# DESIGN EXAMPLES—SECTION 4

**CONTENTS**

## 4.0 CASE STUDY—ROCK CREEK

The purpose of this case study is to demonstrate the following features:

- Detention facility
- Grouted boulder drop structure
- Grouted boulder check structures and wetland bottom channels
- Stream bank stabilization including grouted boulder check structure with low-water crossing, slope flattening and revegetation

McLaughlin Water Engineers, Ltd. (MWE) and the Norris/Dullea Company (both based in Denver) prepared the attached drawings. Photographs are provided for each of the facilities featured in this case study.

The formal names of these projects are:

1. Tributary LB-3 Channel and Flor Storage Facility
2. Rock Creek Stabilization, Tributary RB-3 Outfall Pipe, and Community Pond East

The client for MWE and Norris/Dullea Company was Superior Metropolitan District No. 1 and the relevant drawings were prepared in 1994 and 1997.

Public reaction to the facilities shown on the attached pages and to the overall drainage plan has been extremely positive due to the aesthetic nature of the facilities, the fact that they nicely integrate into the community, their environmentally-sensitive nature and multi-purpose benefits. There is no question that the drainage system in Rock Creek substantially enhances community character and the value of residential properties.

Detention Facility—Flor Storage Facility


Detention Facility—Flor Storage Facility
and Interpretive Sign

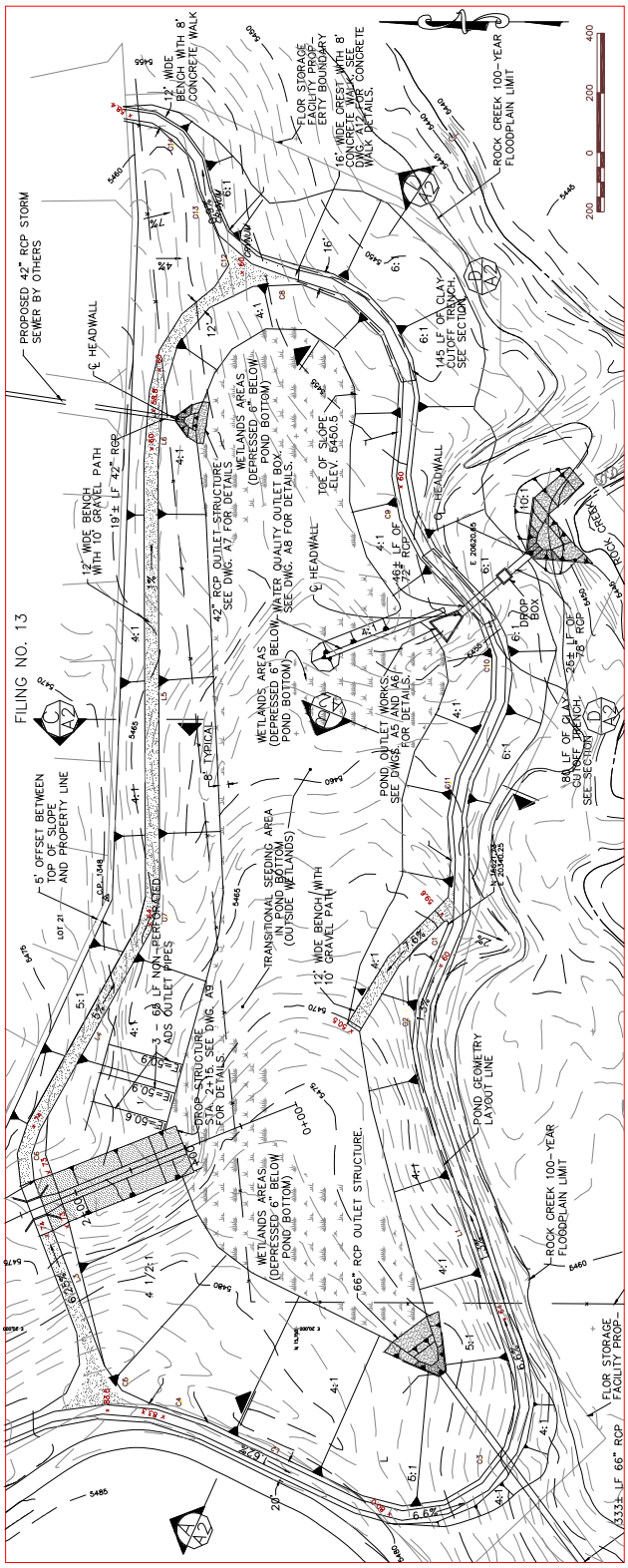



**Figure 1—Flor Storage Facility Plan View**

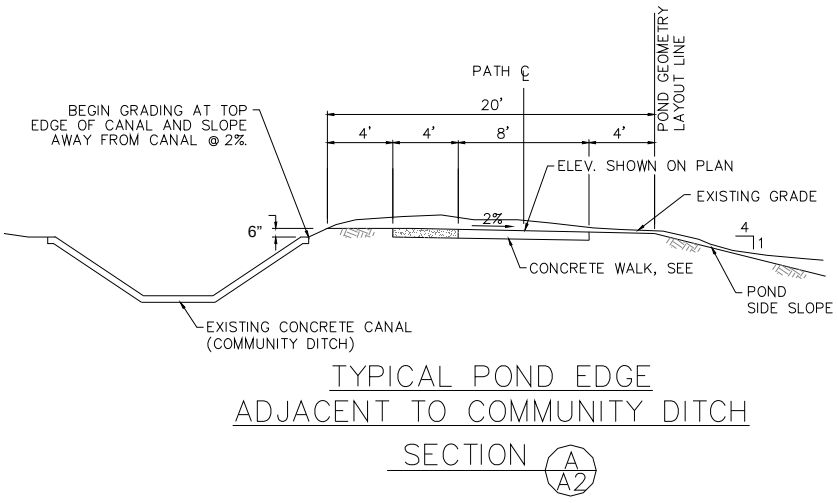



