

Overview: Use a ground surface to create profile data for design of livestock pipeline mains and laterals. Create plan view & profile views for details of the planned pipeline. Labeling tools can be used to identify key features and elevations of the system.

Software: AutoCAD Civil 3D 2020, Civil 3D Workspace, IA NRCS C3D 2020 template

Notation: <input type="button" value="Button to Press"/> <i>Displayed Text</i> Icon <u>Action</u> {Text to Enter} <u>Menu Item</u> ...
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Workflow


- Create Ground surface & place aerial images. Include surveyed important locations.
- Create alignment for Main. Use 0+00 as the pressure tank or pond location.
- Create alignments for Laterals. Use stationing along Main as the starting station for the laterals.
- Create profile views containing the ground profile of the mains and laterals. Overlay profile views using identical Stationing & Elevation extents.
- In profile view create profile lines that identify key features and critical elevations. These will be used with the Livestock Pipeline design spreadsheet.
- Export Station/Elevation data from profile views.
- Import Station/Elevation data into Pipeline spreadsheet and design the system.
- Label key features of the pipeline installation in plan and profile.
- Turn off preliminary design profile lines.

Create Ground Surface, Surveyed Points, and Aerial Images

Follow the instructions for *Original Ground Contours* or *LiDAR Data Use in CAD*, and *Importing Survey Coordinate Point Files*, etc.

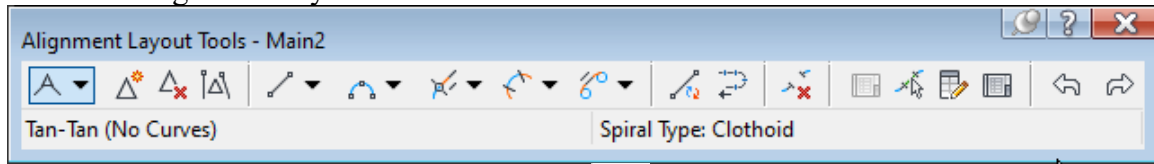
Create Alignments

Create an alignment of the main pipeline. Create separate alignments for the existing main and the new main. Use 0 as the water source stationing.

- Click *Home... Create Design... Alignment... Alignment Creation Tools* 
- Enter the *Name* to E.g. {EX Main 1} for an existing segment or {Main 1} for new. Create the existing pipeline alignment first. Suggested naming convention for multiple mains: Number each main (e.g. *Main 1*). Then the 2nd lateral on Main 1 would be *Lateral 1-2*.
- For the alignment that connects directly to the water source input a starting station of 0. If the new main connects to an existing main, the new main should have a starting station value of where it connects to the existing main. E.g. 50,
- On the *General Tab*, set *Site* to *None*, and *Alignment label* set to *Major (Perp) Minor Geometry (100 and 50)*.
For the existing main: set *Alignment style* to *Water Pipeline Existing (IA)*,
For the new main: set *Alignment style* to *Water Pipeline New (IA)*,
- Click

Livestock Pipeline Profiles

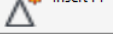

- From the Alignment Layout Tools toolbar

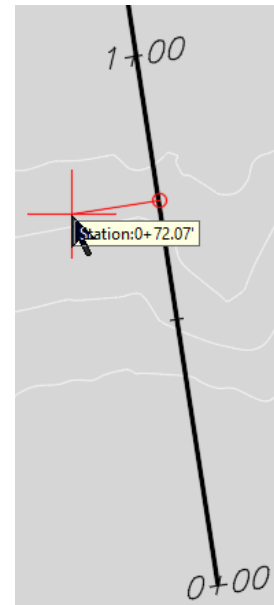


Click *Draw Tangent-Tangent without Curve* 


- Click the starting location of the pipeline and sketch the entire alignment.
 - When done press Enter.
- Repeat from step 1 for the new main.

Add PIs to the Main pipeline alignment at locations where the laterals connect.


