Creating Embankment in Roads

Overview: Use AutoCadd Civil 3D design complete layout

- If using Civil C3D designs for creating Roads layout, make sure all alignments extend beyond cross section, upstream and downstream toes.
- All alignments beginning and ending points need Northing and Easting coordinates.

Equipment: Trimble TSC7/T10, GNSS Receiver, and Trimble Access v2022.01

Laying out Embankment

1. Tap to open existing projects folder
2. Create a new Job
3. Tap ☰… *General Survey* (select Roads)
4. Tap ☰… *Define… RXL Road… New*
5. You will create THREE templates
    a. ***Fill***
    b. ***Auxiliary Spillway***
    c. ***Pipe***

Fill Template

6. Name: New
    a. (e.g., JohnSmith_Fill)
    b. Station Interval-lines: 5000ift
    c. Station Interval-Arc and Transitions: 5000ft
    d. Horizontal alignment entry method: Length/ Coordinates
    e. Transition type: Clothoid Spiral
    f. Vertical alignment entry method: VPI
    g. Vertical geometry entry method: VPI
7. Tap *Accept*
8. Tap *Horizontal Alignment… Add*
    a. Element: **Start Point,** Start Station*:* **0+00***,* Method*:* **Key in Coordinates**
    Northing and Easting *(e.g., N:15120097.085, E:1209210.456)… Enter*

b. Element: **Line**, Method: **End coordinates**, Northing and Easting (e.g., N:15120105.066, E:1209610.376)… *Enter*

c. Check the *Length(grid)* to confirm your alignment length matches your plans

d. Tap *Store… Close*

9. Tap *Accept*
10. Tap *Vertical Alignment…Add*

i. **Enter all stations and elevations across the CL of the embankment, excluding auxiliary spillway. **

ii. **You will need to create a 0+00 Station with the settled elevation outside of you CL Dam Profile. **

11. Input

a. Element: **Start Point***, Station*: **0+00ift**, *Elevation:* **1251.70ift** *... Store… Add*

b. Element: **Point***, Station*: **0+15ift**, *Elevation:* **1251.70ift***... Store… Add*

c. Element: **Point,** *Station*: **0+82ift**, *Elevation:* **1252.80ift** *... Store… Add*

d. Element: **Point,** *Station*: **2+36.50ift**, *Elevation:* **1252.80ift** *... Store… Add*

e. Element: **Point,** *Station*: **3+19ift**, *Elevation:* **1251.70ift** *... Store… Add*

f. Element: **Point,** *Station*: **3+27ift**, *Elevation:* **1251.70ift** *... Store… Add*

g. Element: **Point,** *Station*: **4+00ift**, *Elevation:* **1251.70ift**… *Store*

12. Tap *Accept*
13. Tap *Templates… Add*

a. Input: **Downstream Toe***... Enter… Add… New*

i. String Name: **½ Top Width**, *Method:* **Delta Elevation and Offset**, *Delta Elevation:* **0+00ift**, *Offset:* **½ Top width of structure** (e.g., 6ift) … *Store… New*

ii. String Name: **Downstream Side Slope**, *Method:* **Side Slope**, *Cut Slope:* **3**, *Fill Slope:* **3**, *Cut ditch width:* ***0.00ift****… Enter… Store*

14. Tap *Accept*
15. Tap: *Add*

a. Input: **Upstream Toe**… *Enter… Add… New*

i. String Name*:* **½ Top Width**, Method*:* **Delta Elevation and Offset**, Delta Elevation*:* **0+00ift**, Offset*:* **½ Top width of structure** (e.g., 6ift) … *Store… New*

ii. *****Full Wave Berm Option*****

a. (Settled Top Elev. minus Berm Elev.=__Ift), (Delta Elev. Multiplied by Side Slope= Offset)

2. String Name*:* **Wave Berm**, Method: **Delta Elevation and Offset** Delta Elevation*:* **___ift** (e.g., -3.2**needs to be negative), Offset: **___ift** (e.g., 9.6ift**make positive**) … *Store… New*

3. String Name: **Berm Top**, Method: **Delta Elevation and Offset**, Delta Elevation: **0+00ift***, Offset:* **Full Top Width** (e.g., 10ift) … *Store… New*

iii. String Name: **Upstream Side Slope**, Method: **Side Slope**, Cut Slope*:* **3**, Fill Slope: **3**, Cut ditch width: ***0.00ift*** *... Store*

