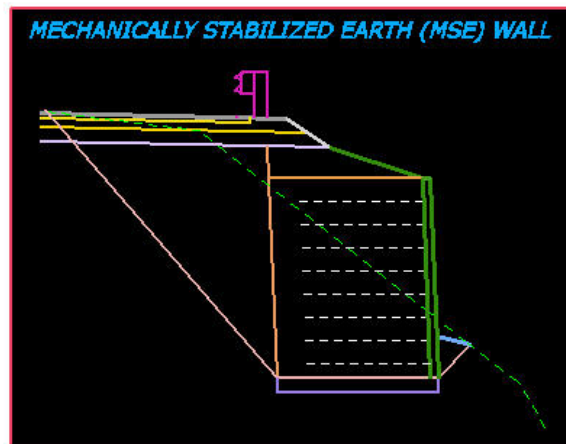


CFLHD Retaining Wall Layout Procedure Manual

MSE Walls



CFLHD Retaining Wall Layout Procedure Manual
MSE Walls

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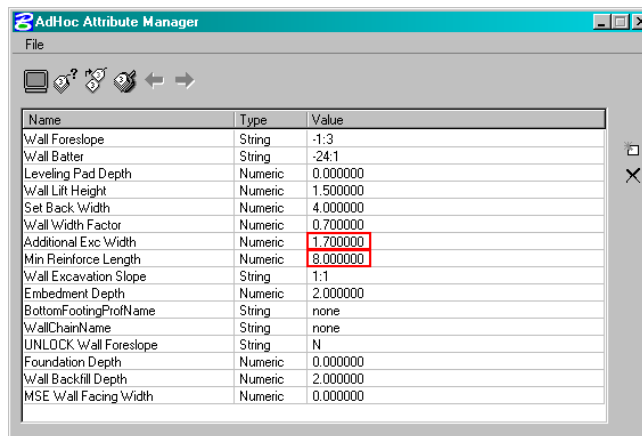
About Retaining Wall Layout Procedures (For CFLHD employees)

The FLH criteria library supports nine wall types; Parapet, MSE, Soil Nail, SMSE, Cut, Fill, Gabion, Guardwall and Rockery. Creating a constructible wall layout is an iterative process, which requires the involvement of the Highway Engineer as well as the Structural and/or Geotechnical Engineer. The process requires two or three phases, depending upon the wall type. The first phase is to create the initial proposed cross sections, using the CFLHD default AdHoc attributes. From these cross sections, several chains and profiles are stored. This information is then given to the Structural/Geotechnical Engineer, to assist in the determination of the appropriate project specific design criteria that will be required. The second phase is to produce proposed cross sections that reflect a constructible wall profile and appropriate site specific design requirements.

Workflow: MSE Wall Layout

Phase 1

1. Draw pattern lines *every five feet through the wall site in the mainline pattern file. Use a different level for the pattern lines than the mainline cross section pattern lines. Additional cross sections may be required at the beginning and end to determine where the wall should begin and end. To start with, extend the wall 20 ft beyond the expected beginning and ending limits of the MSE wall.*
2. Cut existing ground cross sections *based on the pattern lines created in step 1.*
3. Run the proposed cross sections. *The default AdHoc attributes for the MSE wall dimensions must be adjusted to match the CFLHD Detail C255-50. As shown below, change the value for the Additional Exc Width variable from 1.5 to 1.7, and the value for the Min Reinforce Length from 0 to 8. Use the Minimum Detour Width (P_RDW_Detour_Line) to visually determine in the cross sections if traffic can be accommodated during construction of the MSE wall. The minimum detour width must provide room for the temporary barrier and required offset distance. If there is an insufficient roadway width, shoring may be required or another wall type such as a SMSE wall may need to be used.*



Name	Type	Value
Wall Foreslope	String	-1:3
Wall Batter	String	-24:1
Leveling Pad Depth	Numeric	0.000000
Wall Lift Height	Numeric	1.500000
Set Back Width	Numeric	4.000000
Wall Width Factor	Numeric	0.700000
Additional Exc Width	Numeric	1.700000
Min Reinforce Length	Numeric	8.000000
Wall Excavation Slope	String	1:1
Embedment Depth	Numeric	2.000000
BottomFootingProfName	String	none
WallChainName	String	none
UNLOCK Wall Foreslope	String	N
Foundation Depth	Numeric	0.000000
Wall Backfill Depth	Numeric	2.000000
MSE Wall Facing Width	Numeric	0.000000

Figure 1-1: AdHoc Attributes for Phase 1 MSE Wall Layout

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4. To store the MSE profiles, click on *Reports & XS Quantities* from the *Road Project Manager* dialog box as shown below. Click on the *Profile Grade* button in the *XS Report* dialog box.

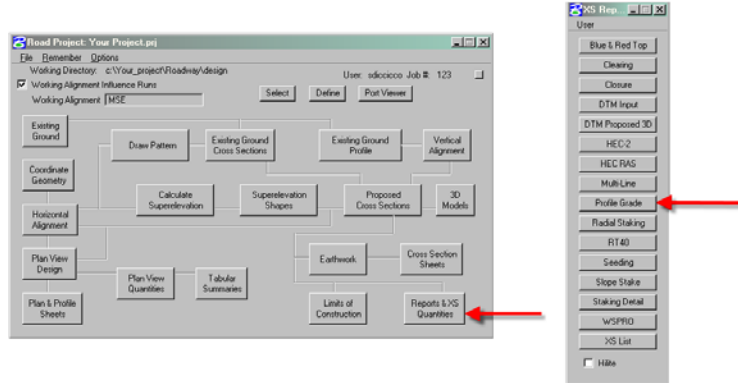


Figure 1-2: Reports & XS Quantities and Profile Grade

5. Fill in the *Begin and End Station of the wall station range*. Under *Search Criteria*, click on the button next to *Existing Ground Line* as shown below. Add the *Lv Names* to the *Existing Ground Line* dialog as shown below. The *Existing Ground Line* should only have existing ground level (*X_E_Ground_XS*) in the *Lv Names*. Close the dialog box.

