Coordinate Geometry

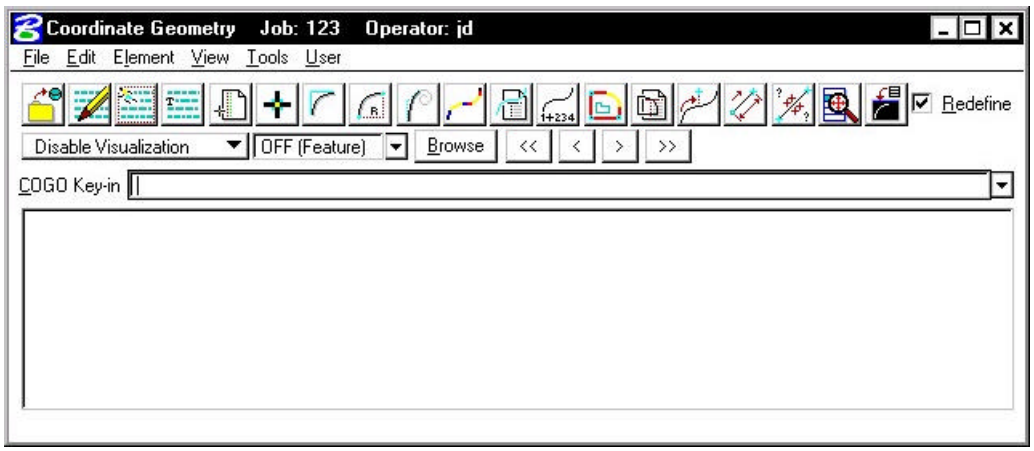
2.1 Basic Alignments

Step 1. Open the MicroStation file **c:\data\geo\vdot\s1373\s1373.dgn**.

Important: Before beginning, attach saved view ALIGN.

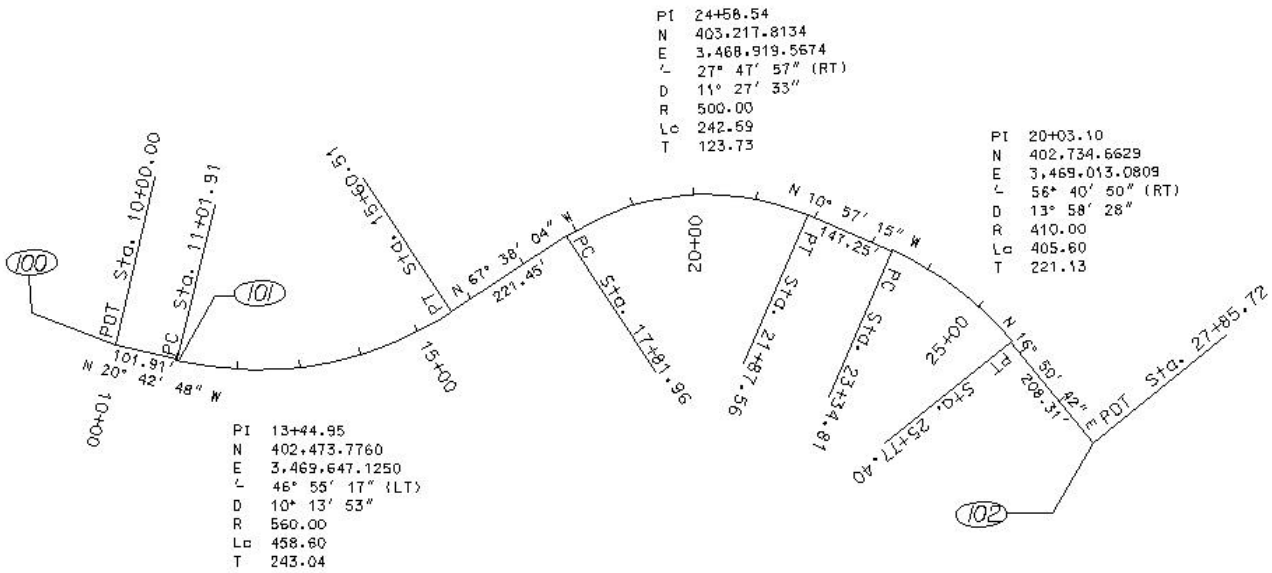
Step 2. Select the **Coordinate Geometry** icon.

Step 3. The Coordinate Geometry (**COGO**) dialog appears.



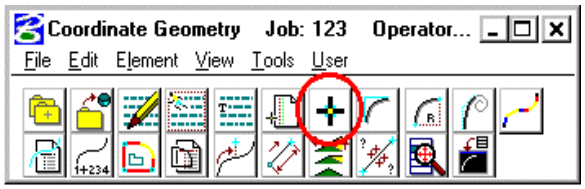
This dialog is completely resizable, so you can position it where you're most comfortable.

In the next few steps, we'll use Coordinate Geometry to store the following alignment:

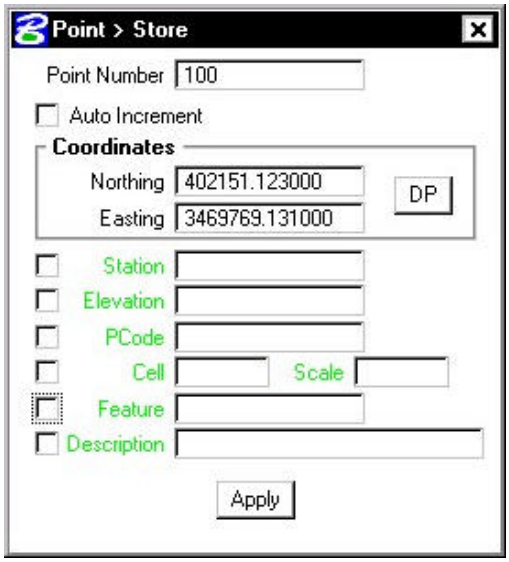


Step 4. Turn on the PERMANENT Visualization on the main COGO dialog.

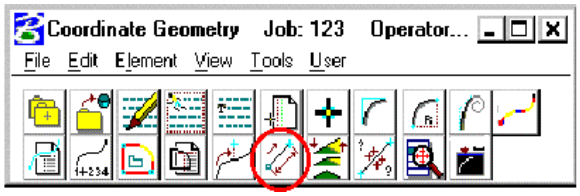
Step 5. Select the Store Point icon as depicted below.



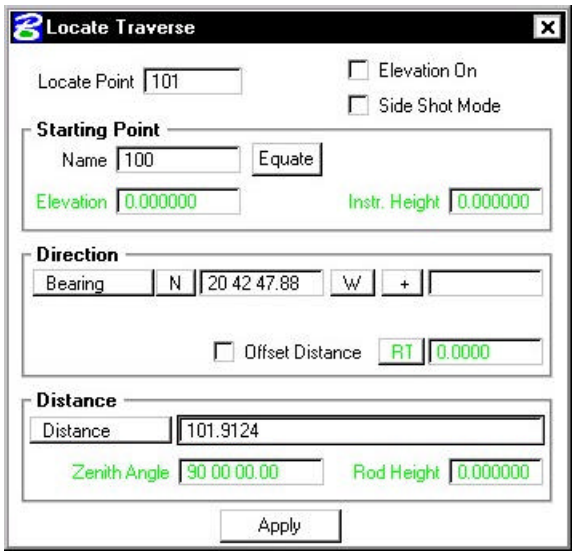
Store Point 100 with the coordinates shown.



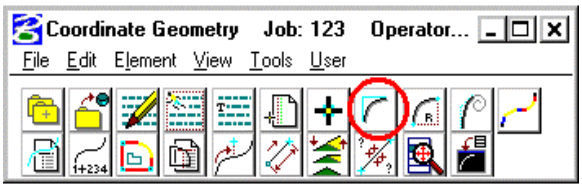
Step 6. Select the Locate Traverse icon as depicted below.



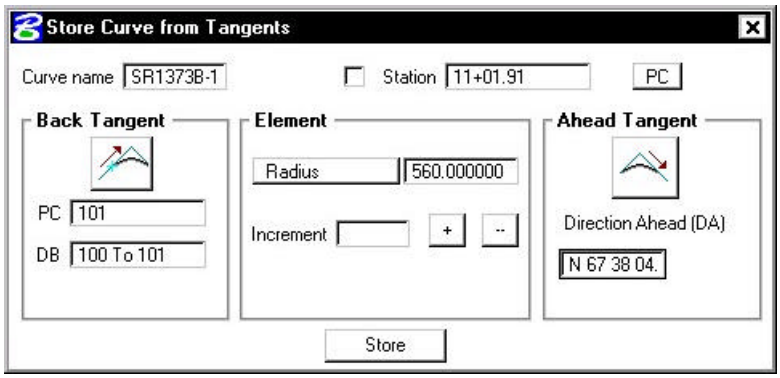
Locate point 101 as shown.



Step 7. Select the Store Curve from Tangents icon as depicted below.



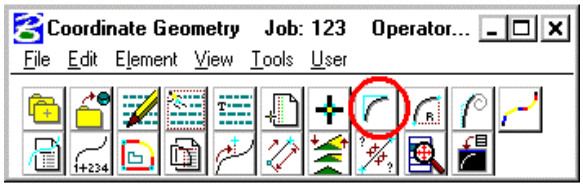
Store the curve SR1373B-1 as shown.



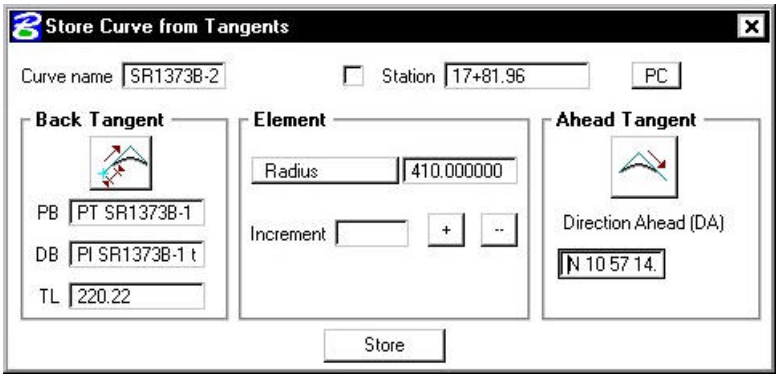
Fill in the **PC** field and **DB** field by selecting the Visualized points.

Note: The Direction Ahead (DA) is N 67 38 04.38 W.

Step 8. Select the Store Curve from Tangents icon as depicted below.



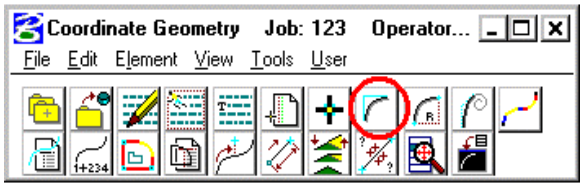
Store the curve SR1373B-2 as shown.



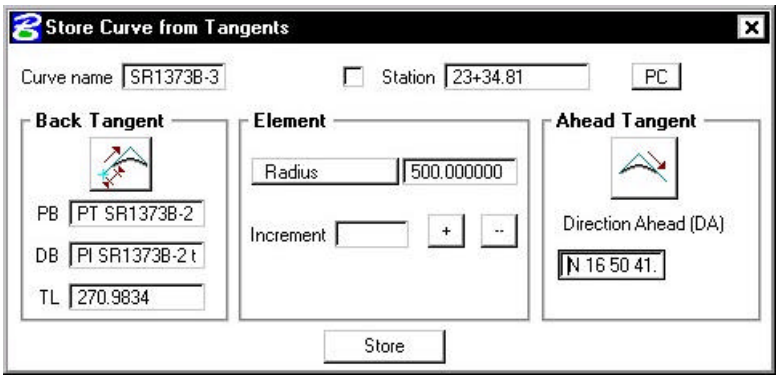
Notice that we can identify points by the PI, PC and PT of curves, even though a stored point doesn't exist at those locations.