16. Tap *Accept*
17. Tap *Template positions… Add*
    a. *****Cross section alignment of embankment*****
    b. Start Station: **0+00,** Left Template: **Downstream Toe**, Right Template: **Upstream Toe**… *Store*
    c. Start Station: **0+15,** Left Template: **Downstream Toe**, Right Template: **Upstream Toe**… *Store*
    d. Start Station: **0+82,** Left Template: **Downstream Toe**, Right Template: **Upstream Toe**… *Store*
    e. Start Station: **2+36.5,** Left Template: **Downstream Toe**, Right Template: **Upstream Toe**… *Store*
    f. Start Station: **3+19.5,** Left Template: **Downstream Toe**, Right Template: **Upstream Toe**… *Store*
    g. Start Station: **3+27.5,** Left Template: **Downstream Toe**, Right Template: **Upstream Toe**… *Store*

h. Start Station: **4+00,** Left Template: **Downstream Toe**, Right Template: **Upstream Toe**… *...Store… Close*

18. Tap *Accept*
19. Select *Elevation… Accept… Accept… Store*

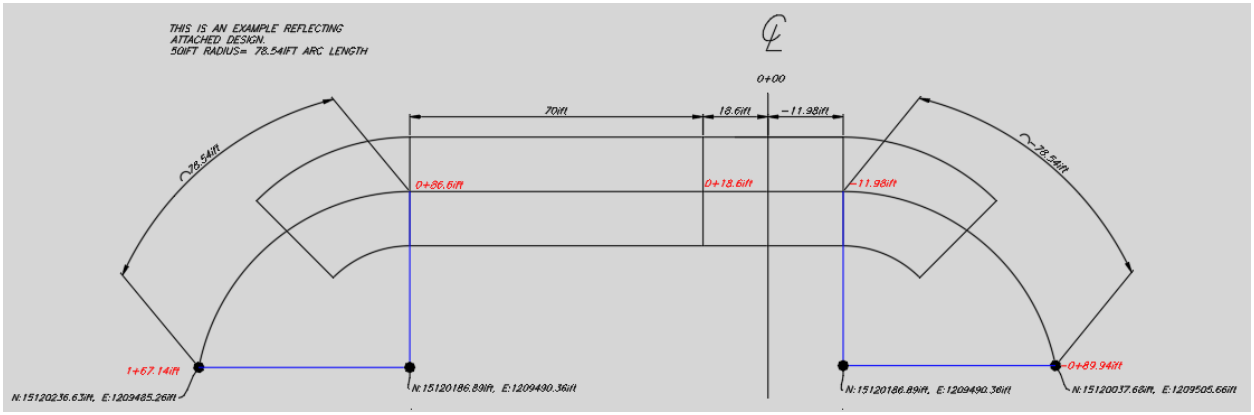
Auxiliary Template

20. Tap *New*
    a. Name: (e.g., JohnSmith_Auxiliary Spillway)
    b. Station Interval-lines: 5000ift
    c. Station Interval-Arc and Transitions: 5000ft
    d. Horizontal alignment entry method: Length/ Coordinates
    e. Transition type: Clothoid Spiral
    f. Vertical alignment entry method: VPI
    g. Vertical geometry entry method: VPI
21. Tap *Accept*
22. Tap *Horizontal Alignment… Add*
    i. *****50ift Aux. Inlet radius= 78.54ift arc length*****
    ii. *****Negative is always upstream no matter which side the Aux. Spillway is drawn into the embankment*****
    iii. *****In Autocadd Civil 3D you will need to get Northing and Easting coordinates and Center point Northing and Easting of the arc*****
    iv. *****To get Northing and Easting coordinates, you have to select the alignment and type "explode", you might have to explode twice. DO NOT SAVE THIS PART OF YOUR DESIGN*****
    b. Element: **Start Point,** Start Station: **-0+89.94ift**, Method**: Key in coordinates**, Northing and Easting (e.g., N:15120037.68ift, E:1209505.66ift) … *Store*
    c. Element: **Arc**, Method: **End coordinates and center point**, Northing and Easting (e.g., N:15120092.51ift, E:1209550.30ift), Center point north (e.g., N:15120087.415ift), Center point east (e.g., E:1209500.560ift) … *Store*

d. Element: **Line**, Method: **End coordinates**, Northing and Easting (e.g., N:15120191.99ift, E:1209540.10ift) … *Store*

e. Element: **Arc**, Method: **End coordinates and center point**, Northing and Easting (e.g., N:15120236.63ift, E:1209485.26ift), Center point north (e.g., N:15120186.89ift), Center point east (e.g., E:1209490.36ift) … *Store*

