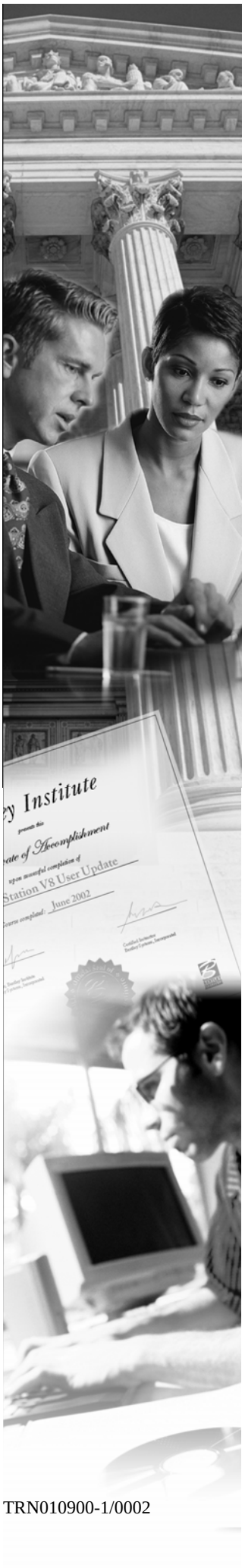

VDOT Advanced GEOPAK Survey

2004 Edition (Version 8.8)

Bentley Institute

TRN010900-1/0002

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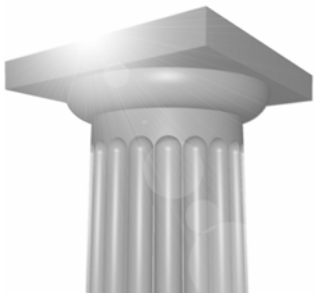


Table of Contents

1 Plat Creation

OBJECTIVES

This chapter will cover several different issues dealing mainly with Plat Creation. Different topics to be covered will include:

- Parcel Editor
- Legal Description Editor
- R/W Staking Reports
- Survey Plan Preparation Tools
- ASCII Import for Plat Creation

INTRODUCTION

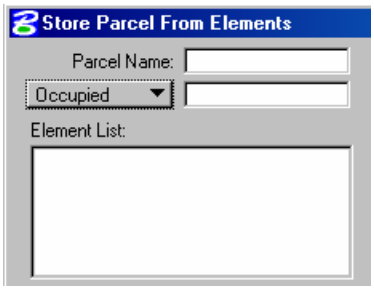
GEOPAK provides several different methods for entering parcel data. Each of these has its own purpose and proves beneficial in different circumstances. Depending on the type of initial data you start with will most likely dictate the approach to storing that data in coordinate geometry.

PARCELS

The parcel interface and additional attributes have been greatly enhanced with version 8.8. Enhancements include:

- Additional Occupied Type
- User Defined Attributes
- Interface Modifications

OCCUPIED TYPE



The new occupied type can be added to a parcel to represent a portion of a parcel that is set aside for something such as an inhabited area. This would then be reflected in area totals where a right-of-way taking has occurred and it overlaps a portion of a parcel designated as occupied. The resulting areas would be indicated as shown below:

Total occupied area: 59542.65531 m^2 = 5.95427 ha = 14.71325 a

Occupied in taken area: 58519.61057 m^2 = 5.85196 ha = 14.46045 a

Net taken area: 23754.67123 m^2 = 2.37547 ha = 5.86988 a

USER DEFINED ATTRIBUTES

Functionality had been added to the parcel element type to attach user defined attributes. These can include any information that the user wishes to associate with a parcel such as address, deed books, etc.

The command line syntax for adding attributes to parcels is shown below.

Maximum attribute name length = 24 and string size = 256

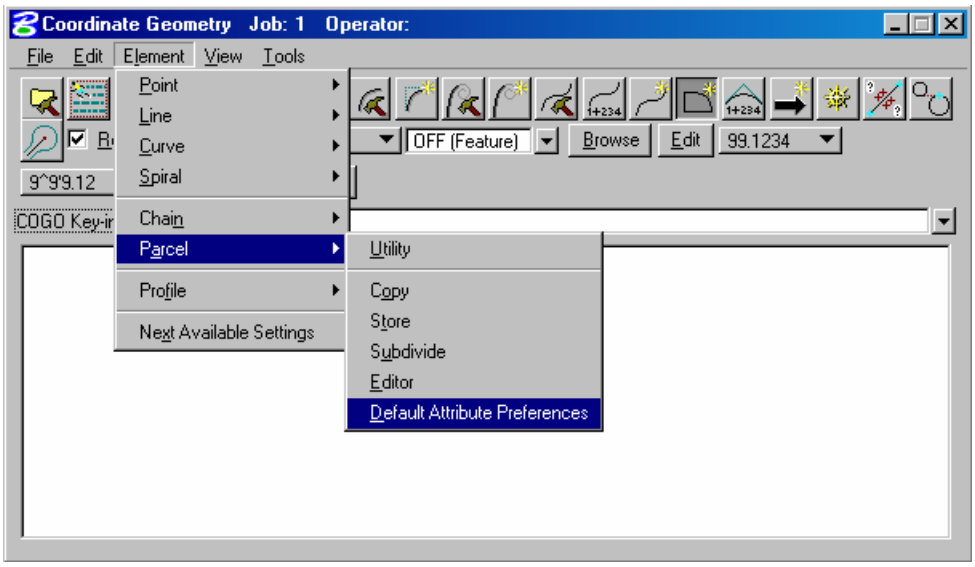
STORE ATTRIBUTE *elementType elementName PARCEL parcelName NAME attributeName TYPE NUMERIC/STRING VALUE attributeValue*

DELETE ATTRIBUTE *elementType elementName PARCEL parcelName NAME attributeName TYPE NUMERIC/STRING*

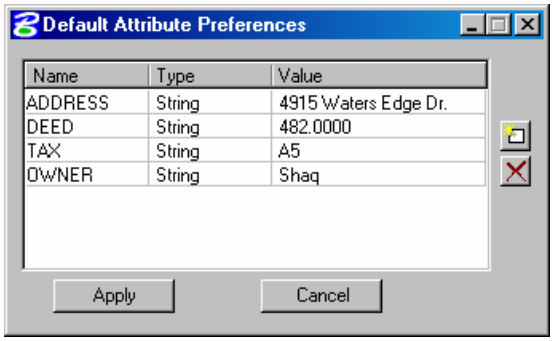
CHANGE ATTRIBUTE *elementType elementName PARCEL parcelName NAME attributeName TYPE NUMERIC/STRING VALUE attributeValue*

Note	The user attribute may be specified in graphic COGO and COGO's Store Parcel dialog without using the command line.

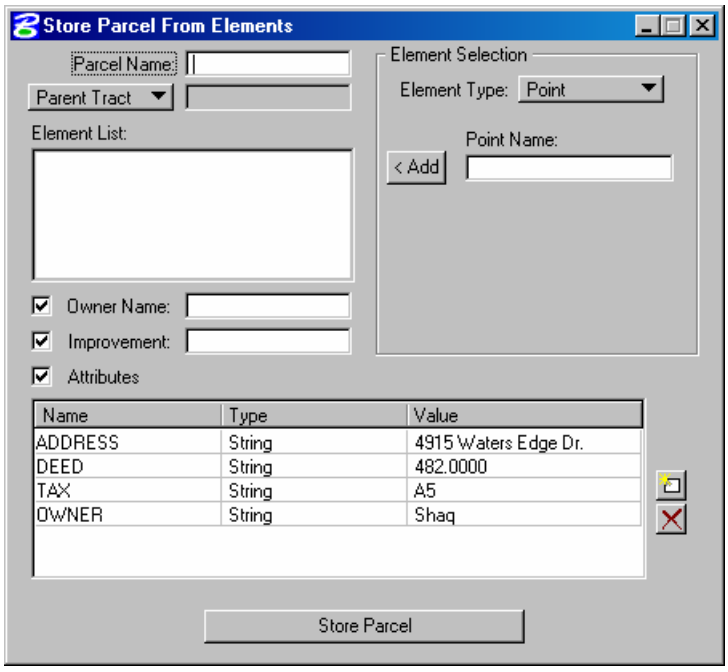
The ability to setup a list of default preferences is also available. This is accomplished by accessing the **Default Attributes Preferences** option from the Element > Parcel pulldown.



The dialog is used to compile a list of default preferences that will be displayed when storing any parcel. Values for each attribute can be changed as parcels are added to the database.

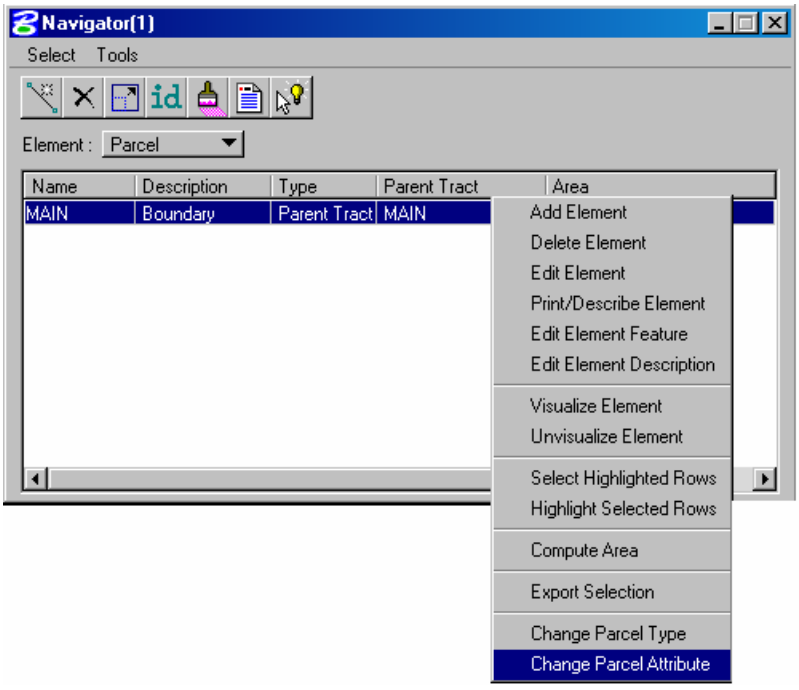


When the Store Parcel dialog is accessed the list of defaults will be displayed in the bottom.

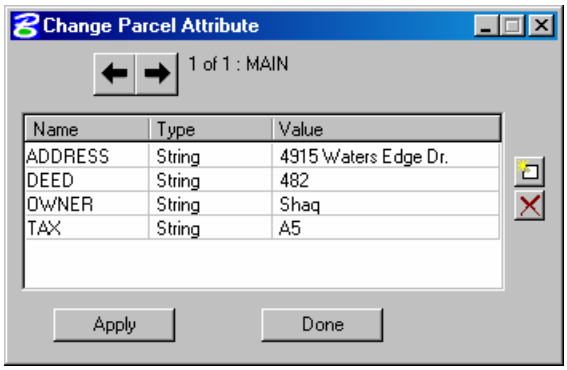


The attribute values are changed by simply clicking on any one of the three columns and providing an overriding value.

Parcel attributes can also be changed directly from the COGO Navigator. This is done by highlighting the previously stored parcel and right clicking. This action will present a menu where one option will be **Change Parcel Attribute** as shown below.

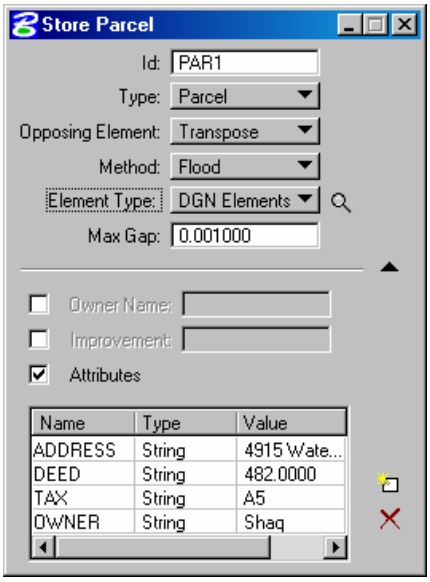


Once selected, the attribute editing dialog will appear allowing for the adding, deleting or changing of the user attributes.



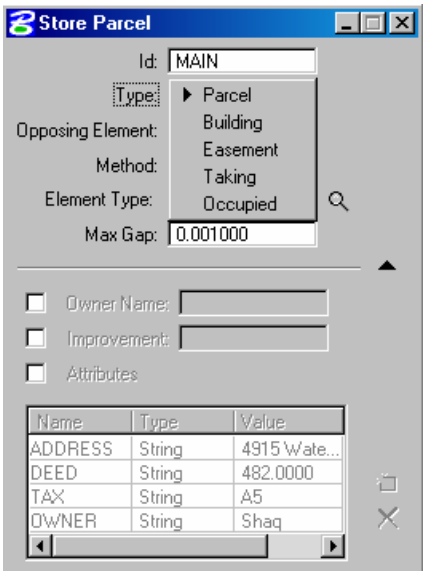
GRAPHICAL COGO

Graphical COGO also supports the addition of user defined attributes when storing graphically. This is accessed via the Store Parcel dialog as shown below.

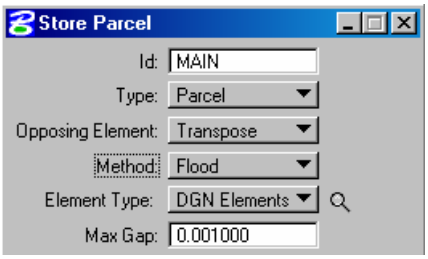


The functionality is identical to assigning the attributes in classic COGO.

The new **Occupied** type has also been added to the graphical Store Parcel dialog as shown below.



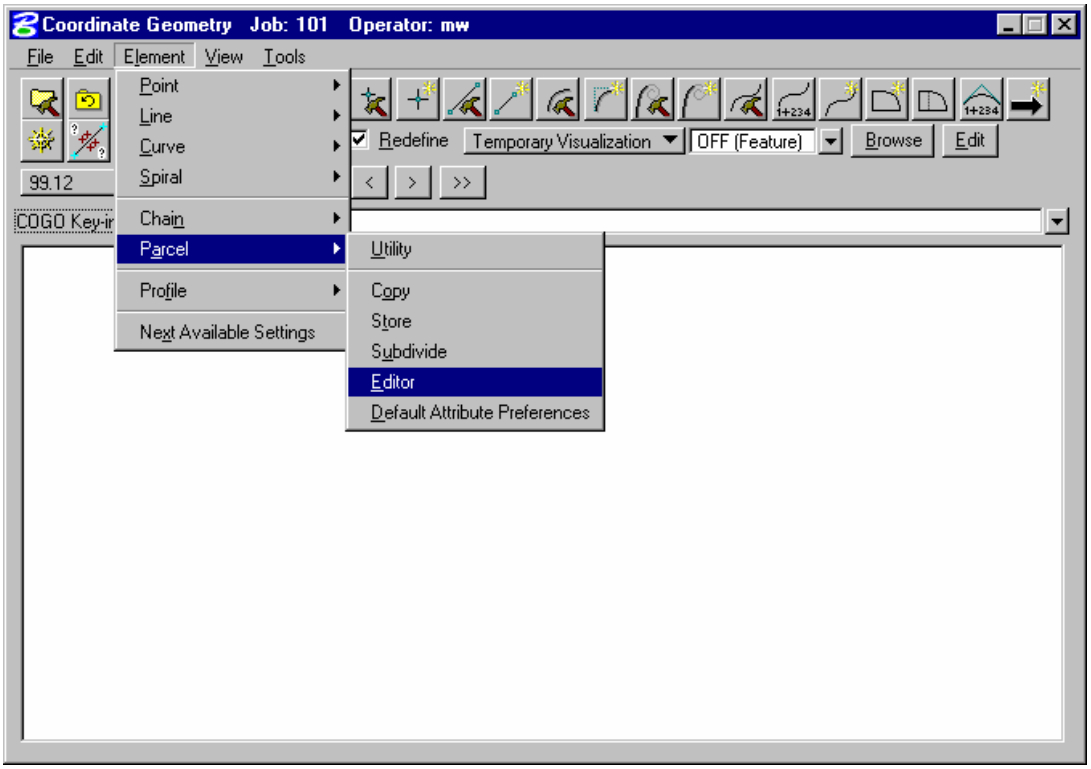
New Flood functionality has also been incorporated into the store graphical parcel dialog. This will allow the use of MicroStation's flooding capabilities for generating areas.



LAB EXERCISE: ENTERING PARCEL DATA

> *PARCEL EDITOR*

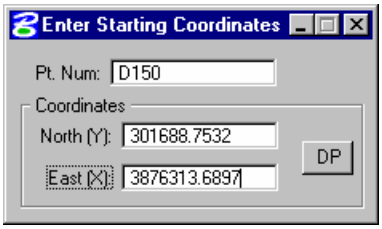
1. Open the MicroStation file ***C:\60843\s60843.dgn***
2. Attach the saved view ***ISTAR***
3. Access ***GEOPAK Survey*** and open the existing project ***60843***.
4. Use the user ***Mary*** to access the project.
5. Click on the button to open Coordinate Geometry
6. Select the Editor from the ***Element*** > ***Parcel*** > ***Editor*** pulldown.



7. Begin by clicking the ***Starting NEZ*** button and entering the POB coordinates.

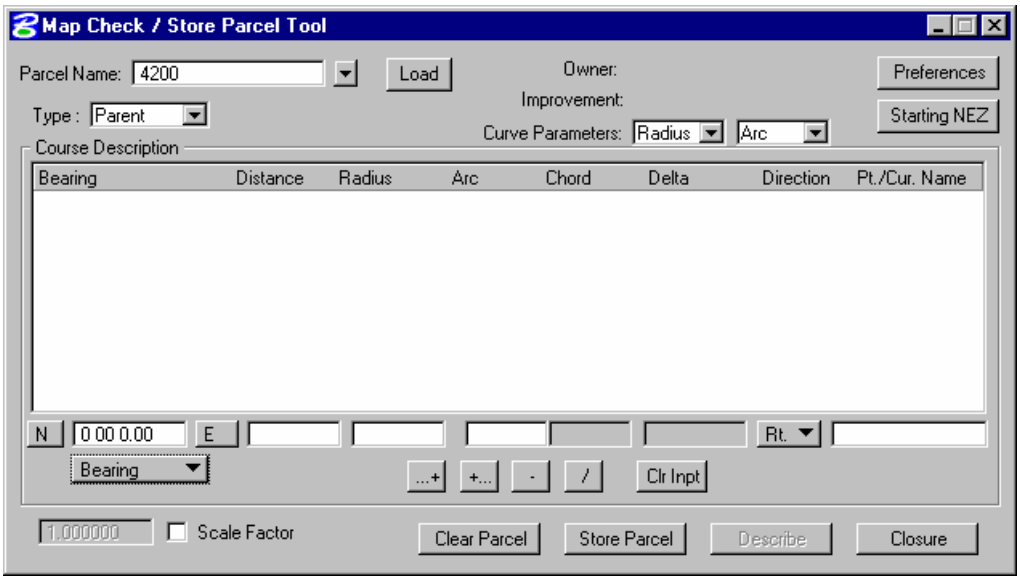
Northing	301688.7532
Easting	3876313.6897

8. Begin with point number D150



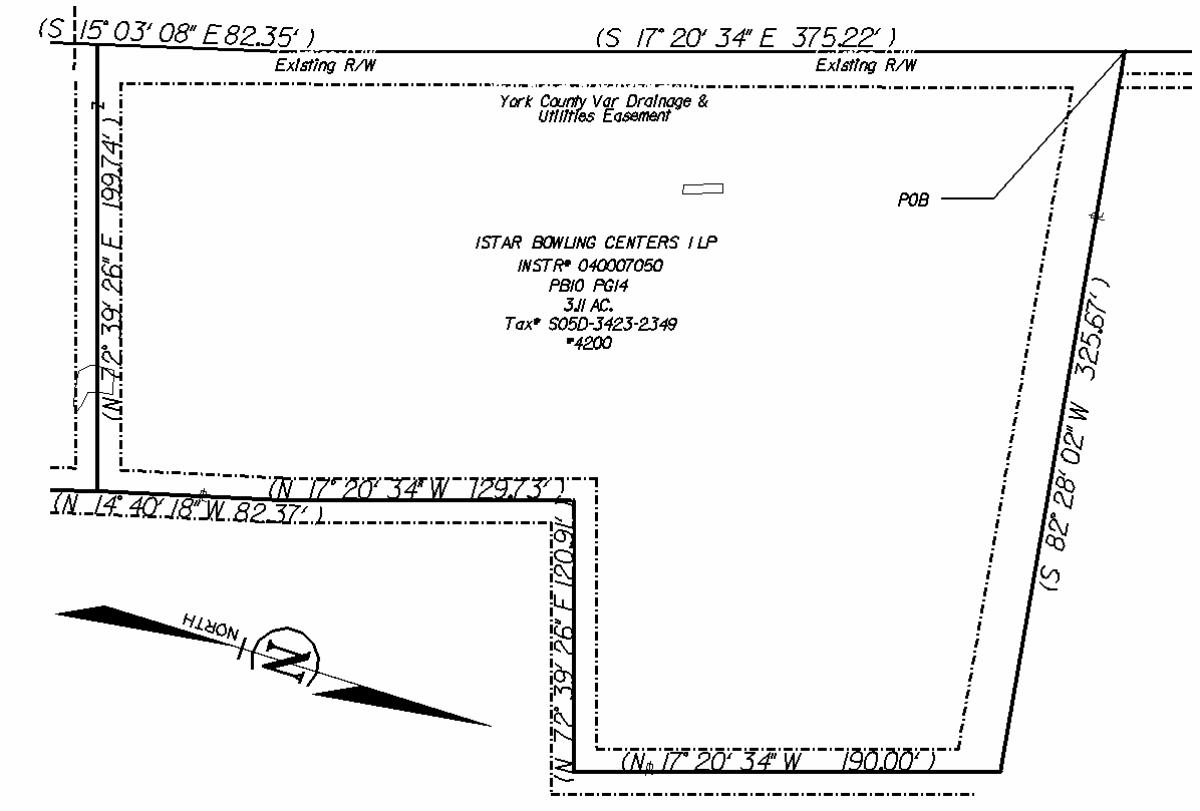
9. Close the ***Starting NEZ*** dialog.

10. Next, enter the ***Name*** 4200 for the parcel and set the ***Parcel Type*** to Parent.

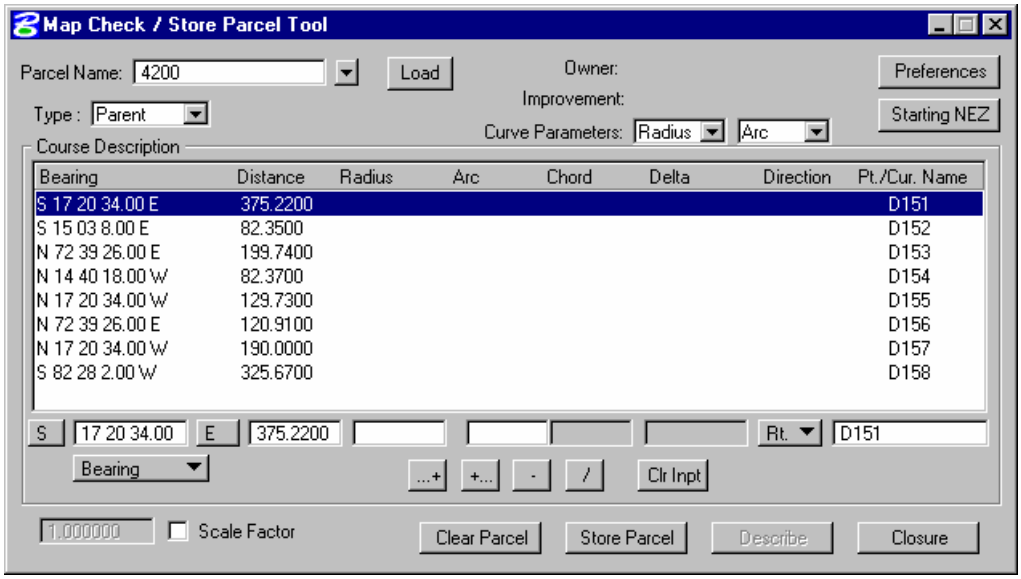


11. Begin entering the metes and bounds outlined below.

Note Pay attention to the direction of the bearings in regards to the North Arrow.



12. When completed you should have all of the metes and bounds entered in the dialog as shown below.



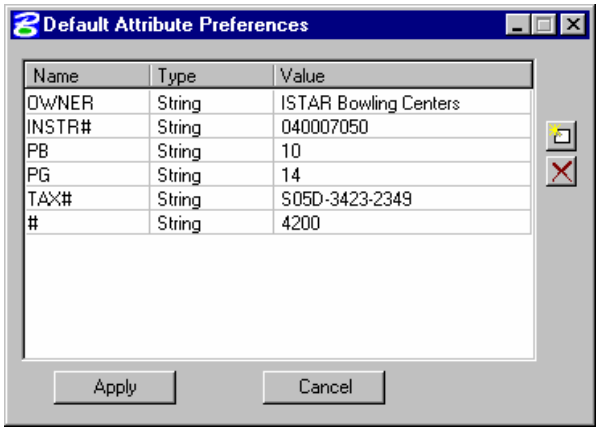
13. Click the ***Closure*** button and review the closure in COGO.

> ***Note*** The Closure should be approximately 1:5200

14. Click the ***Store Parcel*** button to store the parcel.

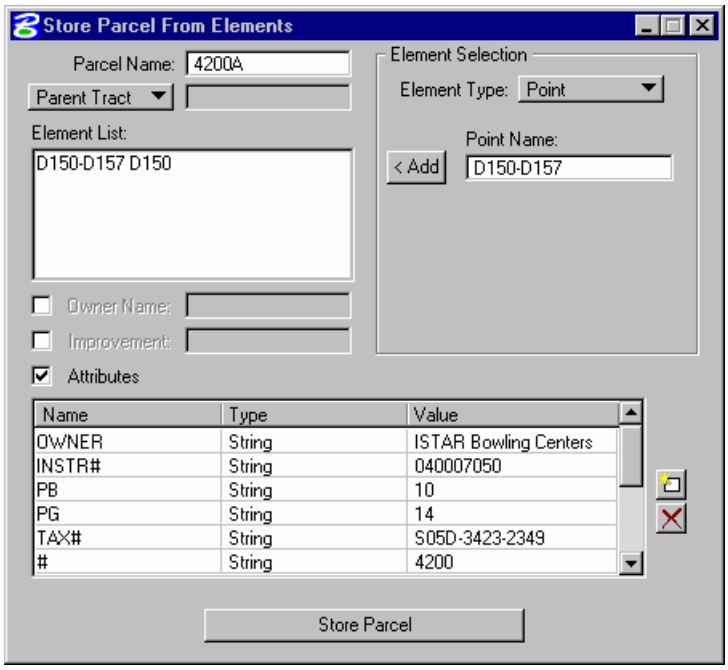
> *STORING PARCEL ATTRIBUTES*

1. Select from the COGO ***Element*** pulldown ***Parcel > Default Attribute Preferences***
2. Add each attribute into the dialog as shown below.

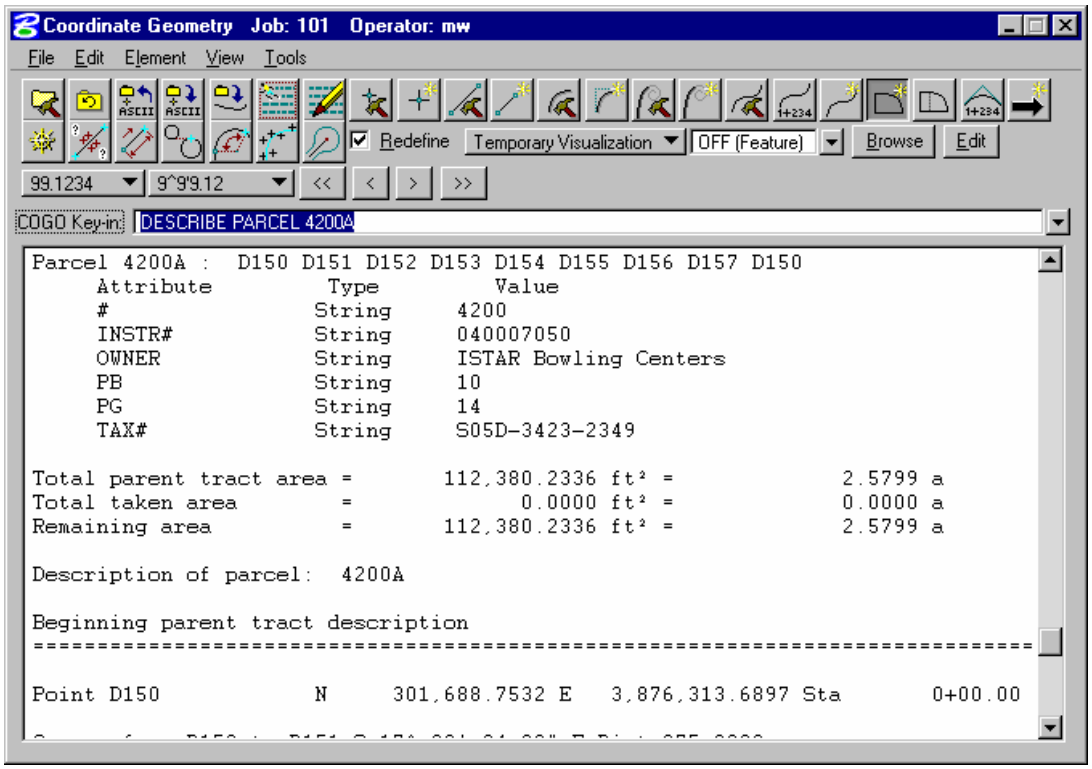


3. Click the ***Apply*** button.
4. Now select ***Element > Parcel > Store***.

5. Include the points as shown below and store the parcel.



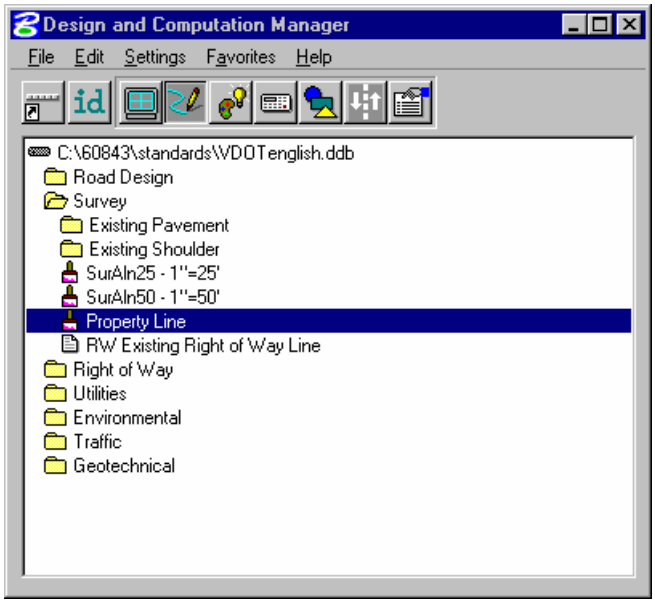
6. From the ***Navigator*** print the parcel and review the information.



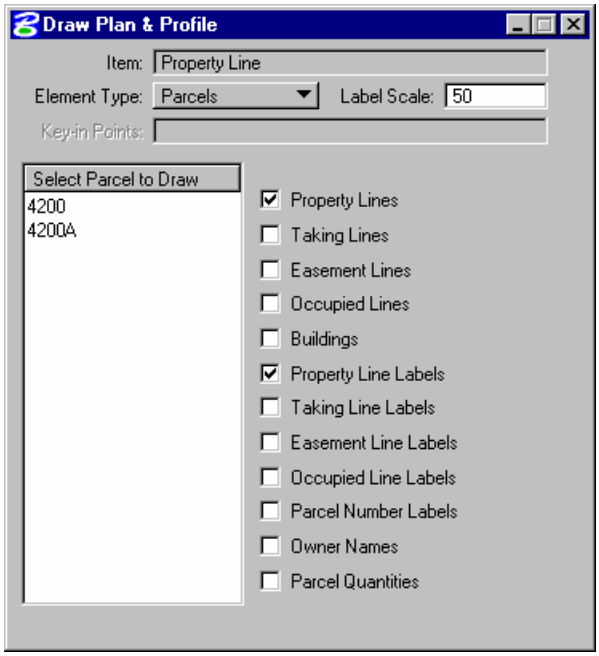
LAB EXERCISE: GRAPHICAL COGO

> *STORING A RIGHT-OF-WAY TAKE*

1. Create a new MicroStation file called ***Parcel.dgn***
2. From the main ***Survey Menu*** bar select ***Plans Preparation > D&C Manager***
3. Navigate the database to the item ***Survey > Property Line***



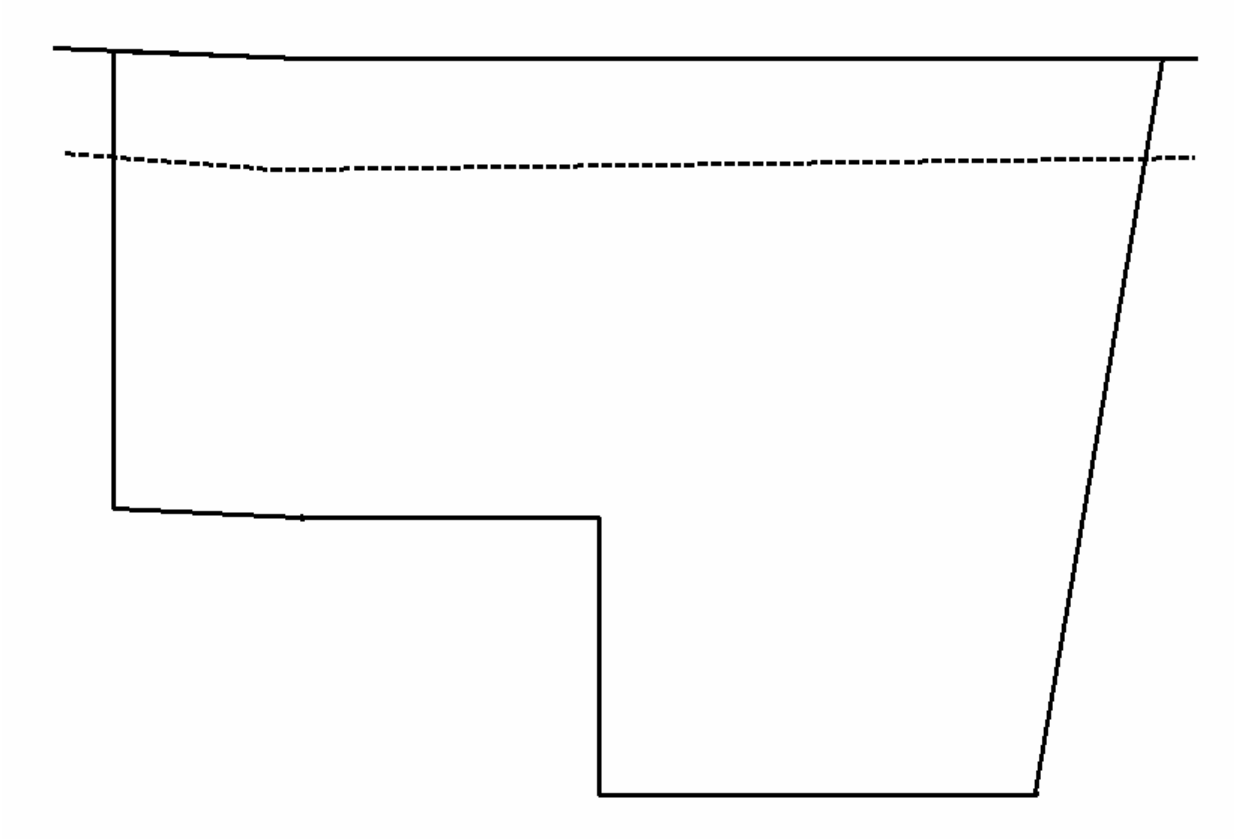
4. Highlight the item and then click the ***Draw Plan & Profile*** button on the companion dialog.
5. Make sure the ***Property Lines*** and ***Labels*** are toggled ON and that the ***Label Scale*** is set to 50.



6. Now click on the Parcel 4200 in the list window to plot it.

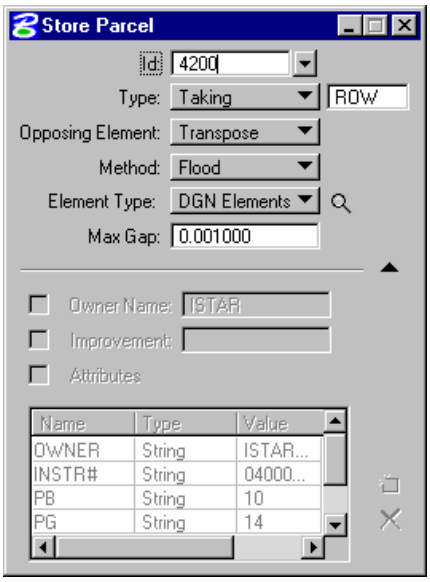
7. Select ***Applications*** > ***GEOPAK Road*** > ***Geometry*** > ***Graphical Coordinate Geometry***.

8. Set the active level to ***Default***.
9. Place a line representing a proposed right-of-way similar to the image below.

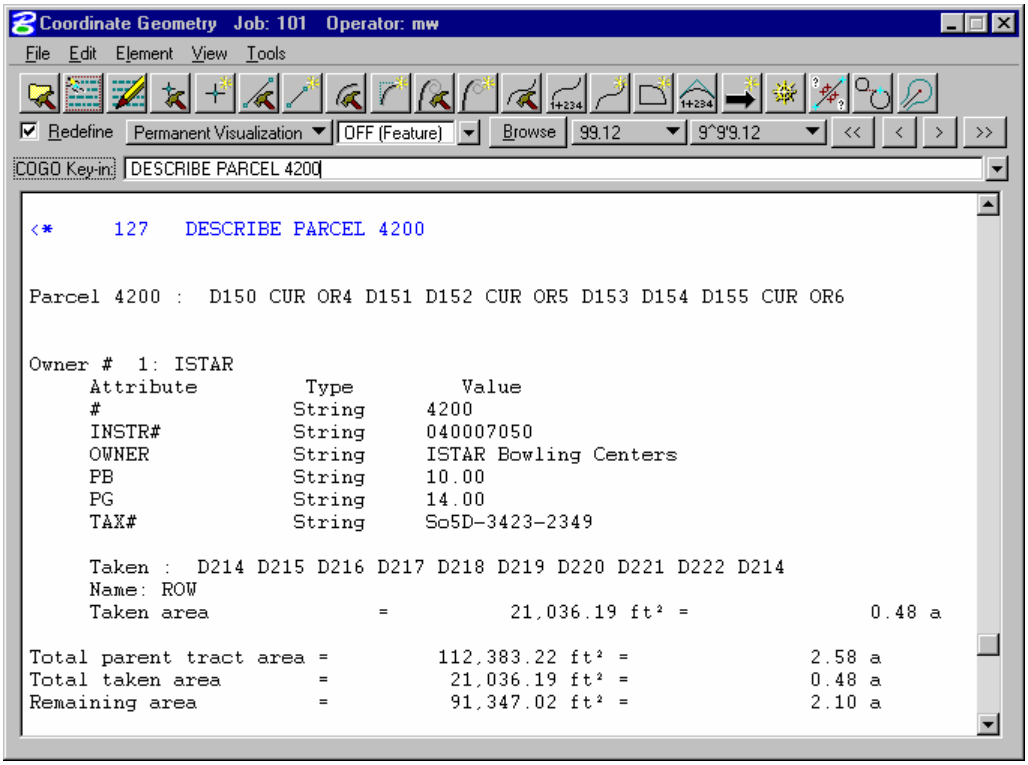


10. Click the icon to store a Parcel.

11. Enter the information as shown below.



12. Data point inside the area making up the right-of-way take.
13. Enter a second data point to accept the direction for storing the right-of-way take. (A right mouse button click will reverse the direction of the arrows).
14. Next, move your cursor around the perimeter of the area making up the right-of-way take and pick a POB for beginning the area and enter a data point.
15. Print the Parcel in Coordinate Geometry and review the data.



LEGAL DESCRIPTION EDITOR

OBJECTIVES

In this session we will review how to set up and access the legal description database and become proficient in using the Legal Description Editor.

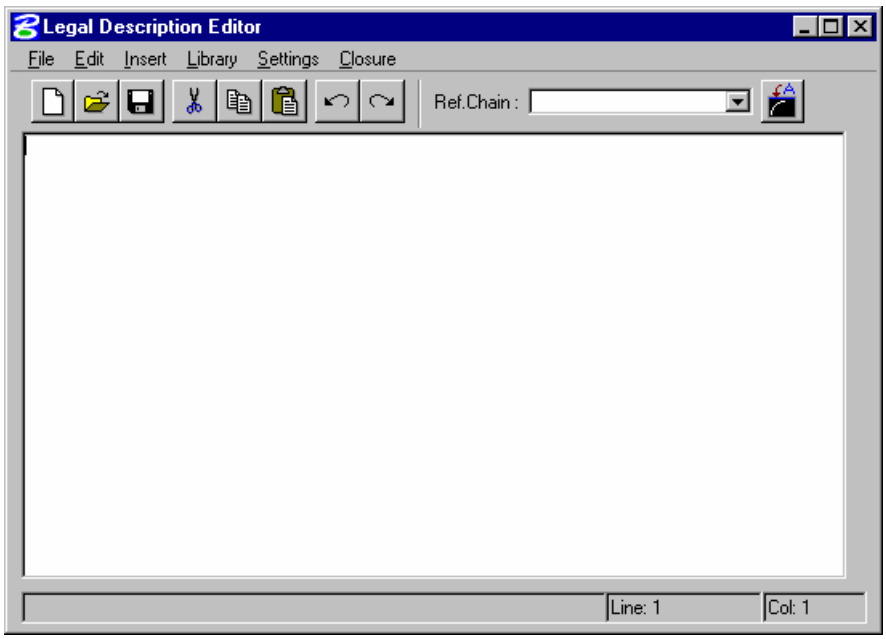
INTRODUCTION

The Legal Description Editor is a powerful tool for the automated generation of legal descriptions. Its power lies in the completely customizable terminology, styles, and preferences, all easily accomplished via dialogs.

ACCESSING LEGAL DESCRIPTION EDITOR

When the Legal Description Editor is accessed a dialog box prompting for the coordinate geometry database will appear like the one below.

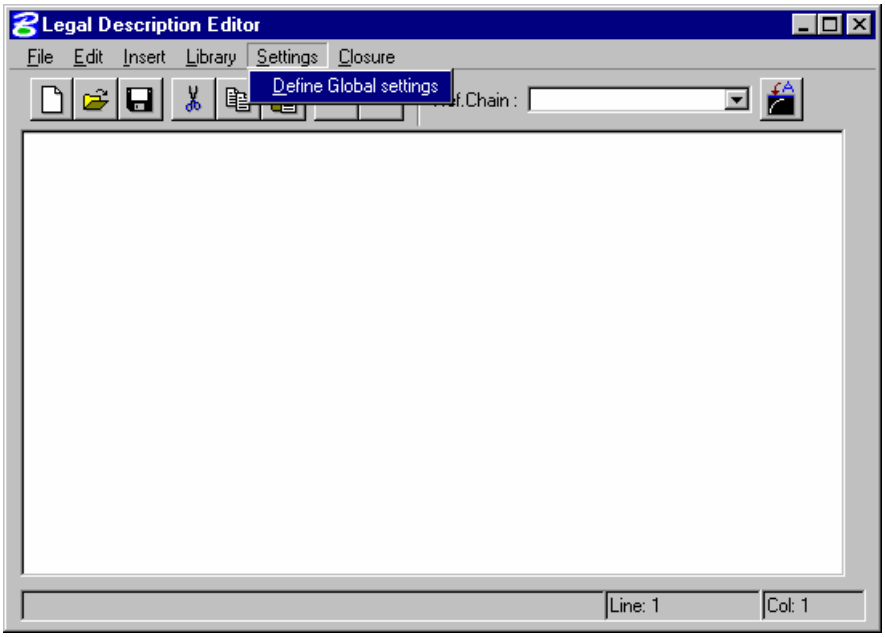
Once the desired job number is selected the main Editor dialog will appear.



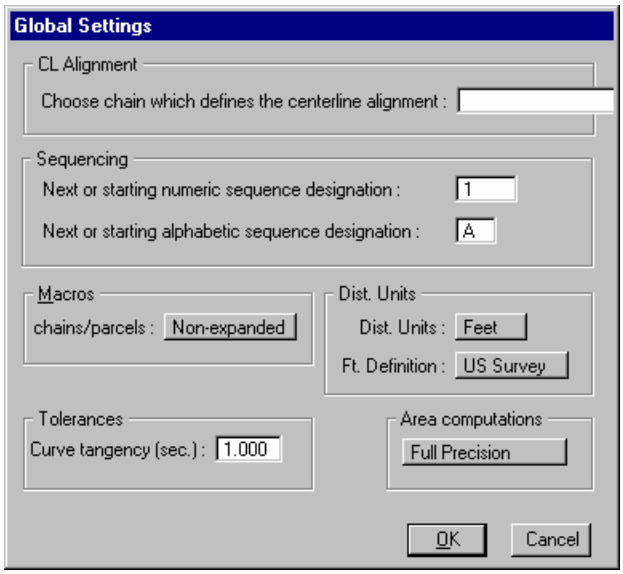
This dialog has several pull-downs allowing for customization of the Editor and default settings for how descriptions will be written.

GLOBAL SETTINGS

The first selection should be to set global settings.



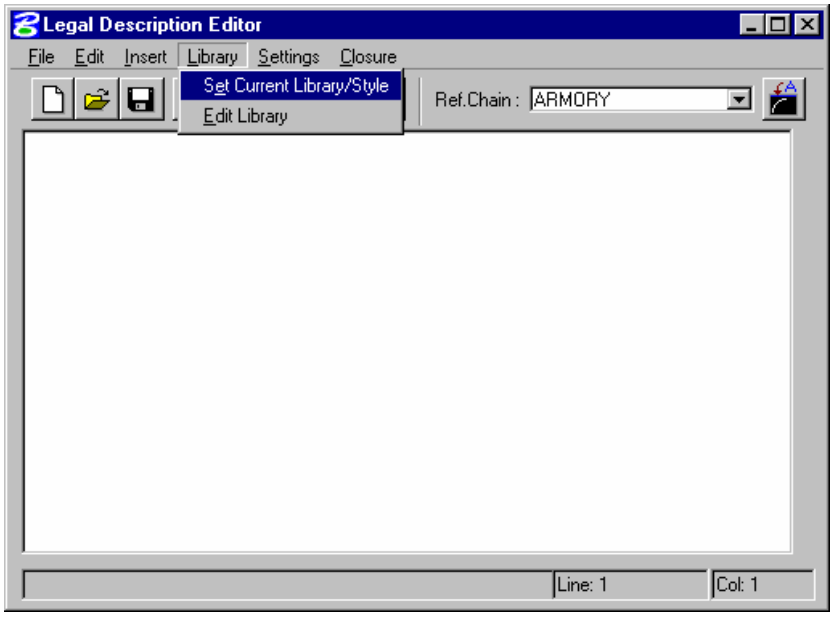
This will invoke the following dialog.



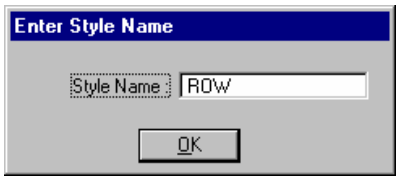
Most of these settings are rather self explanatory however probably the most important one is the very first one allowing the designation of a COGO chain for referencing stations in the description.

LIBRARY SETTINGS

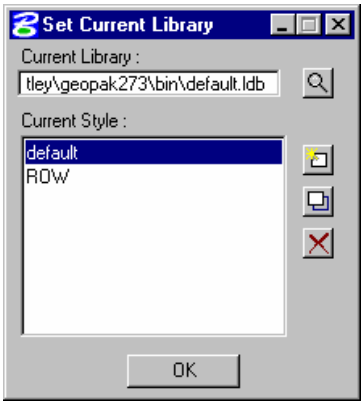
The Library Settings and the Library itself are without a doubt the most important part of the Legal Description Editor. The library provides a way for the user to establish default phrases and add customized phrases to a central location for recall at any time.



The first selection is the **Set Current Library/Style** option. If this is the first time this option has been selected you will be prompted to provide a **Style** name.

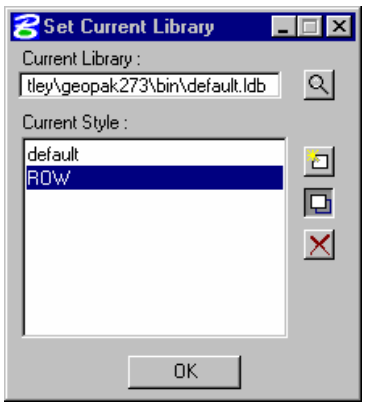


If this is not the first time this has been accessed and there is already a default or custom style name then you will be prompted with the following dialog where you can create a new style or select an existing one.

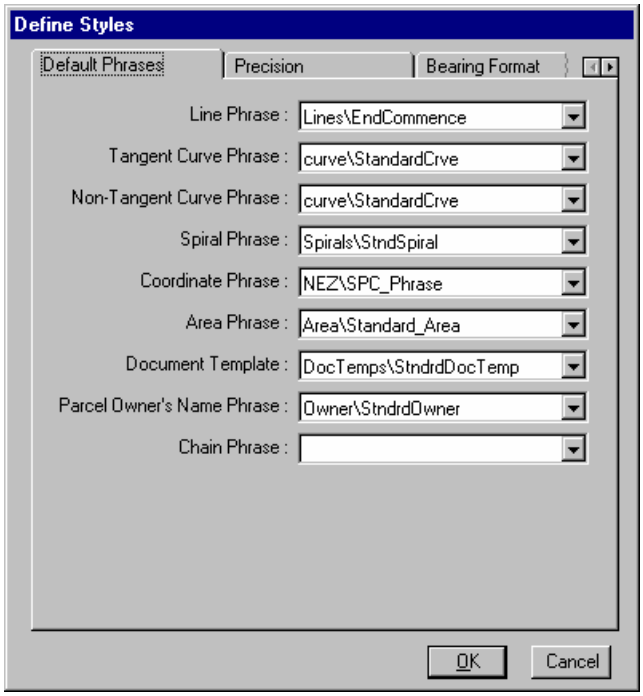


This allows the user to select the library from which to work from or to store defaults to. There is an option here to set various styles such as right-of-way, condemnations, etc. This provides the user with the flexibility to store and recall various styles depending on the type of descriptions that will be written.

Once a style has been created, that style can be edited from the dialog below by selecting the ***EDIT*** button.

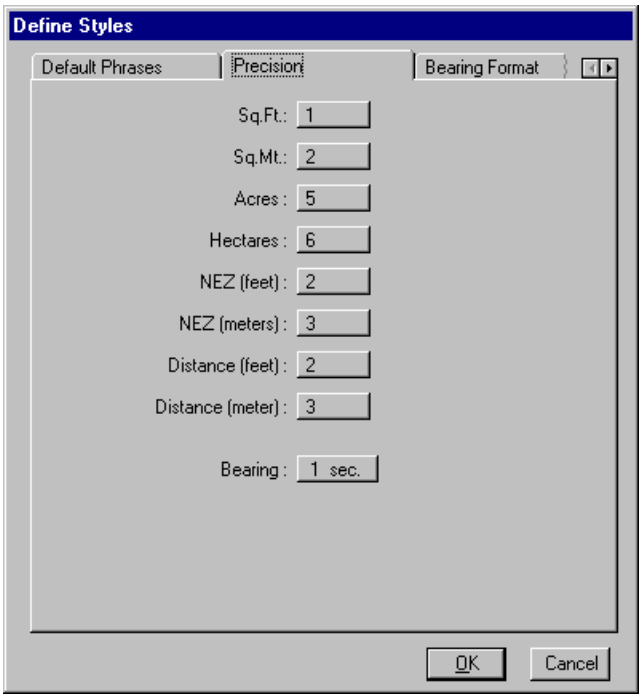


There are several tabs across the top of this dialog to allow the user to make settings according to phrase and defaults he wishes to use for this particular style.

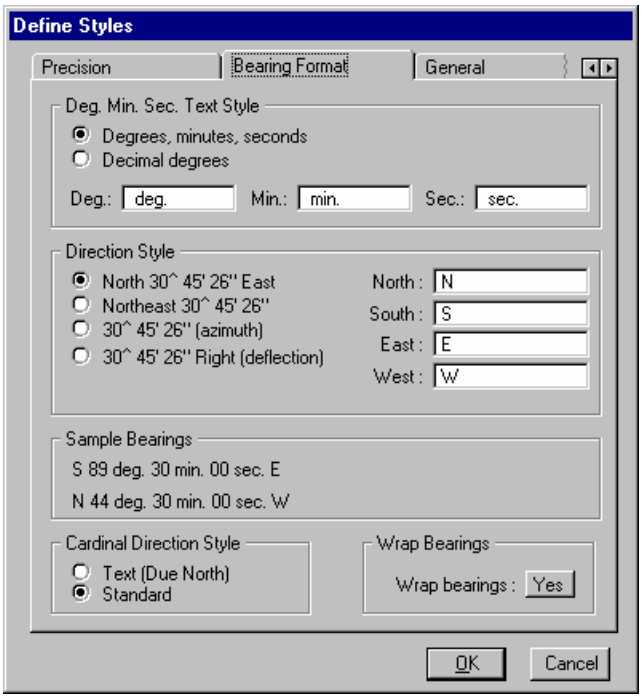


The first, as shown above, is for setting up default phrase for when a particular element is encountered.

The next option, as shown below, allows the setting of precision variables.

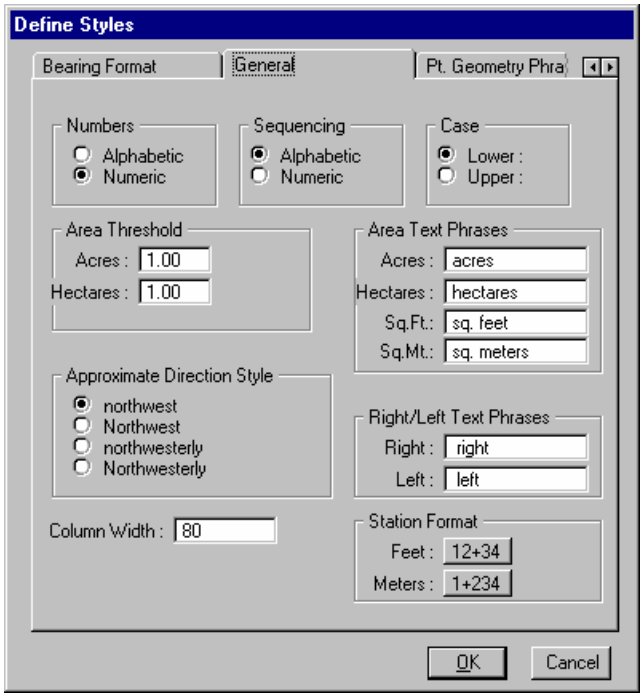


As you review the various tabs the next ***BEARING FORMAT*** tab, gives the user the flexibility to control how bearings are displayed when the description is automatically written.

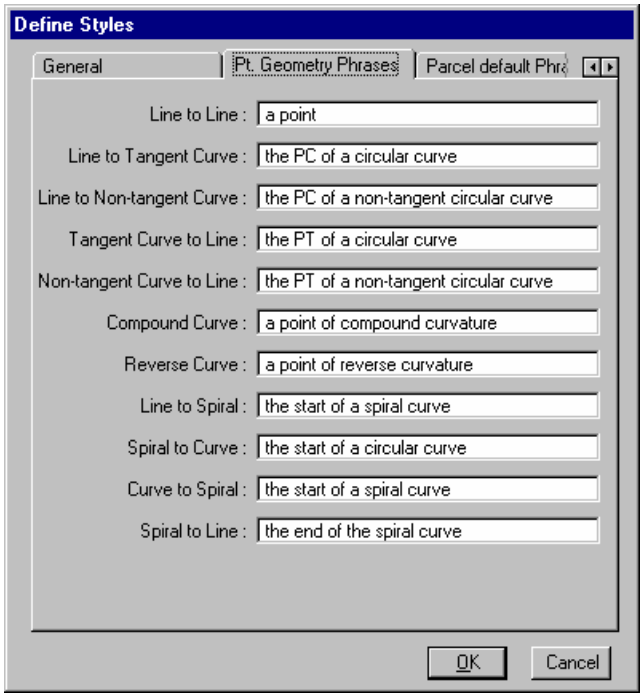


Notice how this dialog displays a sample of the desired bearing as the different options are set.