Note: The Direction Ahead (DA) is N 10 57 14.84 W.
The DB is “PI SR1373B-1 TO PT SR1373B-1”.

Step 9. Select the Store Curve from Tangents icon as depicted below.

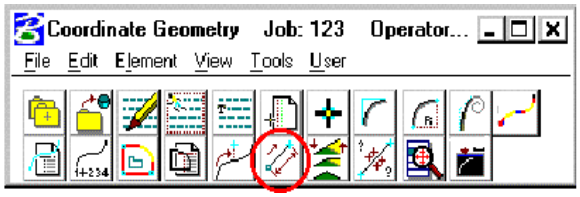


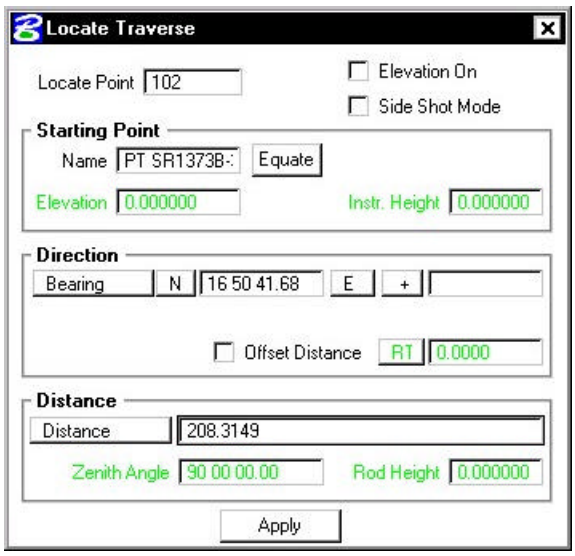
Store the curve SR1373B-3 as shown.



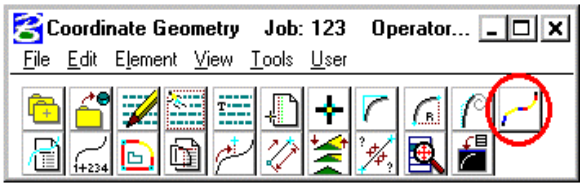
Note: The Direction Ahead (DA) is N 16 50 41.68 E.
The DB is “PI SR1373B-2 TO PT SR1373B-2”.

Step 10. Select the Locate Traverse icon as depicted below.

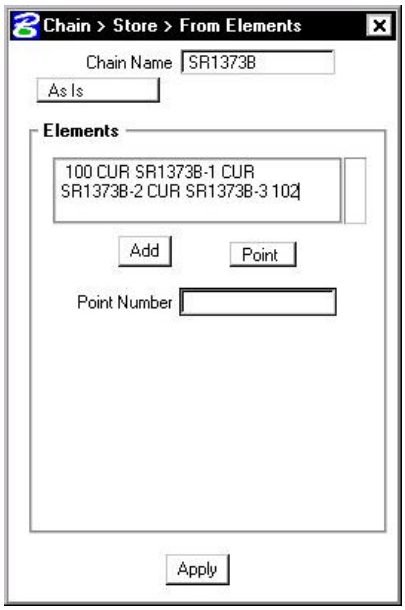




Step 11. Select the Store Chain From Elements icon as depicted below.

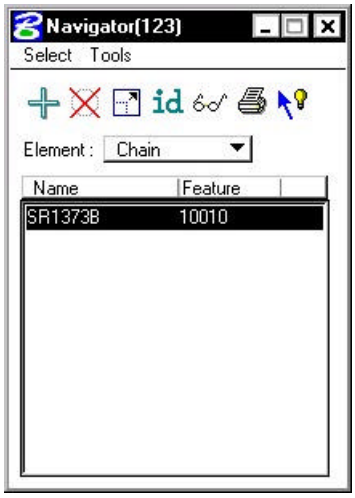


Store the centerline chain “SR1373B”.

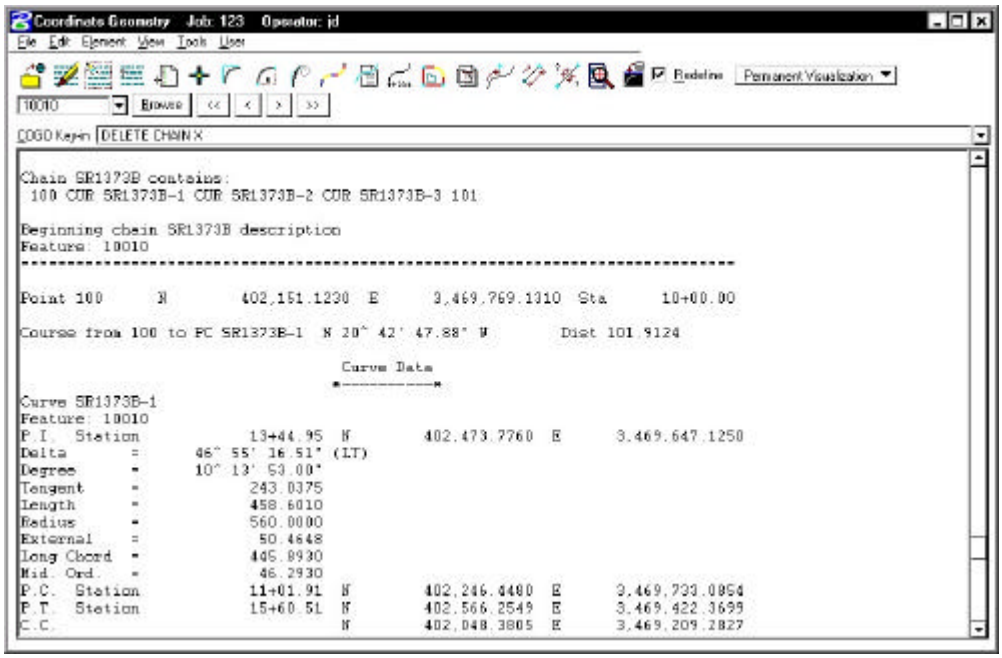


You can fill in the Elements field by typing OR by graphically selecting the visualized elements in the design file.

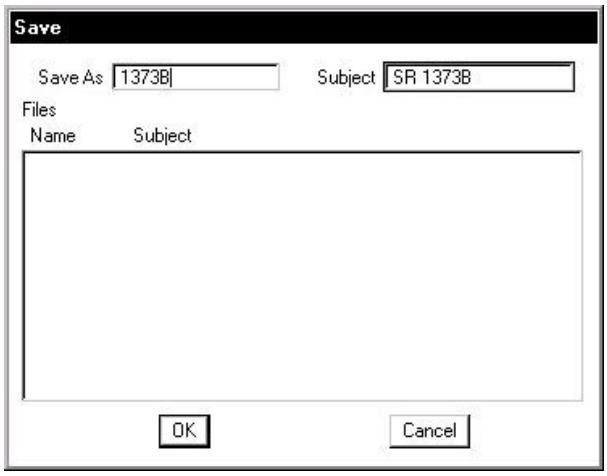
Step 12. Describe Cha "SR1373B."



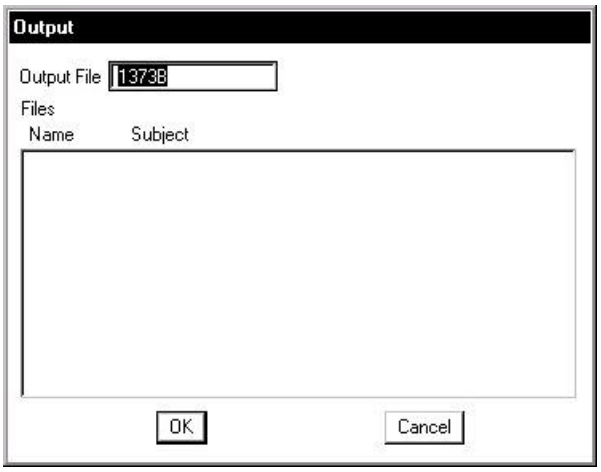
A fragment of the description is displayed below.



Step 13. Save an audit trail of your commands. You can access this dialog from the **File > Save** pulldown.

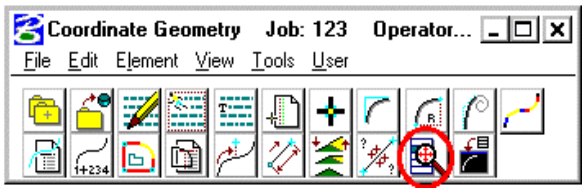


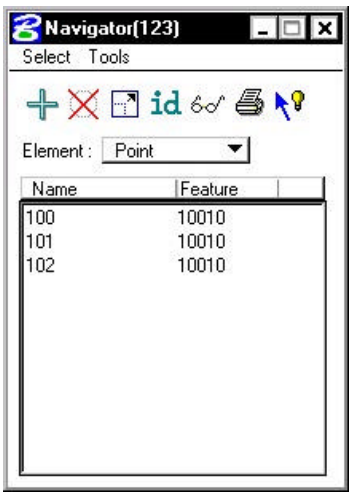
Step 14. Save an output file. You can access this dialog from the **File > Output** pulldown.



Step 15. Review the input file and output file using the GEOPAK editor.

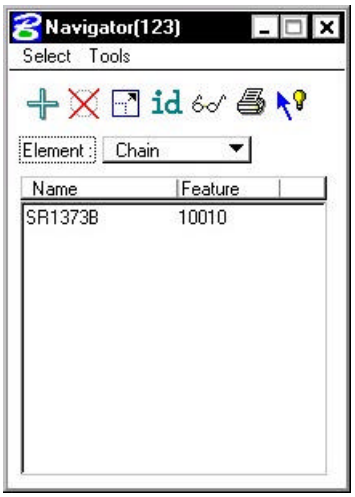
Step 16. Select the **Navigator** icon to access the Navigator dialog.





Step 17. Select points 100, 101, and 102 and **Visualize** by selecting the **Eyeglasses** icon.

Step 18. Change the element pulldown to Chains and **Visualize** chain SR1373B.



Step 19. **Exit** Coordinate Geometry.

2.2 Additional Alignments – Graphical COGO

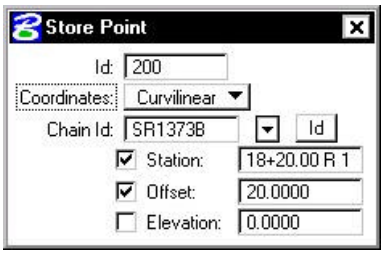
Important: Before proceeding, attach saved view BORROW.

Step 1. Turn on the PERMANENT Visualization on the main COGO dialog.

Step 2. Select the Graphical COGO icon from the Survey Tool Palette.

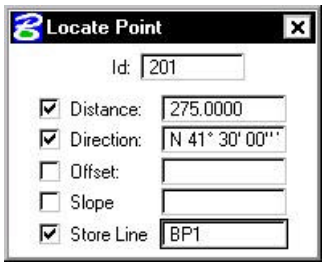
Step 3. From the Graphical COGO tool bar select the first icon for storing a point.

Store Point 200 using the dialog options as shown below.



Step 4. Select the Locate point icon from the Store Elements tool bar as depicted below.

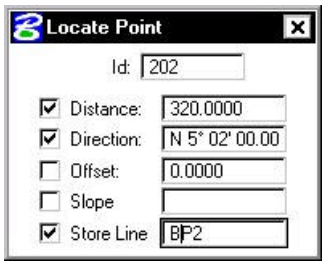
Locate Point 201 using the settings shown below.



The bearing from 200 to 201 should be N 41 30 00 W

This will store point 201 using the bearing and distance above. Be sure to activate the **Store Line** toggle so as to store **BP1** in the gpk file.

