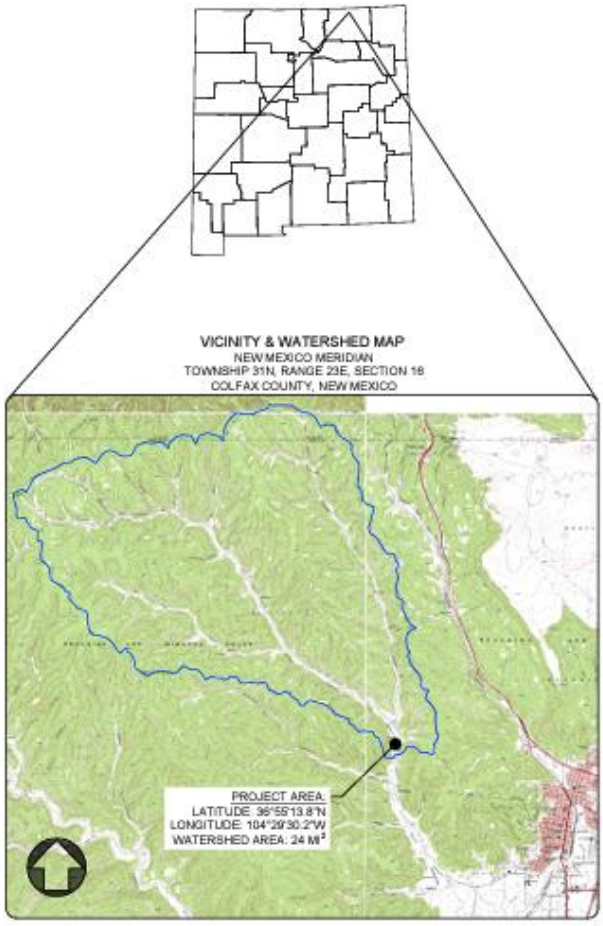


Figure 1. Project Location

A. Brief Description of Mining History

This project site is located in Colfax County, New Mexico, within the Vermejo Park Ranch. Coal mining in this area began in the late 1860s and continued into the 1960s. Swastika Mine was the last coal mine to be developed in Dillon Canyon. In 1944 an explosion killed six men in the Swastika Mine. At one point, the coal mining activity in this area was enough to support a

small bustling town, where workers had to pay rent and electricity for their houses, which were built by the company. All the mining was conducted using primarily room and pillar method.