**Figure 2—Typical Pond Edge Adjacent to Community Ditch**

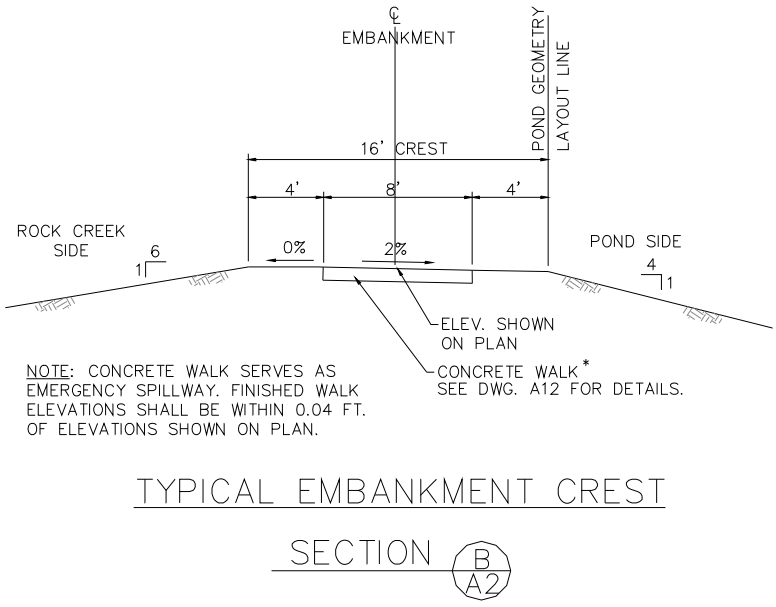



**Figure 3—Typical Embankment Crest**

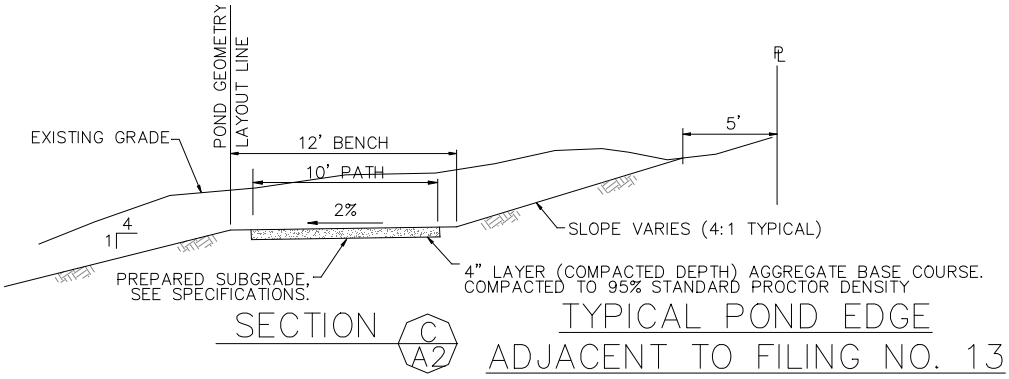



**Figure 4—Typical Pond Edge Adjacent to Filing No. 13**

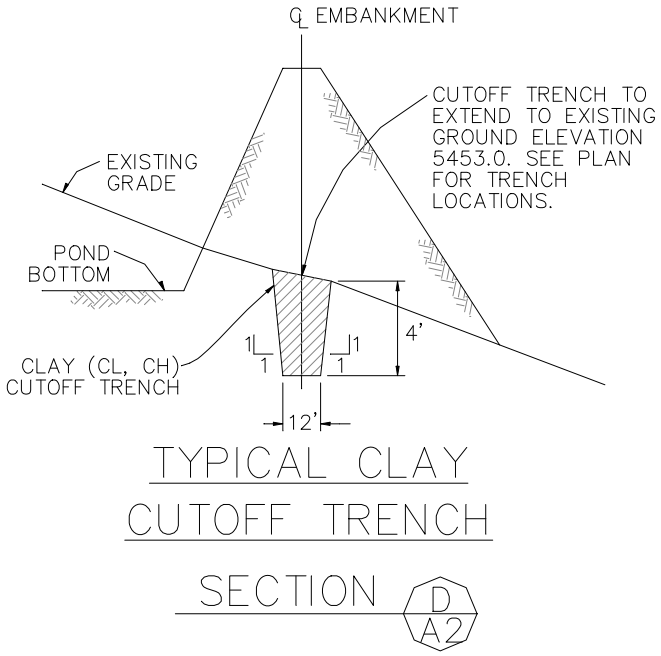



**Figure 5—Typical Clay Cutoff Trench**

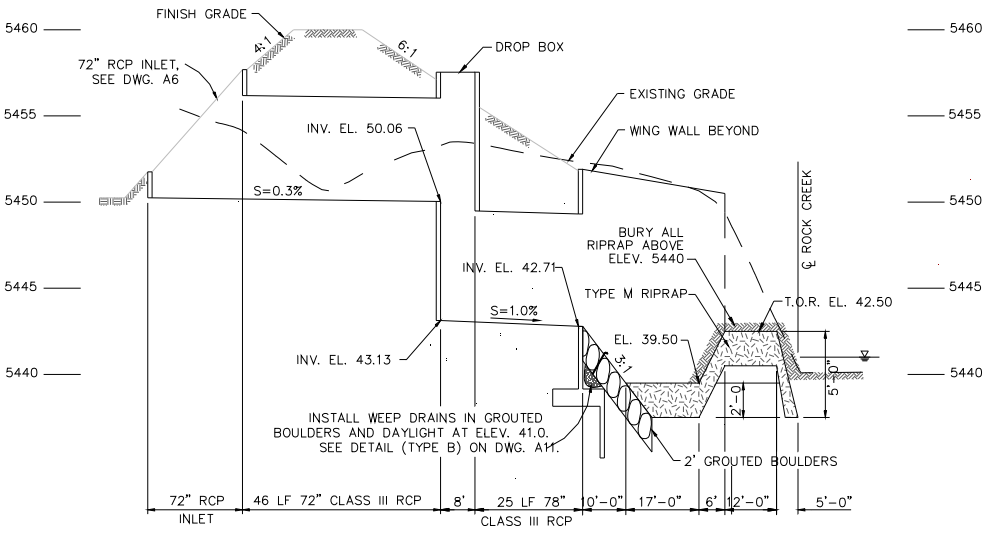



**Figure 6—Profile Pond Outlet Works**

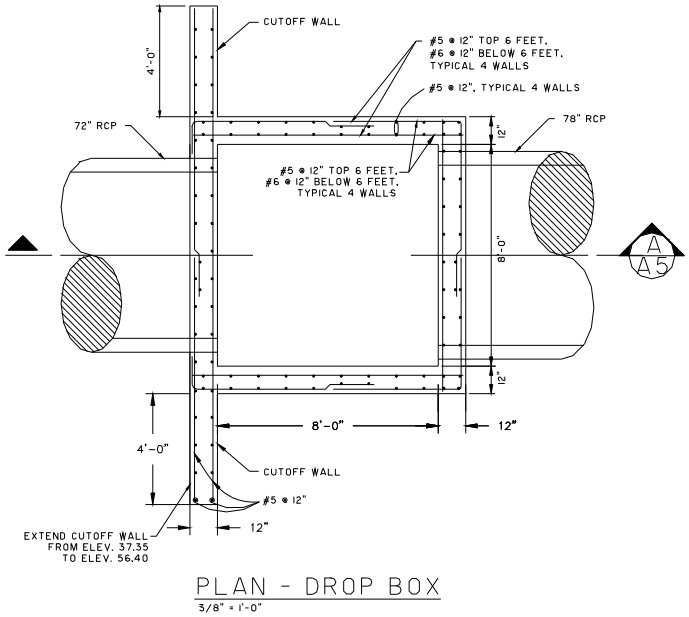



**Figure 7—Plan Drop Box**

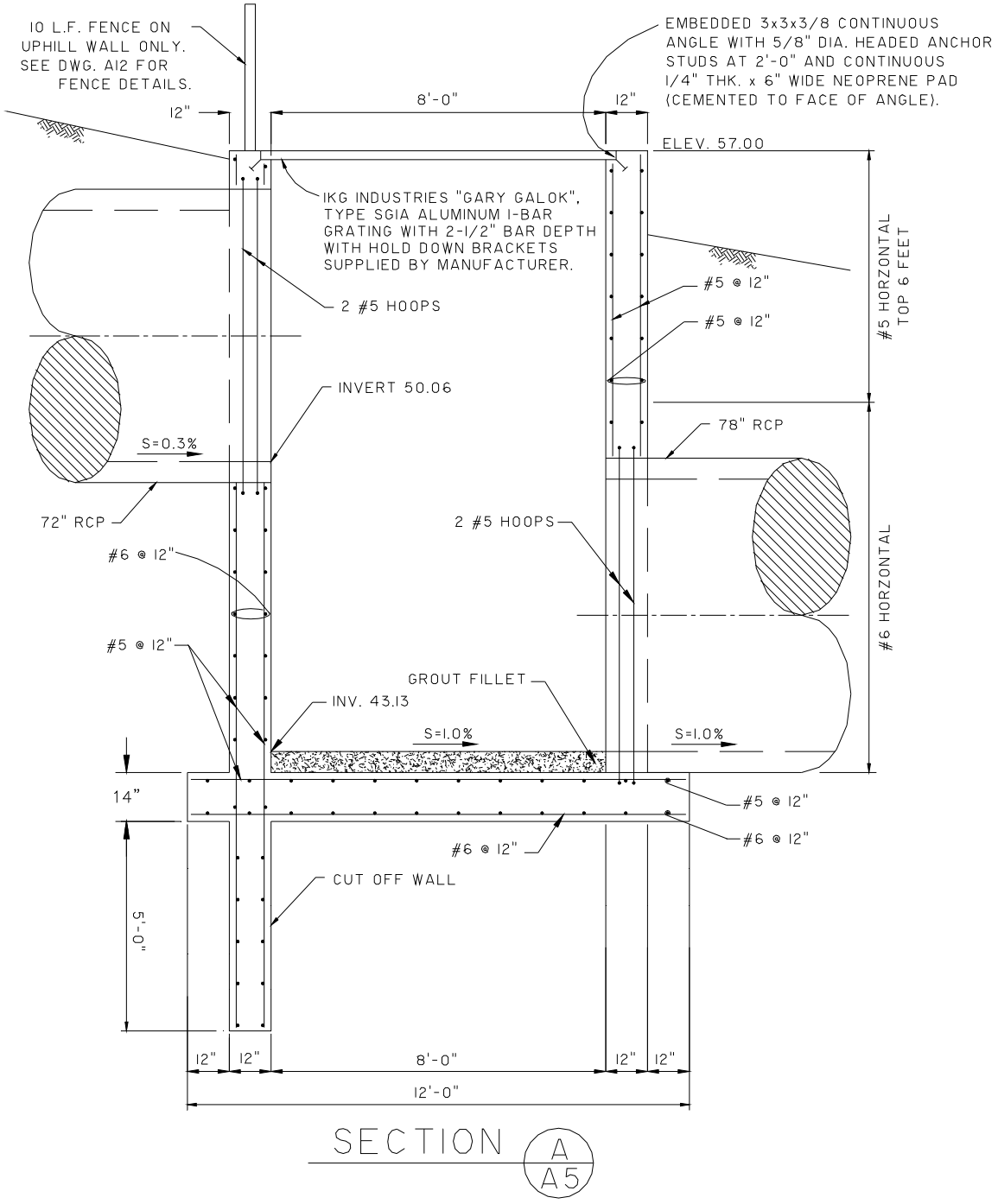



**Figure 8—Section Drop Box**

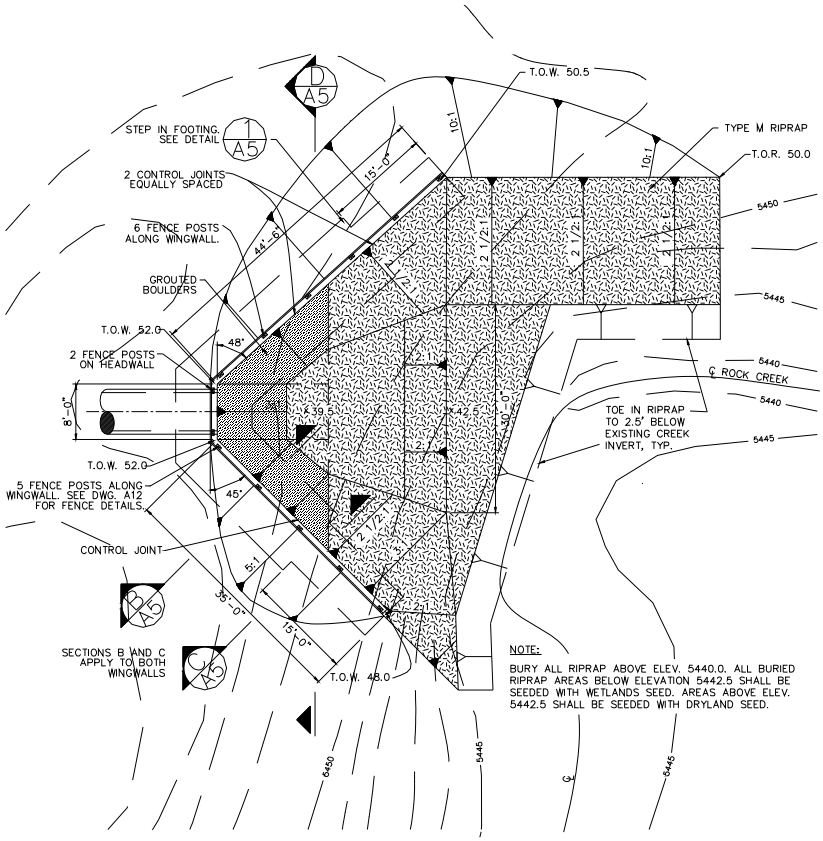



**Figure 9—Plan 78" RCP Outlet**

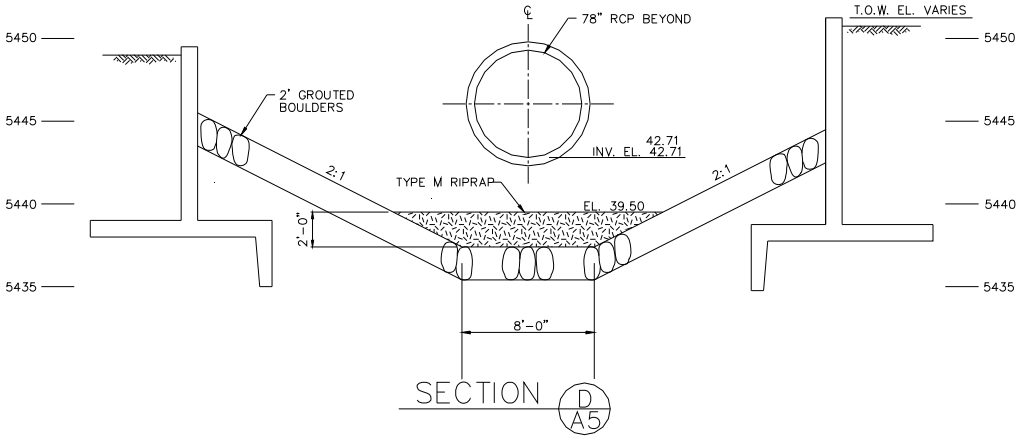



**Figure 10—Section 78" RCP Outlet**

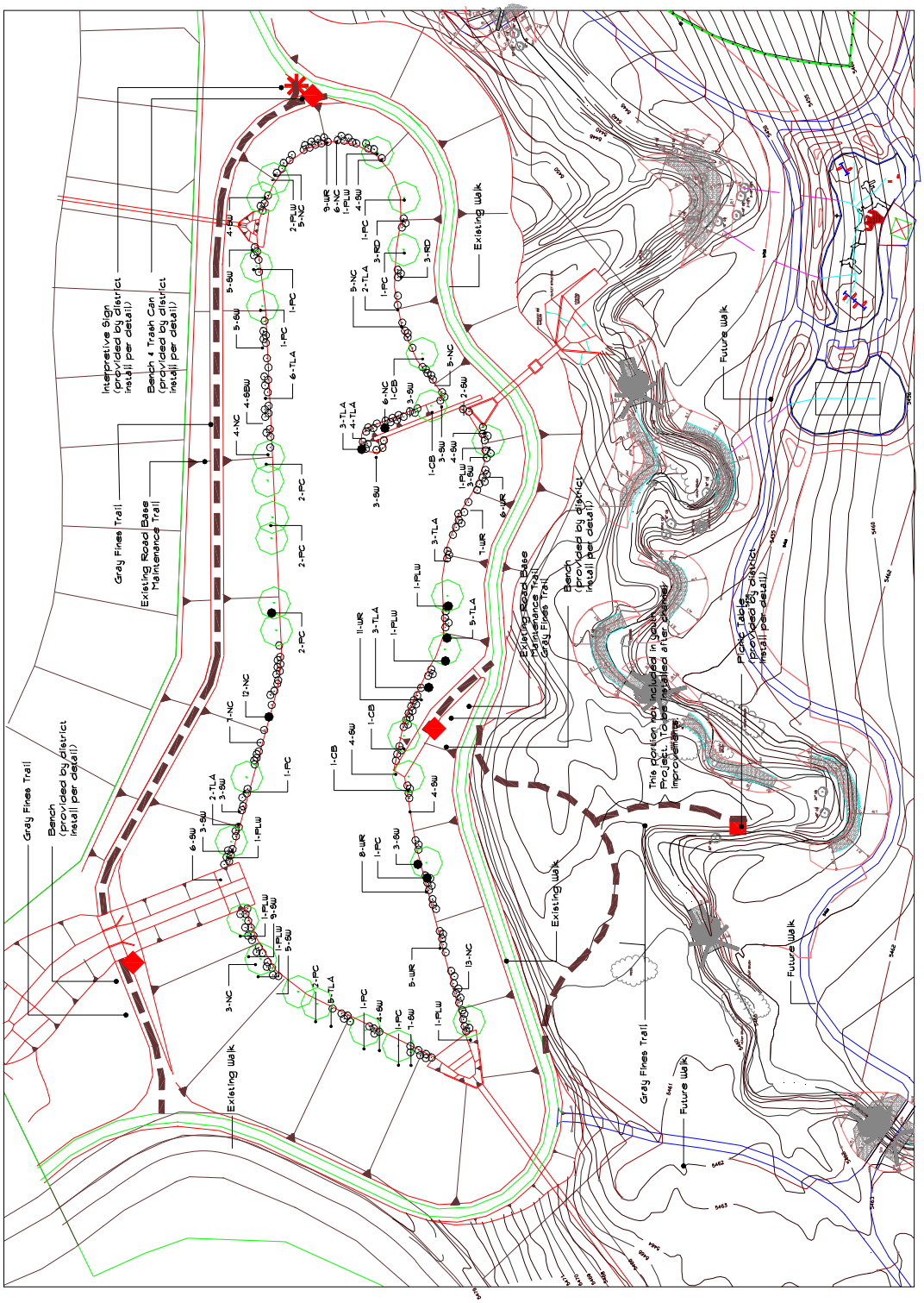



**Figure 11—Rock Creek Flor Storage and Landscape Plan**

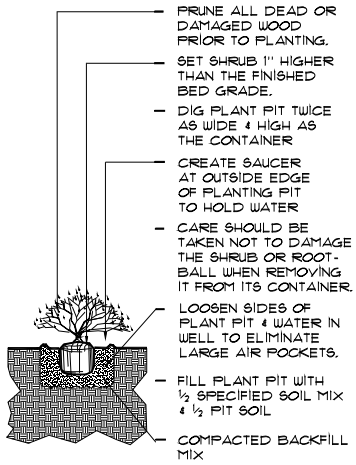
## Construction Notes

1. All plant material, trial surface material, and site furniture will be provided and delivered to project area by the district. Installation of these items shall be by the Boulder County Youth group.
2. Trail cutting by district contractor. Trail surface installation by Boulder Co. Youth. Minimize disturbance to grades and vegetation by removing cut material from the site. Do not pile soil on existing vegetation adjacent to the trial. Seed disturbed areas with native seed.
3. Notify The Norris Dullea Company for Trial, Plant, and Site Furniture locations prior to installation.
4. Trees and shrubs to be planted per detail. Install plant material in general locations shown on plan. Adjust location relative to moisture conditions for each species. Refer to Plant Legend for optimal moisture conditions for each species.