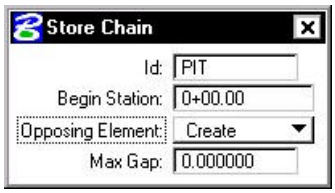
Step 5. Locate Point 202 using the settings shown below.



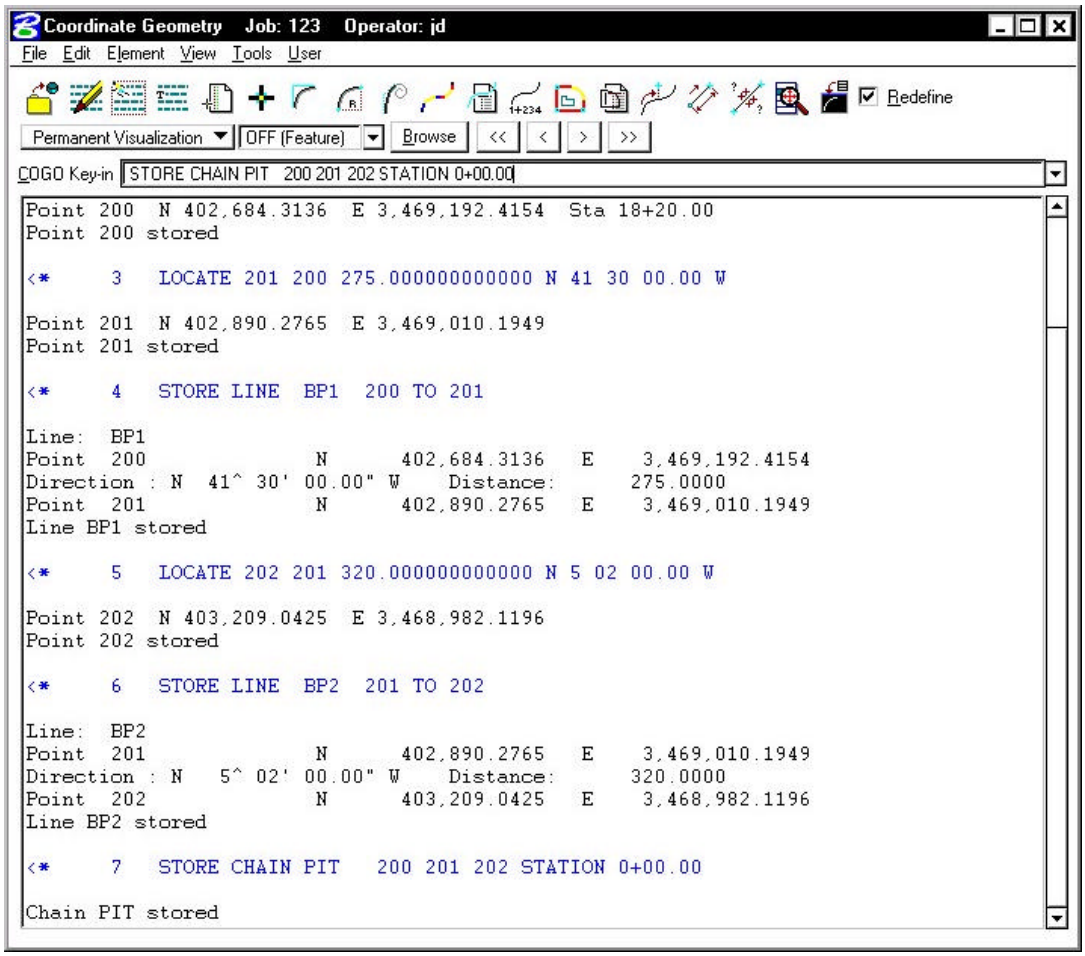
The bearing from 201 to 202 should be N 05 02 00 W

Step 6. Select the **Store Chain** icon from the Groups tool bar as shown below.

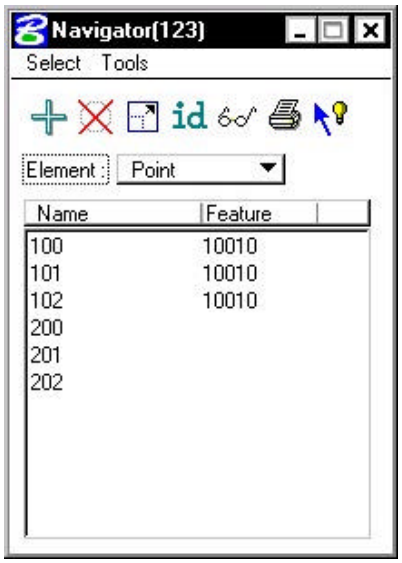
Step 7. Store the chain **PIT** as shown below by selecting the element **BP1** and **BP2** and using the dialog settings shown.



Below is an example of the correct syntax to store the baseline.



Step 8. Select the **Navigator** icon to access the Navigator dialog.



Select points 200-202 **and Visualize** by selecting the **Eyeglasses** icon.

Change the element pulldown to Chains and **Visualize** chain PIT.

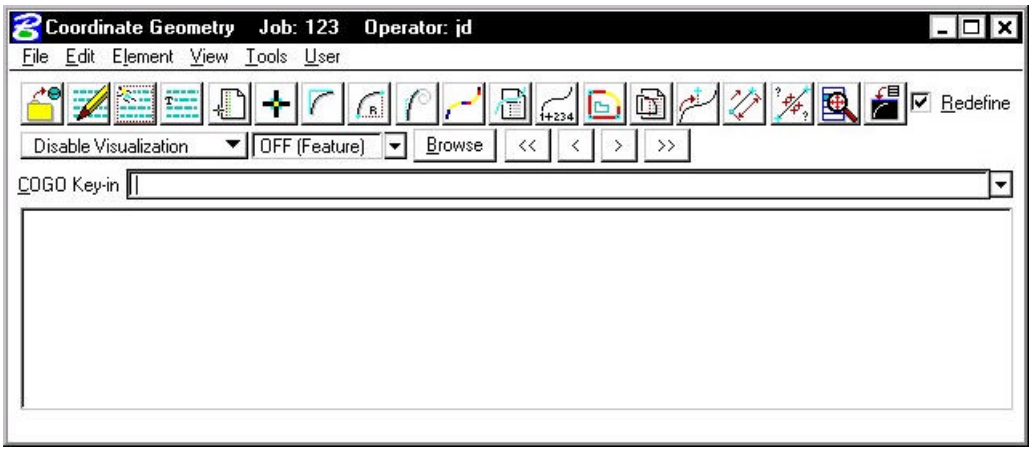
2.3 Additional Alignments – Spirals

Step 1. Open the MicroStation file **c:\data\geo\vdot\s1373\s1373.dgn**.

Important: Before beginning, attach saved view SPIRAL.

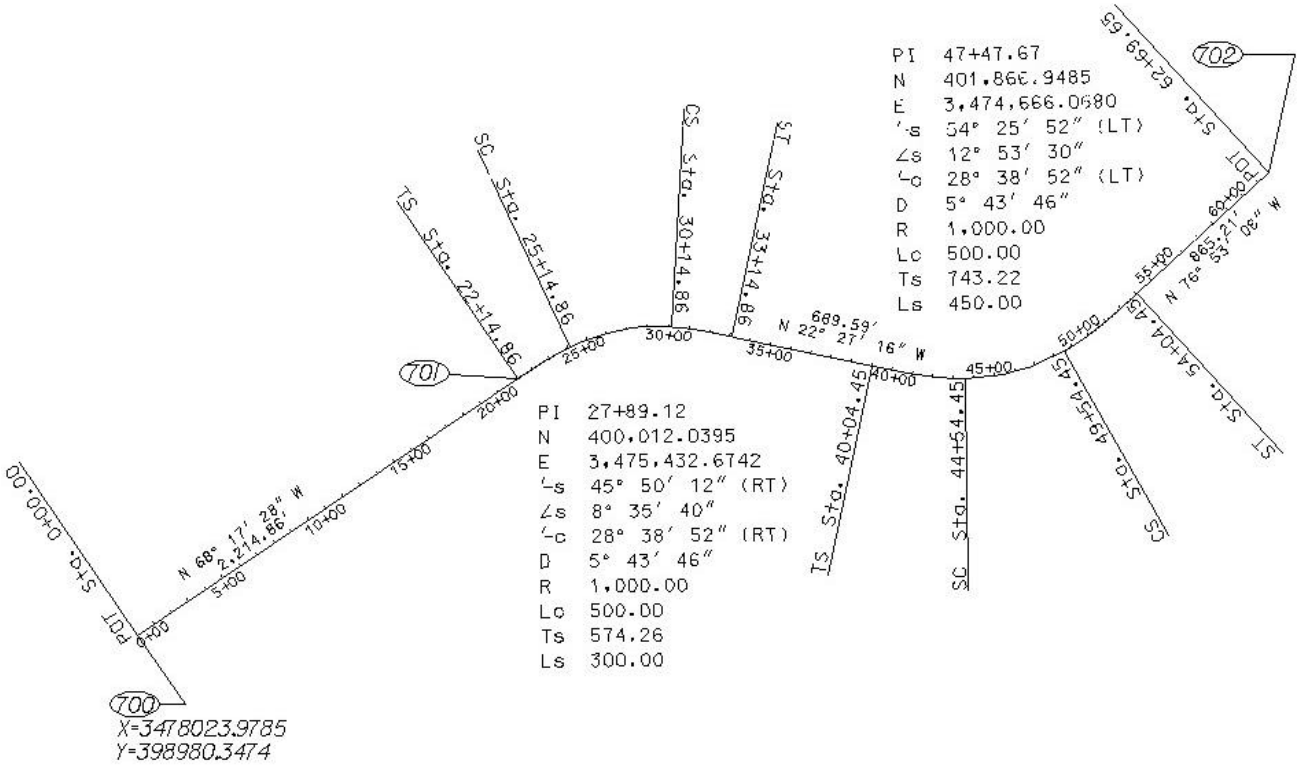
Step 2. Select the **Coordinate Geometry** icon.

Step 3. The Coordinate Geometry (**COGO**) dialog appears.



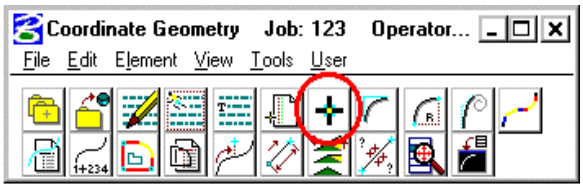
This dialog is completely resizable, so you can position it where you're most comfortable.

In the next few steps, we'll use Coordinate Geometry to store the following alignment:

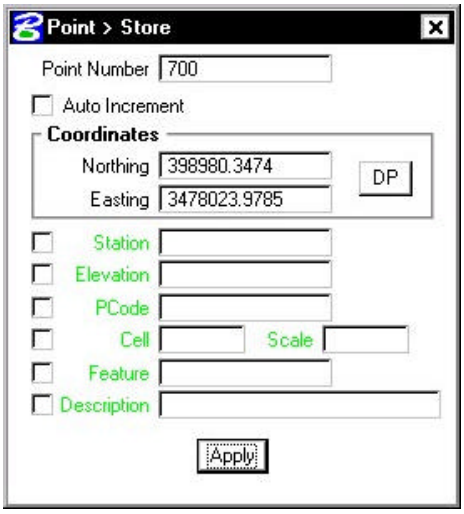


Step 4. Turn on the PERMANENT Visualization on the main COGO dialog.