23. Tap *Accept*



24. Tap *Vertical Alignment… Add*

i. *****Use elevation from where inlet meets original ground to get elevation find slope of inlet from design- Aux. data (78.54ift arc radius multiplied by 2%slope=1.57) *****

ii. *****Level section of auxiliary spillway minus 1.57= the elevation of Inlet*****

b. Element: **Start Point**, Station: **-0+89.94ift**, Elevation: **1247.93ift**

c. Element: **Point**, Station: **-0+11.98ift**, Elevation: **1249.50ift**

d. Element: **Point**, Station: **0+00ift**, Elevation: **1249.50ift**

e. Element: **Point**, Station: **0+18.60ift**, Elevation: **1249.50ift**

f. Element: **Point**, Station: **0+88.60ift**, Elevation: **1248.10ift**

g. Element: **Point**, Station: **1+67.14ift**, Elevation: **1246.53ift**

25. Tap *Accept*

26. Tap *Templates… Add*

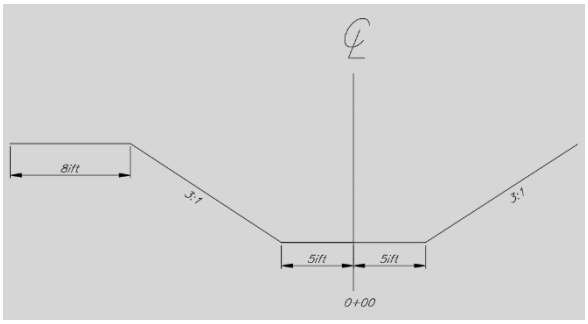
a. Input: **Auxiliary Dike**… *Enter… Add… New*

b. String name: **Auxiliary Bottom**, Method: **Delta elevation and offset**, Delta elevation: **0ift**, Offset ½ bottom width: **___ift** (e.g., 5ift) … *Store*… *New*

c. String name: **Side Slope Dike Top**, Method: **Delta elevation and offset**, Delta elevation: **2.2ift**, Offset: **___ift** (e.g., 6.6ift) … *Store*… *New*

i. *****Side Slope Dike Top (settled top minus auxiliary spillway level section multiped by side slope)*****

d. String name: **Auxiliary Top Dike**, Method: **Delta elevation and offset**, Delta elevation: **0ift**, Offset: **___ift** (e.g., 8ift) … *Store*… *New*



e. String name: **Auxiliary Side Slope**, Method: **Side Slope**, Cut Slope: **3**, Fill Slope: **3**, and Cut ditch width: **0ift** … *Store*

27. Tap *Accept*
28. Tap *Add*
    a. Input: **Auxiliary Cut**... *Enter*… *Add*... *New*
    b. String name: **Auxiliary Bottom**, Method: **Delta elevation and offset**, Delta elevation: **0ift**, Offset ½ bottom width: **___ift** (e.g., 5ift) … *Store*… *New*
    c. String name: **Auxiliary Side Slope**, Method: **Side Slope**, Cut Slope: **3**, Fill Slope: **3**, and Cut ditch width: **0ift** … *Store*
29. Tap *Accept*
30. Tap *Template positions… Add*
    a. Start Station: **-0+89.94ift,** Left Template: **Auxiliary Dike**, Right Template: **Auxiliary Cut**… *Store*
    b. Start Station: **-0.11.40ift,** Left Template: **Auxiliary Dike**, Right Template: **Auxiliary Cut** … *Store*
    c. Start Station: **0+00ift,** Left Template: **Auxiliary Dike**, Right Template: **Auxiliary Cut** … *Store*
    d. Start Station: **0+18.60ift,** Left Template: **Auxiliary Dike**, Right Template: **Auxiliary Cut** … *Store*