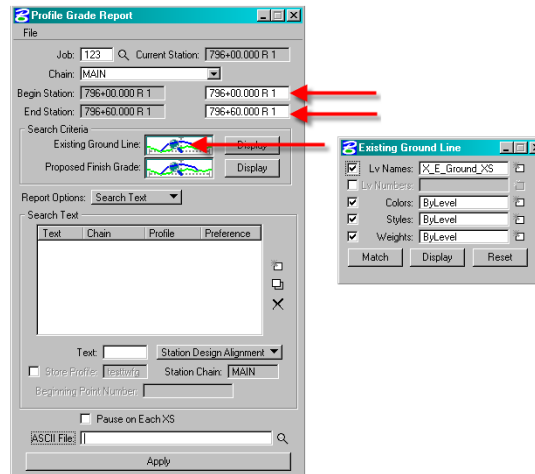


Figure 1-3: Profile Grade Report

6. Under *Search Criteria*, click on the button next to *Proposed Finish Grade*. Add the *Lv Names* to the *Proposed Finish Grade* dialog. The *Proposed Finish Grade* must travel from catch point to catch point, and it must pass through the text points *TW* and *FBW* (See Figure 1-7 for text locations). The following levels must be specified for a MSE retaining wall: *X_P_Fillslope* and *X_P_MSE_Wall_Toeslope*. Close the dialog box.

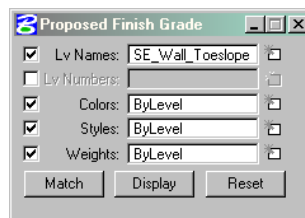


Figure 1-4: Proposed Finish Grade Dialog

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7. Pull down the Search Text menu and fill in the text dialog box as shown in the figure below. Select Station Text Alignment from the pull down menu. The Beginning Point Number should not be a point used in any other chain. Click on the Add tab to populate the search text field.

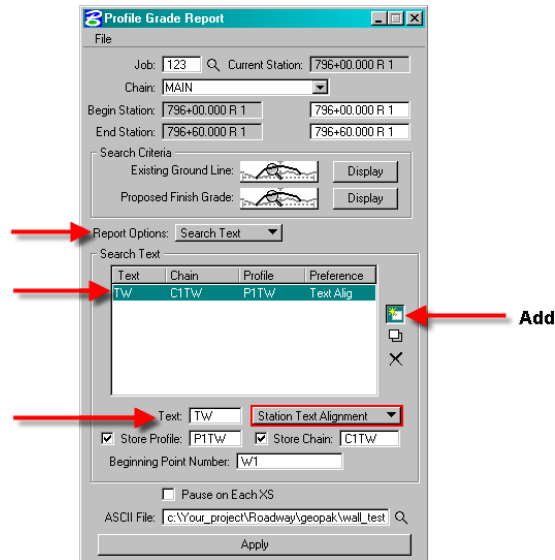


Figure 1-5: Add Profile & Chain at Top of MSE Wall (TW)

Note: For easy reference, wall Chain and Profile names can include a station

8. Add the search text for the front Bottom of Wall (FBW) as shown below. Click on the Add tab to add the text to the search text box. Click on the apply button to generate the chains and profiles based on the locations of the TW and FBW text as shown in Figure 1-7.

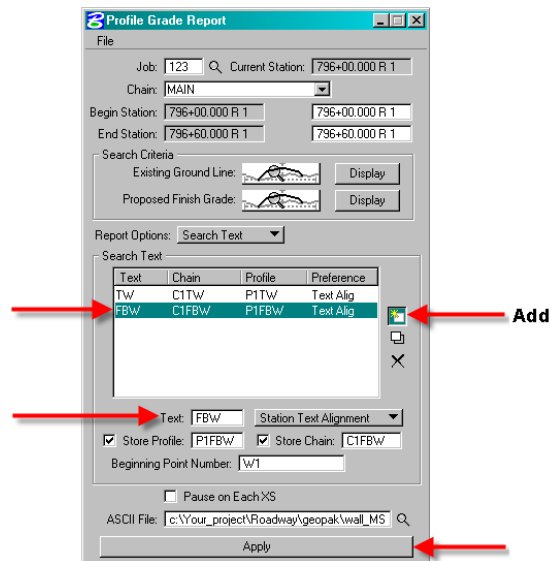


Figure 1-6: Add Profile & Chain at Bottom of MSE Wall (FBW)

Note: All chains will begin at station 0+00

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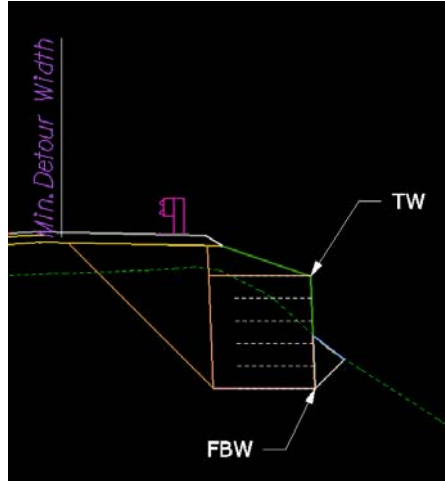


Figure 1-7: Search Text Locations

9. Create a new design file for the wall profiles (See CADD Standards Manual for naming conventions). Open the Draw Profile from the Geopak Road Tools dialog as shown in the figure below.