5. Water all planted material every 2 days for the first 30 days after planting. Reduce watering to every 4 days from 31 days to 90 days after planting. fully saturate soil within planting saucer with pond water. Minimize disturbance to the pond bank while obtaining water. Suspend watering schedule if pond floods. Resume watering after water levels reaches normal pool level.
6. Compact crusher fines in 2" lifts with sod roller. Maintain crusher fine material within the 6' cut area. Mound crusher fines 1" above edges in center of trail.

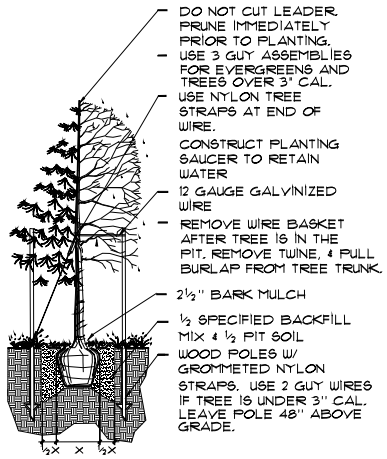
## Plant Legend

| Sym. | Plant Name | Size/Condition | Planting Instructions |
|---|---|---|---|
| PC | Plains Cottonwood | 1 1/2" Cal. B&B | 1'-2' above water table<br>no water in planting pit<br>not in water quality zone |
| PLW | Peach Leaf Willow | 1 1/2" Cal. B&B | 1'-2' above water table<br>no water in planting pit<br>not in water quality zone |
| CB | Common Boxelder | 1 1/2" Cal. B&B | .5'-1.5' above water table<br>no water in planting pit |
| TLA | Thin-Leaf Alder | 5 Gal. | .5'-1.5' above water table<br>no water in planting pit |
| NC | Native Chokecherry | 5 Gal. | 2'-3' above water table<br>no water in planting pit<br>not in water quality zone |
| SW | Sandbar Willow | 5 Gal. | .5'-1' above water table<br>no water in planting pit |
| RD | Redosier Dogwood | 5 Gal. | .5'-1' above water table<br>no water in planting pit |
| WR | Woods Rose | 5 Gal. | 2'-4' above water table<br>no water in planting pit<br>not in water quality zone |