The next dialog provides ***GENERAL SETTINGS*** for areas and directions. Probably the most important settings here is the **column width**, as this will control the line wrapping and how the description is formatted.

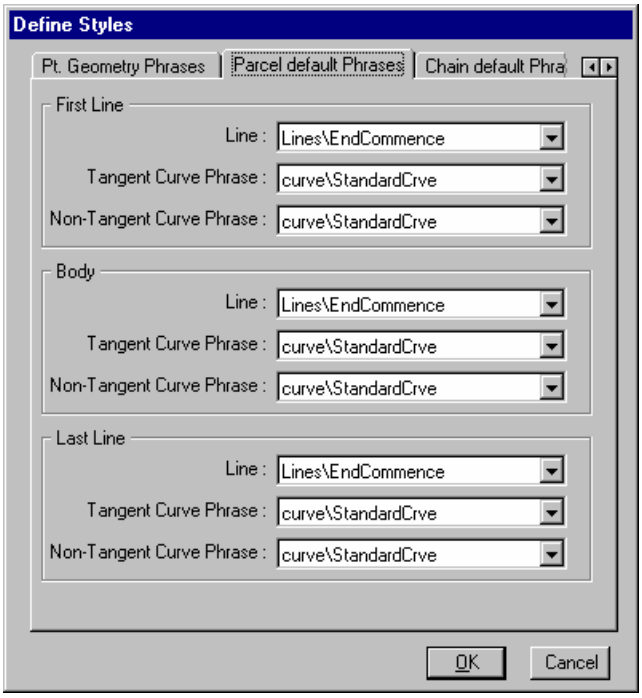


The ***POINT GEOMETRY PHRASE*** option allows the user to set default phrases for when the description encounters particular elements such as a PC or a reverse curve, etc.

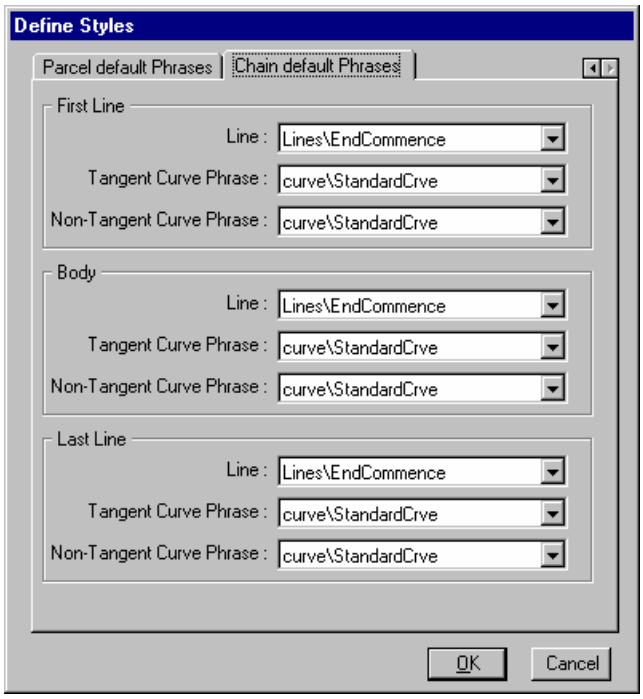


These phrases are inserted into the description using the <PTGEOM> variable. The <PTGEOM> variable may be included as part of a line phrase. It is completely up to the user whether to use the <PTGEOM> as part of his line phrases.

The ***PARCEL DEFAULT PHRASE*** option is very similar to the ***POINT GEOMETRY PHRASES*** in that the user can establish defaults for parcel descriptions from beginning to end. These phrases determine what line style will be used for the first line of a parcel, the body of a parcel, and the last line of the parcel.

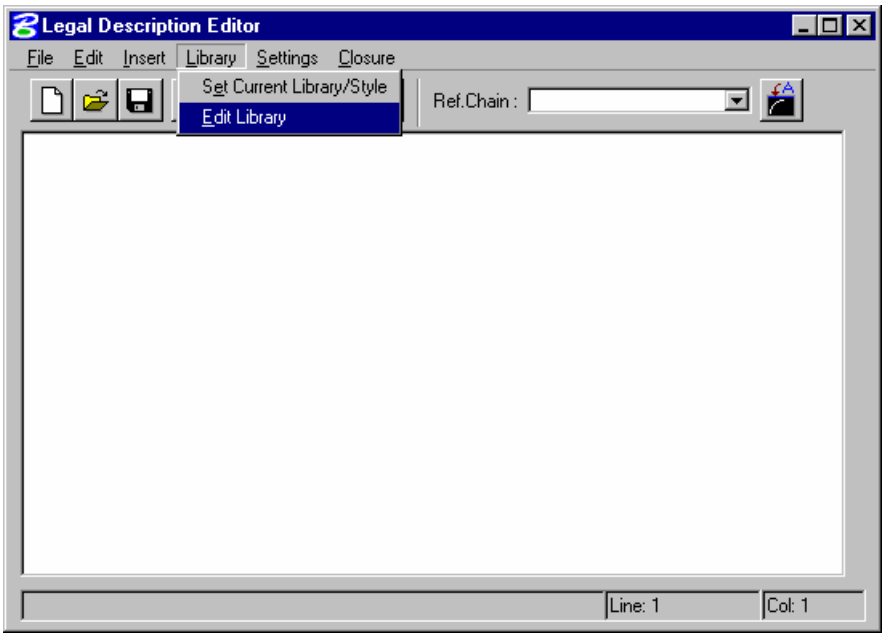


The same goes for the ***CHAIN DEFAULT PHRASES***.

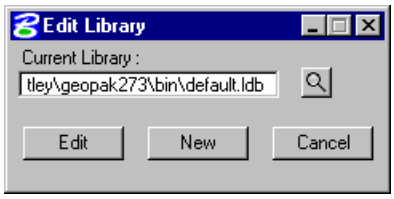


EDIT LIBRARY

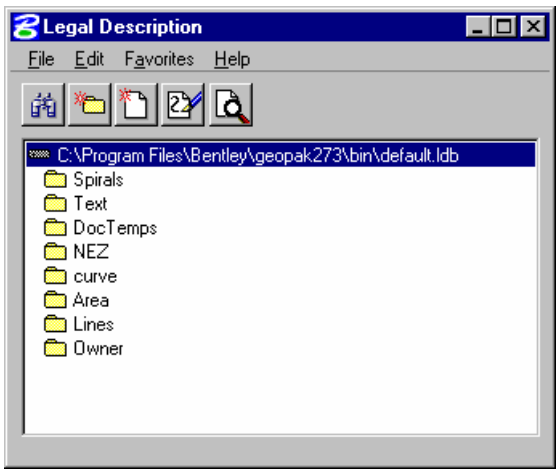
Once the Library and Style have been selected the user can edit the selected library or add to it. This is where the standard phrases are created and stored.



When selected the user must confirm/specify which library he wants to edit.

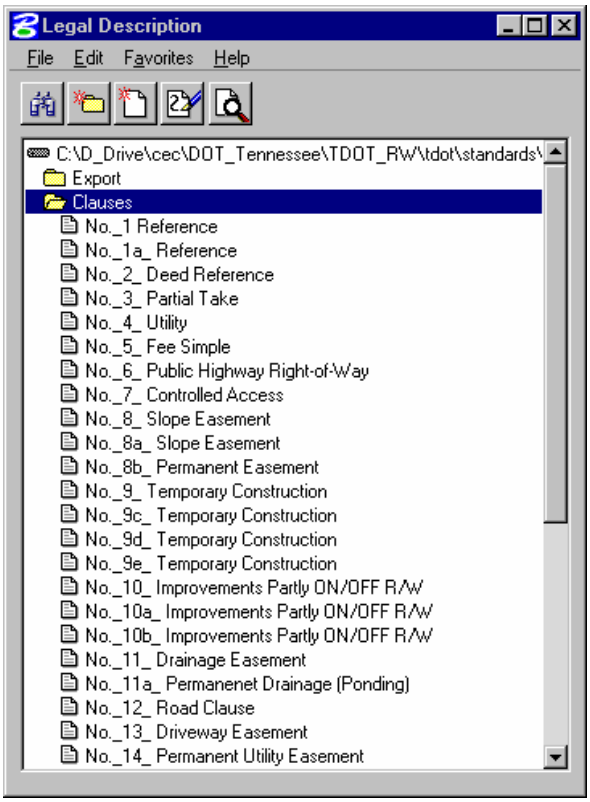


The following dialog will appear once the desired library is selected and the ***EDIT*** button is selected.



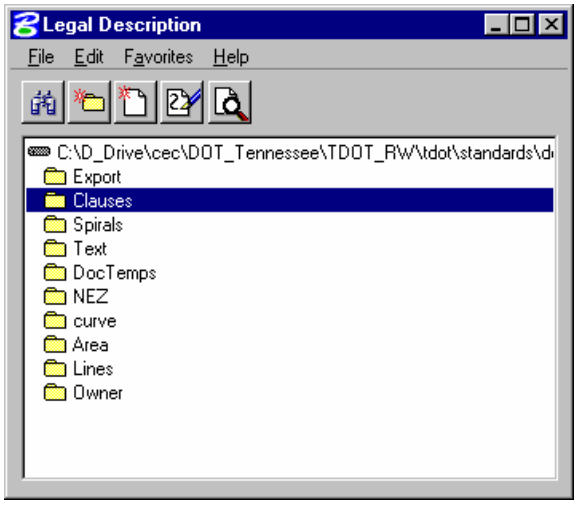
The setup of the library interface is very similar to the SMD file and the DDB file as discussed in previous chapters.

It is a hierarchy database allowing the user to create categories and items. In the dialog below the category ***CLAUSES*** has been created with various standard clauses set up as items within it.

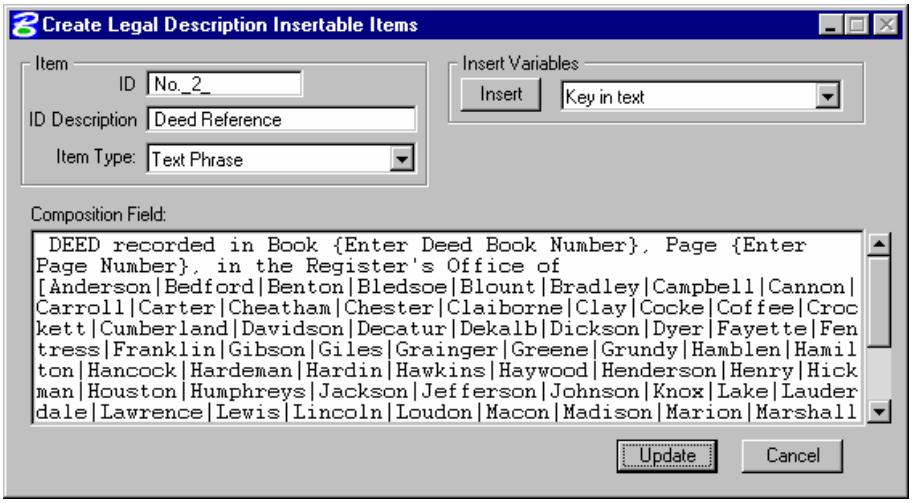


The clauses will be available for selection when writing the legal description and automatically inserted into the description.

Icons appear on the upper portion of the dialog for creating and editing items and categories.



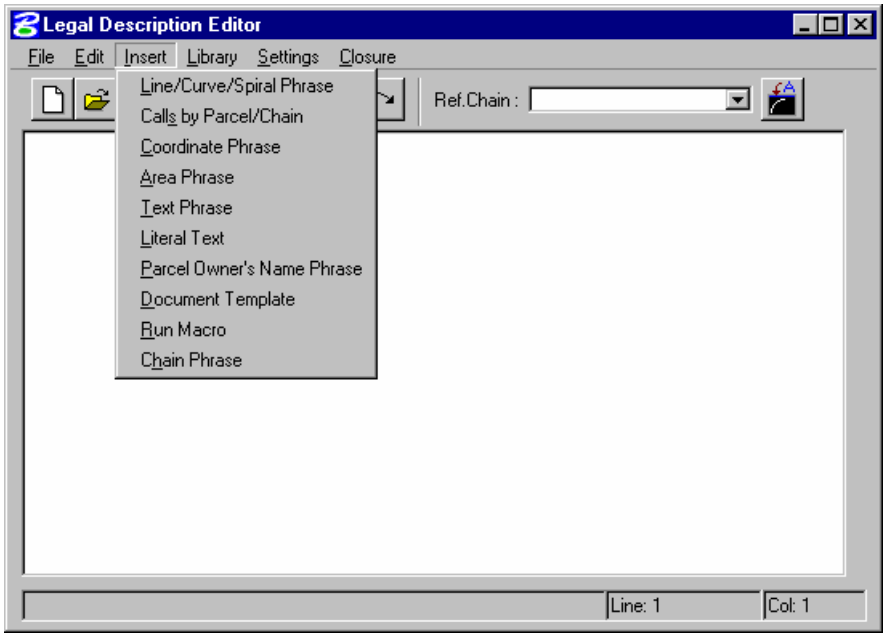
Here you can see an item for ***DEED REFERENCE*** that has been set up. This particular item has a list created in it so that when inserted into a description the user will have the opportunity to select from a list of counties to insert.



INSERTING PHRASES

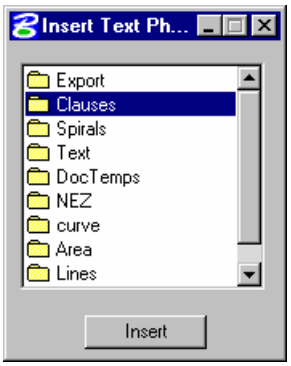
When the library has been set up and stored the user is ready for writing a legal description.

This is done by selecting from the ***INSERT*** pull-down.

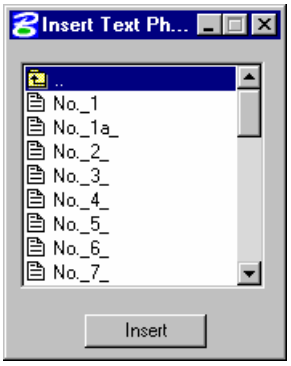


The user uses the insert option to select the desired type of phrase to insert. Once selected, dialogs will appear allowing for the selection of that particular type of phrase from the items that were saved in the library.

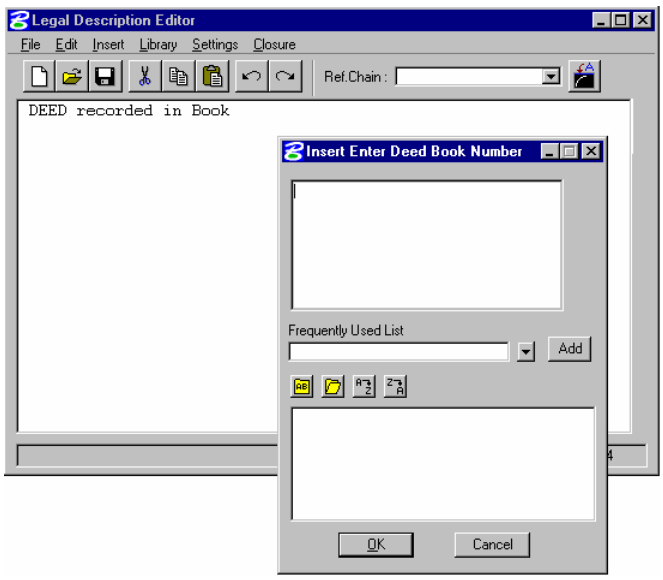
For example a ***TEXT PHRASE*** could be selected and the following dialog will appear.



The user then selected the type of ***TEXT PHRASE*** such as ***CLAUSES…*** and then the following dialog appears allowing for the selection of the desired clause.

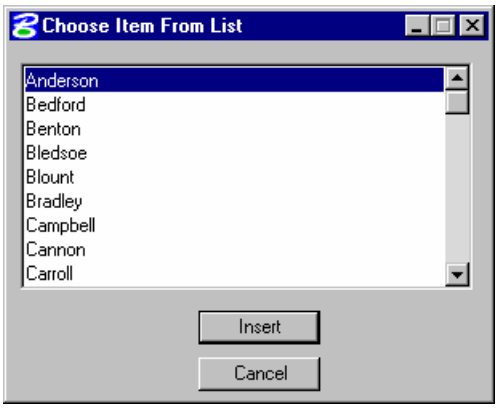


Once highlighted and the ***INSERT*** button selected, the phrase will be inserted into the description in its entirety. In this case part of the phrase is automatically placed in the description and then the user is prompted to provide some variable information.

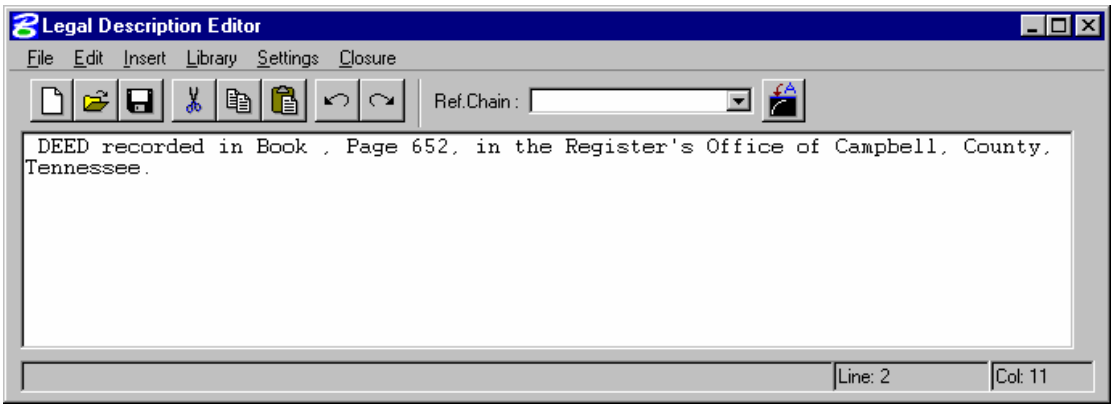


Notice the top bar of the secondary dialog is asking for a Deed Book Number. When keyed-in, it will be placed in the description and the program will continue building the standard text until another variable is encountered.

In this case once the book and page are provided, yet another variable is encountered but this time the user is prompted to select from a list of known options, (counties).



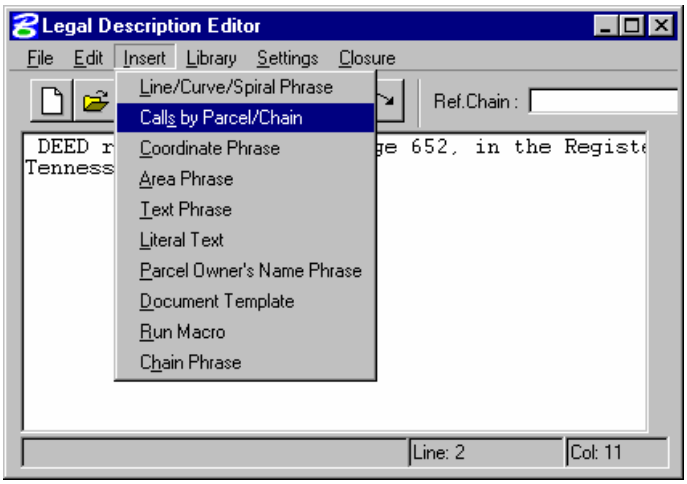
Here you can see the final product of inserting this one phrase.



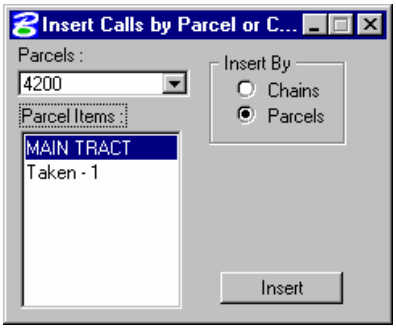
Remember the above dialog is nothing more than an editor and you have the option of simply typing anything in it to supplement or modify what an insert has placed there.

The last thing to remember is that you can use the ***FILE>SAVE*** option to save your completed legal description and then import into Microsoft WORD or any other editor of your choice.

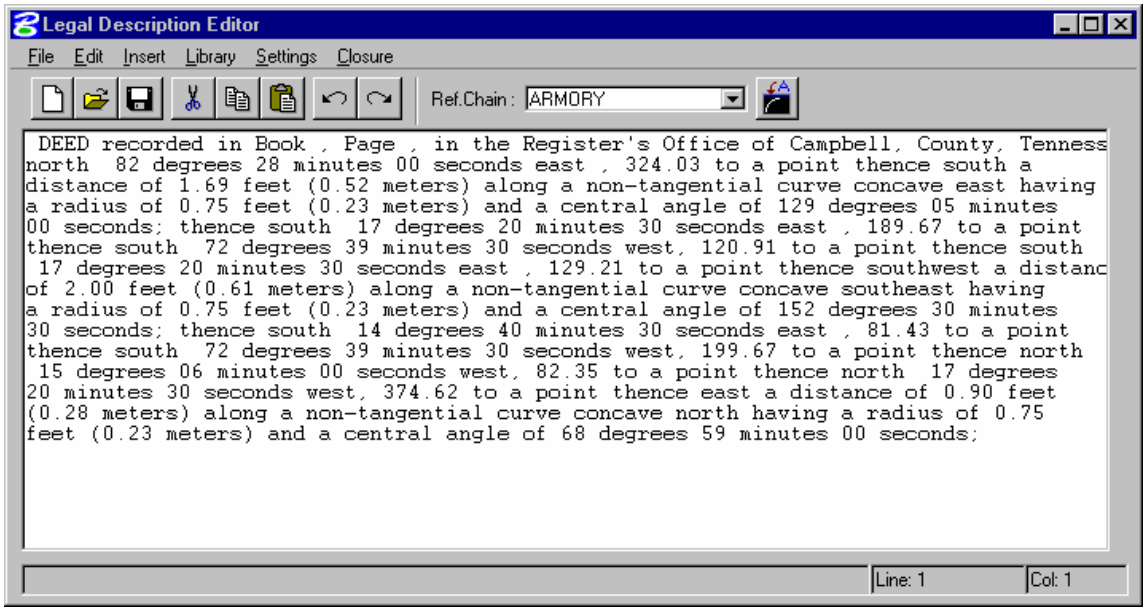
To insert the entire metes and bounds of a stored parcel, you return to the insert option and select the ***CALLS BY PARCEL/CHAIN*** option.



This will invoke the following dialog.



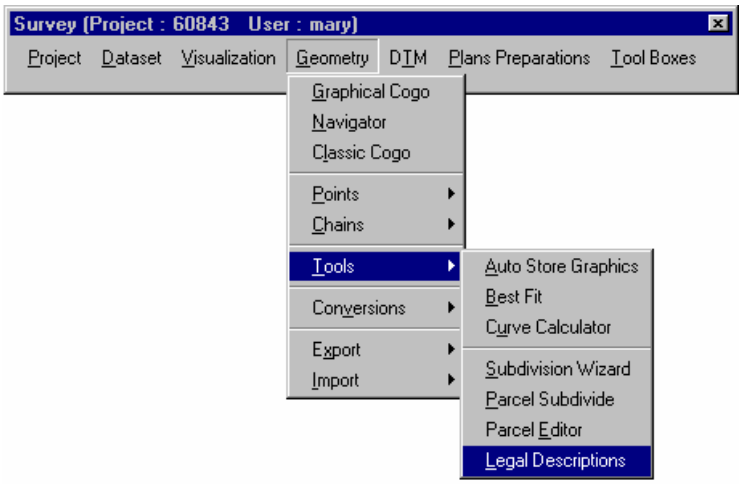
The user must then select whether it is a chain or a parcel he wishes to describe and then select the ***INSERT*** button. This will continue the writing of the description.



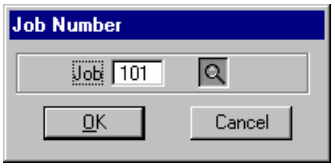
LEGAL DESCRIPTION EDITOR

> ***SETUP OF LEGAL DESCRIPTION EDITOR***

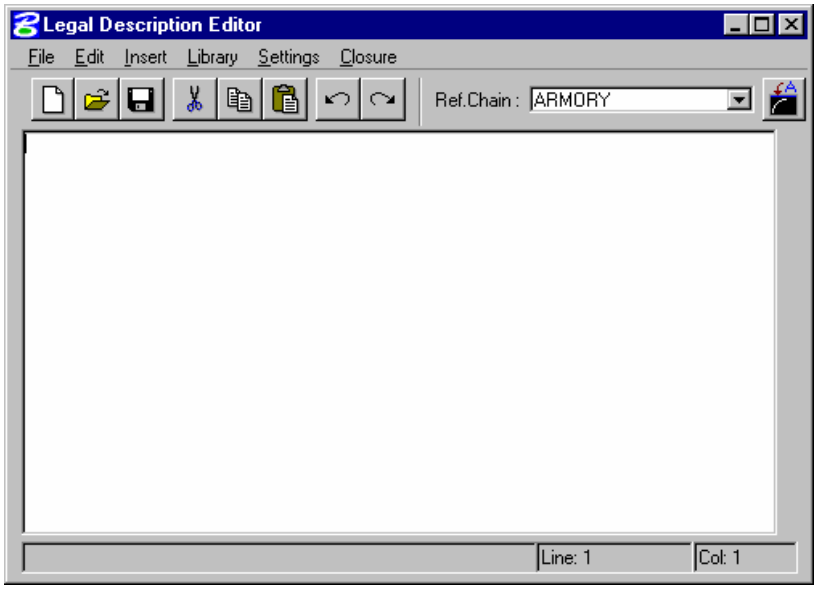
1. Access the ***Legal Description Editor*** from the following pulldown on the ***Survey Menu*** bar:



2. When the Legal Description Editor is accessed a dialog prompting for the coordinate geometry database will appear like the one below. Select the job (job101.gpk) for this project.



3. Once the desired job number is selected the main Editor dialog will appear.



Note We will be attempting to create the following description.

Federal Project Number APD-NHE-111(36)

State Project Number 77041-2219-64

Richmond County, Tract 4200

Owner ISTAR Bowling Centers

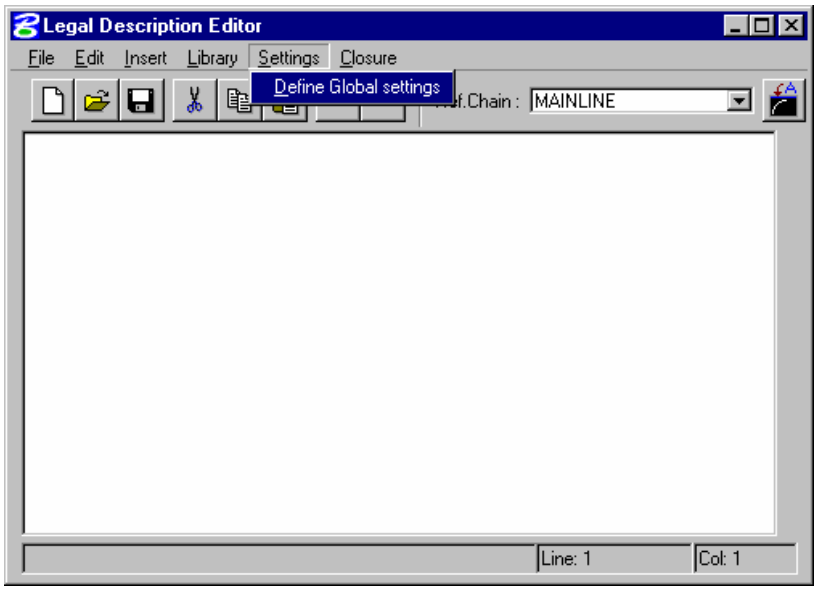
Grantee State of Virginia

DESCRIPTION

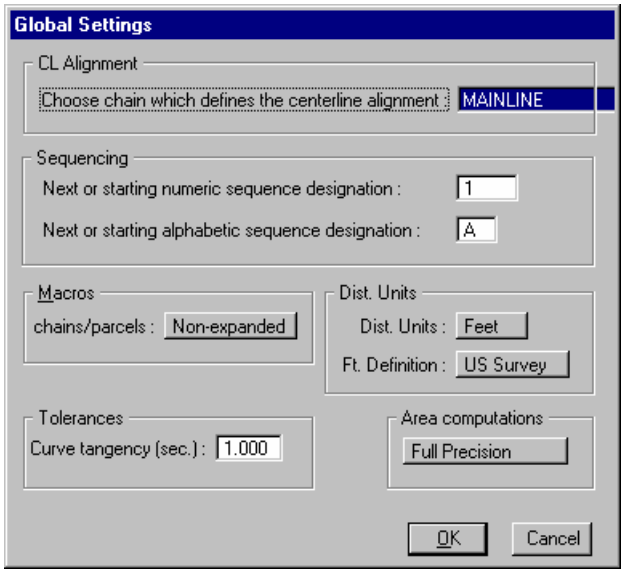
EXHIBIT "A"

Beginning at a point of intersection between the south property line of ISTAR Bowling Centers and the proposed right of way line of George Washington Memorial Highway on highway project no. APD-NHE-111(36), 88.1 feet right of centerline station 59+20.1; thence South 17 deg. 20 min. 30 sec. East, 375.2 to a point thence South 15 deg. 03 min. 00 sec. East, 82.3 to a point thence North 72 deg. 39 min. 30 sec. East, 199.7 to a point thence North 14 deg. 40 min. 30 sec. West, 82.4 to a point thence North 17 deg. 20 min. 30 sec. West, 129.7 to a point thence North 72 deg. 39 min. 30 sec. East, 120.9 to a point thence North 17 deg. 20 min. 30 sec. West, 190.0 to a point thence South 82 deg. 28 min. 00 sec. West, 325.7 to the point of BEGINNING

4. Select from the **Settings** pulldown, **Define Global Settings** to make global settings for our description.



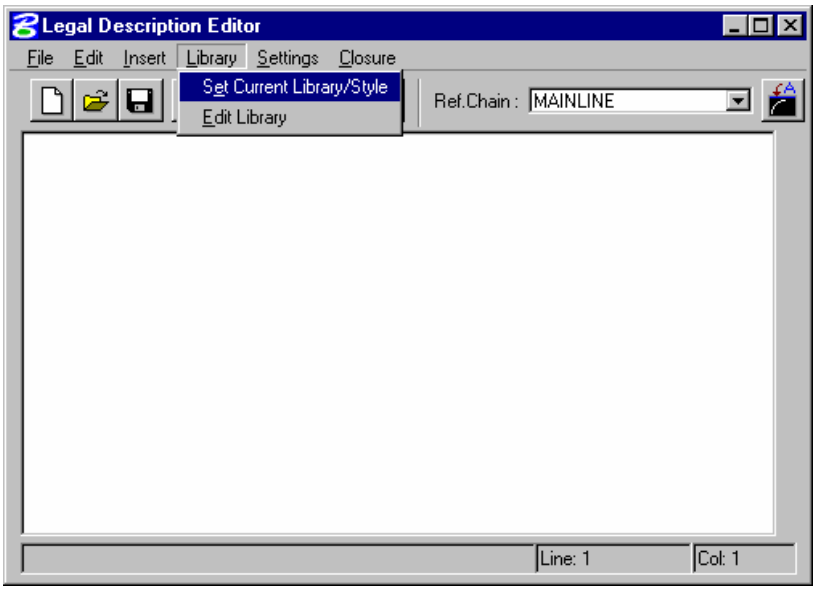
5. Make sure that all of the settings match those as shown below.



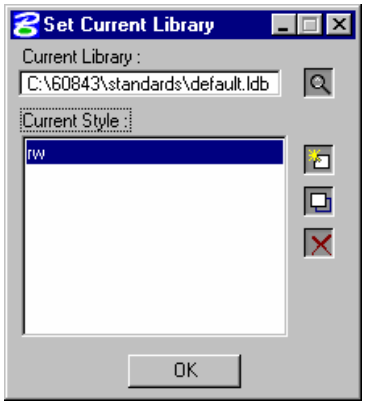
Note Be sure that the centerline chain is set to *Mainline* so that all the station references in our description will be automatically calculated from this alignment.

6. Once the global settings have been made, select the OK button to close the dialog.

7. Select from the Library pulldown, ***Set Current Library/Style***.

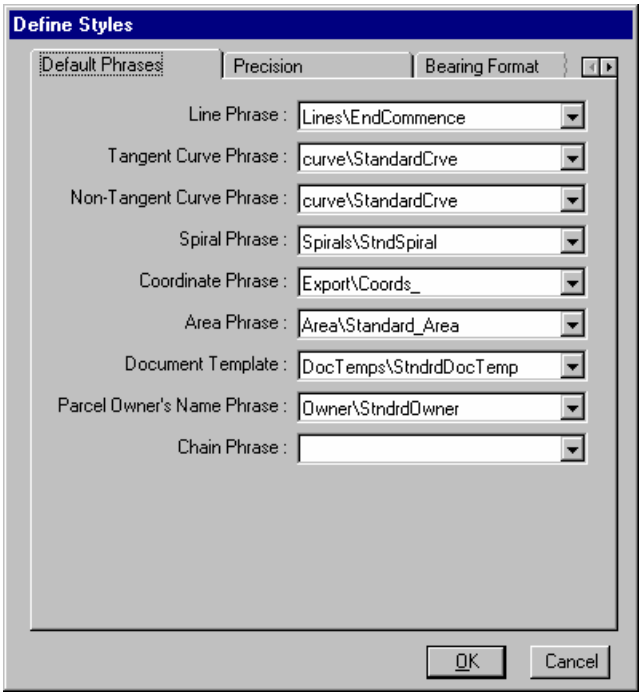


8. Using the ***File*** button select the library as shown below. If the GEOPAK environment variable ***Gpk_ldedit_ldbfile*** was set properly, then the correct library should be selected by default.



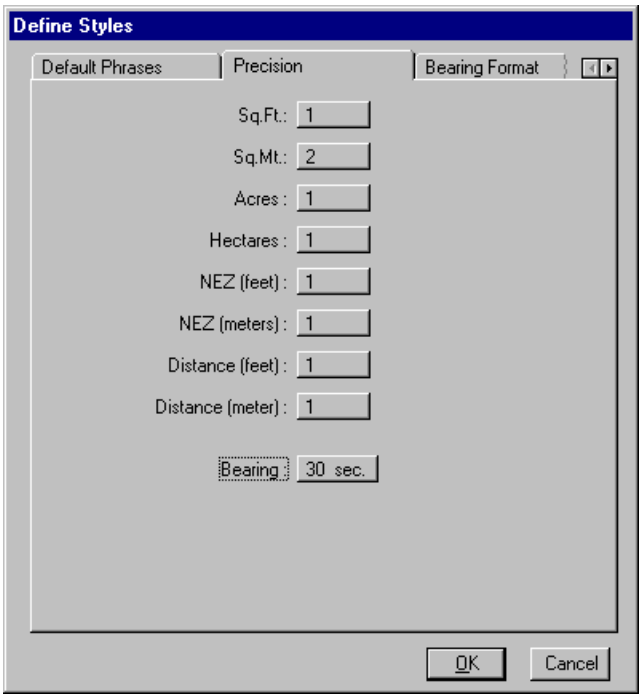
9. Once the library is set and the current style selected, choose the ***Edit*** button to access the dialog.

10. Make the settings as shown in the dialog below.

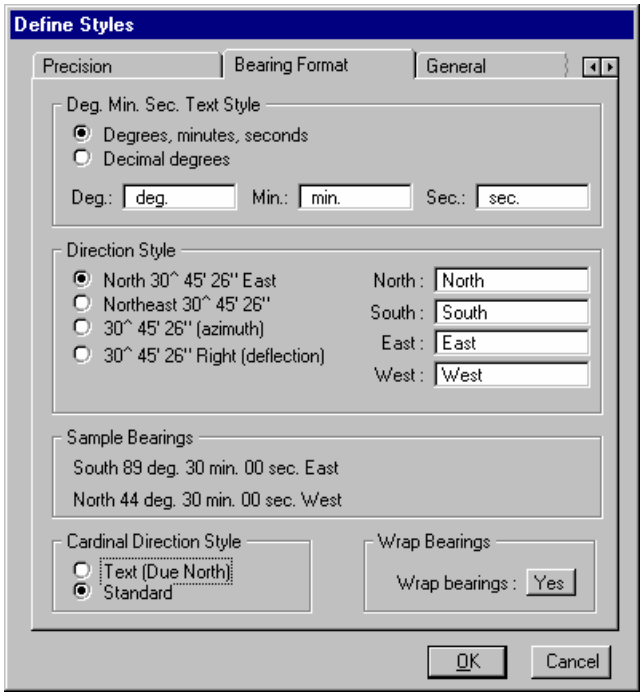


Note This will ensure the correct phrases are used when writing the description.

11. Next select the ***Precision*** tab and make the settings as shown below.

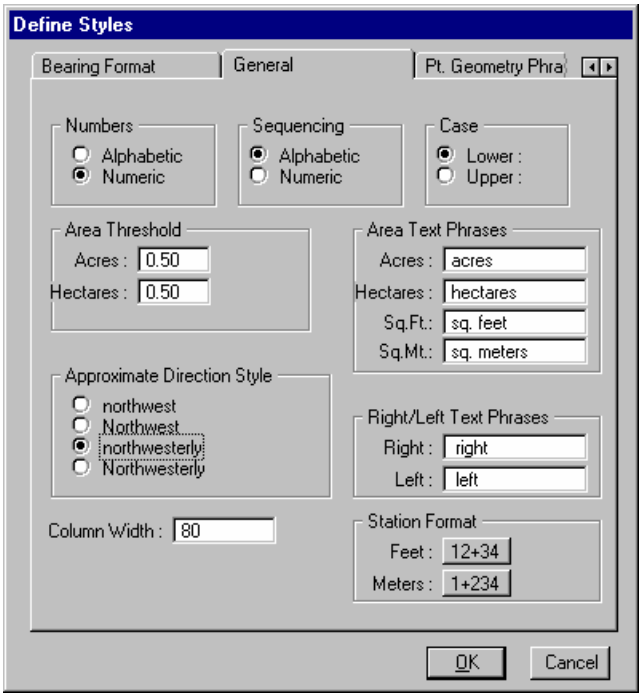


12. Select the ***Bearing*** tab and enter the settings as shown below.

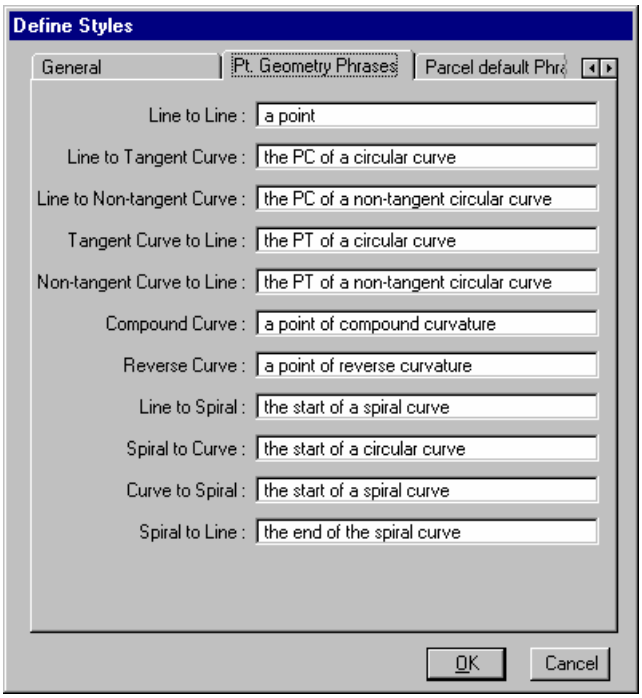


Note Notice how this dialog displays a sample of the desired bearing preferences as they are set.

13. The next tab provides ***GENERAL SETTINGS*** for areas and directions. Probably the most important settings here is the **column width**, as this controls the line wrapping and controls how the description is formatted. Enter the settings as shown below.

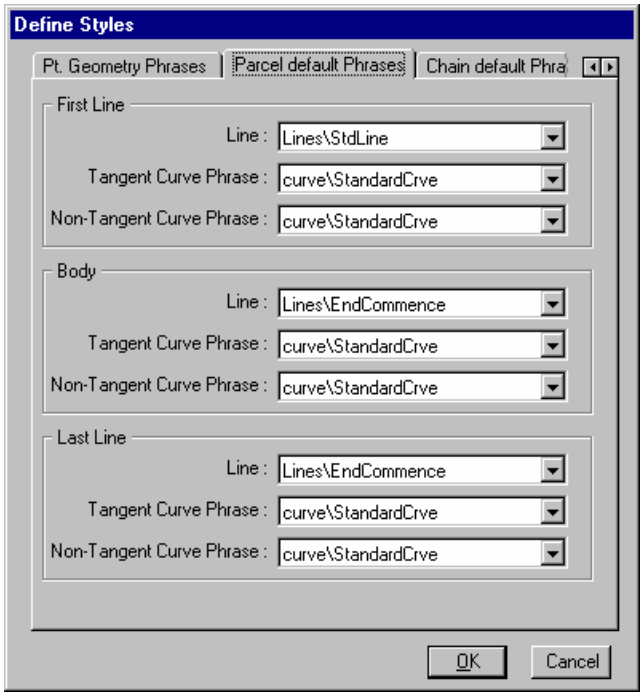


14. The ***POINT GEOMETRY PHRASE*** option allows the user to set default phrases for when the description encounters particular elements such as a PC or a reverse curve, etc.



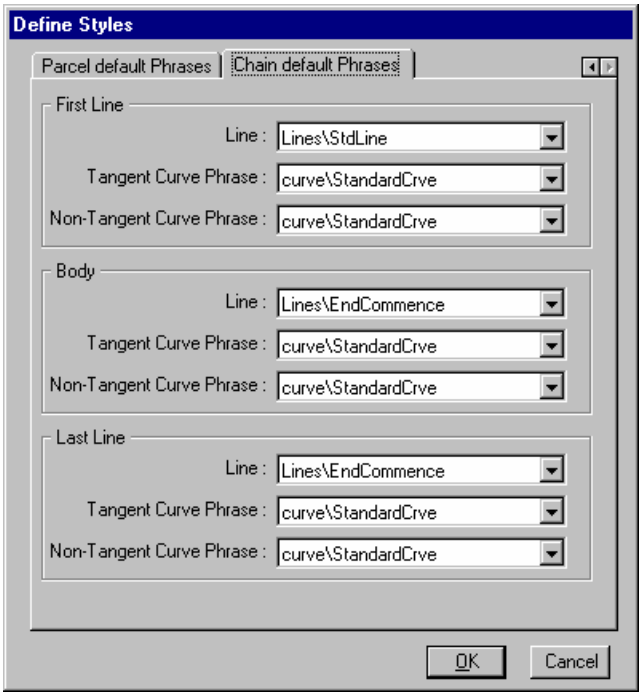
Note	These phrases are inserted into the description using the <PTGEOM> variable. The <PTGEOM> variable may be included as part of a line phrase. It is completely up to the user whether to use the <PTGEOM> as part of his line phrases.

15. Enter the settings as they are shown below for the ***Parcel Default Phrases***.

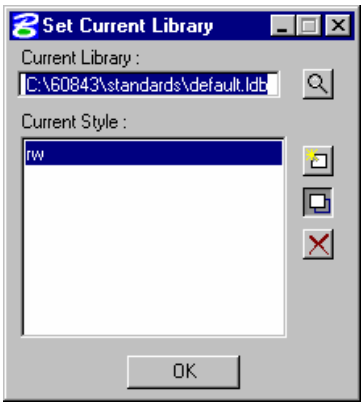


Note The *PARCEL DEFAULT PHRASE* option is very similar to the *POINT GEOMETRY PHRASES* in that the user can establish defaults for parcel descriptions from beginning to end. These phrases determine what line style will be used for the first line of a parcel, the body of a parcel, and the last line of the parcel.

16. ***CHAIN DEFAULT PHRASES*** will also be set as in the dialog shown below.



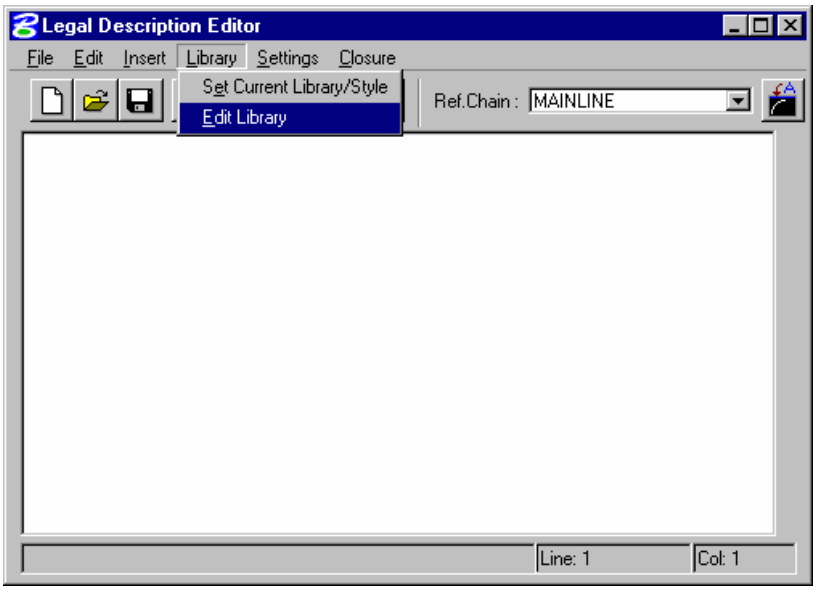
17. Once completed select the **OK** button to close the dialog and then select the **OK** button on the dialog shown below to close the edit option.



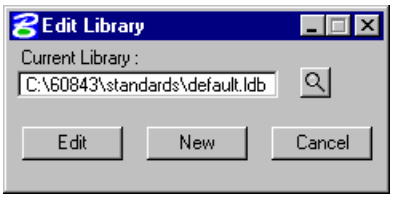
> *EDITING THE LIBRARY*

Note Once the Library and Style have been selected the user can edit the selected library or add to it. This is where the standard phrases are created and stored. In the exercises below we will attempt to create some desired phrases for our descriptions.

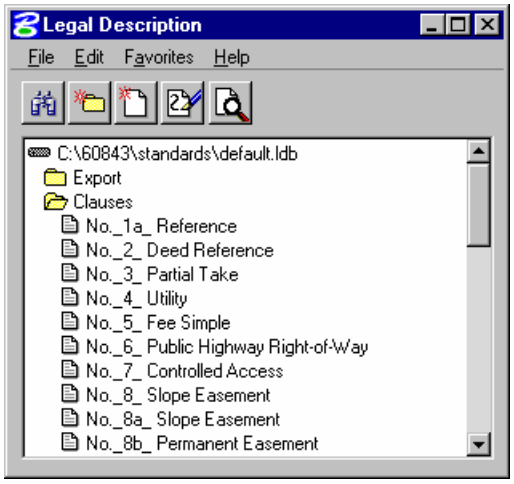
1. Select the **Edit Library** option from the **Library** pull-down.



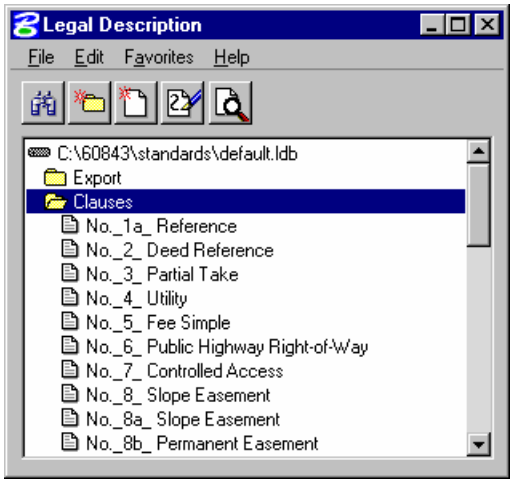
2. When selected the user must confirm/specify which library he wants to edit. Select the library as shown below and then select the **Edit** button.



3. Once selected the following dialog will appear. Now we can begin to set up commonly used phrases. Begin by double clicking on the **Clauses** category.



4. Highlight the **Clause** category, as shown below, and then select the icon to **Create New Item**.

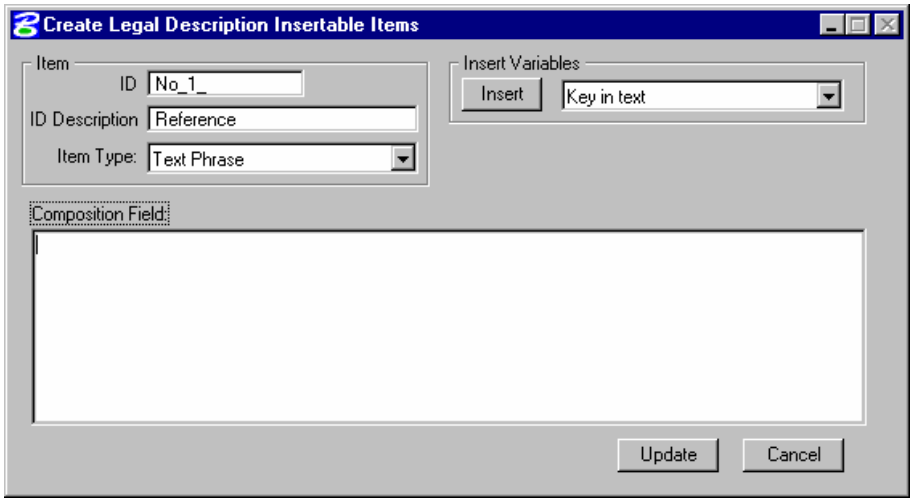


Note Below is an example of the standard clause that we want to create.

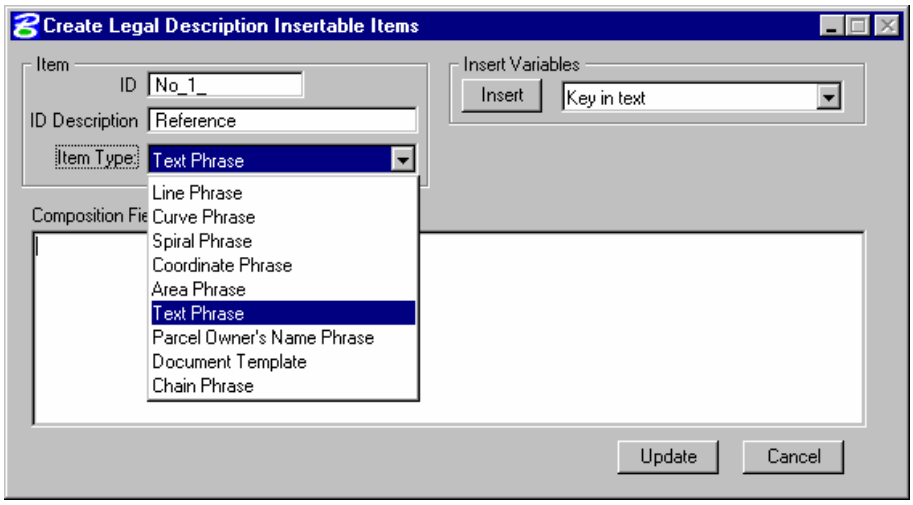
CLAUSE NO. 1

REFERENCE: All boundaries and descriptions as shown on plans for Highway Project No._____ Right-of-Way on file in the Office of the Department of Transportation in Richmond, Virginia.

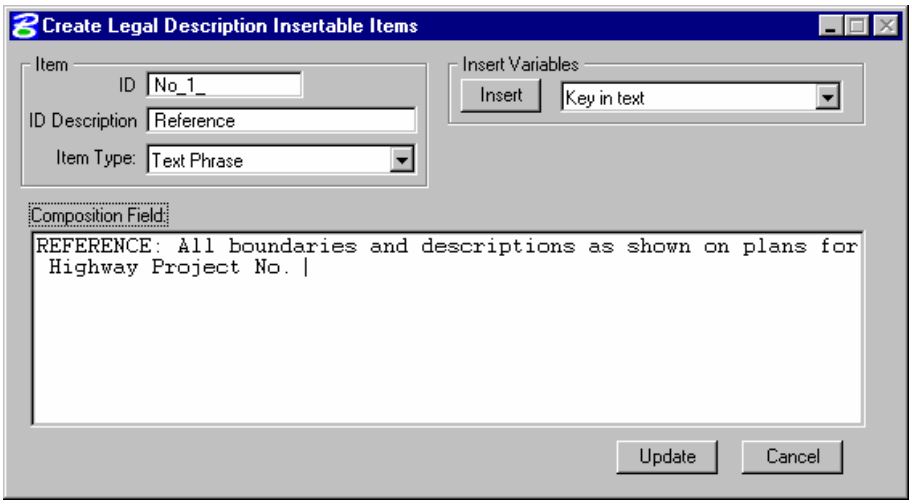
5. When the following dialog appears, enter the following information for ***ID, Description*.**



6. The **Item Type** depends on what type of phrase you wish to create. As seen from the dialog there are several options. The most logical selection from the available list will be a **Text Phrase.**

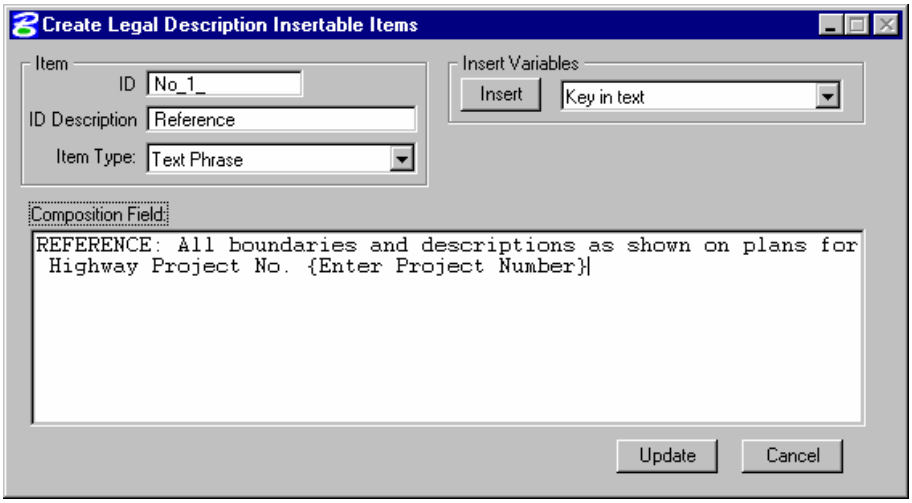


7. Once the ***Type*** is set we can begin to compile the clause. To do this, simply key-in the text for the clause up to the point where we encounter a ***variable.***

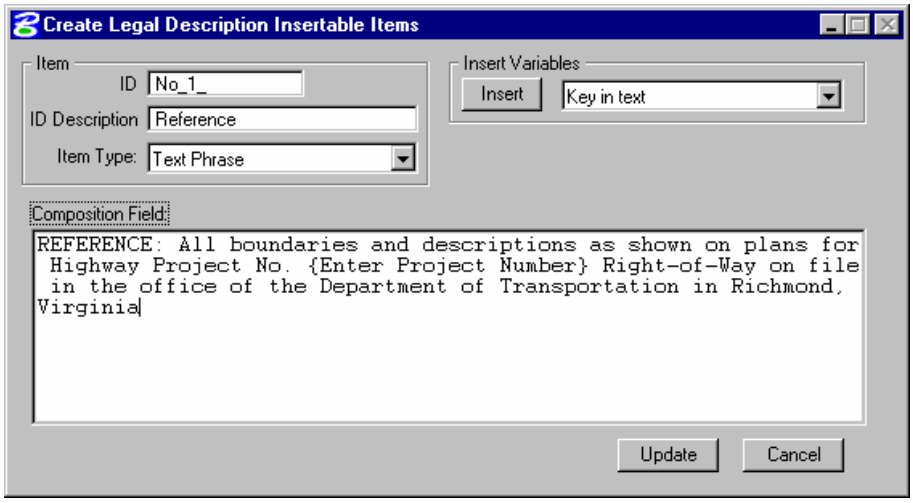


8. Once the variable is encountered we can utilize the ***Insert Variables*** option to build a prompt so that the user can be prompted for what is expected next. To do this we decide between the two options for ***Text Variables.*** In this case we will want to create a key-in as opposed to a list. To do this, simply select ***Key in text*** as the type and select ***Insert.***

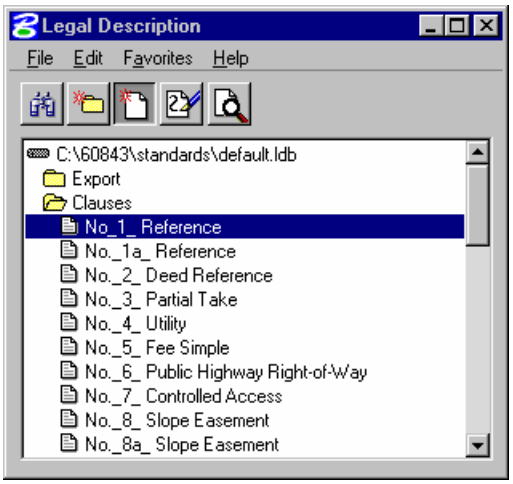
9. This action provides a dialog so that you can key-in a logical prompt that will be presented to the user when it's time for the insertion. Once entered select the **OK** button. This will insert the prompt into the description as shown below.