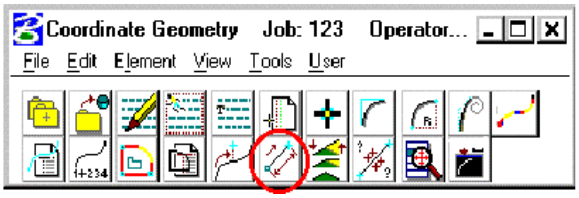
Step 5. Select the Store Point icon as depicted below.

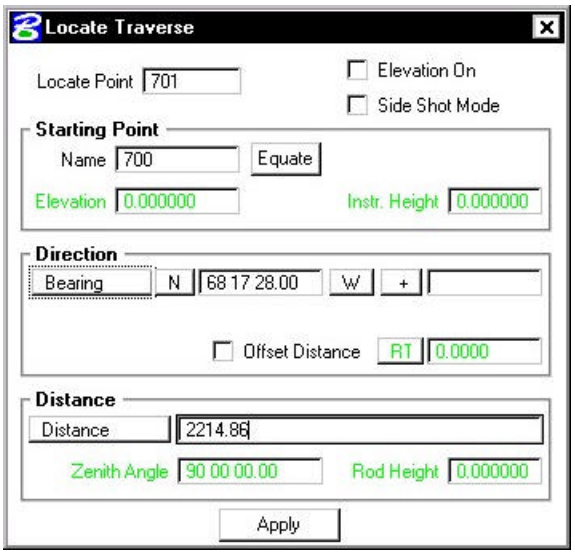


Store Point 700 with the coordinates shown.

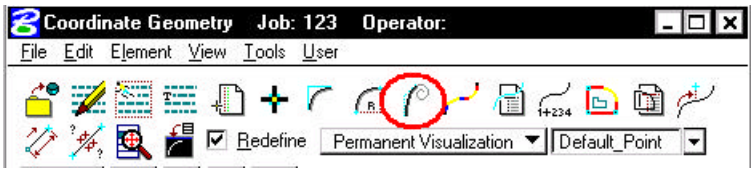


Step 6. Select the Locate Traverse icon as depicted below.

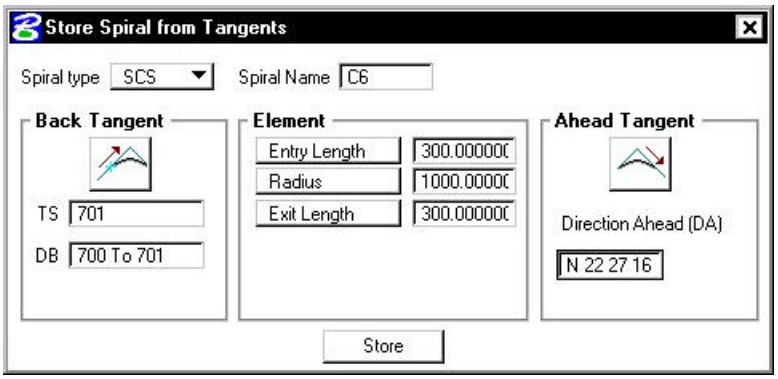




Step 7. Select the Store Spiral icon as depicted below.

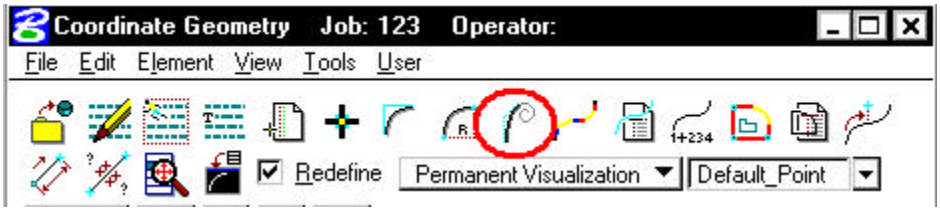


Store the spiral C6 as shown.

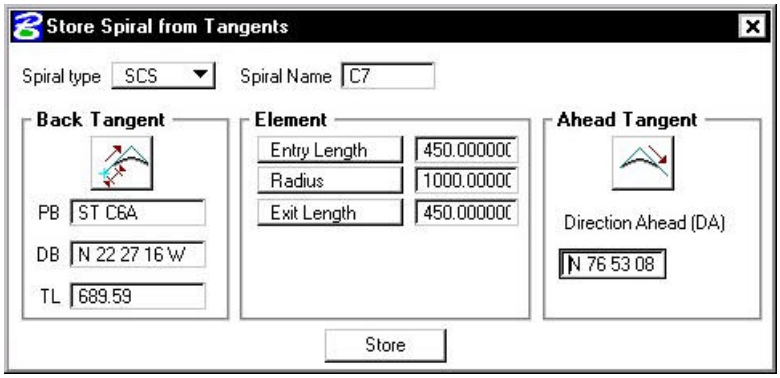


Note: The Direction Ahead (DA) is N 22 27 16 W.

Step 8. Select the Store Spiral icon as depicted below.



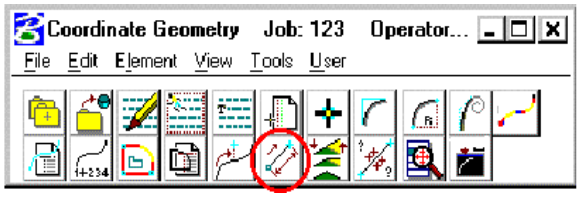
Store the spiral C7 as shown.

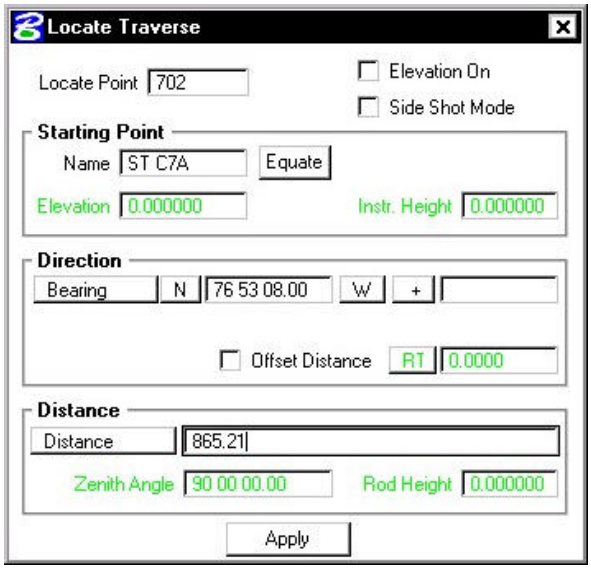


Notice that we can identify points by the TS or ST of spirals, even though a stored point doesn't exist at that location.

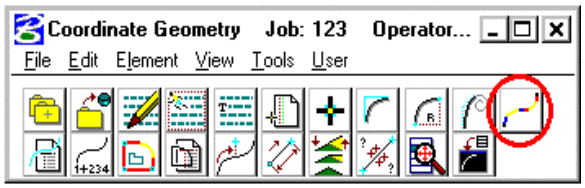
Note: The Direction Ahead (DA) is N 76 53 08 W.

Step 9. Select the Locate Traverse icon as depicted below.

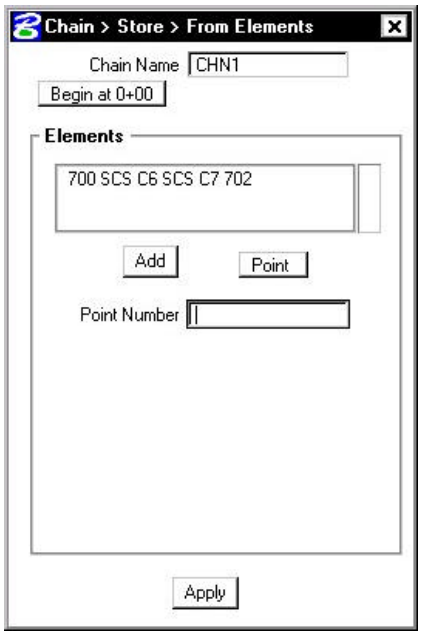




Step 11. Select the Store Chain From Elements icon as depicted below.

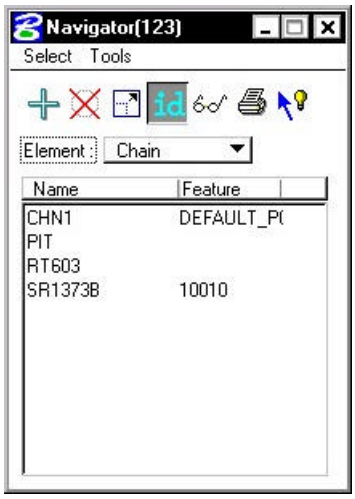


Store the chain “CHN1”.



You can fill in the Elements field by typing OR by graphically selecting the visualized elements in the design file.

Step 12. Describe Cha “CHN1.”

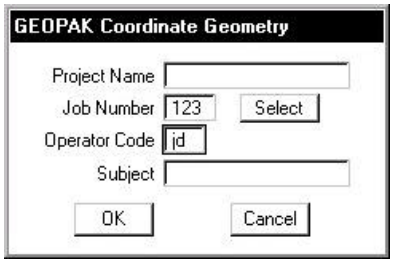


2.4 Additional Alignments – Import PLT

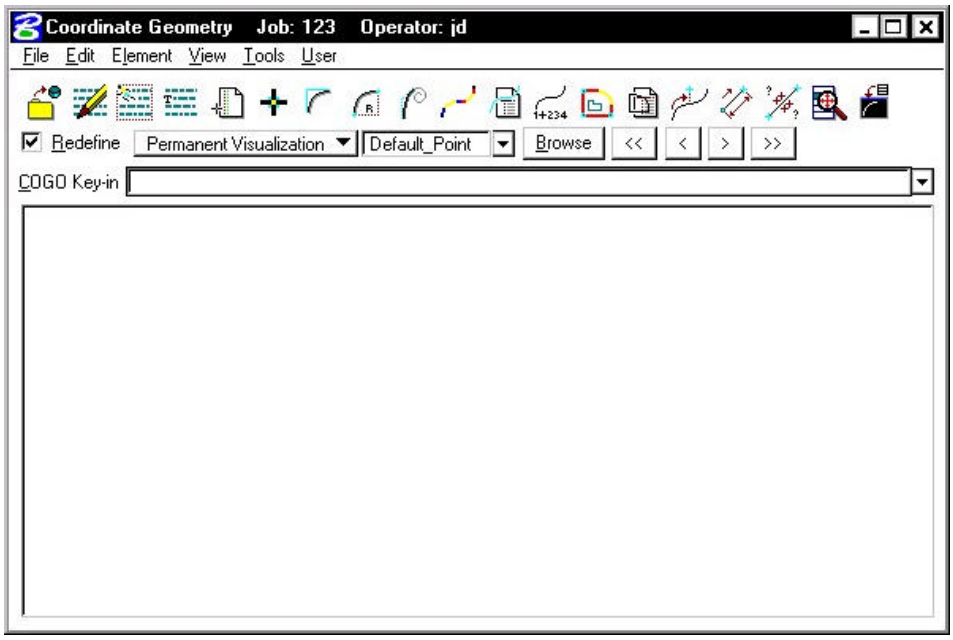
The next exercise will review the process of importing VDOT's traditional **PLT** files directly into COGO.

Step 1. Open the MicroStation file **c:\data\geo\vdot\s1373\s1373.dgn**.