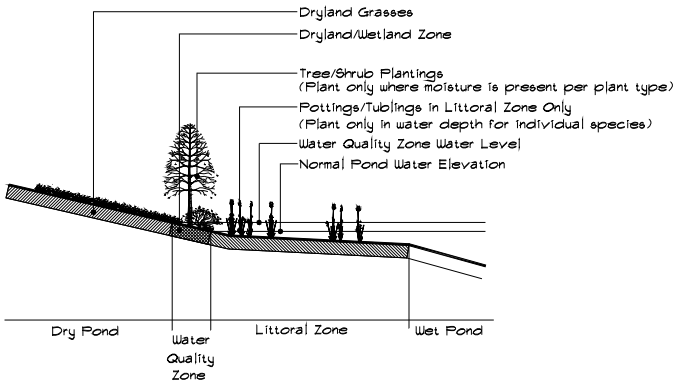
**Figure 12—Landscape Plan Construction Notes and Plant Legend**



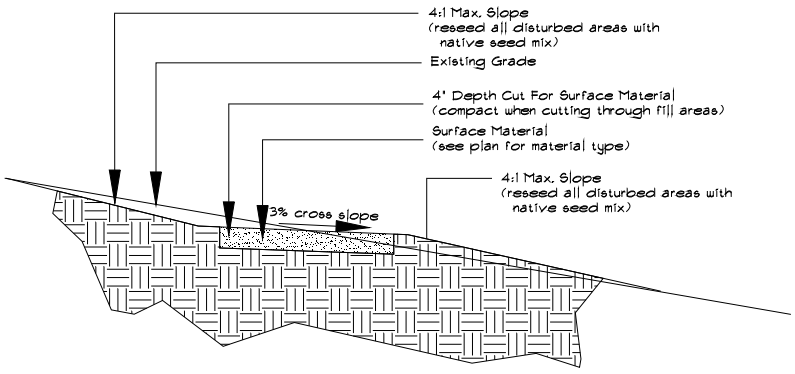

Shrub Planting Detail




Tree Planting Detail




Wetland Planting Section




Trail Construction Section

**Figure 13—Planting and Trail Details**

**Grouted Boulder Drop Structures on Tributary LB-3 Channel**

## Grouted Boulder Drop Structures on Tributary LB-3 Channel

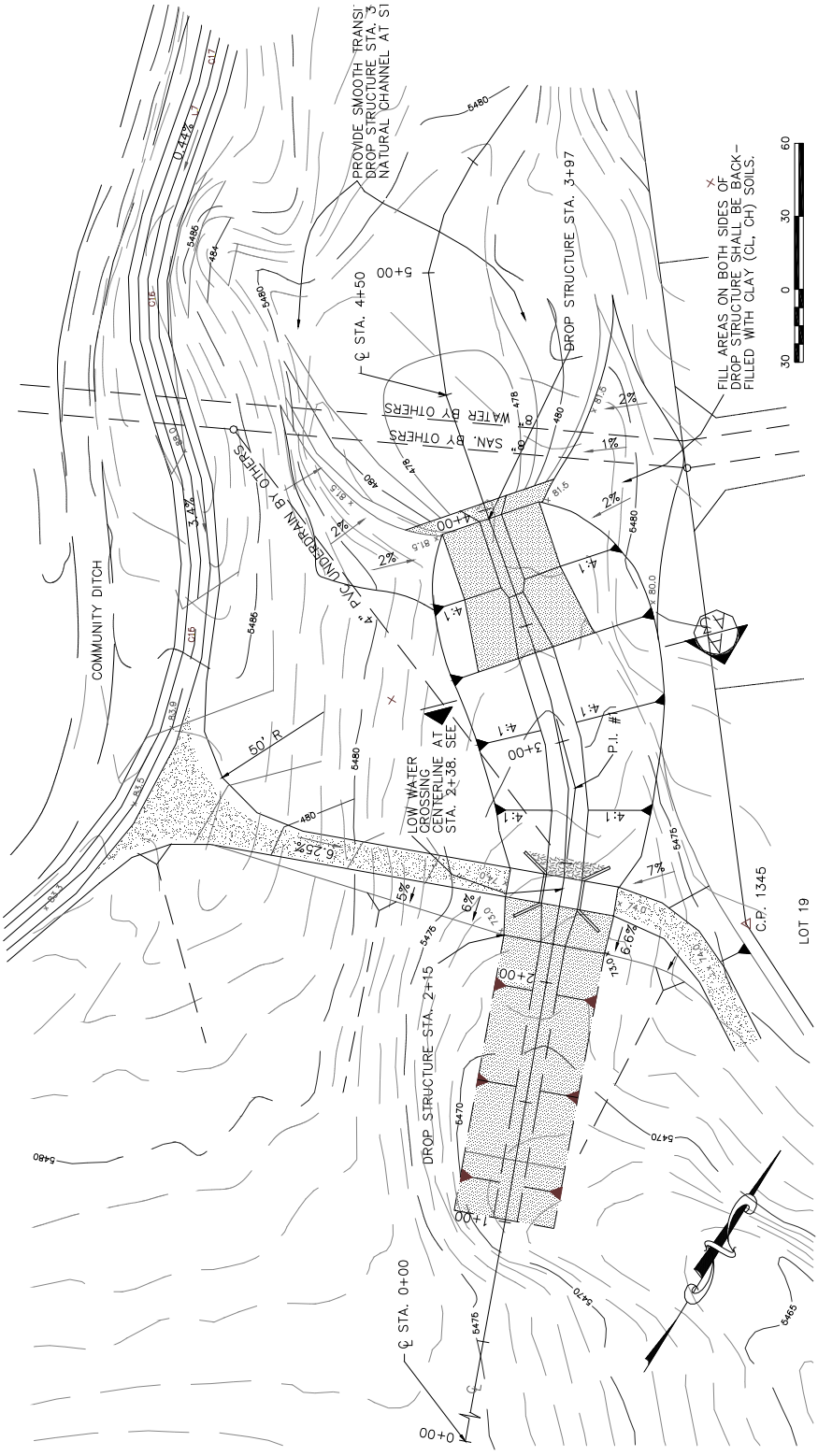



**Figure 14—Grouted Boulder Drop Structures**

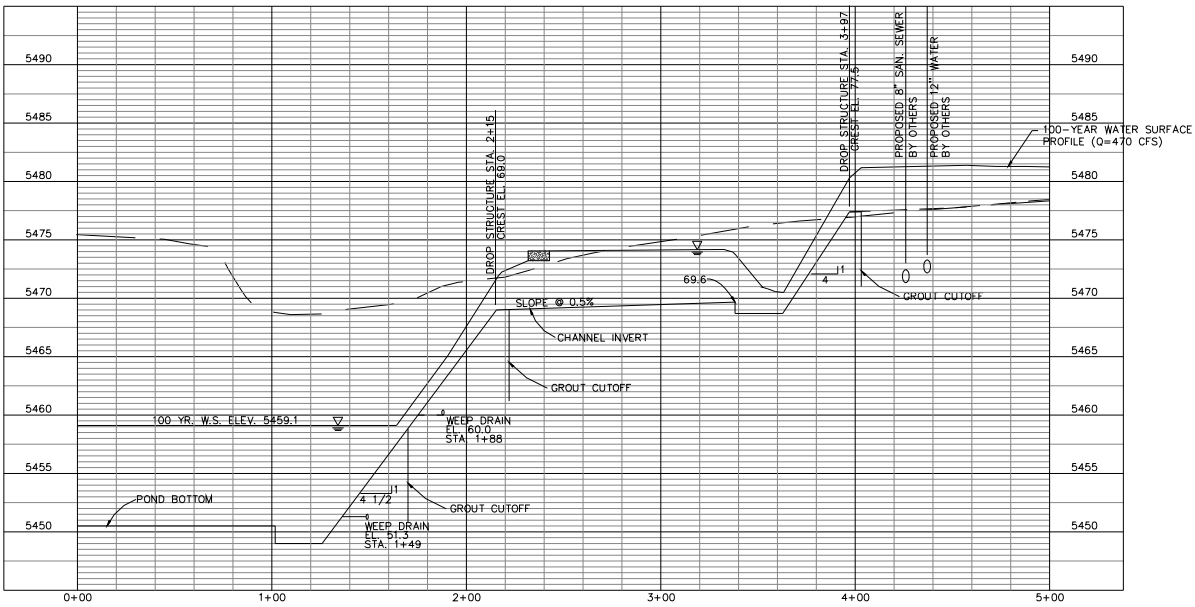



**Figure 15— LB3 Channel Profile**

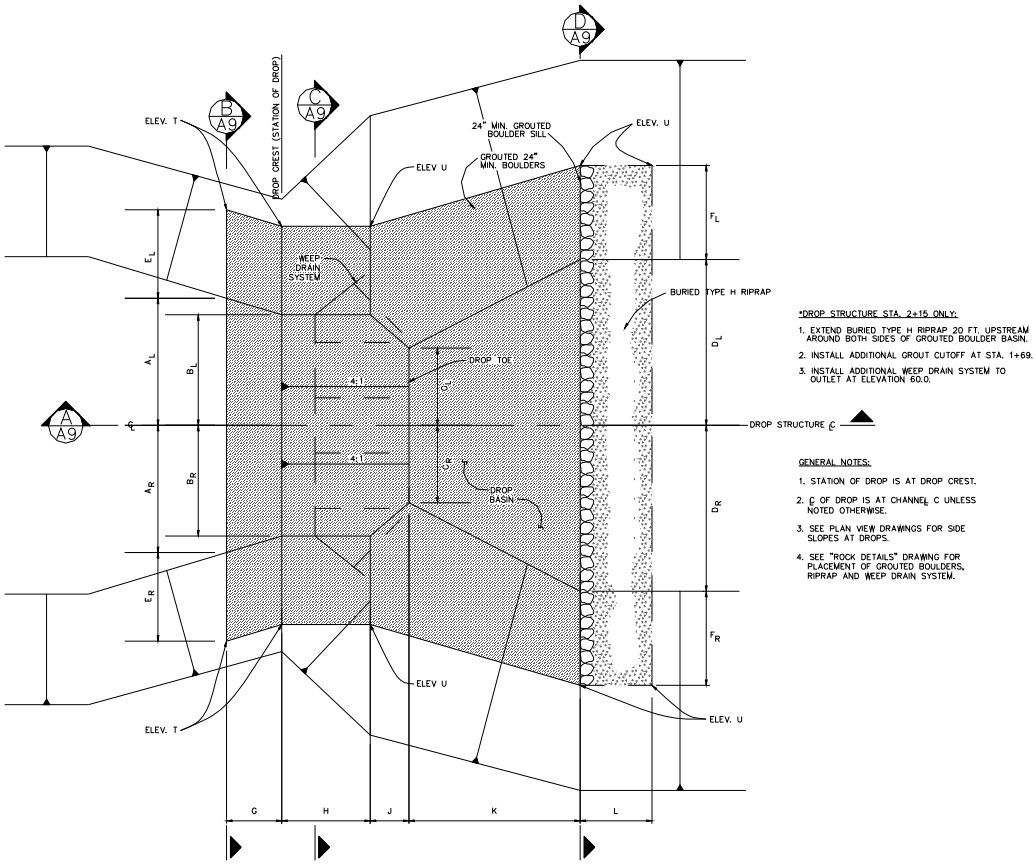



**Figure 16—Typical Drop Structure**

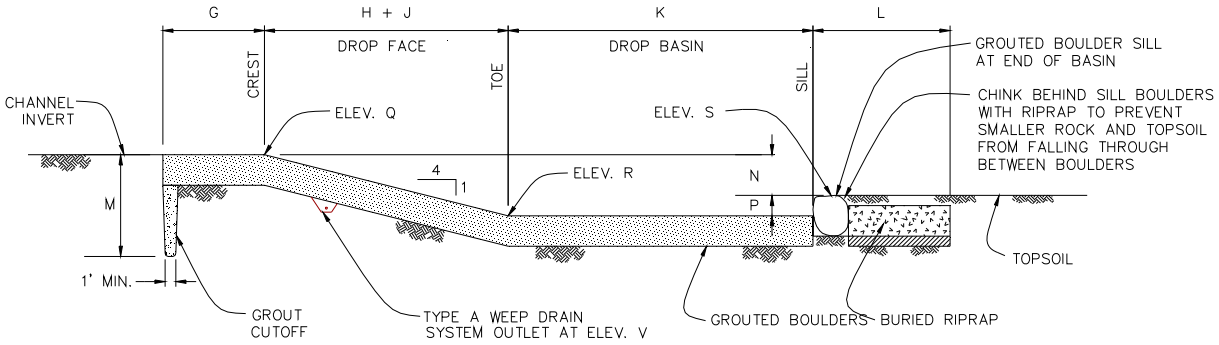



**Figure 17—Grout Cutoff Section**

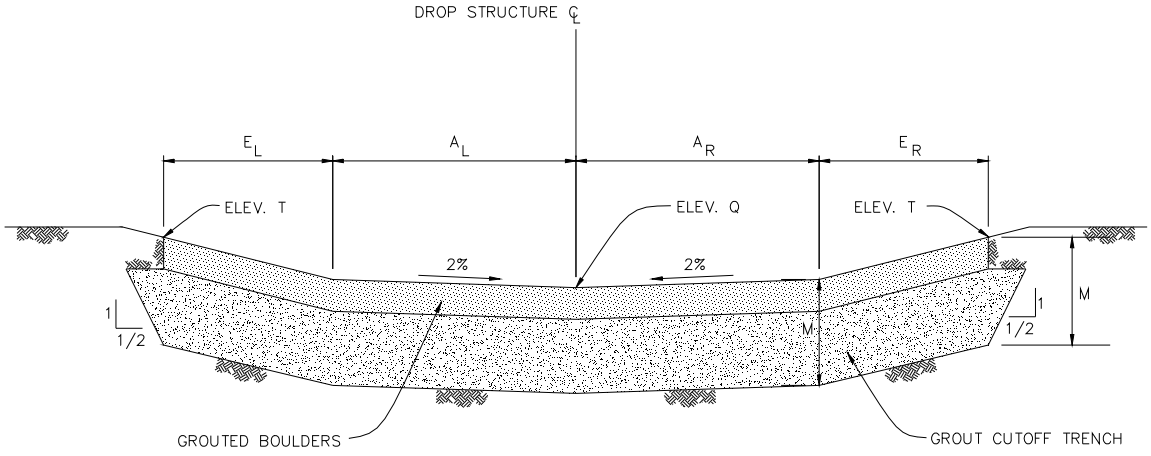



**Figure 18—Drop Structure Profile**

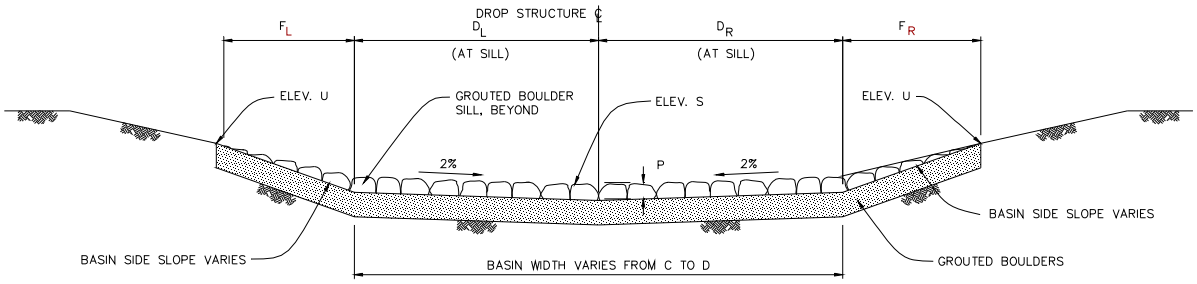