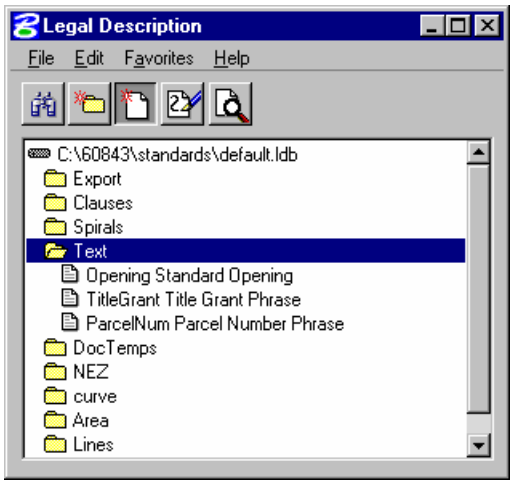
10. Now the remainder of the clause can be enter as shown below.



11. Once this is completed select the ***Update*** button and the clause is completed and stored in the library.

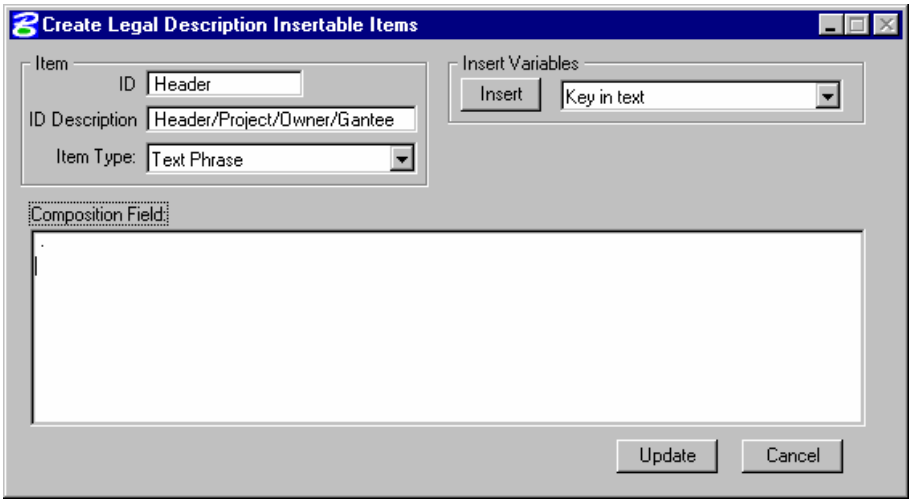


12. We will create one more insert, called a ***HEADER***. This will contain the Project number, county etc. Begin by opening the ***Text*** category and selecting the icon to create a new item.

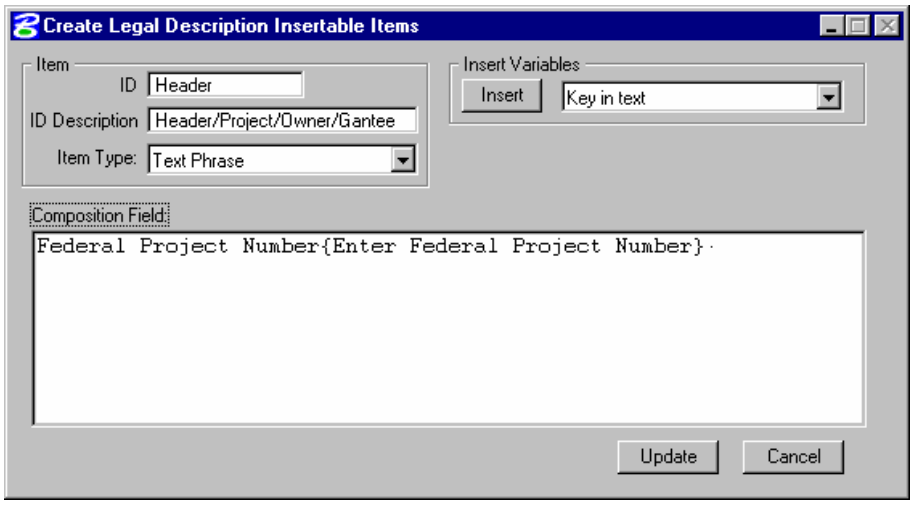


13. Enter the information for the item as shown below.

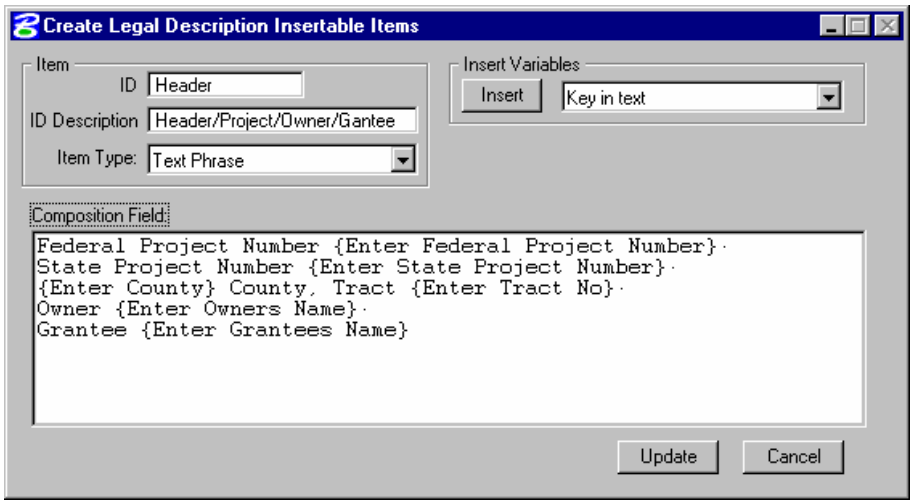
FEDERAL PROJECT NO. APD-NHE-111(36)
STATE PROJECT NO. 77041-2219-64
RICHMOND COUNTY, TRACT 4200
OWNER: ISTAR BOWLING CENTERS
GRANTEE: STATE OF VIRGINIA



14. When compiling the header below, remember press the <Enter> key after each entry so that it appears correctly when inserted.

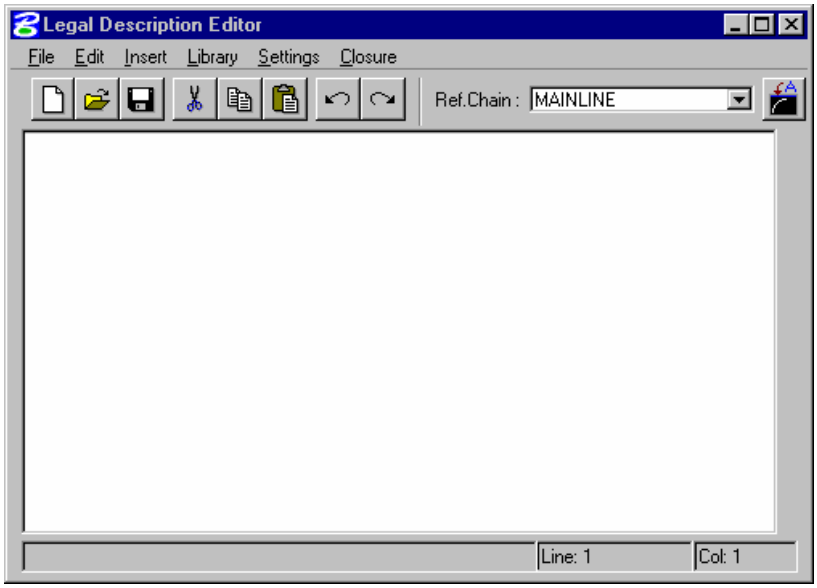


15. Continue until the header is completed. Once complete select the ***Update*** button.

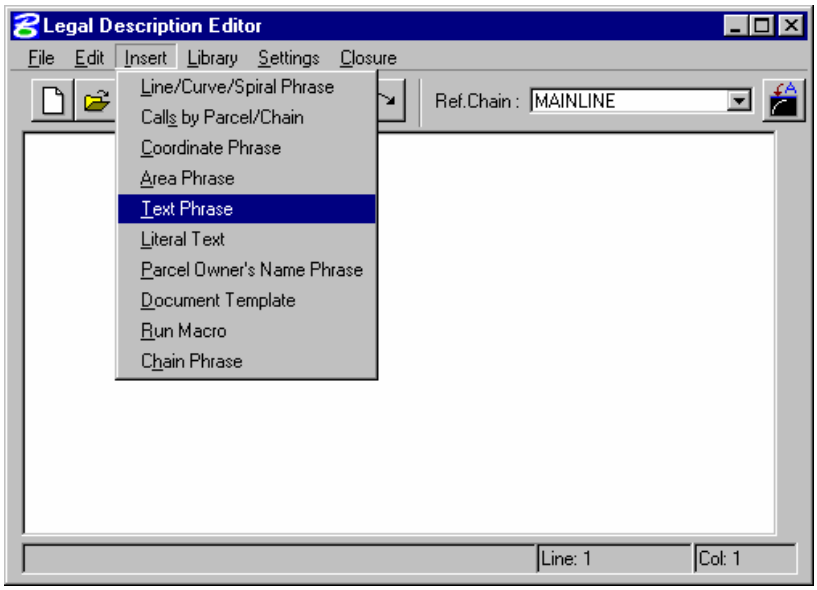


> *WRITING A LEGAL DESCRIPTION*

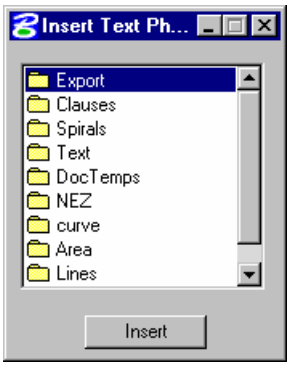
1. Access the main editor dialog and begin by entering several carriage returns **(CR)**. This is necessary to create several blank lines above and below the active cursor. Once you have created 5 blank lines, move the cursor to the third line.



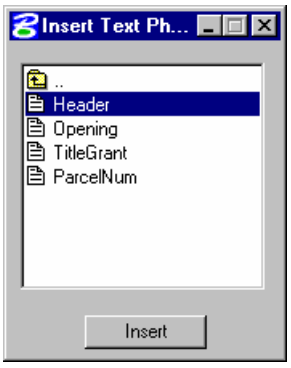
2. Next select from the ***Insert*** pulldown, the option to insert ***Text Phrases.***



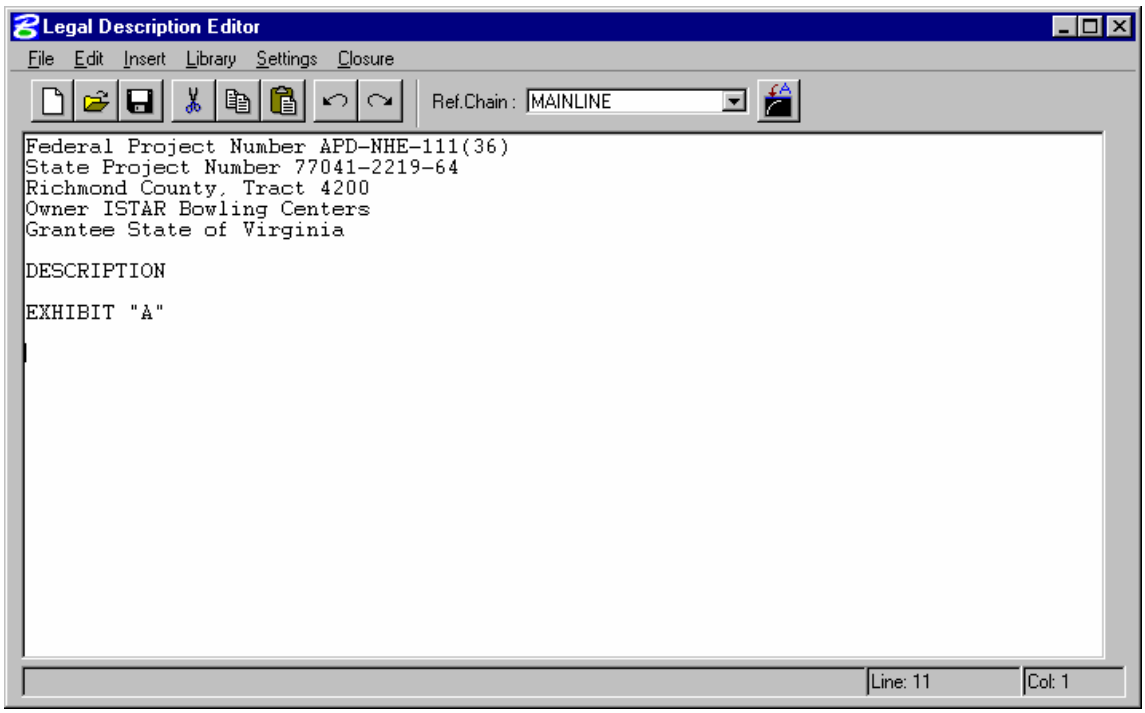
3. This will invoke the following dialog.



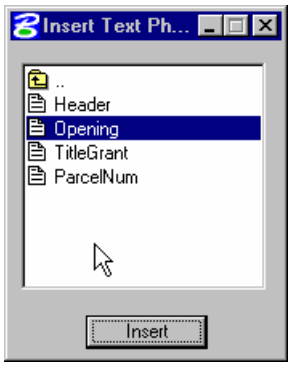
4. Select the option to insert ***Text*** phrases. And then insert the ***Header*.**



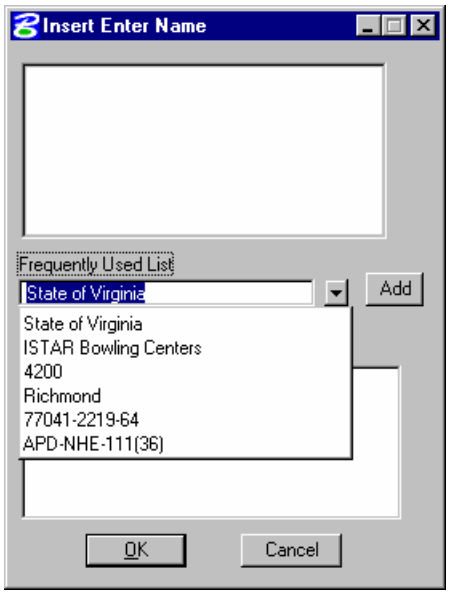
5. After answering all of the prompts, you should end up with this portion of the description as shown below:



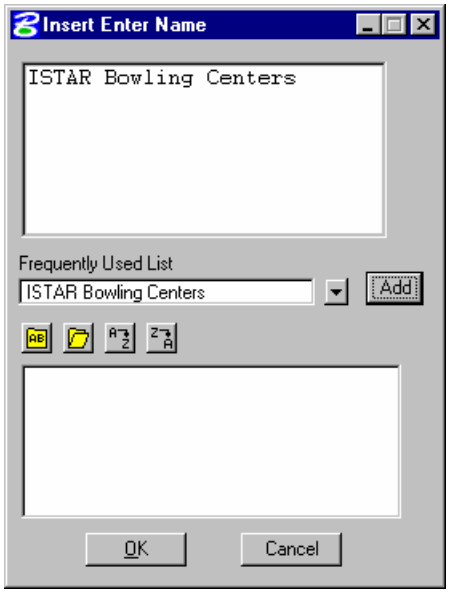
6. Now select from the ***Text*** phrases, the option to insert the ***Opening*.**



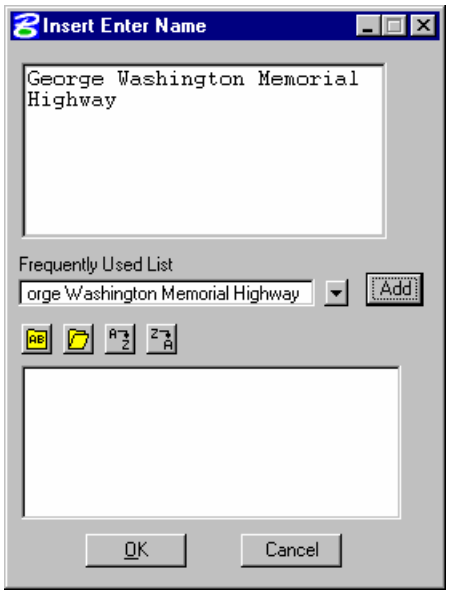
7. Selecting ***SOUTH*** for the first variable will complete the description up to the variable for the owner's name. When prompted for this you can use the ***Frequently Used*** pulldown to select from previous remembered key-ins. Select the owner from the list as shown below.



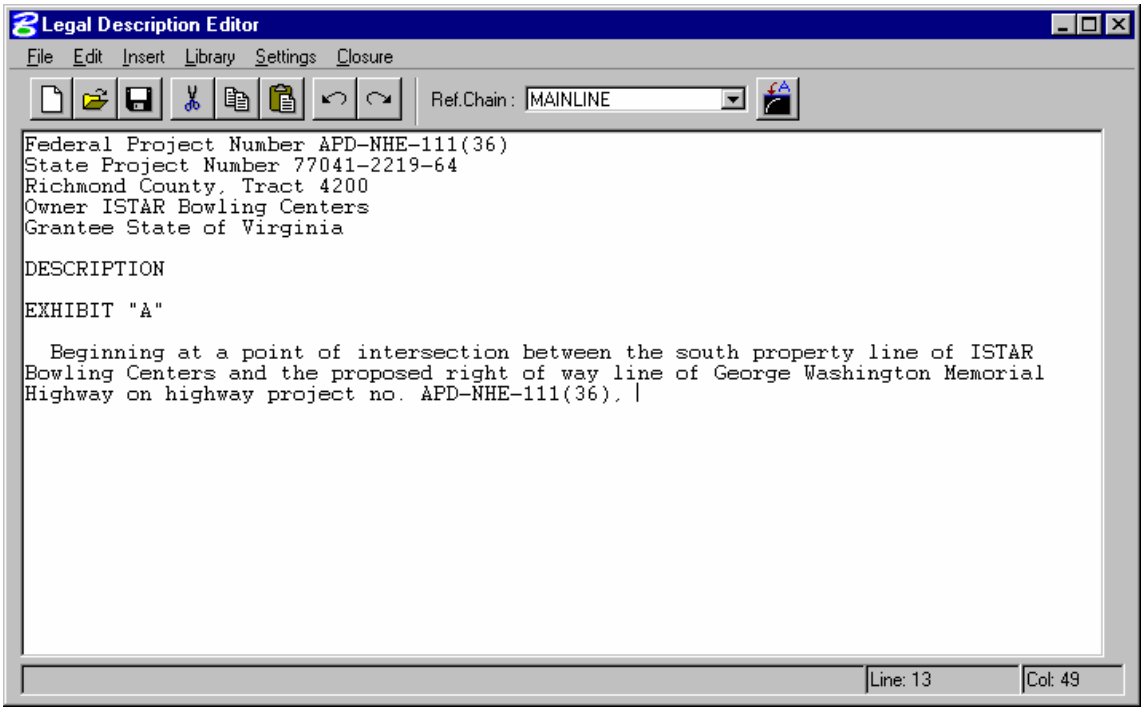
8. Then select the ***Add*** button to use this as the inserted variable as shown below and select ***OK***.



9. Next provide the variable for the road name.

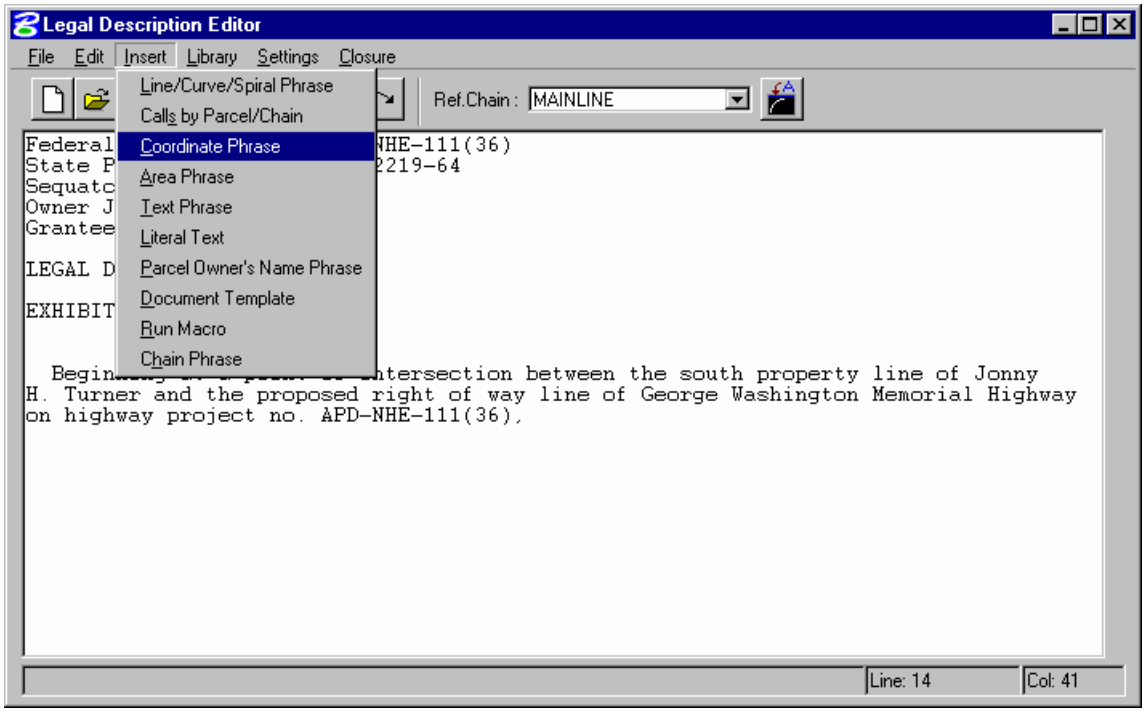


Note Repeat step 7 & 8 when prompted for the *Project No*. Select from the *Frequently Used List* the project number that was used in steps 7 & 8. This should complete the Opening Text phrase as shown below.

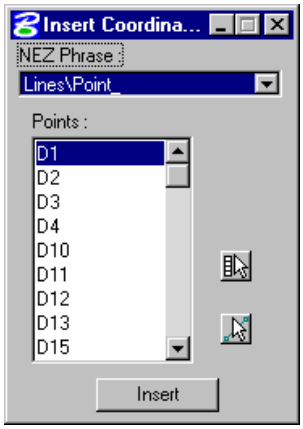


11. Close the ***Insert Text Phrase*** dialog and return to the ***Insert*** pull-down.

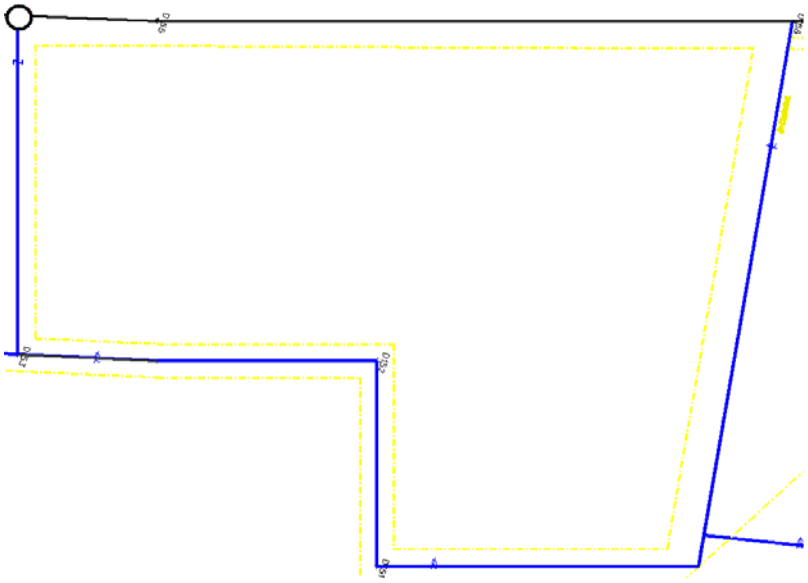
12. This time choose to insert a ***Coordinate*** phrase.



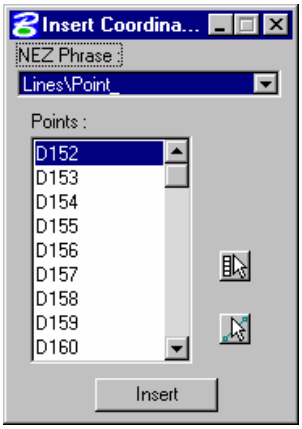
13. Choose from the line types the ***Lines\Point.***



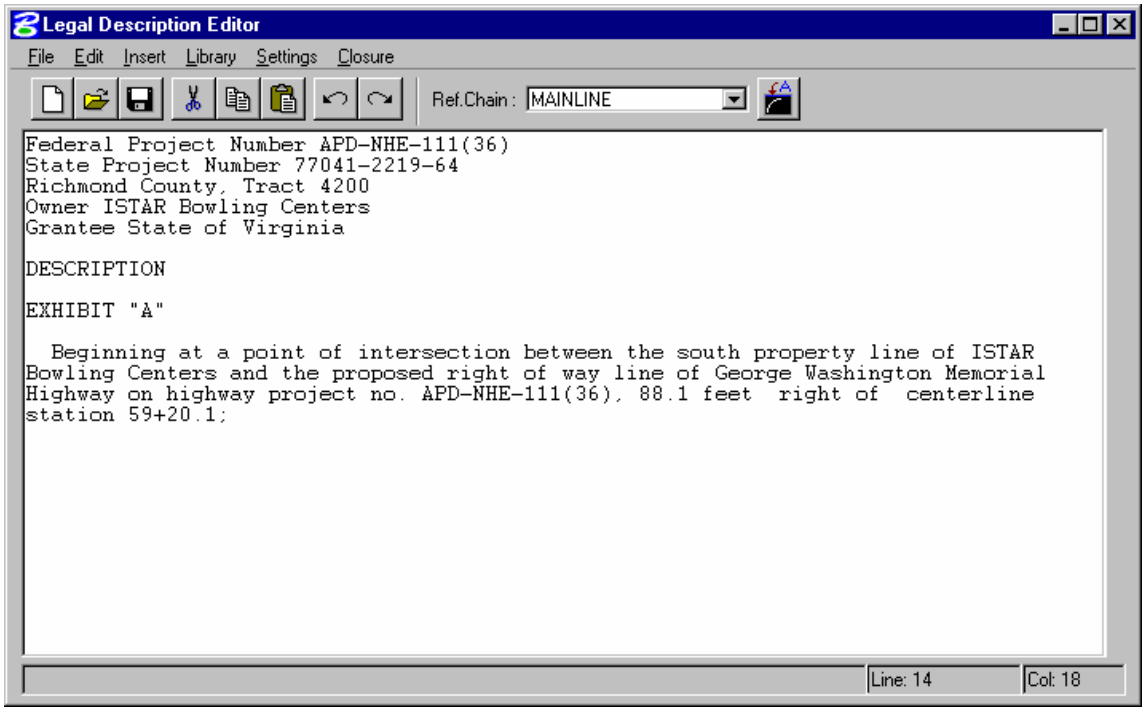
14. Once selected use the MicroStation Power Selector to select graphically the beginning point you wish to use.



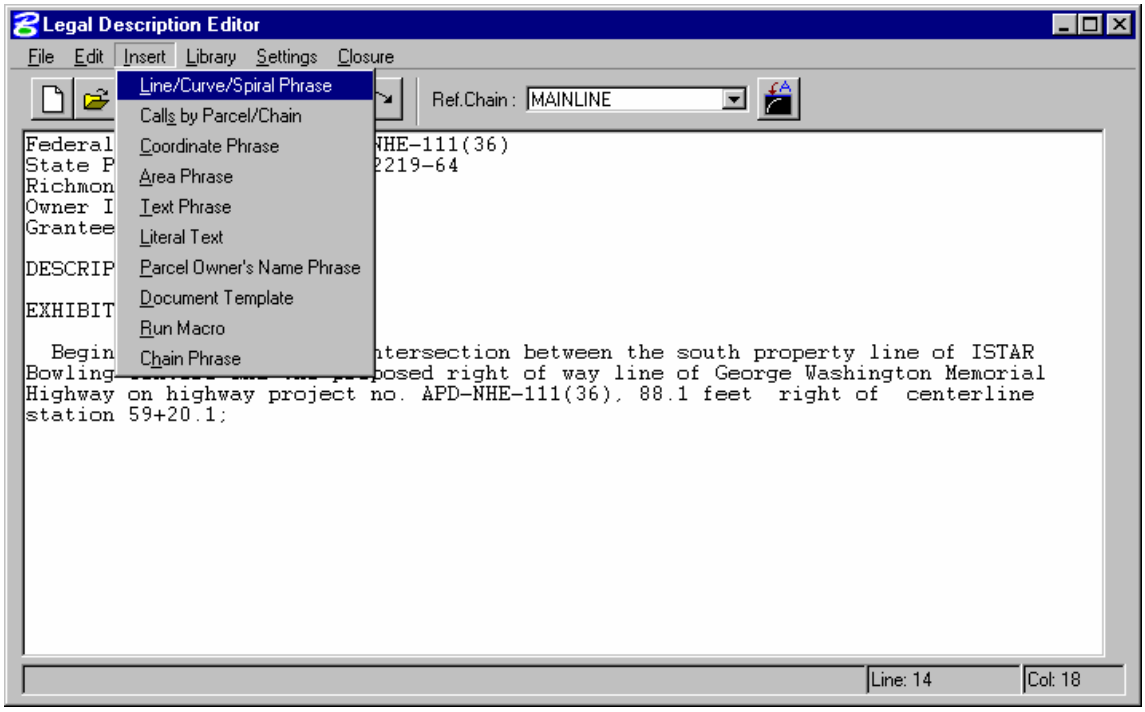
15. Once you have made a MicroStation selection set with the point, you can then use the icon on the ***Coordinate Inser*t** dialog to get the point number from that selection set.



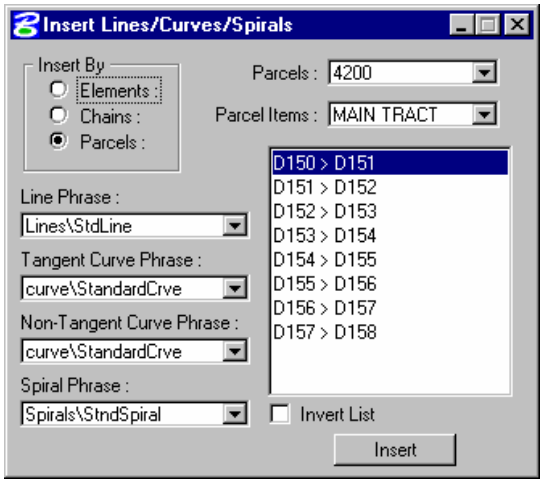
16. Once selected choose the ***Insert*** button. This should complete the following portion of the description.



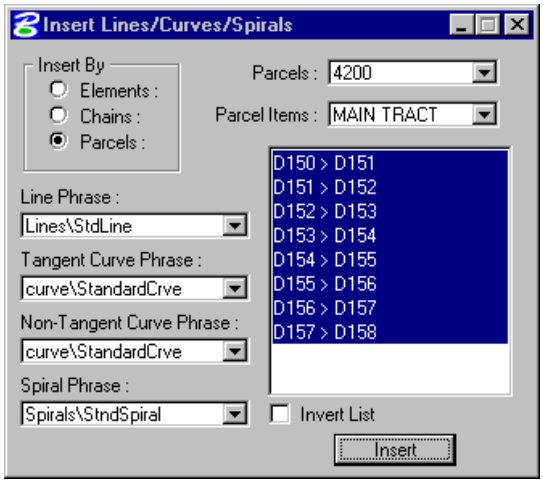
17. Now we are ready to insert the metes and bounds around the entire Tract. Select from the ***Insert*** pulldown the option for inserting **Lines*/Curves/Spiral Phrases***.



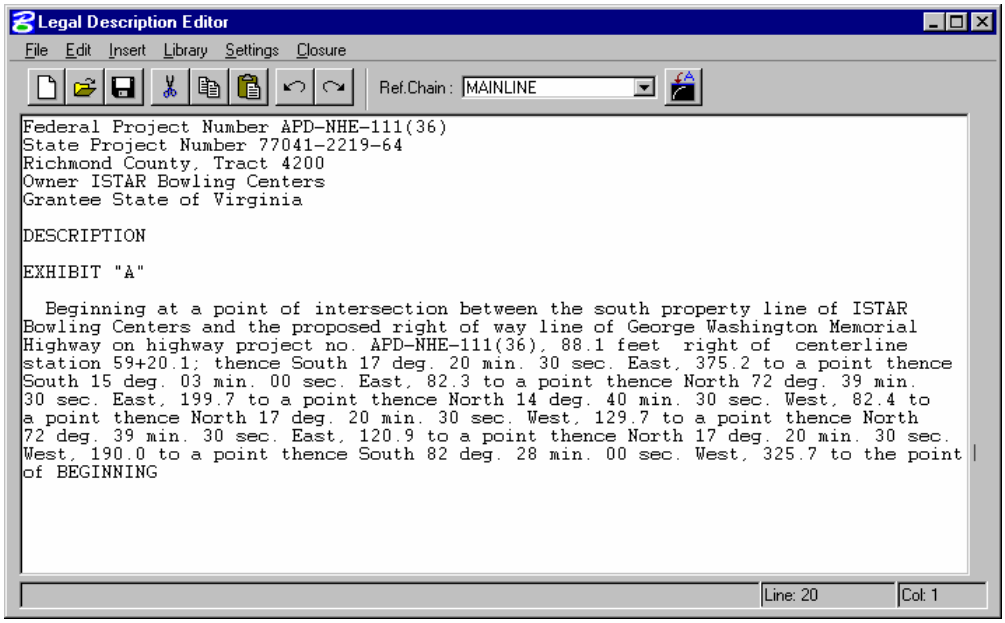
18. Make the following settings in the dialog shown below.



19. Now highlight the desired calls that we wish to describe, that being all the calls from our P.O.B. (#4) to the last call. Once selected choose the **Insert** button.



Note You should now have a completed Legal Description



2 ASCII Import for Plat Creation

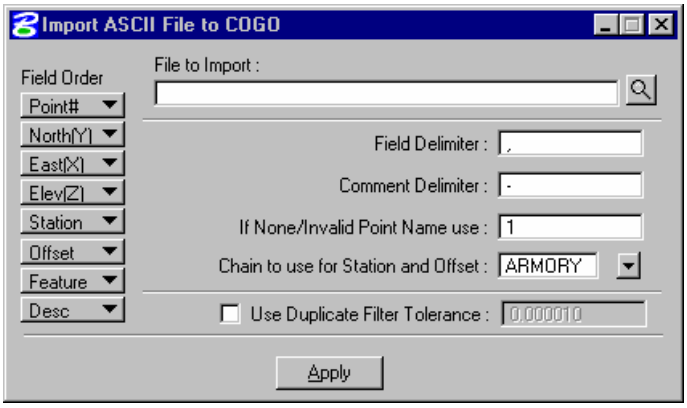
OBJECTIVES

In this session we will review importing ASCII formatted data in order to create parcels in coordinate geometry.

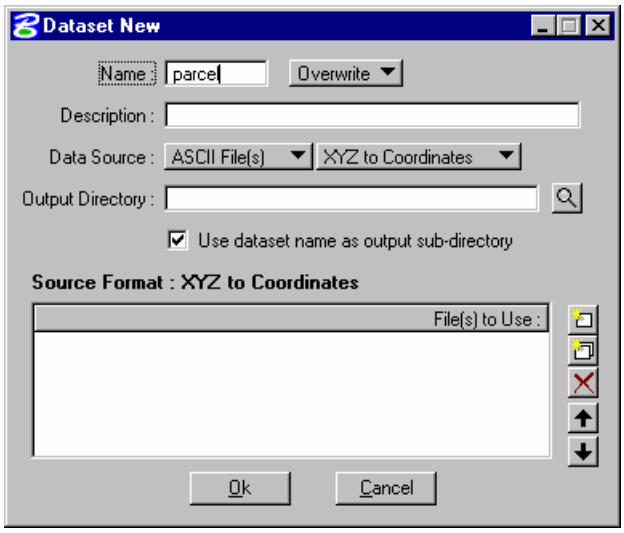
INTRODUCTION

There are several options for importing ASCII data in Coordinate Geometry. Each requires a little different approach. One of the simplest ways is to use the Import > ASCII option directly from within Coordinate Geometry.

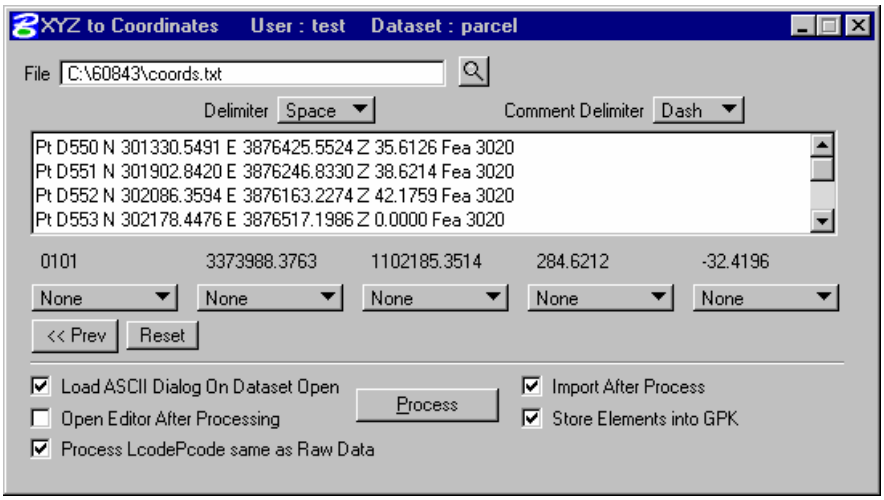
This tool will directly store a plain ASCII XYZ file; no Survey Chains will be created. The ASCII file must have one line of data per point. Enter the name of the file or click Select. Then set the delimiter (character between each field in the data). If a comment is in the file, it must be at the end of the line, and separated by a unique delimiter. Set the None or Invalid Point Name and Chain name. If the Duplicate Filter Tolerance is on, any point within the specified tolerance of another point is ignored. The last step is to set the order of the fields within each row (Field Order). If the first row is Point#, X, and Y, set the Field Order to Point#, East(X), North(Y), and the rest to None. Click **Apply** to commence processing.



Another option would be to import the ASCII data via a Survey dataset. This method would require setting up a Survey project and then creating a parcel dataset.



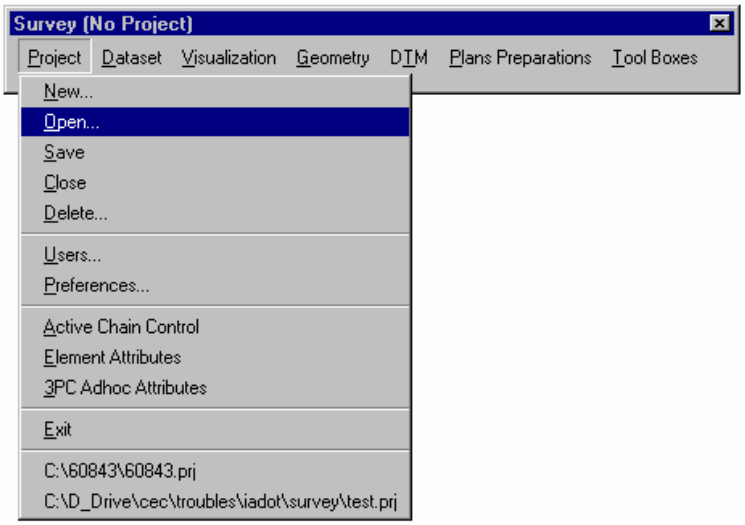
Once a dataset has been created and an ASCII file selected, the interface will allow the user to specify the content of the file and control how it is imported.



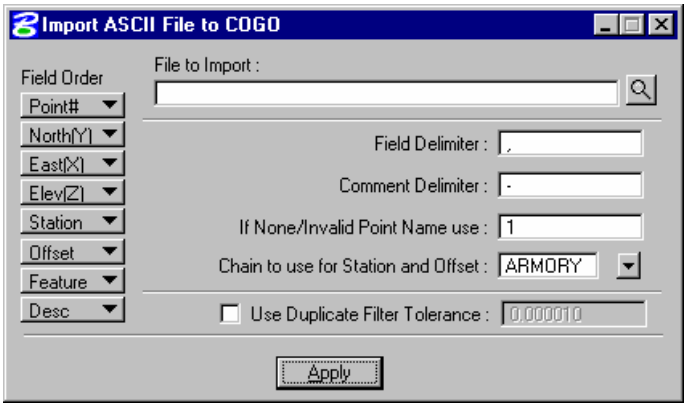
LAB EXERCISE: IMPORTING ASCII

> *IMPORTING VIA COGO*

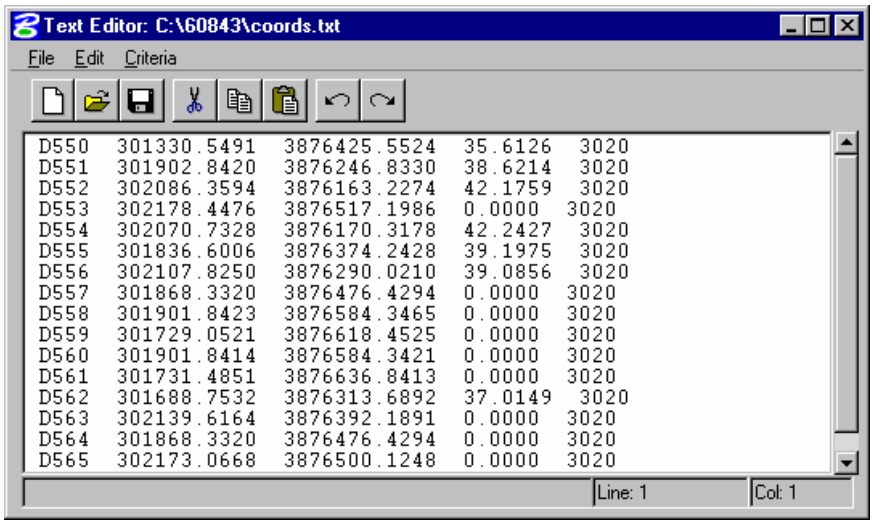
1. Open the MicroStation file ***C:\60843\plat.dgn***.
2. Select from the Survey menu bar ***Project > Open*** and open the project ***60843***.



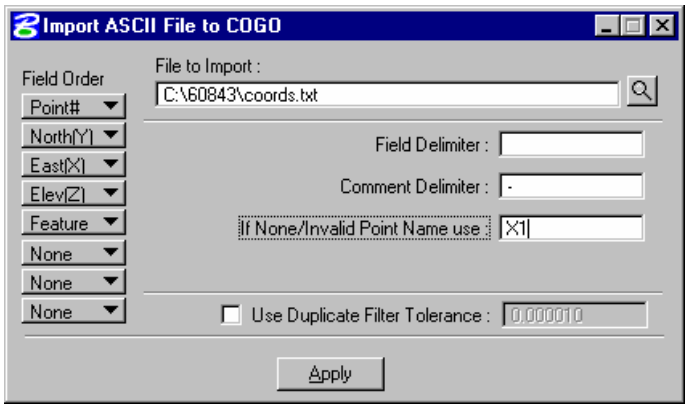
3. Once in the Project select ***Geometry > Classic COGO***.
4. In Coordinate Geometry select ***File > Import > ASCII Points***.



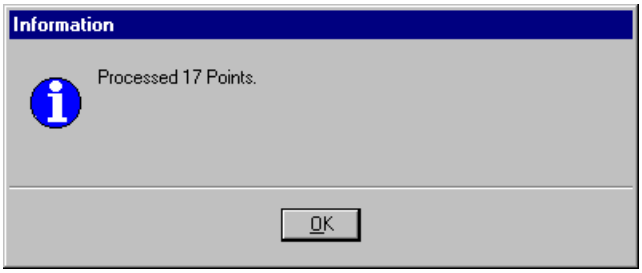
5. Using the toggles on the left side of the dialog, set each one based on the format of the ASCII file as shown below.



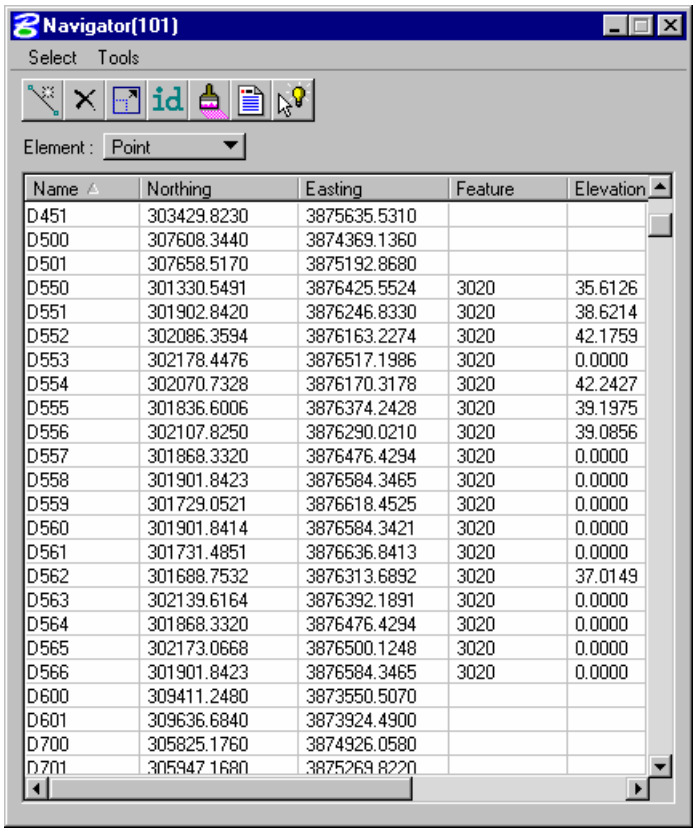
6. The completed toggle settings should look like the dialog below.



7. Complete the remaining portions of the dialog by using ***Space*** as a delimiter.
8. Select the ***File to Import > Coords.txt***.
9. Click the ***Apply*** button.
10. The dialog below will display when completed.



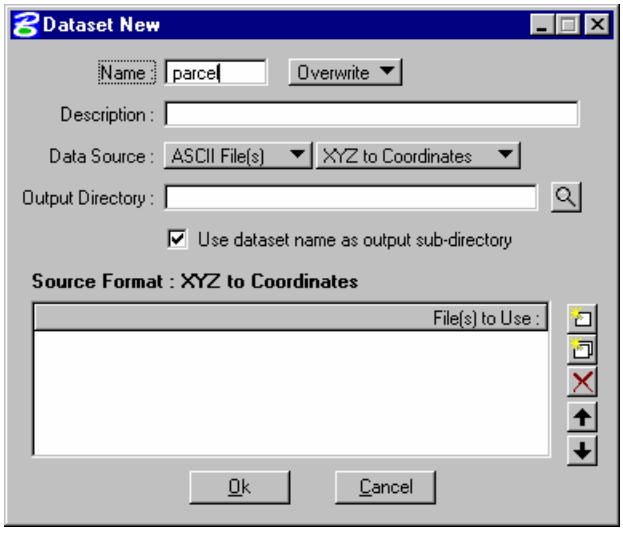
11. Review the coordinates in COGO.



Name	Northing	Easting	Feature	Elevation
D451	303429.8230	3875635.5310		
D500	307608.3440	3874369.1360		
D501	307658.5170	3875192.8680		
D550	301330.5491	3876425.5524	3020	35.6126
D551	301902.8420	3876246.8330	3020	38.6214
D552	302086.3594	3876163.2274	3020	42.1759
D553	302178.4476	3876517.1986	3020	0.0000
D554	302070.7328	3876170.3178	3020	42.2427
D555	301836.6006	3876374.2428	3020	39.1975
D556	302107.8250	3876290.0210	3020	39.0856
D557	301868.3320	3876476.4294	3020	0.0000
D558	301901.8423	3876584.3465	3020	0.0000
D559	301729.0521	3876618.4525	3020	0.0000
D560	301901.8414	3876584.3421	3020	0.0000
D561	301731.4851	3876636.8413	3020	0.0000
D562	301688.7532	3876313.6892	3020	37.0149
D563	302139.6164	3876392.1891	3020	0.0000
D564	301868.3320	3876476.4294	3020	0.0000
D565	302173.0668	3876500.1248	3020	0.0000
D566	301901.8423	3876584.3465	3020	0.0000
D600	309411.2480	3873550.5070		
D601	309636.6840	3873924.4900		
D700	305825.1760	3874926.0580		
D701	305947.1680	3875269.8220		

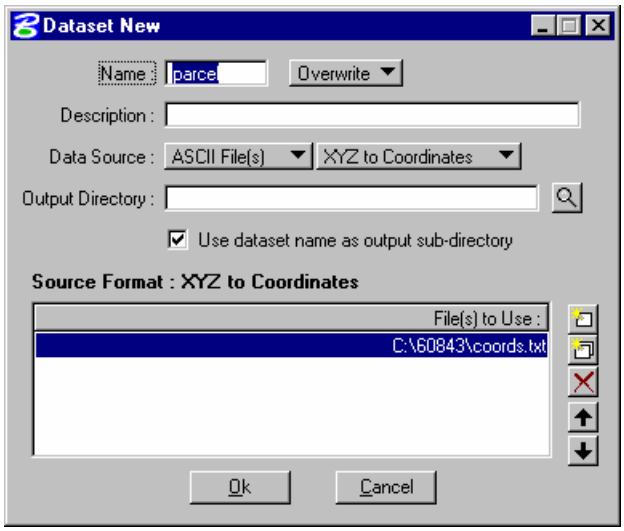
> ***IMPORTING ASCII VIA SURVEY***

1. From the main Survey Menu bar select ***Dataset > New***.

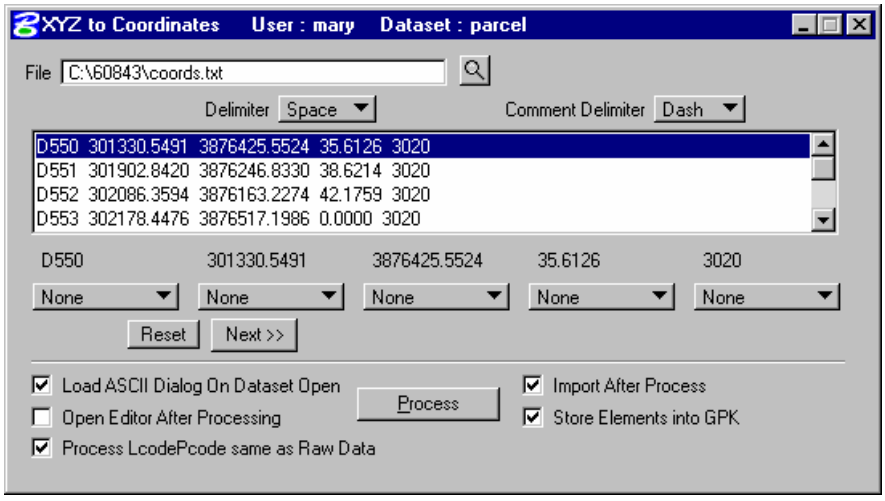


2. Provide a new name for the dataset.
3. Make sure that the ***Data Source*** is set to ***ASCII Files & XYZ to Coordinates.***

4. Select the top icon located on the right side of the lower portion of the dialog.
5. Select the file ***Coord.txt***.

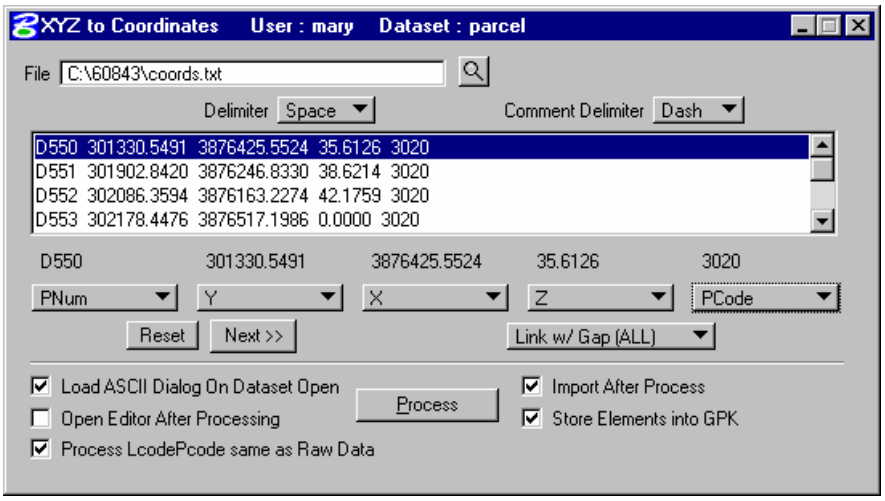


6. Click ***OK***.
7. In the following dialog make sure the ***Delimiter*** toggle is set to ***Space***.



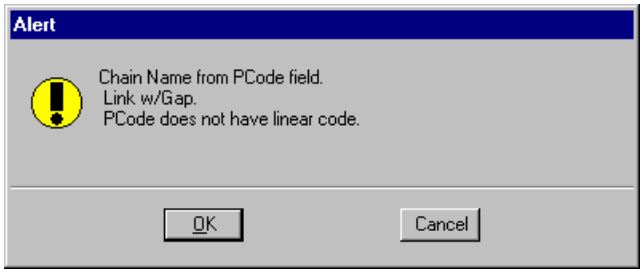
8. Highlight one of the rows in the display window.