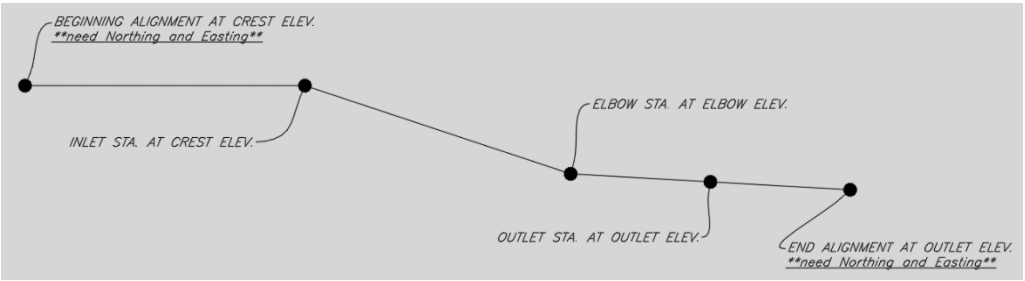
e. Start Station: **0+88.60ift,** Left Template: **Auxiliary Dike**, Right Template: **Auxiliary Cut** … *Store*

f. Start Station: **1+67.14ift,** Left Template: **Auxiliary Dike**, Right Template: **Auxiliary Cut** … *Store… Close*

31. Tap *Accept*
32. Select *Elevation…Accept… Accept… Store*

Pipe Template

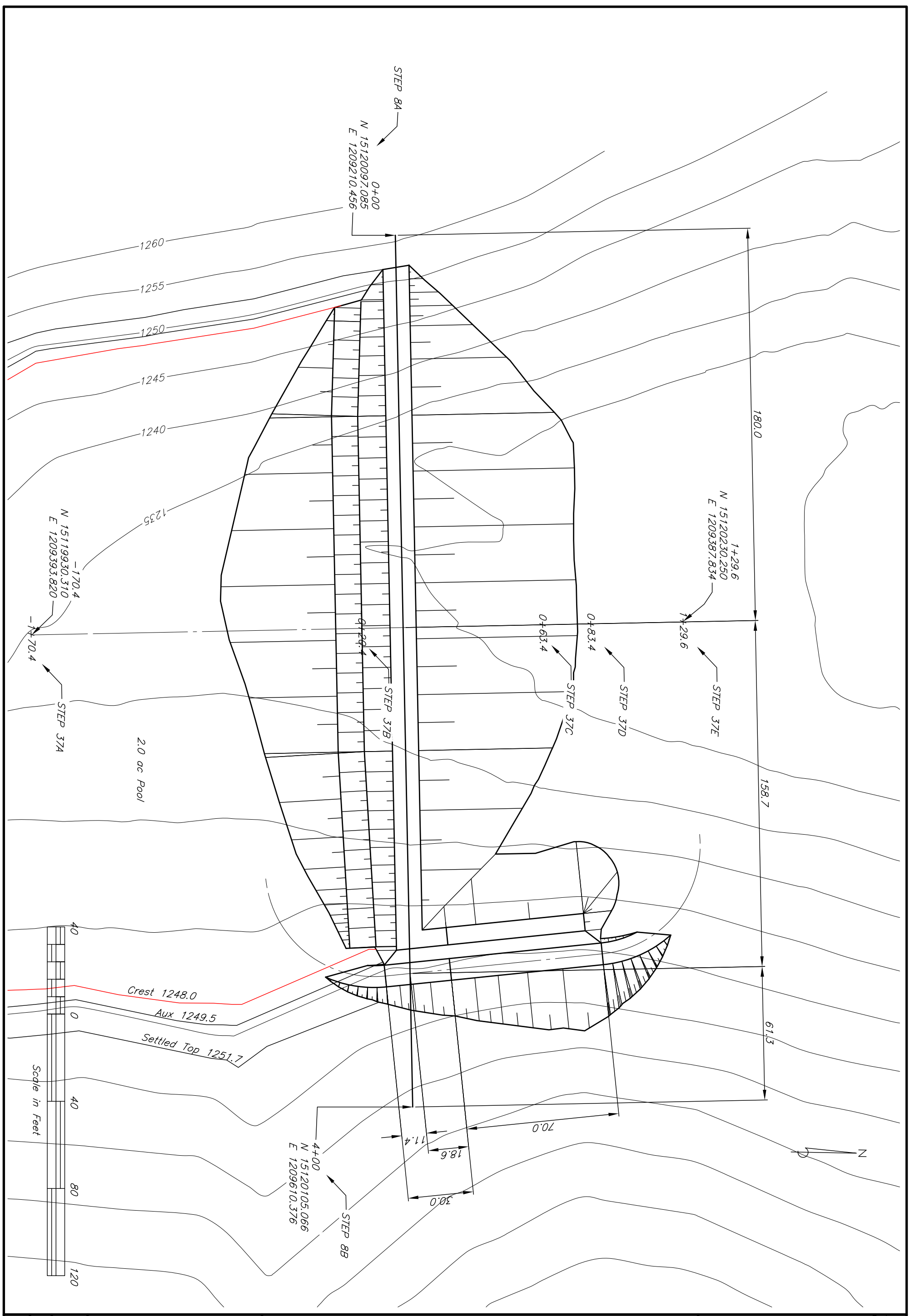
33. Tap *New*
    a. Name: (e.g., JohnSmith_Pipe)
    b. Station Interval-lines: 5000ift
    c. Station Interval-Arc and Transitions: 5000ft
    d. Horizontal alignment entry method: Length/ Coordinates
    e. Transition type: Clothoid Spiral
    f. Vertical alignment entry method: VPI
    g. Vertical geometry entry method: VPI
34. Tap *Accept*