**Figure 19—Typical Drop Basin Section and Sill**

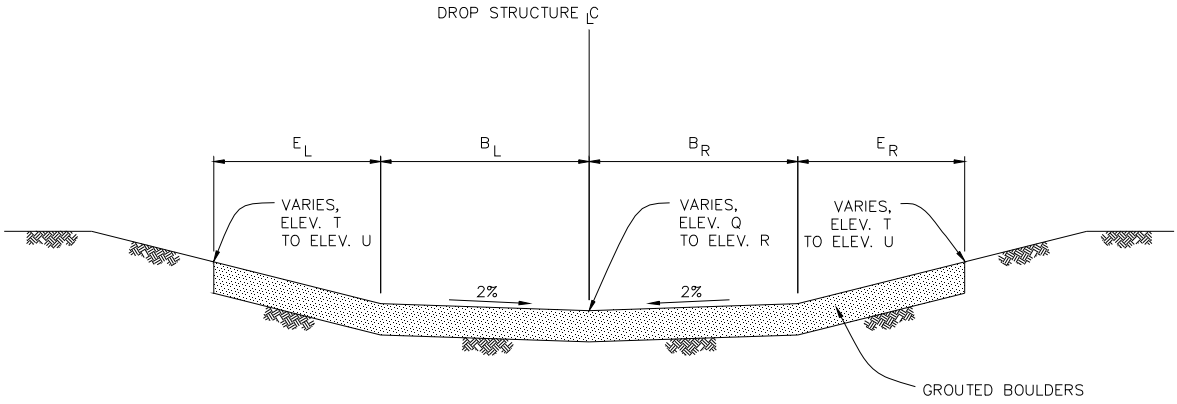



**Figure 20—Typical Drop Face Section**

DROP STRUCTURE MEASUREMENT TABLE

(ALL DIMENSIONS ARE IN FEET)

| STATION OF DROP | $A_L$ | $A_R$ | $B_L$ | $B_R$ | $C_L$ | $C_R$ | $D_L$ | $D_R$ | $E_L$ | $E_R$ | $F_L$ | $F_R$ | G | H | J | K | L | M | N | P | ELEV. Q | ELEV. R | ELEV. S | ELEV. T | ELEV. U | ELEV. V | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2+15 | 6.7 | 6.7 | 5 | 5 | 5 | 5 | 5 | 5 | 16 | 16 | 16 | 16 | 7 | 83.25 | 6.75 | 25 | 10 | 8 | 18.5 | 1.5 | 69.0 | 49.0 | 50.5 | 73.0 | 54.5 | 51.3 & 60.0 | FACE SLOPE IS 4-1/2:1<br>ELEV. T = 73.7 AT UPSTREAM END OF DROP; ELEV. U = 60.5 AT SILL AND DOWNSTREAM |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3+97 | 11 | 11 | 5 | 5 | 3 | 3 | 7.5 | 7.5 | 16 | 16 | 16 | 16 | 6 | 31.2 | 4 | 25 | 10 | 6.5 | 7.9 | 1.0 | 77.6 | 68.7 | 69.6 | 81.5 | 73.7 | 70.4 | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |