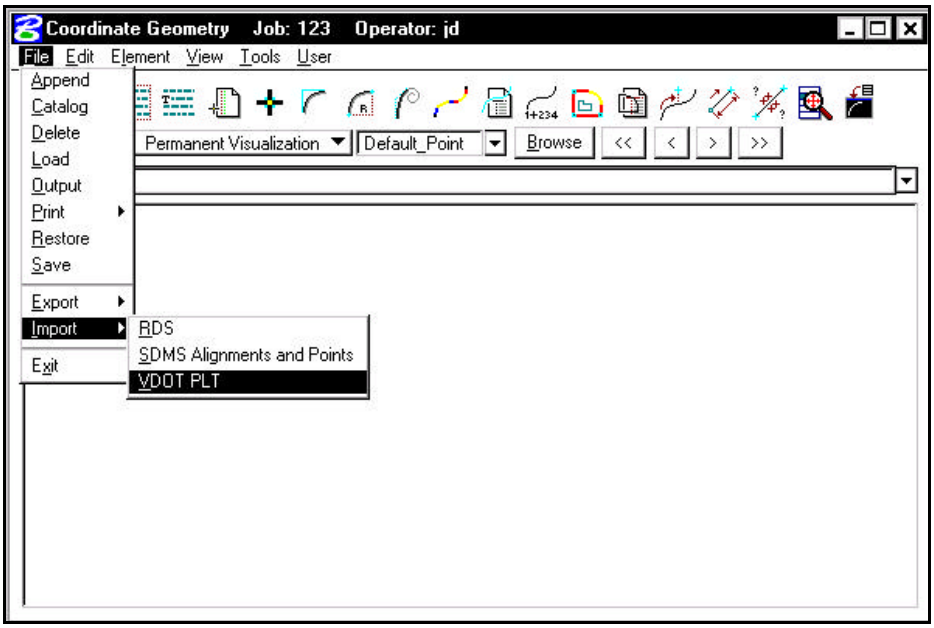
Step 2. Select the **Coordinate Geometry** icon and open the desired gpk.



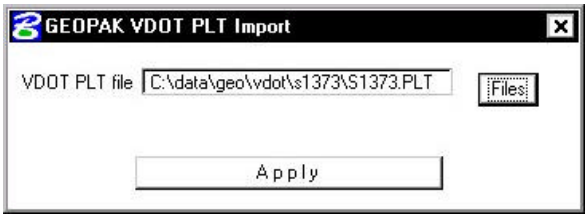
Step 3. The Coordinate Geometry (**COGO**) dialog appears.



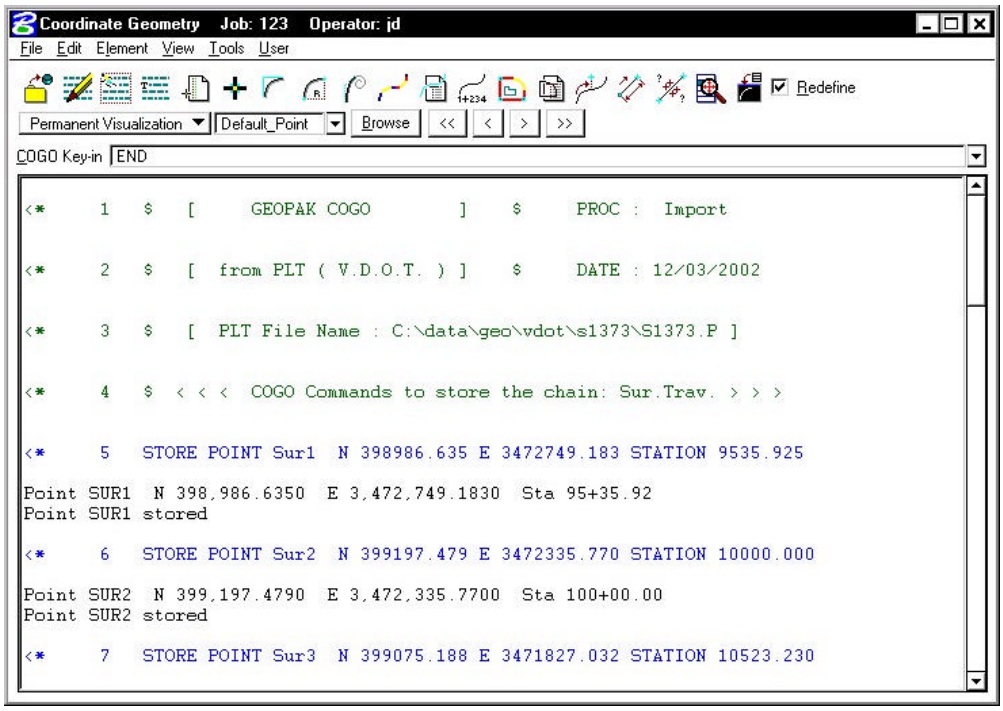
Step 4. Select from the **File** pulldown, the option to import the PLT file. **File>Import>VDOT PLT**



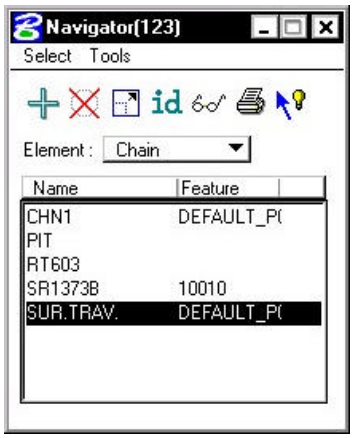
Step 5. When the following dialog appears, use the **File** button to select the desired PLT file and then press the **Apply** button.



Step 6. This will process the PLT file into COGO, automatically storing the points, curves, spirals, and chains.



Step 7. Once the COGO elements have been stored you can access the **COGO Navigator** to visualize them MicroStation.



2.5 Right of Way Commands in COGO

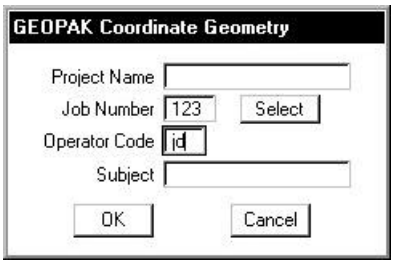
This section discusses entering an existing parcel from a deed, offsetting a centerline chain and taking additional property from the parcel. During the course of creating the taking area, several coordinate geometry commands will be introduced.

All exercises in this session use Coordinate Geometry **JOB123.GPK** and use the **S1373.DGN** file.

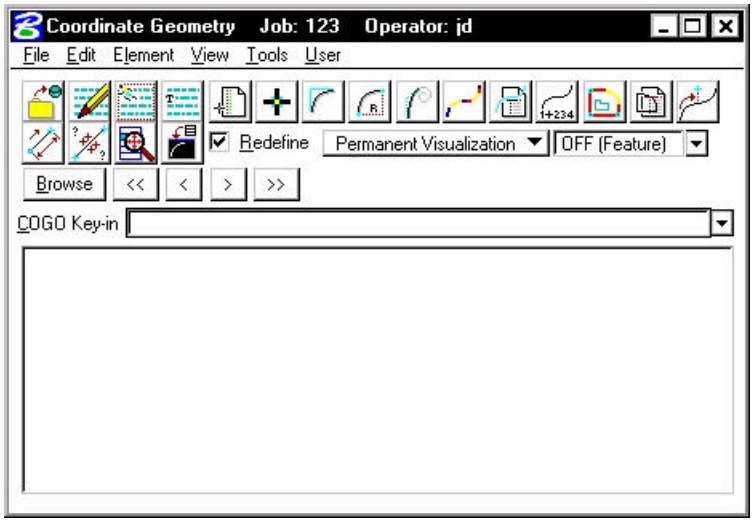
Step 1. Open the **S1373.DGN** file and invoke the Project Manager.

Step 2. Attach saved view **PLAT.**

Step 3. Invoke Coordinate Geometry by accessing the **GEOPAK Survey > Geometry > Coordinate Geometry**. Populate the dialog as shown below to access COGO.

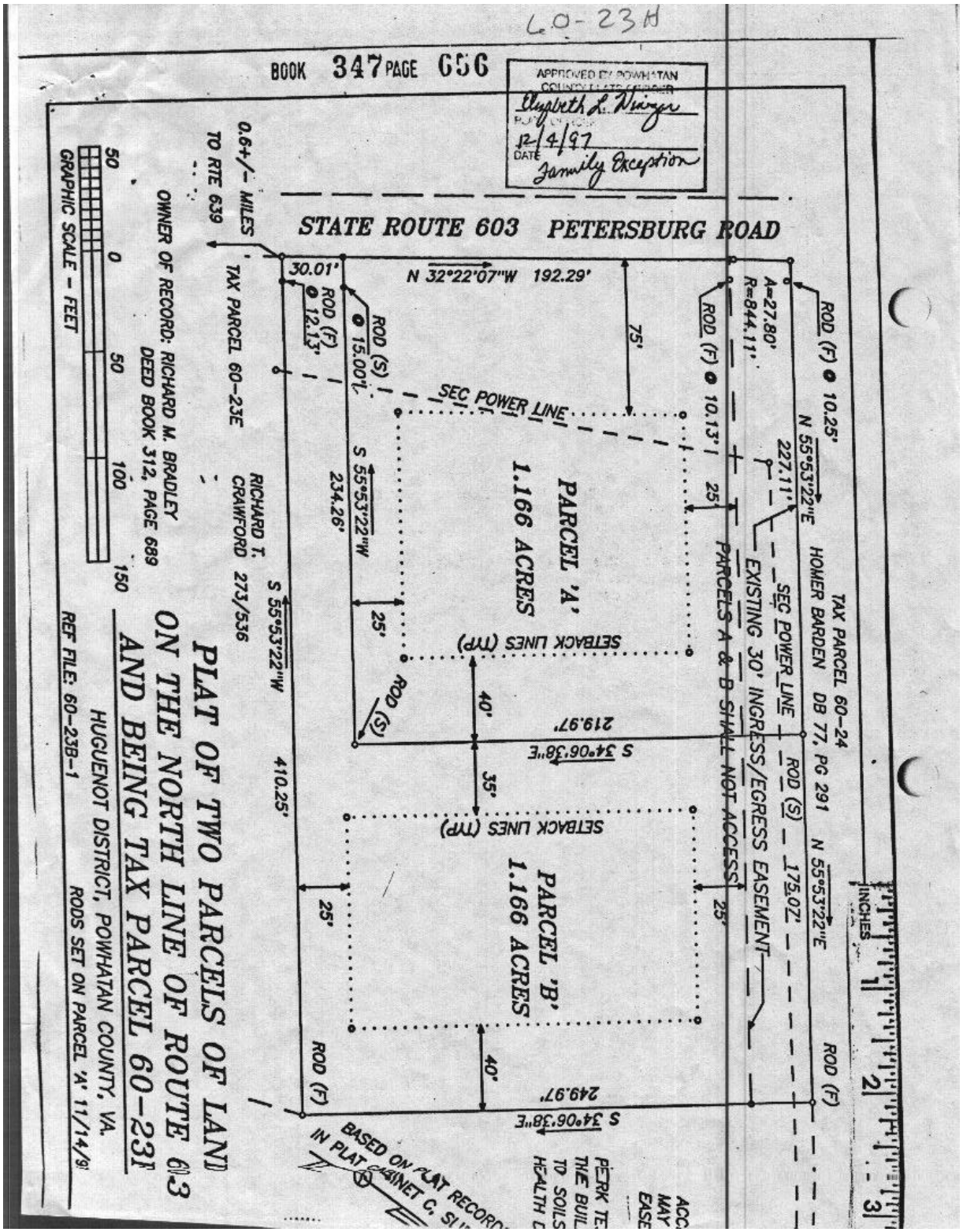


Step 4. The COGO session should have the **Redefine** toggle active, Visualization set to **Permanent Visualization** and the current Feature set to **Off**. Depending on how your COGO view options are set, a portion of your screen may resemble the graphic below:

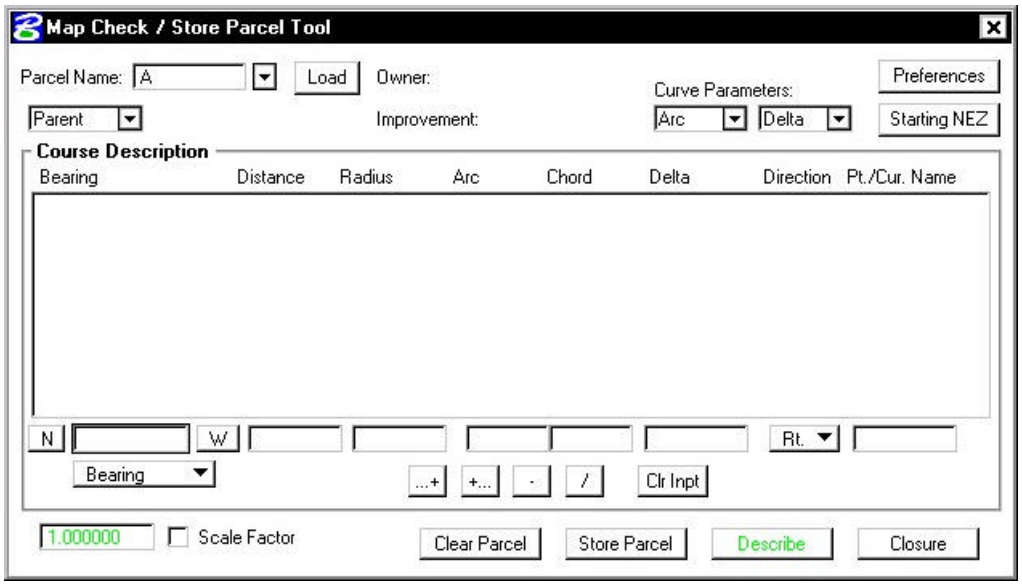


2.5.1 Parcel Editor/Map Check

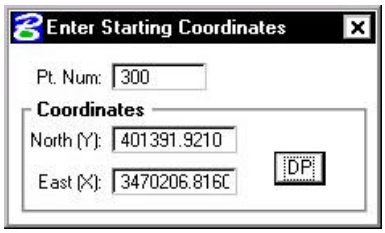
Below is a plat of the parcel we will store in COGO.



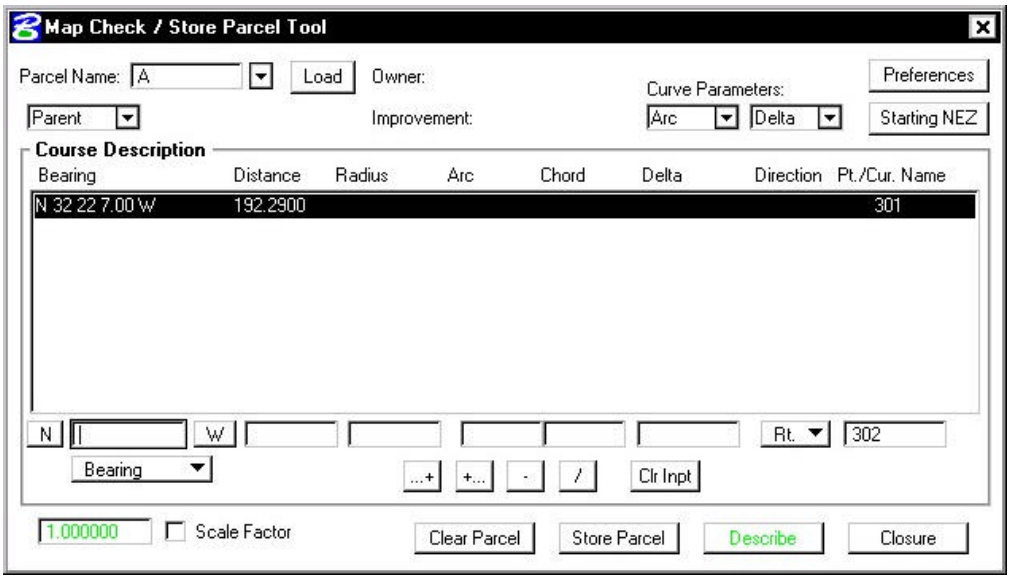
Step 1. Access the Map Check/Store Parcel tool by selecting **Tools > Map Check**. The following dialog is displayed.



Step 2. Enter the Parcel Name **A** by typing over the entry already present. Press the **Starting NEZ** button and set the starting point as follows:

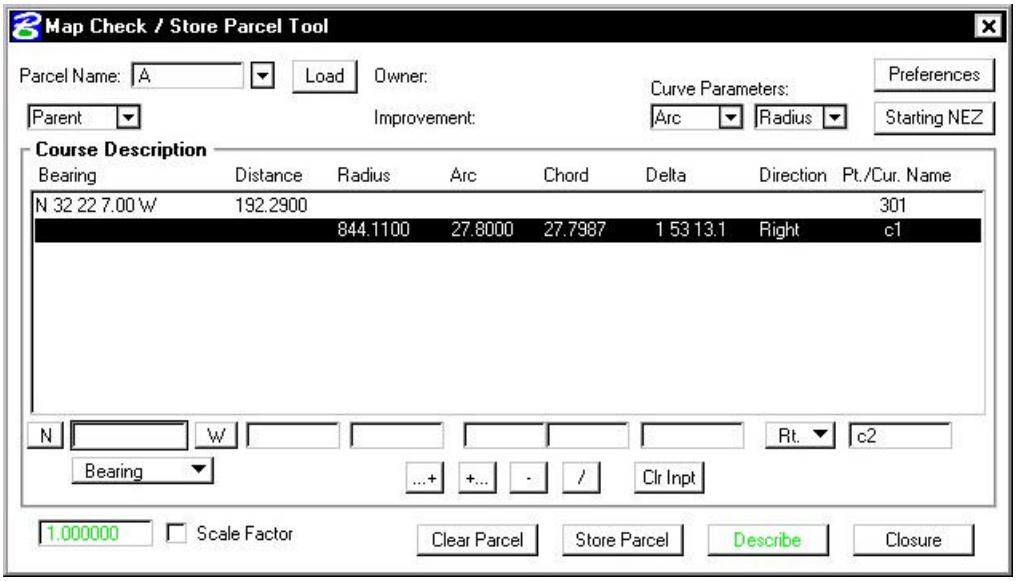


Step 3. Close the Enter Starting Point dialog. Set the Curve Parameters to **Arc** and **Radius**. To enter data, fill in the edit fields just below the list box, then press one of the edit buttons located directly below edit fields. Several buttons are supported: **Add Below**, **Add After**, **Delete**, and **Modify**. Enter the first **Bearing**, **Distance** and **PT / Desc Name** in the edit fields just below the list box, as depicted in the graphic below.



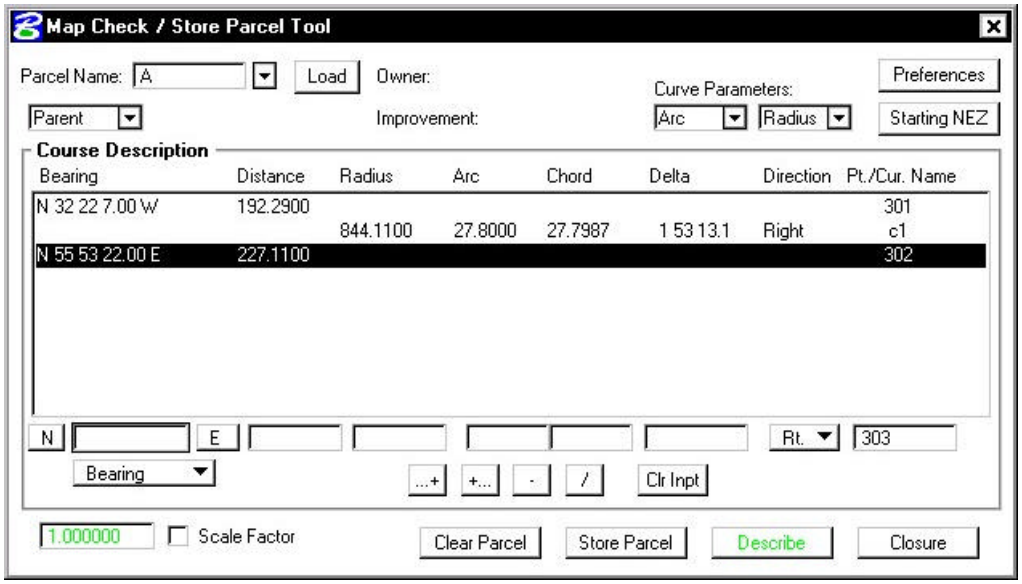
When complete, press the **Add** button directly below the edit fields. The information is now displayed in the list box and the edit fields are cleared for subsequent input.

Step 4. To add the first curve, leave the **Bearing** and **Distance** fields blank. Populate the **Radius**, **Arc**, **Direction**, and **Curve Name** as depicted in the graphics below.

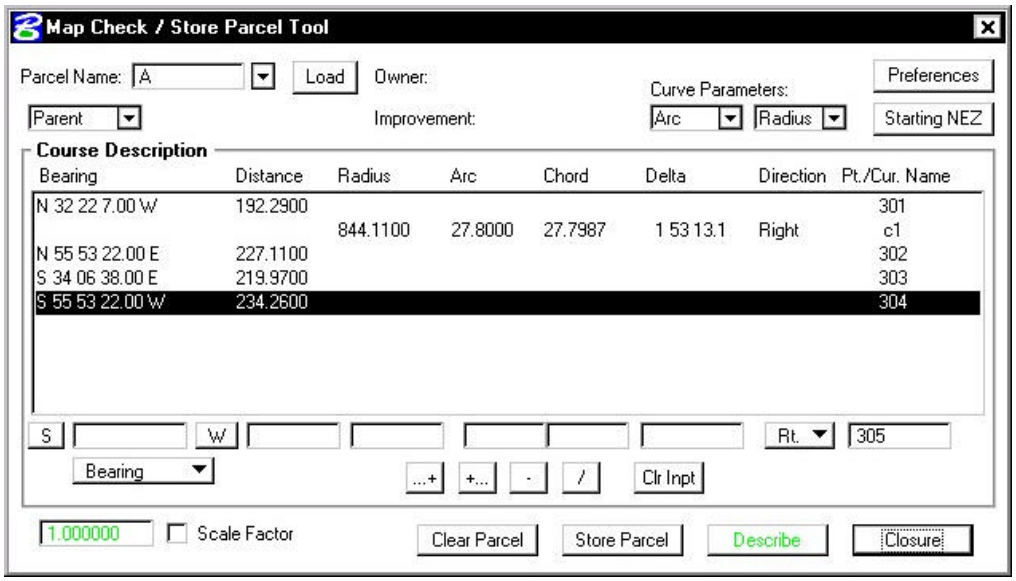


Step 5. When the edit fields are populated, press the **Add After** (…+) button to add the information to the list box.

Step 6. Add in the next **Bearing** (be sure to change the W to E), and **Distance**. Note the Pt Number automatically incremented. Once the edit fields are populated, press the **Add After** (…+) button.



Step 7. Continue adding information, utilizing the edit buttons. If a line is entered incorrectly, highlight the line in the list box, change the incorrect data, then press the Modify (/) button. The Clr Input button clears all data in the list box. When complete, your dialog should match the dialog graphic below.