- Click *Insert PI*  to begin to place locations along main where a lateral will connect.
- From the *Transparent... Plan...* ribbon tab or from the Transparent Commands toolbar select Station Offset  (or type 'SO Enter).
- Click on the alignment for the Main.
- With the command line showing *Specify Station*, Move your cursor along the main and pay attention to the tooltip that shows the stationing. Then type the station that you would like the lateral to connect at. Considering using 5' increments. E.g. {75} Enter.
- With the command line showing *Specify offset* type 0 Enter.
- Continue entering the station and 0 offset for the rest of the connection points for the laterals.
- When done press ESC twice.
The new PI station labels will appear.
- Close the Alignment Layout Tools toolbar




Reversing the direction of an existing Alignment (optional)

- Select the alignment.
- From the activated Alignment ribbon use *Modify*  *Reverse Direction*. Click **OK**

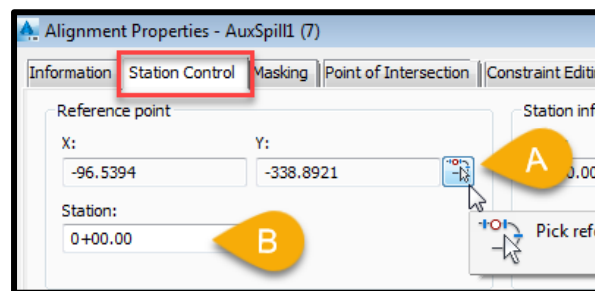
Create the alignments for the laterals

- Click *Home... Create Design... Alignment... Alignment Creation Tools* 
- Input the Name - E.g. {Lateral 1-1}.
- For the starting station input the station along the Main where this lateral is connecting. E.g. 75
- On the General Tab, set Site to None, *Alignment style* to *Water Pipeline New (IA)*, and *Alignment label set* to *Major (Perp) Minor Geometry (100 and 50)*.
- Click **OK**

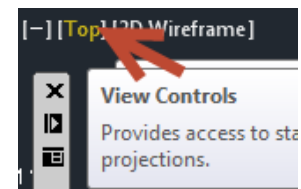
24. From the Alignment Layout Tools toolbar click *Draw Tangent-Tangent without Curve* 
25. Osnap the starting location of the lateral to the PI of the main and sketch the lateral alignment.
26. When done press Enter.
27. Verify that the starting label of the lateral matches the PI value of the main.
Repeat from step 19 for the remaining laterals.
28. When done close the Alignment Layout Tools toolbar.

Change the Beginning Stationing of an Alignment (optional)

29. Select the alignment
30. Right-Click *Alignment Properties...*
31. *Station Control* Tab
32. Click **Pick reference point** (See A),
Click OK at the warning message,
and snap to a location in the drawing.
33. Set the station value of the reference point. E.g {1000} (See B)
34. Click OK. Click OK at the warning message. Click OK



35. Zoom to a full view of the alignment that you just created.
36. Click the *View Controls... View Manager... New...*
37. Inter a View Name. E.g {Plan View}
38. On the View Properties tab Uncheck *Save layer snapshot with view*.
39. Click OK. Click OK.



Create Profile Views

Extract profiles from the ground surface and place it into a profile view

40. Decide on the horizontal scale that you want for the Profile Views based on the maximum and minimum elevation of the main and laterals, and the smallest and largest stationing. Set the drawing annotation Scale.



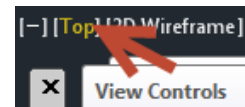
Horizontal scale vs Profile length that fits a viewport for NRCS 11x17 template.
 (1"=5') 70'; (1"=10') 140'; (1"=20') 280'; (1"=30') 420'; (1"=40') 560'; (1"=50') 700';
 (1"=100') 1400'; (1"=200') 2800'; (1"=400') 5600'.

41. Click *Home... Create Design... Profile... Create Surface Profile ...*
42. Pull down the alignment to *Main 1*.
43. Select the ground surface to be profiled. E.g. Ognd or Ognd LiDAR

44. Click to make the profile info appear in the lower Profile list
45. In the Profile list pulldown the style to match the type of surface E.g. *Original Ground*
46. Click
47. Set the Profile View style to the Horizontal/Vertical scaling desired. E.g. (A100Hx10V) Click
This will be used for the remainder of the Laterals as well.
48. Select User Specified Range and input values for starting and stopping.
Important: Take into account the maximum stationing values including laterals. These will be used for the remainder of the Laterals as well. Click
49. Select User Specified view height and input values for grid elevations.
Important: Take into account the minimum and maximum elevations including laterals. These will be used for the remainder of the Laterals as well. Click
50. Click
51. Click a location in the drawing for the profile view to appear.

Create a Named View in order to find this Profile View easily later

52. Zoom to a full view of the profile view that you just created.
53. Click the View Controls... *View Manager... New...*
54. Input a View Name. E.g. {Main 1 Profile}
55. On the View Properties tab Uncheckmark *Save layer snapshot with view.*
56. Click Click .



