**Phase 1 Final Design Deliverable**

Camp Bird Removal Action

**Site Name:** Camp Bird Mine
**Site ID:** A8H9
**Prepared by:** Mike Thompson, Project Coordinator, Caldera Mineral Resources, LLC
**Prepared for:** Martin McComb, On-Scene Coordinator, EPA
**Date:** October 1, 2017

**Introduction**

This narrative and the enclosed drawings are being provided as a requirement under the Camp Bird Mine Removal Action Work Plan (Work Plan) in support of the Administrative Settlement Agreement and Order on Consent for Removal Action between the U.S. Environmental Protection Agency (EPA) and Caldera Mineral Resources, LLC (Caldera).

In general, the work being completed at the Site is on a design/build basis with back-up conceptual drawings that do not perfectly reflect the past or future construction activities. However, the drawings combined with the following narrative represents the final design deliverable for all of the Phase 1 Tasks. There will likely be changes to the designs in the future as construction continues, and Caldera will provide physical updates to the designs at EPA's request.

**Phase 1 Task 1: Obtain restoration materials**

Topsoil is being obtained from the following sources:

- The large stockpile of colluvium mixed with blast rock, comprising the left bank of Imogene Creek from the pipe bridge downstream to the low water crossing, and extending west towards the historic houses.
- East and behind the P1T2 tailings cell where the native slope has been exposed by the excavation of tailings
- Accumulated topsoil that was on top of the bedrock bench east and above the P1T2 tailings cell
- Accumulated topsoil that will be excavated to build and grade the constructed drainage that will capture and divert all seeps and storm water upgradient from the historic tailings.
- The natural alluvial fan extending south and parallel with Canyon Creek that was exposed from excavating tailings from the slope and toe of the P1T2 tailings.

Rip-rap, bank stabilization and vane arm materials are being obtained from the following sources:

- Stockpiling of large boulders, and blasting of oversized boulders throughout the Site.
- Blasting of exposed bedrock along the water tank road.
- Blasting of exposed bedrock east and upgradient of the P1T2 tailings cell, at the future location of the constructed drainage.
- Blasting of the exposed bedrock bench along the east margin of the access road, from the main mine area to the P1T2 tailings area.
- Blasting of exposed bedrock along the right bank of Canyon Creek, from the narrow pinch point downstream to the end of the natural bedrock bench that formerly comprised the right bank of Canyon Creek

- Screening of the DRMS stockpile.
- Screening of the alluvium and large boulders accumulated in Imogene Creek.
- Screening of alluvium accumulated in the right bank of Canyon Creek from the confluence, downstream to the P1T2 tailings area.
- Screening of alluvium accumulated at the large flat nose at the confluence of Imogene and Sneffels Creeks, which forms the left bank of the Sneffels and Canyon Creeks.
- The rock slide at U.S. Mountain will only be used as a last resort if all of the above sources are exhausted.

Inert, angular waste rock (if needed for geotechnical stability or for coverage of exposed tailings) can be obtained by reducing the slopes of the existing waste rock piles on Site.

Hydromulch with a combination of soil media, fertilizer, native seed and other amendments (e.g. pH adjustments) will be used to cover exposed tailings on slopes too steep for conventional capping or if there is a shortage of topsoil or waste rock.

**Phase 1 Task 2: Stabilize downstream historic tailings**

The drawing for P1T2 is conceptual and does not reflect the exact conditions. As of the date of this submittal, the entire downstream historic tailings cell has been regraded, shaped and prepped for capping. The slopes on all sides have been reduced to the minimum grade possible without compromising the structural integrity of underlying slime layers. Tailings have been removed entirely from the toe, which is now comprised of a natural colluvial deposit that was buried beneath 10s of feet of windblown tailings sand.

The former bisecting channel was completely filled with materials generated from the slope reduction, and the fill material in the mouth of the former channel has been armored and compacted with a wedge of large angular boulders and high quality topsoil. The drain placed in the bisecting channel will remain in place to ensure long term structural integrity of the material placed in the void. Removal of tailings at the toe resulted in a large 20’ wide bench that will serve as an access route to maintain the drain and toe of the pile as needed.

Most of the trees were removed from the bench, with the exception of those that were growing at the base of the former toe. After removal of the windblown sand at the toe, the trees are now as much as 10’ from the newly exposed colluvium toe. The large boulder at the toe was removed entirely along with several smaller boulders that were too large to move without blasting.

The channel on the backside of the tailings pile is still under construction. The channel will be built above a bench of bedrock that was lowered while producing restoration materials. Where appropriate the channel will be lined with 24mil woven poly liner and reinforced with 140N geotextile fabric as needed. The liner will be placed to capture all evidence of seepage that once fed the former bisecting channel that cut through the tailings. Rip-rap blended with topsoil will be placed on the liner and will comprise the substrate of the constructed channel. Check dams will be placed periodically to eliminate erosion of the channel during high flow events. The road built to access the tailings pile will remain passable to provide access for long term maintenance.

The top of the tailings pile will be gently graded so that the crest of the slopes forms a ridge, and behind the crest/ridge, the top will be gently graded backwards towards a single point where the access road and constructed channel first intersect with the pile to minimize long term storm water maintenance.

The top and slopes of the tailings cell will be amended with organic fertilizer, wood chips, then capped with topsoil generated from multiple sources. A native seed mix, unique to the Site, will be hand broadcast onto the topsoil then dragged over to protect from wind.

A series of water guns will be placed in the following summer to irrigate the reclaimed tailings pile. Trees and willows will be planted at select locations along the toe and slopes for added stability. Water sources will be from the water rights owned by Caldera at the Site.

Erosion control features such as downed trees, silt fence, erosion logs, and hydromulch will be used as needed to prevent storm water erosion prior to vegetation taking hold.

**Phase 1 Task 3: Stabilize upstream historic tailings**

Construction has not started, so the drawings combined with the Work Plan narrative, accurately reflect the current design concepts anticipated for next year.

**Phase 1 Task 4: Enhance and reinforce streams adjacent to historic tailings**

<u>Imogene Creek</u>:

Imogene Creek from the pipe bridge to the low water crossing is completed. The stream channel was quadrupled in size, a large sinuous bend was constructed, all loose mine debris and loose boulders were removed, and 3 vane arms with accompanying bank stabilization were constructed. Large boulders were used for bank stabilization beneath and adjacent to the pipe bridge. The banks of Imogene were laid back to approximately 3H:1V. Approximately 30 feet of the secondary discharge pipe was dismantled to remove the pipe from the stream channel and bank. All old cribbing along the right and left banks was removed and replaced with bank stabilization boulders. Mine features pinned to bedrock (e.g. historic trestle footers and the foundation for the coarse ore bin) were left in place due to their strength and historical significance.

Imogene Creek from the low water crossing to the confluence with Sneffels Creek will be addressed during the next construction season. Installation of 2, 20'x12' pieces of corrugated metal pipe (CMP) may be used to build a permanent crossing over Imogene Creek below the area that was worked on in 2017. Exact designs depend on numerous factors (e.g. location of bedrock, location of slimes, gradient of stream, etc.) that will be revealed as debris removal and excavation occurs next year.

The nose deflecting Imogene Creek at the confluence with Sneffels Creek will be removed and the resulting slope on the right bank will be heavily armored.

Ideally a bench the width of heavy equipment will be constructed along the toe from the low water crossing in Imogene Creek to the end of the upstream historic tailings pile along Canyon Creek. However, there may be limiting factors (e.g. proximity of slimes, powerline locations, etc.) that prohibit or limit construction of a bench.

Sneffels Creek:

The drawings accurately reflect the current design concepts.