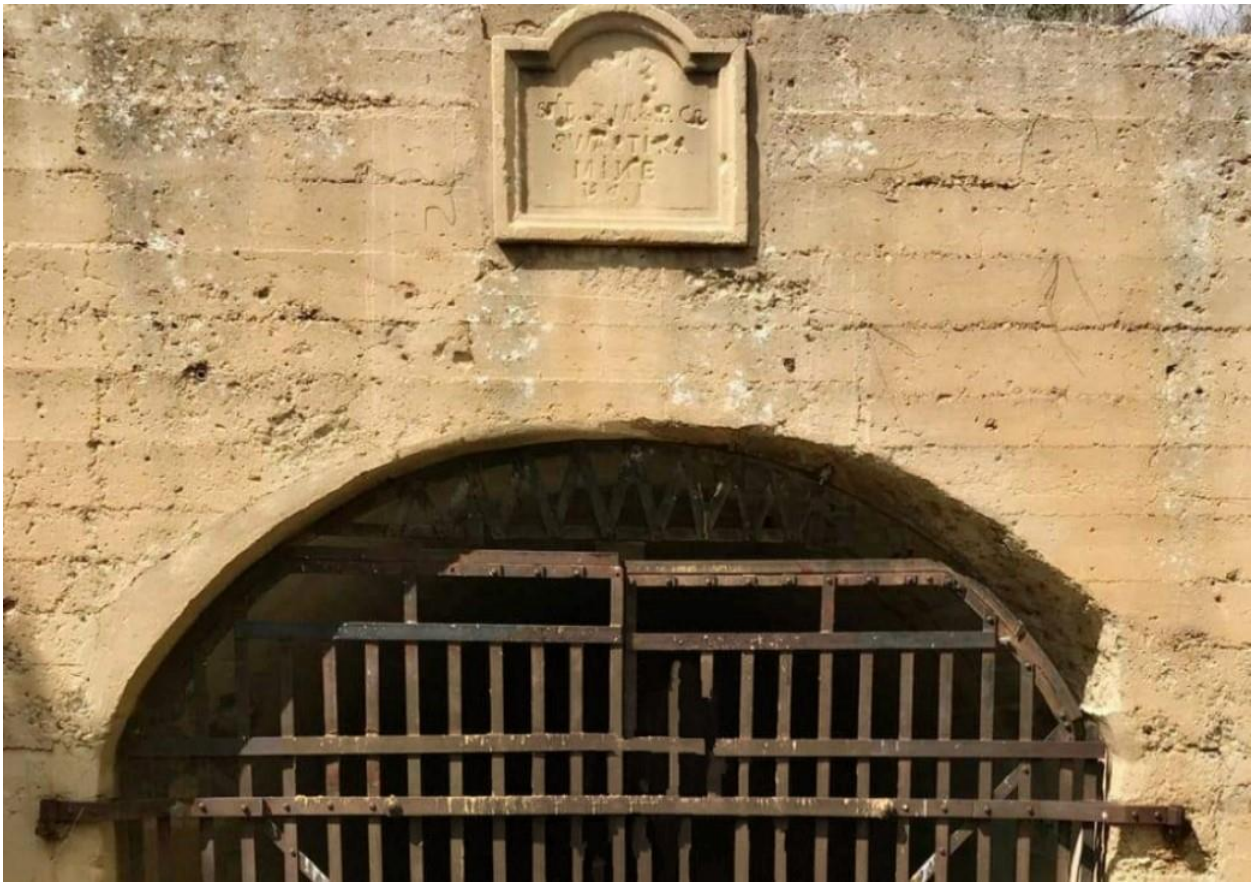


Figure 2. Mine Entrance

B. Project Description

The Swastika Mine and Dutchman Canyon Maintenance and Stream Reclamation Project follows an original 2012 reclamation project that added sinuosity to a straightened stream channel and buried nearly 200,000 cubic yards of gob piles utilizing geomorphic reclamation methods. Shortly after the first project was completed, torrential flooding in the canyon caused project-wide erosion to previously restored elements including gullying of swales and channels constructed as part of the upland landform restoration and down-cutting, scour, and lateral migration of the constructed stream channel. This project was designed to address the erosion issues resulting from the damage caused in the 2012 storm. The design methods used for this stream restoration project were dictated by applied morphology, hydrology and ecology to

address each meander within the 1-mile-long stream channel and the adjacent uplands in a holistic manner.

Figure 3. Finished Original Project and Aftermath of the Storm

C. Geomorphic Stream Restoration and Bank Stabilization

The design used geomorphic criteria developed from measurements of nearby, undisturbed features of the stream channel to mimic thriving sections that have developed naturally.

The soils in the Dillon Canyon valley are neither rocky nor clayey, and the fine silts with occasional cobbles composing the straightened channel bed and banks have little cohesion to resist shear stresses associated with high-velocity flood flows. High flow events scoured the channel bed and increased the channel depth. The additional conveyance capacity further concentrated high flows in the channel and established a tendency towards ongoing channel erosion during subsequent high flow events. The straightened reach of the Dillon Canyon channel had become deeply incised within vertical, unstable stream banks. These issues were addressed with the following primary design elements:

1. Pool construction and bank stabilization at meanders: to help dissipate energy, construct floodplain benches on the outside bank of meander, integrating large bolder clusters to protect bank bench,

2. Channel conversions and enhancements: stabilize by construction inner berms and benches,
3. Grade control: install cross vanes at the head of pools and riffles and sills at the tailout to provide grade control,
4. Upland erosion in gullies: install media lunas and one-rock check dams in actively eroding gullies in the uplands adjacent to the stream channel,
5. Native plantings: willow poles, native wetland plugs and seed,
6. Removal of erosion control fabric left over from previous project.