9. Set the toggles to the appropriate columns of data beneath the display window.

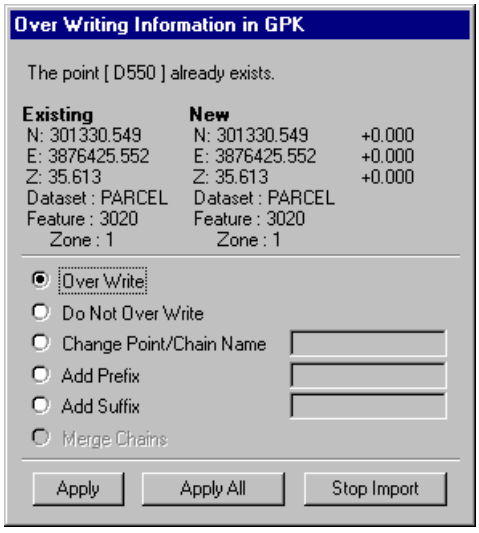


10. Click the ***Process*** button.

11. When the dialog below appears click ***OK***.



12. Allow the point to overwrite the previously stored points be clicking ***Apply All*** on the following dialog.



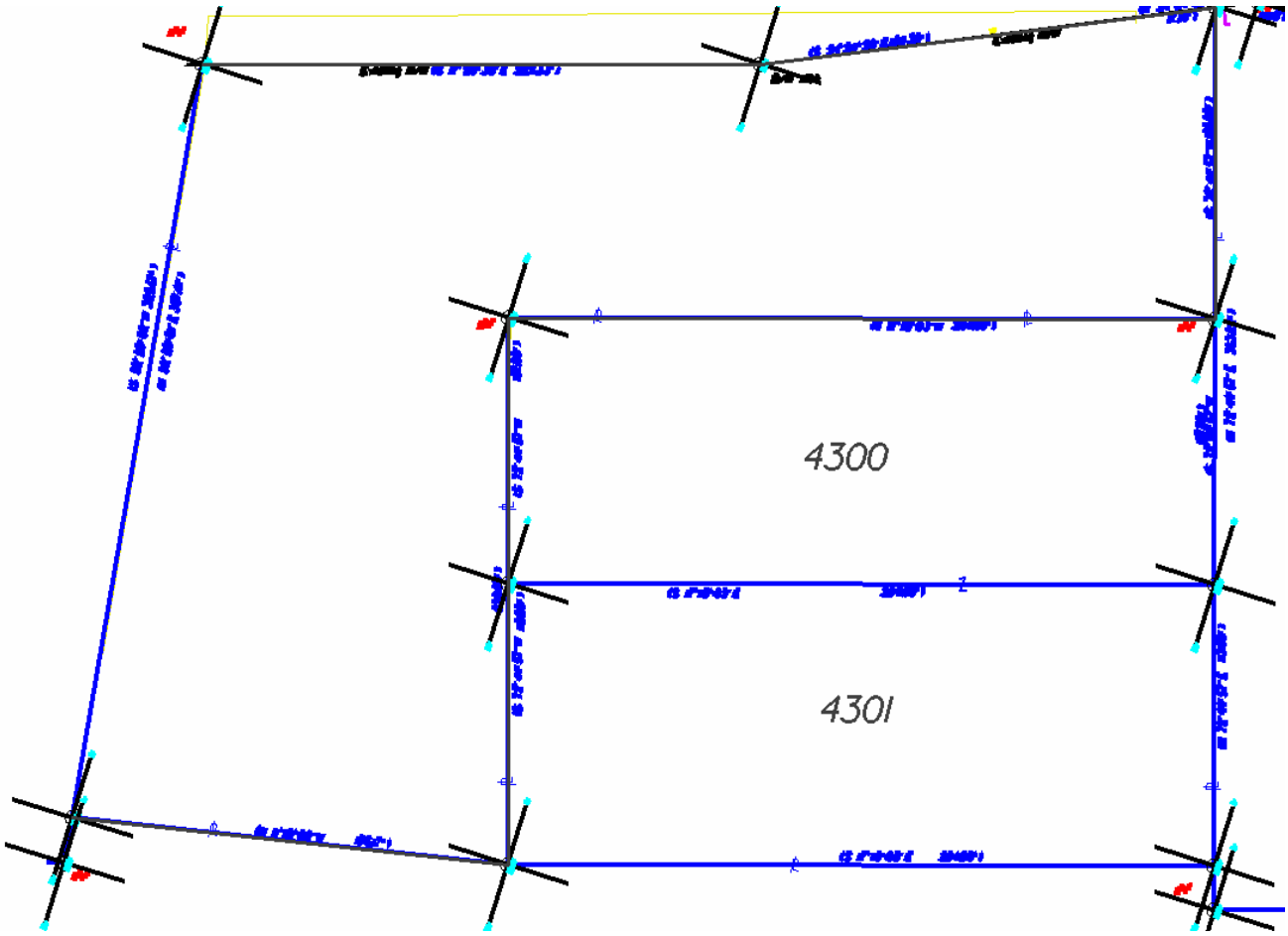
13. Review the points in COGO.

Note	This method would be preferable if linking codes are provided in the field data. This method would draw the boundary line work where the first import method would not.

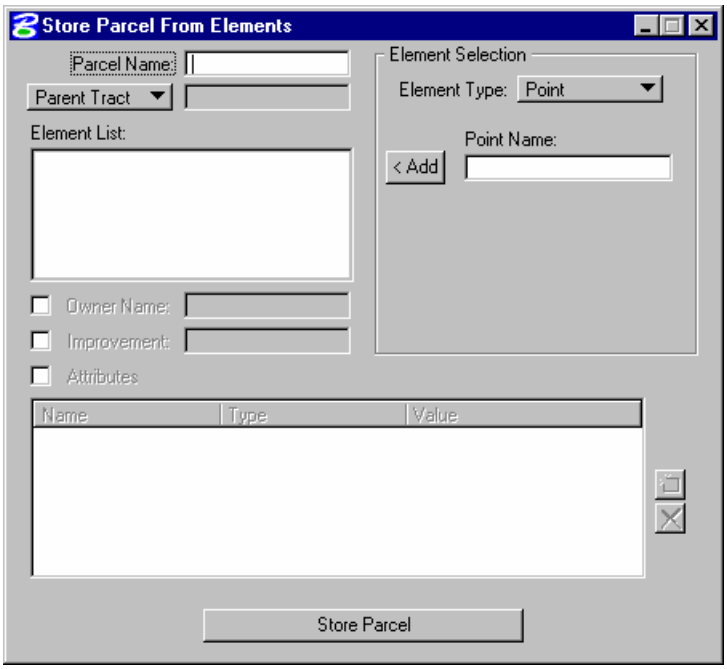
LAB EXERCISE: STORING PARCELS

> ***STORE PARCEL FROM POINTS***

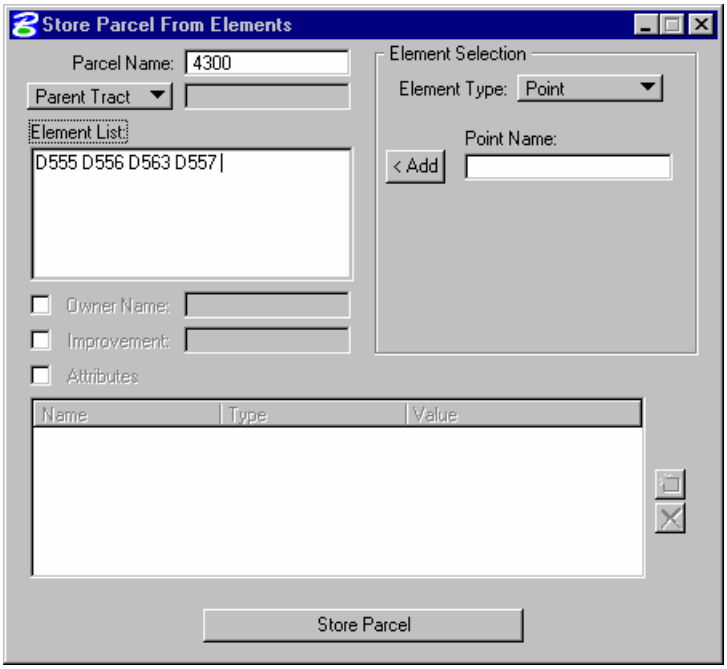
1. This exercise will store each of the two parcels shown below. (4300 & 4301)



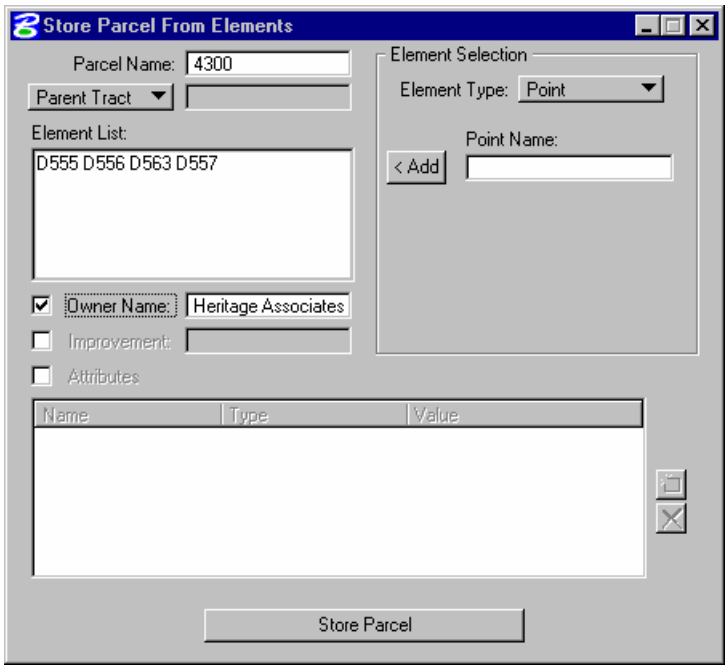
2. From the COGO pulldowns select ***Element*** > ***Parcel*** > ***Store***.



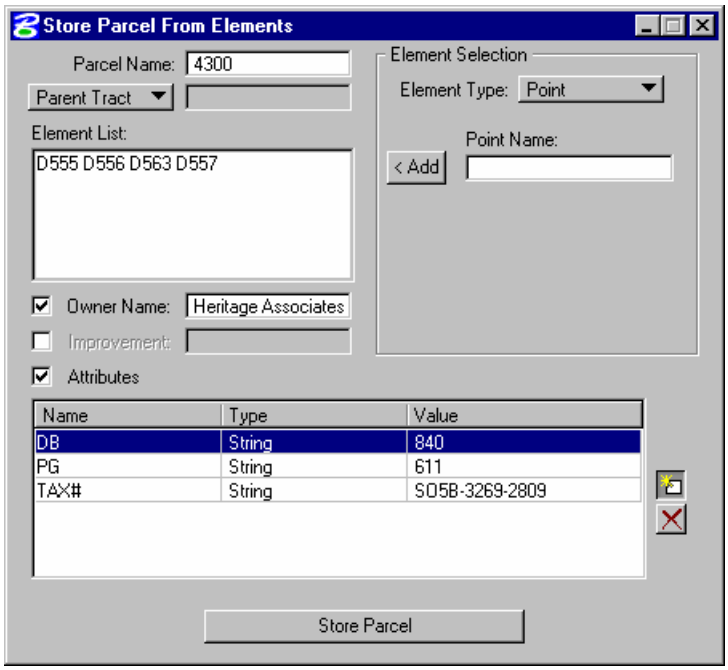
3. Provide a Parcel name in the dialog.
4. Place cursor in the ***Element List*** window of the dialog.
5. Graphically click on each point that makes up parcel 4300 as shown above.



6. Toggle on the ***Owners Name*** and type in ***Heritage Associates***.



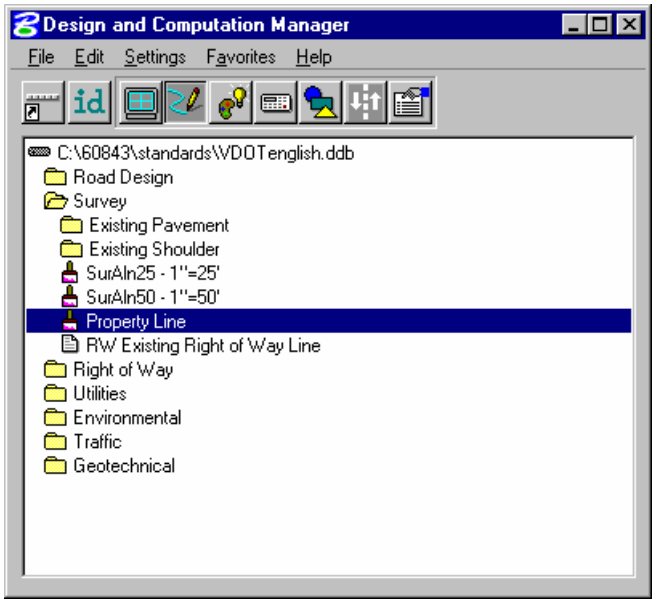
7. Toggle on the ***Attributes*** option and provide the following attributes by clicking on the ***Add*** icon to the right side of the window.



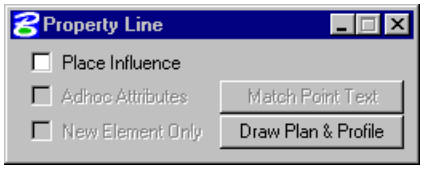
8. Click the ***Store Parcel*** button.
9. Describe the parcel in COGO and review.
10. Repeat the process for parcel 4301.

> *SURVEY PLAN PREPARATION TOOLS*

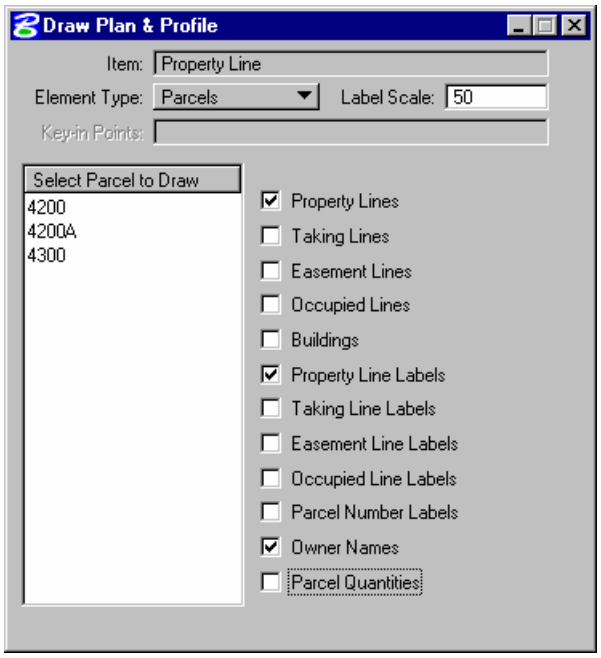
1. Create and open a new file called ***4300.dgn***.
2. From the main Survey Menu Bar, select ***Plans Preparation > D and C Manager***.
3. Navigate to the **Property Line** item as shown below.



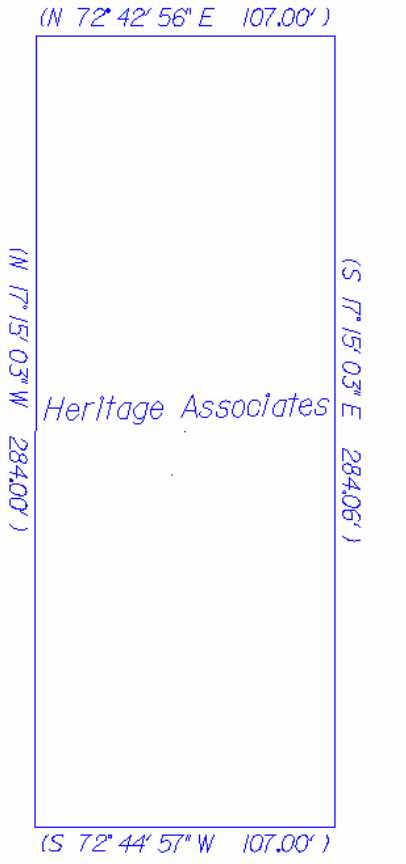
4. Click the ***Draw Plan & Profile*** button on the secondary dialog.



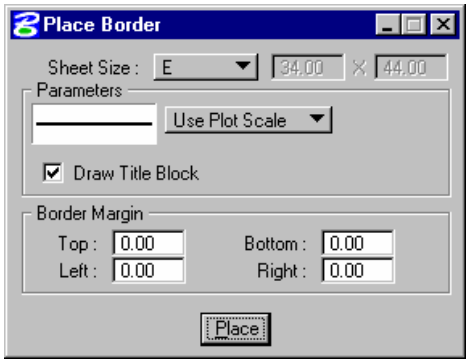
5. Make sure the settings are as shown below and click on the parcel 4300 in the list window.



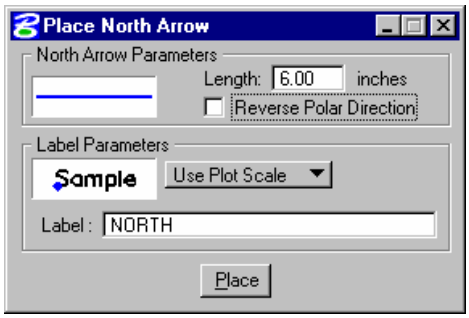
Note You may have to adjust the labels and rotate the view to get the parcel in the desired location.



6. From the main Survey Menu Bar select ***Plans Preparation*** > ***Place Border***.
7. Complete the settings as shown below then click the ***Place*** button to place the border.

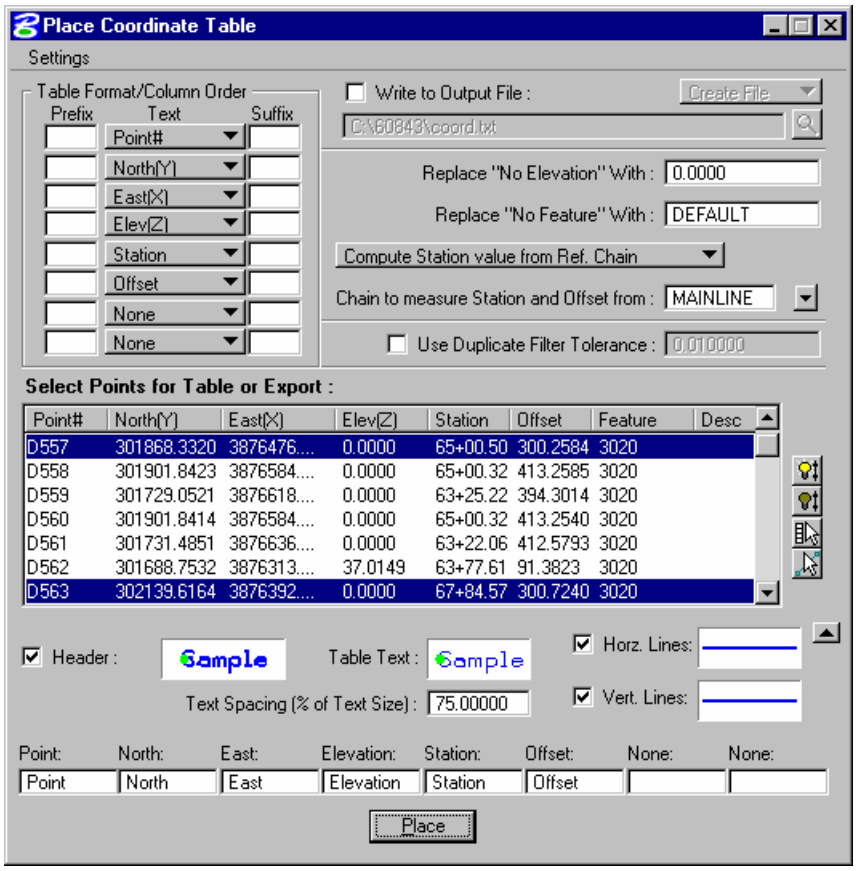


8. Next select the ***Place North Arrow*** from the ***Plans Preparation*** pulldown.
9. Complete the settings as shown below then click the ***Place*** button to place the arrow.



10. Next select the ***Place Coordinate Table*** from the ***Plans Preparation*** pulldown.

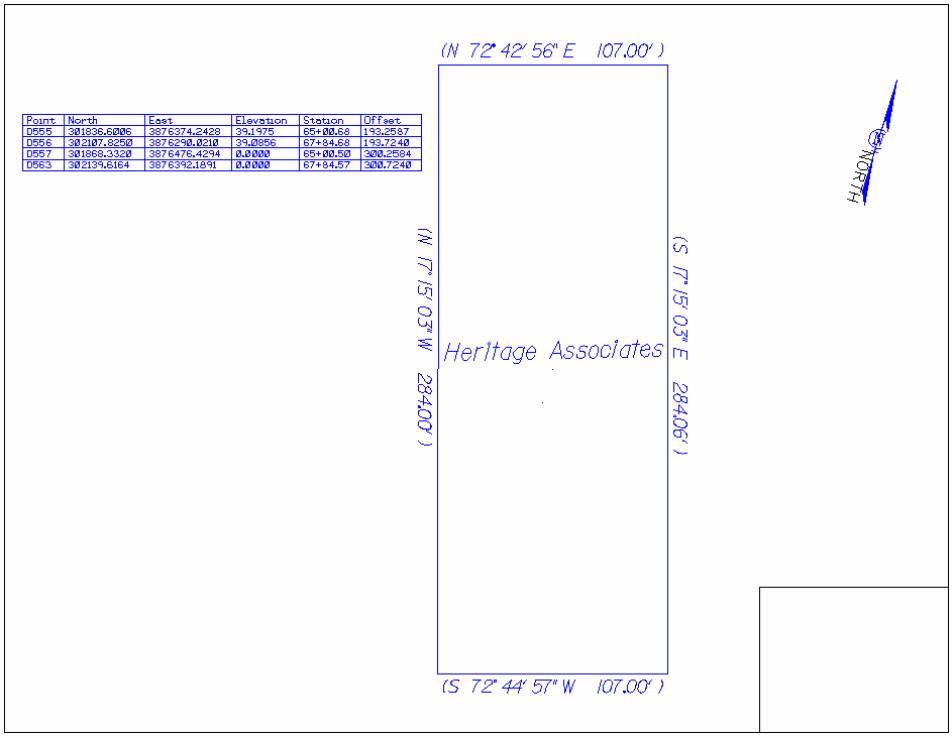
11. Complete the settings as shown below then click the ***Place*** button to place the table.



Note You have to highlight the point numbers in the list window that you wish to be included in the table.

Note The size of the table itself is controlled by the size of the text.

12. You should now have a plat similar to the one shown below.



Point	North	East	Elevation	Station	Offset
0555	301836.6006	3876374.2428	39.1975	65+00.68	193.2587
0556	302107.8250	3876290.0210	39.0856	67+84.68	193.7240
0557	301868.3320	3876476.4294	0.0000	65+00.50	300.2584
0563	302139.5164	3876392.1891	0.0000	67+84.57	300.7240

PLAN VIEW LABELING

INTRODUCTION

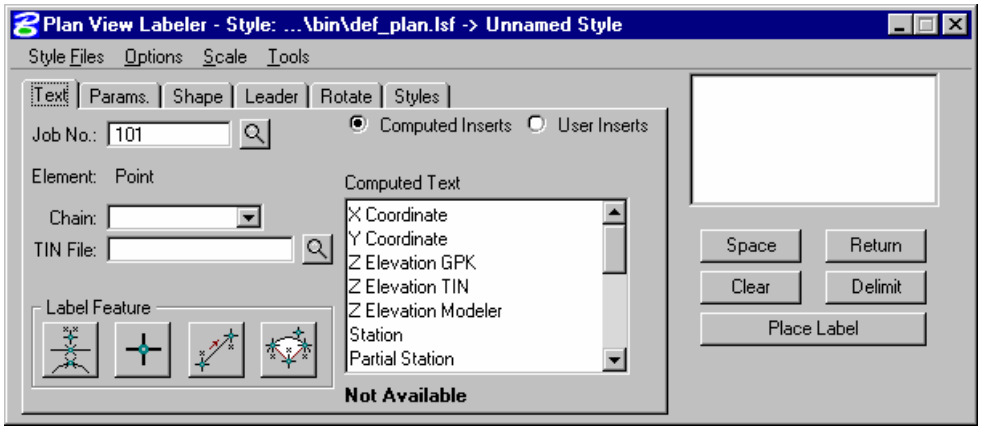
GEOPAK's labeling tools allow a user to place "smart" labels in a MicroStation drawing. These labels have the ability to calculate XYZ coordinates, station, offset, direction, length, radius, degree of curvature, etc. of the associated element.

ACCESSING THE PLAN VIEW LABELER

The Plan View Labeler can be accessed by selecting ***Plans Preparation*** > ***Plan View Labeling*** from the main Survey Menu Bar.

PLAN VIEW LABELING

When the Plan View Labeling icon is selected, the dialog depicted below is displayed.



The label to be placed is displayed in the box on the right side of the dialog as shown above. The Space button places a space in the label at the cursor position. The Return button starts a new line of text. The Clear button starts a new label. The Delimit button places a line above or below a line of text. The Place Label button attaches the label to the cursor for placement in the drawing.

The user can select the various tabs to define / modify the label appearance.

TEXT

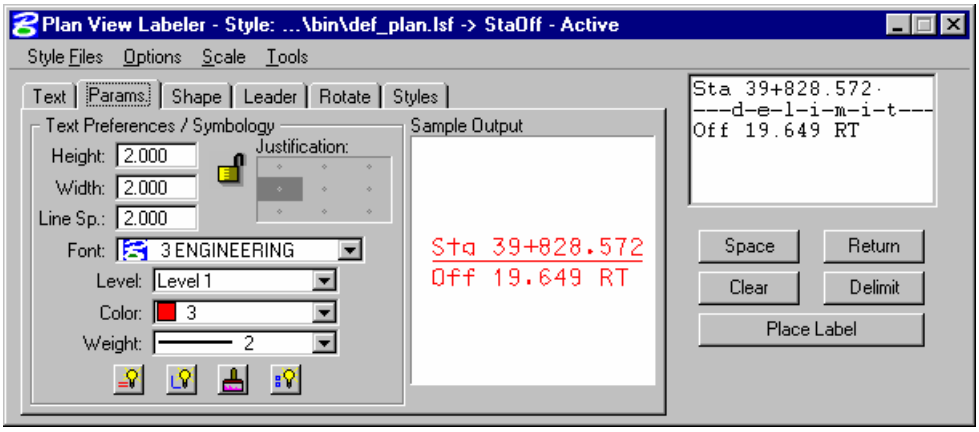
For data to be computed, the job number and the chain need to be selected. If elevations are to be calculated, a TIN file needs to be chosen.

The Computed Inserts are items that GEOPAK has the ability to calculate for the chosen item. The list of Computed Inserts changes with the type of element that is chosen. If a line is chosen, the list of Computed Inserts will show inserts of bearing, and length. If a curve is chosen the list of Computed Inserts will change to show inserts of radius, curvature, chord length, etc.

The User Inserts are inserts that a user may use on a regular basis. This list can be customized for a specific user's needs.

The Identify Element button allows the user to choose the element to use for calculations in the label. The Data Point button will let the user pick a specific point to calculate the coordinates, station, or offset for.

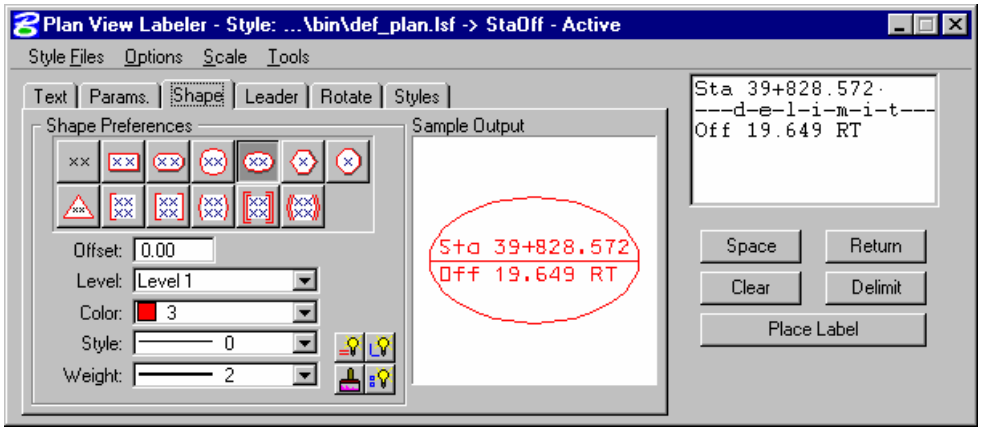
PARAMETERS



The **Parameters** tab enables the user set up the text size and symbology for the label.

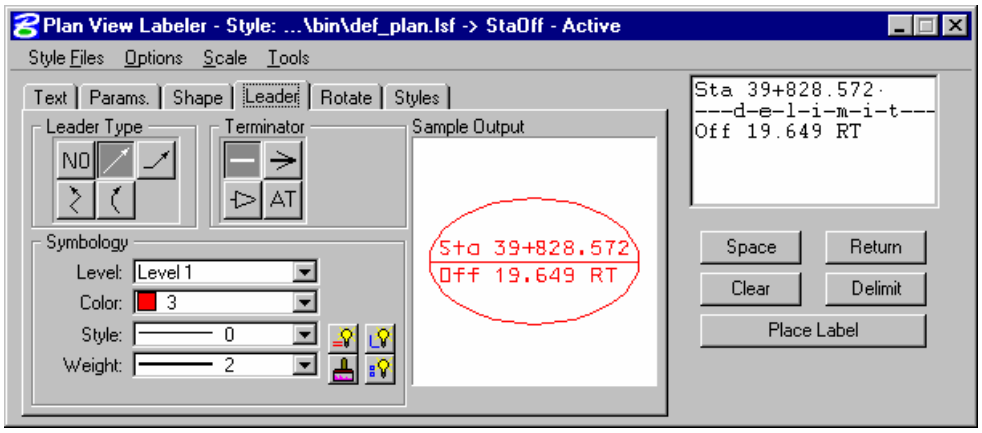
By Current sets the symbology to the current MicroStation settings. **By Element** allows the user to set the symbology by choosing a MicroStation element. **D&C Symbology** allows the user to set the symbology based on a item stored in the D&C Manager database. **Set All** sets the symbology for all elements in the label (text, delimiters, leader lines, etc.).

SHAPE



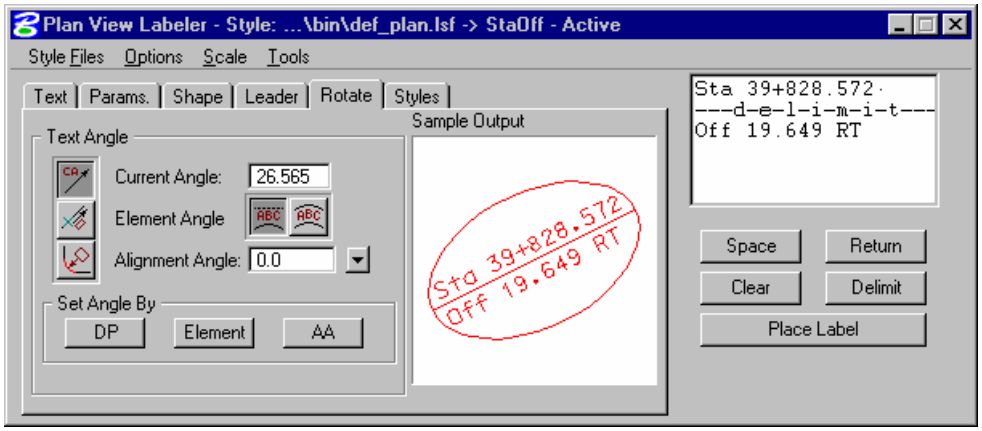
The Shape tab allows the user to place a shape around the label, and set the symbology for the shape.

LEADER



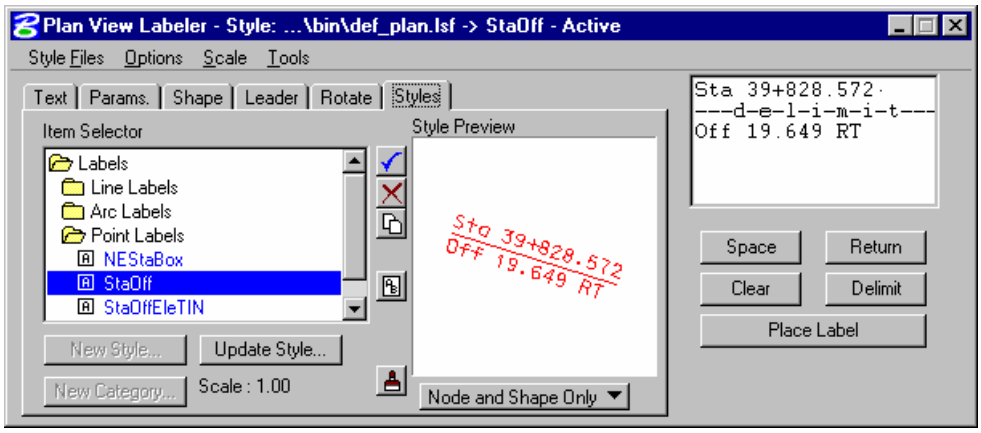
The Leader tab allows the user to attach a leader from the label to the point. Different leader types and terminators can be chosen. The active terminator can also be used.

ROTATE



The **Rotate** tab allows the label to be rotated. The rotation can be determined from the current angle, the angle of the element, or an angle relative to the alignment. The angle can also be set by two data points (first data point set the location, next data point sets the angle) or the active angle.

STYLES



The Styles tab allows a user to choose label symbology from a library of pre-defined styles. When the user chooses the style, all symbology, leaders, shapes, etc. is set up for the user.

MENUS

The Style Files menu allows the user to open a new style library. You must be under the **Styles** tab in order to open a style library.

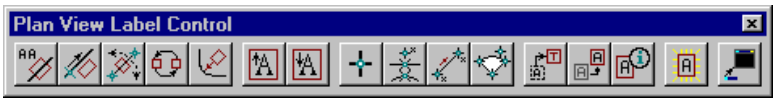
Options > Minimize Dialog minimizes the main dialog (when the Place Label button on the main dialog is pressed) to allow for easier label placement. The Label Viewer can be used in conjunction to still view the sample contained in the Label dialog.

The main labeling window can be maximized by selecting the **Restore Label Dialog** icon within the appropriate View Label Control tool frame or the labeling tool on the main Road, Site, or Drainage tool frame.

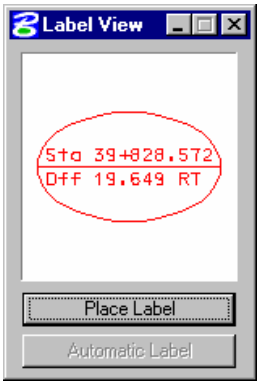
Options > Use Reference File Coordinates - When labeling elements within a reference file, it is useful to utilize the reference file coordinates, rather than the current active file. Simply activate the toggle, and subsequent computed text inserts using reference file elements or data points will reflect the reference file coordinates, if the snap and locate in the reference file are active.

Options > Use DP Element Association - This option will enable the association between MS elements and DP (data point) labels that are snapped to the element. If the element is modified, the point labels will move with the element when the Label Update feature is used. Note: This only applies to elements within the active design file.

Options > Label Tools invokes the tool frame shown below which enables the user to modify GEOPAK labels.



Options > Label Viewer brings up a dialog that allows a user to view and place a label.

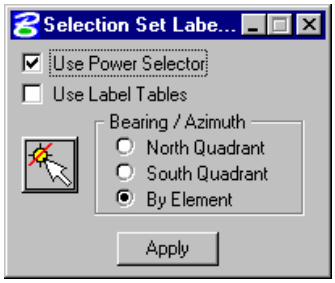


The **Scale > Scale Style** menu allows the user to choose a plan scale. All labels will be adjusted according to the plan scale. The user simply keys in a scale, and chooses a **Labeling Style**. The corresponding label will be placed at the correct size for the scale that was chosen.

Tools > Label Updater - The Label Update tool is a powerful tool for updating GEOPAK labels. When alignments are updated, TIN files modified, labels moved, etc., GEOPAK remembers the computed text information utilized in the placement of the original label. Therefore, the software can update the label based on updated data. The tool utilizes the dialog depicted below.

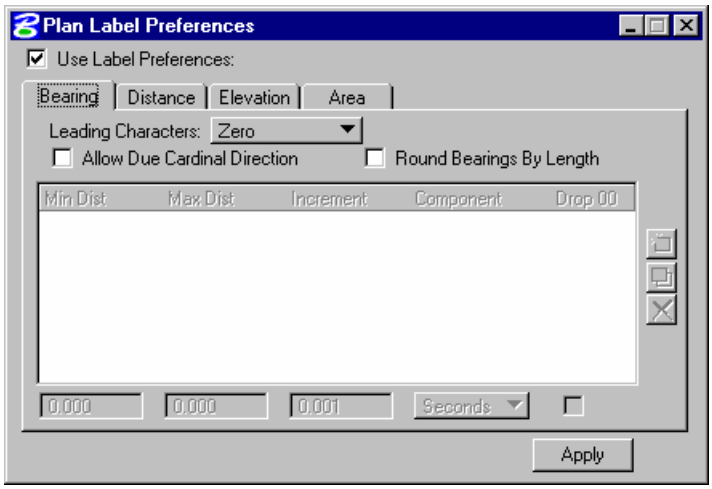
Tools > Selection Set Labeling - The Selection Set Label tool is a powerful tool for placing or updating labels within a selection set.

When the Selection Set Labeling tool is activated from the pulldown menu, the dialog depicted below opens.



Tools > Plan Label Preferences – Allows for the customization of the plan view labels. Options include Bearing, Distance, Elevation, and Area.

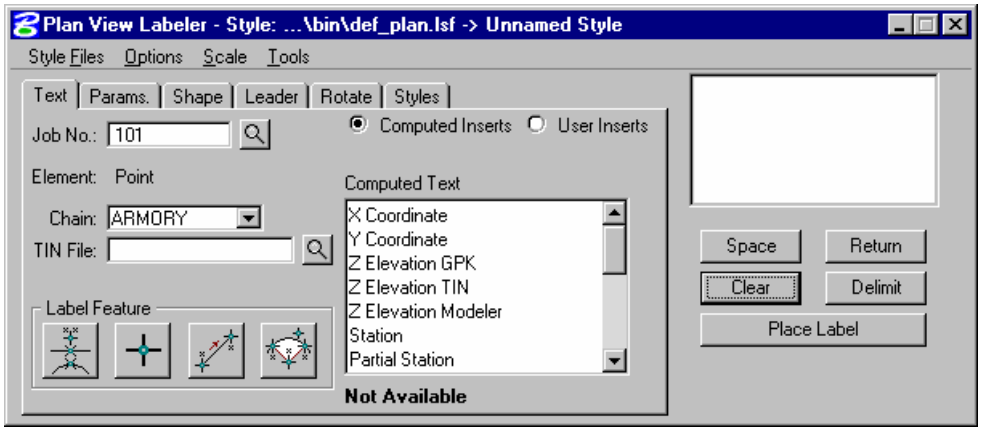
When the Plan Label Preferences tool is activated from the pulldown menu, the dialog depicted below opens.



LAB EXERCISE: LABELING

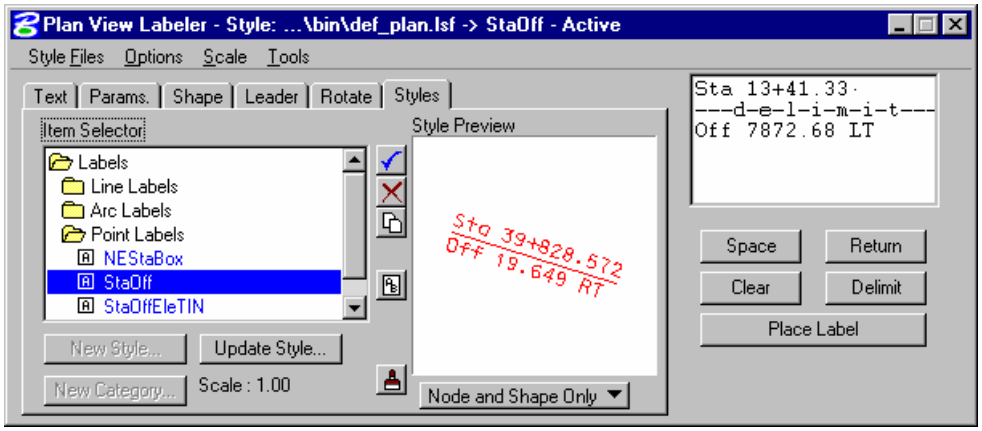
> ACCESSING THE LABELER

1. While still in ***4300.dgn*** select ***Plan View Labeling*** from the main Survey Menu Bar. (***Plans Preparation > Plan View Labeling***).



> USING PREDEFINED LABEL STYLES

1. Select the ***Styles*** Tab.
2. Traverse with the Item Selector box to locate the following style:
   Labels > Point Labels > StaOffEleTIN
3. Next, double click the ***StaOffEleTIN*** style.

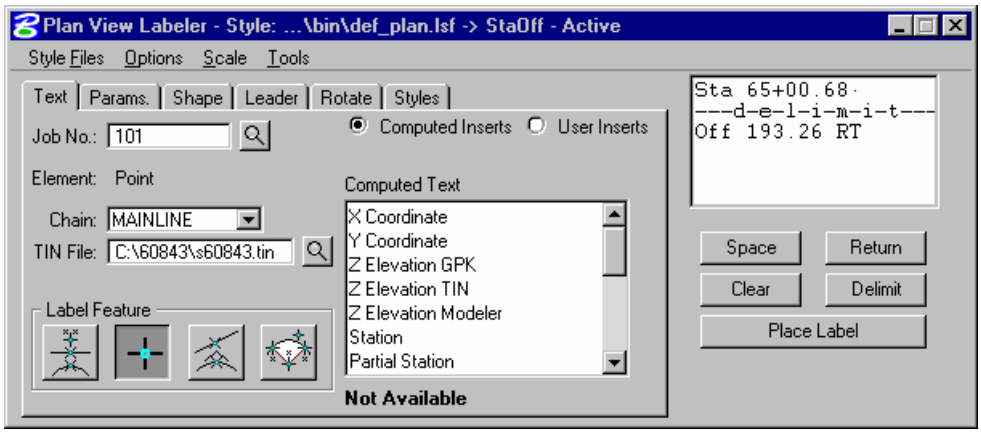


3. Move back to the Text tab and complete as defined below:

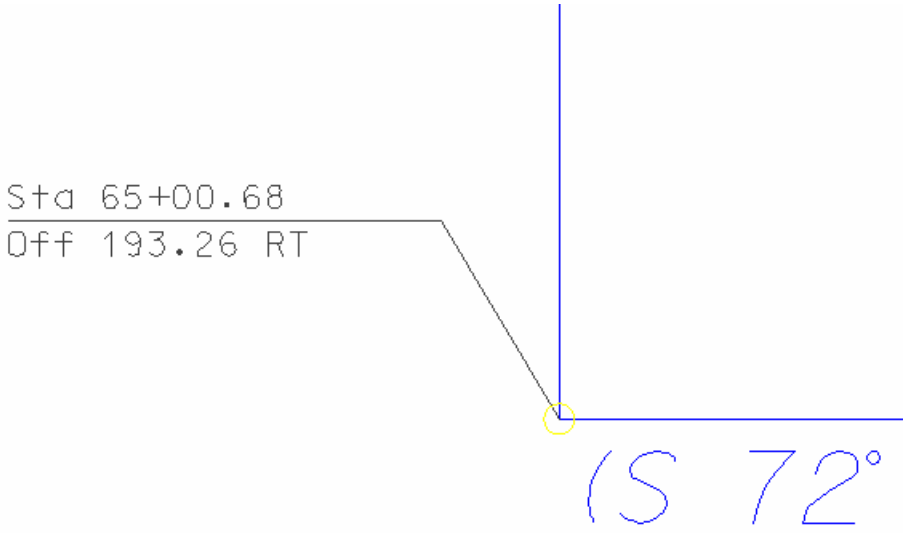
Job No.	101
Chain	MAINLINE
TIN File	S60843.tin

In the following steps, we will use the ***Plan View Labeler*** to label the station and offset for the corners of parcel 4300.

4. To begin the process, select the **DP** button and then identify the location that you wish for the Station and Offset to be computed. The labeler automatically calculates the information.

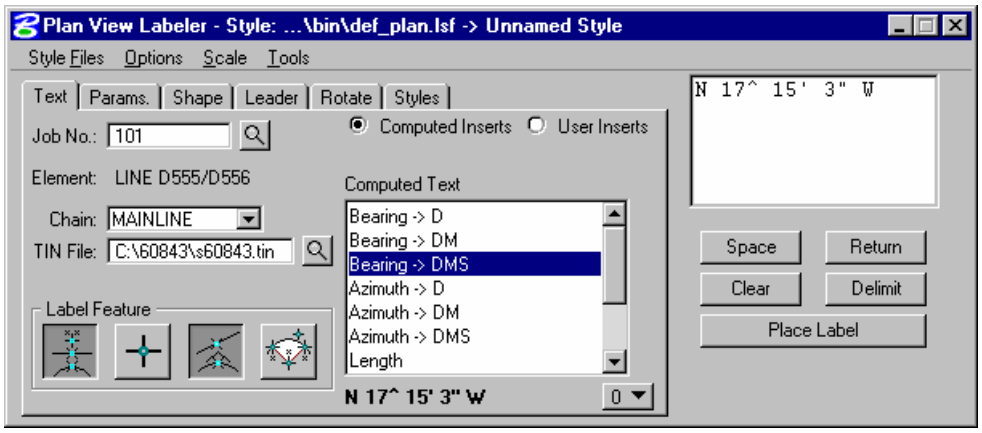


5. Use the ***Params.***, ***Shape***, ***Leader*** and ***Rotation*** tabs to experiment with different labeling styles.
6. To place the label, return to the ***Text*** tab and click the ***Place Label*** button.
7. The label is now attached to your cursor (without the leader for the delimiter).
8. Data point at the location you wish the text to be located.
9. A second data point will define the side of the label, which the leader line will be drawn from the delimiter line to the computed location.



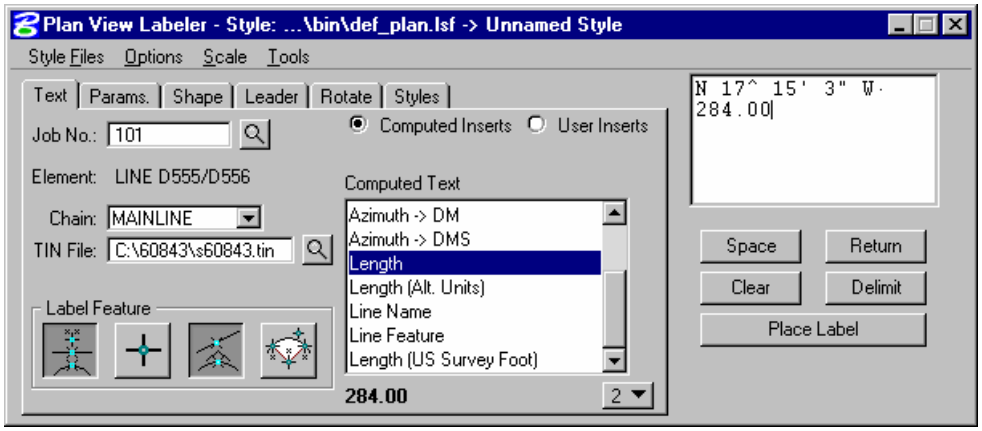
> *CREATING AND SAVING A NEW LABEL STYLE*

1. Select the ***Text*** tab then click ***Clear*** below the label composition window.
2. On the ***Plan View Labeler*** dialog, click the ***Select GEOPAK or MS Element*** icon, then identify any of the lines representing the parcel and accept. The computed text inserts should now contain items such as ***Bearing, Azimuth,*** and ***Length***.
3. Click on the ***Bearing -> DMS*** insert. This should show the current value below the Computed Text window in addition to a user definable toggle for the number of decimal places. Set this to ***0***, then double click ***Bearing -> DMS***. Click ***Return*** to start a new line for the label.



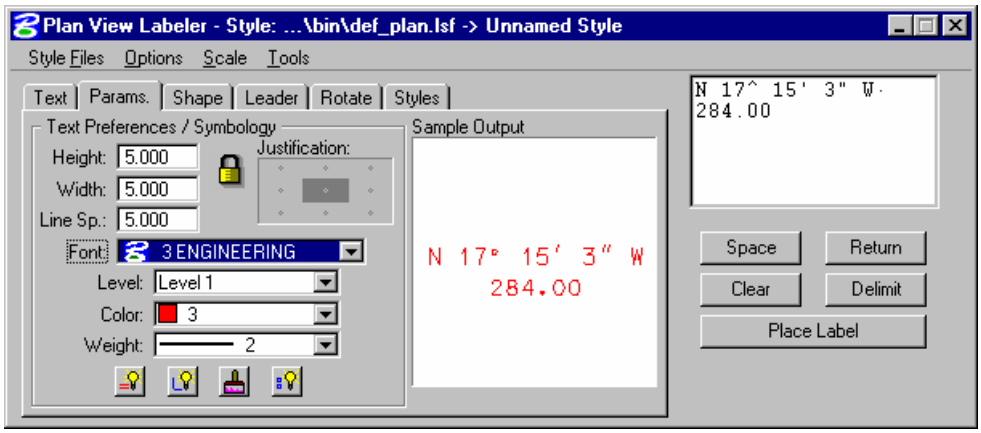
Note Your Bearing may be different depending on which MicroStation line you identified.

4. Single click on the ***Length*** item, set its number of decimal places to ***2***, then double click ***Length***.



Note Your Distance may be different depending on which MicroStation line you identified.

5. Select the ***Params.*** Tab and set the ***Height, Width,*** and ***Line Sp.*** to ***5.0*** and the ***Justification*** to ***Center-Center***.



6. Select the ***Shape*** tab, set the ***Shape Preferences*** to ***No Shape.***
7. Select the ***Leader*** tab and set the ***Leader Type*** to ***NO Leader*** and the set the ***Terminator*** to ***No Terminator***.
8. Click **Continuous Place**.
9. Set the MicroStation snap to Midpoint. Snap the previously identified line and accept.
10. Data point and accept each of the remaining lines of the parcel.
11. Select the ***Styles*** tab.
12. In the ***Item Selector*** window, double click ***Labels*** then double click ***Line Labels***.
13. Click ***New Style***.
14. Set the Style name to ***Bear_Dist***.
15. Click ***OK*** to save the style.
16. Click ***Style Files*** > ***Save*** to update the ***def_plan.lsf*** file.
17. Exit MicroStation.

3 Borrow Pits

OBJECTIVES

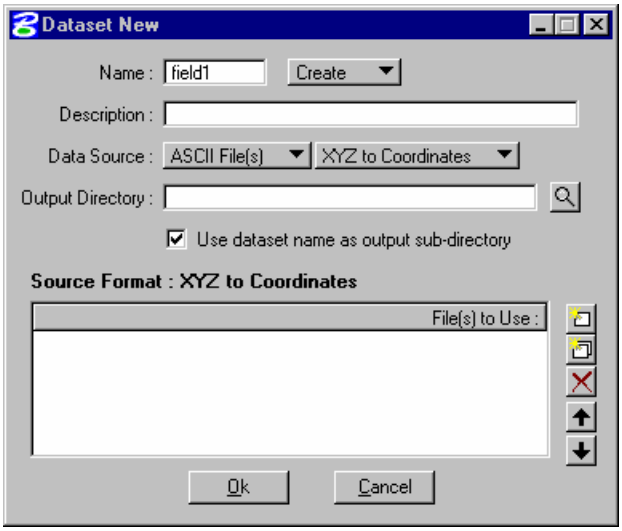
This chapter will focus on the critical process within the districts of creating data for borrow pits. Attention will be focused on creation of digital terrain models, both existing and proposed, from multiple data sources as well as calculating volumes using both the prismoidal and end area methods.

INTRODUCTION

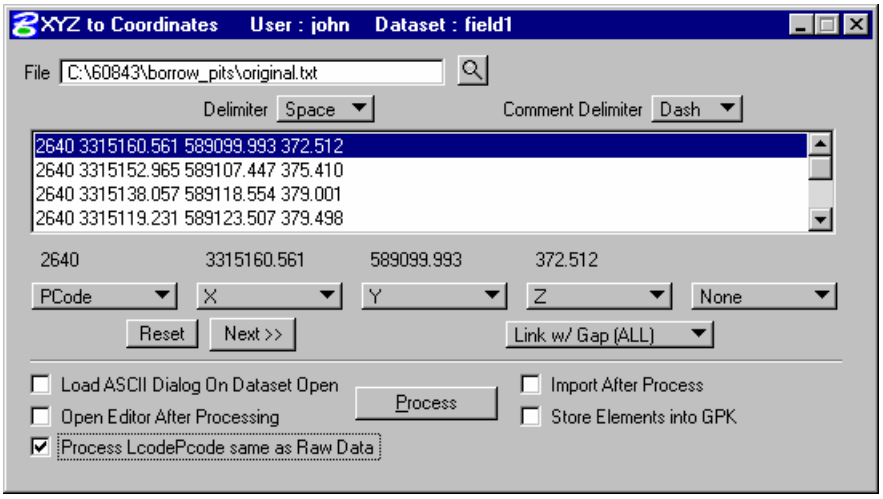
Compiling data to create a digital terrain model for the existing ground will allow the user to create volumes after construction or excavation. After construction a secondary terrain model provides the surface to compute differences with the existing model.

IMPORTING ASCII DATA

The first step in processing the ASCII data is to appropriately define the settings in the ***Dataset*** dialog. This involves the selection of the desired ASCII field data file to be processed.

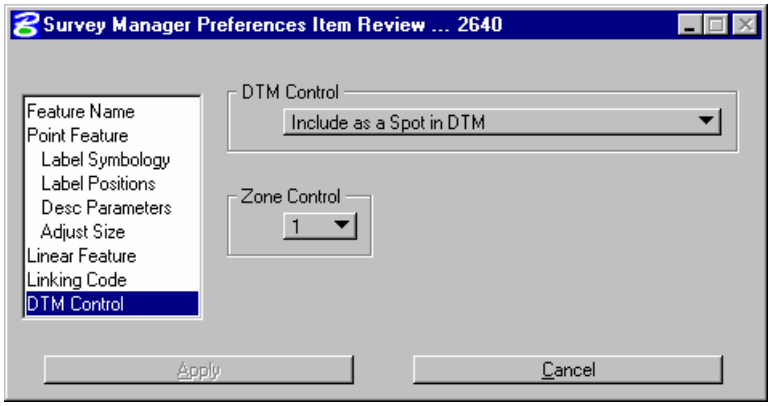


Once the ASCII file has been selected for processing it is simply a matter of identifying the appropriate information in each column.

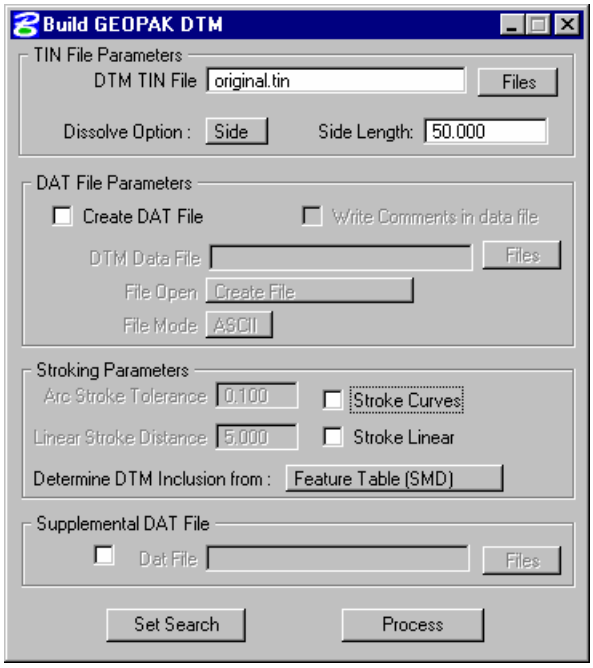


CREATING A TERRAIN MODEL

Once the data is imported then a digital terrain model can be compiled using the ground shots. Since the ground shots have been imported through ***Survey*** all information about each shot is known regarding DTM inclusion. This information is read directly from the feature code for each shot in the SMD feature table.



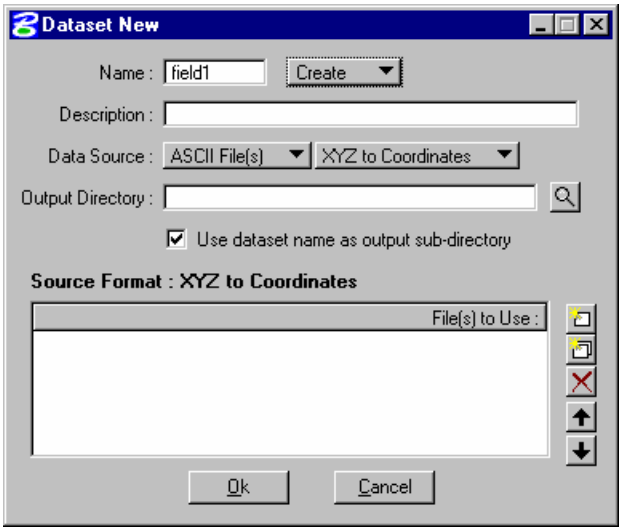
After importing the ground data, the ***Build GEOPAK DTM*** tool is then used to triangulate the data and create the terrain model or ***TIN*** file.