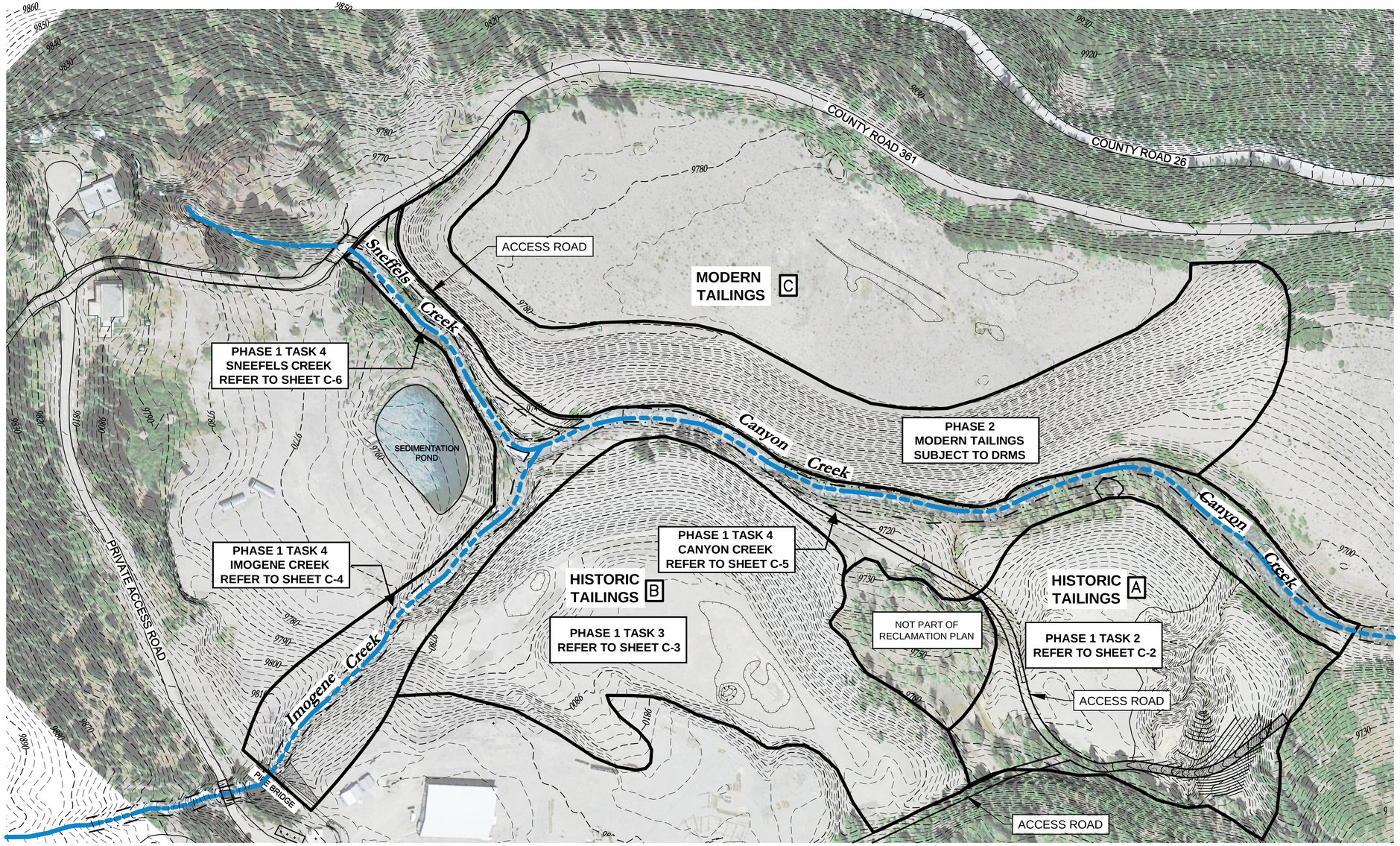
Canyon Creek:

The drawings accurately reflect the current design concepts.

Tailings have been removed from the flood plain bench from the terminus of the upstream historic tailings to the terminus of the downstream historic tailings. Bedrock has been blasted into vane arm and bank stabilization materials where exposed on the right bank of Canyon Creek. As the toe of the modern tailings is armored, the channel of Canyon Creek will shift to the east where the bedrock has been removed.

The large boulder in the floodplain down gradient from P1T2 tailings pile has been blasted and completely removed and most trees that could constrict high flows were removed.

Tailings in the once hummocky area between the upstream and downstream historic tailings have been regraded and mixed in with topsoil. Seeps and springs have been exposed along the bedrock contact and these will be captured and routed along the floodplain bench to establish riparian vegetation.




PHASE 1 TASK 2:
- EXCAVATE EAST TAILINGS AND FILL UNNAMED DRAINAGES.
- REVEGETATE EASTERN HISTORIC TAILINGS [A]

PHASE 1 TASK 3:
- SHAPE AND REVEGETATE HISTORIC TAILINGS [B]

PHASE 1 TASK 4:
- IMOGENE CREEK RESTORATION AND REVEGETATION
- CANYON CREEK RESTORATION AND REVEGETATION
- SNEFFELS CREEK RESTORATION AND REVEGETATION

NOTES
1. Reclamation boundary and topography provided by Caldera Minerals, LLC.
2. Image from Google Earth 7/27/2014.

N

SITE PLAN

80 0 80 160
SCALE IN FEET
2' CONTOUR INTERVAL

DRAFT
Subject to Review

WESTERN STREAM WORKS
970.708.2138
RIDGWAY, COLORADO
Design • Build • Restore

Prepared for the Camp Bird Mine Removal Action Work Plan in support of the Administrative Settlement Agreement and Order on Consent between U.S. EPA and Caldera Mineral Resources, LLC.
EPA Site ID: A8H9

| REVISIONS | | | |
|---|---|---|---|
| REV | DATE | DESCRIPTION | BY |
| 1 | 9/22/17 | REVISIONS | DC |

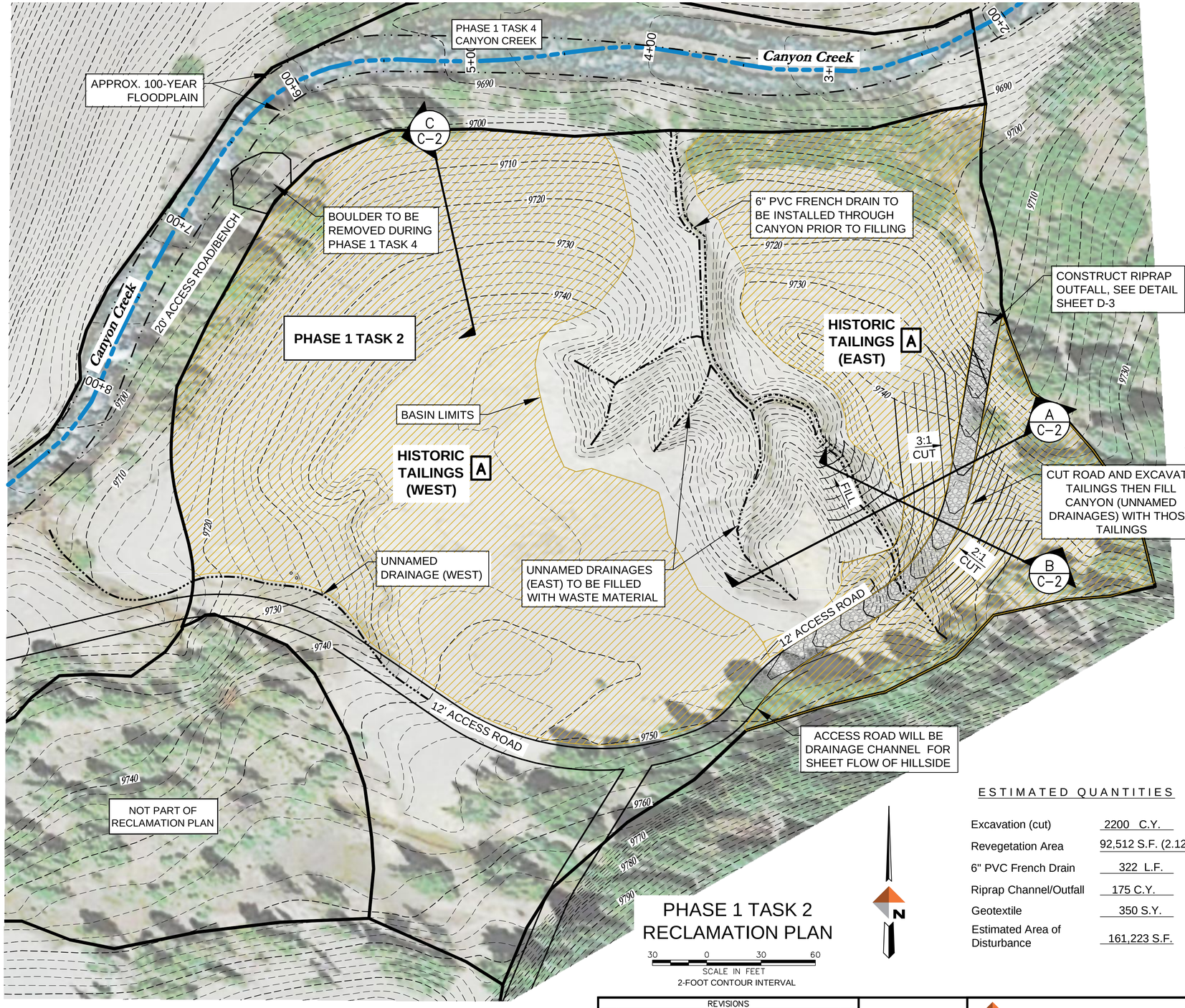
DOWL
WWW.DOWL.COM
222 South Park Avenue
Montrose, Colorado 81401
970-249-6828