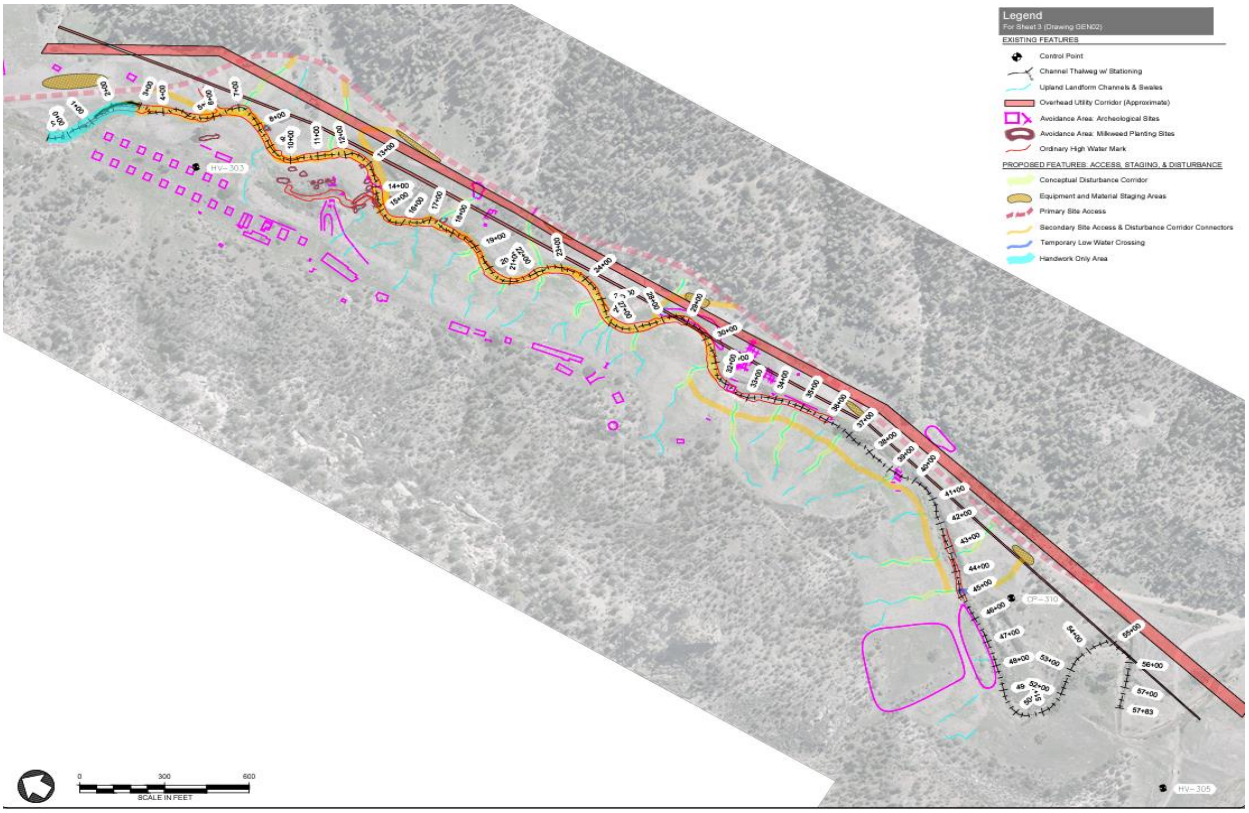


Figure 4. Overview of stream work

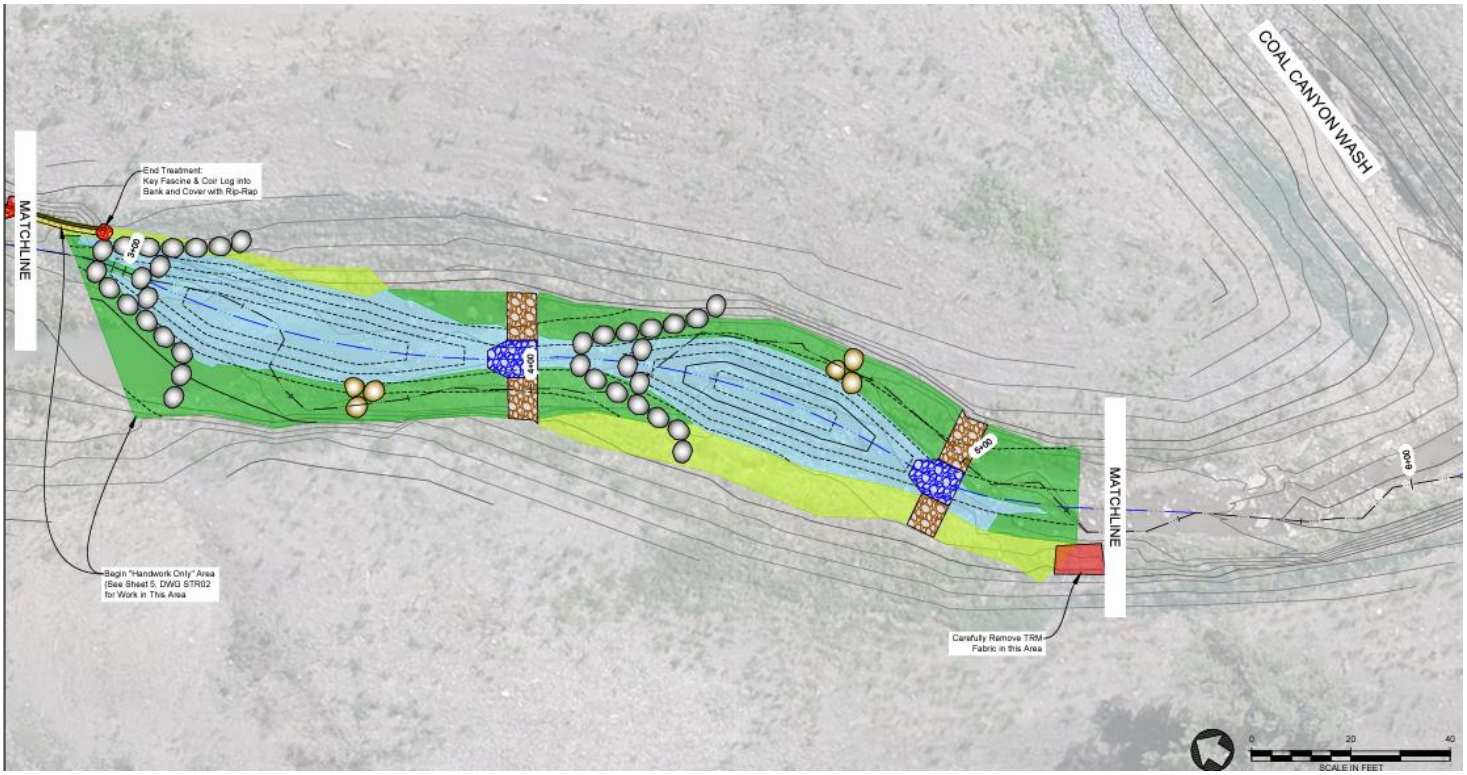


Figure 5. Typical Meander Overview

1. DIFFICULTY ACHIEVING RECLAMATION UNDER EXISTING CONDITIONS

A. Innovation/Utilization of Current Technology

The New Mexico AML Program used small uncrewed aircraft systems (sUAS) as an innovative method to monitor construction activities and post-construction changes in the terrain and resulting revegetation. Small UAS video flights documented construction activities and changes in the constructed pools within the creek during the span of construction and post-construction. These videos were paired with on-ground video and time-lapse video/photos of construction to inform viewers of the reclamation process.

Additionally, heavy equipment used to excavate and install stream restoration structures was programmed with highly precise GPS equipment by TopCon 3D-MC to excavate the pools and install the boulders to specification. Such precision was achieved with a Level Best attachment

by setting the grade on the model, and once the grade was set, the equipment would excavate up to specification, never exceeding the depth it was programmed to excavate. Accuracy of this was verified by minimal on-the-ground traditional surveying methods.

Figure 6. A John Deere track loader equipped with Level Best attachment and Topcon 3D-MC grade control software

B. Special and Unique Considerations

Challenges for geomorphic design at the Swastika channel included the presence of many valuable cultural and natural resources lying within an area that limited access for construction in the northernmost part of roughly 300 linear feet. It was required that the construction contractor limit their disturbance footprint by utilizing the actual stream channel as access route to preserve archaeological features surrounding the project including the buildings and facilities that served the mine, and the relics of the coal camp where as many as five hundred miners lived at the height of coal production in the late 1920's. The construction contractor solved this issue by utilizing a swinging conveyor belt to transport boulders into place while a crew in the channel installed them by hand and thus completely bypassing this avoidance area.

Figure 7. Conveyor belt being used to drop boulders into place in the stream channel across an archaeological avoidance area.

C. On-Site difficulty of the Project