35. Tap *Horizontal Alignment… Add*
    i. *****The pipes centerline 0+00 station must start beyond front toe and end beyond back toe of centerline of embankment profile*****
    ii. *****You will need Northing and Easting for each ending station of the alignment*****
    b. Element: **Start Point,** Start Station*:* **-1+70.4ift***,* Method*:* **Key in Coordinates** Northing and Easting *(e.g., N:15119930.310, E:1209393.820) … Enter*

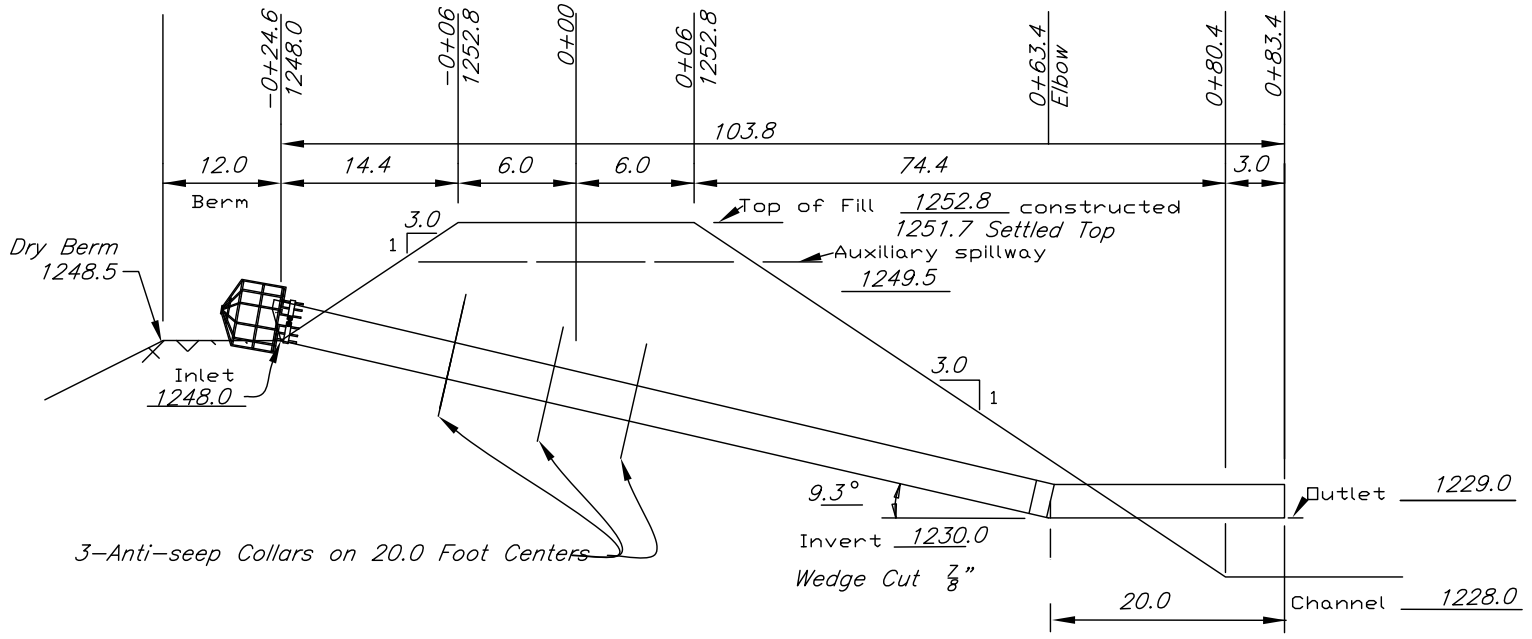
c. Element: **Line**, Method: **End coordinates**, Northing and Easting (e.g., N:15120230.250, E:1209387.834) … *Store*