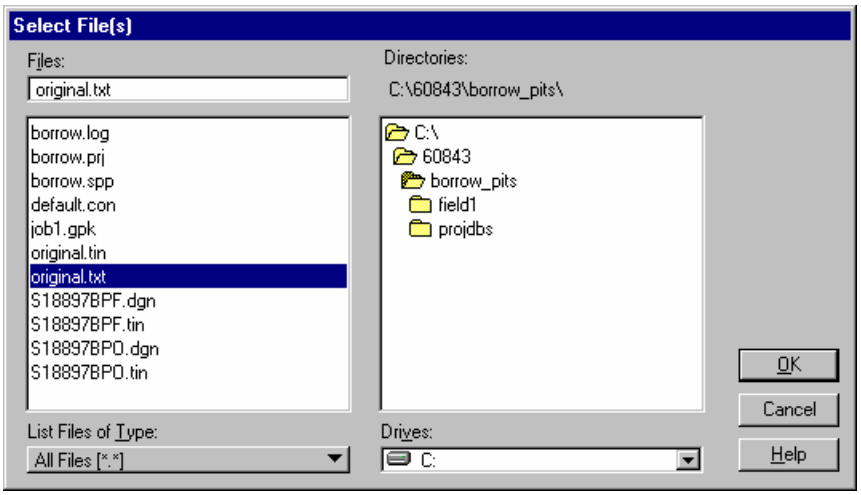
LAB EXERCISE: BORROW PITS

> *IMPORTING ASCII DATA*

1. Open the MicroStation file ***C:\60843\borrw_pits\S18897BPO.dgn***.
2. Access GEOPAK Survey from ***Applications*** > ***GEOPAK Survey*** > ***Survey***.
3. Open the existing project ***Borrow***.
4. Create a new ***Dataset*** called ***Field1***.

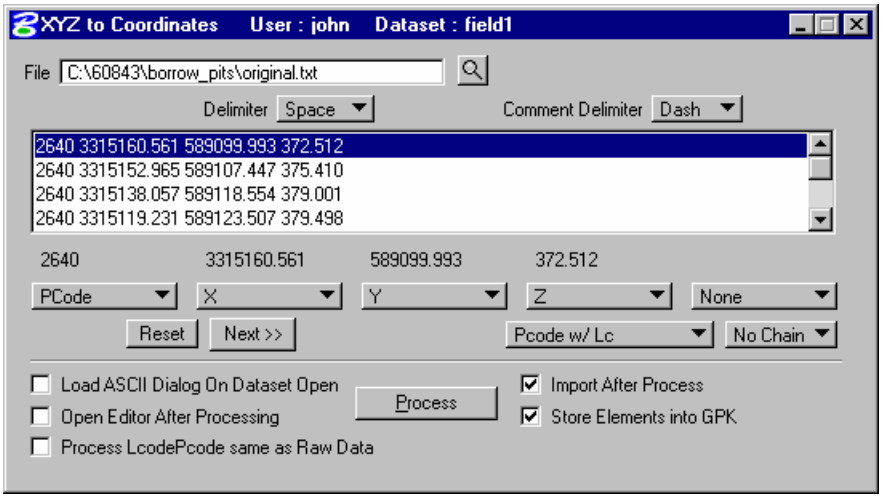


5. Using the ***Dataset Add Source File to List*** icon on the right of the list window, add the file ***original.txt***.



6. Click ***OK***.

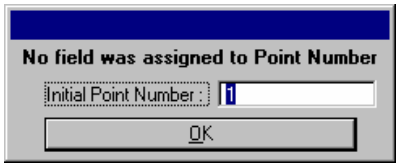
7. Change the ***Delimiter*** to ***Space*** and highlight one of the lines in the list window.



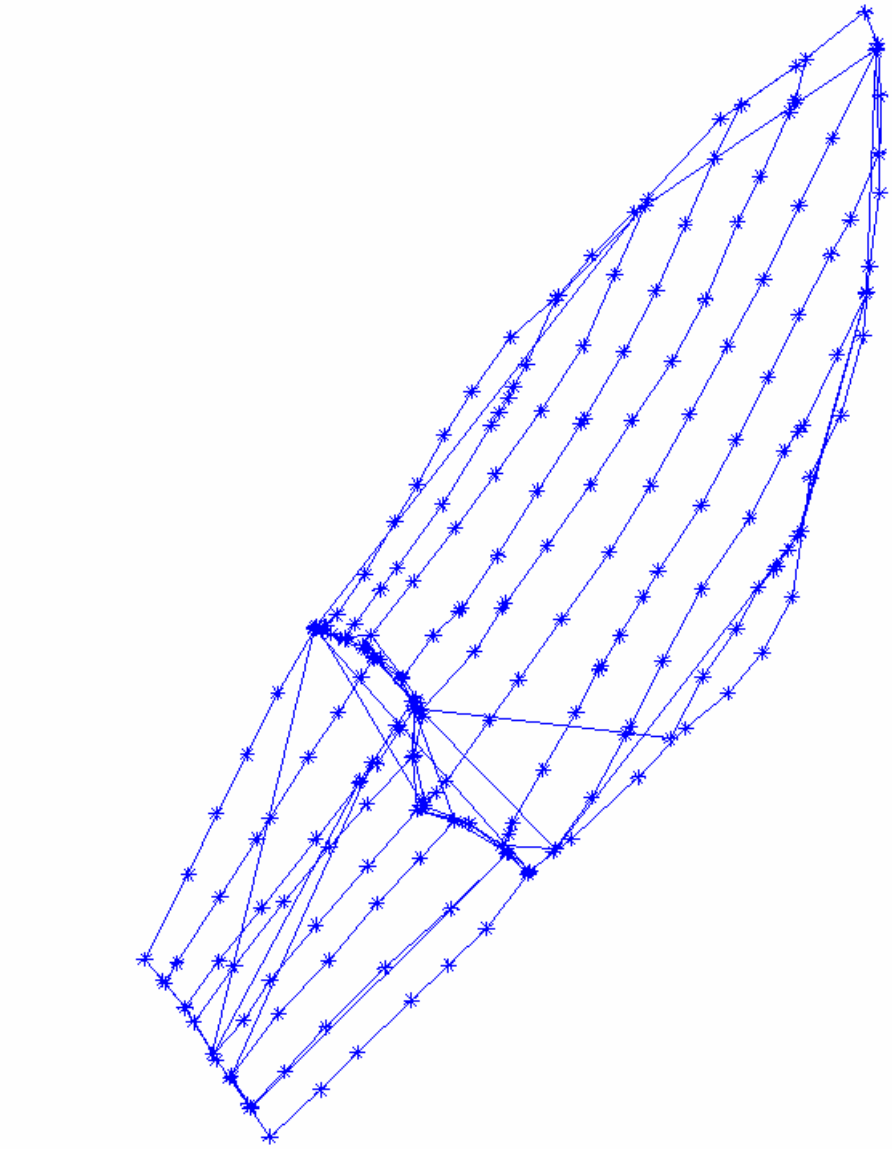
8. Now set the toggles for each column.

9. Once completed click the ***Process*** button.

10. When the following prompt appears, make sure the point is set to 1 and click ***OK***.

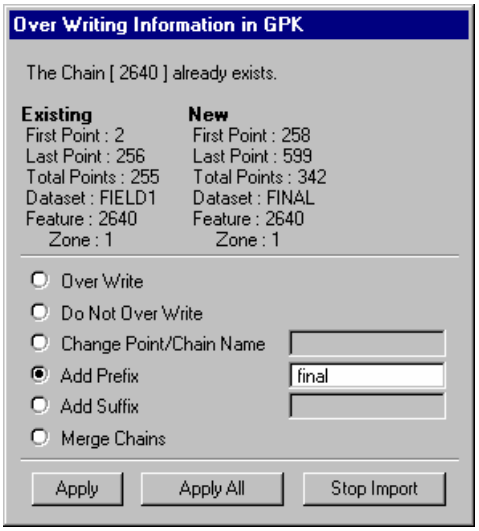


11. You should now have points displaying similar to the ones shown below.



12. Repeat this process for the ASCII file ***Final.txt*** beginning with creating a new dataset called ***Final***.

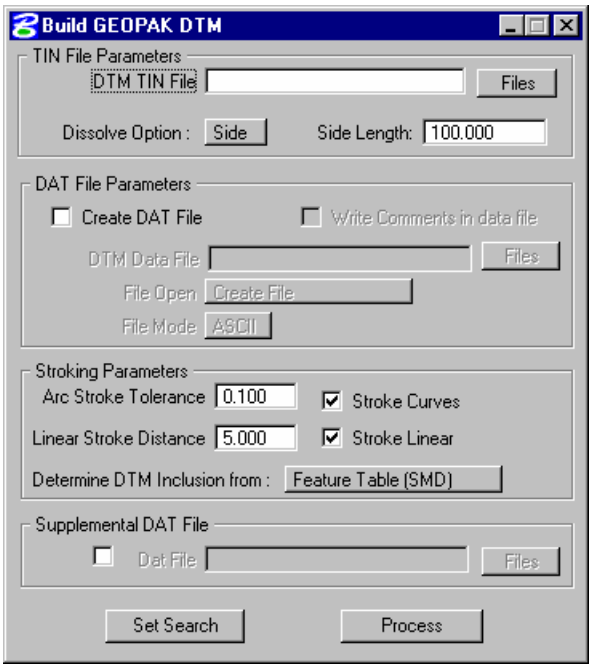
13. When the ***Chain*** warning appears provide a prefix name of ***Final***.



14. Click ***Apply***.

> *CREATING A TIN FILE*

1. To create the TIN file for the existing ground select ***Build DTM*** from the ***DTM*** pulldown. (***DTM > Build DTM > From Survey Data***)

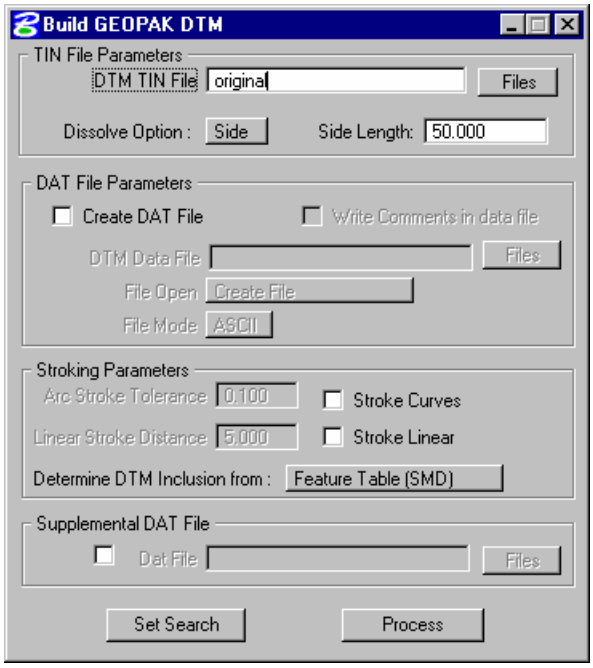


2. Provide a TIN file name of ***Original***.
3. Set the ***Dissolve*** option to ***Side*** and provide a length of 50'.

4. Toggle OFF the ***Stroking Parameters***.
5. Make sure the ***Determine DTM Inclusion From*** option is set to ***Feature Table (SMD)***.
6. Click the ***Set Search*** button and select the existing dataset ***Field1***.

Note Toggle OFF the *Final* dataset.

7. Click ***OK***.
8. Click ***Process*** on the main dialog.

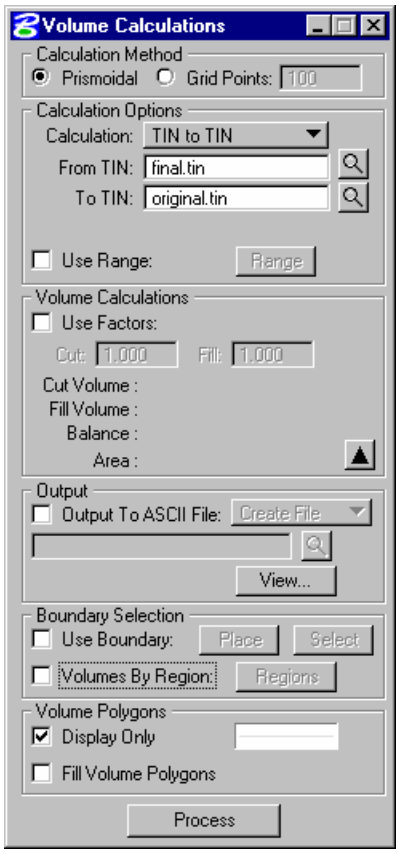


9. Create a TIN file named ***Final*** using the Final dataset.

VOLUME CALCULATIONS

The Volumes Tool computes volumes between TIN models or a TIN model and plane. The quantities are displayed in the dialog, and can be optionally written into an ASCII file.

For each volume option, the area about which volume calculations are performed is defined by a MicroStation shape or complex shape element (Select mode). An alternative method of defining the area about which volume calculations are performed is by interactively defining the area (Place mode). Both Select and Place mode operations will be discussed for each volume calculation option. In addition, depth ranges may also be utilized for each Volume option.



Calculation Method:

Activate one of the two methods to determine the method of calculation. Prismoidal utilizes the triangulation models, while the Grid Points utilizes lattice models created on the fly.

Prismoidal

When activated, triangulated models are utilized to compute the prismoidal volume.

Grid Points

When activated, the program utilizes the user-specified number of **Grid Points** to create a lattice, and then computes lattice volumes.

Calculation Options

This group box specifies which TIN files or planes are to be utilized for volume calculations. As the Calculation type is selected, the From and To fields directly below dynamically change to reflect the selection.

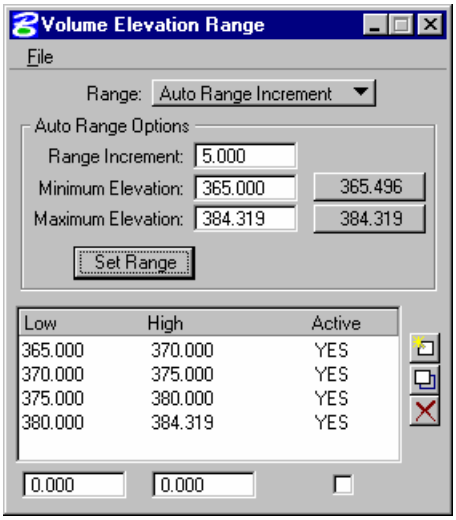
Calculation

When **TIN to TIN** is selected, the fields directly below are **From TIN** and **To TIN**. This configuration would be common for determining the project volumes, i.e., from existing ground terrain to the proposed surface.

When **Plane to TIN** is selected, the fields directly below are **From Plane** and **To TIN**. In this case, a key-in field for the elevation is provided. This example is common for determining volumes between a water level (elevation) and the proposed pond.

Use Range

Clicking **Range** opens the dialog depicted below. Note the button is un-ghosted only when the **Use Range** toggle is active. If the toggle is active and no ranges are defined, the **Process** button remains ghosted.



The dialog contains a list box, with edit fields directly below. Options are supported (button to the right of the list box) to **Add**, **Modify**, and **Delete** ranges. When the **Active** toggle is activated, the selected range is utilized for computations. A range can be activated or deactivated at any time during the processing by highlighting the desired line and changing the **Active** toggle in the lower right corner of the dialog. In this manner, the user has complete control over which ranges are computed at any one time.

To add a single range, simply key in the desired values, set the **Active** toggle, and click **Add**. The created line is added to the list box. To modify a line, highlight the desired line. The current values are displayed in the edit fields. Change the desired field, and then click **Modify**. GEOPAK updates the list box. To delete a line, highlight the line and click **Delete**. The line is removed from the list box. A maximum of 50 ranges is supported. When more than five ranges are specified, the scroll bar and arrows on the right side of the dialog are automatically invoked for easy scanning.

The top of the dialog supports automatic creation of ranges. Two options are supported:

- **Auto Number of Ranges** - the number of ranges is specified, along with the Minimum and Maximum elevations. GEOPAK divides the Minimum and Maximum elevation difference into the specified number of elevation ranges.

- **Auto Range Increment** - the range increment is specified, along with the Minimum and Maximum elevations. GEOPAK divides the elevation into as many elevation ranges as necessary at the specified increment.

Note the buttons to the right of the Elevations are the Min /Max values for the current TIN Model. They are displayed only when TIN file names are specified within the main dialog. To utilize them in populating the fields, simply press the appropriate button.

To utilize the specified ranges for subsequent sessions, several File functions are supported: **Save**, **Save As**, and **Open**.

Volume Calculations

This group box contains the **Cut Volume**, **Fill Volume**, **Balance**, and **Area** tools. Units are determined by the User Preferences. In English projects, units are cubic and square yards, while metric projects are cubic and square meters. Fields are supported for Cut Factor and Fill Factor.

Fill Factor
Cut Factor

To utilize the **Fill Factor** or **Cut Factor**, activate the toggle to the left of the Fill Factor. When activated, the **Fill Factor** is applied to the Fill volume, while the **Cut Factor** is applied to the Cut Volume. The calculations displayed in the Volume Calculations and in the optional report reflect the adjusted volumes. The Factors are also applied to the range totals.

Output

An optional output can be generated, placing the results in an ASCII file.

Output to ASCII File

When activated, the results are placed in the specified ASCII file.

Files

Name of ASCII file to be created or appended. In lieu of typing, clicking **Files** invokes the Create ASCII Output File dialog, wherein the desired file may be selected.

Create File
Append File

Setting the option to **Create File** creates a new output file, while setting the option to **Append File** adds the results of the current processing to the bottom of the previously created output file.

View

Pressing this button invokes the Text editor, and automatically loads the output report for review.

Boundary Selection

Volume calculations can be performed in a user-defined area(s), rather than the entire model, utilizing information within this group box.

Use Boundary

When activated, a single user-defined boundary is utilized, rather than computing volumes for the entire model. When activated, both the **Place** and **Select** buttons are un-ghosted.

Place

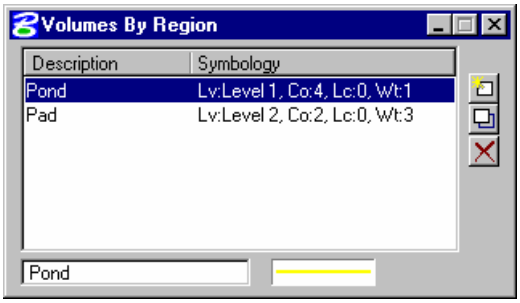
Clicking **Place** enables the user to subsequently identify data points within the model to define the boundary limits. To close the boundary, place the last data point within the circle at the initial point of the boundary.

Select

Clicking this button enables the user to identify a previously defined closed element, wherein volume calculations can be computed.

Volumes by Region

When activated, the Volumes for multiple boundaries based on element symbology can be computed. Clicking **Regions** opens the Volumes by Region dialog.



To add region(s), enter a Description, and then set the symbology. Click **Add** to add the items to the list box. To modify a listing, highlight the desired line to be modified, which places the current line in the edit fields. Make the desired changes, and then click **Modify**. The list box is updated. To delete a line, simply highlight the line to be deleted, and then click **Delete**.

Note numerous regions of the same symbology can be computed by a single entry in the list box. If defined areas overlap, their union is utilized for volumes, so the volumes are not included twice in the computations. The regions must be closed shapes, as any non-closed shapes are ignored. Closed areas comprised of other elements (i.e., lines or line strings) are also not utilized, only MicroStation shapes.

Each region (one line in the list box) and its associated volume are listed separately within the output report, while only the total volume is shown within the Volume Calculations part of the dialog.

Volume Polygons

The areas where volumes are computed are displayed or drawn into the design file. The area of the volume polygon is identical to the Area value displayed within the Volume Calculations group box.

Fill Volume Polygons

When activated, polygons are filled, rather than just outlined. Note the MicroStation fill attribute must be active for the fill to display.

Display Only

When activated, the polygons which outline the area where volumes have been computed are visually displayed, but not drawn into the design file. Therefore, they disappear when the screen is refreshed or any view control command is executed. When not activated, the polygons are drawn into the design file.

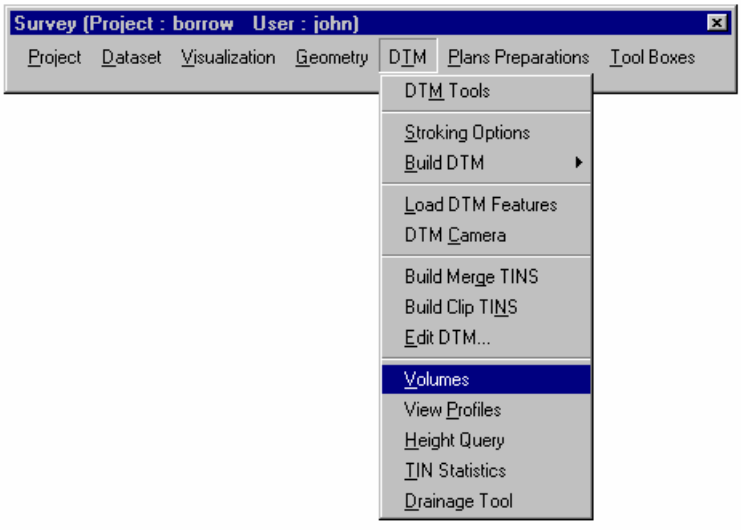
Process

Commences the volume calculations. Note this button is ghosted until sufficient data has been incorporated within the dialog.

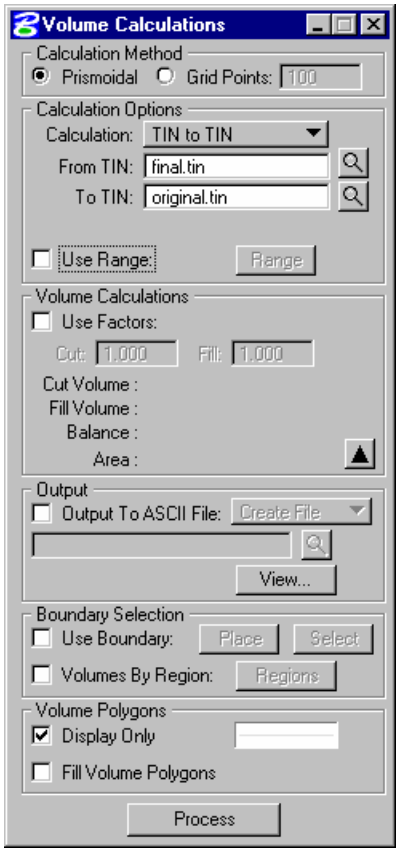
LAB EXERCISE: PRISMOIDAL VOLUMES

> *COMPUTING VOLUMES*

1. Open the MicroStation file ***C:\60843\borrw_pits\S18897BPO.dgn***.
2. Access GEOPAK Survey from ***Applications > GEOPAK Survey > Survey***.
3. Open the existing project ***Borrow***.
4. From the main ***Survey Menu*** bar select ***DTM > Volumes***.

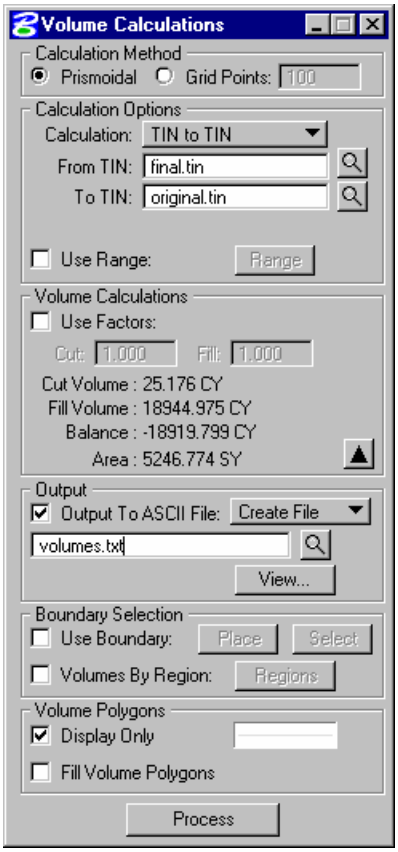


5. Use the Browse buttons to select the From and To TIN files as shown below.



6. Toggle ON the ***Output to ASCII File*** and provide a file name.
7. Click ***Process***.

8. Review the volumes in the dialog and ASCII file.



9. Exit MicroStation.

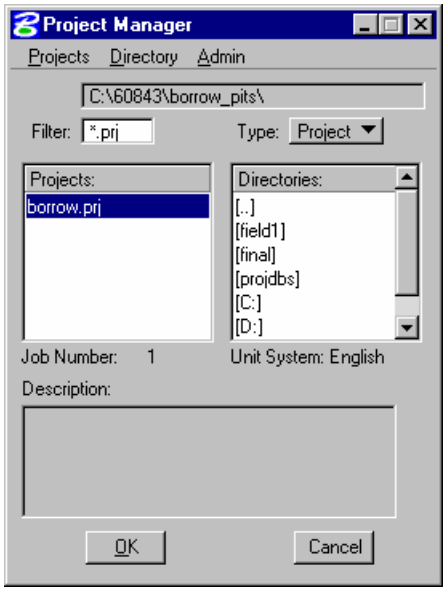
CROSS SECTIONS

In this section we will review how to create a baseline in order to calculate end area volumes using the same two TIN files from the previous section.

LAB EXERCISE: END AREA VOLUMES

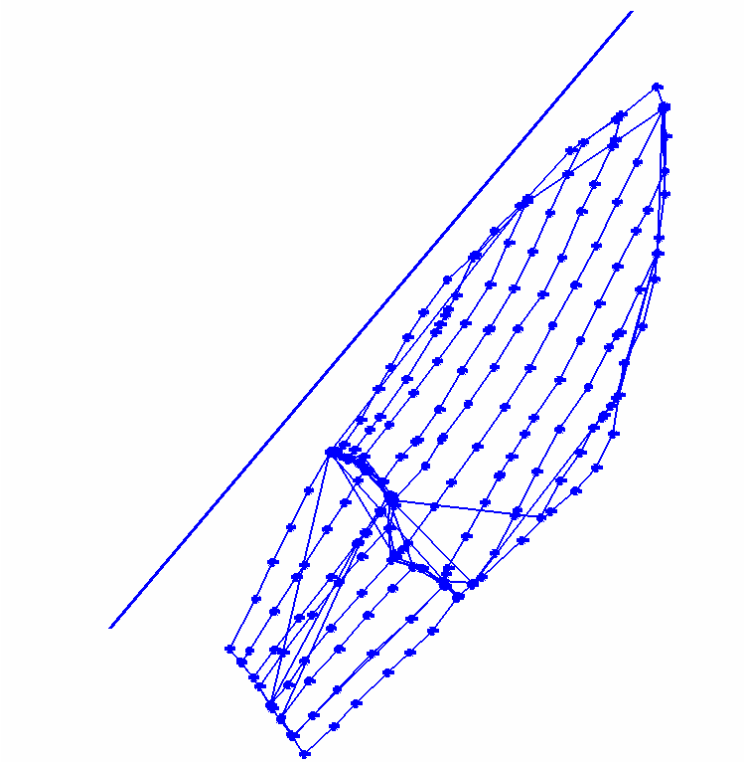
> *CREATING A BASELINE*

1. Open the MicroStation file ***C:\60843\borrw_pits\S18897BPO.dgn***.
2. Access GEOPAK Survey from ***Applications > GEOPAK Road > Project Manager***.



3. Open the existing project ***Borrow***.
4. Use the User Name ***John***.

5. Using the MicroStation ***Place Line*** command, place a line to be used as a baseline in the location as shown below.



6. Select from the Applications pulldown ***Applications > GEOPAK Road > Geometry > Store Graphics***.

7. Populate the dialog as shown below and then click on the ***ID Element*** button.

8. Data point on the baseline element previously drawn.

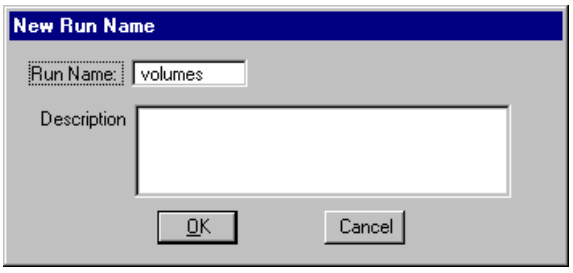
9. Issue one more data point anywhere on the screen to accept the baseline.

10. Click the ***Store*** button that is now un-ghosted on the dialog.

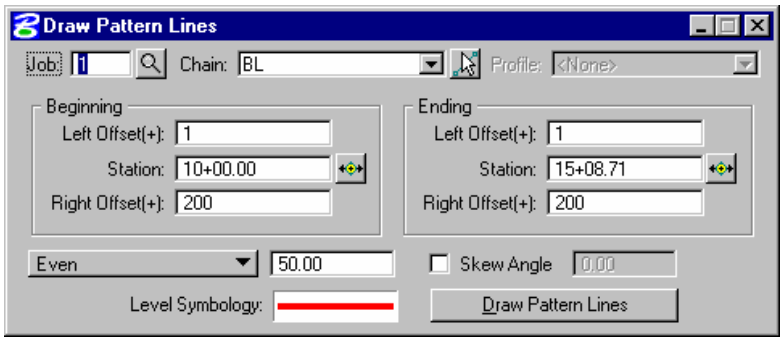
11. Click ***OK*** to finish storing the chain in the COGO database.

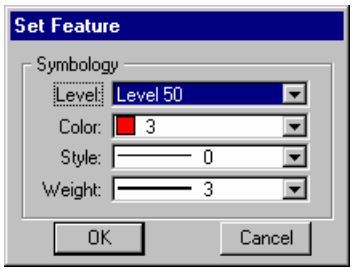
> *CREATING PATTERN LINES*

1. Return the main **Project Manager** dialog.
2. Click on the button ***Draw Pattern***.
3. Select ***Run*** > ***New*** on the RUN dialog and create a new RUN named ***Volumes***.



4. Click ***OK.***
5. Open the new RUN.
6. Make the settings in the dialog as shown below.

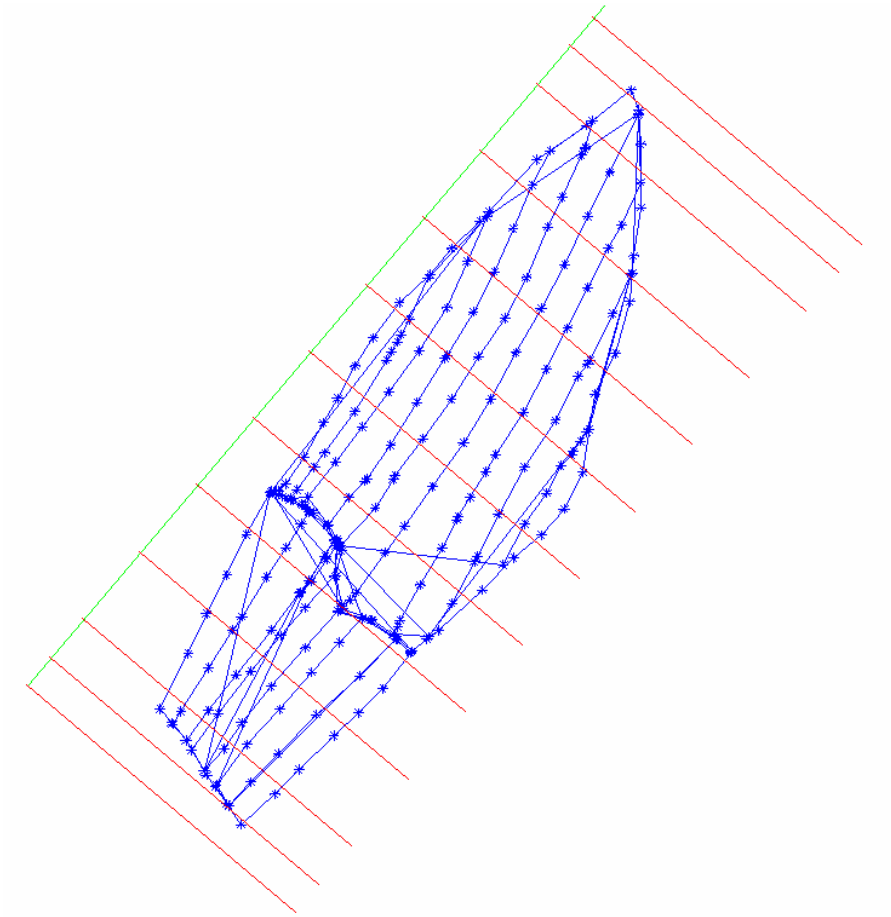




Note	It is important to provide a distance other than zero for the offset values. The Pattern Lines MUST cross the baseline.

7. Click the ***Draw Pattern Lines*** button.
8. Close the ***Draw Pattern Lines*** dialog.

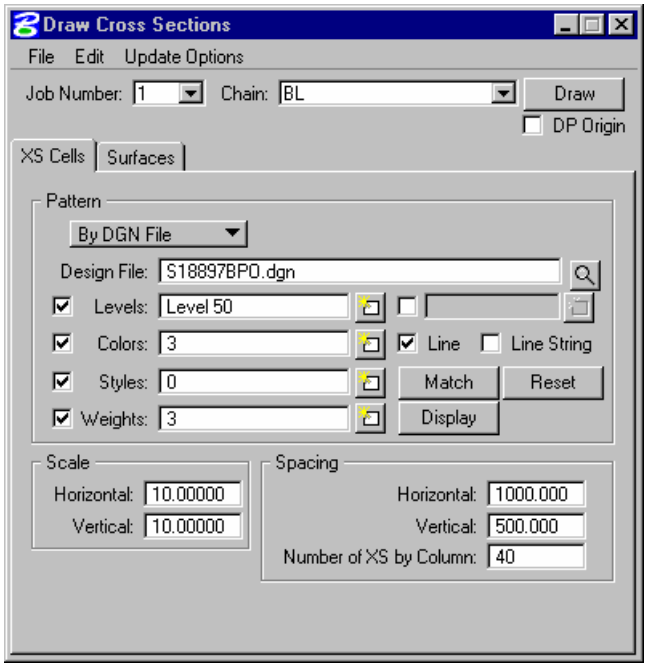
Note You should now have Pattern Lines as shown below. You may find it necessary to ADD additional Pattern Lines particularly at the beginning and end of the area to be calculated.



> ***CREATING GROUND CROSS SECTIONS***

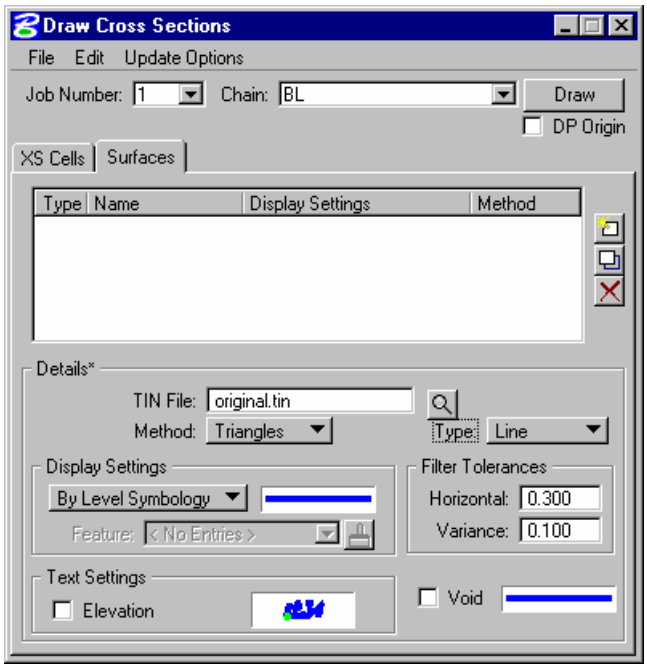
1. Click the button for ***Existing Ground Cross Sections*** on Project Manager.
2. Create a new RUN named ***volumes***.

3. Make the settings in the dialog as shown below.

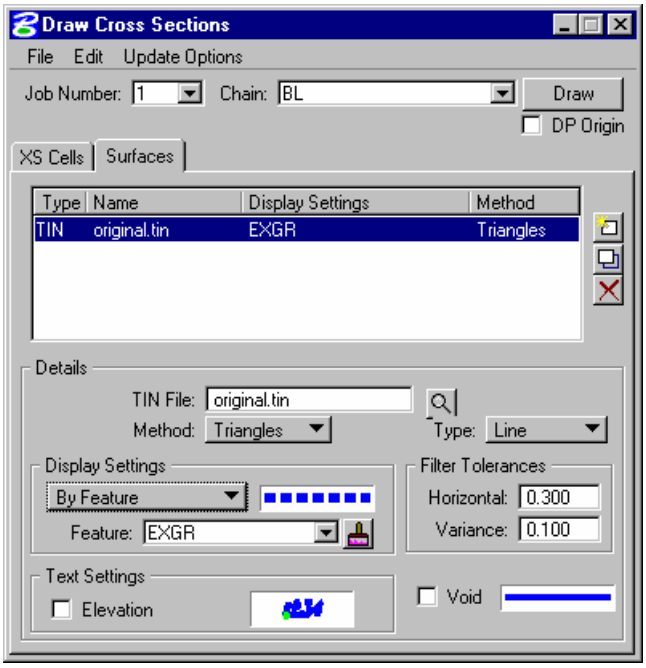


4. Click the ***Surfaces*** tab and complete the remaining settings.

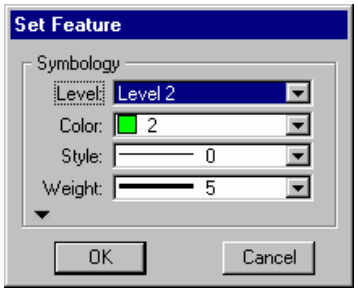
5. In the ***Details*** portion of the dialog set the TIN file to ***Original*** and the ***Method*** to ***Triangles*** and the ***Type*** to ***Line***,



6. In the ***Display*** portion of the dialog set the toggle to ***By Feature.***
7. Use the Browse button and select the item ***Road Design*** > ***Cross Section*** > ***Existing*** > ***EXGR***.
8. Click the ***Add Item*** on the right side of the list window.

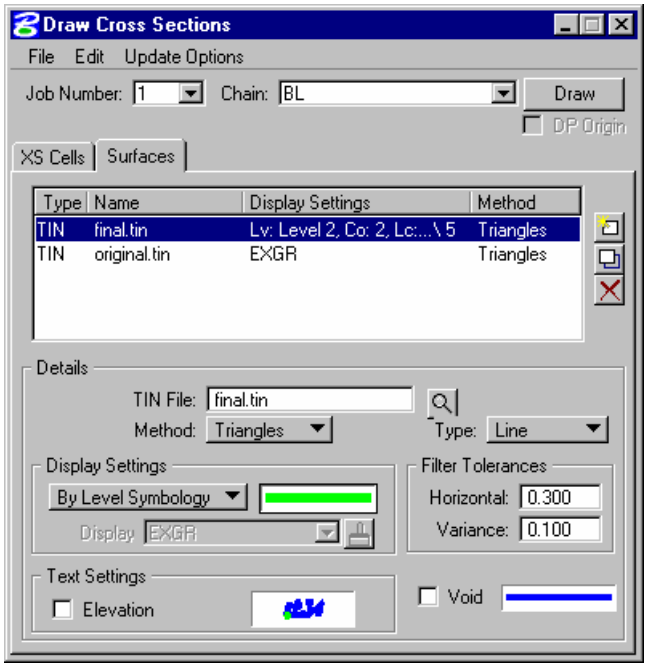


9. Change the TIN file to ***Final***.
10. In the ***Display Settings*** portion of the dialog change the toggle to ***By Level Symbology***.
11. Double click on the symbology window and set the dialog as shown below.

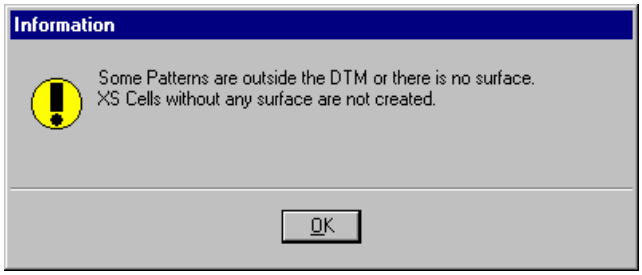


12. Click ***OK***.

13. Click the ***Add Item*** on the right side of the list window.



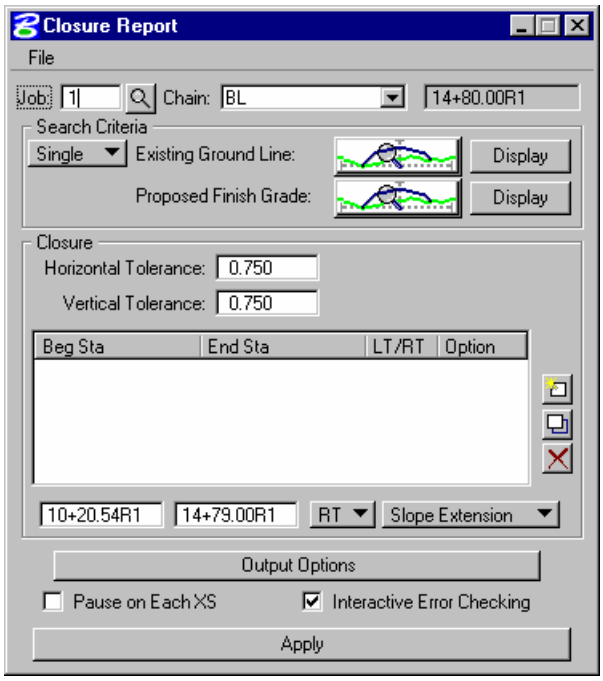
14. Create and open a new 2D MicroStation file named ***xs_volumes.dgn***.
15. Click the ***Draw*** button on the ***Existing Ground Cross Section*** dialog.
16. You can click ***OK*** if you receive the warning below.



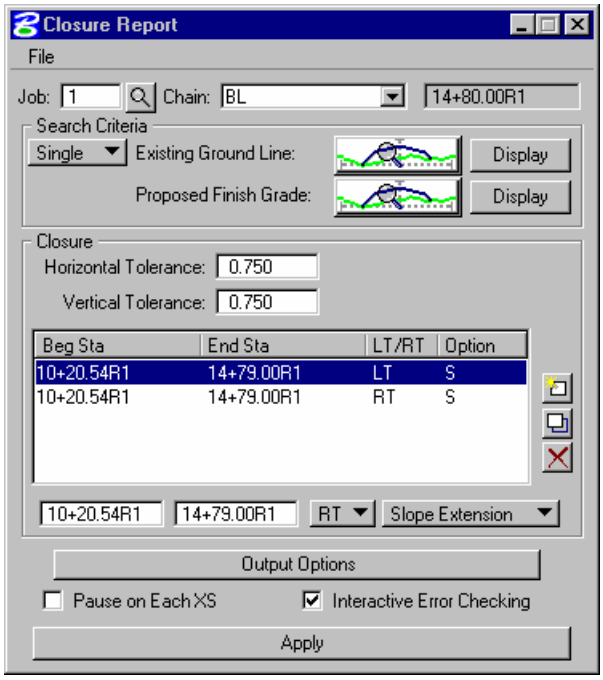
Note You should now have both original and final cross sections.

> *CLOSURE REPORT*

1. Access the ***Reports & XS Quantities*** from the main Project Manager dialog.
2. Click on the ***Closure*** report.

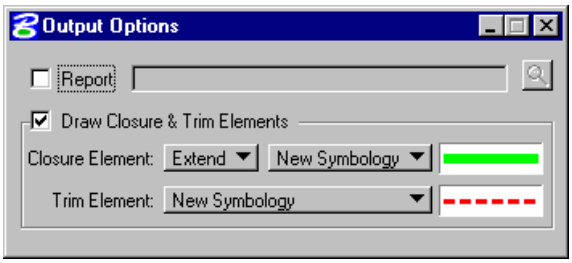


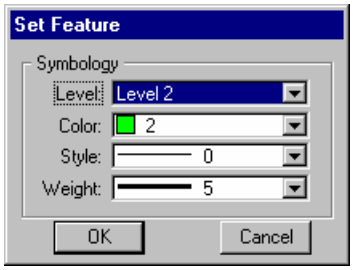
3. Using the toggles directly below the list window set the ***LT*** & ***RT*** sides to ***Slope Extension*** by adding each to the list window separately.

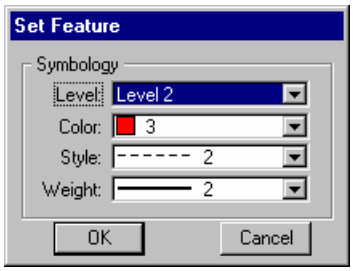


4. Click the ***Output Options*** button.

5. You can visualize the affects of running the report by making the settings as shown below.





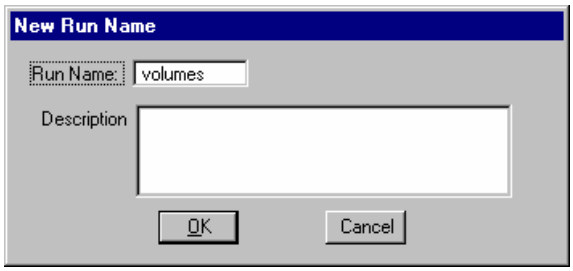


6. Once the settings have been made close the ***Output Options*** dialog.
7. Click the ***Apply*** button on the main dialog.
8. Close the ***Closure Report*** dialog and review the sections.

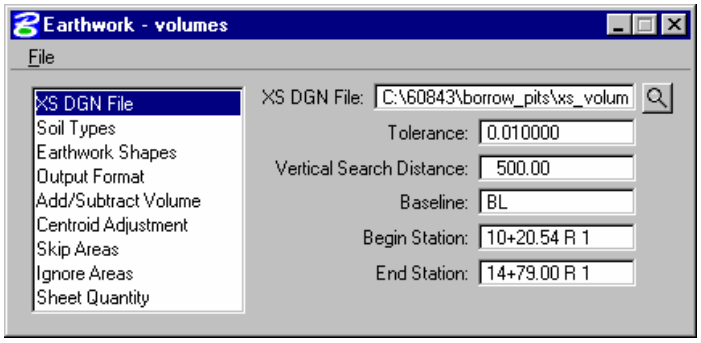
Note	The reason the Closure Report did not perform much in the way of clean up on these particular sections is the fact that there are multiple line segments beyond the intersection of existing and proposed or the fact that an extension of proposed would not tie to existing. Because of this we can opt to step through each section and fix or continue on with the Earthwork application and perform inter-active corrections as we are computing end area volumes.

> ***END AREA VOLUMES***

1. Click on the ***Earthwork*** button on the main Project Manager dialog.
2. Create a new RUN named ***volumes***.

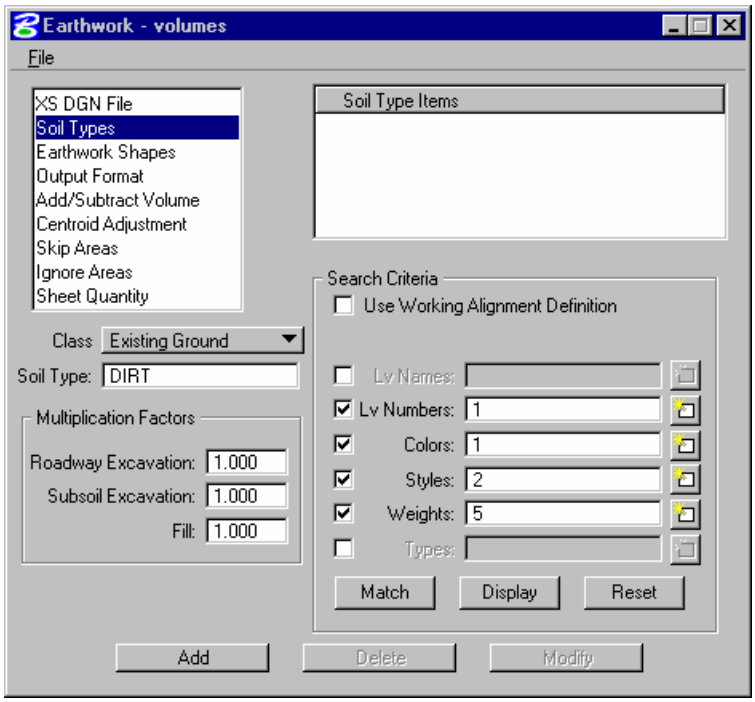


3. Click ***OK***.
4. Open the **new** RUN.
5. Input the ***XS DGN File*** information as shown below.

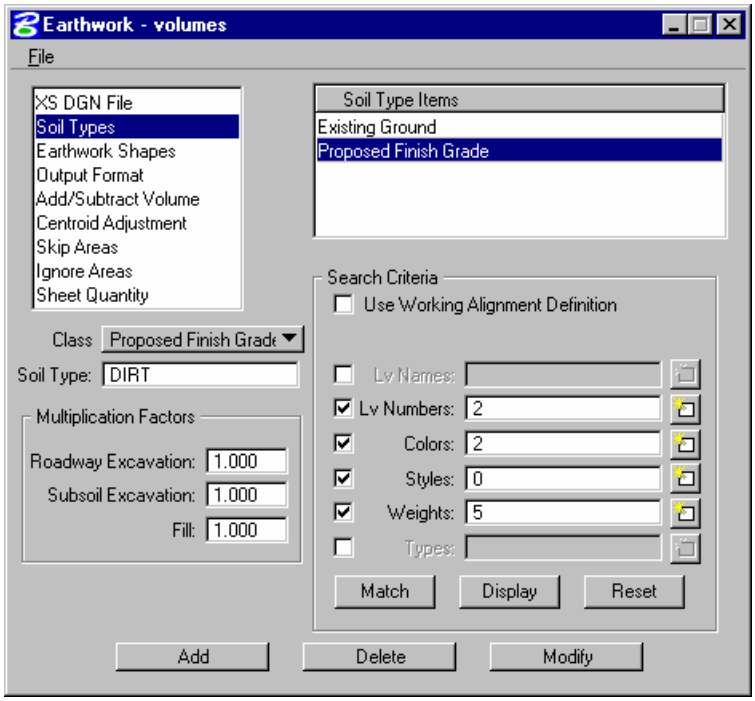


6. Click on ***Soil Types***.
7. Set the ***Class*** toggle to ***Existing Ground*** and provide a name like ***DIRT***.

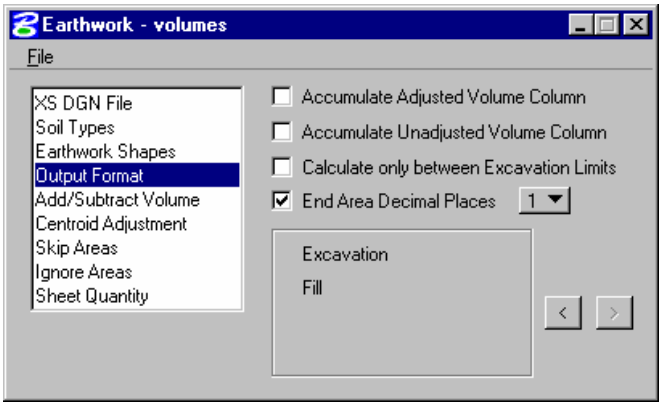
8. Toggle on the desired symbology toggles and using the ***Match*** button data point on an existing ground element and accept it.



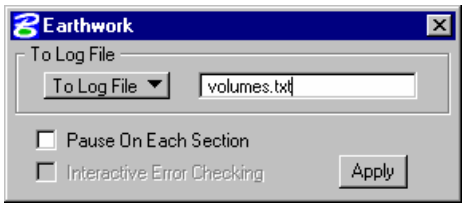
9. Click the ***Add*** button to add it to the list window.
10. Repeat this process for the ***Proposed Finish Grade***.



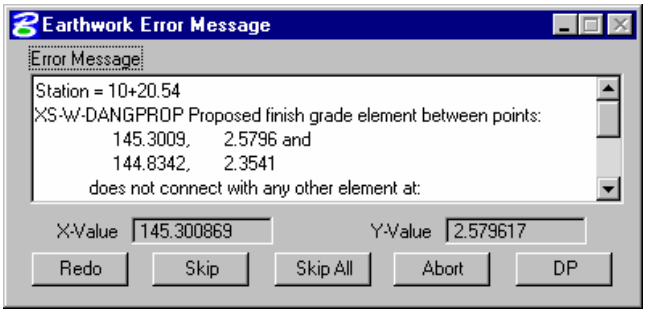
11. Click on ***Output Format***.
12. Using the toggles change the format to only ***Excavation and Fil***.



13. Select ***File*** > ***Run***.
14. Provide a file name to write the volume information into.

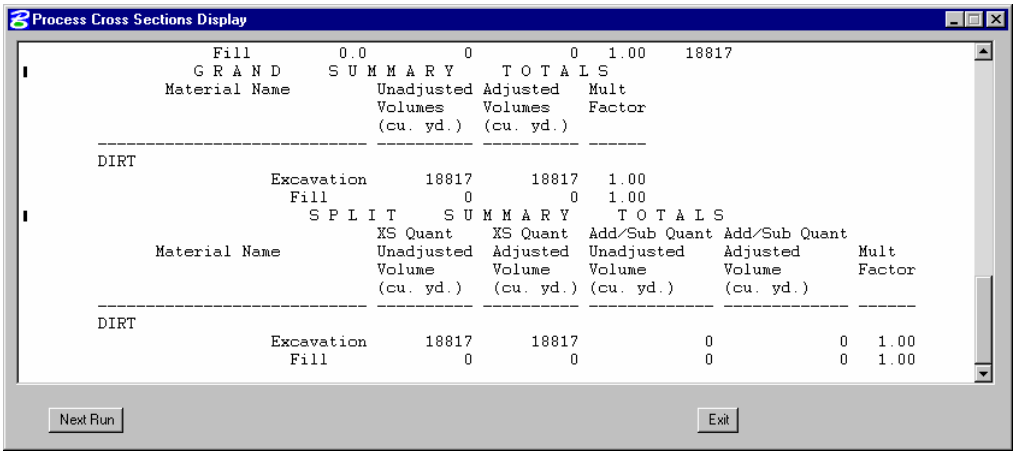


15. Click ***Apply***.
16. When the following error message appears it is warning of an error at a specific coordinate location. You can navigate to this location by clicking on the MicroStation ***Zoom In*** tool and then clicking the ***DP*** button on the error dialog.



17. Once zoomed into the problem use any MicroStation commands to fix it and then click on the ***Redo*** button on the dialog.
18. Repeat this process on all sections that report back an error.

19. Once completed you can review the total volumes.



20. Exit the ***Earthwork*** RUN.

Note	The less distance there is between cross sections the more accurate the end area volumes will be.

CROSS SECTION SHEETS

The GEOPAK sheet layout component provides an automated tool to draw cross section data in a format suitable for producing hard-copy cross section construction drawings. The input includes specifying sheet layout parameters as well as the graphic design file where the cross sections were originally created by GEOPAK. The output is a MicroStation design file of the cross sections. Each cross section is displayed as a reference file and labels such as baseline, station, offsets and elevation are added. There are several advantages to using sheet input:

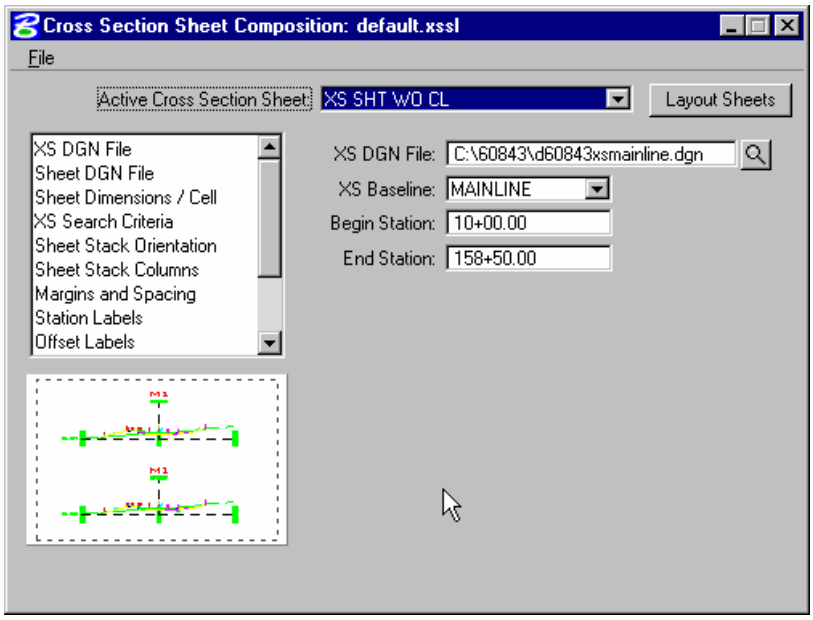
- The cross sections will be sorted in numeric order for the specified baseline.
- The cross sections will be spaced closer together.
- The original cross section file is left intact and any modifications to the cross sections will be automatically displayed in the sheet file due to the use of reference files.
- The cross sections are placed into "sheet format" according to user specified criteria.

The parameters for each sheet are defined in a Sheet Library. In order to lay out sheets, a Sheet Library must be attached to the current session. The name of the currently attached Sheet Library is shown in the title bar. Sheet Libraries have an extension of xssl. An unlimited number of different sheets can be stored within one library. When the user begins the sheet process, he selects the desired sheet layout from the attached library, which loads the associated parameters.