Construction of the Swastika Mine and Dutchman Canyon Maintenance and Stream Restoration Project took place over a nine-month period in 2020-2021. Construction engineering oversight was provided by Oxbow Ecological Engineering out of Flagstaff Arizona. Construction was provided by Sweatt Construction from Artesia, New Mexico. Equipment was mobilized and the installation of erosion control structures began on September 1, 2020.

It is worth mentioning that this project was constructed at the height of the CoVID-19 pandemic.

On March 11, 2020, the State of New Mexico declared a Statewide Health Emergency in response to the CoVID-19 Pandemic. This meant that all in-person gatherings, including construction projects, were to be limited to slow the spread of the virus. It was determined that this project was essential to protect the public health and safety and authorization to proceed with procurement was granted. Curiously, and perhaps due to the ongoing pandemic, all the bids received for this stream restoration project were from companies that had oil and gas experience.

The Statewide Health Emergency Declaration put the State of New Mexico under lockdown, and the Native American Pueblos were no exception. The New Mexico AML Program partnered with Santa Ana Native Plants, located in the Pueblo of Santa Ana, to grow all the plant materials necessary for this project. This agreement was put in place before the CoVID-19 virus epidemic. On April 3, 2020, the Pueblo of Santa Ana Tribal Council formally adopted the State's emergency measures and furthered them by formally closing access to outsiders. This created a multitude of logistic issues that included an incomplete number of plants materials, receiving plants materials much later than expected at a location outside of the Pueblo. A refrigerated truck was procured to keep them dormant as long as possible. Still, all plant materials (wetland plugs, cottonwood poles, willow cuttings) were planted with a delay.

While the logistics of navigating a project in the middle of a pandemic were challenging, the harsh winter weather of northern New Mexico is another factor to consider when talking about special considerations. The project area is located within a valley that has an elevation of approximately 6,600 feet and during a typical year gets an average of 28-30 inches of snow with temperatures ranging from 18°F to 44°F during the day. These low temperatures caused

the heavy equipment to warm up very slowly in the mornings, work in slippery steep conditions, and limited the work hours due to limited daylight.

Figure 8. Working on upland erosion control structure in steep, frozen conditions.