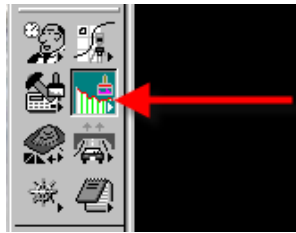


Figure 1-8: Geopak Tool Draw Profile

10. Select the top of wall chain (C1TW) in the Draw Profile Dialog box. Set the Label Scale to the final plan scale. Click on the dialog for Profile Cell Control as shown below.

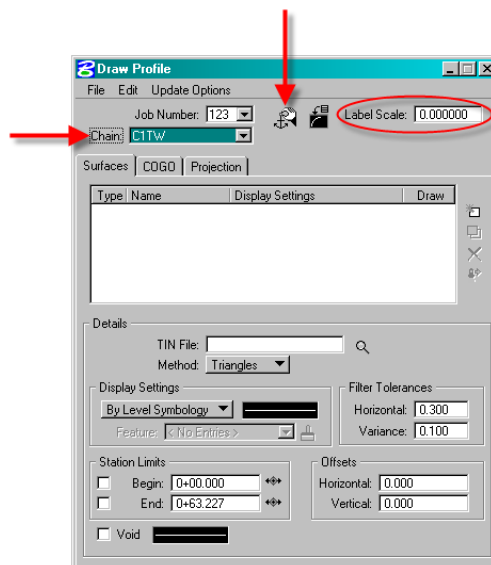


Figure 1-9: Draw Profile Dialog Box

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11. Select the Active chain. Click on the Place Profile Cell in the Profile Cell Control dialog box as shown below.

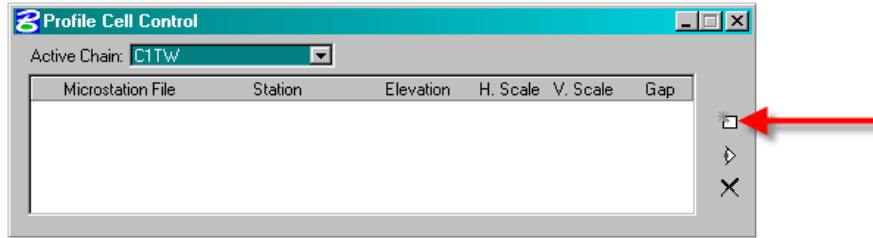


Figure 1-10: Profile Cell Control

12. Enter the beginning station, elevation (lower than proposed cross sections) and 1:1 scale as shown below. Then place the cursor in the View 1 and click to place the profile cell.

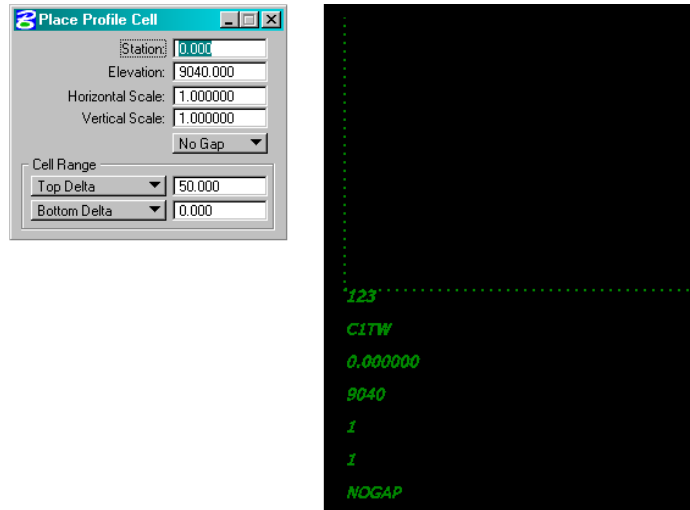


Figure 1-11: Place Profile Cell

13. The Profile Cell Control will appear with the Active Chain information as shown below. Close the Profile Cell Control box.

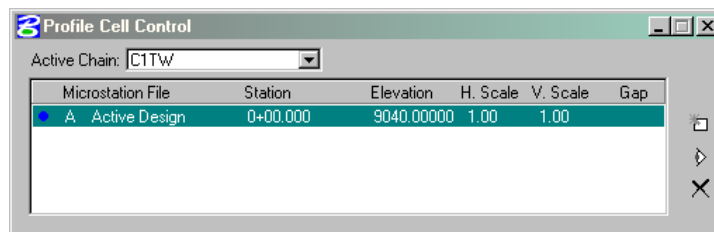


Figure 1-12: Active Profile Cell Information

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14. Click on the COGO tab in the Draw Profile box. Double click on the By Level Symbology field. Change the level symbology as shown below. Click OK.

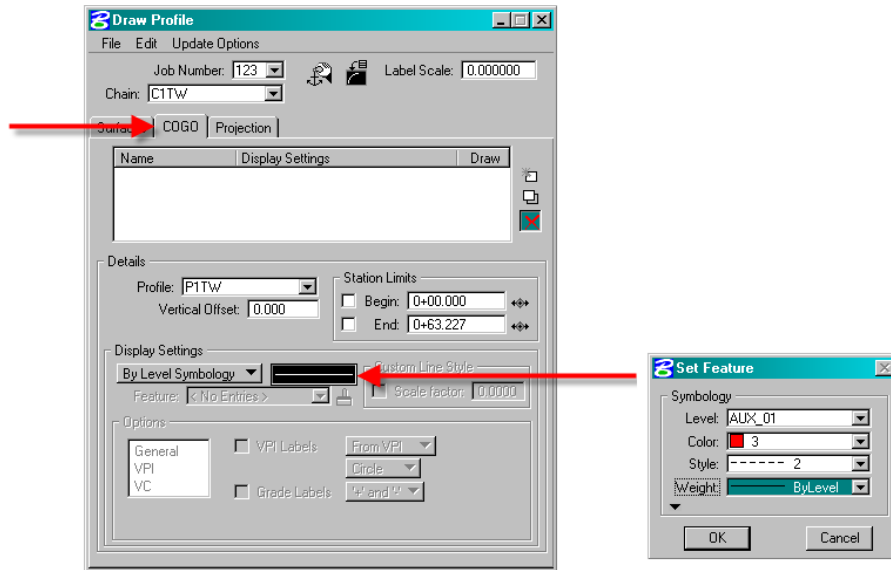


Figure 1-13: Draw Profile

15. Click on the Add COGO Profile Settings as shown in below. The top of MSE wall profile will display in the design file.