Create Profile views along the laterals and existing main (if present).

57. Click *Home... Create Design... Profile... Create Surface Profile ...*
58. Pulldown the alignment to *Lateral 1-1*.
59. Select the ground surface to be profiled. E.g. Ognd or Ognd LiDAR
60. Click to make the profile info appear in the lower Profile list
61. In the Profile list pulldown the style to one that is different from each of the others that have been used E.g. *Core Trench, Bank – Right, Bank – Left, Stream Channel Cleanout, Borrow, Stripping, etc*
62. Click
63. Set the Profile View style to the Horizontal/Vertical scaling that was used for the main. E.g. (A100Hx10V) Click
64. Select User Specified Range and input values for starting and stopping that were used for the main. Click
65. Select User Specified view height and input values for grid elevations that were used for the main. Click
66. Click
67. Click a location in the drawing near the Main profile view for the lateral profile view to appear.

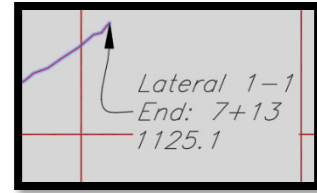
Repeat from step 57 for each of the laterals along this main.

Label start and ending stations & **name** of main and laterals (Option 1)
(Requires the new Iowa template: *IowaNRCSc3d2020rev2.0 (11x17).dwt.*)

68. In the Profile Grid View, select the profile line of the main.

69. Right click, click *Edit labels*.

70. In the Profile labels screen set the *Type* to *Horizontal Geometry Points*, *Profile Horizontal Geometry Point* to *Start and End Station (0) and Elevation (1)* and click **Add>>**



71. In the Geometry Point screen uncheck all except for *Alignment Beginning* and *Alignment End*. Click OK.

72. Click OK.

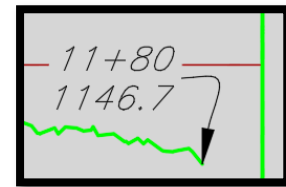
Repeat from step 68 for each of the laterals along this main.

Label start and ending stations of main and laterals (Option 2)

73. In the Profile Grid View, Select the profile line of the main.

74. Right Click, click *Edit labels*.

75. In the Profile labels screen set the *Type* to *Major Stations*, *Profile Major Station Label Style* to *Station and Elevation (Perp 1 Decimal)* and click **Add>>**



76. Set the increment to a number larger than the length of the profile so that only the start and end are labeled. E.g. *20000*

77. Click OK.

Repeat from step 73 for each of the laterals along this main.

Optional: Profile View Adjustments

Modifying Profile views: Adjusting the scale or the station and elevation range.

Do this to make sure all the profile views have the same scale, stations, and elevations.

78. Select the Profile View grid. Right-click... click *Profile View Properties*

Changing the Scale of the view:

79. On the *Information* tab, Pulldown the *Object Style* to the desired scaling (E.g. A100Hx2V). The text will be sized correctly once you set the drawing scale (or viewport scale) to match the horizontal scale of the profile view. (E.g. 1"=100')

80. On the *Stations* tab, select *User specified range* and input the start & end stations.

81. On the *Elevations* tab, select *User specified height* and input the minimum & maximum elevations.


82. When done click **Ok**.

Note: If you added plain AutoCAD labels or objects to a Profile View, the location of those items will NOT be correctly adjusted if you change the scaling of the view.

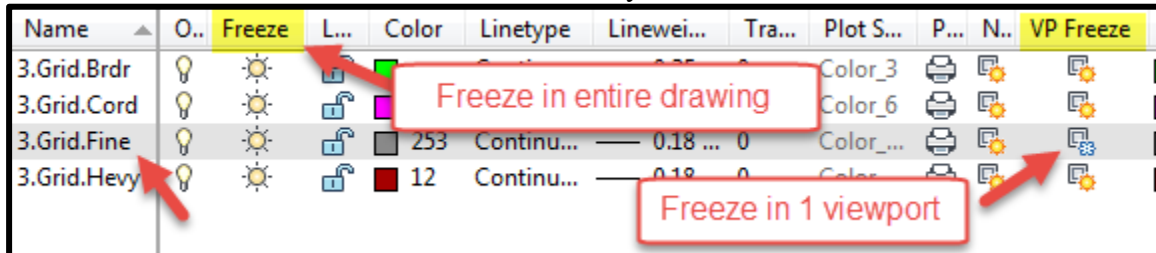
Controlling the Display of Gridlines – Optional, but recommended for a cleaner drawing. Fine Gridlines are controlled by the Layer 3.Grid.Fine. This needs to be done through the Layer manager.