CAMP BIRD MINE RECLAMATION
OURAY COUNTY, COLORADO

SITE PLAN

| | |
|---|---|
| PROJECT: | 7128.74652.01 |
| DATE: | 8/24/17 |
| ENGINEER: | DCQ |
| DRAWN BY: | JC, PH, DC |
| CHECKED BY: | |
| APPROVED BY: | |

SHEET
C-1




# PHASE 1 TASK 2 RECLAMATION PLAN

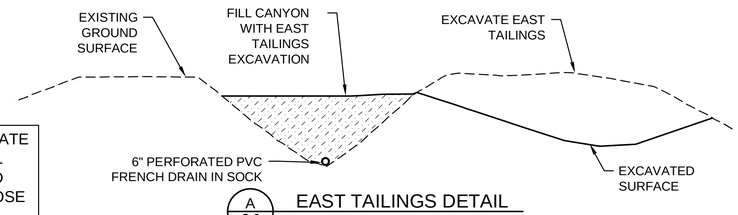
SCALE IN FEET
30 0 30 60
2-FOOT CONTOUR INTERVAL

## PHASE 1 TASK 2 WORK PLAN (2017)

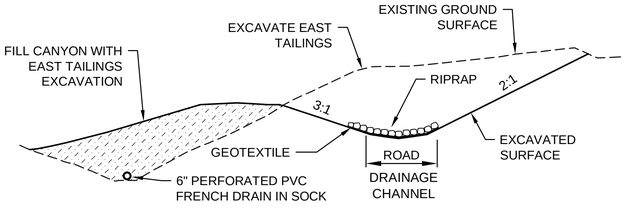
1. Cut access roads for construction equipment. Road will eventually become the drainage outfall after excavation and revegetation.
2. Excavate tailings material at southeast area and fill Unnamed Drainage (East) with those tailings.
3. Revegetation of slopes by contractor using approved seed mix, and Erosion Control Measures (ECM's) (see Sheet D-3).

## LEGEND

- Phase/Task Boundary
- Creek Flowline
- Drainage Flowline
- Approximate 100-Yr. Floodplain
- Approximate Limits of Revegetation
- 6" PVC French Drain
- Drainage Channel Riprap



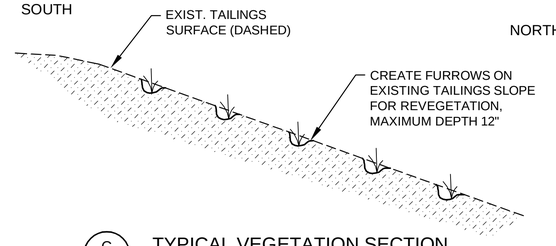

A C-2 EAST TAILINGS DETAIL
NTS




B C-2 DRAINAGE CHANNEL DETAIL
NTS

## ESTIMATED QUANTITIES

| | |
|---|---|
| Excavation (cut) | 2200 C.Y. |
| Revegetation Area | 92,512 S.F. (2.12 AC.) |
| 6" PVC French Drain | 322 L.F. |
| Riprap Channel/Outfall | 175 C.Y. |
| Geotextile | 350 S.Y. |
| Estimated Area of Disturbance | 161,223 S.F. |




C C-2 TYPICAL VEGETATION SECTION
NTS

FINAL
Deliverable

Prepared for the Camp Bird Mine Removal Action Work Plan in support of the Administrative Settlement Agreement and Order on Consent between U.S. EPA and Caldera Mineral Resources, LLC.
EPA Site ID: A8H9

REVISIONS

| REV | DATE | DESCRIPTION | BY |
|---|---|---|---|
| 1 | 9/22/17 | REVISIONS | DC |

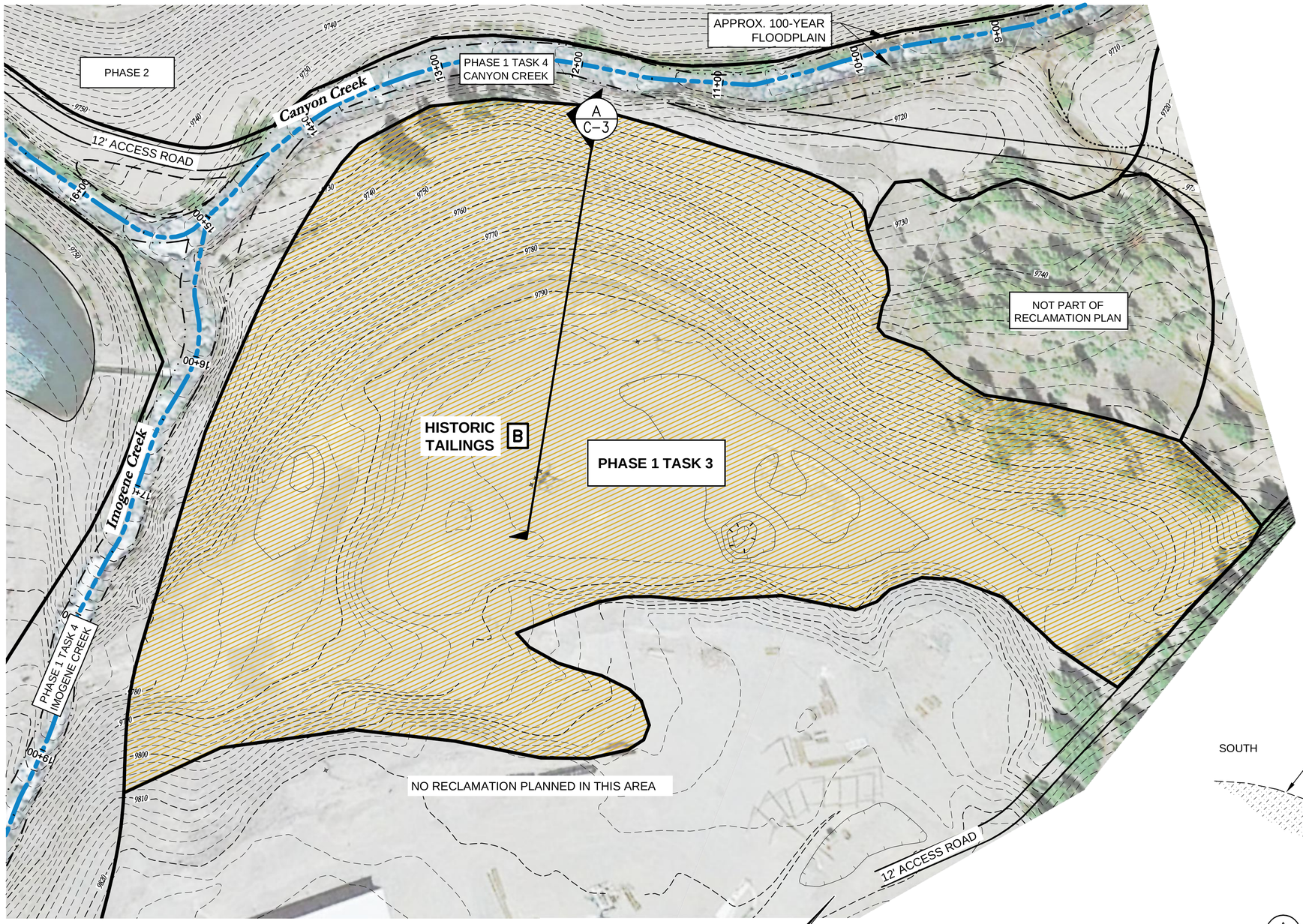
DOWL
WWW.DOWL.COM
222 South Park Avenue
Montrose, Colorado 81401
970-249-6828

CAMP BIRD MINE RECLAMATION
OURAY COUNTY, COLORADO

PHASE 1 TASK 2
RECLAMATION PLAN

| | |
|---|---|
| PROJECT: | 7128.74652.01 |
| DATE: | 8/24/17 |
| ENGINEER: | DCQ |
| DRAWN BY: | JC, PH, DC |
| CHECKED BY: | |
| APPROVED BY: | |

SHEET
C-2




## PHASE 1 TASK 3 RECLAMATION PLAN

40 0 40 80
SCALE IN FEET
2-FOOT CONTOUR INTERVAL

N

## PHASE 1 TASK 3 WORK PLAN (2017)

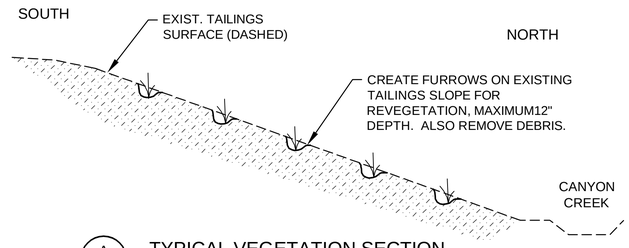
1. Develop access roads as needed for constructing current and future areas.
2. Regrade Historic Tailings B for revegetation by contractor. Remove timbers and debris as part of this task.
3. Revegetation by contractor using approved seed mix and Erosion Control Measures (ECM's) (See Sheet D-3).