36. Tap *Accept*
37. *Tap Vertical Alignment… Add*
    a. Element: **Start Point**, Station: **-1+70.4if**t, Elevation: **1248.0ift**
    b. Element: **Point**, Station: **-0+20.4if**t, Elevation: **1248.0ift**
    c. Element: **Point**, Station: **0+63.4ift**, Elevation: **1230.0ift**
    d. Element: **Point**, Station: **0+83.4if**t, Elevation: **1229.0ift**
    e. Element: **Point**, Station: **1+29.6ift**, Elevation: **1229.0ift**
38. Tap *Accept*
39. Tap *Templates… Add*
    a. Input: **Pipe**… *Enter*… *Add… New*
        i. *String Name:* **Pipe**, *Method:* **Delta Elevation and Offset**, *Delta Elevation:* **0+00ift**, *Offset:* **100ift**… *Store… Accept*
    b. Tap *Accept*
40. Tap *Template positions… Add*
    a. Start Station: **-1+70.4ift,** Left Template: **Pipe**, Right Template: **Pipe**… *Store*
    b. Start Station: **1+29.6ift,** Left Template: **Pipe**, Right Template: **Pipe**… *Store… Close*
41. Tap *Accept… Store*
42. Select one of the three templates you just created.
43. Tap *Review*
    a. If your project is not showing on the screen, Tap 
44. Tap
    a. A string to review
        i. Once selected you can 3D drive your structure
    b. A station on a string to review



12/19/22 10:28 Sheet 2M of 5	Drawing No.	File No.	USDA United States Department of Agriculture Natural Resources Conservation Service	GRADE STABILIZATION STRUCTURE *PLAN VIEW*

	Date
Designed	11/17/2022
Drawn	11/17/2022
Checked	
Approved	



SECTION ON CENTERLINE

Not to Scale

Bill of Materials

107 ft. of 6 " dia. 1/4 " thick smooth metal pipe with Canopy inlet.

Pipe and appurtenances to be welded water tight.

1 ea. Bee-Hive Trash Rack Assembly (see sheet 5 of 5)

3 ea. anti-seep collars 48 " x 48 ", 1/4 " _____ _____ piece.

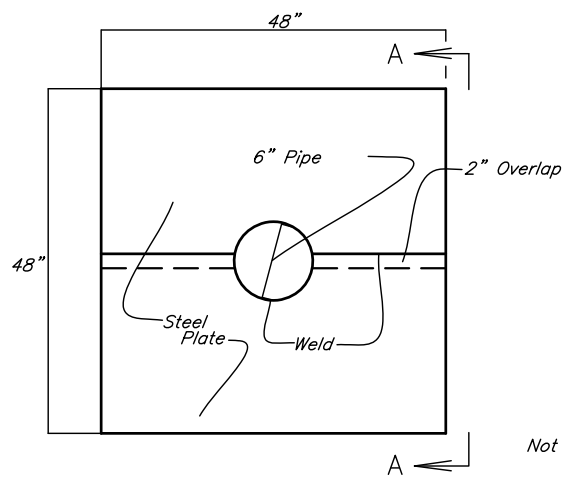
14,665 cu. yd. Main Fill, Berm, Aux. Dike & Strippings (5% Overfill Added to Berm)

697 cu. yd. Core Trench

_____ cu. yd. Stream Channel Cleanout

_____ cu. yd. Other

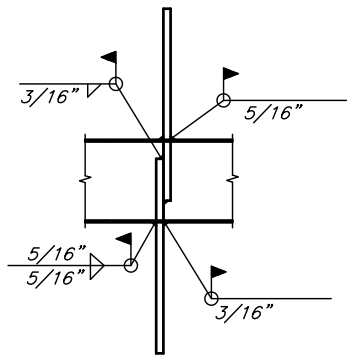
15,362 cu. yd. Total Earth Fill



ANTI-SEEP COLLAR

DETAIL

Not to Scale



SEC. A-A

Not to Scale

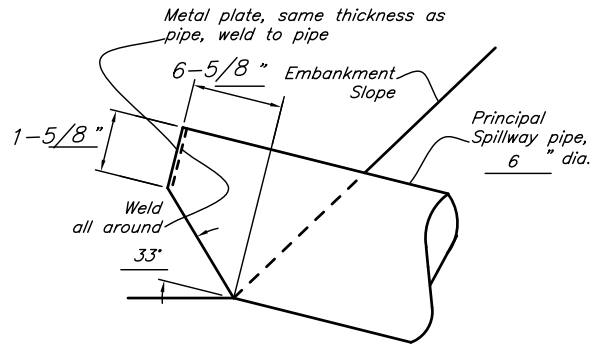
NOTES:

1. The steel pipe shall comform to Construction Specification 52A, Steel Pipe Conduits.
2. The nominal wall thickness of the steel pipe shall be 0.280".
3. The nominal thickness of all other steel shall be 0.250".
4. All welds shall be watertight. On pipe joints weld four straps (2" x 10" x 1/4") across the joint with 1/8" fillet welds. Straps shall be flush with pipe surface. Welds on pipe joints shall be either (a) or (b):

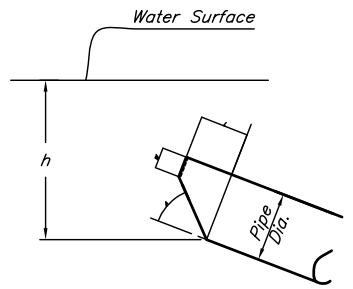
(a) Single "V" butt weld, 60 degree angle bevel, root face and gap measurements 0 to 1/8". The "V" is to be completely filled.

(b) Butt weld joint with two passes.

5. Center antiseep collar(s) on the pipe.
6. All pipe sections shall have a minimum length of 16 feet.



DETAIL OF CANOPY INLET



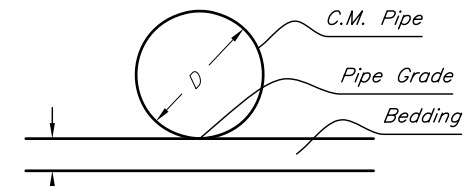
h=Minimum height for full pipe flow.

CANOPY INLET DIMENSIONS

PARTIAL ISOMETRIC VIEW

NOTES:
Materials and installation shall adhere to Iowa NRCS Construction Specification IA-52; "STEEL PIPE CONDUITS".

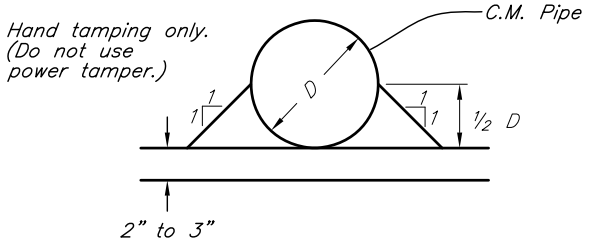
Pipe Diam. In.	Pipe Grade %	W In.	L In.	A Deg.	h Ft.
6	15.1-25	1 5/8	6 5/8	33	0.9



Excavate 2 to 3 inches below pipe grade. Then backfill with damp friable soil free from lumps and raked or graded to a true plane before placing C.M. Pipe. No compaction of bedding is required.

CORRUGATED OR SMOOTH METAL PIPE
PRINCIPAL SPILLWAY
BEDDING DETAIL

Note
Begin backfill immediately after pipe has been placed.



CORRUGATED OR SMOOTH METAL PIPE
PRINCIPAL SPILLWAY
BACKFILL DETAIL

	Date
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Drawn	11/17/2022
Checked	.
Approved	.

GRADE STABILIZATION STRUCTURE

PRINCIPAL SPILLWAY DETAILS

United States Department of Agriculture
Natural Resources Conservation Service

File No.

Drawing No. .