The construction crew took one week off during the Thanksgiving 2020 holiday and traveled back to Artesia, NM. The Monday after the Thanksgiving holiday break, it was reported that several key members of the construction crew had contracted CoVID-19. Construction did not resume until the last week of January 2021, setting back the project completion date by two months.

2. ON-SITE EFFECTIVENESS

A. Effective/Innovative Use of Technology

This project utilized a combination small uncrewed aircraft system (sUAS) construction activities and GPS guided heavy equipment for accuracy of installation of structures to make sure they were built to specifications. It even included a low-impact Terramac Crawler Carrier with rotating bed. The channel designs used low-impact erosion control measures with no man-made materials.

Figure 9. GPS-guided John Deere track loader above and Terramac Crawler below

Figure 10. One year after reclamation monitoring using small uncrewed aircraft systems

More of how the small uncrewed aircraft systems were utilized for this project can be seen in the following Story Map here:

https://storymaps.arcgis.com/stories/a3d423ce020c400db124f0a0b6fae76f

B. Landscape Conforms to the Natural Environment

Water was moving too fast through the system and causing erosion of the banks of the channel. Rock structures were created using local sourced materials that were intended to be covered over with sediment as the water was slowed. The deposited sediment provides a stable formation for plants to thrive and further protect the channel from erosion. The design used geomorphic criteria developed from measurements of nearby, undisturbed features of the stream channel to mimic thriving sections that have developed naturally. This approach was used in every meander throughout the project.

Figure 11. Recovered Riffle Section

C. Elimination of Significant Health and Safety Problems

Erosion issues were addressed throughout the channel and the uplands. This was proven to be effective after a significant storm came through after construction was completed. This storm helped identify weak points of the channel that needed further boulder reinforcement and rock placement. The whole system seems to be doing its job and directing channel flows away from cut banks and depositing sediment in areas as intended. This will in turn provide a stable base for vegetation to thrive. Intermittent monitoring happens throughout the year by various AML staff to make sure the channel continues to work as intended and no further erosion issues are present.

3. FUNDING

A. Effective Use of Funds

This project was procured through the New Mexico Invitation to Bid process. The lowest bidder was Sweatt Construction, out of Artesia, New Mexico which was traditionally an oil-and-gas company. There was a concern regarding an oil-and-gas company doing stream restoration work. The crew turned out to be conscientious about the work they were performing. Although the project took longer to be completed than expected due to weather and the CoVID-19 pandemic, the final construction cost was *less* than the initial bid. The initial bid for this project was $1,011,003.43. The final construction cost was **$979,786.79.** ($312,166 under budget!)

B. Leveraging

This project would not have been successful without the cooperation of all parties involved. The Vermejo Park Ranch was very accommodating to any requests we had. The New Mexico Abandoned Mine Land Program partnered with The Pueblo of Santa Ana and the New Mexico Forestry Department both provided plant materials for the project, and Vermejo Park Ranch donated a portion of the rocks from their own quarry. George Cathey of Oxbow Ecological Engineering did a pro-bono post-construction flight to show the structures installed. Natural Channel Design, working on a separate project, gave a demonstration to the Sweatt Construction crew on wetland plug planting to ensure their success.

4. BENEFITS TO THE COMMUNITY

A. Community Support for the Project

Plans had been made to use high school students to help with planting and educate them about the project, but at construction time New Mexico schools went exclusively online, and large gatherings were prohibited due to the ongoing CoVID-19 pandemic**.** Nonetheless, the citizens of Raton were very excited about the project and supported it wholeheartedly.

B. Long Term Benefits to the Community

Better water quality in the stream channel and more vegetative cover are a benefit to the downstream users of the water and the abundant wildlife in the area. The landform is more stable and there will be less sediment in the stream. A more stable channel is less likely to expose the buried coal gob on both sides of the stream channel. The gob was buried in a previous 2012 geomorphic reclamation project.

Figure 12. Two-tailed Swallowtail (Papilio multicaudata) nectaring at thistle, July 2022.

5. SURFACE MINING CONTROL AND RECLAMATION ACT (SMCRA)

A. Exceeds Spirit and Intent SMCRA

This project represents low-impact stream restoration near abandoned coal mines. Addressing erosion issues and installing structures to reduce the speed of the water as it travels downstream will improve vegetation growth and wildlife usage. This is one of the main reasons SMCRA is in place. The intent of SMCRA is to safeguard hazardous coal mine openings (done in previous work) and reclaim the environment affected by coal mining waste. The goal to protect human life and wildlife was achieved.

Figure 13. Completed stream restoration project

B. Increased Public Awareness of SMCRA

The successful completion of the project was published in the New Mexico State Employees Newspaper Round the Roundhouse, in a press release was published on July 22, 2021 and updates about the project aired in local Raton KRTN radio station. Local TV stations also picked up on the press release and associated news story. It was made clear that the project was funded through a fee on coal production.