## LEGEND

- Phase/Task Boundary
- Creek Flowline
- Drainage Flowline
- Approximate 100-Yr. Floodplain
- Approximate Limits of Revegetation

## ESTIMATED QUANTITIES

| | |
|---|---|
| Regrading | 500 C.Y. |
| Revegetation Area | 218,903 S.F. (5.03 AC.) |
| Estimated Area of Disturbance | 499,528 S.F. |




A / C-3 TYPICAL VEGETATION SECTION
NTS

DRAFT
Subject to Review

Prepared for the Camp Bird Mine Removal Action Work Plan in support of the Administrative Settlement Agreement and Order on Consent between U.S. EPA and Caldera Mineral Resources, LLC.
EPA Site ID: A8H9

| REVISIONS | | | |
|---|---|---|---|
| REV | DATE | DESCRIPTION | BY |
| 1 | 9/22/17 | REVISIONS | DC |

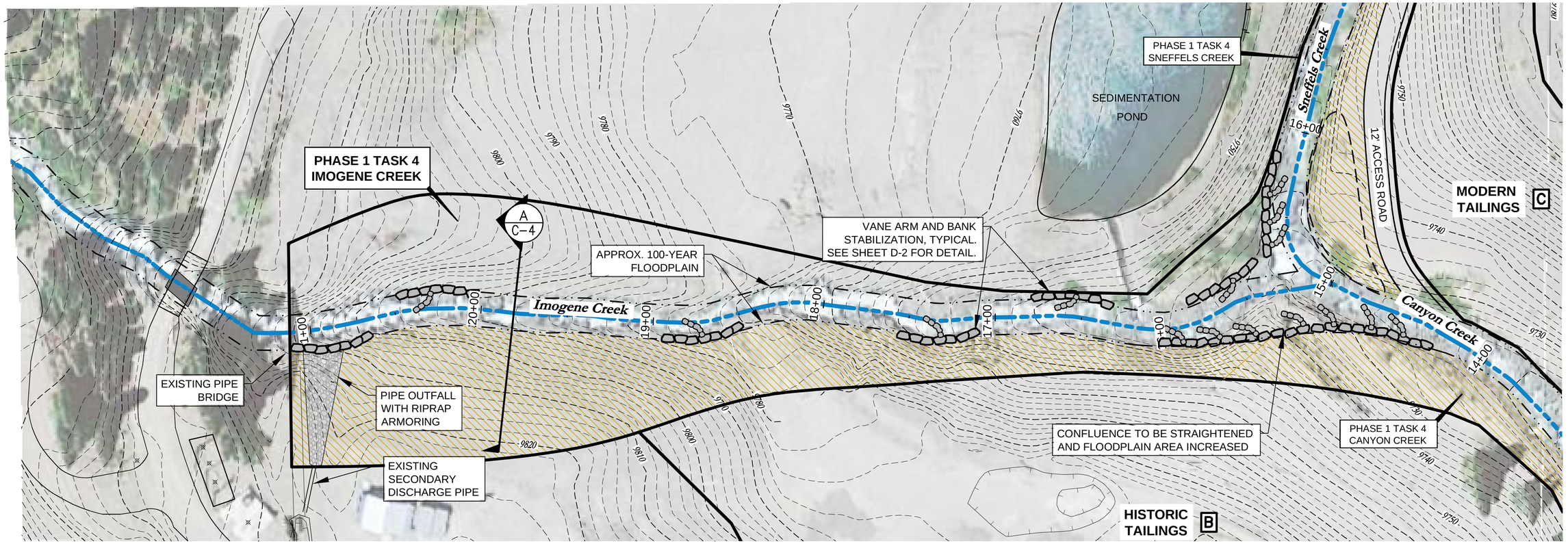
DOWL
WWW.DOWL.COM
222 South Park Avenue
Montrose, Colorado 81401
970-249-6828

CAMP BIRD MINE RECLAMATION
OURAY COUNTY, COLORADO

PHASE 1 TASK 3
RECLAMATION PLAN

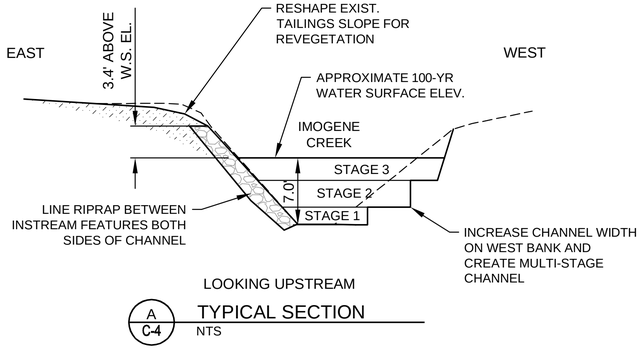
| | |
|---|---|
| PROJECT: | 7128.74652.01 |
| DATE: | 8/24/17 |
| ENGINEER: | DCQ |
| DRAWN BY: | JC, PH, DC |
| CHECKED BY: | |
| APPROVED BY: | – |

SHEET
C-3




# PHASE 1 TASK 4, IMOGENE CREEK RECLAMATION PLAN

30 0 30 60
SCALE IN FEET
2-FOOT CONTOUR INTERVAL




A/C-4 TYPICAL SECTION
NTS

## ESTIMATED QUANTITIES

| | |
|---|---|
| Excavation (cut) | 215 C.Y. |
| Vane Arms | 9 |
| Riprap Armoring | 700 L.F. |
| Bank Stabilization | 320 C.Y. |
| Revegetation Area | 23,642 S.F. (0.54 AC.) |
| Estimated Area of Disturbance | 54,200 S.F. |

## LEGEND

- Phase/Task Boundary
- Creek Flowline
- Drainage Flowline
- Approximate 100-Yr. Floodplain
- Approximate Limits of Revegetation
- Vane Arm and Bank Stabilization (See note 4)

## PHASE 1 TASK 4 IMOGENE CREEK WORK PLAN (2017)

1. Contractor to lay back historic tailings on east bank of Imogene Creek to accommodate stream restoration. Should slurry ("slime") be encountered, cease work and contact DOWL for guidance to stabilize slope. Existing mine debris (timbers, metal debris, etc.) shall be removed.
2. Contractor to install stream restoration features, which includes reshaping channel and installing boulder vane arms as generally shown herein and amoring both banks. Actual locations and dimensions of will be determined by contractor during construction.
3. Revegetation in areas shown using approved seed mix and Erosion Control Measures (ECM's) (See Sheet D-3).
4. Vane arm location, extent and quantities are approximate. Location will be determined in the field.