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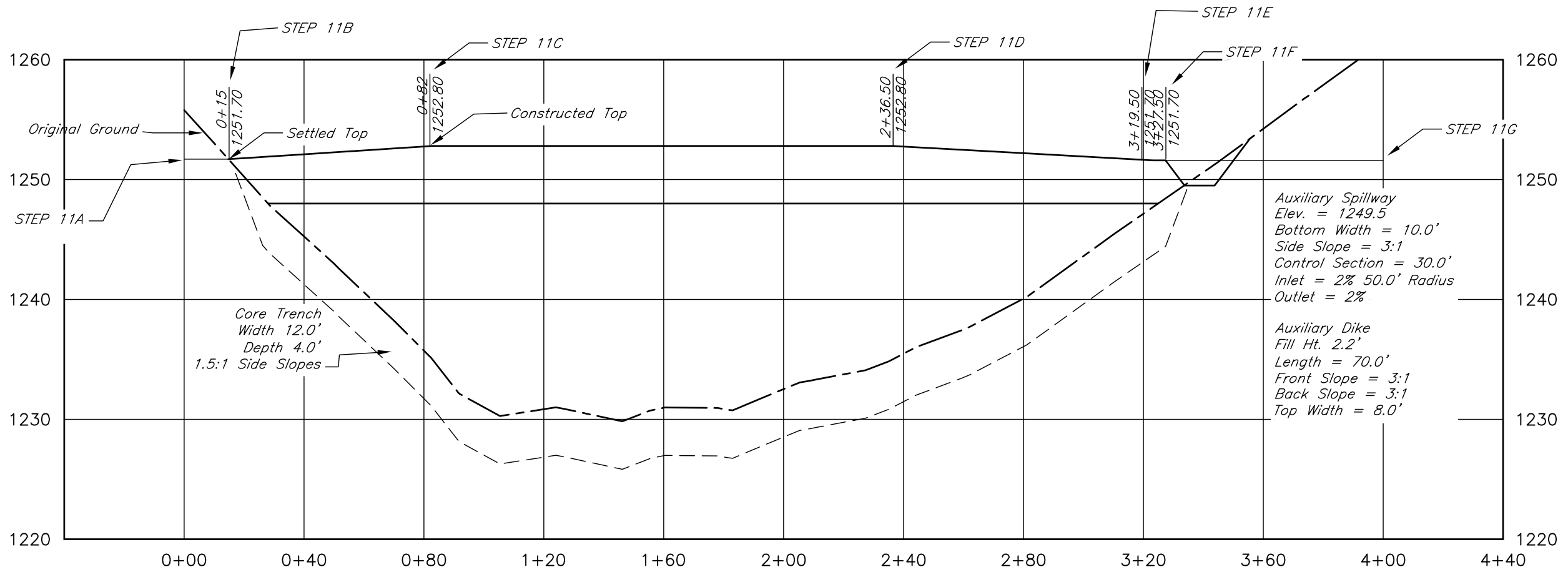
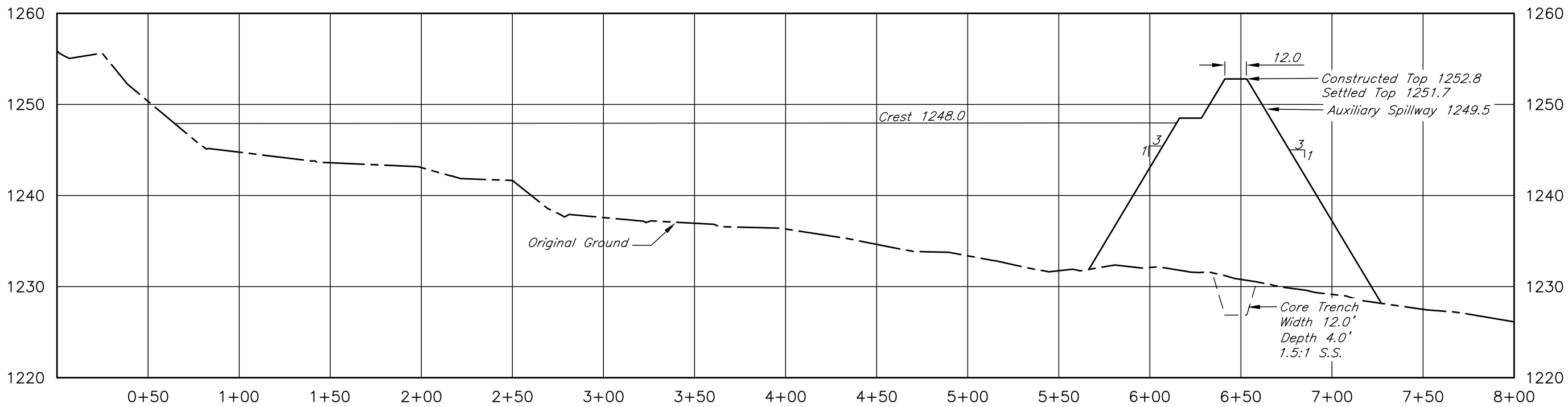


* Core Trench dimensions are minimum. Should the resulting exposed materials be unfit to build upon, excavation shall continue until a satisfactory condition is reached.

CL DAM PROFILE



Gully Profile PROFILE

Date
Designed 11/17/2022
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GRADE STABILIZATION STRUCTURE

PROFILES

United States Department of Agriculture
USDA
Natural Resources Conservation Service

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