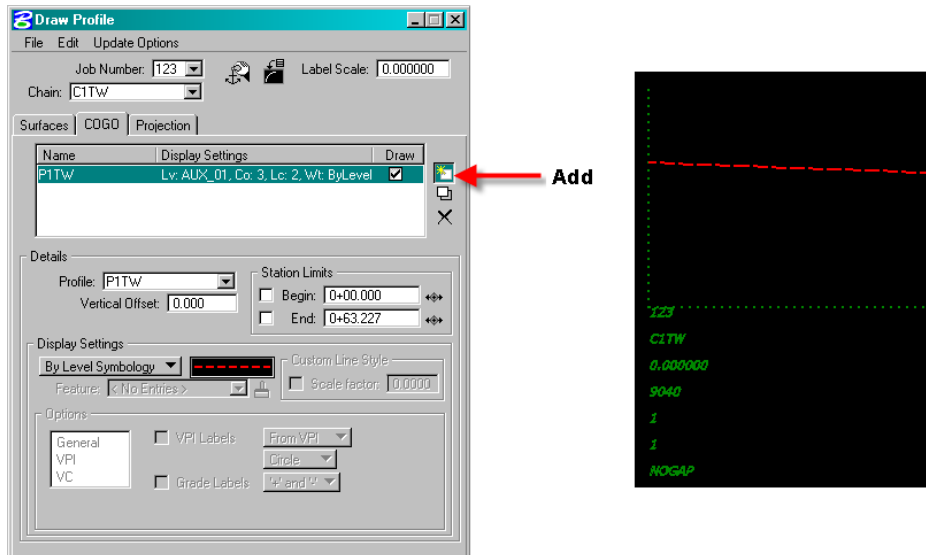


Figure 1-14: Draw Top of Wall Profile (P1TW)

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16. Click on the *Projection* tab in the *Draw Profile* dialog box. Select the chain and profile for the bottom of the MSE wall (FBW text). Double click on the *By Level Symbology* field and select the symbology as shown in below. Click on *OK*.

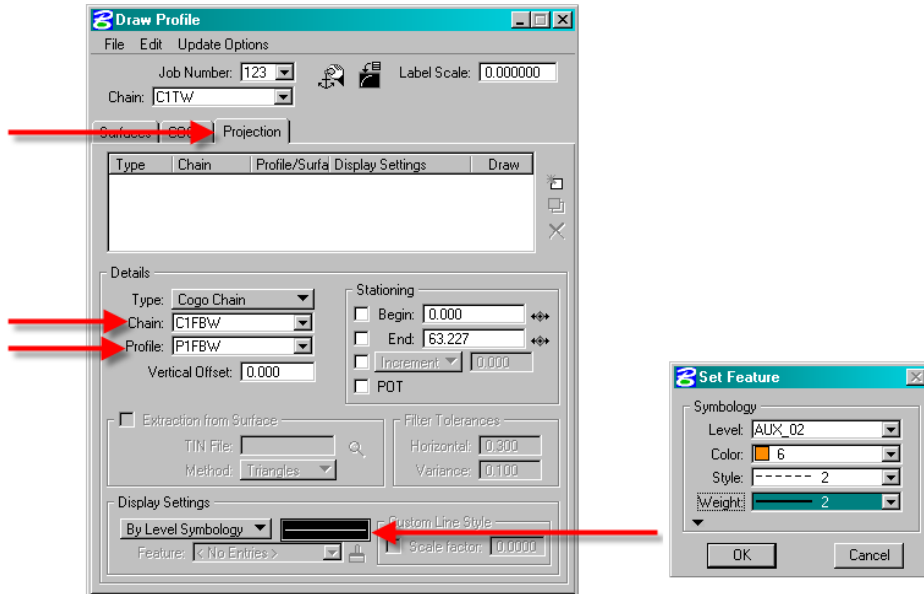


Figure 1-15: Project Profile for Bottom of MSE Wall (P1FBW)

17. Click on the *Add COGO Profile Settings* as shown below. The bottom of MSE wall profile will be displayed in the design file. Label the profiles as shown in the figure below.