**Figure 21—Drop Structure Measurement Table**

Grouted Boulder Check Structures And Wetland Bottom Channels

Grouted Boulder Check Structures And Wetland Bottom Channels

Wetland Bottom Channel

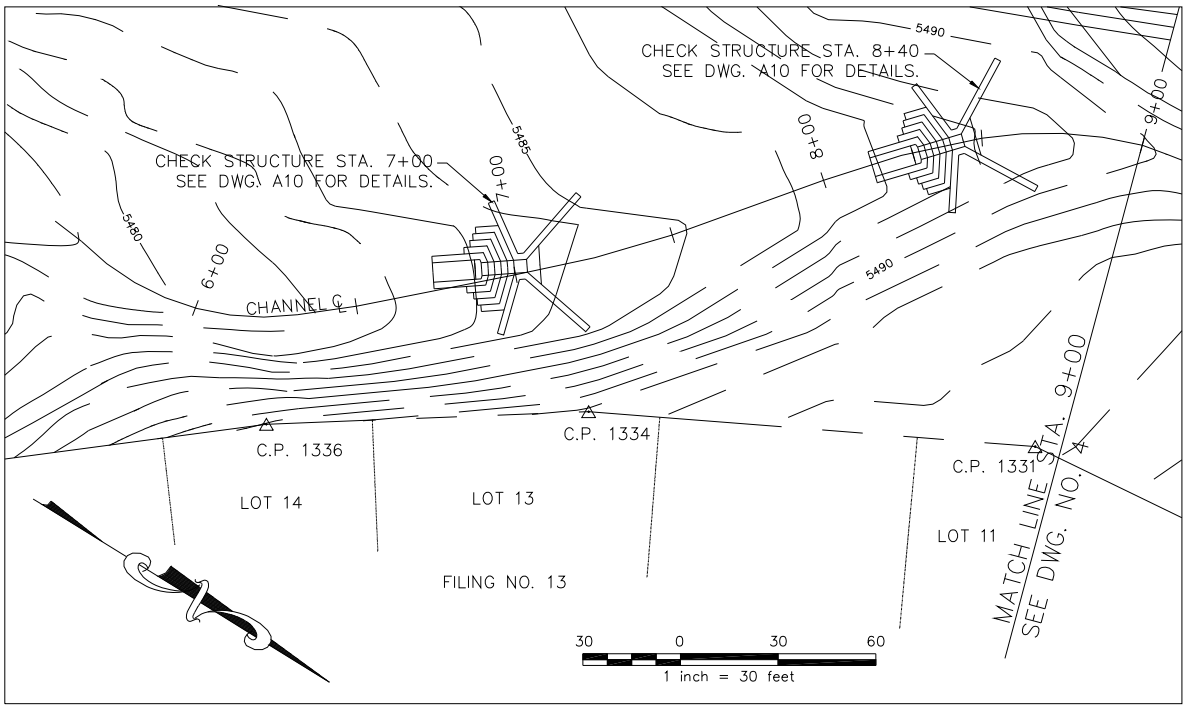



**Figure 22—LB3 Channel Plan**

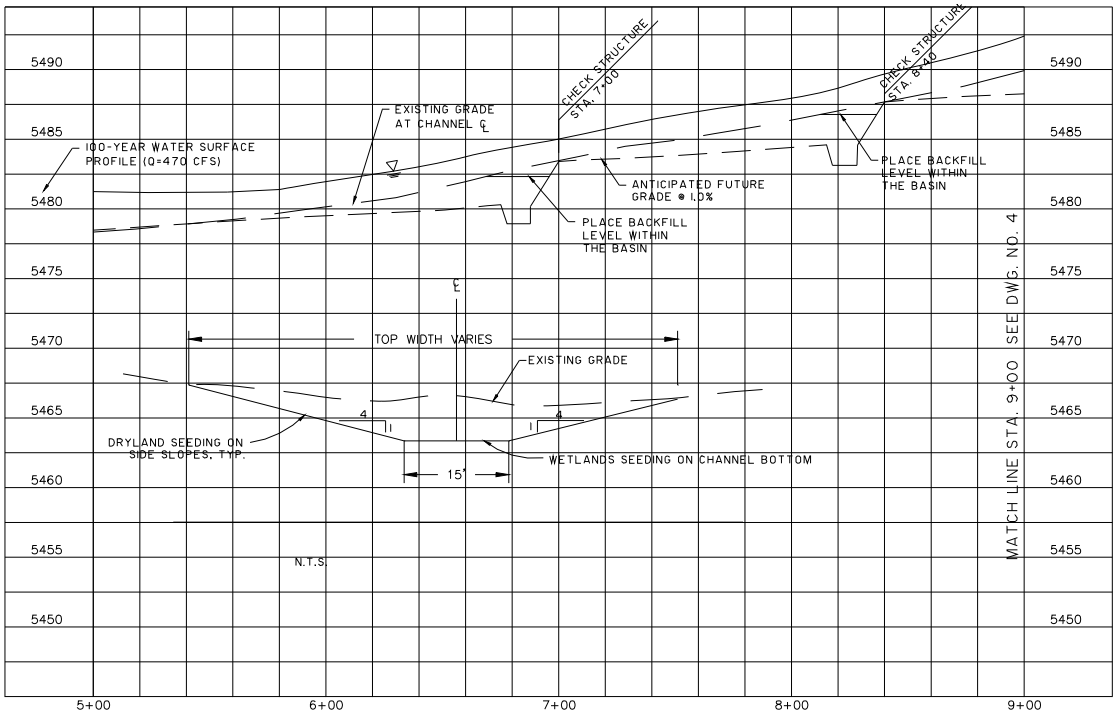



**Figure 23—Typical Wetland Channel Section and LB3 Channel Profile**

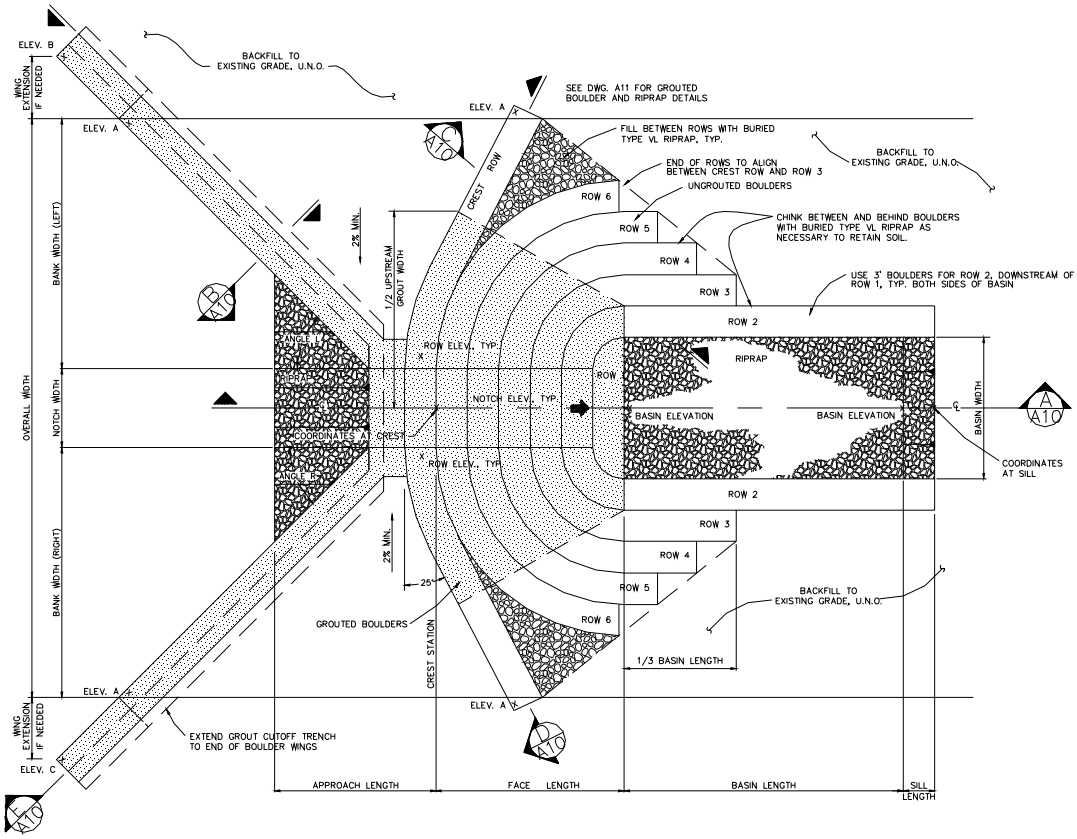



**Figure 24—Check Structure Plan**

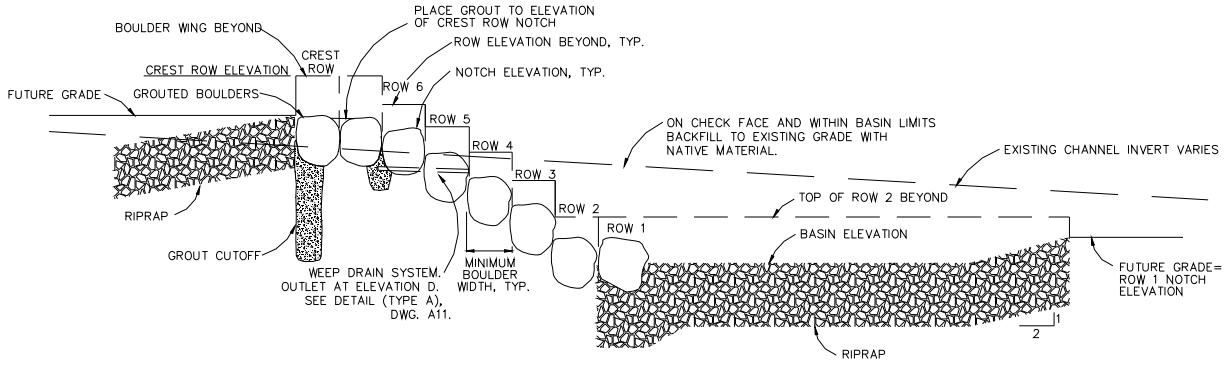



**Figure 25—Check Structure Profile**

## CHECK STRUCTURE LAYOUT TABLE (all dimensions in feet, U.N.O.)

| CHECK STRUCTURE DESIGNATION | STA. 7+00 | STA. 8+40 | STA. 10+50 |
|---|---|---|---|
| SILL LENGTH | 3' | 3' | 3' |
| BASIN LENGTH | 10' | 10' | 10' |
| FACE LENGTH | 12' | 12' | 12' |
| APPROACH LENGTH | 8' | 8' | 8' |
| NOTCH WIDTH | 4' | 4' | 4' |
| BANK WIDTH | 18' L/18' R | 18' L/18' R | 18' L/18' R |
| WING EXTENSION | 0' L/0' R | 0' L/0' R | 0' L/0' R |
| OVERALL WIDTH | 40' | 40' | 40' |
| BASIN WIDTH | 6' | 6' | 6' |
| 1/2 UPSTREAM GROUT WIDTH | 13' L/13' R | 13' L/13' R | 13' L/13' R |
| MINIMUM BOULDER SIZE | 2' | 2' | 2' |
| RIPRAP TYPE FOR BASIN AND APPROACH | H | H | H |
| COORDINATES AT CREST | | | |
| NORTHING | 16,333 | 16,427.5 | 16,628 |
| EASTING | 19,849 | 19,747 | 19,729 |
| COORDINATES AT SILL | | | |
| NORTHING | 16,313 | 16,411 | 16,603.5 |