DRAFT
Subject to Review

WESTERN STREAM WORKS
970.708.2139
RIDGWAY, COLORADO
Design • Build • Restore

Prepared for the Camp Bird Mine Removal Action Work Plan in support of the Administrative Settlement Agreement and Order on Consent between U.S. EPA and Caldera Mineral Resources, LLC.
EPA Site ID: A8H9

| REVISIONS | | | |
|---|---|---|---|
| REV | DATE | DESCRIPTION | BY |
| 1 | 9/22/17 | REVISIONS | DC |

DOWL
WWW.DOWL.COM
222 South Park Avenue
Montrose, Colorado 81401
970-249-6828

CAMP BIRD MINE RECLAMATION
OURAY COUNTY, COLORADO

PHASE 1 TASK 4, IMOGENE CREEK
RECLAMATION PLAN

| | |
|---|---|
| PROJECT: | 7128.74652.01 |
| DATE: | 8/24/17 |
| ENGINEER: | DCQ |
| DRAWN BY: | JC, PH, DC |
| CHECKED BY: | |
| APPROVED BY: | – |

SHEET
C-4

MODERN TAILINGS C

STABILIZE EXISTING ERODED SWALE WITH BANK STABILIZATION AND VANE ARMS

PHASE 1 TASK 4 CANYON CREEK

PHASE 2

APPROX. 100-YEAR FLOODPLAIN

12' ACCESS ROAD

Canyon Creek

Sneffels Creek

Imogene Creek

VANE ARM AND BANK STABILIZATION, TYPICAL. SEE SHEET D-2 FOR DETAIL

BOULDER TO BE REMOVED

REMOVE SELECTED TREES

MOVE CANYON CREEK SOUTH BANK 15' SOUTH AND ARMOR

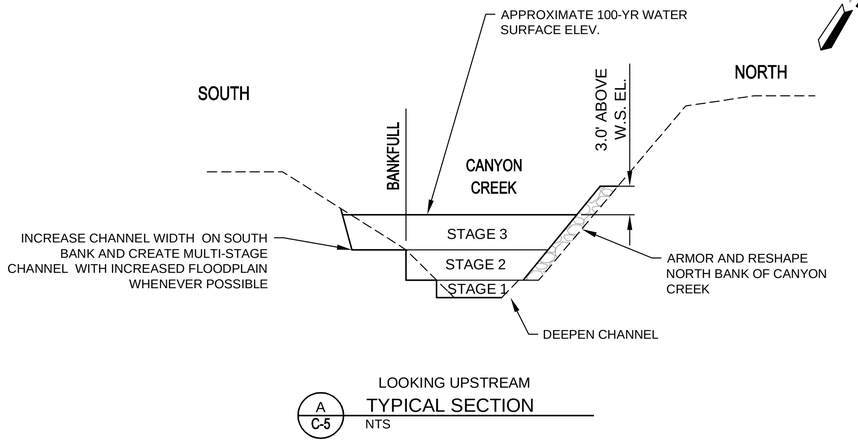
CONFLUENCE TO BE STRAIGHTENED AND FLOODPLAIN AREA INCREASED

PHASE 1 TASK 4 IMOGENE CREEK

HISTORIC TAILINGS B

HISTORIC TAILINGS A

A C-5




LOOKING UPSTREAM

A C-5 TYPICAL SECTION

NTS

# PHASE 1 TASK 4 - CANYON CREEK RECLAMATION PLAN

40 0 40 80

SCALE IN FEET

2-FOOT CONTOUR INTERVAL

## ESTIMATED QUANTITIES

| | |
|---|---|
| Boulder Removal | 1 |
| Cut | 837 C.Y. |
| Riprap Armoring | 500 L.F. |
| Vane Arms | 14 |
| Revegetation Area | 50,133 S.F. (1.15 AC.) |
| Estimated Area of Disturbance | 89,935 S.F. |

## LEGEND

- Phase/Task Boundary
- Creek Flowline
- Drainage Flowline
- Approximate 100-Yr. Floodplain
- Approximate Limits of Revegetation
- Vane Arm and Bank Stabilization (See note 8)

## PHASE 1 TASK 4 CANYON CREEK WORK PLAN (2018)

1. Develop access road on south bank of Canyon Creek for construction/vegetation access.
2. Remove large boulder by approved method to create required stream restoration material.
3. Contractor to thin density of trees along south bank to open channel within floodplain.
4. Reshape Canyon Creek north and south banks.
5. Install stream restoration features including multi-stage channel, vane arms, scour pools and riprap armoring of banks in the general locations shown herein. Actual locations and dimensions will be determined in the field.
6. No excavation of the north bank will be permitted.
7. Revegetate a strip above the instream work using approved seed mix and Erosion Control Measures (ECM's).
8. Vane arm location, extent and quantities are approximate. Location will be determined in the field.

DRAFT
Subject to Review

WESTERN STREAM WORKS
970.708.2139
RIDGWAY, COLORADO
Design • Build • Restore

Prepared for the Camp Bird Mine Removal Action Work Plan in support of the Administrative Settlement Agreement and Order on Consent between U.S. EPA and Caldera Mineral Resources, LLC.
EPA Site ID: A8H9

REVISIONS

| REV | DATE | DESCRIPTION | BY |
|---|---|---|---|
| 1 | 9/22/17 | REVISIONS | DC |

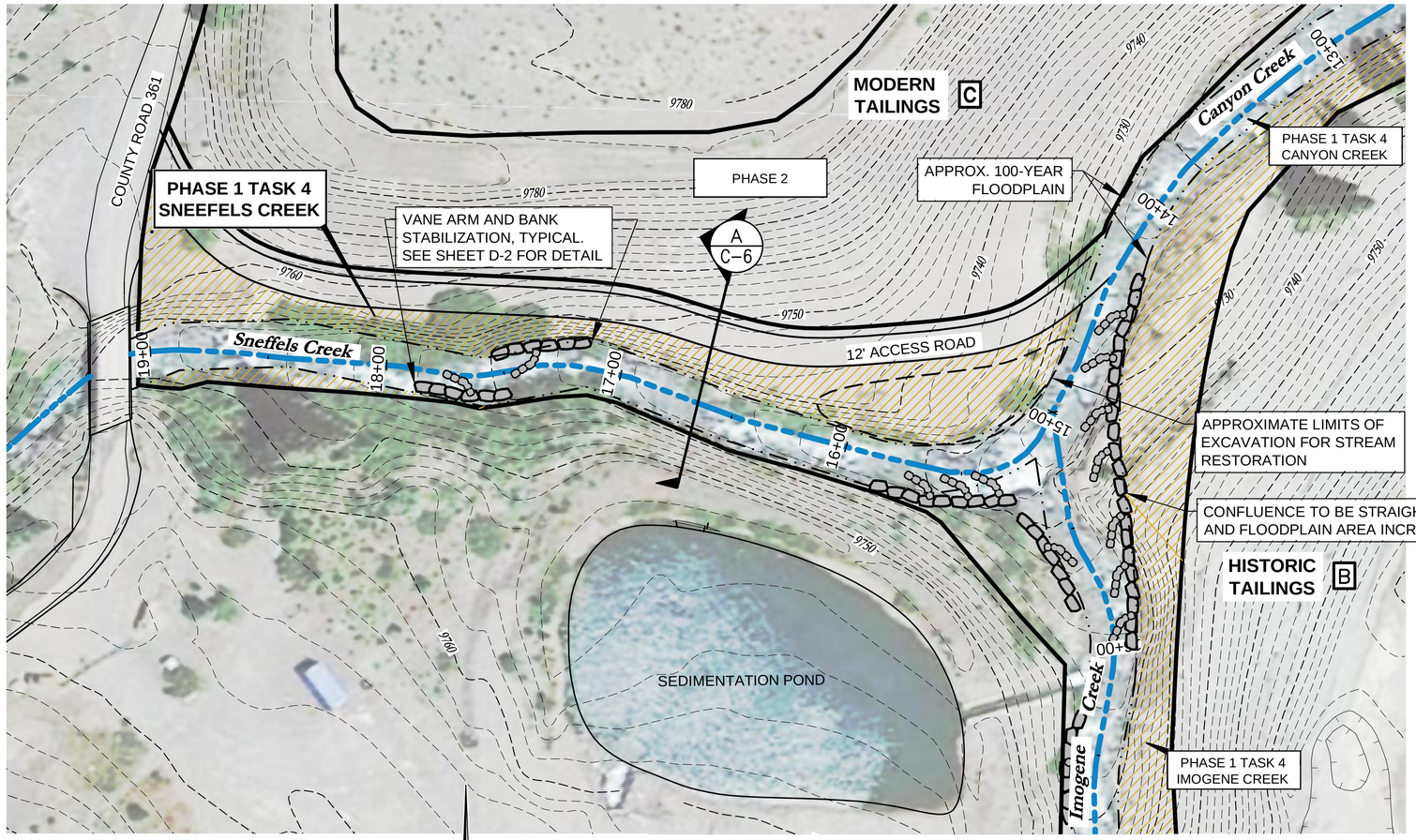
DOWL
WWW.DOWL.COM
222 South Park Avenue
Montrose, Colorado 81401
970-249-6828