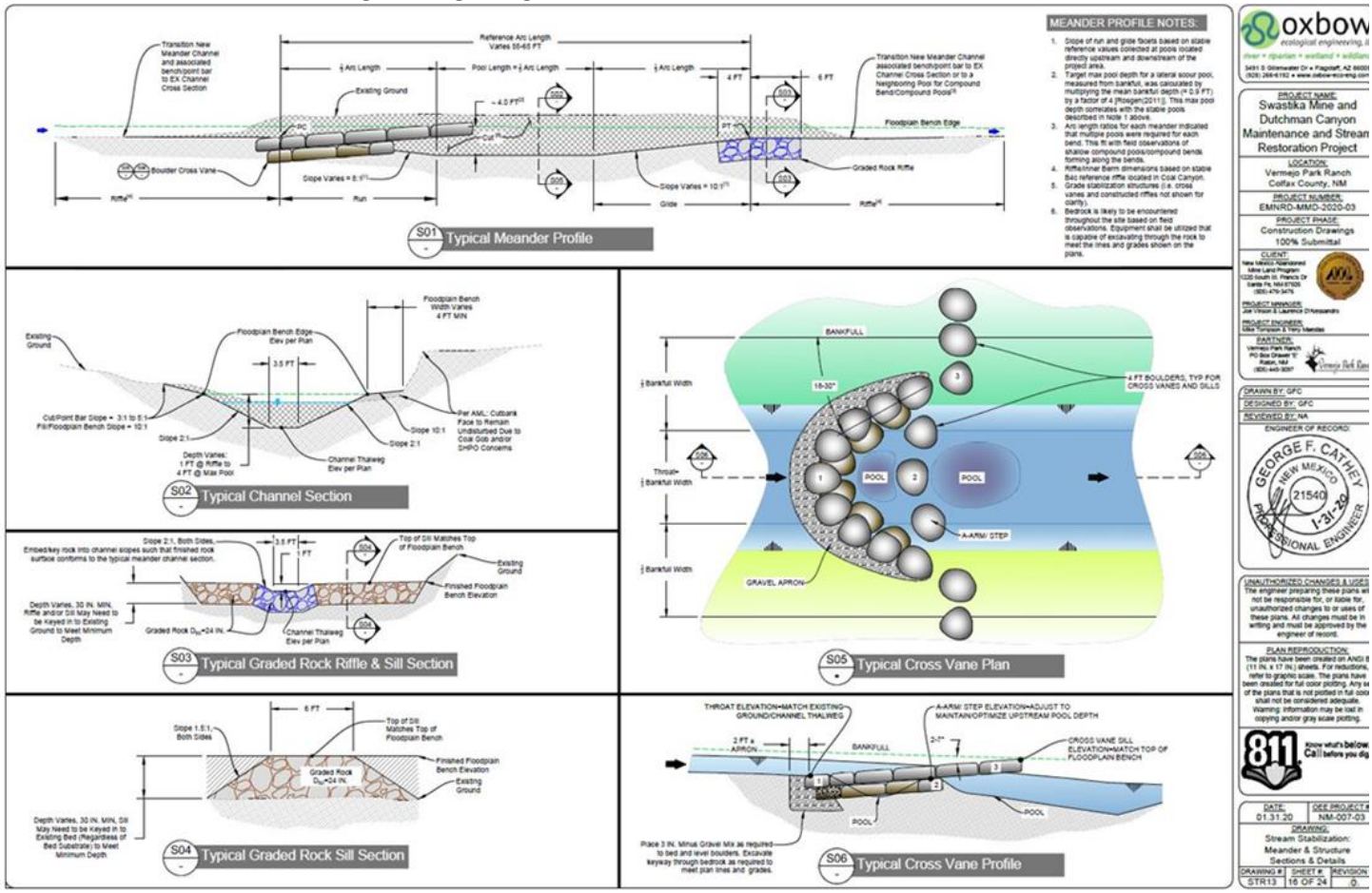
C. Transferability or value of the accomplishment(s) to other mining and reclamation operations:

The success of this project will be a template to follow internally and be a resource to show others involved in wetland protection and erosion control best practices through tours and written literature. Topics that can pass on to other include:

- Geomorphic reclamation
- Stream Restoration
- Historic preservation
- GPS-guided heavy equipment
- Wildlife cameras to track wildlife usage of reclaimed mine sites