| EASTING | 19,864 | 19,766 | 19,723 |
| BASIN ELEVATION | 79.2 | 83.5 | 88.5 |
| NOTCH ELEVATIONS/ROW ELEVATIONS | | | |
| ROW 1 | 80.4/80.4 | 84.7/84.7 | 89.7/89.7 |
| ROW 2 | 80.4/80.9 | 84.7/85.2 | 89.7/90.2 |
| ROW 3 | 81.0/81.6 | 85.3/85.9 | 90.3/90.9 |
| ROW 4 | 81.7/82.3 | 86.0/86.6 | 91.0/91.6 |
| ROW 5 | 82.4/83.0 | 86.7/87.3 | 91.7/92.3 |
| ROW 6 | 83.1/83.7 | 87.4/88.0 | 92.4/93.0 |
| CREST ROW | 83.4/84.4 | 87.7/88.7 | 92.7/93.7 |
| BOULDER WING ELEVATIONS | | | |
| ELEVATION A | 84.7 | 89.0 | 94.0 |
| ELEVATION B | NA | NA | NA |
| ELEVATION C | NA | NA | NA |
| CUTOFF DEPTH | 5' | 5' | 5' |
| ANGLE L (in degrees) | 45° | 45° | 45° |
| ANGLE R (in degrees) | 45° | 45° | 45° |
| WEEP DRAIN OUTLET–ELEVATION D | 80.9 | 85.2 | 90.2 |

* IF NA APPEARS IN TABLE, THEN THAT PARTICULAR ROW OR ELEVATION IS NOT REQUIRED IN THE CHECK STRUCTURE.

**Figure 26—Check Structure Layout Table**

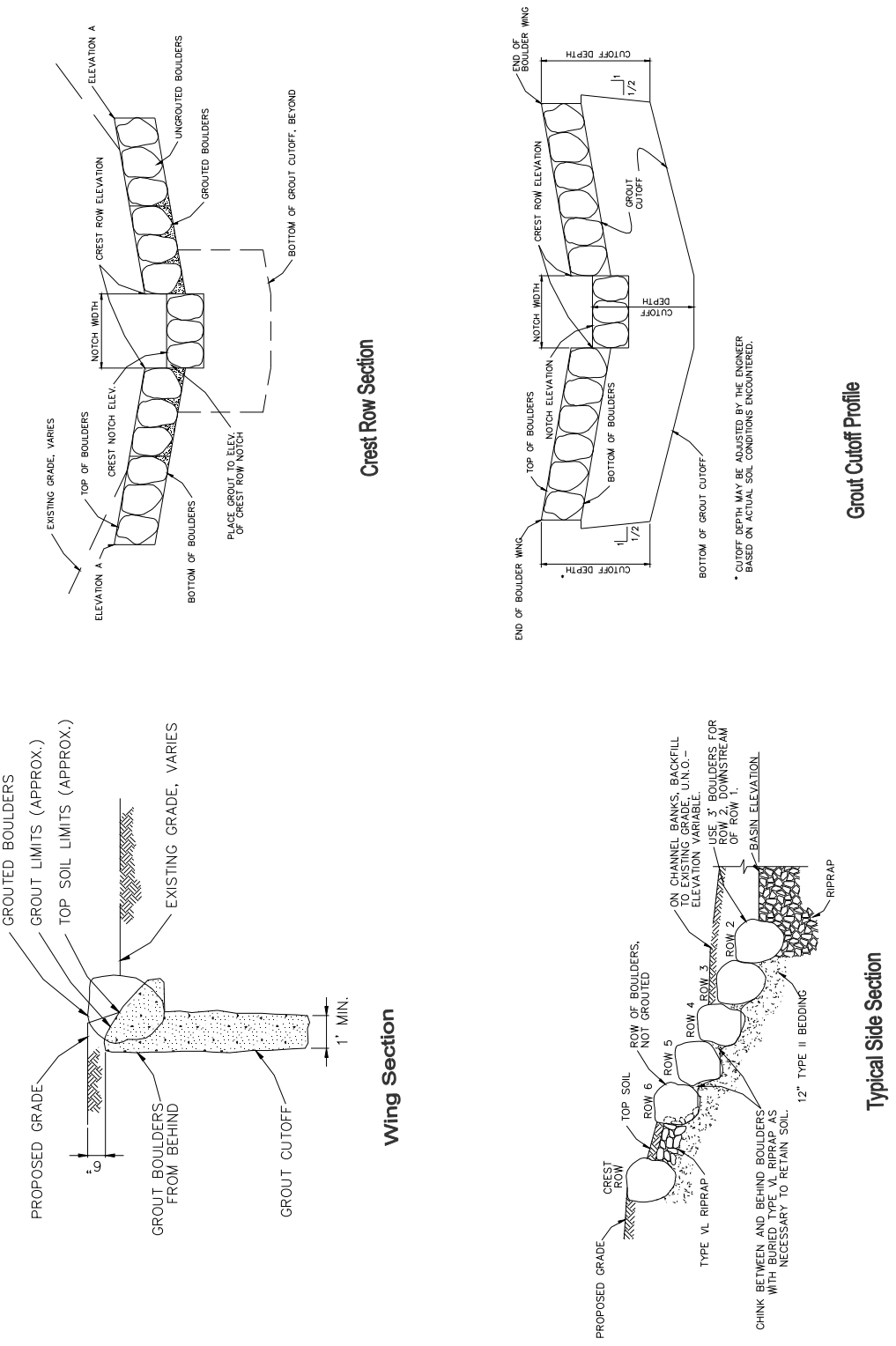



**Figure 27—Check Structure Details**


Stream Bank Stabilization Including Grouted Boulder Check Structure With Low-Water Crossing, Slope Flattening, And Revegetation

Stream Bank Stabilization Including Grouted Boulder Check Structure With Low-Water Crossing, Slope Flattening, And Revegetation

Stream Bank Stabilization Including Grouted Boulder Check Structure With Low-Water Crossing, Slope Flattening, And Revegetation