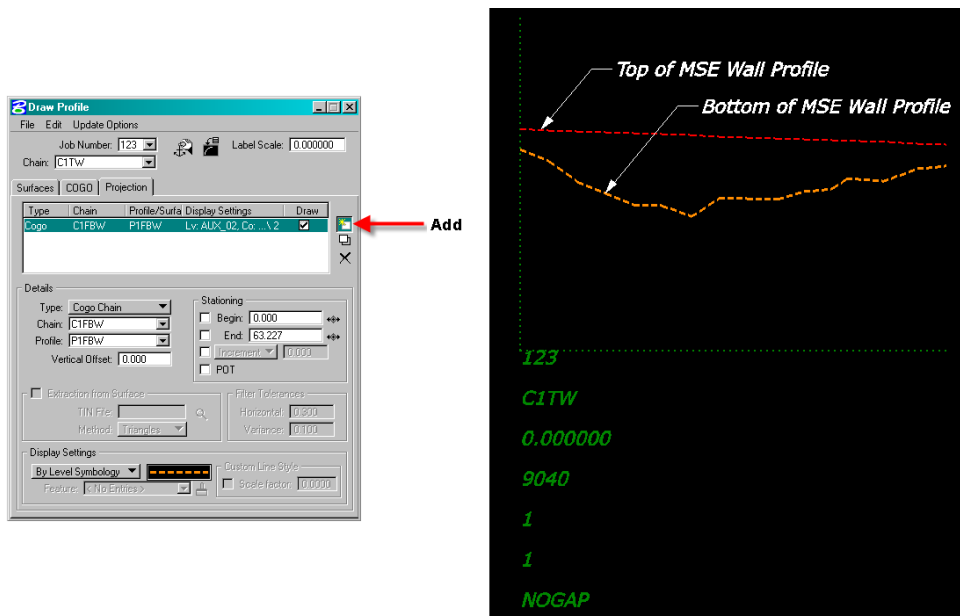
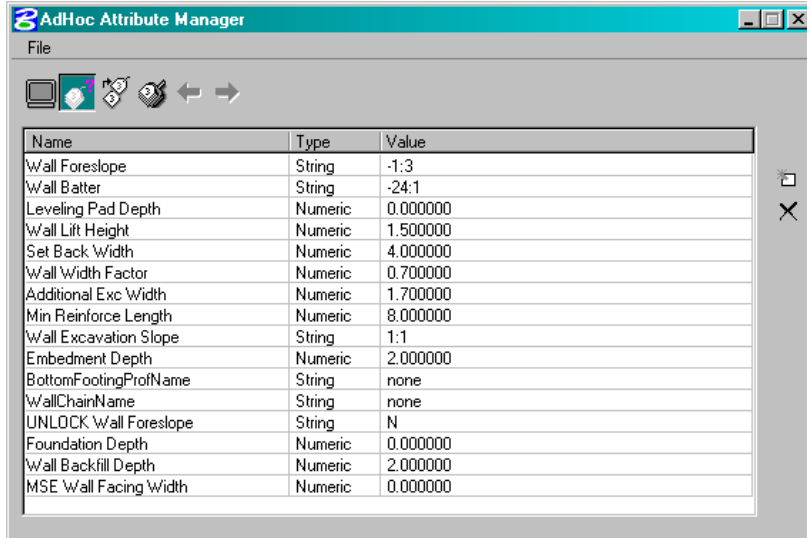


Figure 1-16: Draw Bottom of MSE Wall Profile

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18. Send the MSE wall profile and cross section dgn files to the Geotechnical Engineer *to assist in the determination of the site specific design criteria to use for the Phase 2 AdHoc attributes of the MSE wall. Include a print out of the AdHoc attributes used for the MSE wall as shown below.*



The screenshot shows a software window titled "AdHoc Attribute Manager". It contains a table with three columns: "Name", "Type", and "Value". The table lists various attributes for an MSE wall, such as "Wall Foreslope", "Wall Batter", "Leveling Pad Depth", etc. The values are either strings or numeric values.

Name	Type	Value
Wall Foreslope	String	-1:3
Wall Batter	String	-24:1
Leveling Pad Depth	Numeric	0.000000
Wall Lift Height	Numeric	1.500000
Set Back Width	Numeric	4.000000
Wall Width Factor	Numeric	0.700000
Additional Exc Width	Numeric	1.700000
Min Reinforce Length	Numeric	8.000000
Wall Excavation Slope	String	1:1
Embedment Depth	Numeric	2.000000
BottomFootingProfName	String	none
WallChainName	String	none
UNLOCK Wall Foreslope	String	N
Foundation Depth	Numeric	0.000000
Wall Backfill Depth	Numeric	2.000000
MSE Wall Facing Width	Numeric	0.000000

Figure 1-17: AdHoc Attributes for Phase 1 MSE Wall

Note: The default AdHoc Attributes must be modified for Phase 1 cross sections as shown above.

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Phase 2

1. The Geotechnical Engineer will provide project specific criteria *for the MSE wall*. These parameters, such as *Embedment Depth* and *Set Back Width* will vary depending upon the height of the MSE wall. Adjust the MSE wall Adhoc attributes to reflect the new design parameters. To change the AdHoc values, open the AdHoc Attribute Manager as shown below. Click on File then Preferences. The Set Mode should be set to Replace. Close the Preferences dialog box.

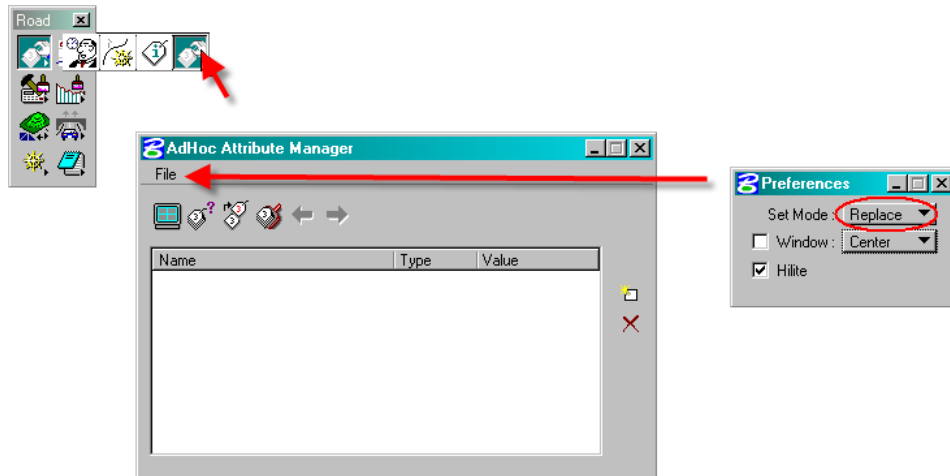


Figure 2-1: AdHoc Attribute Manager

2. Click on the Identify Element button as shown below. Double click on the plan view MSE wall line. The AdHoc Attributes of the line will then be displayed in the field.