Project Photos

Channel Structure details in Engineering Design

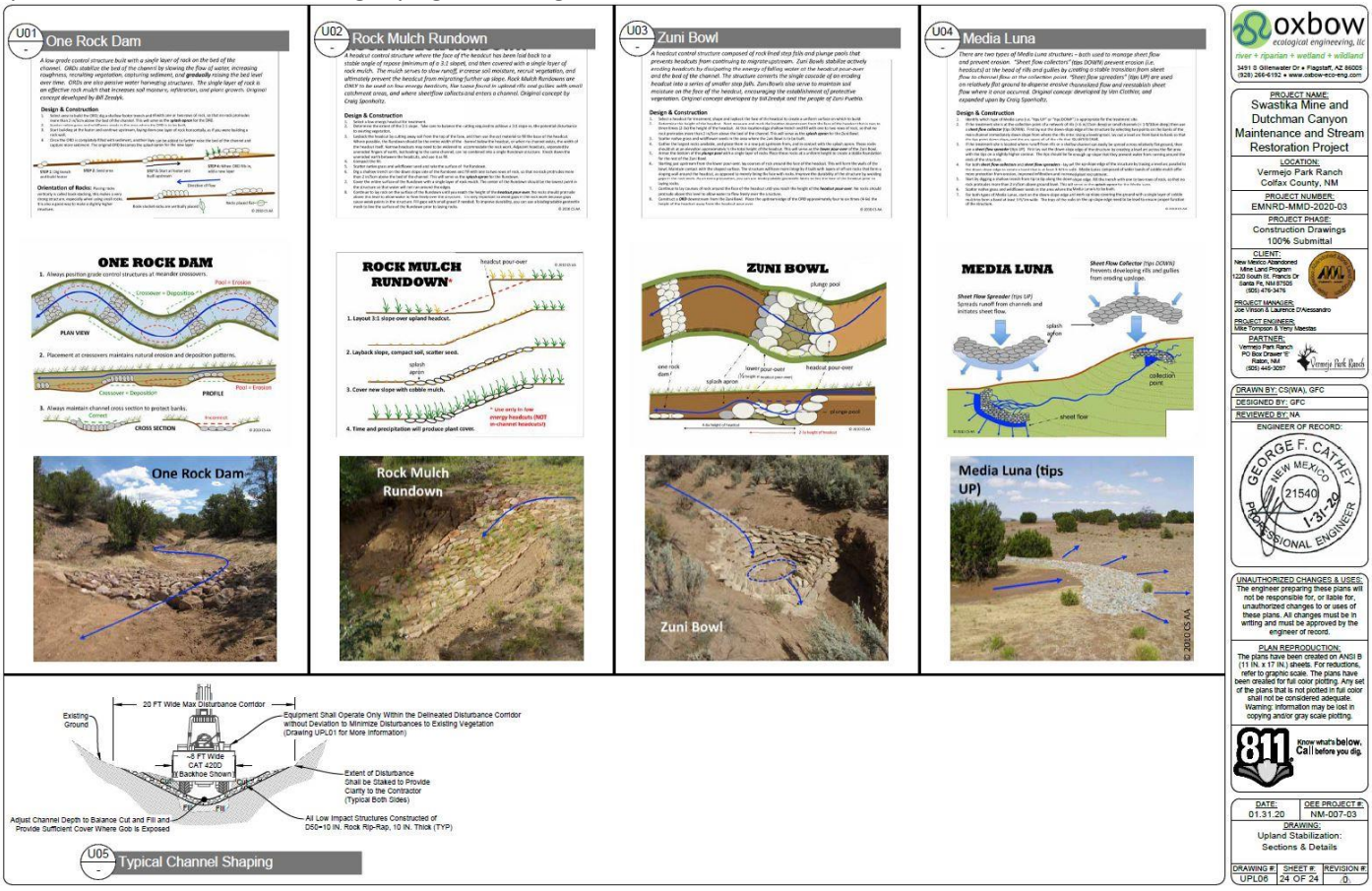


Shaping channel for rock structures


DEERE


CAT

Upland rock structures to cure gullying and rilling



oxbow ecological engineering, llc
river + riparian + wetland + wildland
3491 S Gillenwater Dr • Flagstaff, AZ 86005
(928) 266-6192 • www.oxbow-eco-eng.com

PROJECT NAME:
Swastika Mine and Dutchman Canyon Maintenance and Stream Restoration Project

LOCATION:
Vermejo Park Ranch
Colfax County, NM

PROJECT NUMBER:
EMNRD-MMD-2020-03

PROJECT PHASE:
Construction Drawings
100% Submittal

CLIENT:
New Mexico Abandoned Mine Land Program
1220 South St. Francis Dr
Santa Fe, NM 87505
(505) 476-3476

PROJECT MANAGER:
Joe Vinson & Laurence D'Alessandro

PROJECT ENGINEER:
Mike Tompson & Terry Maestas

PARTNER:
Vermejo Park Ranch
PO Box Drawer 'E'
Raton, NM
(505) 445-3097

DRAWN BY: CS(WA), GFC
DESIGNED BY: GFC
REVIEWED BY: NA

ENGINEER OF RECORD:
GEORGE F. CATHEY NEW MEXICO 21540 1-31-20 PROFESSIONAL ENGINEER

UNAUTHORIZED CHANGES & USES:
The engineer preparing these plans will not be responsible for, or liable for, unauthorized changes to or uses of these plans. All changes must be in writing and must be approved by the engineer of record.