If a different Sheet Library is needed, it can be attached via the menu items File > Sheet Library > Attach. Detailed information on the set-up of the Sheet Library can be found in the online help section entitled "Sheet Library Set-up."

ACCESSING THE CROSS SECTION SHEET LAYOUT TOOL

The Cross Section Sheet tool can be accessed by selecting Applications > GEOPAK ROAD > Cross Sections > Cross Section Sheet Composition. It can also be invoked from Project Manager by clicking the Cross Section Sheets button or by selecting the Cross Section Sheet Composition icon from the GEOPAK ROAD tool frame.



FILE > SHEET LIBRARY

TOOL	DESCRIPTION
New	Create a new Sheet Library.
Attach	Attach a Sheet Library.
Save	Saves a Sheet Library.
Save As	Save a Sheet Library as a new name.

Note \\coapp52\proj\geopakv8\road\standards\

FILE > SHEET

TOOL	DESCRIPTION
New	Create a new Sheet in a Sheet Library.
Delete	Delete a Sheet in a Sheet Library.
Copy	Copy a Sheet in a Sheet Library.
Update	Update a Sheet in a Sheet Library.

FILE > LOAD V7 INPUT FILE

This option gives the user the ability to load an ASCII input file that was created in previous versions of GEOPAK.

FILE > SAVE SETTINGS

Saves all dialog settings in Project Manager.

FILE > LAYOUT SHEETS

Layout cross sections into sheet format.

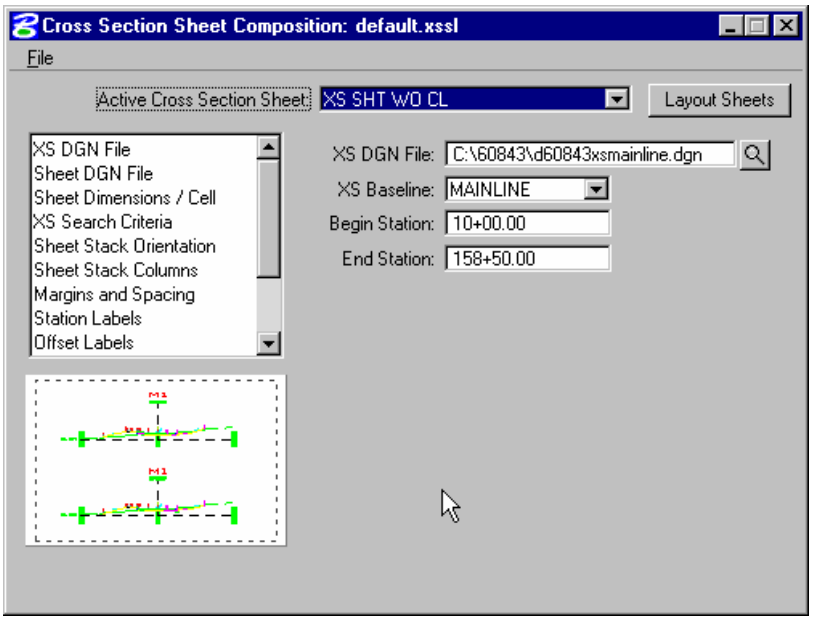
FILE > EXIT

Exit the Cross Section Sheet Composition application.

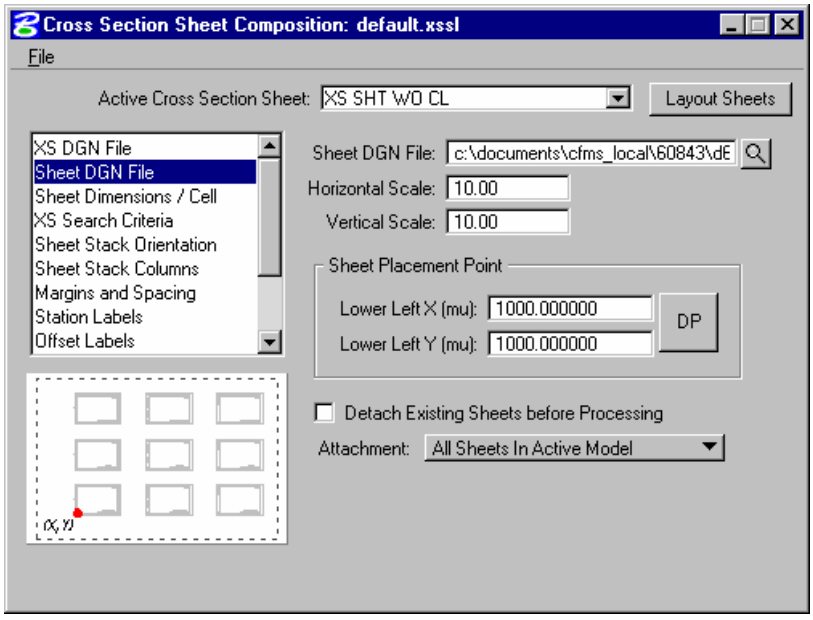
CROSS SECTION SHEETS DIALOG

The left side of the dialog contains the list of parameters required to compute earthwork. When each parameter is selected, the dialog changes as do the key-in fields to reflect the selected parameter.

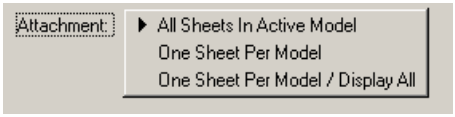
XS DGN File – Tells the software where to locate the cross sections. The Chain and stationing will be filled out automatically if defined via the project manager. By default, the software will find all elements within the confines of the cross section cell.



Sheet DGN File - Specifies which file the cross section sheets will be placed in. Also allows you to set the horizontal and vertical scale at which they are to be laid out and the coordinate location in the MicroStation Design file at which the sheets will be placed.



If the **Detach Existing Sheets before Processing** option is toggled on then all elements are removed and reference files are detached before new sheets are processed.



Attachment:

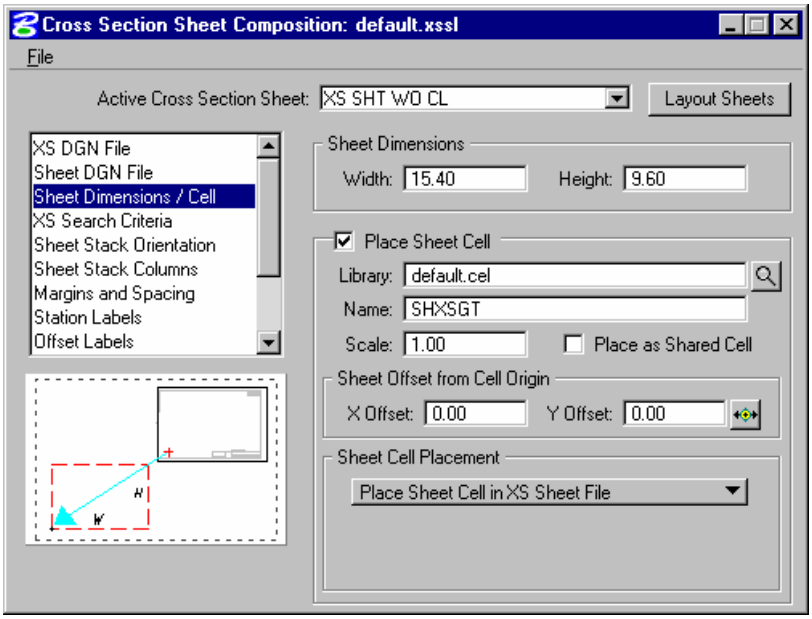
All Sheets In Active Model – All sheets are placed in the Active Model.

One Sheet Per Model – Sheets are placed in separate models and no sheets are placed in the active model.

One Sheet Per Model / Display All – Sheets are placed in separate models and all sheets are attached to the active model as reference files.

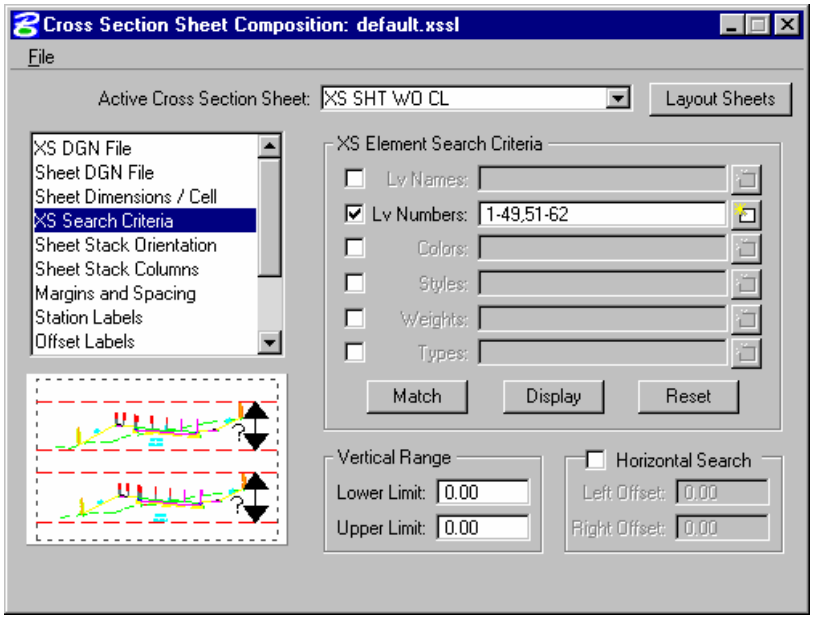
Note Models are named XS_SHEET_ and the sheet number is added to the name.

Sheet Dimensions/Cell – Sheet Dimensions defines the Sheet Height and Sheet Width to be used for the cross section sheet. When Place Sheet Cell is toggled on, the application will place a sheet border cell from the specified cell library. A scale can be applied and the sheet cells can be placed as Shared Cells. Sheet Offset from Cell Origin is the X and Y offset from the sheet border cell origin.

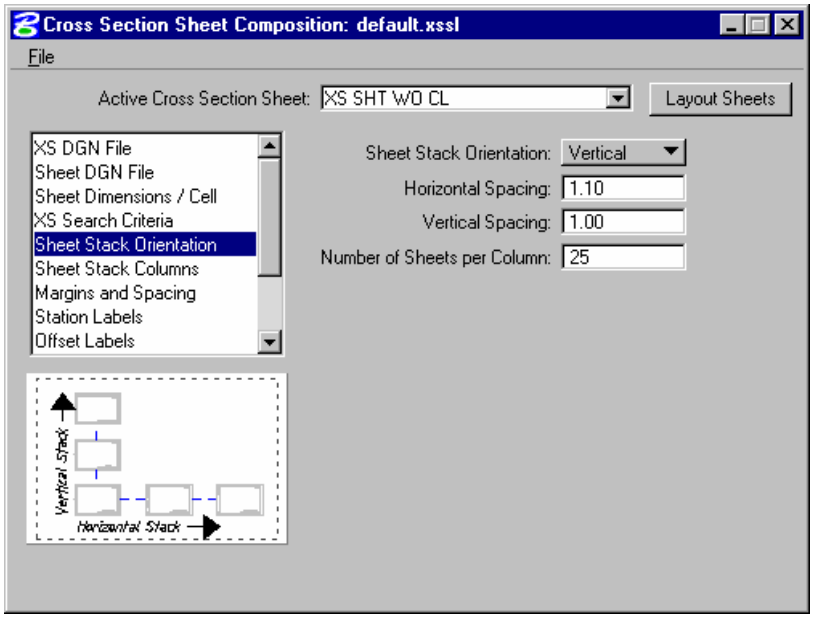


There are two options for **Sheet Cell Placement**. The sheet border cell can be placed in the sheet file with the cross section reference files as shown above. It can also be placed once in a reference file then the sheet cell file is attached to the file that contains the cross section reference files as many times as it is needed.

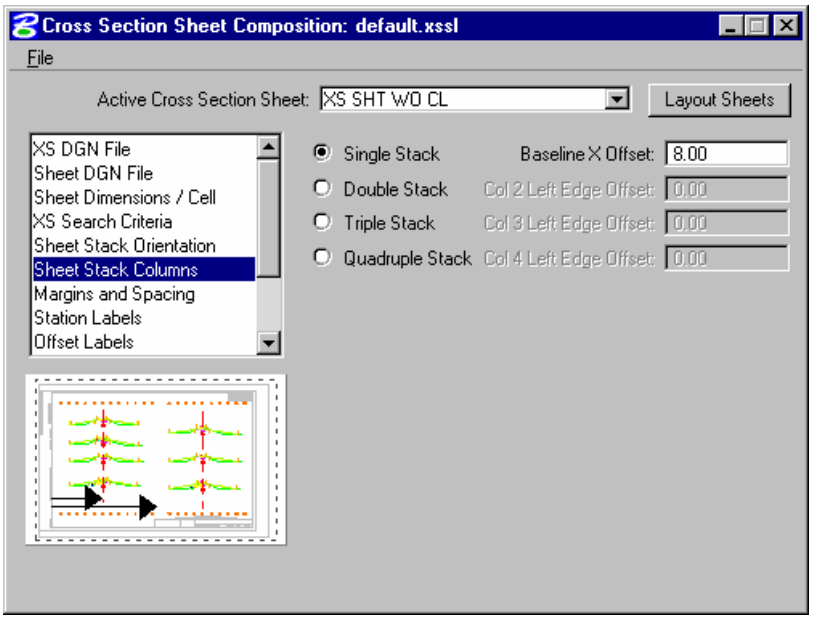
XS Search Criteria – Indicates the search criteria (symbology) for the data to be used as input to the sheet layout software. If you need to look farther than that (i.e. outside of the cell), you can use the Lower and Upper Range Limit values to extend beyond the cell limits. There is also a Horizontal Search to look outside the limits of Sheet Width setting.



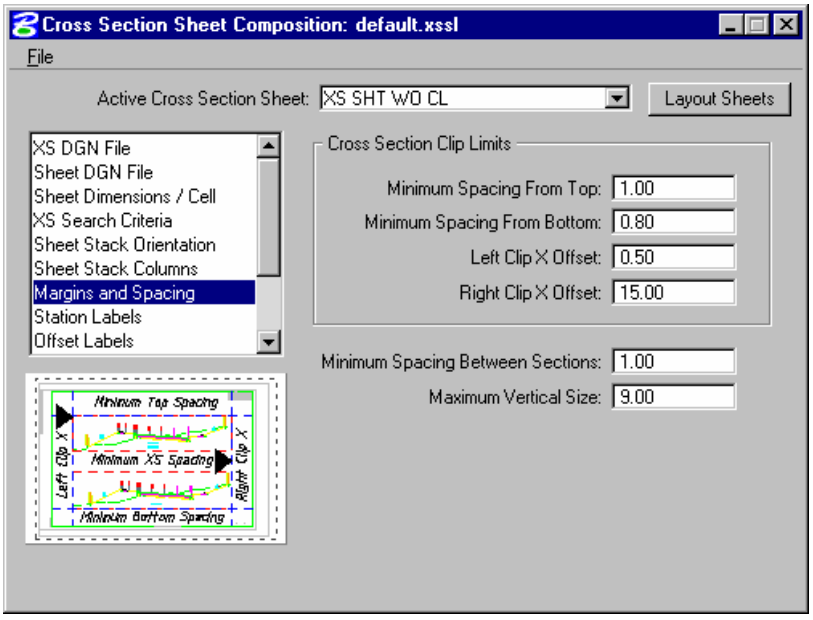
Sheet Stack Orientation – Determines whether you want the sheets to be stacked vertically or horizontally. Also allows you to set the maximum number of sheets you want placed per column in the file as well as the Horizontal and Vertical spacing between sheets.



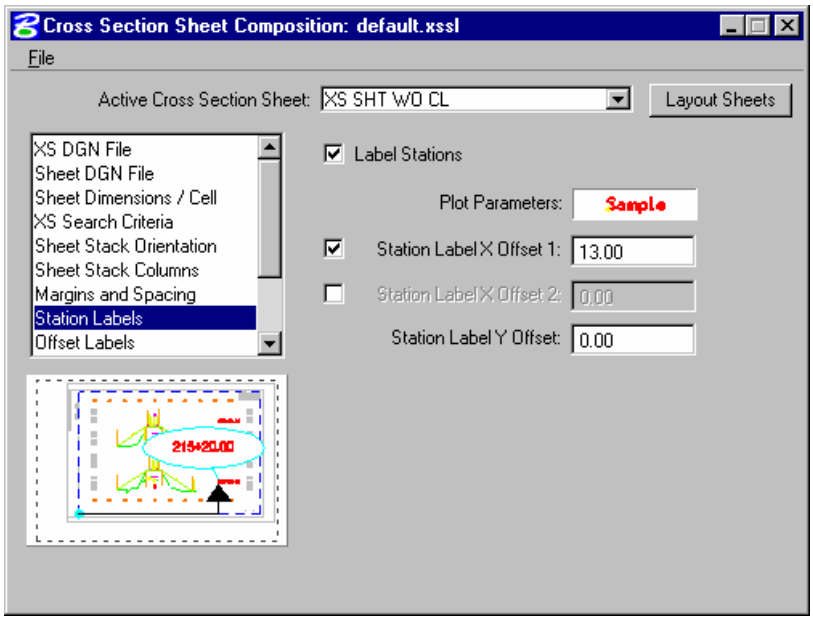
Sheet Stack Columns – Determines whether you want a single stack or a double stack of cross sections per sheet. Baseline X Offset defines the distance from the left-hand edge of the sheet to the zero offset position (i.e. baseline) of the cross sections. If you select Double Stack, you can give an offset value which is the distance of the second stack from the left hand edge of the sheet. There are also options for Triple and Quadruple stacking.



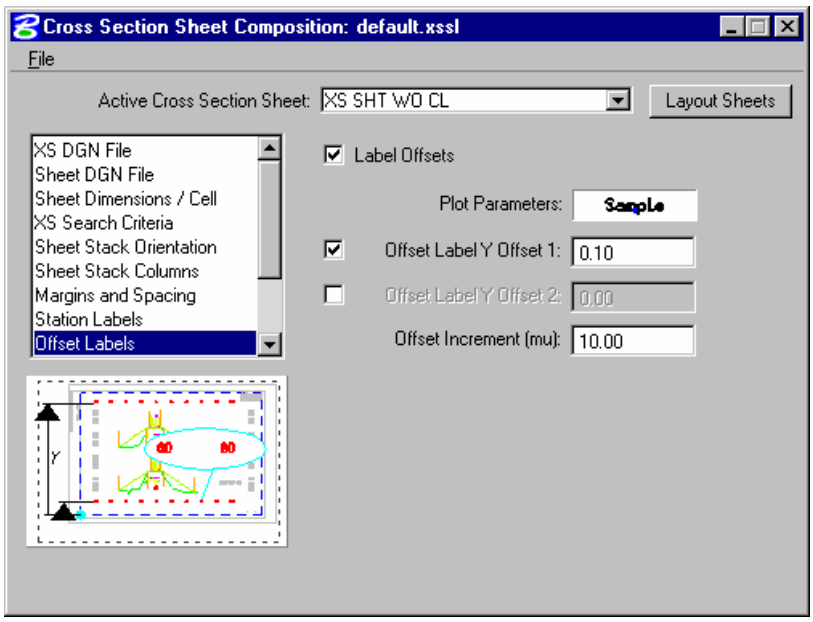
Margins and Spacing – Cross Section Clip Limits defines the clipping limits from the left hand edge of the sheet. To the left of the Left Clip X Offset remains clear space and to the right of the Right Clip X Offset remains clear space. All minimum spacing requirements as well as the maximum allowable vertical size of any cross section is also set here.



Station Labels – Allows you to define the station label locations and plot parameters.

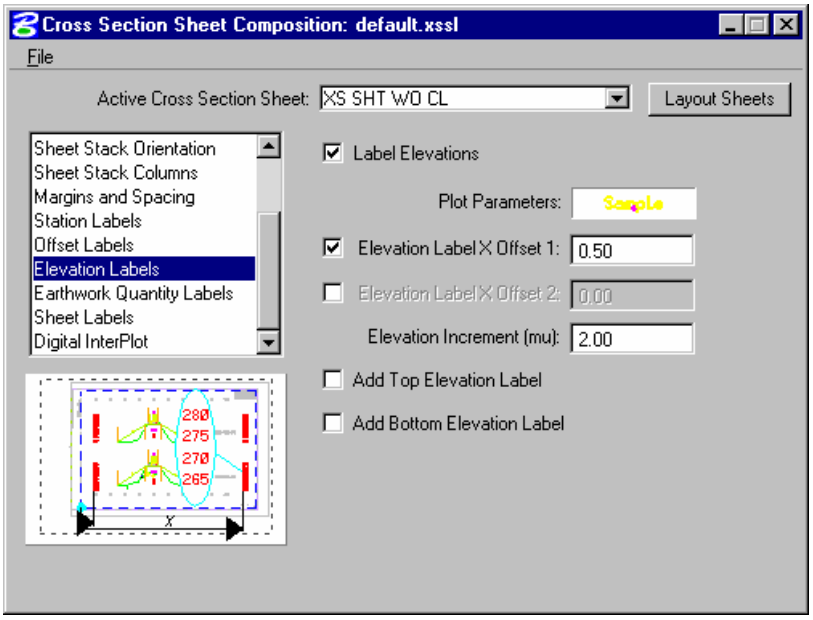


Offset Labels – Allows you to define the offset label positions, increments and plot parameters.

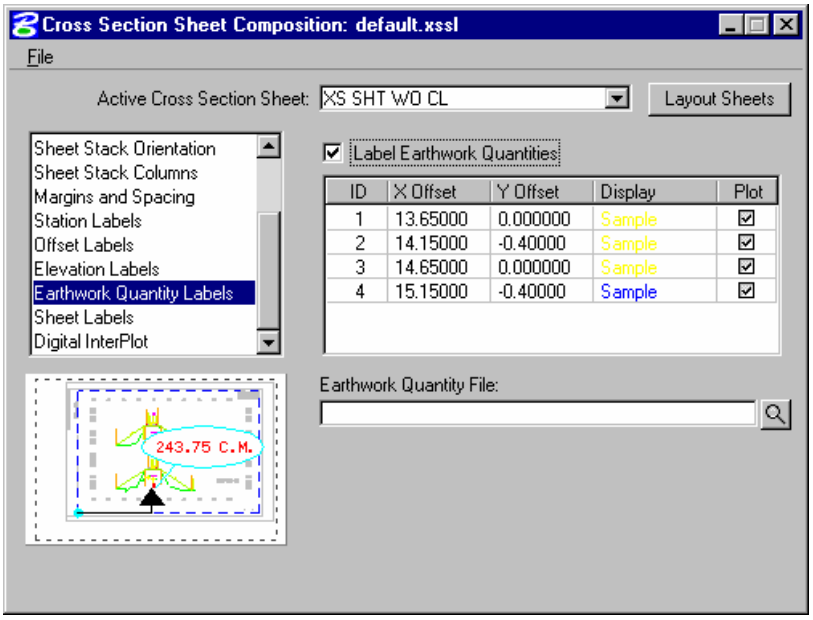


Elevation Labels – Allows you to control the elevation label locations, increment and plot parameters. Add Top Elevation Label - Activating this toggle adds another elevation label above the current labels placed within the elevation labels parameters. If two sets of elevations labels are placed (one on each side of the section), the top elevation is added to both.

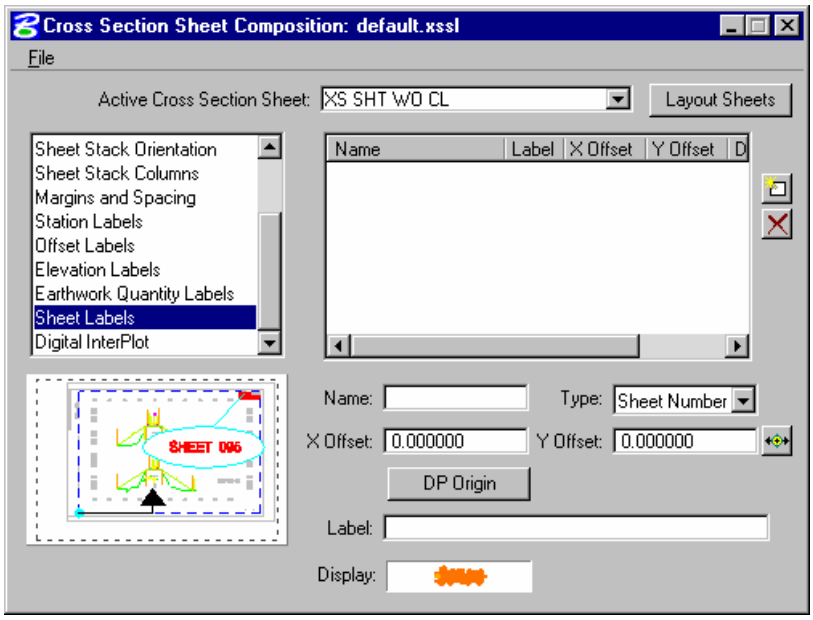
Add Bottom Elevation Label - Activating this toggle adds another elevation label below the single label placed within the elevation labels parameters. If two sets of elevations labels are placed (one on each side of the section), the bottom elevation is added to both.



Earthwork Quantity Labels – The user can define the ASCII file that contains the earthwork quantity information, as well as set the symbology and location of the earthwork quantity labels. This will use the information gathered during the earthwork run to place the earthwork quantity labels on the cross section sheets.



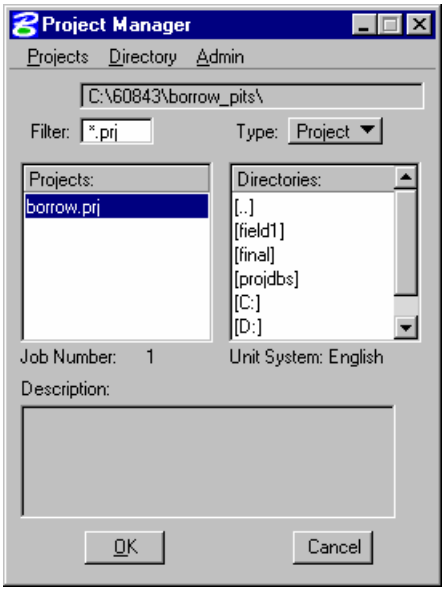
Sheet Labels – Allows the placement of numerous labels. There are three sets of labels that can be placed where the labels change from sheet to sheet. These labels include Sheet Number, Begin Station, and End Station. Any number of custom labels can also be placed. These labels would be something that does not change from sheet to sheet such as Project Number, Designer, etc. A list of labels can be created and each label can have its own symbology. Location of the labels is controlled by the DP Origin and DP Label Justification Point buttons. The DP Origin button locates the origin of the sheet cell and the DP Label Justification Point button sets the X and Y Offset from the sheet cell origin for the placement of the label.



LAB EXERCISE: CROSS SECTION SHEETS LAYOUT

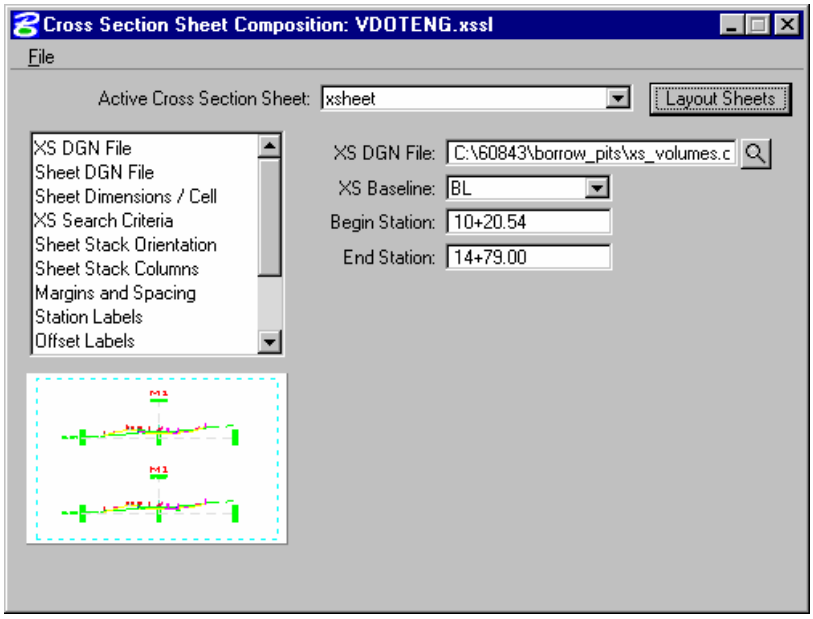
> *GENERATING CROSS SECTION SHEETS*

1. Open the MicroStation file ***c:\60843\borrow_pits\xs_volumes.dgn***.
2. Access ***Project Manager***.
3. Open the project, ***borrow***.



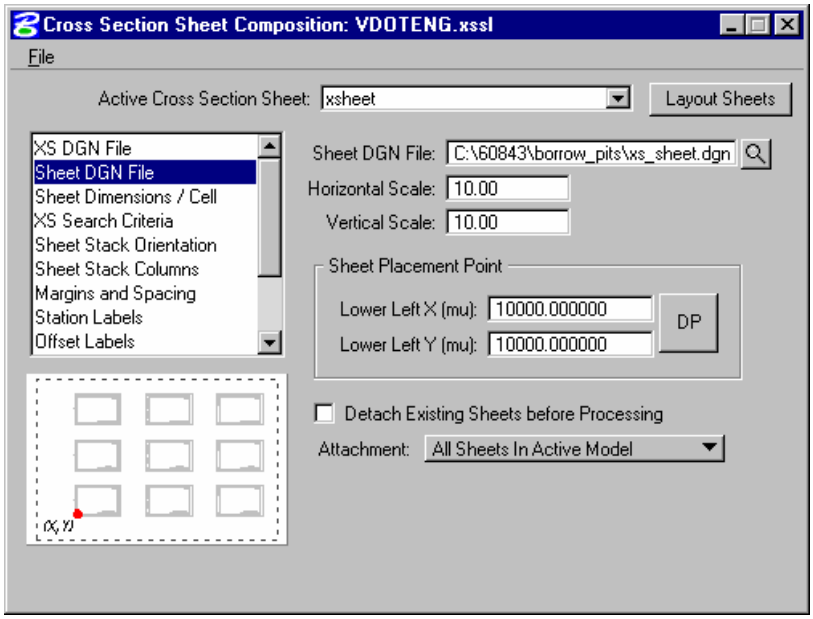
4. Click **Cross Section Sheets** from the Project Manager dialog and create a new run named **BL**.
5. Open the new run.
6. Select **File > Sheet Library > Attach**.
7. Select **C:\60843\standards\VDOTENG.xssl**.

Note \\coapp52\proj\geopakv8\road\standards\VDOTENG.xssl

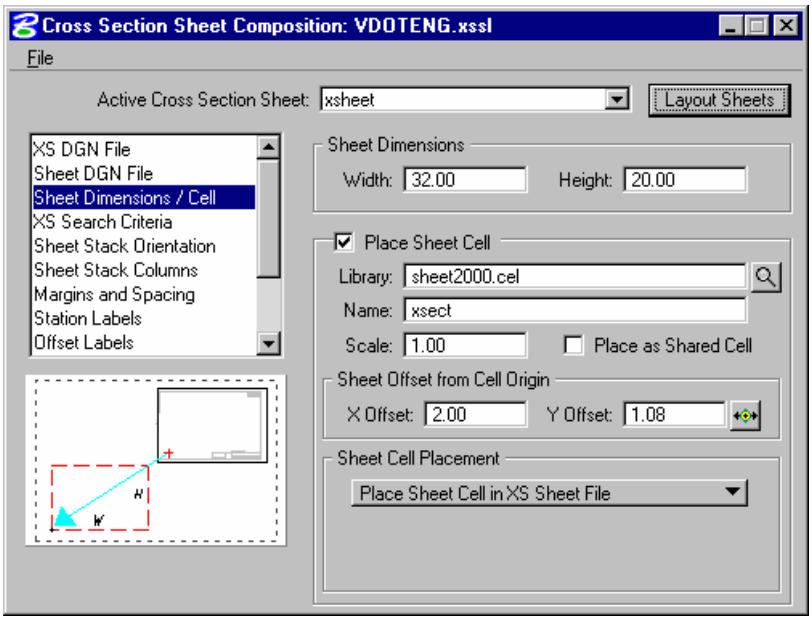


Note We will be using "XSSHEET" as the sheet name for our Cross Section Sheet layout.

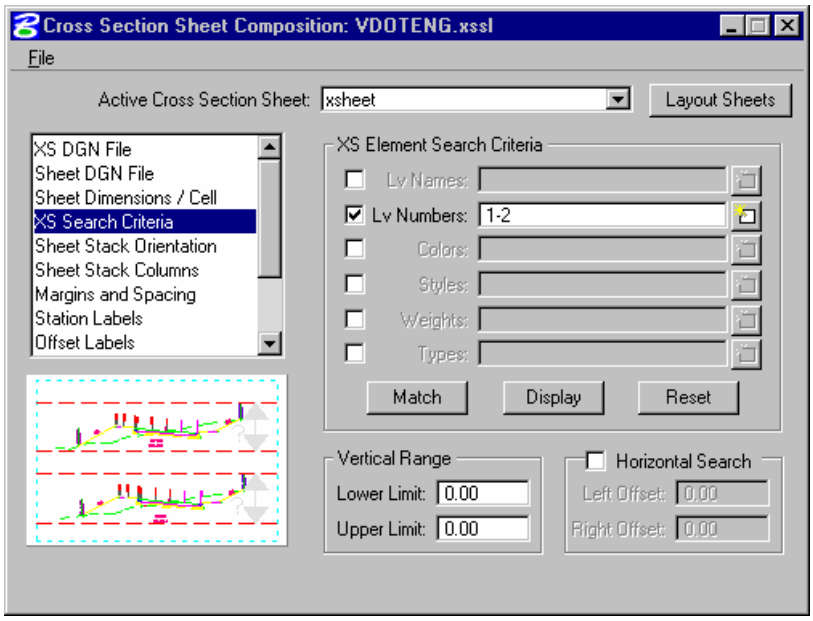
8. Click **Select Sheet DGN File** and select the sheet design file **xs_sheet.dgn**.



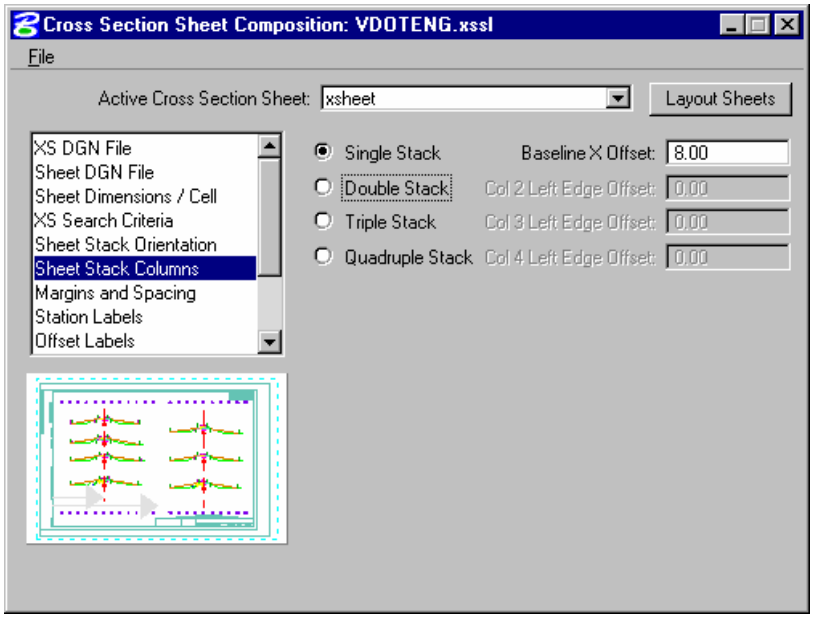
9. Select **Sheet Dimensions / Cell** and verify the settings below.



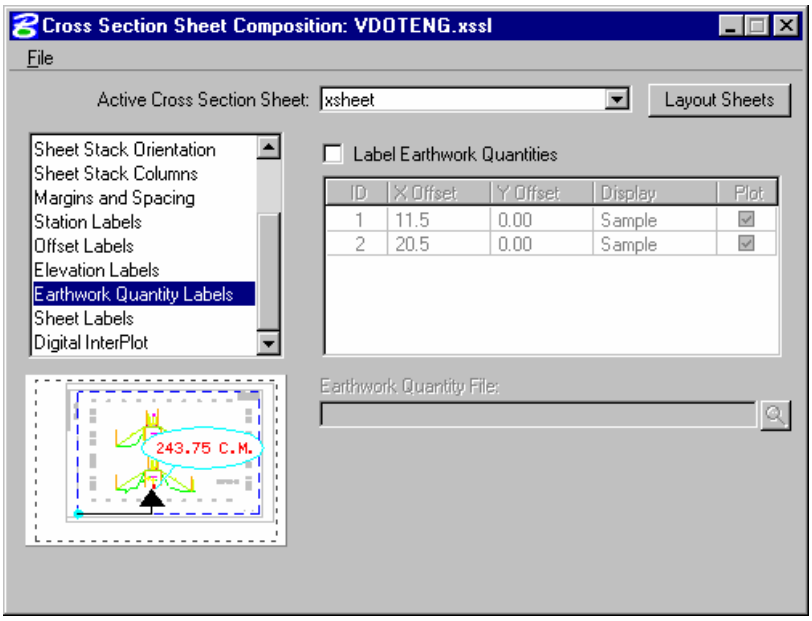
10. Select **XS Search Criteria** and make settings as shown below.



11. Select **Sheet Stack Columns** and change the **Baseline Offset** *to 8.*



12. Select **Earthwork Quantity Labels** and toggle OFF **Label Earthwork Quantities**.



13. Turn off level, **Level 63**.
14. Process the cross sections onto the sheets using either the **File > Layout Sheets** pulldown or by clicking the **Layout Sheets** button.
15. Close the **Cross Section Sheet Composition** dialog.
16. When prompted to **Save Settings**, click **Yes**.
17. When the Cross Section Sheet Layout process is completed, you will be in the sheet file. Review your work.
18. Exit MicroStation.

4 Cross Section Reports

OBJECTIVES

In this chapter, we will create various cross section reports:

- for plan use (design elements and quantities).
- as input for other programs and/or applications of GEOPAK.
- for construction layout.

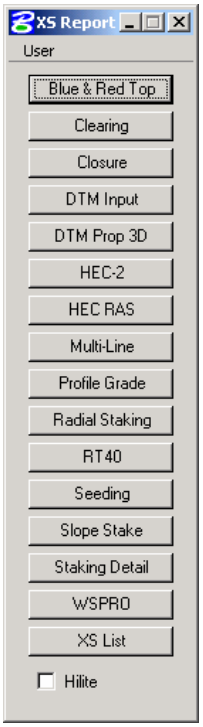
Create and draw construction limits in the plan view file.

INTRODUCTION

The GEOPAK Cross Section Report Utility can extract up to sixteen different reports from original and design cross-sections. For each report generated, the user must set the parameters of the existing and/or design cross sections. GEOPAK also provides an option to make custom headers for each of the reports via the User pull down menu.

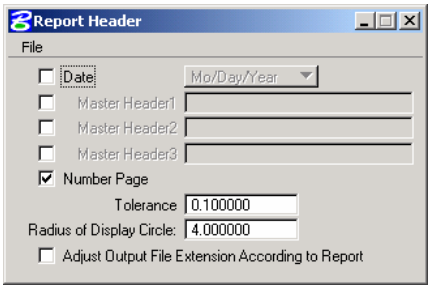
ACCESSING CROSS SECTION REPORTS

The Cross Section Reports dialog can be accessed by selecting Applications > GEOPAK ROAD > Cross Sections > Reports. It can also be invoked from Project Manager by clicking the Reports & XS Quantities button or by selecting Cross Section Reports from the GEOPAK ROAD tool frame.



CUSTOM HEADER

From the XS Report dialog, select **User > Preferences.** To activate the individual fields simply toggle on the box next to the desired field. Once you have completed the dialog box, the information will be saved as an .hdr file. This allows for the creation of a separate header for each type of report. The tolerance field determines the maximum gap allowed between cross section elements.



BLUE AND RED TOP

Based on the dialog box settings, GEOPAK determines the offset and elevation of a slope and its breakpoints. Blue refers to the top of pavement and Red is the top of subgrade. The user must determine this by indicating text and level, color, weight and style for each surface.

CLEARING

The Clearing Report is useful for obtaining clearing and grubbing quantities. For each station, GEOPAK will list the clearing distance on each side of the chain and the width of any exception. You can obtain the results in the appropriate units. Toggle boxes for Cut Slope Rounding, Additional Clearing in Cut and Fill, and Minimum Clearing Width are provided for increased control over the output. GEOPAK can also generate quantity sub-totals based on the value specified in Sub Every.

To use the Except Width option, you must have an existing ASCII file that includes the Beginning and Ending Station and Exception Width.

Once everything is set, you can output the information to an ASCII file.

CLOSURE

The **Closure Report** provides information on the intersection point between the user defined proposed finish grade and existing ground. In addition to the ASCII report, the designer may instruct GEOPAK to close any gap either by drawing a vertical line between the endpoint of the proposed finish element and the existing ground or extending the slope of the last proposed element to intersect existing ground. The procedure will not extend existing ground. The **Closure Report** can be accessed within any MicroStation cross section file by selecting Closure from the main XS Reports dialog.

DTM INPUT

This process generates XYZ coordinates from cross section elements and places this information into an ASCII file for use by the DTM portion of GEOPAK. To use this dialog box simply enter the .gpk job number, chain name and station range. GEOPAK will read the cross section elements based on level, weight, color and style.

DTM PROPOSED 3D

This report is similar to DTM Input except that you can set both original and proposed cross sections at the same time. This report also differs in that it makes break lines across the cross sections.

HEC – 2

This process reads cross section elements and formats the information in an ASCII text file suitable for use in the HEC-2 hydraulic program.

HEC RAS

This process reads cross section elements and formats the information in an ASCII text file suitable for use in the HEC RAS hydraulic program.

MULTI-LINE

This report is useful in creating cross-sections for staged construction. Begin by entering the job number, chain name and station limits. Primary cross section element parameters must be completed before secondary element parameters. This is important due to the order in which GEOPAK reads the information. Once all the parameters have been entered, the new cross sections may be drawn to the design file or you may choose the display only option. An ASCII text file will be generated.

PROFILE GRADE

The **Profile Grade Repor**t is one of the most versatile reports available. It prints existing ground and design grade elevations and low point elevations for each cross section. Additionally, this report has the ability to search either for the low points or any text string that you specify and create horizontal and vertical alignments and store them directly into the .gpk. Horizontal alignments created from this report will have no curves.

RADIAL STAKING

The **Radial Staking Report** is a specialized report created for the U.S. Federal Highway Administration (FHWA).

RT 40

The RT 40 Report produces RDS based RT40 data. To use this dialog box simply fill in the job chain name, stationing range and the parameters of the cross section elements you wish to use.

SEEDING

Other than the usual entries, the user must enter the parameters of the elements to be seeded.

This dialog box includes slope and subtotal options as well as a way to limit the number of segments read (By-Pass Segments). The user may also establish additional seeding specifications (Additional Distance).

Once all of the settings are complete, the report will produce seed or sod quantities written to an ASCII output file for use in plan quantities.

SLOPE STAKE

The Slope Stake Report is a special format report developed for the FHWA. This report generates offsets, elevations and superelevation information for each cross section. To generate this report fill in the usual cross section parameters plus Subgrade and Hub Staking information. When complete, push Apply and the report is written into an ASCII file.

STAKING DETAIL

The Staking Detail Report determines the tie down point between the proposed finished grade and the existing ground. GEOPAK will list the right and left offset, elevation, and slope of the finish grade and superelevation rate for each cross section. To create this report, fill in the project information and desired cross section elements' parameters. Once complete, you have the choice between two formats, a FHWA ASCII report or a Montana DOT report (includes ditch elevations).

WSPRO

This report takes the cross section elements and turns them into an ASCII file for use as input in the WSPRO hydraulic analysis program.

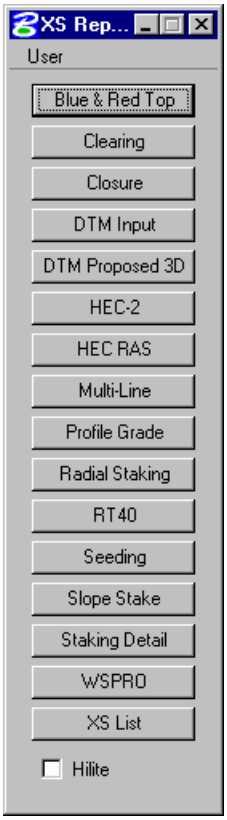
XS LIST

This report creates a listing of elevations and offsets for each cross section element according to user defined parameters. You have the option of creating either an original cross section list or a design cross section list. These reports are very similar to RDS cross section lists.

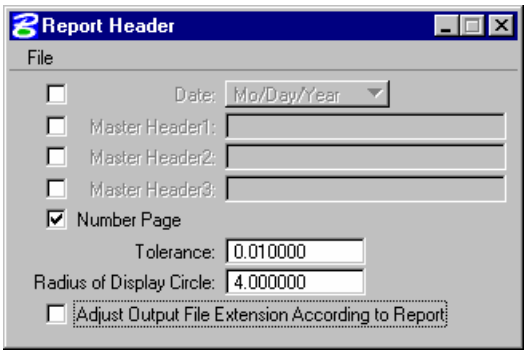
LAB EXERCISE: CROSS SECTION REPORTS

> ***REPORTING***

1. Open the MicroStation file ***c:\60843\d60843xsmailine.dgn***.
2. Open the project ***60843*** via Project Manager.
3. Click on the button ***Reports & XS Quantities***.

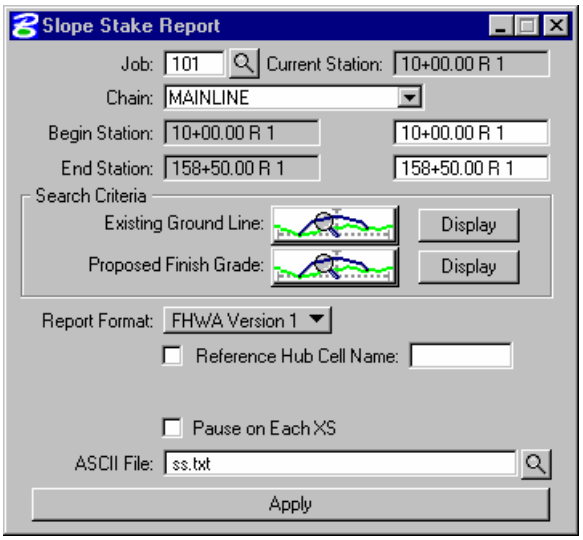


4. Select from the main dialog ***User*** > ***Preferences*** and set as shown below.

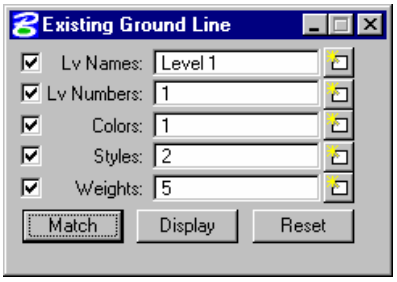


5. Close the Preference dialog.

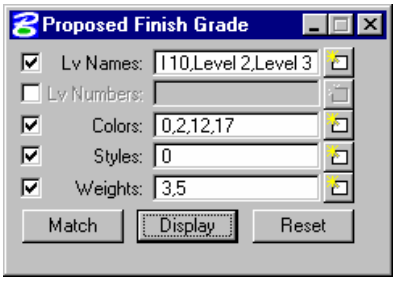
6. Click on the ***Slope Stake*** button and make the settings as shown below.



7. The ***Existing Ground*** symbology should be set as follows.



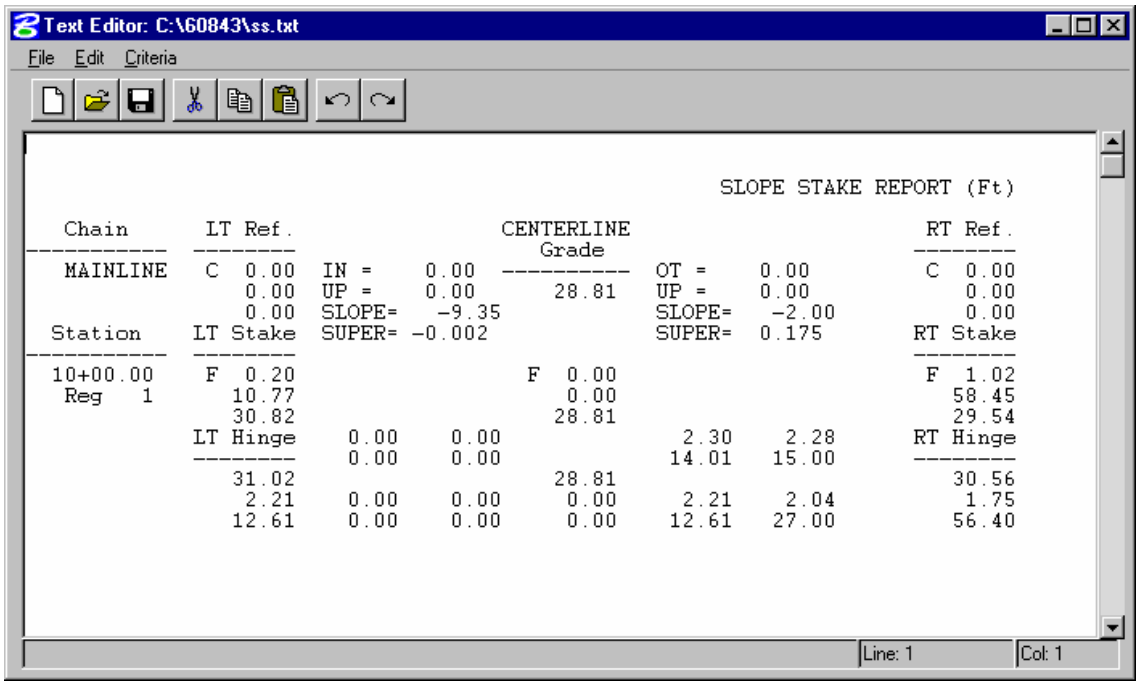
8. The ***Proposed Finish Grade*** should be set as follows.



Note The Levels include 4, 11, 10, 2, 3.

9. Change the ***Ending Station*** to ***15+00***.
10. Click ***Apply***.

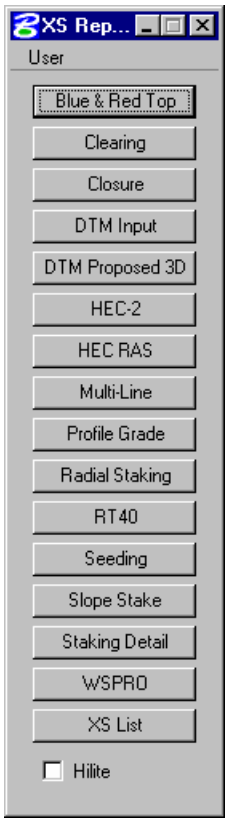
11. Review the report.



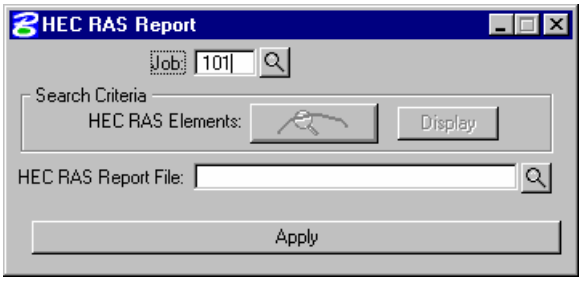
12. Review some of the other reports on the main dialog.
13. Close the Report dialog.

> ***HEC-RAS***

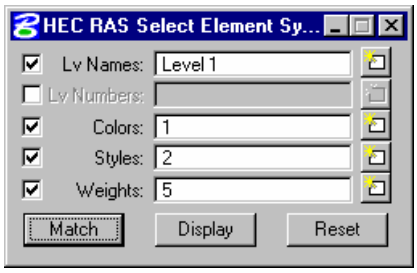
1. Open the MicroStation file ***c:\60843\d60843work.dgn***.
2. Attach the saved view ***creek1***.
3. Review the creek pattern lines.
4. Open the MicroStation file ***c:\60843\xscreek.dgn***.
5. Review the cross sections.
6. Open the project 60843 with ***Project Manager***.
7. Click the button ***Reports & XS Quantities***.



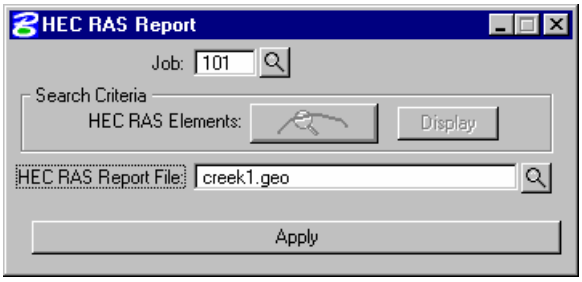
8. Click the button for ***HEC-RAS***.



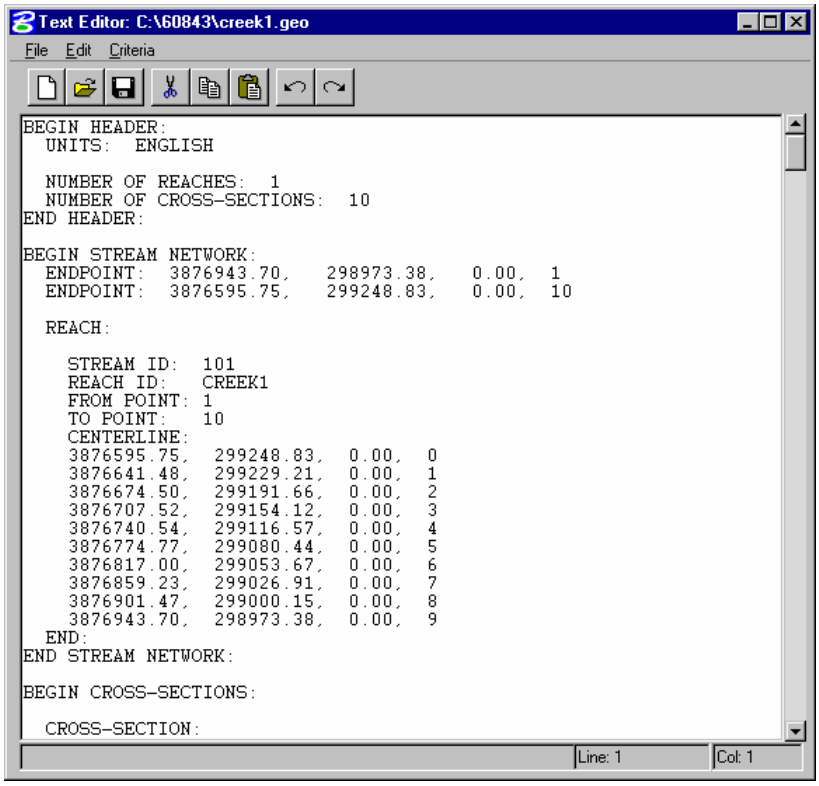
9. Set the ***HEC RAS Element*** to match existing ground as shown below.



10. Close the symbology dialog.
11. Provide a report file name of ***creek1.geo***.



12. Click ***Apply***.
13. Review the report.



14. Exit MicroStation.

5 Digital Terrain Models

OBJECTIVE

In this session we will review the DTM tools for analyzing the TIN files.

DTM Analysis Tools provide a means to query the terrain model for critical information ranging from drainage areas to volumes along with thematic mapping. The tools that will be addressed in this section are listed below.

- Height
- Elevation Differences
- Slope Areas
- Themes
- Drainage Tools
- Visibility
- Trace Slope Path
- Camera
- Trench Volumes

INTRODUCTION

A Digital Terrain Model (DTM) represents the topography of a project in the form of a triangulated network. The DTM can be drawn in a 2D or 3D file, and then rotated to see the existing surface of the project area.

Digital Terrain Models can be generated from various sources including MicroStation Elements, survey data, photogrammetry data, GEOPAK cross sections, and geometry data.

Triangulation is a mathematical process applied to ground points and vertices along longitudinal features to create planar surfaces. The result of triangulation is the creation of triangles connecting these points. These triangles are included in the GEOPAK TIN file from which existing ground profiles and existing ground cross sections can be generated.