To Freeze the display of fine grids in one viewport only.

83. Switch into the Modelspace of the viewport.

84. Home... Layers.. Layer Properties Manager 

85. Use the *Grid* filter or find the **3.Grid.Fine** layer and use the *VP Freeze* column



Align the Lateral profile views to overlay the main

86. Verify that the station & elevation grids of the laterals match the main profile view.

If not, see 78 – 82 for instructions on adjusting profile views.

87. Select the lateral profile view.

88. Use Osnap to move the lateral Profile View so that it aligns with the main.


Repeat from step 86 for each of the laterals along this main.

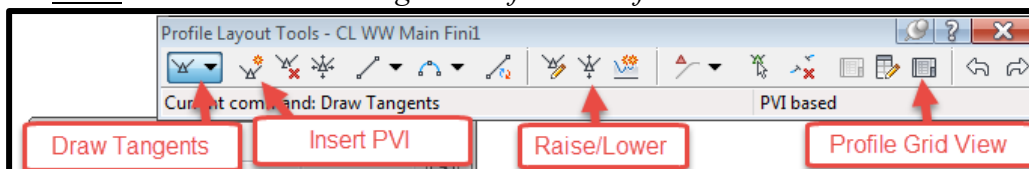
Note: When Profile Views are overlaid, adding or editing the labeling described earlier may not update as expected. Moving a profile view to a blank location, then adding labels, and moving the profile view back in line will resolve the problem.

Create Profile Lines of Pipeline Key Features and Critical Elevations in Profile Views

In the profile view create a profile of the key elevations along the main needed for the hydraulic design, **Note:** These profiles will be turned off in the final drawings.

Note: A maximum of 19 key locations for the main can be handled in the Iowa Livestock Pipeline spreadsheet.

89. Click Home... Create Design... Profile... Profile Creation Tools 




90. Select the Profile View of *Main 1*. A Profile View is the grid holding the profiles.

Note: It doesn't matter which of the overlapping profile views that this profile is placed into.



Alignment = *Main 1* (or other)

Livestock Pipeline Profiles

91. Input Name = {*Main 1 KeyPts*}
92. General: Profile Style = *Finished Ground* & Profile label set = <none>
93. Click OK
94. From the Profile Layout Tools click Draw Tangents 
95. Click the starting point, important design elevations, components to be installed (tanks, hydrants, etc), and ending point of the Main profile from left to right. Use Shift + Right-Click to use Endpoint or other Osnaps.
Important: Be sure to snap to the junctions of the laterals.
96. Press Enter when done creating the profile of key elevations along the main.
Note: Editing tools from the Profile Layout Tools toolbar can be used to modify the profile.
97. Click X to close out of the Profile Layout Tools toolbar



Create a profile of the key elevations along the laterals

Note: A maximum of 7 key locations for each lateral can be entered in the Iowa Livestock Pipeline spreadsheet.

98. Click Home... Create Design... Profile... Profile Creation Tools 
 99. Select the Profile View of *Main 1*. Note: It doesn't matter which of the overlapping profile views that this profile is placed into.
Alignment = *Main 1* (or other)
 100. Input Name = {*Lateral 1-1 KeyPts*}
 101. General: Profile Style = *Finished Ground* & Profile label set = <none>
 102. Click OK
 103. From the Profile Layout Tools click Draw Tangents 
 104. Click the starting point, important design elevations, components to be installed, and ending point of the Lateral profile from left to right. Use Shift + Right-Click to use Endpoint or other Osnaps.
 105. Press Enter when done creating the profile of key elevations along the lateral.
 106. Click X to close out of the Profile Layout Tools toolbar
- Repeat from step 98 for all of the laterals.

Export Station/Elevation Data from Profile Views

Export key Station/Elevation Data from newly drawn profiles

107. Toolspace... Toolbox...Reports Manager... Profile...
Double Click Profiles_in_CSV...
108. In the Export to XML Report click Uncheck All 
109. Click Collapse All 
110. Expand Alignments...
111. Checkmark all of the newly drawn profiles. Eg. *Main 1 KeyPts, Lateral 1-1 KeyPts, Lateral 1-2 KeyPts*
112. Click OK
A file named CivilReport.csv will be saved in a tmp folder and will open up in Excel.