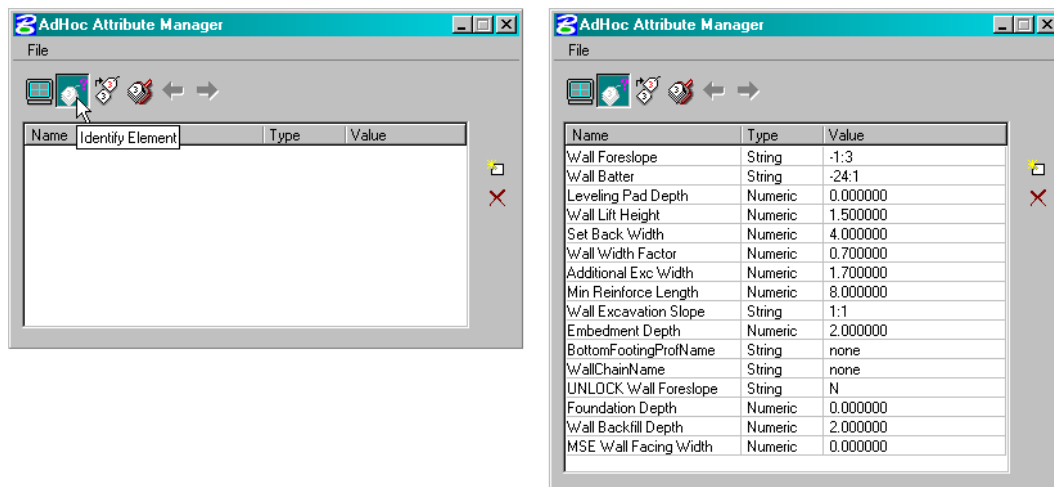


Figure 2-2: Identify Element

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- To change any of the values, click on the value and type in the desired change as shown below. Include all design parameters supplied by the Geotechnical Engineer.

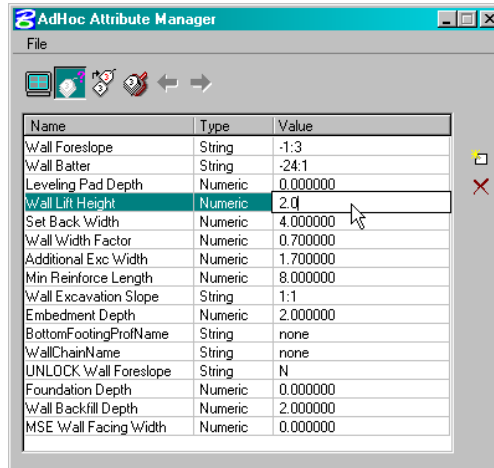


Figure 2-3: Adjust the AdHoc Values

- If the Design and Computation Manager is open, make sure that the 'Place Influence' and 'AdHoc Attributes' are toggled off as shown below.

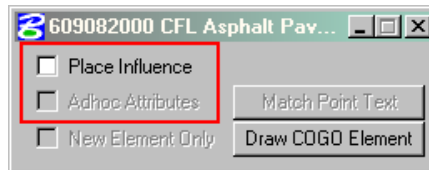


Figure 2-4: Toggle Place Influence Off

- Click on the Set Attributes button as shown below. Click on the MSE wall line to identify it, and click again to accept the changes. To check if the changes have been stored, use the Identify Element button as described above.

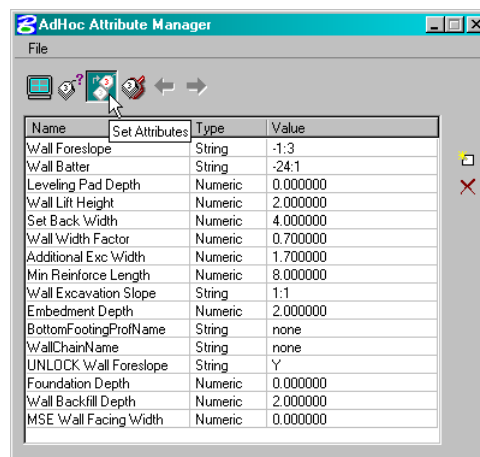


Figure 2-5: Change MSE Wall AdHoc Attributes

- Re-run the proposed cross sections *with the new AdHoc Attributes*. Repeat Phase 1 steps 4 through 16.

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7. Determine the locations of the MSE Wall cells. *Copy the C1TW profile line down by increments of the Wall lift Height as shown below (choose an unused level that can be turned off). Start at the lowest point of the wall, and center the first cell of the MSE wall as shown below. Copy parallel the vertical lines at 8' increments to cover the length of the wall. One or two MSE wall cells should be completely buried at the beginning and at the end of the wall (verify the wall start/stop conditions with the Geotechnical Engineer).*