Step 8. Press the **Closure** button to check the closure. The closure report appears in the COGO display output window. One sample is depicted below.

```
<*     1   $                Parcel Closure Report: A

<*     2   $ - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

<*     3   $ Start Coordinates,  North: 401391.9210   East: 3470206.8160  Name:-
 300

<*     4   $  Line:   N 32^ 22' 7.00" W   Dist.: 192.2900  PtNum: 301

<*     5   $  Curve: c1  Rad.: 844.1100  Delta:   1^ 53' 13.15" rt.  Arc: 27.80-
00

<*     6   $     Degree:   6^ 47' 15.77"  Tan.: 13.9013  Mid Ord.: 0.1145  Ext.-
 0.1144

<*     7   $     Chord Bearing: N 31^ 25' 30.43" W   Chord Dist.: 27.7987

<*     8   $  Line:   N 55^ 53' 22.00" E   Dist.: 227.1100  PtNum: 302

<*     9   $  Line:   S 34^ 06' 38.00" E   Dist.: 219.9700  PtNum: 303

<*    10   $  Line:   S 55^ 53' 22.00" W   Dist.: 234.2600  PtNum: 304

<*    11   $ End Coordinates,  North: 401391.9192   East: 3470206.8144

<*    12   $ Error North: -0.0018   Error East: -0.0016

<*    13   $ Error Direction: N 40^ 22' 39.82" E   Total Distance Error: 0.0024

<*    14   $ Error of Closure: 1/372826.4646

<*    15   $ Perimeter: 901.4300

<*    16   $ Area: sq. Feet: 50789.6561  Acres: 1.1660
```

Step 9. Once satisfied with the closure, press the **Store Parcel** button to store the parcel into COGO. Commands are generated to store the parcel points and curves.

2.6 Translate & Rotate

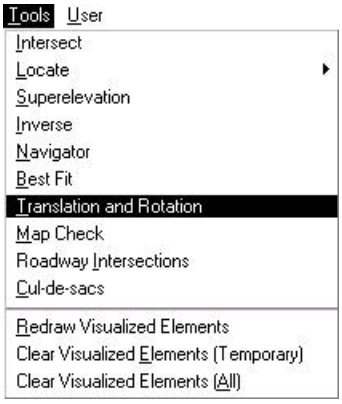
This section discusses using translate & Rotate application to adjust the parcel location.

All exercises in this session use Coordinate Geometry **JOB123.GPK** and use the **S1373.DGN** file.

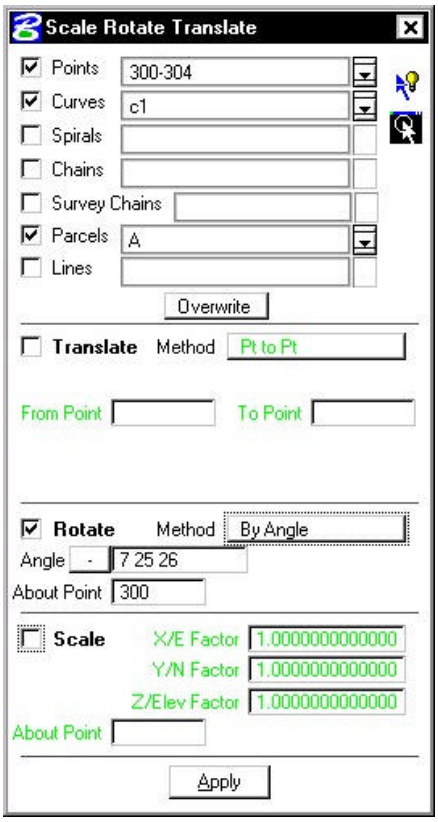
Step 1. Open the **S1373.DGN** file and invoke the Project Manager.

Step 2. Attach saved view **PLAT**.

Step 3. From the **Tools** pulldown within COGO, select the Translate & Rotate option.

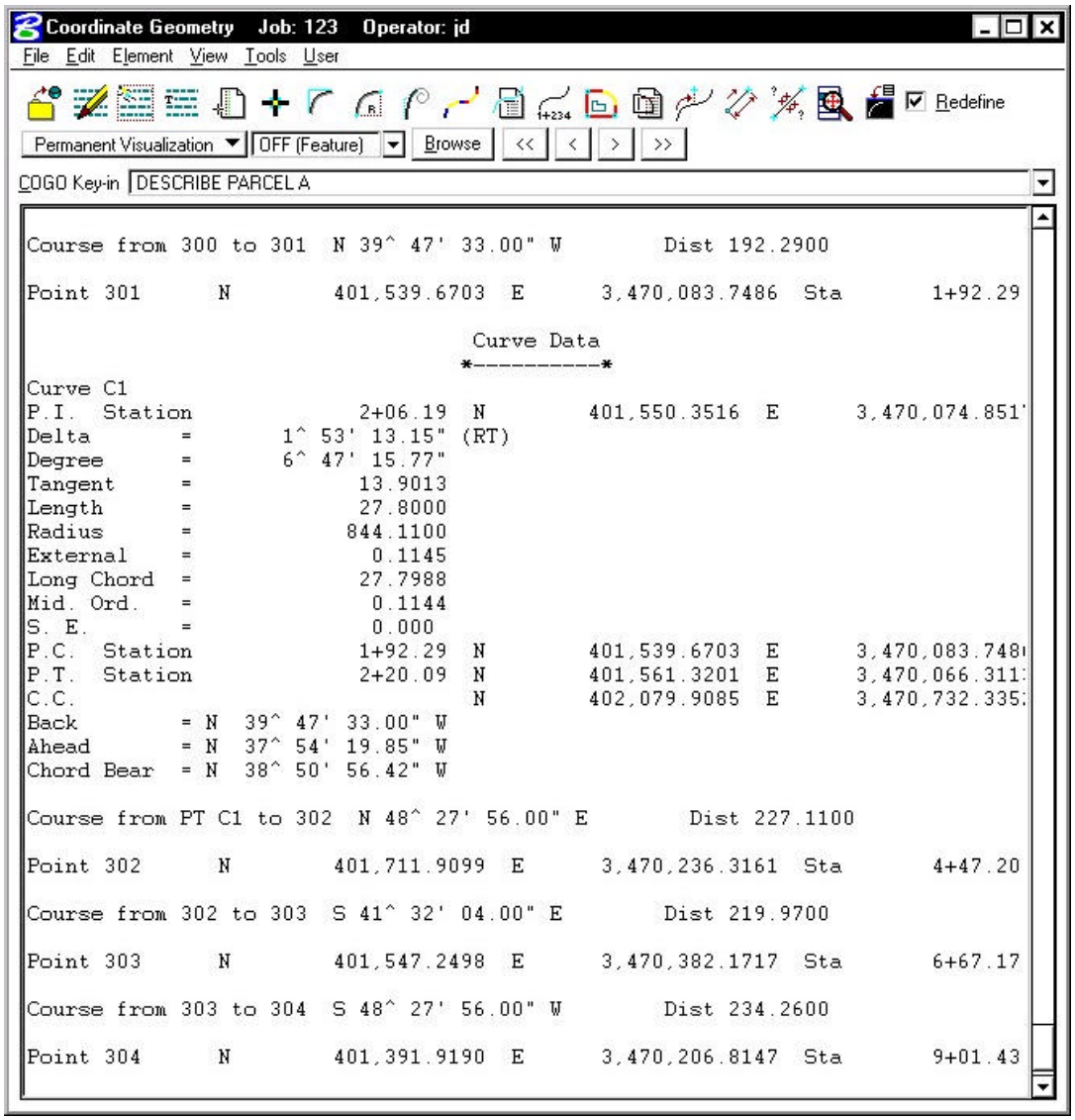


Step 4. Once the dialog appears we will want to adjust everything related to the parcel as shown below.



Step 5. Once all of the information has been entered into the dialog press the **Apply** button to execute the command.

Step 6. Now access coordinate geometry and **Describe** parcel A



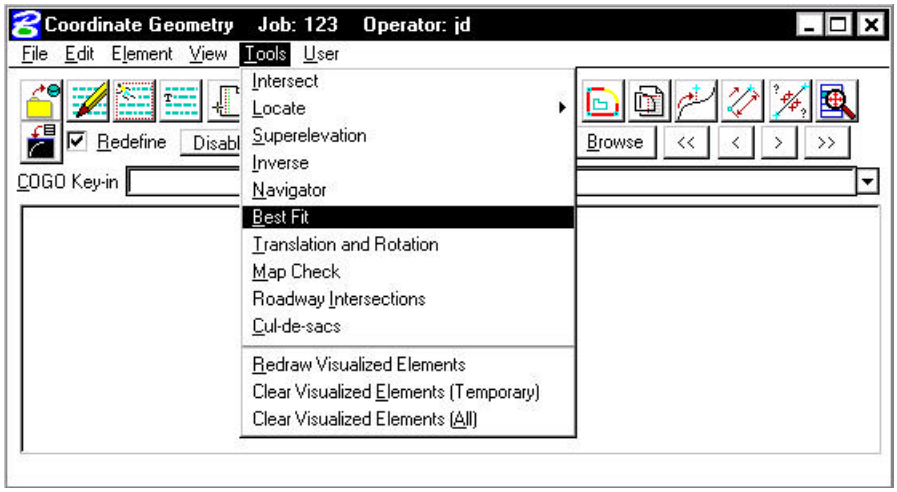
2.7 Best Fit

Step 1. Attach the saved view **FIT.**

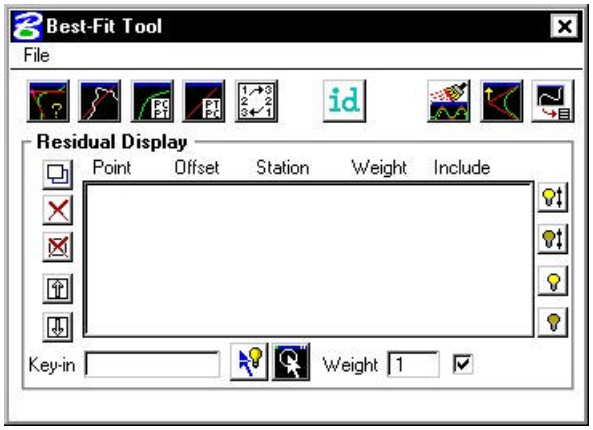
Step 2. Using the MicroStation Select tool, create a selection set of the displayed points.

You will want too turn OFF level 3 before creating the selection set.

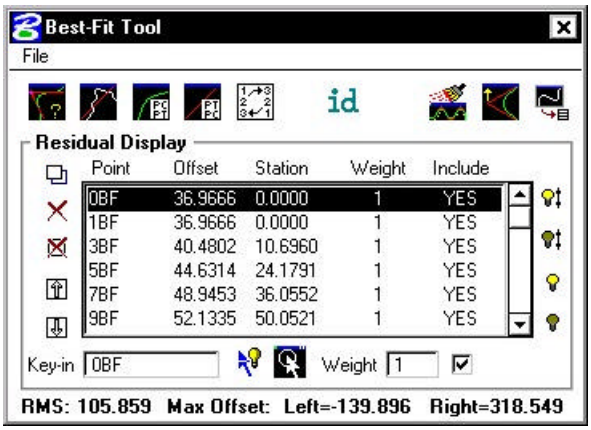
Step 3. Now from the **Tools** pulldown in COGO, select the **Best Fit** tool.



Step 4. Choose the icon on the bottom of the Best Fit dialog to populate the display window with the points in the selection set.

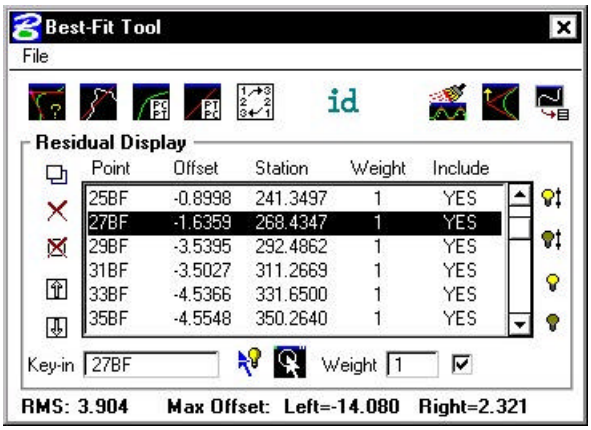


This will populate the dialog as shown below.