ANALYSIS TOOLS

Tools	
Menu Bar	**Analysis > Height** **Analysis > Profile** **Analysis > Volumes** **Analysis > Elevation Difference** **Analysis > Slope Area** **Analysis > Themes** **Analysis > Drainage Tools** **Analysis > Visibility** **Analysis > Trace Slope Path** **Analysis > DTM Camera** **Analysis > Trench Volumes**

The Analysis tools allow the user to visually analyze the digital terrain model utilizing numerous tools as a profile analysis, thematic analysis, drainage flow patterns, and visual portions on the model from any given location.

Height	To determine the height and other associated data dynamically based on user-defined data points within the model.
Profile	View a profile based on a user defined MicroStation element.
Volumes	To compute the volume between two TIN models, the volume between a TIN model and a plane, or the cut and fill totals between two TIN models while applying a shrinkage/swell factors.
Elevation Difference	Will display the elevation difference or the amount of cut and fill between two TIN models, or a TIN model and a plane of constant elevation.
Slope Area	The Slope Area tool displays the horizontal area and actual slope area (area following the terrain of the Model).
Themes	Displays the digital terrain model based on different user definable themes such as elevation ranges, slope percentage, slope degree, or aspect.
Drainage	Displays and analyzes drainage patterns within a TIN model. Tools include delineating watersheds, drawing flow arrows, determining upstream and downstream traces, finding high and low points, and ridge and sump lines.
Visibility	Based on a user-defined point of origin, GEOPAK visually displays which triangles can and cannot be seen, or what is visible between two points.
Trace Slope Path	From a user-defined point of origin, GEOPAK visually displays or writes into the dgn file the route a user-specified slope will follow into the DTM.
DTM Camera	Provides a drive-thru navigation tool along the DTM.
Trench Volumes	The Trench Volume tool utilizes a TIN file (and optional offset) to compute trench and bedding volumes.

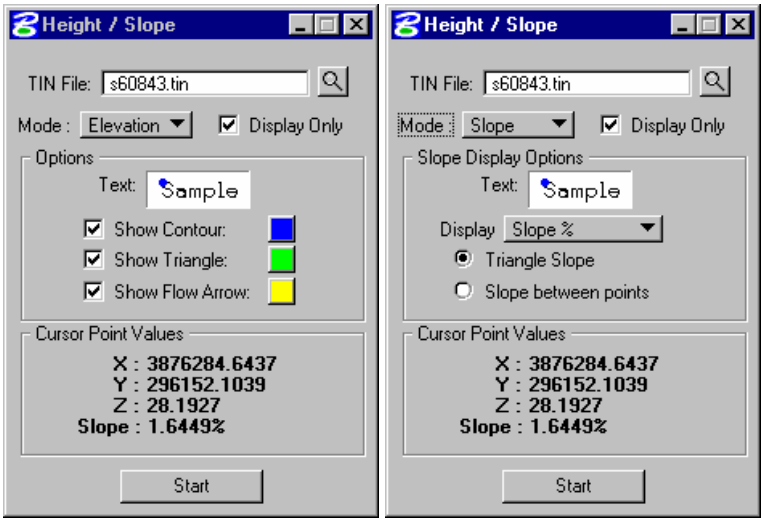
LAB EXERCISE:

> *HEIGHT*

1. Open the MicroStation file ***c:\60843\spo60843.dgn***.
2. Select ***Applications > GEOPAK Road > DTM Tools***.

3. Tear off the tool box from the lower left icon.

4. Click the first icon from the left.



To Determine an Elevation or Slope

1. Click **Select File** and browse to the desired TIN file.
2. Select **Mode** (Elevation or Slope).
3. If the Mode is Elevation, turn on the desired Show features.
4. If the Mode is Slope, set the Display Options.
5. Turn on **Display Only** if you do not want the data drawn into the MicroStation file.
6. Click **Start**.
7. Move the cursor over any location within the boundary of the triangulated model. If the Slope between points is used, data point per the prompt then move the cursor for data display.

8. If a data point is selected outside the hull, the message displayed is: "Point External To Tin." The **Plan View Coordinates**, **Elevation**, and **Slope** of the triangulated model are displayed.

Note The number of decimal places is based on the GEOPAK User Preferences.

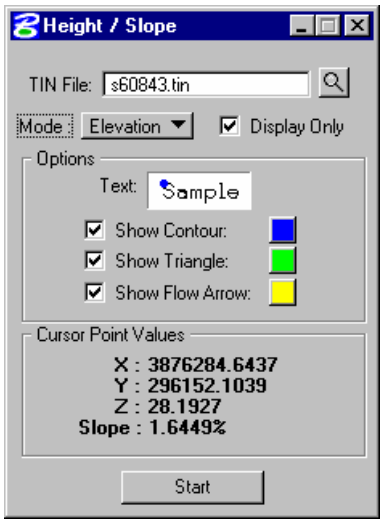
Display Options for Elevation Mode

Three options are supported within the dialog:

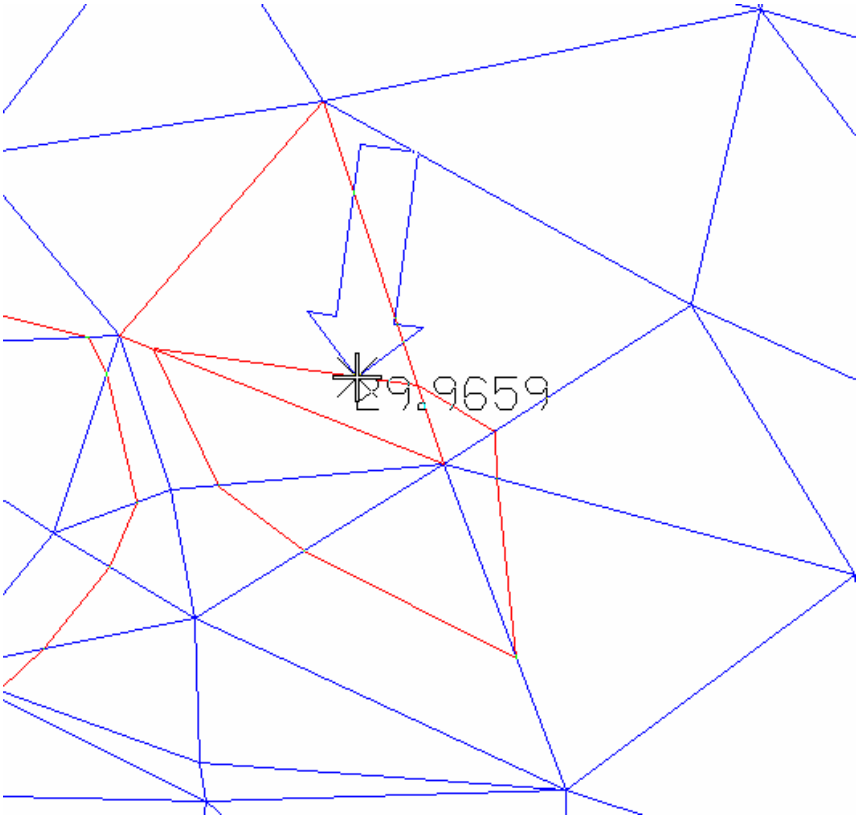
Show Contour - displays a contour of the same elevation as the selected point.

Show Triangle - identifies the triangle wherein the point is located.

Show Flow Arrow - displays an arrow to indicate direction of flow from the selected point.

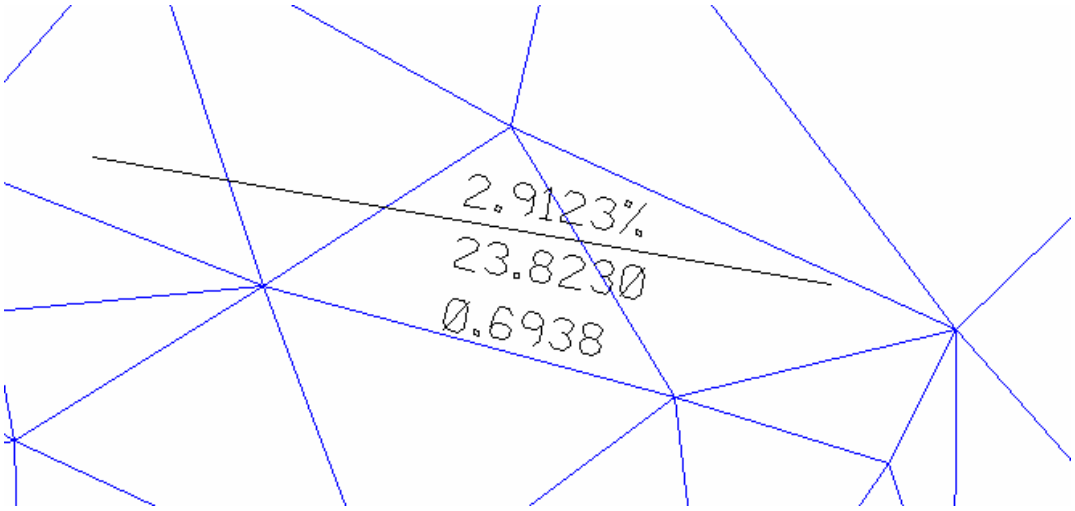


The affected triangle (wherein the identified point is located) displays the flow arrow and elevation and the identified point as well as the contour for that elevation.



Display Options for Slope Mode

Slopes can be displayed in a variety of formats, such as rise:run, run:rise, percent, and unit/unit. The slope can be the specified as the triangle slope at the point of the cursors, or between points. In this case, click Start and the user is prompted for a data point as the origin. Then as the cursor is moved, the slope between the origin and the current cursor position is displayed.



> ***PROFILES***

The Profile tool drapes a user defined MicroStation element onto a TIN model. It creates a series of line strings by draping each linear reference element onto the triangulated model, or in the case of site modeler, an object.

The dialog has three tabs:

Selection

TIN file specifications, profile element symbology and create legend button.

Profile

Profile placement buttons and viewing dialog before drawing the actual profile into the MicroStation file.

Preferences

Profile and grid scales, text parameters, elevation and station ranges.

To Draw a Profile

Identify the TIN file(s) through which the profile intersects and set symbology.

Select or draw the element whose X,Y values are utilized to generate a profile along the TIN, This is accomplished via the Profile tab.

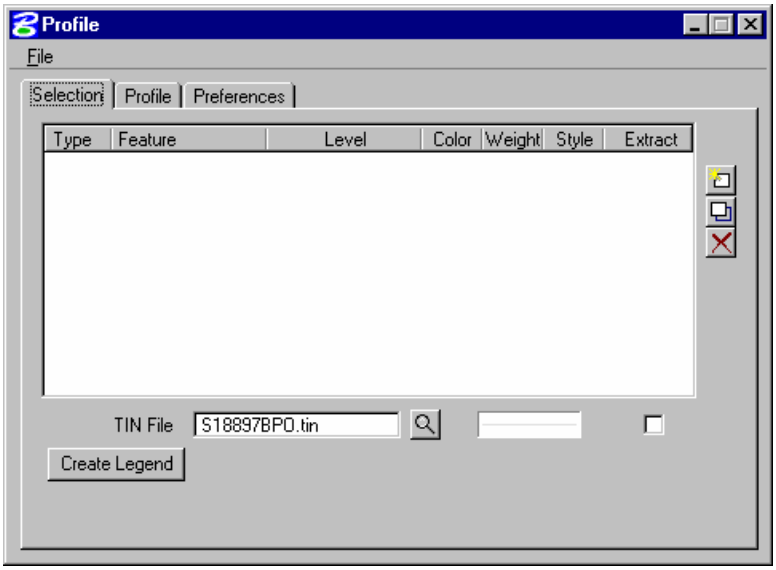
Set the element symbology and text parameters for the grid. In addition, Minimum and Maximum Stations and Elevations may also be set. This is accomplished via the Preferences tab.

Generate the profile and view in the Profile window. Optionally, draw the profile into the MicroStation file. These are accomplished via the Profile tab.

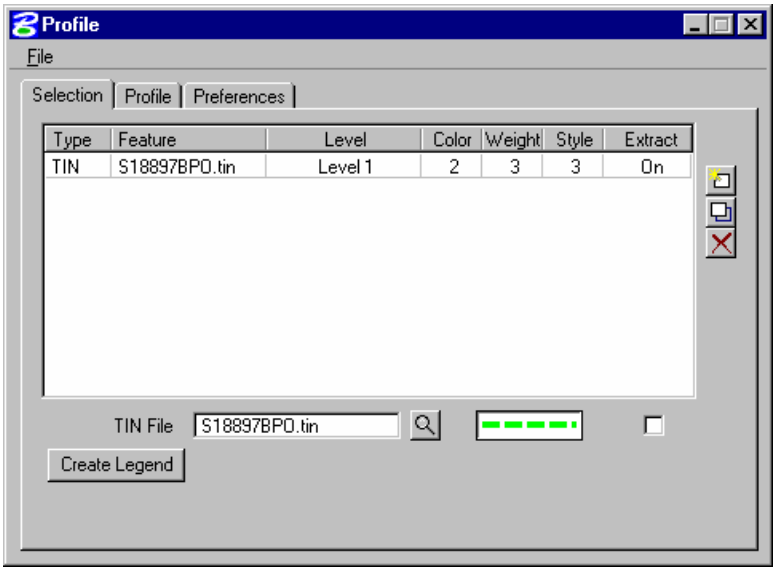
(Optional) Create a Legend or Store the profile into COGO. These are accomplished via the Selection tab.

1. Open the MicroStation file ***c:\60843\borrow_pits\s18897bpo.dgn***.
2. Access ***Applications > GEOPAK Road > DTM Tools***.
3. Tear off the ***Analysis*** tool bar.

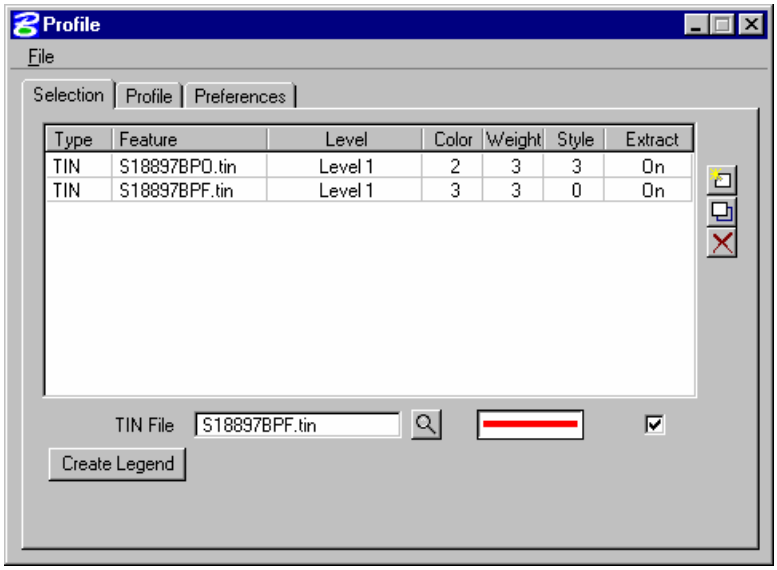
4. Select the second icon from the left for ***Profiles***.



5. Use the browse option to identify the original ground TIN file.
6. Set some symbology for the profile.
7. Use the icon to the right of the list window to ADD the item to the list.

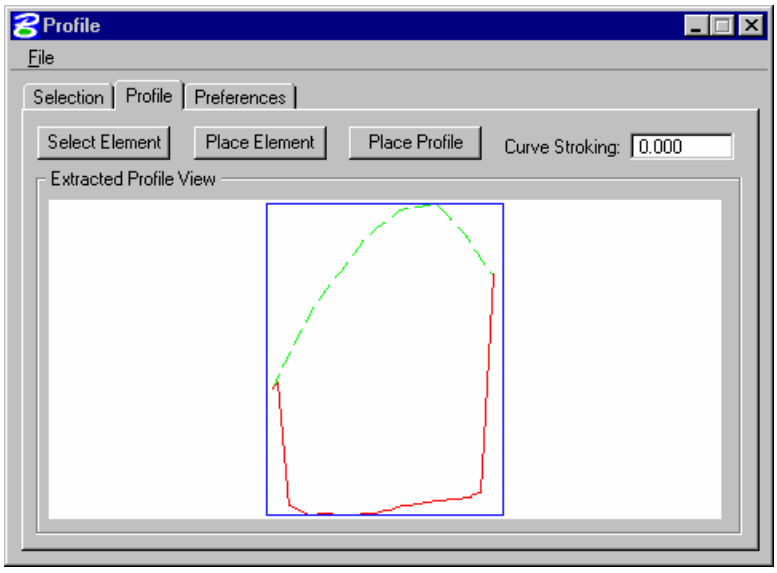


8. Repeat the process using the final ground TIN file and different symbology.

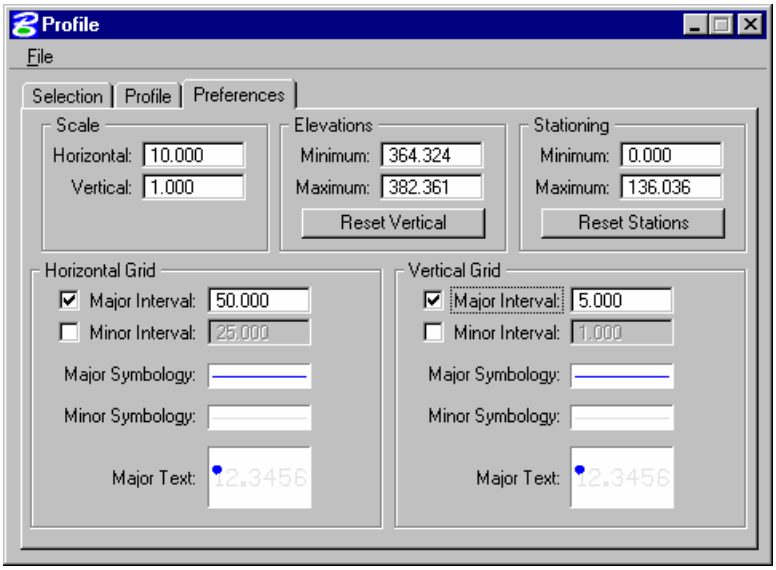


9. Click on the ***Profile*** *tab.*

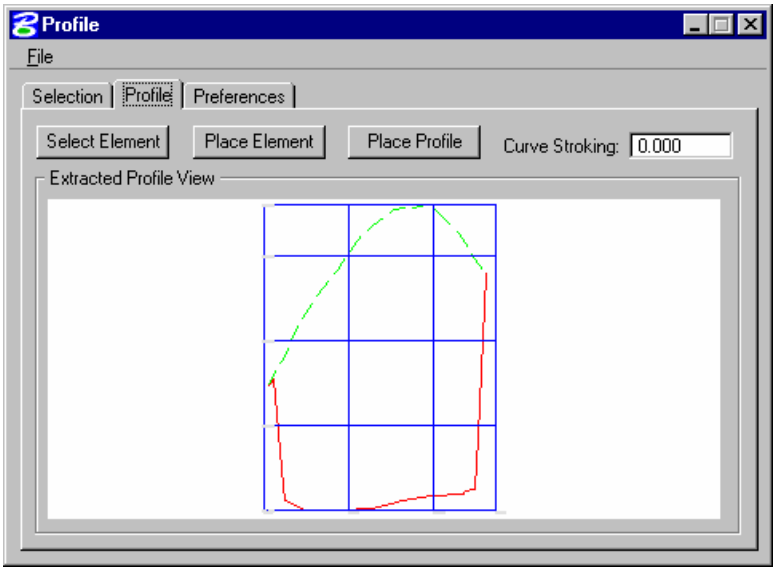
10. Click on the ***Place Element*** and identify two points on the TIN files.



11. Click the ***Preference*** tab and make the settings as shown below.



12. Click back on the ***Profile*** tab and review the grid.



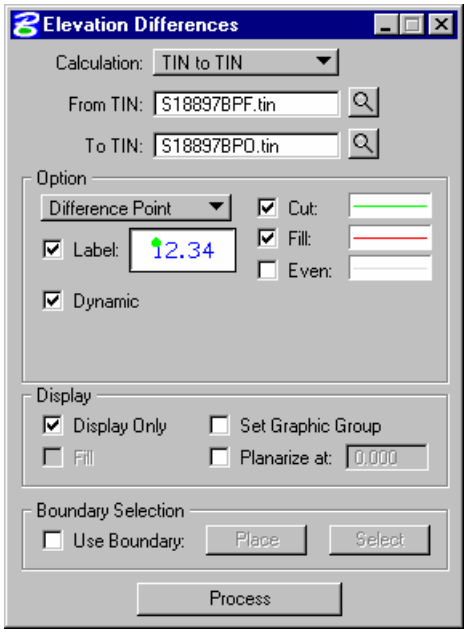
13. Click on the ***Place Profile*** tab and data point in the MicroStation view to place the profile graphically.
14. Close the profile tool.

ELEVATIONS DIFFERENCE

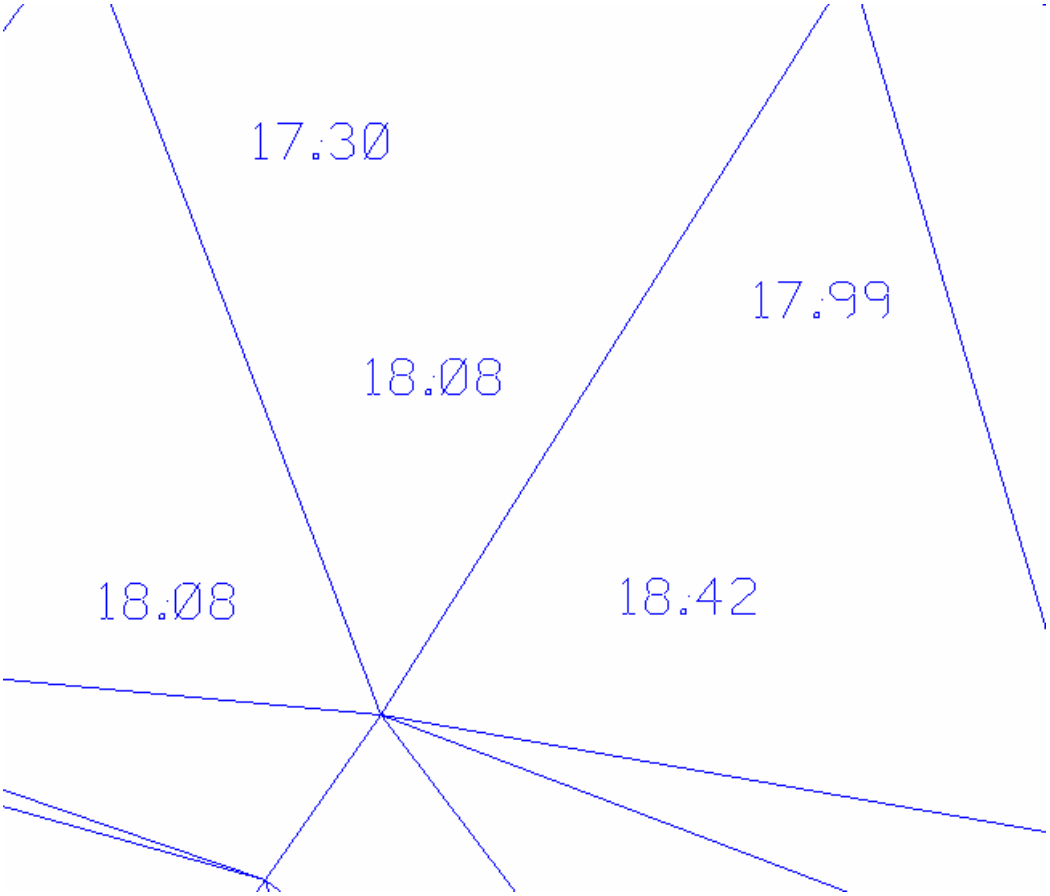
The Elevation Difference tool supports a variety of grid generation, Isopach contour drawing, and cut/fill latticing. The tools are:

- Difference Point – draws the text of cut / fill elevations, i.e., the cut or fill depth between the two specified TIN files at each specified point. In a 3D design file, when in a front or side view, the grid displays T's. The T's represent the cut or fill values. The vertical part of the T is the vertical length of the cut or fill and the bar of the T is the text value of the cut or fill. The bar of the T is placed on the surface of the From TIN. Therefore, in a cut situation, a normal T is placed, while in a fill situation the T is inverted.
- Difference Grid - draws a textual grid of cut / fill elevations, i.e., the cut or fill depth between the two specified TIN files at each grid point. The user specifies the grid interval; therefore, GEOPAK determines the number of text placements. In a 3D design file, when in a front or side view, the grid displays T's. The T's represent the cut or fill values. The vertical part of the T is the vertical length of the cut or fill and the bar of the T is the text value of the cut or fill. The bar of the T is placed on the surface of the From TIN. Therefore, in a cut situation, a normal T is placed, while in a fill situation the T is inverted.
- Cut / Fill Grid - a lattice with a user-defined number of points determining the density with different element symbology for cut and fill. The lattice can be wireframe or filled color.
- Cut / Fill Contours (Isopach) - which are simply contours of the cut and fill depths. A fill of two feet is a positive two contour, while a cut depth of six would be a negative contour. A zero contour would be where the surface and plane intersect.

1. Open the MicroStation file ***c:\60843\borrow_pits\s18897bpo.dgn***.
2. Select the fourth icon from the left on the ***Analysis*** tool bar, ***Elevation Differences***.



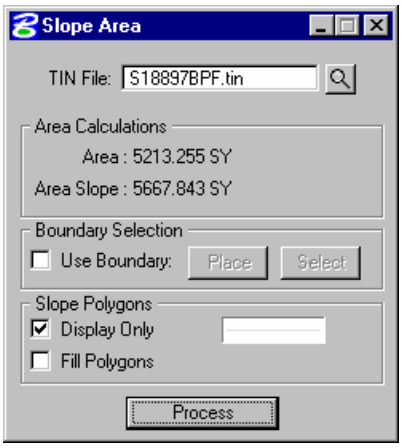
3. Datapoint on the view to display difference elevations at random points.



> *SLOPE AREAS*

The Slope Area tool displays the horizontal area and actual slope area (area following the terrain of the TIN File).

1. Open the MicroStation file ***c:\60843\borrow_pits\s18897bpo.dgn***.
2. Access ***Applications > GEOPAK Road > DTM Tools***.
3. Tear off the ***Analysis*** tool bar.
4. Access the fifth icon from the left ***Slope Areas***.
5. Select the TIN file ***S18897BPF.tin***
6. Click ***Process***.



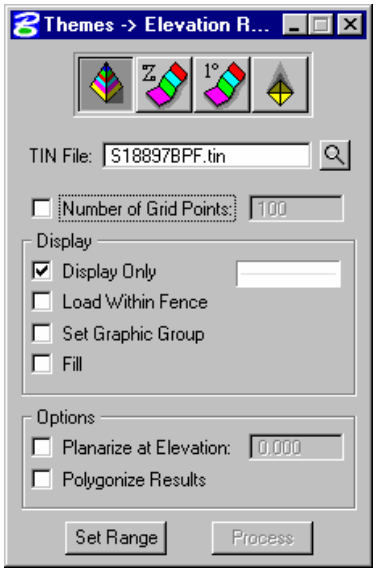
7. Close the dialog.

> ***THEMES***

The four options are depicted across the top of the dialog and include (from left to right):

- **Elevation Range** - reflects ranges of elevations.
- **Slope Range** - (in terms of **Percent** or **Degrees**) describe the angles of individual triangles.
- **Aspect Range** - describe the direction that the triangle plane faces. Aspect ranges are expressed in degrees. The north axis is defined as zero degrees and angles increase in a clockwise direction. Therefore, zero degrees points north, 90 degrees points east, 180 degrees points south and 270 degrees points west.

Note A level triangle is assigned a default aspect of 360 degrees.



As each option is selected, the dialog title changes to reflect the selection. The remainder of the main dialog remains unchanged.

Set Ranges.

Before the Themes processing commences, the user must define the desired ranges and associated colors. This is accomplished by clicking **Set Range**.

The lower half of the dialog contains the list box, with edit fields directly below. Options are supported (button to the right of the list box) to **Add**, **Modify**, and **Delete** ranges. When the **Active** toggle is activated, the selected range is displayed or drawn when the themes are processed. A range can be activated or deactivated at any time during the processing by highlighting the desired line and changing the **Active** toggle. In this manner, the user has complete control over which ranges are visible on the screen at any one time.

To add a single range, simply key in the desired values, select a color from the color picker, and click **Add**. The created line is added to the list box. To modify a line, highlight the desired line. The current values are displayed in the edit fields. Change the desired field, and then click **Modify**. GEOPAK updates the list box. To delete a line, highlight the line and click **Delete**. The line is removed from the list box. An unlimited number of ranges are supported. When more than five ranges are specified, the

scroll bar and arrows on the right side of the dialog are automatically invoked for easy scanning. Note the lines are displayed in ascending low value order, regardless of the order in which they were created.

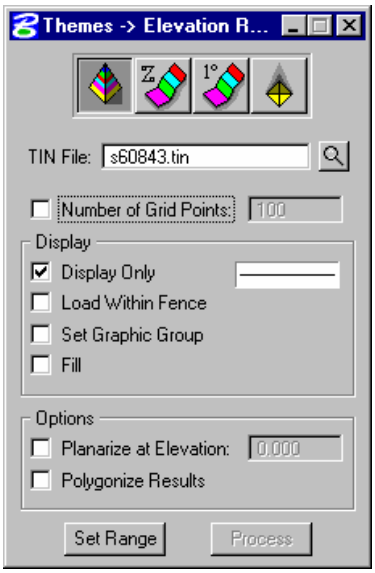
The top of the dialog supports automatic creation of ranges. Two options are supported:

Auto Number of Ranges - the number of ranges is specified, along with the Minimum and Maximum elevations (or slopes or aspects). GEOPAK divides the elevation into the specified number of ranges.

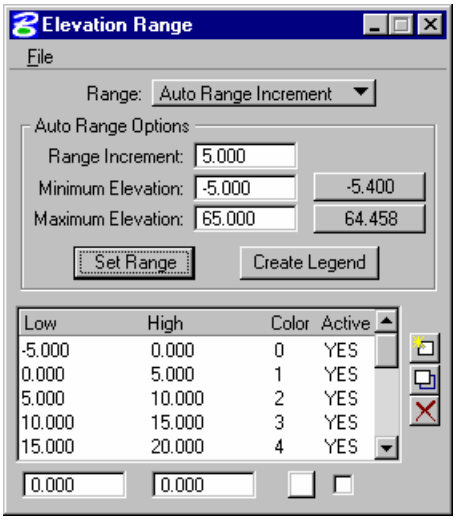
Auto Range Increment - the range increment is specified, along with the Minimum and Maximum elevations (or slopes or aspects). GEOPAK divides the elevation into as many ranges as necessary at the specified increment.

By pressing one of the buttons, the value is populated within the **Minimum** or **Maximum Elevation** field without typing. However, in order to utilize even value ranges, it is prudent to set the **Minimum Elevation** to a number divisible by the **Range Increment**.

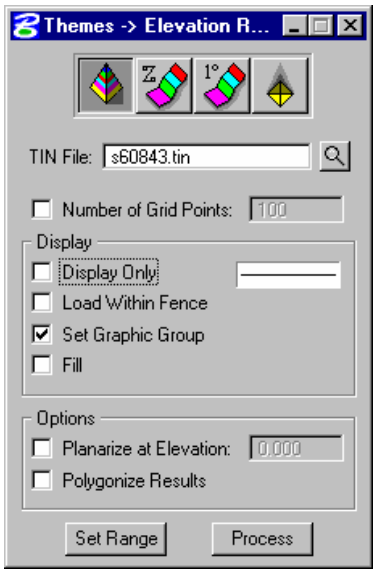
1. Open the MicroStation file ***c:\60843\3D.dgn***.
2. Access the ***Themes*** tool from the ***DTM Analysis*** tool bar.
3. Click the first icon from the left ***Elevation Range***.
4. Use the Browse button to select the TIN file ***60843.tin***.



5. Click the ***Set Range*** button and make the settings as shown below.



6. Close the ***Range*** *dialog.*
7. Toggle ON the ***Set Graphic Group*** option.



8. Click ***Process***.
9. Review the results.

6 Survey

OBJECTIVE

In this session we will review the tools and steps for creating survey chains and profiles form existing graphical data.

INTRODUCTION

Several tools will be used to create break lines and profiles from existing graphical elements. The tools will include the following:

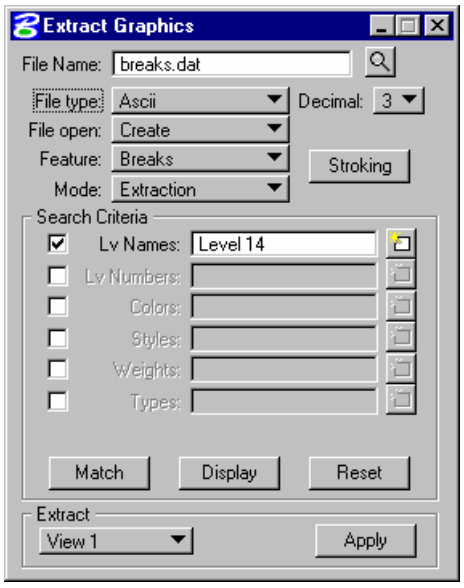
- Extract Graphics
- Import ASCII
- Chain Edit
- Convert Survey Chains

EXTRACTION OF GRAPHIC ELEMENTS

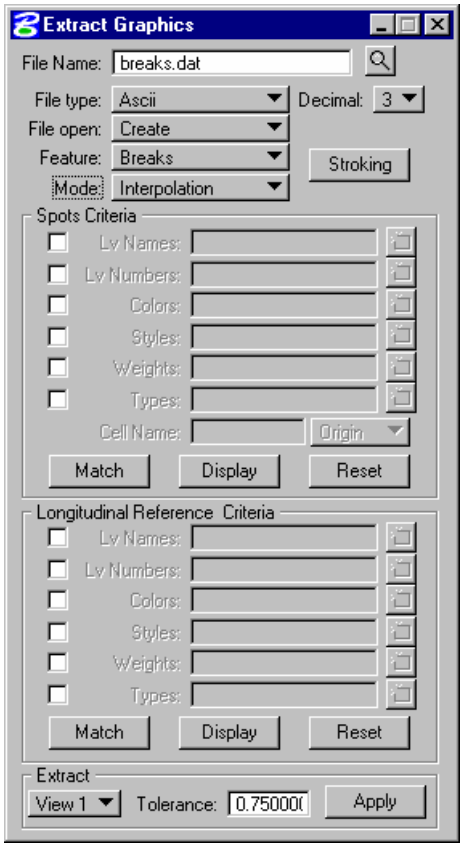
Graphic elements in MicroStation 2D or 3D files can be extracted. In a 3D file where elements are drawn coordinate correct (X, Y, and Z), the extraction mode is used. In a 2D file, where the elevations are determined by tags or text labels, the interpolation mode must be used for Breaks, Contours, and Break Voids. The Extract mode is used in 2D files for contours and spots.

Extraction of elements of specified parameters include all elements visible in a view, within a fence or within a selection set, whether the elements are in the active file or reference files (with locate activated).

Extraction Mode



Interpolation Mode



Whereas the Extraction mode creates a DTM input data file from the coordinate vertices of MicroStation elements, the Interpolation mode must first calculate the elevations for the coordinate vertices of MicroStation elements. The interpolation process is applicable where elevations are not stored with the MicroStation longitudinal reference elements. This occurs when longitudinal reference elements are two-dimensional or three-dimensional, but are all drawn at a common elevation. In both of these topographic mapping instances, the spot elevations determine the elevations along longitudinal reference elements. Therefore, the dialog for the Interpolation mode has two sets of Search Criteria, one for the Longitudinal References and a second for the Spot Elevations.

Spot elevations can be represented by graphical elements or text. For each MicroStation longitudinal reference element, GEOPAK locates the spot elevations nearest to and on either side of the element endpoint. Then, the elevation at the element endpoint is calculated.

The interpolation mode is only valid for Feature Types: Breaks, Contours, and Break Voids. For contours within a 2D file, the associated elevation must be within the Con Z-range, more commonly known as "tagged." Elevations for spot elevations may be determined by textual value (if the origin of the text is the origin of the spot) or "tagged" elevations for other element types, i.e., zero length lines or cells.

The resulting input file includes XYZ coordinates for both source spot elevations as well as for interpolated endpoints. Inclusion of the source spot elevations is mandatory since the spot elevation data often reflects important vertical topological features such as the high and low points along the longitudinal reference. Inclusion of interpolated endpoints is mandatory since the endpoints of longitudinal reference elements define changes in the horizontal topological features. These alterations in the horizontal topology determine break lines.

DIALOG FIELDS

File Name

Name of DAT file to be created.

File Type:

ASCII
Binary

The advantage of the binary format is that input data is loaded much quicker when generating the triangulated model since the point and/or break line data can be read much faster from a binary file than from an ASCII file. However, other than reduced loading time, there are no functional differences between the ASCII and binary files. One advantage of the ASCII file format is that the file may be viewed and/or edited with a text editor.

Decimal

Only valid when the ASCII File option is selected, the number of decimal places displayed within the file ranges from zero to six. The binary option defaults to double precision, with no user options.

File Open:
Create
Append

The data file used as input to the DTM process can be created as a new file or the extracted data can be appended to the end of an existing data file. When you type the file name or use the **Files** button to access a file, the data file is not actually opened until you establish all entries on the dialog and press the **Apply** button. At that time, GEOPAK creates a new file or opens an existing file depending upon the setting of the **File Open** option button.

If the **File Open** option is set to **Create** and the file already exists, an Alert dialog appears with the message "Overwrite existing <file name>?" when the **Apply** button is pressed. If you press **OK**, the existing file is overwritten. Pressing the **Cancel** button permits you to return to the main Extract dialog and readjust the file name or **File Open** mode.

If the **Open** option button is set to **Append** and the file does not exist, an Alert dialog appears with the message "Create <file name>?" when the **Apply** button is pressed. Pressing **OK** results in the creation of the specified file. Pressing **Cancel** returns control back to the main Extract dialog.

Feature Type:

Spots

Spots are points that have no functional relationship to any other point. Random survey shots in open terrain would be an example of random spots. Point elements such as cells, circles, and text strings are typical MicroStation elements used to define spot elevations. Lines, line strings, and other longitudinal elements are equally valid. GEOPAK simply creates a spot elevation for each vertex of each longitudinal element.

Breaks

Breaks are used to designate linear features such as edges of pavement, ditch bottoms, ridges, etc. Any longitudinal element may be defined as a break line. Circular arcs are automatically segmented by GEOPAK in a manner consistent with the arc radius.

Boundary

A **Boundary** is used to constrain the external boundary of the triangulated model. No triangles are created outside the boundary polygon. In addition, any point data outside the boundary polygon is ignored. A boundary polygon must start and finish with the same point. In addition, the boundary polygon must be continuous within the data file.

Contours

Contours are a special feature intended for use if the source MicroStation elements represent digitized or otherwise created contours. Use of this feature insures the integrity of the contour strata in the subsequent DTM. Processing of a DTM with contours classified as spot elevations invariably results in a DTM that, if subsequently contoured, will not match the original extracted contours.

Voids

Void areas are closed shapes to demarcate areas of missing data or obscure areas. No point or break data located within the void area is utilized and no triangles are created inside the void areas. The Void coordinates are included in the triangulation and void lines between successive void coordinates are inserted as drape lines on the TIN surface. Therefore, they do not change the slope or elevations of the TIN surface.

Island

Island - used to place triangulated data within a void, i.e., islands in the middle of rivers, lakes, etc.

Graphic Triangle

Graphic Triangles - by extracting as triangles, the sides of each triangle, in addition to the vertices are maintained. If spots are used, the vertices would be utilized but not the triangle sides.

Drape Void

Drape Void - In the drape void, the void coordinates are not included in the triangulation. Voids are inserted post triangulation. The void coordinates and lines are draped on the TIN surface. Even though a user must provide an elevation for the Drape Void vertices, the user elevations are changed to the elevation of the TIN surface at the XY Drape Void coordinate position.

Break Void

Break Void - A void utilizes the elevations of each vertex, while the void lines between successive void coordinates are inserted as break lines. Therefore, break voids change the slope and elevations of the TIN surface.

Mode: Extraction or Interpolation

The **Extraction** mode determines XYZ data directly from the coordinate values of three-dimensional MicroStation elements. The **Interpolation** mode, by contrast, derives XYZ data by locating spot elevations on longitudinal MicroStation elements and interpolating. Hence, the **Interpolation** mode can be applied to both two-dimensional as well as three-dimensional MicroStation files as long as a Z-coordinate reading can be ascertained from the spot elevations.

Stroking

Utilized in the interpolation mode, this shortcut button to the **Settings > Stroking** dialog may be used. Changing the dialog from either location automatically updates the dialog in the other location. For a detailed discussion, refer to the **Settings > Stroking** documentation.

Select Criteria

Before extracting MicroStation elements, a description of the desired elements must be defined in terms of element types, levels, colors, weights and styles. Not every extract operation requires the definition of every parameter; only enough parameters to uniquely differentiate the desired element from all other graphical elements in the MicroStation file. For example, if the elements desired for extraction are only present on level 25, then only the level parameter need be defined. To the left of each parameter label is a toggle. If the toggle for any parameter is deactivated, GEOPAK assumes that the full range of settings for this parameter is available. For example, if the **Colors** toggle is deactivated, GEOPAK searches for all colors: 0-256.

Similarly, a deactivated **Colors** toggle is equivalent to an activated **Colors** toggle and a key-in of **0-256**. If a toggle is activated and no

values given, GEOPAK searches for nothing, therefore, be sure if a toggle is on that values are defined.

Level
Weight
Styles
Types
Colors

If specific parameter settings are to be considered, the toggle must be activated. Once activated, the associated **Select** button becomes available. Simply toggle on the desired parameter, the click **Select**. The Mask dialog is displayed, wherein the desired parameter settings may be identified. You may select as few or as many parameters to identify the desired elements.

When the **Type > Cell** option is activated, all cells with the other specified parameters (i.e., level, color, weight) are utilized. However, if the **Cell** option is activated and a cell name is typed into the field to the right of **Cell** toggle, then only the named cell with the other specified parameters is utilized. For example, if level 40 is specified in the Level Mask, and two cells, SPOT and X are located on level 40, and no cell name is specified in the cell field, then both cells are extracted. However, if SPOT is typed into the field, then only the SPOT cells are extracted, although other cells are located on level 40.

The Text String also has two options: **Origin** and **Content**. When the **Text String** toggle is activated and the option is set to **Origin**, GEOPAK utilizes the origin of the text as the x, y, z coordinates for extraction. If the Content option is specified, the x, y coordinates are derived from the text origin. However, the z value is not the z value within a 3D file, but the actual value of the text, whether a 2D or 3D file.

Match

The **Match** tool is a method of determining and adding the symbology of elements to be extracted to the Mask dialogs. First, activate the desired toggle(s) to the left of the Select Criteria. Then click **Match**. You are prompted to select the desired element. After identifying and accepting the element, its select criteria is added to any criteria whose toggle is activated. In addition, any elements of the specified parameters are highlighted. The **Match** button can be utilized numerous times to select additional elements. The information is appended to the Mask dialogs until the **Reset** button in the dialog is pressed, (which clears all active criteria selections).

Display

Clicking **Display** displays all elements of the current parameters.

Reset

The **Reset** button clears all Mask dialogs, so a new match procedure may commence.

Tolerance
(Interpolation mode only)

If a spot elevation is within 0.75 master units of a longitudinal reference, the software projects the spot onto the reference (perpendicular) element and uses the elevation to interpolate.

Extract Method:
View 1, 2, …….

The **View** method extracts every element that is visible in the specified active view and satisfies the select criteria. This includes elements in both the active as well as reference files if the Locate is activated. Simply set the desired View number before pressing the **Apply** button.

Fence

The **Fence** method extracts every element that satisfies both the fence criteria as well as the selection criteria defined via the Select Criteria group box. All MicroStation fence options are supported. Place the fence prior to pressing the **Apply** button.

Complex Chain
Selection Set

Complex Chain - The Select Criteria group box disappears from the dialog, since you identify the elements via the cursor; and no file-wide searches are involved. Also, notice that the **ID Element** button appears adjacent to the Extract method option button. This button initiates the "chaining" of MicroStation elements. The following outlines the sequence of operations associated with the Complex Chain method.

1. Establish the desired dialog settings.
2. Adjust the Extract method option button to **Complex Chain**.
3. Press the **ID Element** button.
4. Identify and accept the first element that constitutes the beginning of the chain.

   Selection of subsequent elements is identical to the operation of the MicroStation automatic create complex chain command. Successive connected elements are highlighted one at a time for inclusion or rejection as long as the endpoint of the next element is within a specified tolerance to an endpoint of the current element. The Tolerance is specified on the MicroStation Automatic Create Complex Chain palette. After the first element is selected and accepted, the next connected element is highlighted.

   If more than a single element is located within tolerance to the next element endpoint, the message "Fork Accept/reject" appears in the MicroStation prompt field. A data point accepts the highlighted element. Pressing the reset cursor button rejects the highlighted element and highlights another one.

   Once the end of the chain is reached or the user presses the reset cursor button when no more connecting elements are available, the identification of component chain elements is complete. At the completion of the selection process, the **Apply** button becomes available. The extraction of elements to a DTM input file commences when the **Apply** button is selected.

   Selection Set - This method is identical to the Complex Chain in every aspect other than the actual selection of elements. The Selection Set method employs the MicroStation **Selection Set** tool to identify the element(s) for processing. This method is particularly useful when selecting a single element or a group of disjointed elements few in number. The following outlines the sequence of operations associated with the Selection Set method.

1. Establish the desired dialog settings.

2. Adjust the Extract method option button to **Selection Set**.

3. Click **ID Element**.

4. Identify the element(s) comprising the selection set. If more than one element is being selected, the control key on the keyboard must be utilized during the selection process.

5. At the completion of the selection process, the **Apply** button becomes available. The extraction of elements to a DTM input file commences when **Apply** is clicked.

Apply — Commences the extraction procedure. Note that the dialog should be filled in completely, and the Extract mode selected and applicable fence, view, selection set or complex chain identified prior to clicking **Apply**.

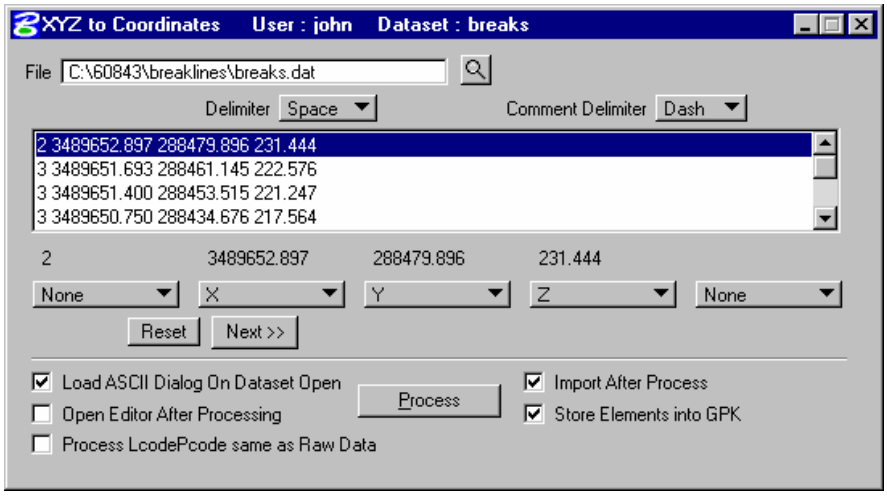
IMPORTING ASCII FILES

All data must be imported into database before mapping, writing to DTM, etc. can be done. Although this seems like an extra step, the benefits of a binary database, rather than ASCII OBS/XYZ files as the repository of all information, is worth the extra toggle.

Having the multiple datasets incorporated into a single database provides the following benefits:

- Multi Point Editing- Change multiple points simultaneously by editing their Feature, Description, Zone, PCode, etc.
- Display by Set Search- Display uses the Set Search to select what items are displayed.
- Editing simultaneously in different runs.

The ASCII data extracted from the graphics can be imported using a dataset that specifies X, Y, Z information.



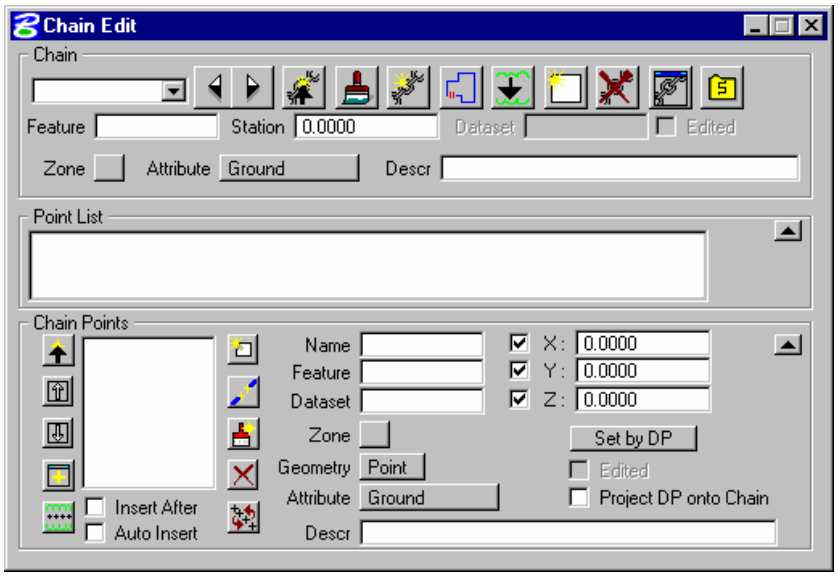
SURVEY CHAINS

CHAIN EDITOR

The **Chain Editing** tool enables existing chains to be modified and allows the creation of new chains. When the dialog is first loaded, the existing survey chains, if any, will be loaded into memory and the dialog will contain the first chain. The most common editing sequence of chains occurs when points need to be deleted or added to a chain or when the Geometry of the chain needs to be modified. The Geometry of a chain is controlled by the Geometry (Point or Curve) of the individual points which comprise the chain. Chains may be a combination of straight lines, circular arcs, or spline curves. The following table explains how the Geometry of a chain is constructed:

Geometry Code Sequence	**Resulting Element**
P-P...	Line. Two or more consecutive P's cause a line element to be generated.
C-C-C	Circular Arc. Exactly three consecutive C's cause a circular arc to be generated that passes through each of the points.
P-P-C-P-P	Line-Circular Arc-Line. The combination of two P's, exactly one C followed by two P's causes a circular arc to be generated that is tangent to both of the lines and that passes through the C point.
C-C-C-C	Curve String. Four or more consecutive C's cause a curve string to be generated that passes through each of the points.

Once the chains have been edited and the dialog is closed, the user will be prompted to save the chain edit or not. If the edits are saved, a backup file will optionally be written.



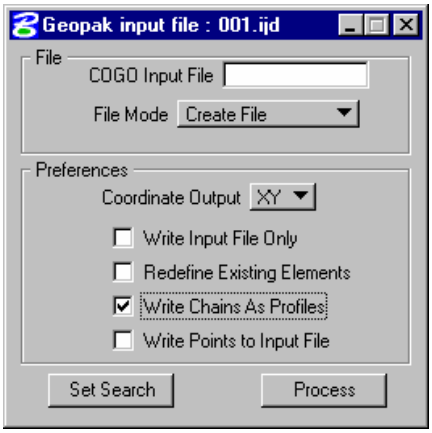
The dialog consists of the **Name**, **Feature**, **Station**, **Description**, **Attribute** and **Zone**. The **Name** field is the currently selected chain. A chain name may be selected from the list or sequenced by use of the Next Chain and Previous Chain buttons to the right. The **Feature** field holds the feature name of the currently selected chain. The feature of the chain may be changed by keying in another feature into this field. The **Station** field is the starting station of the currently selected chain. The station may be changed by entering a new station value into this field in the format of 1+25.48. The **Description** field is the description of the currently selected chain. If a different description is to be associated with that chain, then enter the new description value into the field.

The **Attribute** option button depicts the DTM attribute the chain is in. The **Zone** option button to the left of the **Attribute** option button depicts which zone the chain is in. For data collectors that do not support this field, it is defaulted to one.

Icons or processing buttons located across the top of the dialog are described in the table below and process an entire chain, rather than a single vertex as in the case of the Chain Points group box processing.

CONVERT SURVEY CHAINS

The **Convert Survey Chains** tool creates COGO chains (alignments) and optionally profiles from survey chains.



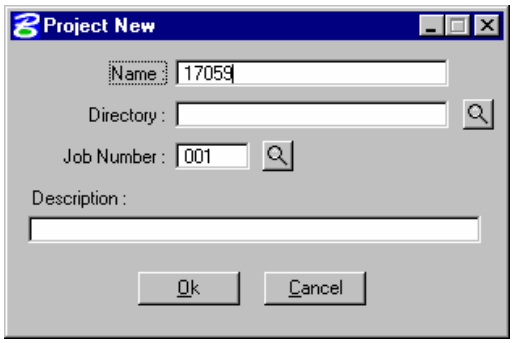
The **COGO Input File** field is the name of the ASCII input file (maximum of five characters) to be generated for subsequent processing via GEOPAK Coordinate Geometry. The Job Number from the project is appended to the end of this name and the extension is in the form of .IOC where OC is the operator code as entered for the project. For example, if the name of the input file name was keyed in as CGO and the current Job Number was 99 and the current Operator Code was ZZ, then the file would be named COGO99.IZZ. Note when the COGO Input File is populated, the input file name is added to the Title Bar. Below the **COGO Input File** field is the option to **Create File** or **Append to an Existing File**.

In the case where the file name already exists and the **Create File** option is selected, the user is prompted to overwrite the existing file, while the **Append to an Existing File** will add the new data to the bottom of the existing file.

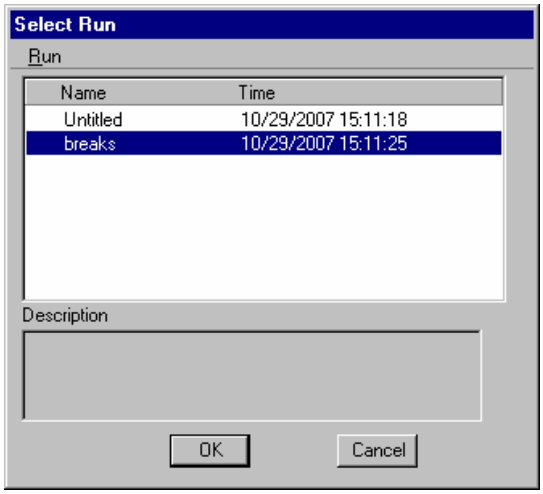
LAB EXERCISE: SURVEY CHAINS

> *EXTRACT GRAPHICS*

1. Open the MicroStation file ***c:\60843\17059\sdt17059hw.dgn***.
2. Create and open a Survey project named ***17059***.

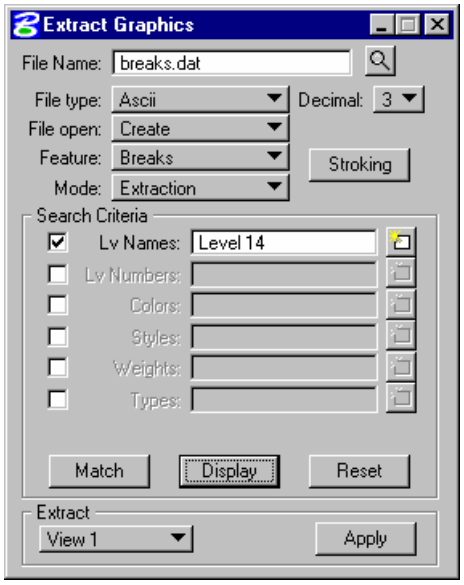


3. From the main Survey Menu bar select ***DTM > DTM Tools***.
4. Create a new run called ***Breaks***.



5. Select the ***Extract Graphics*** tool.
6. Enter a file name for the DAT file of ***Breaks***.

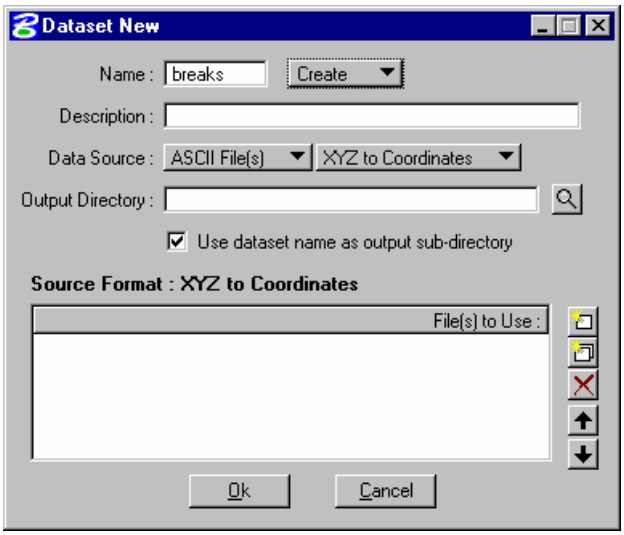
7. Make the settings as shown below.