Livestock Pipeline Profiles

113. Delete blanks rows or use Excel sorting on the individual sections of the profiles so there are not spaces within the station/elevation listing for that section.
114. Save the csv file with a site specific name into your drawing folder.


Import Station/Elevation Data into Spreadsheet & Design the Pipeline

Open Iowa Livestock Pipeline spreadsheet and import profile data

115. Browse to *P:\Design Tools\Spreadsheets* and open *IA_LivestockPipeline.xlsm*
116. From the csv file copy the Station and Elevation entries for the main and paste it into the spreadsheet. The beginning station for the main can be skipped since the elevation is entered in the section for the Pressure Tank Data.
117. Repeat for each lateral. The station/elevation of the main to lateral junction can be skipped. Column A in the main is used to mark the row for the junction of each lateral.
118. Design the pipeline.

Label Key Features of the Pipeline Installation in Plan and Profile

Label the components along the pipeline profile using Profile View labels (tanks, hydrants, valves) [These labels are not live linked to any profile line]

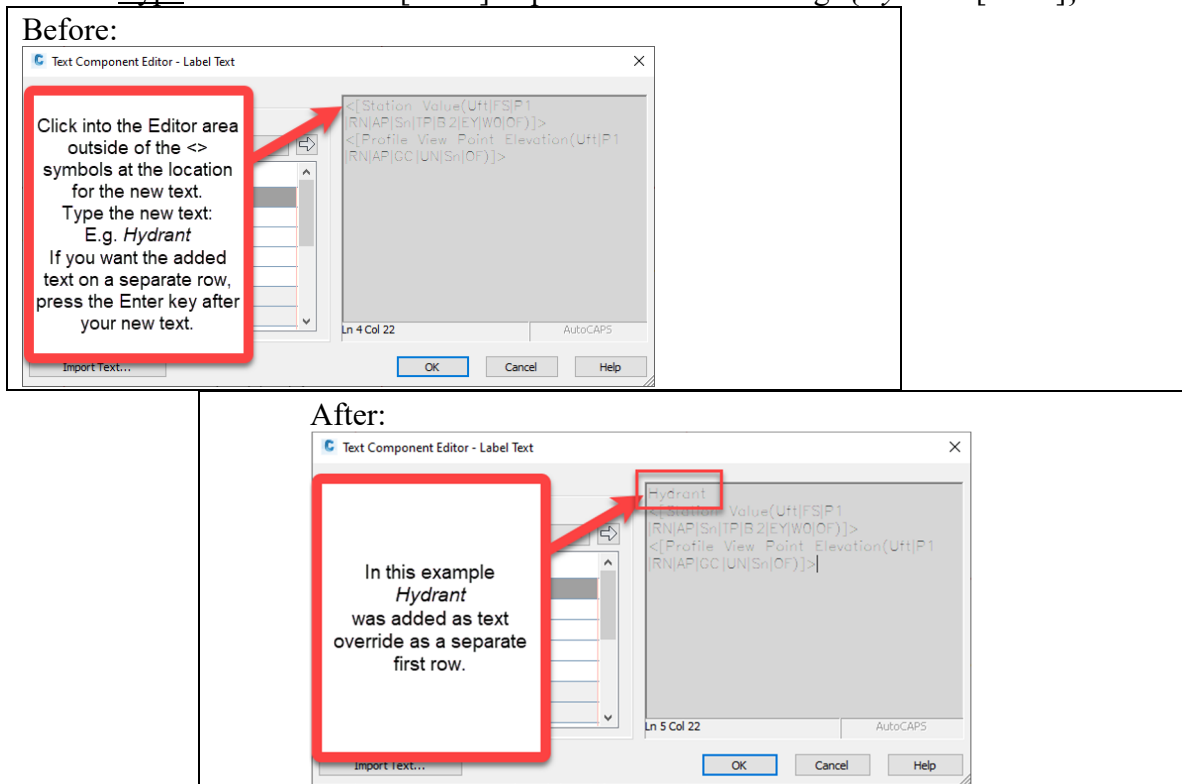
119. Click *Annotate... Labels & Tables... Add Labels* ...
120. In the *Add Labels* dialog box: set
Feature = Profile View,
Label Type = Station Elevation,
Station Elevation label style = Sta Elev (Vertical Above),
Marker Style = <None>
121. Click **Add**
122. Click the Profile View.
123. Click the station to be labeled. Or input the value and press Enter
124. Click the elevation to be labeled. Or input the value and press Enter
125. When done Press Enter. Click **Close**.