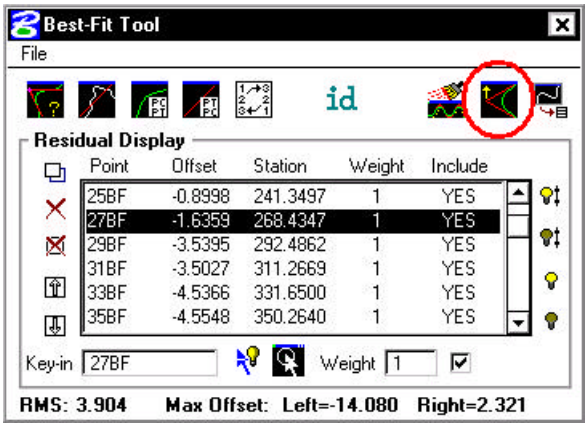


Step 5. Now select the first icon **Add Geometry** on the top left of the dialog to let COGO apply a best guess of where the curves and tangents are located in the point data. This should now be represented graphically.

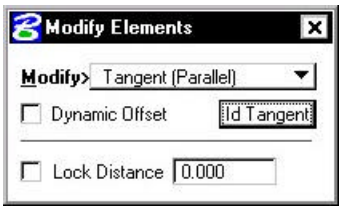
Step 6. Proceed through the list of points until you reach the point shown in the dialog below.



Step 7. Now select the Modify Elements icon to modify the tangent sections.

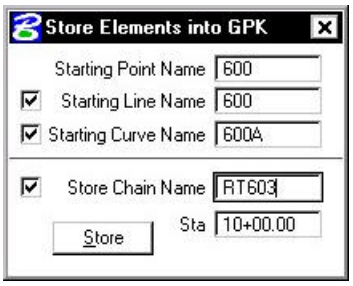


Step 8. Now change the settings as shown below so as to make modifications to the tangent section.



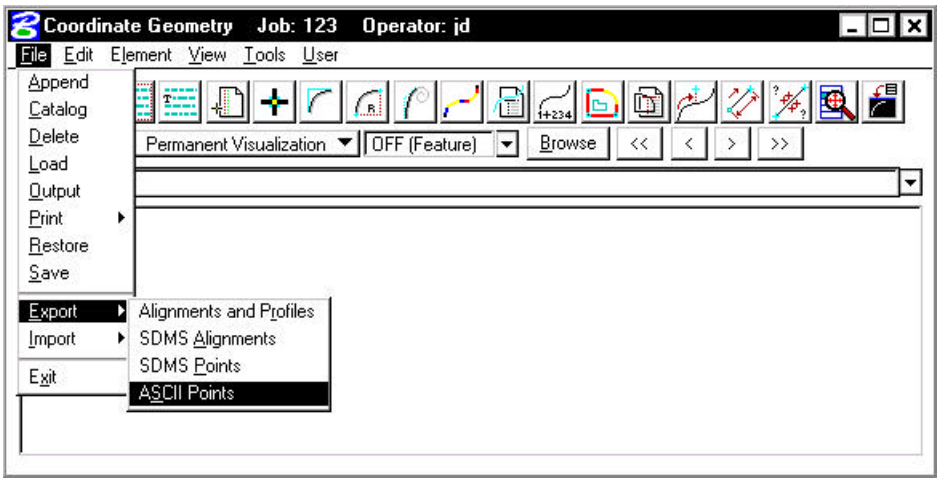
Step 9. Select the **Id Tangent** button and dynamically slide the tangent on the screen to a more acceptable location to fit the points.

Step 10. After the tangent has been placed, select the icon on the far upper right of the dialog and populate as shown below. This will allow us to store the alignment into the gpk.

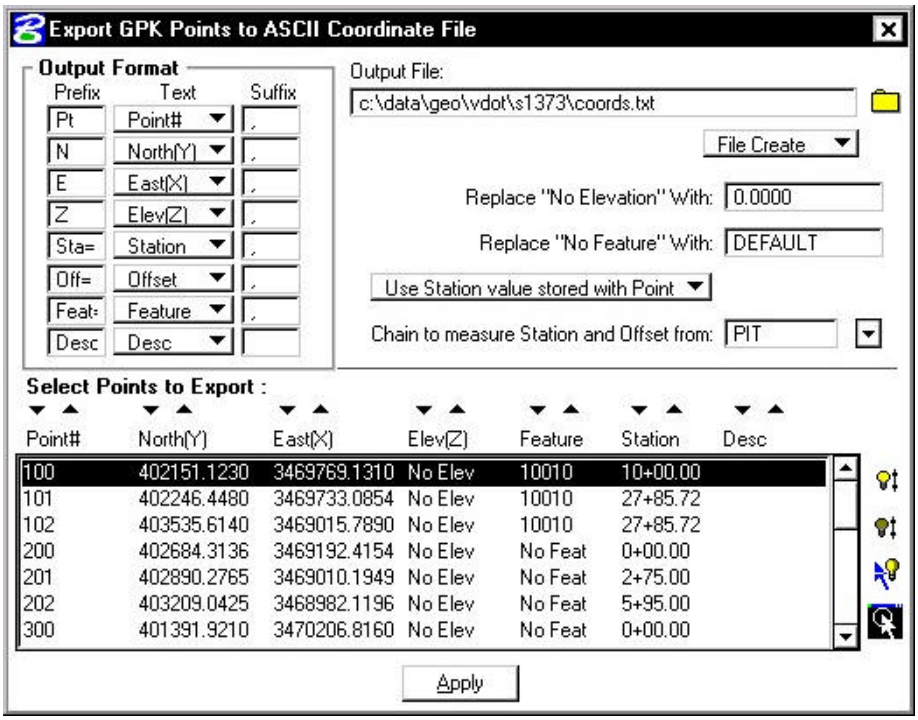


2.8…Export to ASCII

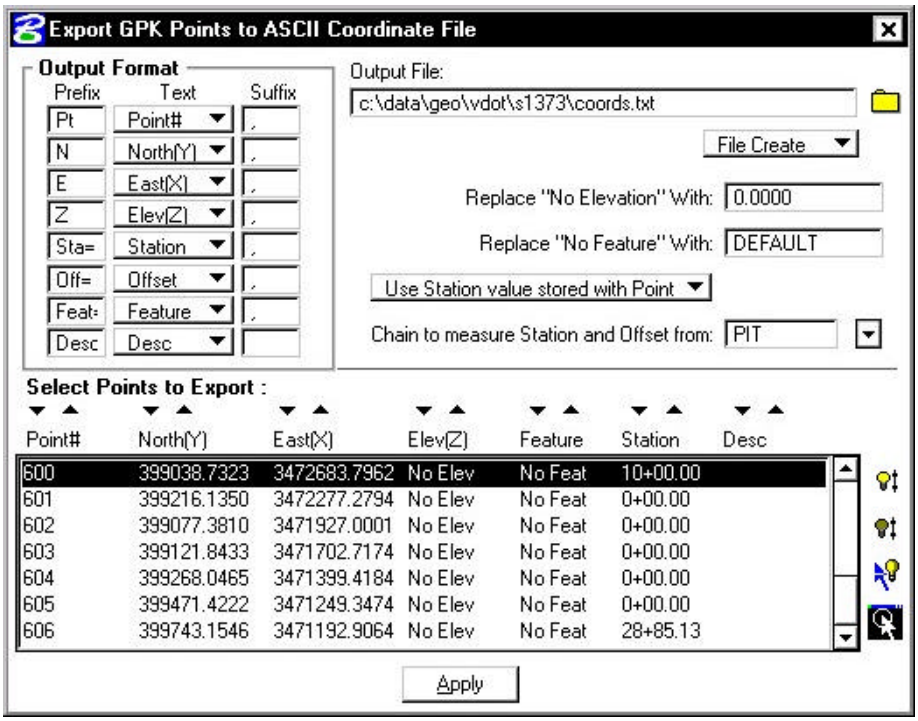
Step 1. From the COGO **File** pulldown, select the **Export** option for writing out ASCII as shown below.



This will invoke the following dialog.

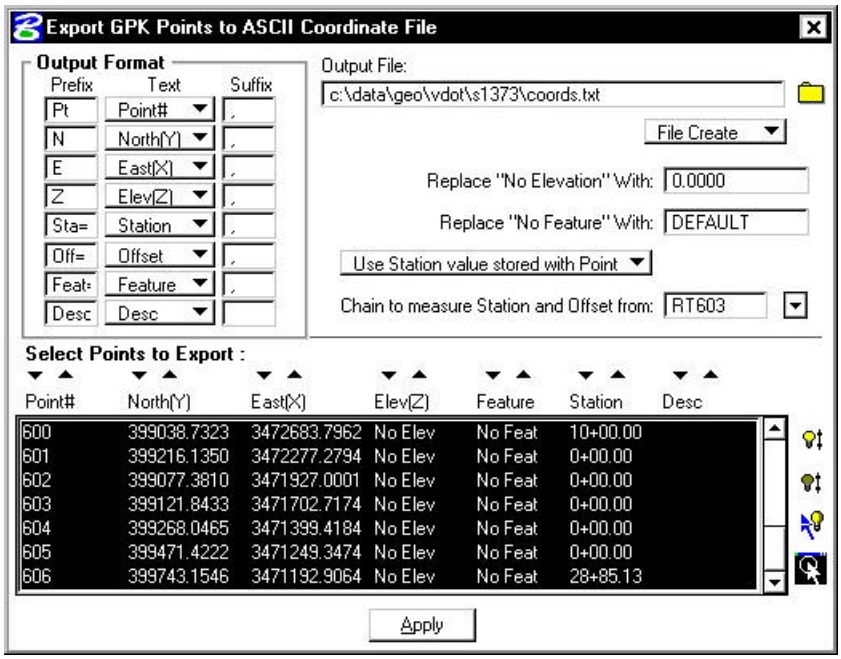
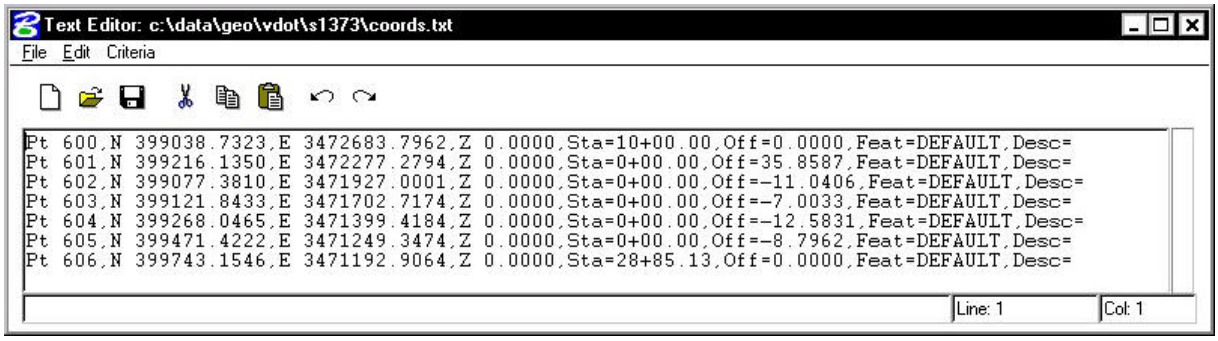


Step 2. From this dialog there are several option for controlling the filtering of points, by using the control toggles above each column. We will want to generate a list of the PI points created from the alignment we previously stored. Scrolldown to the bottom of the list until reaching the 600 point range.



Step 3. Highlight the desired points to export, thus creating a selection set.

Step 4. Once the dialog settings are made, select the **Apply** button to create the ASCII file.



Step 5. Now you should have an ASCII file like the one shown below.