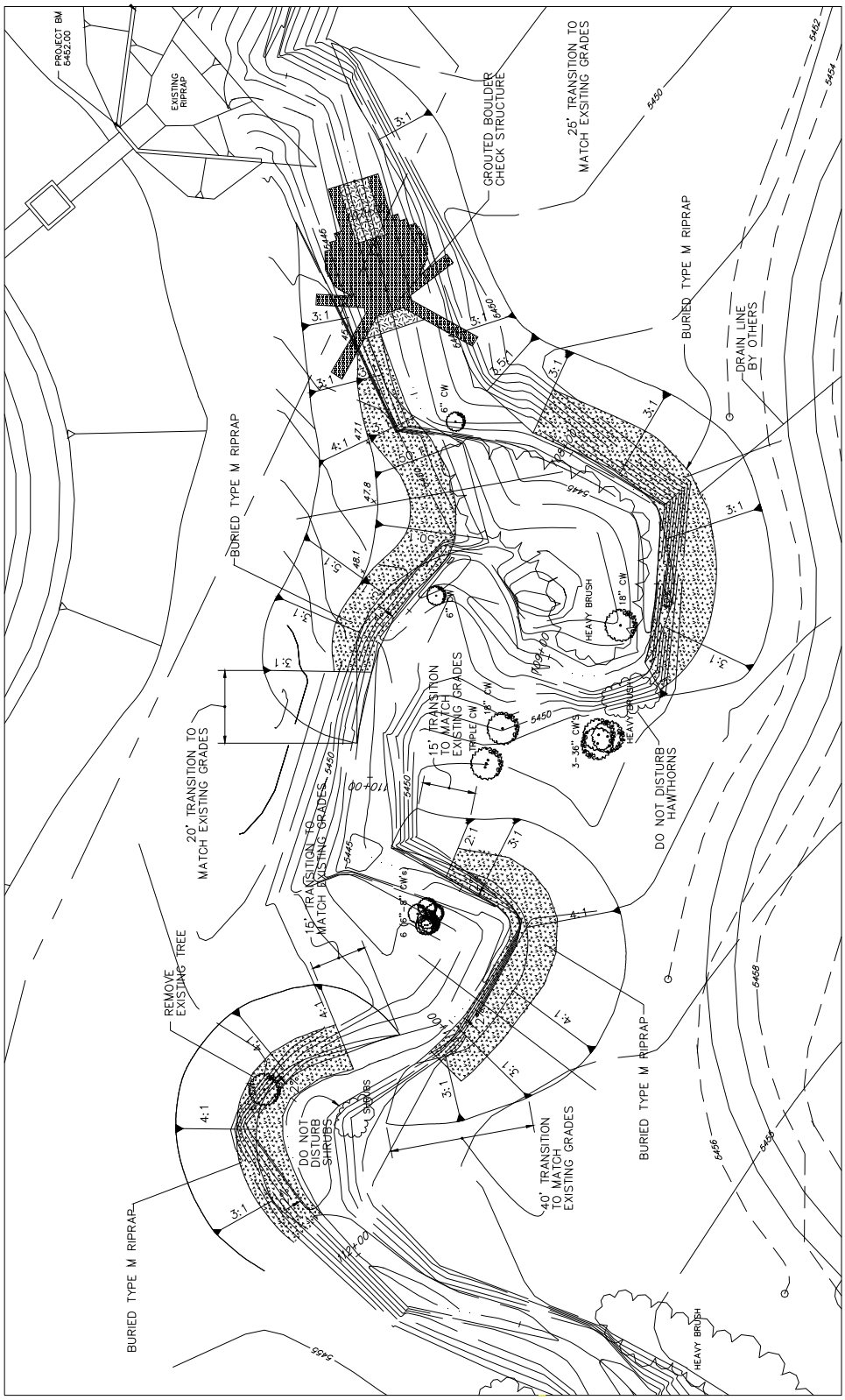



**Figure 28—Stream Stabilization Plan**

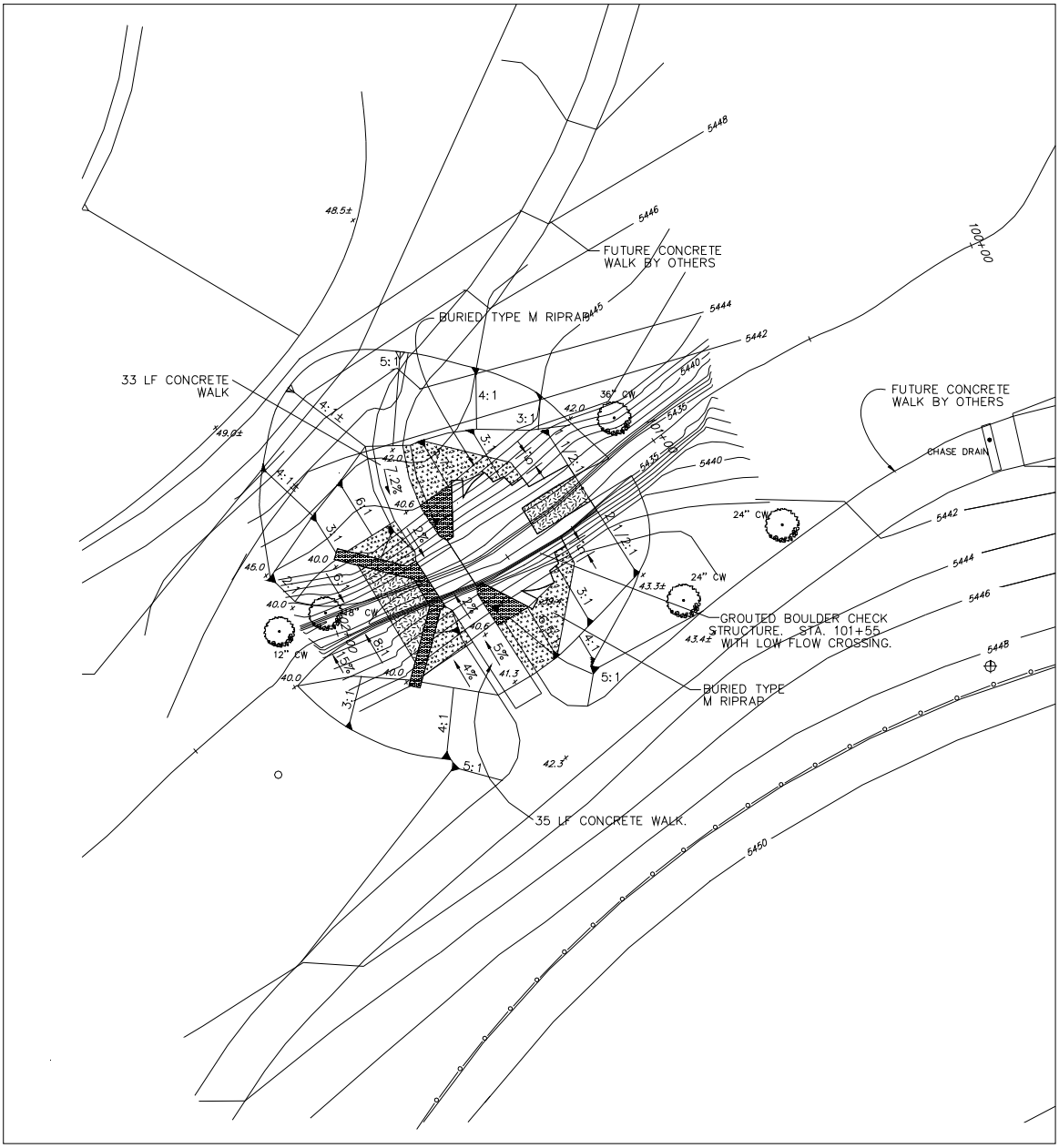



**Figure 29—Grouted Boulder Check Structure with Low-Water Crossing Site Plan**

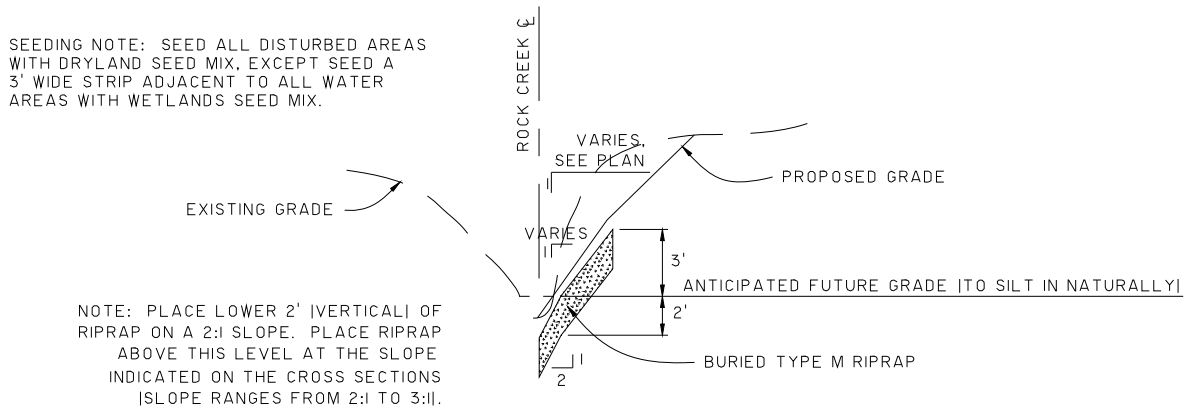



**Figure 30—Typical Stream Stabilization Detail**

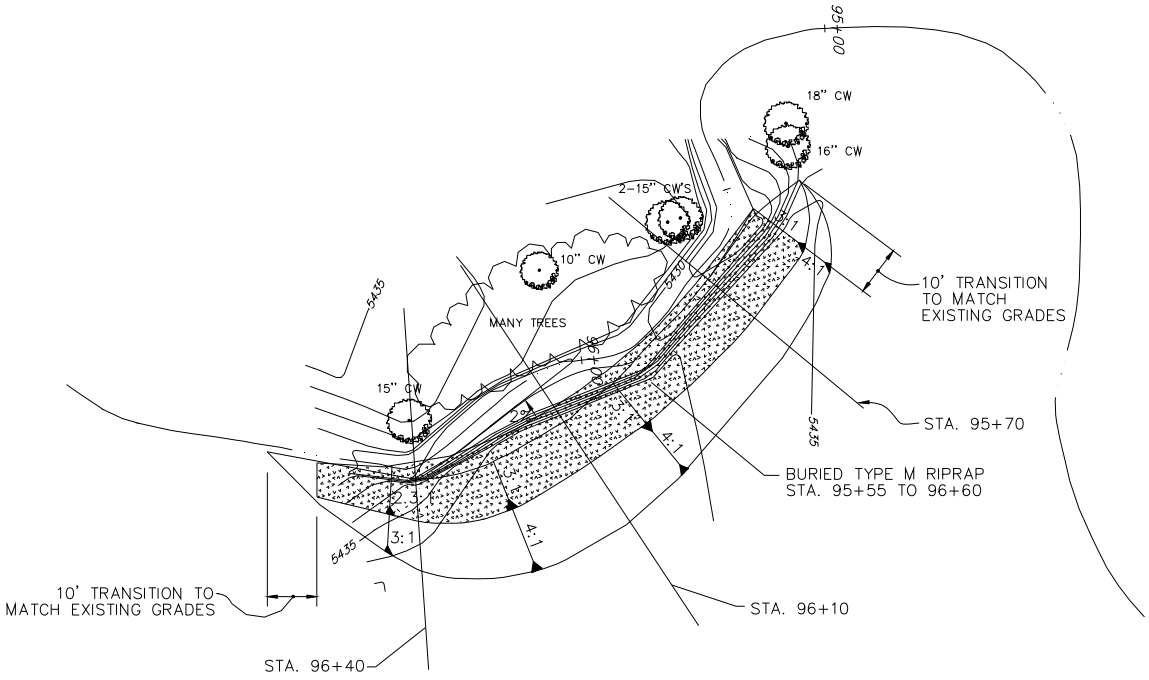



**Figure 31—Stream Stabilization Site Plan**