CAMP BIRD MINE RECLAMATION
OURAY COUNTY, COLORADO

PHASE 1 TASK 4, CANYON CREEK RECLAMATION PLAN

PROJECT: 7128.74652.01
DATE: 8/24/17
ENGINEER: DCQ
DRAWN BY: JC, PH, DC
CHECKED BY:
APPROVED BY: –

SHEET
C-5




PHASE 1 TASK 4, SNEFFELS CREEK
RECLAMATION PLAN

30 0 30 60
SCALE IN FEET
2-FOOT CONTOUR INTERVAL

## ESTIMATED QUANTITIES

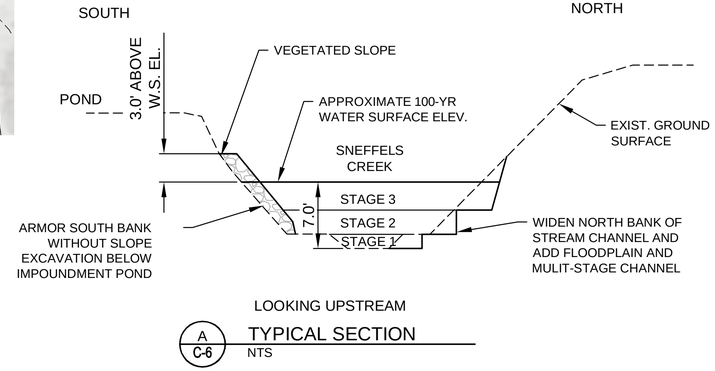
| | |
|---|---|
| Cut | 720 C.Y. |
| Vane Arms | 5 |
| Armoring | 200 L.F. |
| Revegetation Area | 9,077 S.F. (0.21 AC.) |
| Estimated Area of Disturbance | 24,913 S.F. |

## PHASE 1 TASK 4
## SNEFFLES CREEK WORK PLAN (2018)

1. Develop access road for construction/vegetation equipment access to Phase 1 Task 4 Area.
2. Excavate north bank of Sneffels Creek and Imogene Creek confluence as shown. Should slurry ("slime") be encountered, cease work and contact DOWL for guidance to stabilize slope per accepted site methods (see Sheet D-1).
3. Install stream restoration features, which includes reshaping Sneffels Creek, installing boulder vane arms and scour pools and adding multi-stage floodplain. Actual locations and dimensions will be decided in the field.
4. Revegetate using approved seed mix and Erosion Control Measures (ECM's) (See Sheet D-3).
5. Vane arm location, extent and quantities are approximate. Location will be determined in the field.

### LEGEND

- Phase/Task Boundary
- Creek Flowline
- Drainage Flowline
- Approximate 100-Yr. Floodplain
- Approximate Limits of Revegetation
- Vane Arm and Bank Stabilization (See note 5)




LOOKING UPSTREAM

A C-6 TYPICAL SECTION
NTS

**DRAFT**
**Subject to Review**

WESTERN STREAM WORKS
970.708.2139
RIDGWAY, COLORADO
Design • Build • Restore

Prepared for the Camp Bird Mine Removal Action Work Plan in support of the Administrative Settlement Agreement and Order on Consent between U.S. EPA and Caldera Mineral Resources, LLC.
EPA Site ID: A8H9

REVISIONS

| REV | DATE | DESCRIPTION | BY |
|---|---|---|---|
| 1 | 9/22/17 | REVISIONS | DC |

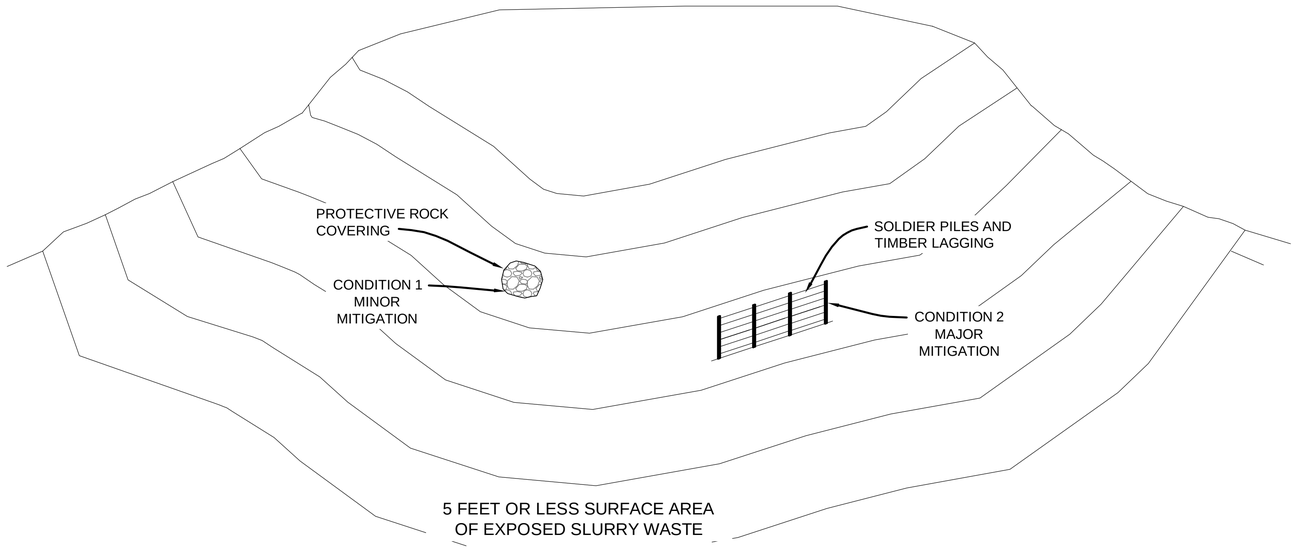
DOWL
WWW.DOWL.COM
222 South Park Avenue
Montrose, Colorado 81401
970-249-6828

CAMP BIRD MINE RECLAMATION
OURAY COUNTY, COLORADO

PHASE 1 TASK 4 SNEFFLES CREEK
RECLAMATION PLAN

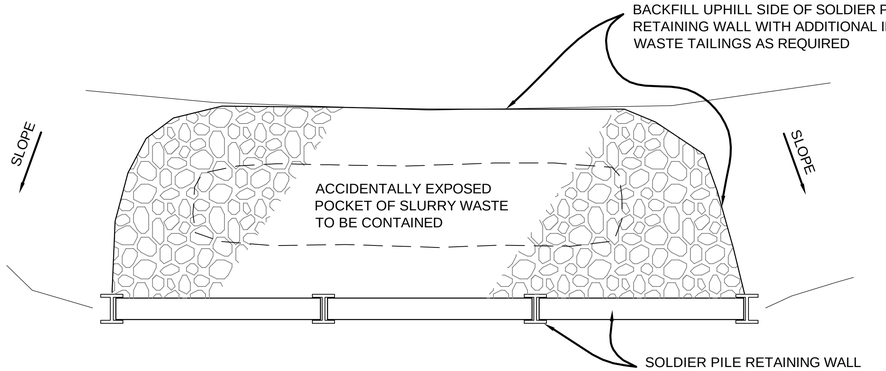
| | |
|---|---|
| PROJECT: | 7128.74652.01 |
| DATE: | 8/24/17 |
| ENGINEER: | DCQ |
| DRAWN BY: | JC, PH, DC |
| CHECKED BY: | |
| APPROVED BY: | – |