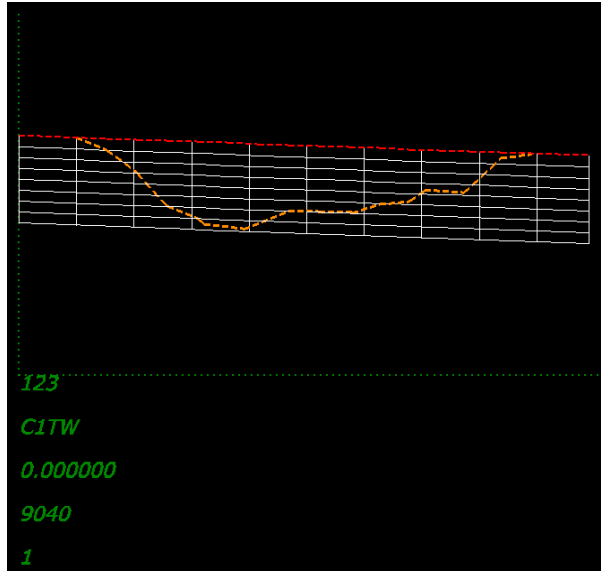


Figure 2-6: Place MSE Wall Cells (8'x Wall Lift Height)

8. *Edit the bottom of the wall cells so that unnecessary cells are eliminated. The bottom of the MSE wall profile should be completely enclosed within the wall cells as shown in the figure below. If the wall ends midway into a cell; consider extending the wall, shortening the wall or shifting the cells to split the difference.*

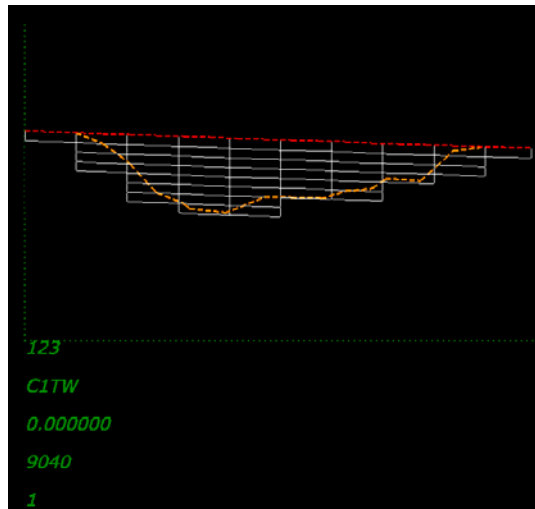


Figure 2-7: Eliminate Unnecessary Wall Cells

Note: For constructability, the bottom of the MSE wall should not be stepped in increments which create a vertical cut greater than 4 feet or as recommended by the Geotechnical Engineer.

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9. Store the new bottom of MSE wall profile. *Click on Vertical Alignment from the Road Project Manager dialog box as shown in the figure below.*

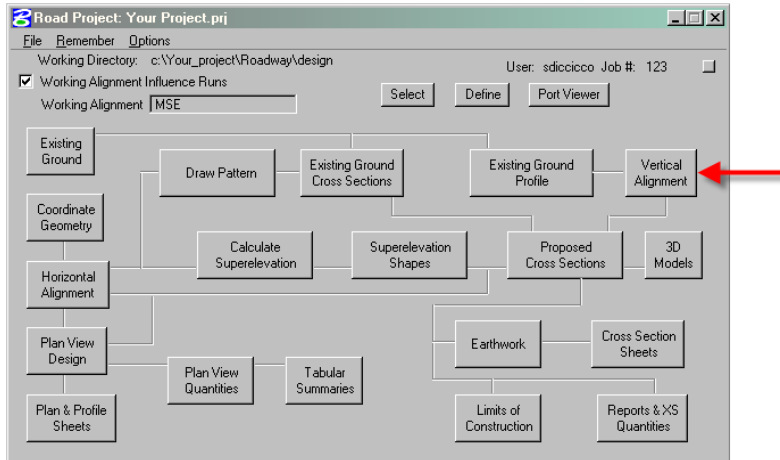


Figure 2-8: Vertical Alignment

10. From the Settings dialog box, select Identify Cell or select PGL Chain C1TW. Enter a Horizontal and Vertical Scale of 1. Click on the DP button and data point to the origin of the Profile Cell as shown below. Click on OK.

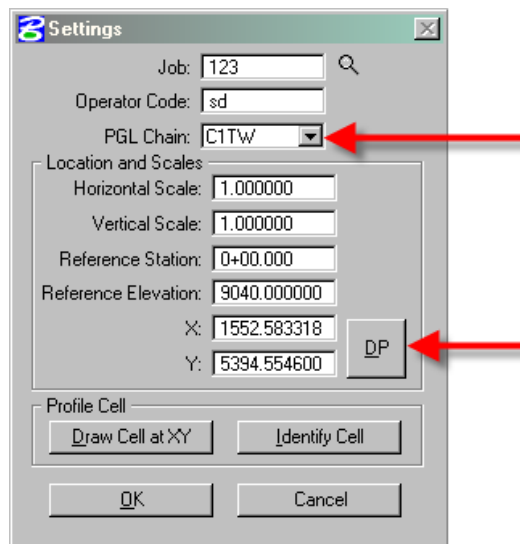


Figure 2-9: Vertical Alignment Settings Dialog

11. Click on the Dynamic button on the Profile Generator dialog box. Tentative Snap to the first VPI of the MSE wall footing and accept it. See the figure below. Click on the Insert button

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and then the Dynamic button. Tentative Snap to the second VPI and accept it. Continue the process until the entire profile has been input.