PLAN REPRODUCTION:
The plans have been created on ANSI B (11 IN. x 17 IN.) sheets. For reductions, refer to graphic scale. The plans have been created for full color plotting. Any set of the plans that is not plotted in full color shall not be considered adequate. Warning: Information may be lost in copying and/or gray scale plotting.

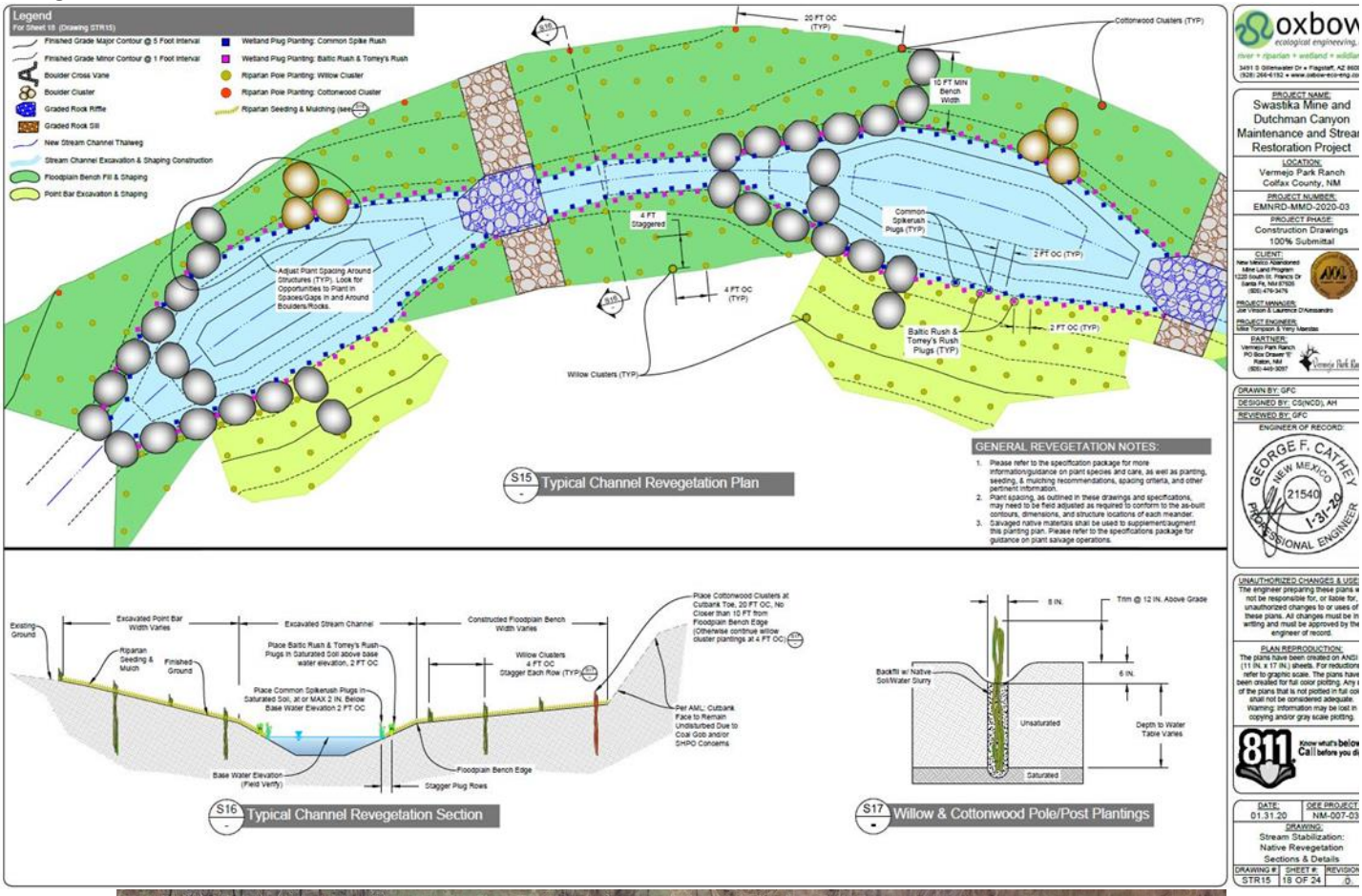
811 Know what's below. Call before you dig.

DATE:	OEE PROJECT #:
01.31.20	NM-007-03

DRAWING:
Upland Stabilization:
Sections & Details

DRAWING #	SHEET #	REVISION #
UPL06	24 OF 24	0

Revegetation Plan




299D

Structures doing their job after rain events, moving the flows away from eroding banks

Channel after a season of good precipitation