SHEET
C-6



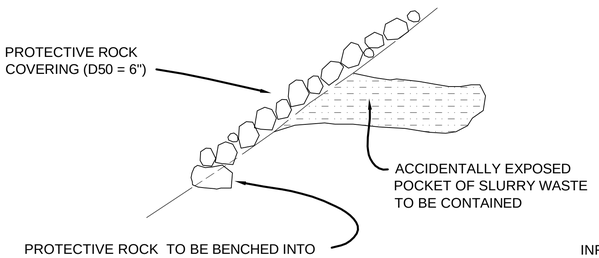

5 FEET OR LESS SURFACE AREA
OF EXPOSED SLURRY WASTE

1 / D-1 SCHEMATIC SECTION
CONDITION 1 MINOR MITIGATION
NTS



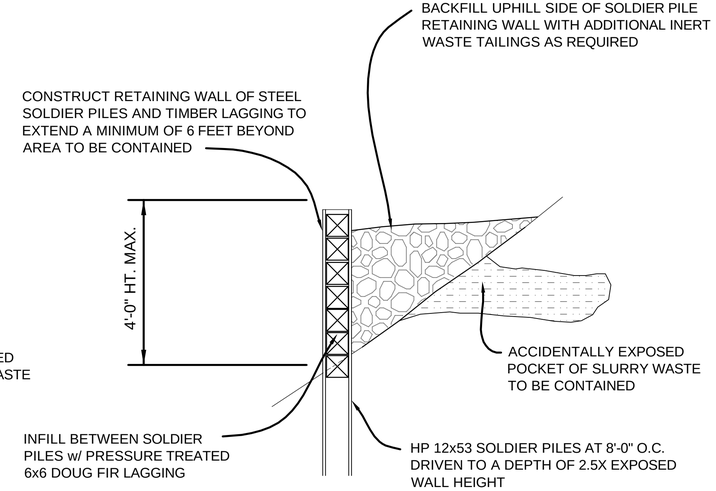

GREATER THAN 5 FEET SURFACE
AREA OF EXPOSED SLURRY WASTE

2 / D-1 SCHEMATIC PLAN VIEW
CONDITION 2 MAJOR MITIGATION
NTS



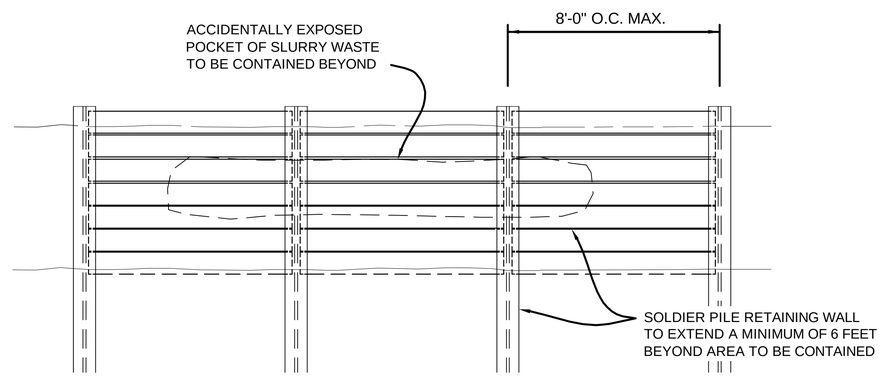

5 FEET OR LESS SURFACE AREA
OF EXPOSED SLURRY WASTE

3 / D-1 SCHEMATIC SECTION
CONDITION 1 MINOR MITIGATION
NTS




GREATER THAN 5 FEET SURFACE
AREA OF EXPOSED SLURRY WASTE

4 / D-1 SCHEMATIC SECTION
CONDITION 2 MAJOR MITIGATION
NTS




**( LOOKING UPHILL )**

GREATER THAN 5 FEET SURFACE
AREA OF EXPOSED SLURRY WASTE

5 / D-1 SCHEMATIC ELEVATION
CONDITION 2 MAJOR MITIGATION
NTS

D R A F T
Subject to Review

Prepared for the Camp Bird Mine Removal Action Work Plan in support of the Administrative Settlement Agreement and Order on Consent between U.S. EPA and Caldera Mineral Resources, LLC.
EPA Site ID: A8H9

| REVISIONS | | | |
|---|---|---|---|
| REV | DATE | DESCRIPTION | BY |
| 1 | 9/22/17 | REVISIONS TO PHASE/TASK BOUNDARIES | DC |

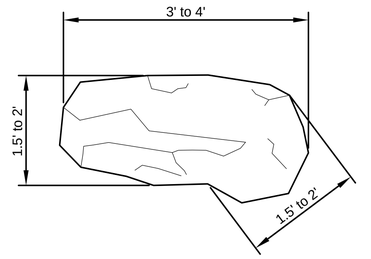
DOWL
WWW.DOWL.COM
222 South Park Avenue
Montrose, Colorado 81401
970-249-6828

CAMP BIRD MINE RECLAMATION
OURAY COUNTY, COLORADO

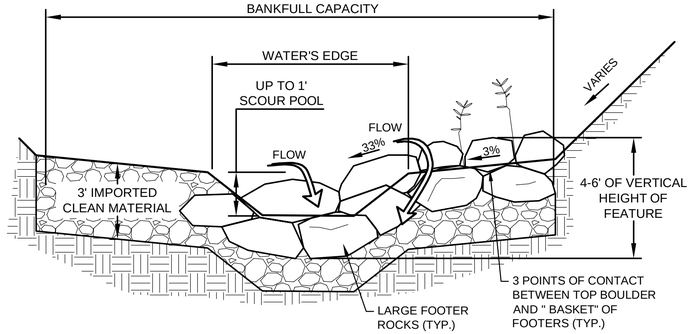
SLURRY WASTE
MITIGATION DETAILS

| | |
|---|---|
| PROJECT: | 7128.74652.01 |
| DATE: | 8/24/17 |
| ENGINEER: | DCQ |
| DRAWN BY: | JC, PH, DC |
| CHECKED BY: | |
| APPROVED BY: | |

SHEET
D-1

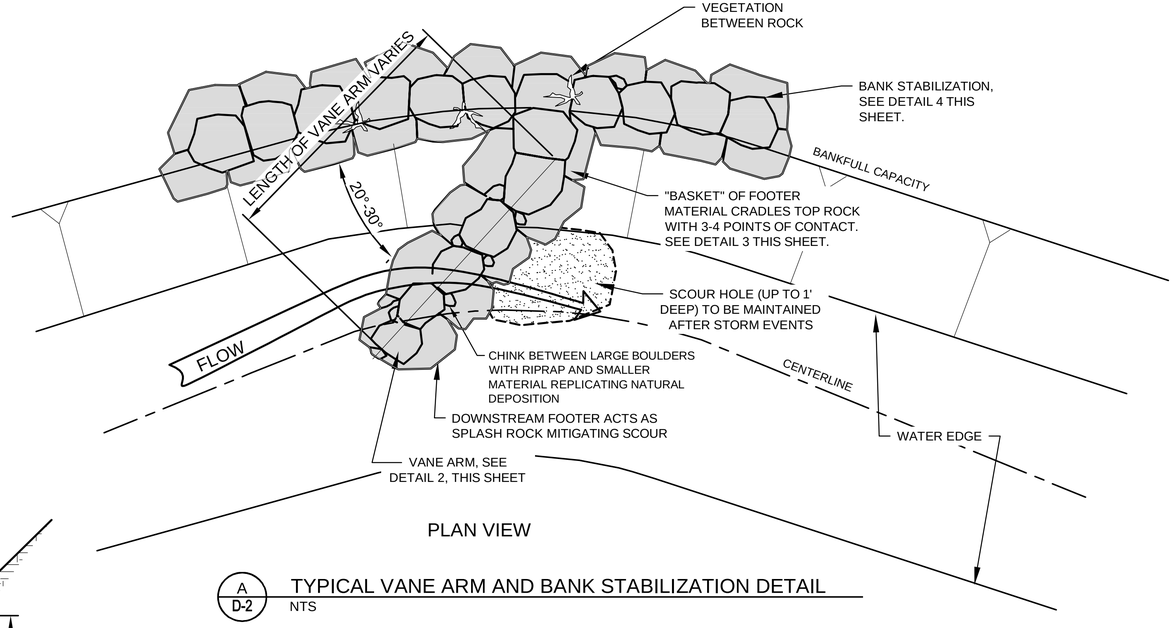



1 D-2 BOULDER DETAIL
NTS



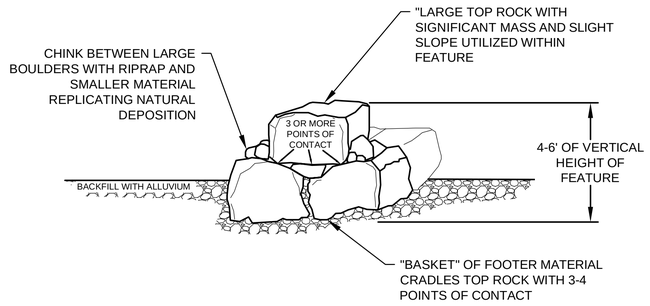

PROFILE VIEW

2 D-2 TYPICAL VANE ARM DETAIL
NTS

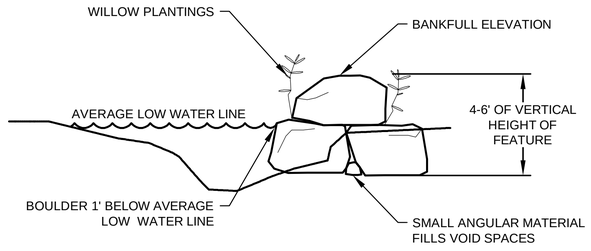



PLAN VIEW

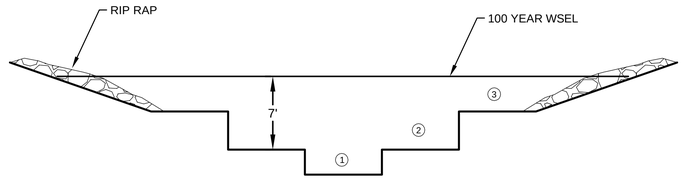
A D-2 TYPICAL VANE ARM AND BANK STABILIZATION DETAIL
NTS




3 D-2 TYPICAL FOOTER DETAIL
NTS




4 D-2 TYPICAL BANK STABILIZATION DETAIL
NTS




5 D-2 TYPICAL MULTI-STAGE CHANNEL CROSS SECTION
NTS

ACTUAL CHANNEL SECTIONS FOR EACH STREAM BANK TO BE DETERMINED IN FIELD

NOTES:

1. Vane arm location, extent and quantities are approximate. Location will be determined in the field.
2. The angle of the vane arm construction from the bank varies with individual location and conditions. The vane arm faces upstream and acts to roll the current center channel away from the bank. The feature does not resist the erosive force of the river, it acts to make the path of least resistance back in the stream channel.
3. Slope of vane arm will depend on conditions. The shorter the vane arm the steeper the slope. If the length is one third the channel width, we build an approximate 9%-12% slope. If the vane is intentionally shorter and "stubbier", it can still offer excellent bank protection, and slope angles of 20%-25% are common. Other field conditions can offer a combination of varying degrees of slope angle, to replicate natural symmetry.
4. Bank stabilzation boulders are placed parallel to the channel. The largest boulders act as a foundation for the boulders on top. The overall vertical height of the feature is between 4-6 feet. Smaller angular rocks are placed between the larger boulders to replicate naturally occurring deposition. All efforts will be made to replicate naturally occurring stream conditions. Compaction can increase within the feature after several peak flow events.
5. When bank stabilization treatments are used in conjunction with a vane arm, both act in harmony to protect the bank from erosive sheer stress. When bank stabilization used independently the construction remains the same. Well placed boulders, with smaller rocks keyed in between the larger rock, will compact more with each successive bankful event. Roots of willow plantings intended to grow around and between the rocks to increase the overall strength of the reconstructed stream bank.

DRAFT
Subject to Review

WESTERN STREAM WORKS
970.708.2135
RIDGWAY, COLORADO
Design • Build • Restore

Prepared for the Camp Bird Mine Removal Action Work Plan in support of the Administrative Settlement Agreement and Order on Consent between U.S. EPA and Caldera Mineral Resources, LLC.
EPA Site ID: A8H9

| REVISIONS | | | |
|---|---|---|---|
| REV | DATE | DESCRIPTION | BY |
| 1 | 9/22/17 | REVISIONS TO PHASE/TASK BOUNDARIES | DC |

DOWL
WWW.DOWL.COM
222 South Park Avenue
Montrose, Colorado 81401
970-249-6828

CAMP BIRD MINE RECLAMATION
OURAY COUNTY, COLORADO

CHANNEL RESTORATION DETAILS

| | |
|---|---|
| PROJECT: | 7128.74652.01 |
| DATE: | 8/24/17 |
| ENGINEER: | DCQ |
| DRAWN BY: | JC, PH, DC |
| CHECKED BY: | |
| APPROVED BY: | – |

SHEET
D-2

## REVEGETATION PROCESS

STEP 1. Soil Preparation - Includes shaping, contouring, and furrowing

STEP 2. Soil Conditioning - Hydraulic application of soil conditioners to neutralize pH. Sulfur for pH > 8.0, Agricultural lime for pH < 6.0

STEP 3. Soil Amendment - Hydro-mulching of prepared/conditioned slopes with Prorganics, Richlawn, QuantumGrow Lite and QuantumGrow VCS, seed mix ( see below )and tackifier as directed by Triton

STEP 4. Erosion Control Measure ( ECM ) - Hydraulic application of ECOFlex HP ECM at rate prescribed by Triton

Estimated Application Rates :

Sulfur ( pH > 8.0 ) - 1500 to 2000 lbs./acre

Agricultural lime ( pH < 6.0 ) - 2000 to 3000 lbs./acre

Proganics - 5000 lbs./acre

Richlawn - 2000 lbs./acre

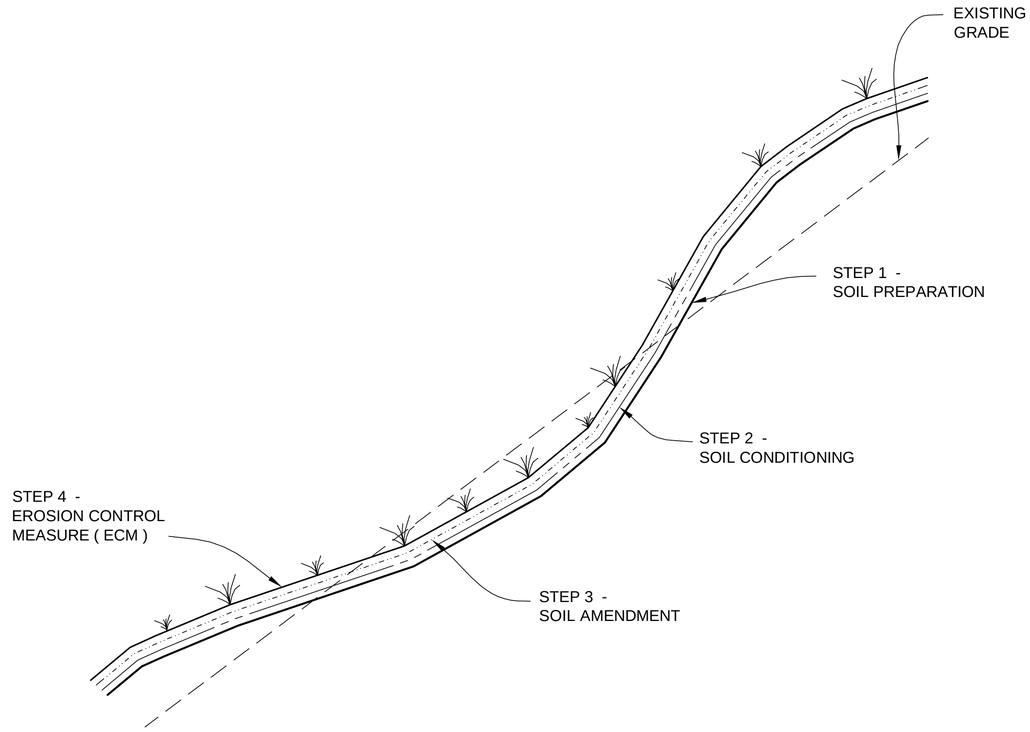
QuantumGrow Lite - 1 gal./acre

QuantumGrow VCS - 1 gal./acre

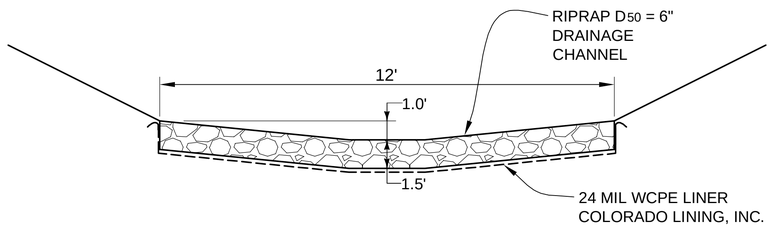
Seed Mix - "Native Ecomix" designed for a high altitude setting in the San Juan Mountains from Southwest Seed Company :

- 35% Slender Wheatgrass ( 7 lbs./acre )
- 35% Mountain Brome ( 7 lbs./acre )
- 10% Blue Bunch Wheat Grass ( 2 lbs./acre )
- 10% Canadian Wild Rye ( 2 lbs./acre )
- 10% Lewis Flax ( 2 lbs/acre )

ECOFlex HP - 3000 to 3500 lbs./acre




1 / D-3 SCHEMATIC REVEGETATION DIAGRAM
NTS




2 / D-3 RIPRAP CHANNEL & OUTFALL DETAIL
NTS

DRAFT
Subject to Review

Prepared for the Camp Bird Mine Removal Action Work Plan in support of the Administrative Settlement Agreement and Order on Consent between U.S. EPA and Caldera Mineral Resources, LLC.
EPA Site ID: A8H9

REVISIONS

| REV | DATE | DESCRIPTION | BY |
|---|---|---|---|
| 1 | 9/22/17 | REVISIONS TO PHASE/TASK BOUNDARIES | DC |

DOWL
WWW.DOWL.COM
222 South Park Avenue
Montrose, Colorado 81401
970-249-6828

CAMP BIRD MINE RECLAMATION
OURAY COUNTY, COLORADO

REVEGETATION PROCESS NOTES AND RIRAP OUTFALL DETAIL

PROJECT: 7128.74652.01
DATE: 8/24/17
ENGINEER: DCQ
DRAWN BY: JC, PH, DC
CHECKED BY:
APPROVED BY:

SHEET
D-3