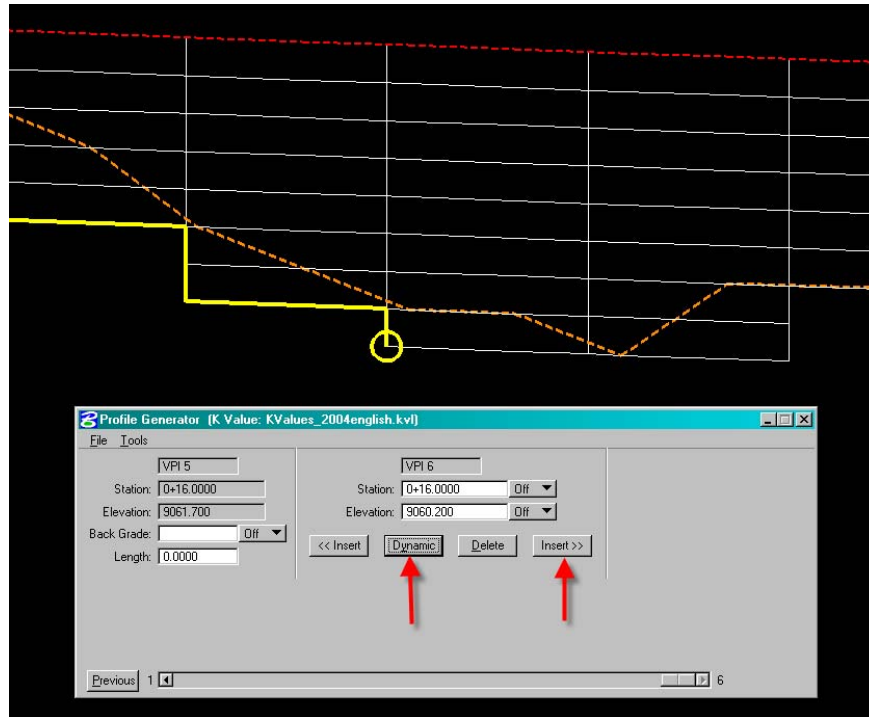


Figure 2-10: Generate Phase 2 Profile for Bottom of MSE Wall Footing Using Profile Generator

12. Click on File and select Save Profile As. Save the Profile as P1BFFP (Profile 1 Bottom of Footing Final Profile) as shown below. Click on OK.

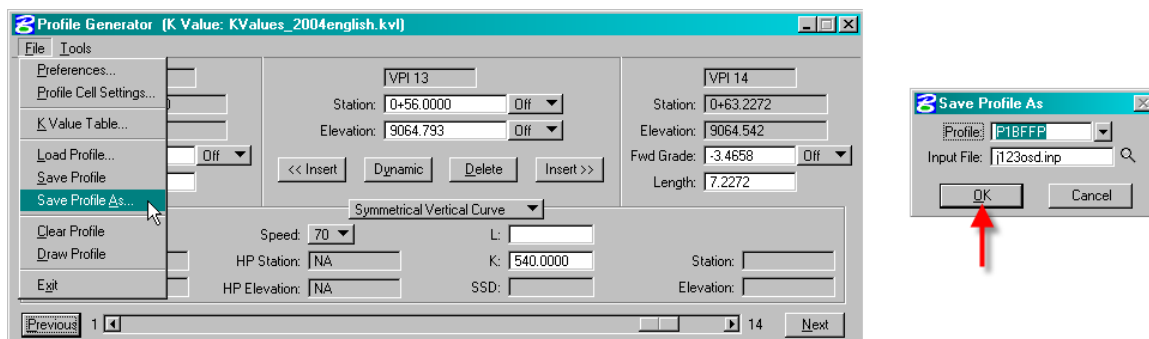


Figure 2-11: Save Phase 2 Profile for Bottom of MSE Wall Footing

13. Open the proposed plan dgn file containing the MSE wall AdHoc line. Use the AdHoc Attribute Manager, as previously described, to change the AdHoc attributes for each section

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of the MSE wall to include the bottom of wall footing profile and the top of wall chain as shown in the figure below. Adjust the limits of the MSE wall line to match the profile.

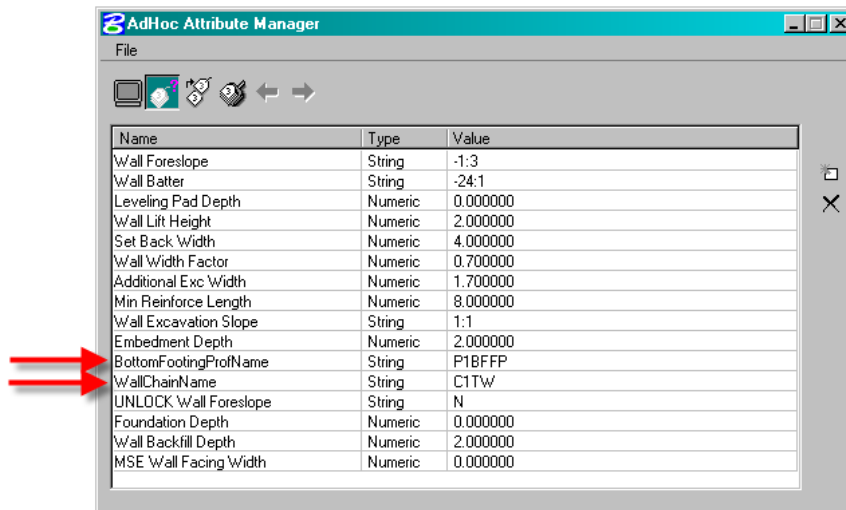


Figure 2-12: Change Phase 2 MSE Wall AdHoc Attributes

14. Re-run the proposed cross sections. *Check the cross sections to make sure that the design parameters have been achieved. It is helpful to keep the last iteration of cross sections to track where changes have occurred. Additional iterations of phase 2 procedures may be required.*
15. Send the final cross section, plan view and profile dgn files to the Geotechnical Engineer *for review. Include a print out of the AdHoc attributes for each MSE wall section. Additional iterations of phase 2 procedures may be required.*

Note: During the preparation of the final MSE plan sheets, the subgrade hinge point and temporary shoring limits may need to be shown. To generate a profile at these locations, place an original search text at the subgrade hinge point and another unique search text at the top of the temporary shoring. Use the Profile Grade tool as described in this workflow to store these additional profiles.