Add custom text to an individual Station/Elevation label.

Note: If you switch to a different Label Style after editing the text, the text override will be **removed**.

126. Select a label in the Profile View.
127. Right-click then click *Edit Label Text*.
128. In the Text Component Editor click into the location of the editor where you want to add text or edit or remove components for this label.

129. Type the text and use [Enter] to provide a line feed. E.g. {*Hydrant* [Enter]}



130. Click **OK** to apply it. A Warning symbol  will show up in the drawing where a text override has been applied. This symbol will not plot.

Label the location of key components in plan view (start of laterals, tanks, etc)

131. In the plan view Select the main or lateral to have components labeled

132. In the context sensitive ribbon click *Labels & Tables... Add Labels... Station/Offset...*

133. Move your cursor and click to set the station. Or input the station value and press Enter.

134. Type 0 for the Offset value. Press Enter

135. Press ESC

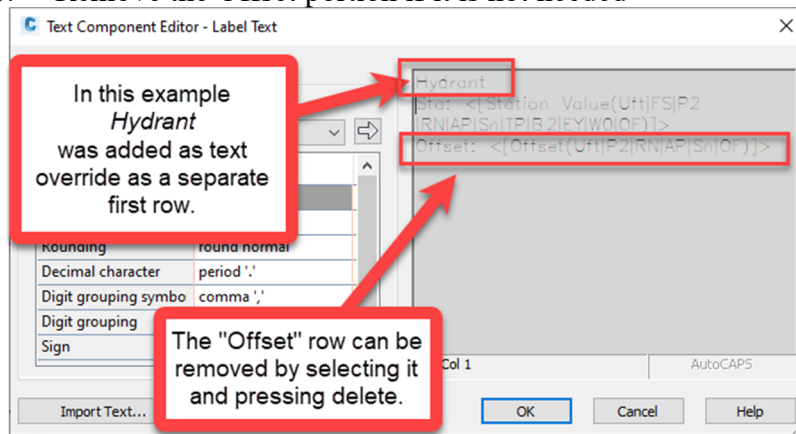
136. Select the label.


137. Right click and click *Edit Label Text*

138. In the Text Component Editor click into the location of the editor where you want to add text or edit or remove components for this label.

139. Type the text and use [Enter] to provide a line feed. E.g. {*Hydrant* [Enter]}

140. Remove the Offset portion if it is not needed



141. Click **OK** to apply it. A Warning symbol  will show up in the drawing where a text override has been applied. This symbol will not plot.

142. If the marker (plus sign) is not needed at the point, select the label. Right-click then click *Properties*. Set the *Marker style* = <none>.

Note: Add additional labels. Or make copies of a label along the **same** alignment using *Modify... Copy* and the *Plan: Station Offset* transparent command.

Repeat from step 131 for other alignments.

Turn Off Display of Preliminary Design Profile Lines

The *Finished Ground* profile style is controlled by the Layer *C.Prof.Fini*.

143. Click *Home... Layers.. Layer Properties Manager* 

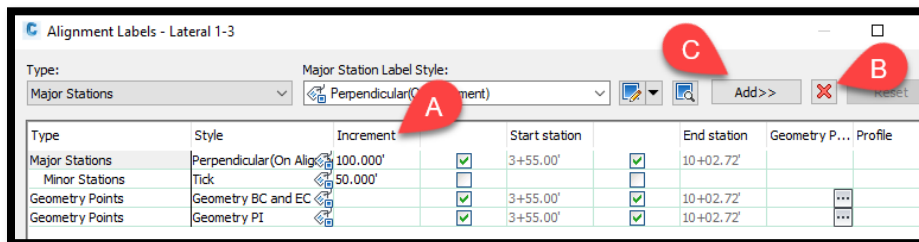
144. Freeze or VP Freeze the *C.Prof.Fini* layer.

Edit Alignment Label Types Being Displayed

Optional: Turn off PI labels or adjust stationing labels increments.

145. In the plan view Select the main or lateral

146. Right Click... Click *Edit Alignment Labels...*



147. In the Alignment Labels dialog box you can
- A) Change the increment of Major & Minor stationing
 - B) Select a row with a label type and delete those labels
 - C) Set a label Type & Style and Add it to the labels.

148. When done with changes click **OK**.