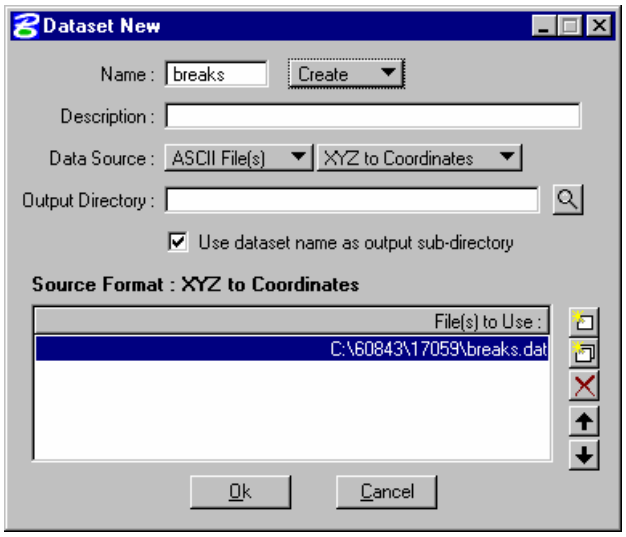
8. Click ***Apply***.
9. Close the ***DTM Tools***.

> *IMPORTING ASCII*

1. From the main Survey Menu bar select ***Dataset*** > ***New***.
2. Create a new dataset named ***Breaks.***

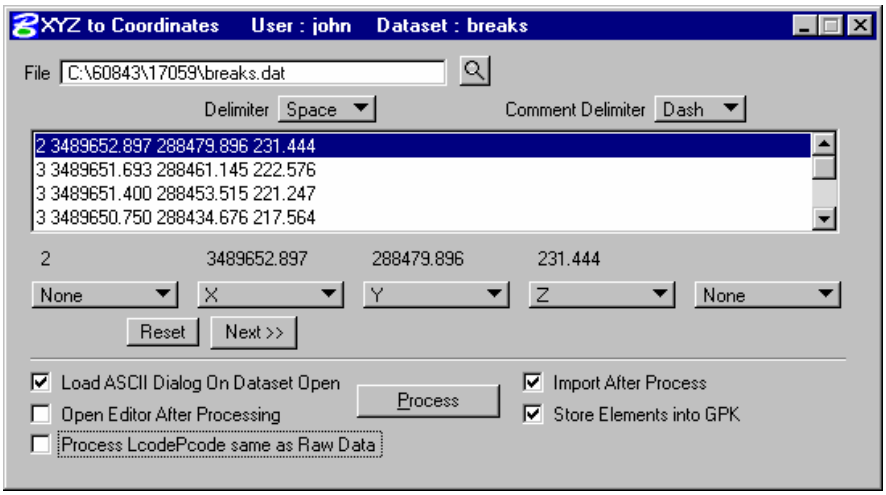


3. Use the ***Dataset Add*** to browse and add the ***Breaks.dat*** created in the previous step.



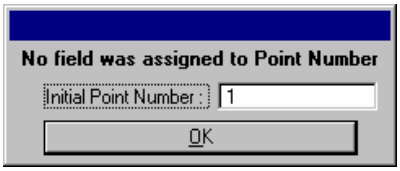
4. Click ***OK***.

5. Make the settings as shown below.



6. Click ***Process***.

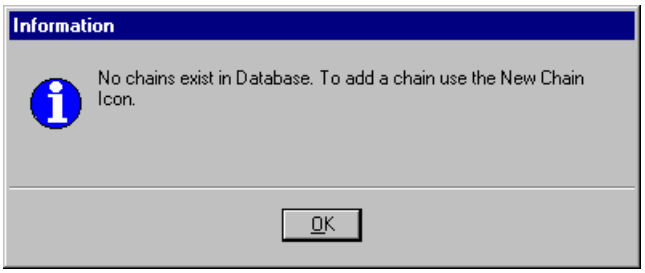
7. When prompted for a beginning point number key-in point ***1*** and click ***OK***.



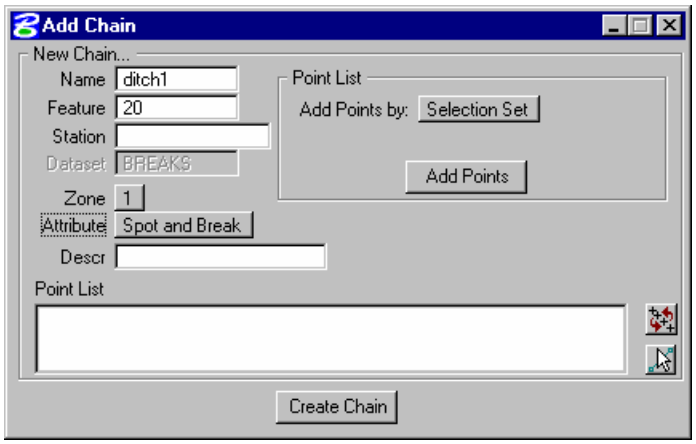
8. Once the import is complete close the import dialog.

> *CREATE SURVEY CHAINS*

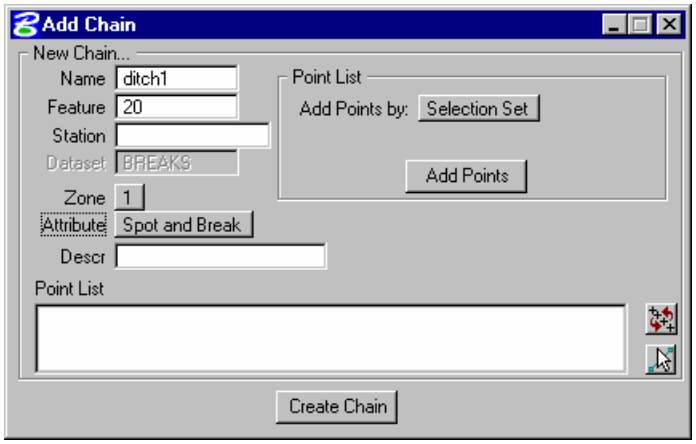
1. From the main Survey Menu bar select ***Geometry*** > ***Chains*** > ***Edit***.
2. Click through the following prompt to begin adding chains.



3. Once in the ***Chain Edit*** dialog click on the icon for ***New Chain***.
4. Enter the information as shown below.

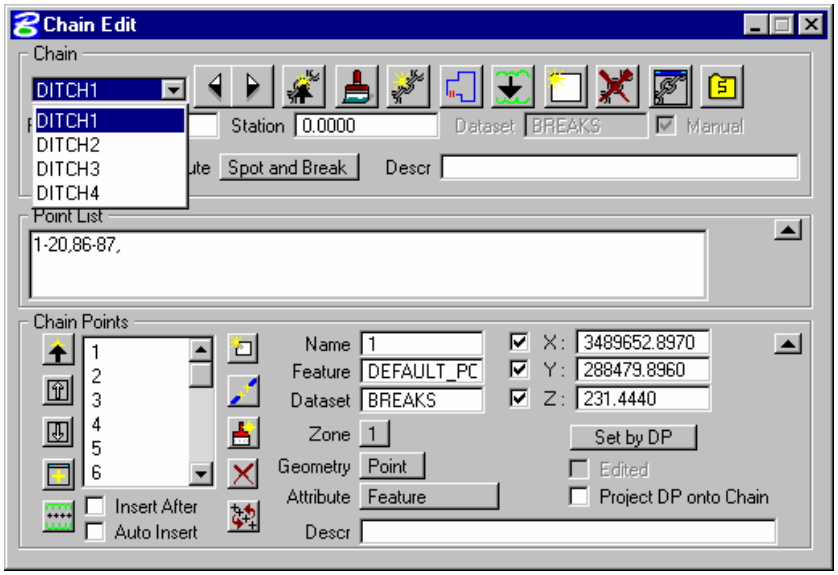


5. Using MicroStation's Power Selector place all of the points for a single break line into a selection set.
6. Click on the ***Add Points*** button.



7. Click on the ***Create Chain*** button.

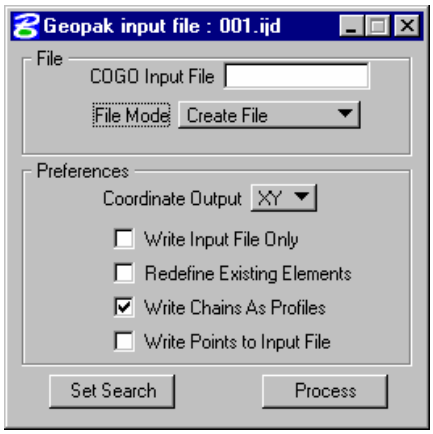
8. Repeat these steps form the remaining 3 break lines incrementing the name by 1.
9. Close the ***Add Chain*** dialog.
10. You should now have 4 Survey Chains listed in the chain pulldown in the Chain Edit dialog.



11. Close the ***Chain Edit*** dialog.

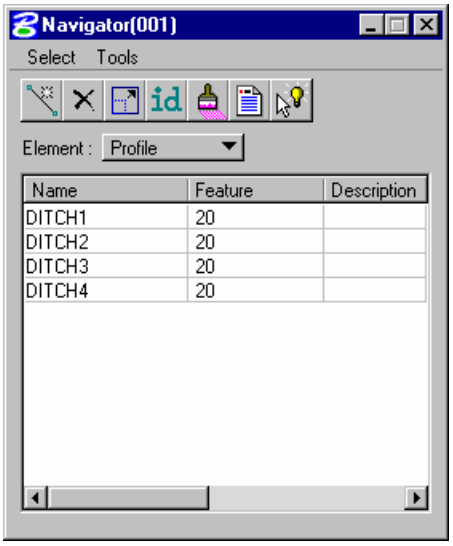
> *STORING CHAINS & PROFILES*

1. From the main Survey Menu bar select ***Geometry*** > ***Chains*** > ***Convert Survey Chains***.
2. Make the settings as shown below.

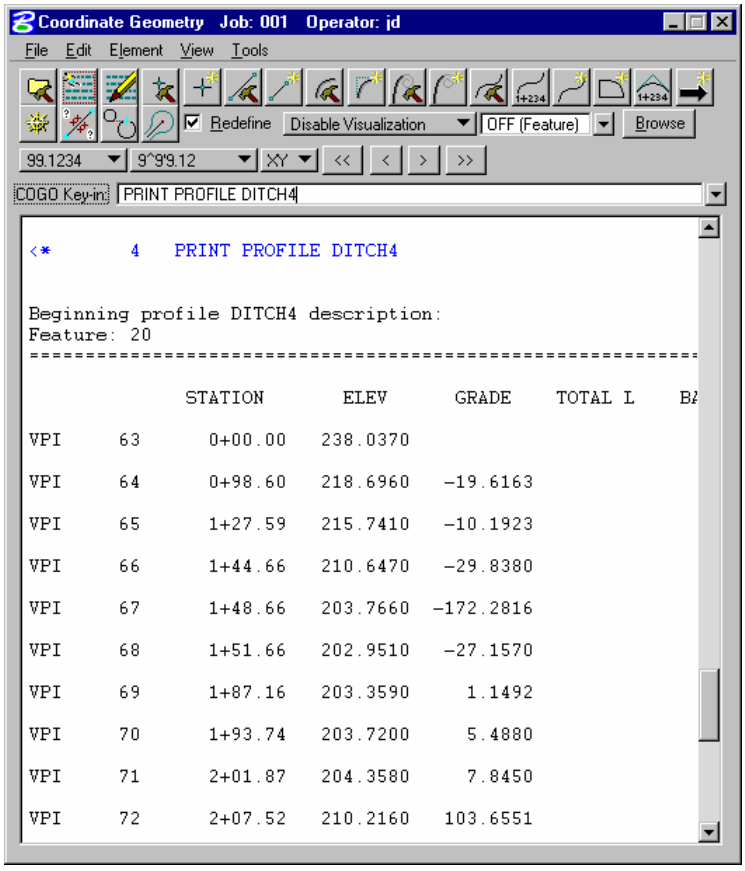


3. Close the ***Convert Survey Chain*** dialog.

4. From the main Survey Menu bar select ***Geometry > Navigator***.
5. Set the ***Navigator Element Toggle*** to ***Profiles***.



6. Highlight a single ditch or all ditches and click the ***Print/Describe*** icon.
7. Review the profiles in the main COGO window.



8. Exit MicroStation.

7 Geodetic Conversions

OBJECTIVES

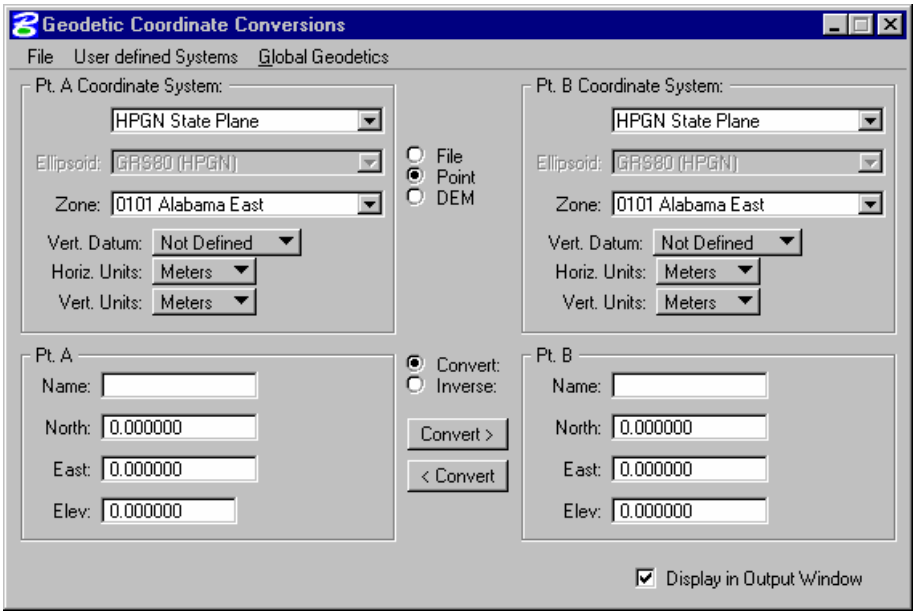
This chapter will focus on converting coordinates from one system to another.

INTRODUCTION

The processes involved in converting coordinates are relatively simple once an understanding is gained of the various tools in GEOPAK and their uses. In this session we will use several different tools within GEOPAK as outlined below.

GEODETIC CONVERSIONS

The Geodetic conversion utility performs many of the common computations encountered when working with geodetic and grid coordinate systems. Points can be individually entered and converted or multiple points from a coordinate geometry database (GPK file) can be converted via batch mode. All output is directed to an ASCII report file, in addition to a resizable output window.



GEOPAK's conversion tool supports a wide variety of conversions of latitude / longitude, grid coordinates in different zones, and systems (assuming they have a common ellipsoid). In addition, optional scale factors may also be utilized.

CONVERSION OPERATIONS

A wide variety of conversion operations are supported including:

- converting latitude and longitude to grid coordinates.
- converting grid coordinates to latitude and longitude.
- converting grid coordinate from one zone to grid coordinates in another zone.
- converting grid coordinates from one system to another system. Note that both systems must have a common ellipsoid.
- computing grid scale factor and convergence angle for grid coordinates.
- computing geodetic forward and back azimuth and distance between two geodetic positions.
- Computing grid azimuth and grid distance in addition to geodetic forward and back azimuth and distance between two points in the same zone.
- Computing the line grid scale factor and combined scale factor if elevation data is entered.

SUPPORTED SYSTEMS AND PROJECTIONS

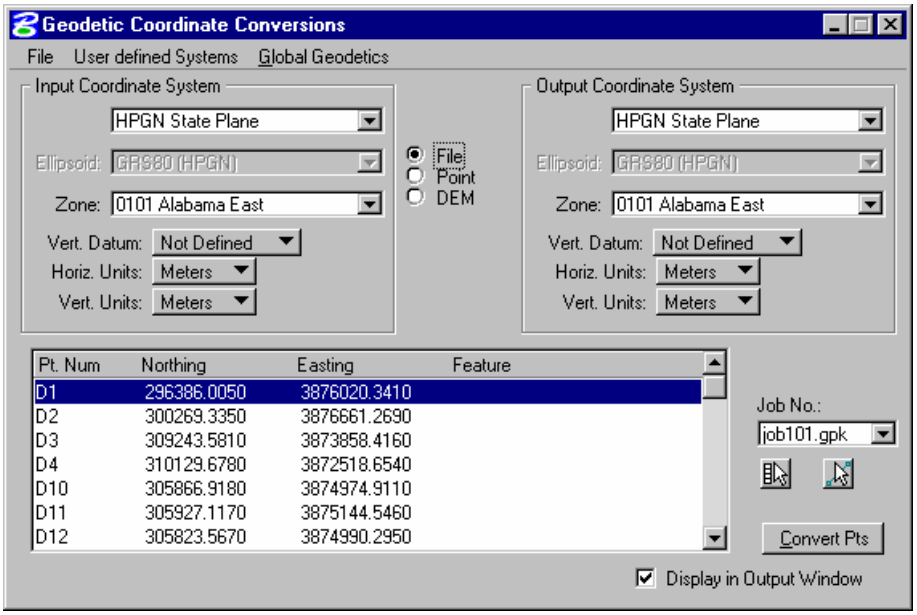
Several common systems and projections are supported including the following:

- HPGN State Plane.
- 1983 State Plane Coordinate systems (all zones).
- 1927 State Plane Coordinate systems (all zones).
- Universal Transverse Mercator system (all zones, northern and southern hemisphere).
- Latitude / Longitude.
- User-defined zones based on either the Lambert Conformal or the Transverse Mercator projection.
- Variety of ellipsoids are supported for the user-defined and UTM projections.
- New Zealand Map Grid (1949).
- New Zealand Local Circuits (1949).
- New Zealand Local Circuits (2000).

Three options are supported for the Vertical Datum:

- Not Defined.
- NAVD 88.
- NAVD 29.

FILE CONVERSIONS



Input Coordinate System

This group box includes **System** type, **Ellipsoid**, and **Zone**. As each system is selected, the ellipsoid and zone unghost as needed. For example, when 1983 State Plane is selected, the Ellipsoid is ghosted, however, a Zone must also be selected from the list. However, when Latitude / Longitude option is selected, the Zone field is not present, however, the Ellipsoid is unghosted, as depicted in the sample below.

Output Coordinate System

The right side of the dialog contains the Output Coordinate System, which has the same fields as the Input Coordinate system. Note, however, not all combinations can be converted. For example, when converting from UTM to Latitude / Longitude, GEOPAK must utilize the same ellipsoid. Therefore, when the ellipsoid option is selected in either coordinate system group box, the other ellipsoid dynamically changes to stay in sync. If a selected combination is not supported, i.e., changing from 1927 to 1983 state plane coordinates, GEOPAK changes the Output coordinate system after the user has selected Input coordinate system to reflect a supported option. The opposite is also true, i.e., GEOPAK changes the Input coordinate system after the user has selected the Output coordinate system.

Job No.

GEOPAK database (gpk file) wherein the points to be converted are stored. The list reflects all gpk files in the current directory or project.

List box

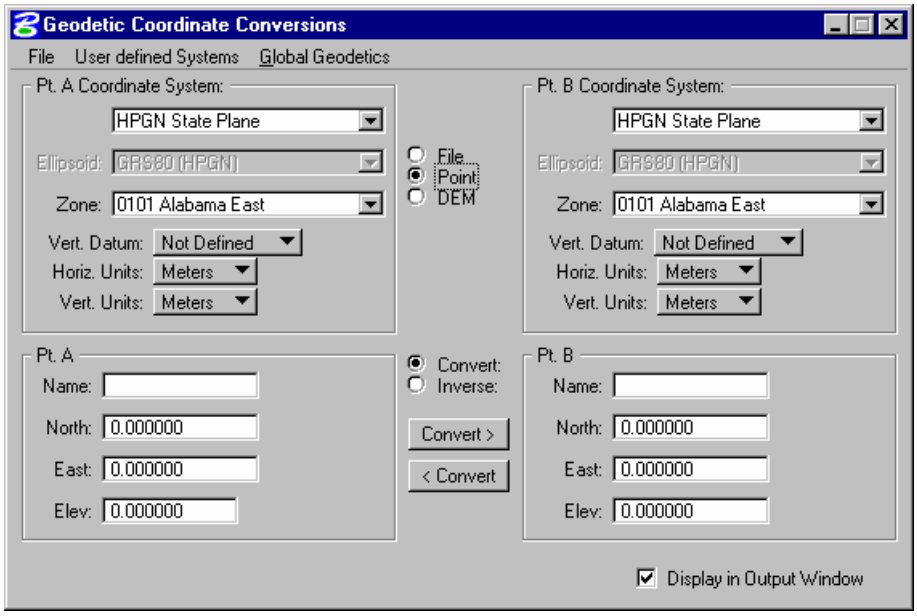
After selecting the **Job No.,** GEOPAK displays all point numbers and associated information in the list box. To convert, simply highlight as few or as many points as desired. Points can be highlighted either of the two icons directly below the Job Number. Options include getting points from a MicroStation selection set or from the COGO navigator.

Convert Points

Commences the procedure. Once converted, the Geodetic conversion Output window is displayed.

If a conversion not supported by GEOPAK is attempted, an information message is displayed.

POINT CONVERSIONS



Pt. A Coordinate System

This group box includes System type, Ellipsoid, and Zone. As each system is selected, the ellipsoid and zone un-ghost as needed. For example, when 1983 State Plane is selected, the Ellipsoid is ghosted, however, a Zone must also be selected from the list. However, when Latitude / Longitude option is selected, the Zone field is not present, however, the Ellipsoid is un-ghosted

Pt. B Coordinate System

The right side of the dialog contains the Pt. B Coordinate System, which has the same fields as the Pt. A Coordinate system. Note, however, not all combinations can be converted. For example, when converting from UTM to Latitude / Longitude, GEOPAK must utilize the same ellipsoid. Therefore, when the ellipsoid option is selected in either coordinate system group box, the other ellipsoid dynamically changes to stay in sync. If a selected combination is not supported, i.e., changing from 1927 to 1983 state plane coordinates, GEOPAK changes the Pt. B coordinate system after the user has selected Pt. A coordinate system to reflect a supported option. The opposite is also true, i.e., GEOPAK changes the Pt. A coordinate system after the user has selected the Pt. B coordinate system

Pt. A.

Point Name (or Number) and associated data. Note the fields are determined by the Pt. A Coordinate system option. When the option is changed, these fields dynamically change to reflect the selection. For example, when 1927 State Plane is selected as Pt.

Note that Meters, U.S. Foot and International Foot are supported in coordinate systems that require units. In addition, Elevations are also supported. However, when Latitude / Longitude is selected, the dialog changes.

Pt. B

The second set of data, with the same options as Point A. Note that when the Convert toggle is active, the results of converting Point A are displayed in Point B. If the Inverse toggle is active, then the geodetic distance and direction between Points A and B are computed and displayed in the output window.

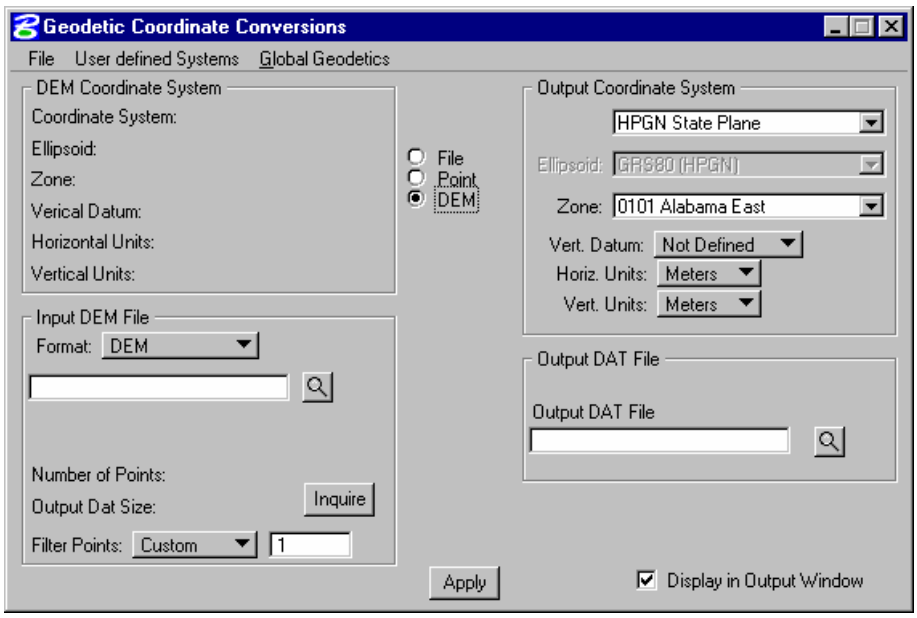
Convert / Inverse Toggles

Determines the type of processing and affects the action buttons directly below. If Convert is active, the user supplies all information regarding Pt. A, the Pt. B Coordinate System options and the Pt. B Name. When the Convert > button is pressed, GEOPAK converts the Pt. A data into the specified Pt. B system, and populates all fields in the Pt. B group box except the Name. The < Convert button commences the opposite process. It utilizes Pt. B data and converts to Pt. A coordinate system. Once converted, the Geodetic conversion Output window is displayed.

If a conversion not supported by GEOPAK is attempted, an information message is displayed.

When the Inverse option is active, GEOPAK computes the geodetic distance and direction between Pt. A and Pt. B. note the arrows on the Inverse > and < Inverse buttons are important as they dictate the direction. The Inverse > button inverses from Pt. A to Pt. B, while the < Inverse button inverses from Pt. B to Pt. A. To inverse, all associated data for both points must be supplied. The results of the inverse are displayed in the output display window

DEM CONVERSIONS



Other data sources utilized in the Geodetic Coordinate conversions tools are the various DEM formats including DEM, SDTS, and DTED. "A Digital Elevation Model (DEM), consists of a sampled array of elevations for ground positions that are normally at regularly spaced intervals. The basic elevation model is produced by or for the Defense Mapping Agency (DMA), but is distributed by the USGS, EROS Data Center, in the DEM data record format." A wealth of information on DEM formatted data can be obtained from www.usgs.gov. When the DEM option is selected in the center section of the dialog, the dialog changes to reflect the selection.

Within the Input DEM File group box, the data format is selected. The group box changes based on the selection. Once the selection is made, the File Name may be typed in, or selected via the **Files** button. Each format is discussed in subsequent sub-sections.

Once the file is read, the DEM Coordinate system group box is populated automatically. Therefore, the DEM Coordinate System group box is display only and the values cannot be edited.

The Output Coordinate system box includes **System** type, **Ellipsoid**, and **Zone**. As each system is selected, the ellipsoid and zone unghost as needed. For example, when 1983 State Plane is selected, the Ellipsoid is ghosted, however, a Zone must also be selected from the list.

When Latitude / Longitude option is selected, the Zone field is not present; however, the Ellipsoid is unghosted.

The **Vertical Datum** options include NAVD88, NAVD 29 or may be Not Defined.

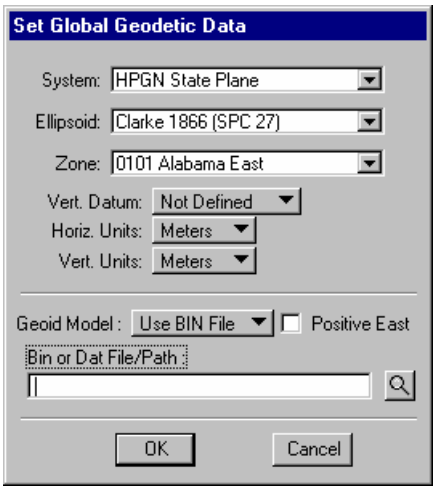
Supported **Horizontal and Vertical Units** include Meters, U.S. Ft., and Int'l Ft.

The Output DAT File group box has a single key-in field for the file name of the DAT file to be created. This file can be used within the Build Triangles dialog in the DTM tools. Manually enter the file name or select via the **File** button.

When the dialog is completely populated, click **Apply** in the center bottom of the dialog to commence processing.

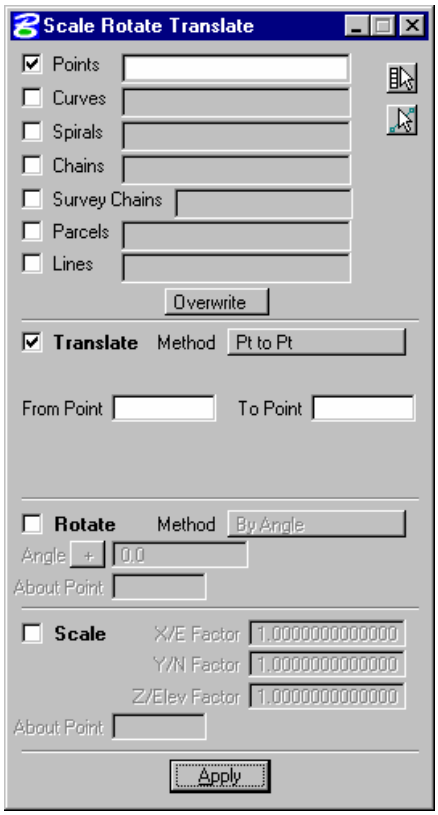
GLOBAL GEODETIC DATA

The dialog below allows the user to set a global geoid to use when converting.



SCALE, ROTATE, TRANSLATE

The **Translation** and **Rotation** tool translates and/or rotates the coordinate values of geometric elements. A variety of options to specify the distance and direction of the translation, as well as several rotation methods provide maximum user flexibility.



ELEMENT SELECTION

The top of the dialog displays the variety of COGO elements which can be translated, rotated or scaled. To utilize an element, simply activate the toggle to the left of the element name. Then populate the input field with the names of the elements. This can be done by three methods:

Manual

Type in the names separated by comas. For a range, utilize a hyphen.

Get Elements from Navigator

For elements from the navigator, access the COGO navigator and highlight the desired element names. Then click **Get Elements from Navigator**. GEOPAK automatically populates the dialog.

Get Elements from MS Selection Set

Place the desired elements in a MicroStation selection set, activate the desired element toggles, and then click **Get Elements from MS Selection Set**. GEOPAK scans the selection set and populates the dialog automatically.

INCREMENT / OVERWRITE

When storing new points, the increment must be specified. This value is added to each existing element to obtain the translated element name. If the points are overwritten, no new point number is required; hence, the field is not shown.

PROCESSING

The rest of the dialog consists of the three types of processing supported in this dialog: Translate, Rotate, and Scale. More than one type may be processed simultaneously. For example, elements can be just translated, or just rotated, or translated and rotated and scaled. Activate the desire toggles, and then populate the appropriate fields.

TRANSLATE

Translate

When active, translation is part of the processing.

Methods

Four methods are supported. When selected, the dialog dynamically changes to reflect the selection.

Direction / Distance

In this option, the distance direction each point is moved is specified. A variety of directions are supported.

Options include Azimuth, Bearing, QDD.MMSS, two points, and direction ahead or back of curves or spirals. The direction of the chord of a curve or spiral is also supported. The distance options include: two points, curve radius, chord, length, or tangent, and spiral chord, short tangent, and long tangent.

Pa to Pb

The distance and direction between the two specified points are used to translate all points, moving them by the same distance and direction.

Delta North/East/Elev.

All points are translated by the change in coordinates, i.e., change in North, East, and Elevation. Note: For those not needed, set the Delta to 0.00.

Coordinate Value

The distance and direction from the **Translation Point** to the **Desired North** and **East** is determined, then all points are moved the same distance and direction.

ROTATION

The second type is Rotate, which can be utilized by activating the toggle to the left of **Rotate**. Two methods are supported for rotation. The dialog dynamically changes as each is selected.

Pa to Pb To Bearing

In the **About Point**, specify a previously defined point. In addition, two points (**Point Back** and **Point Ahead**) are specified, and GEOPAK computes the direction between them. It then determines the rotation angle by comparing the computed direction and the desired bearing.

Angle

In the **About Point**, specify a previously defined point. The rotation angle is specified with an optional add-on.

SCALE

The third type is Scale, which can be utilized by activating the toggle to the left of **Scale**.

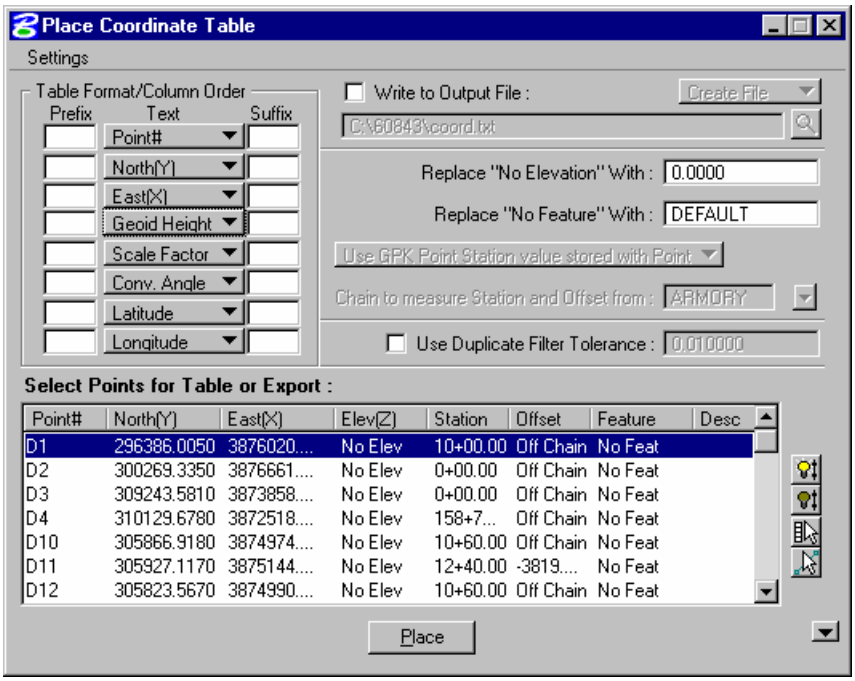
All elements are scaled utilizing the specified scale factors. If scaling is not desired for one factor, set the value to 1.00 (default). All scaling is done about the specified point.

When the dialog has been populated, clicking **Apply** commences the procedure.

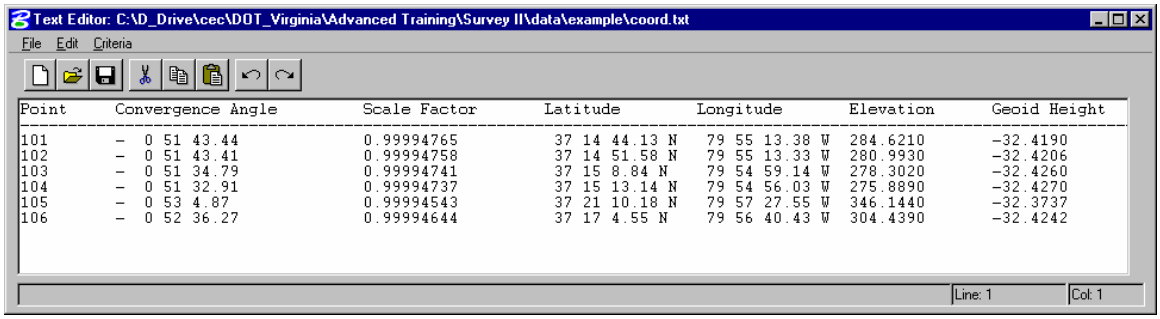
PLACE COORDINATE TABLE

The Place Coordinate Table tool draws a table using COGO points based on user-defined parameters.

One use of the table is to create a list of geodetic data including latitude, longitude, geoid height, etc.



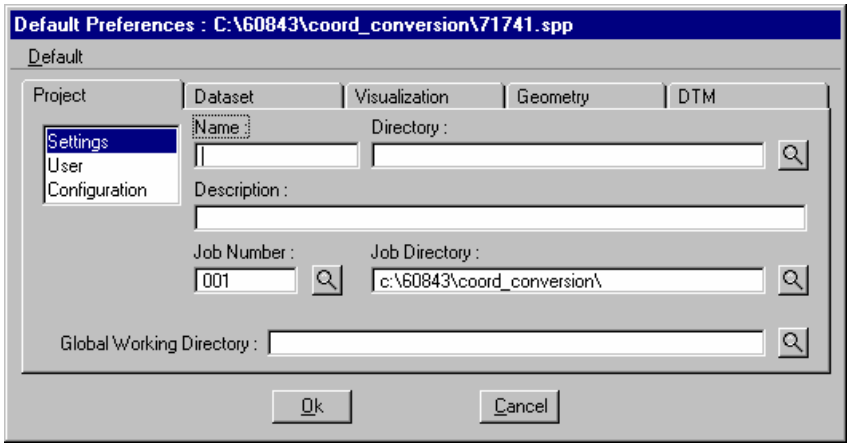
The table will appear similar to the one below.



LAB EXERCISE: COORDINATE CONVERSIONS

> *CONVERTING FROM LATITUDE / LONGITUDE TO DECIMAL DEGREES*

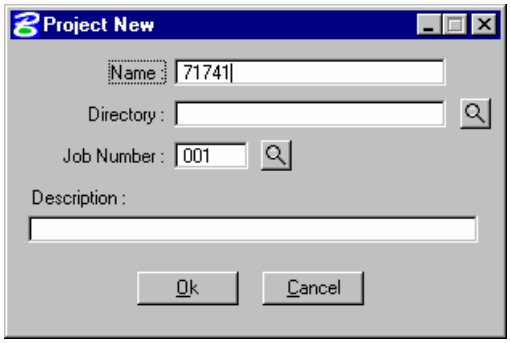
1. Open the MicroStation file ***C:\60843\coord_conversion\s71741.dgn***.
2. Select ***Applications > GEOPAK Survey > Survey***.
3. From the main Survey Menu bar select ***Project > Preferences***.



4. On the Project Preferences dialog select ***Default > Open*** and select the file ***71741.spp***.

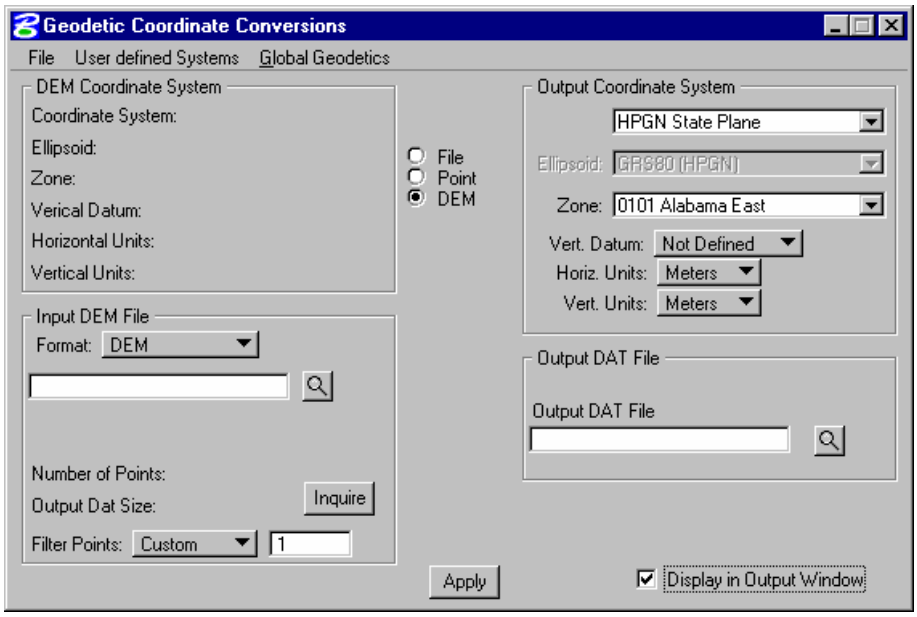
Note This is a project preference file with default settings for this project.

5. Click ***OK***.
6. From the main Survey Menu bar select ***Project > New*** and create a new project.



7. Click ***OK***.

8. From the main Survey Menu bar select ***Geometry*** > ***Conversions*** > ***Geodetic***.



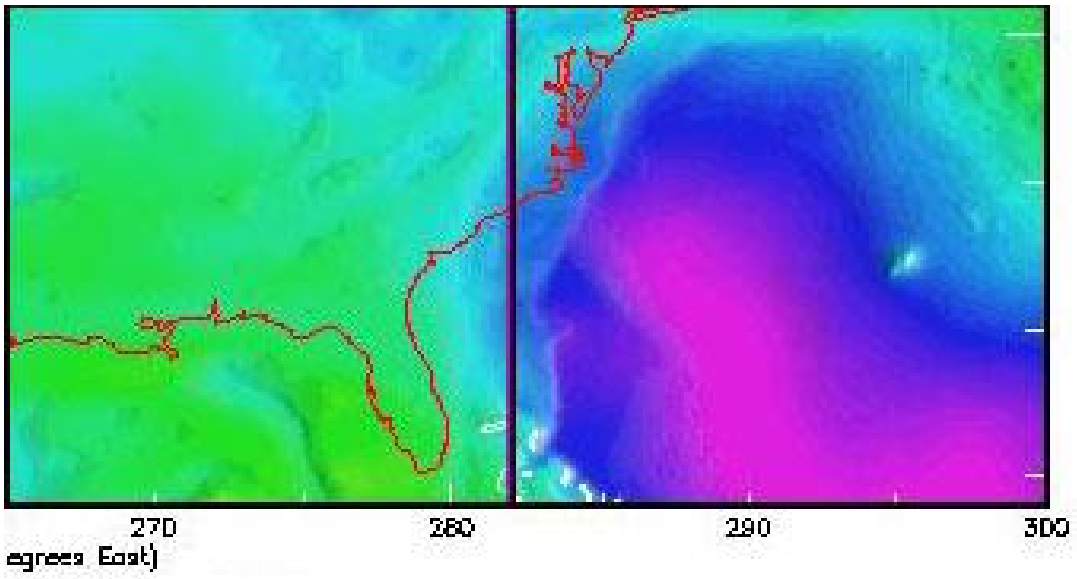
9. Set the radio button in the middle of the dialog to ***File***.

10. Prior to processing, be sure that the correct GEOID 03 files have been downloaded.

http://www.ngs.noaa.gov/PC_PROD/GEOID03/index.shtml

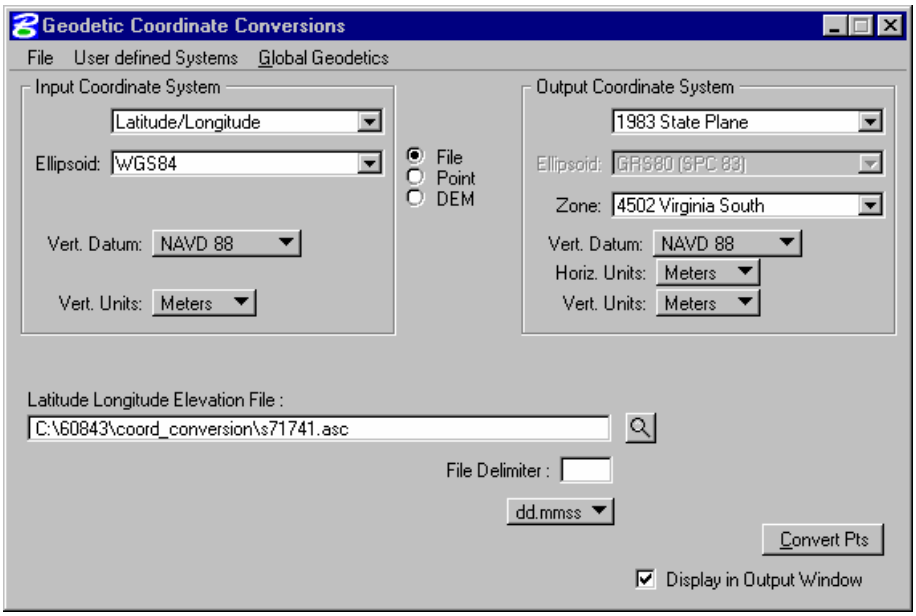
g2003u08.bin

g2003u07.bin



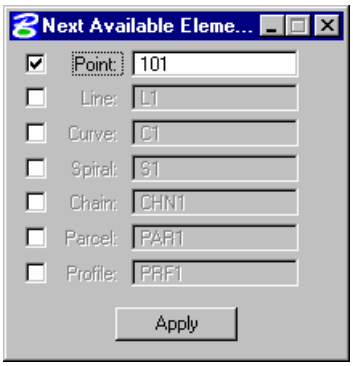
11. From the ***Geodetic Coordinate Conversion*** dialog select ***Global Geodetics > Set Global Geodetic Data***.
12. Make the settings as shown below.

13. Click ***OK***.
14. Make the remaining settings as shown below.

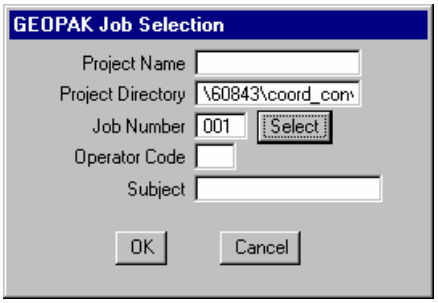


Note The *File Delimiter* should be set as a *space*.

15. Before converting the data we will define a point range in ***COGO***. From the main Survey Menu bar select ***Geometry*** > ***Classic COGO***.
16. Select ***Element*** > ***Next Available Settings*** and provide a beginning point as shown below.

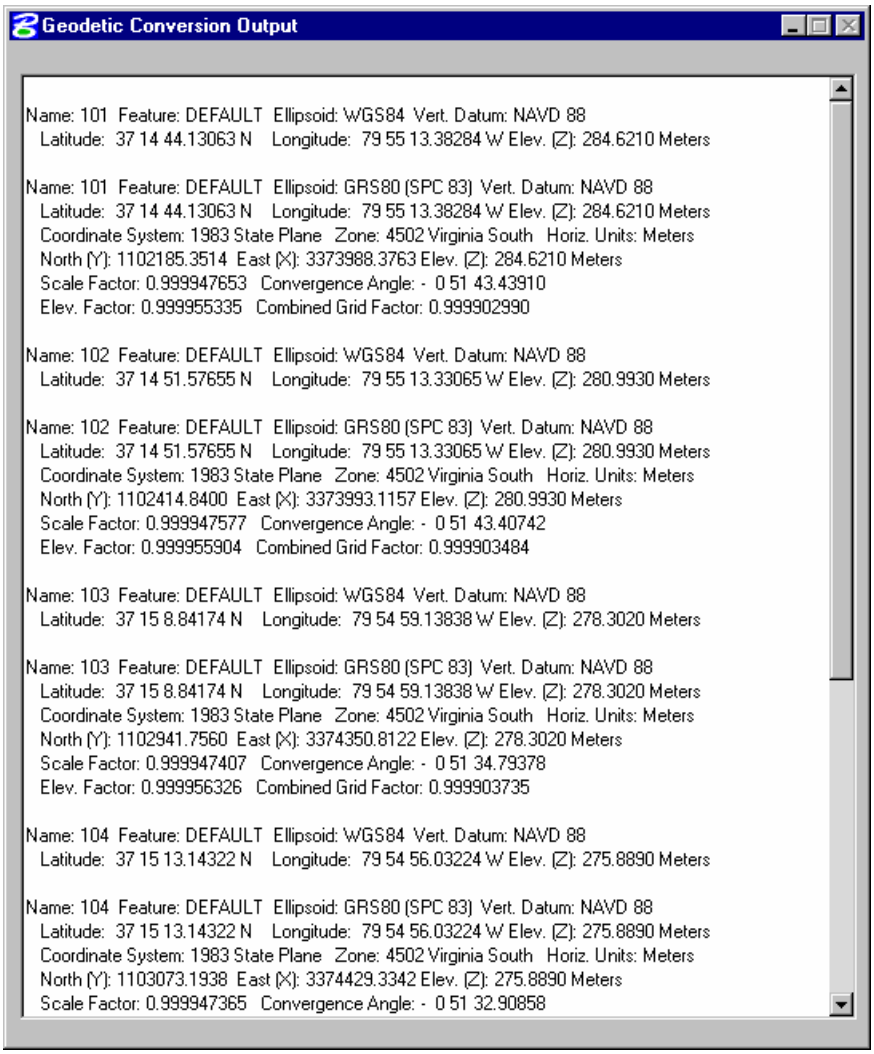


17. Click ***Apply***.
18. Return to the ***Geodetic Conversion*** dialog and select ***File*** > ***Output to GPK***.
19. Select the gpk file as shown.

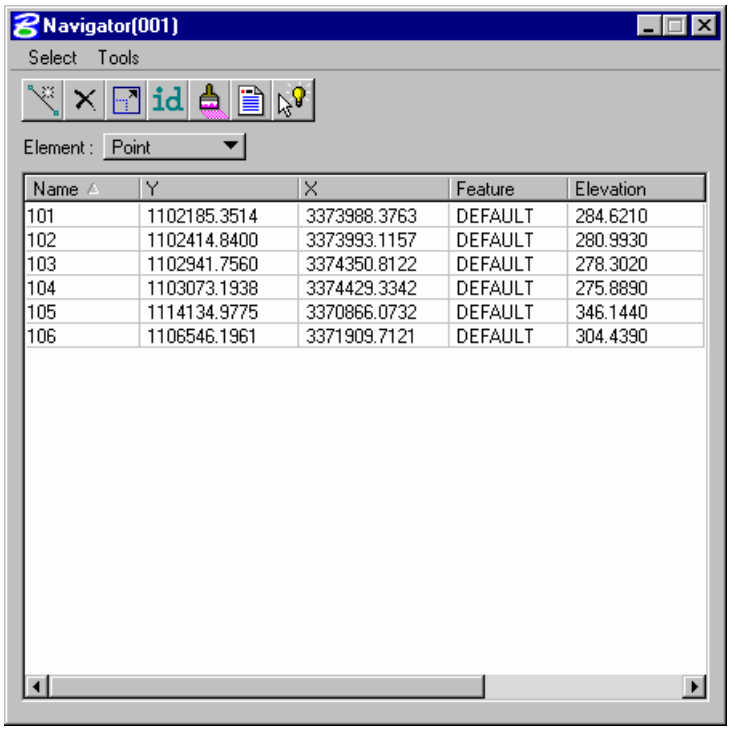


20. Click ***OK***.
21. Click ***Convert Pts.*** On the main ***Geodetic Conversion*** dialog.

22. Review the Geodetic Conversion Output.

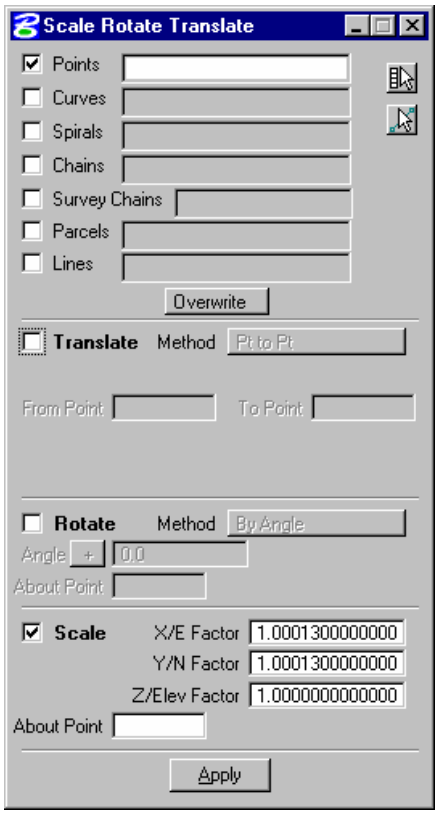


23. Open ***Navigator*** and review the points in COGO.

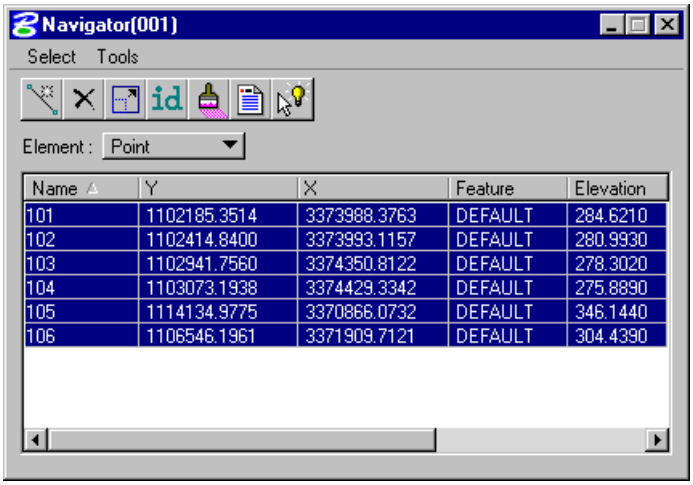


> ***CONVERTING METRIC PROJECT COORDINATES***

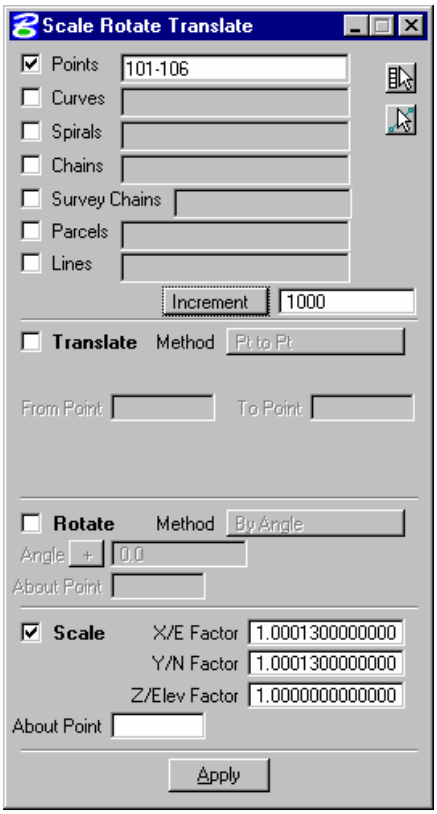
1. Open both ***Navigator*** and ***Geometry > Conversions > Translate/Roatate/Scale***.
2. Toggle ON the ***Points*** option and set the ***Scale*** options as shown below.



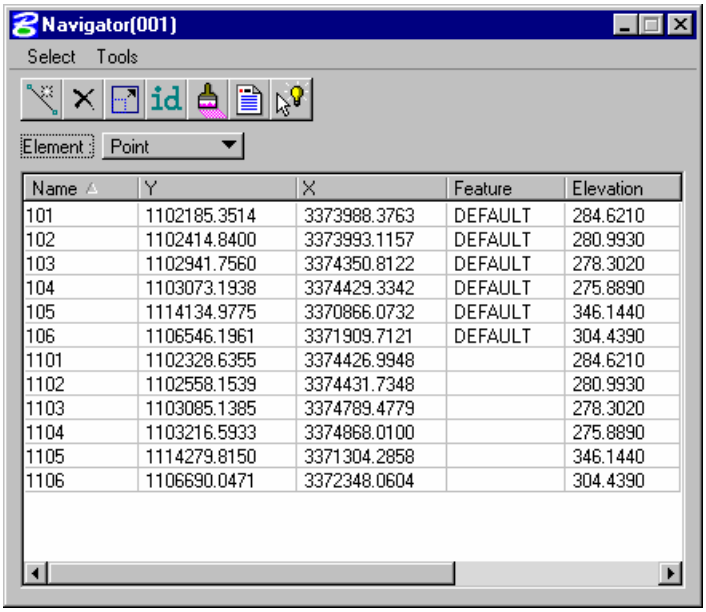
3. Now highlight the points in ***Navigator***.



4. Use the icon on the top right of the Rotation Translation dialog to populate the points. Be sure to set the Increment value in order to preserve the original points.



5. Toggle ON the ***Scale*** option and enter the scale factors.
6. Click Apply and scale the points.
7. Review the coordinates in the Navigator.

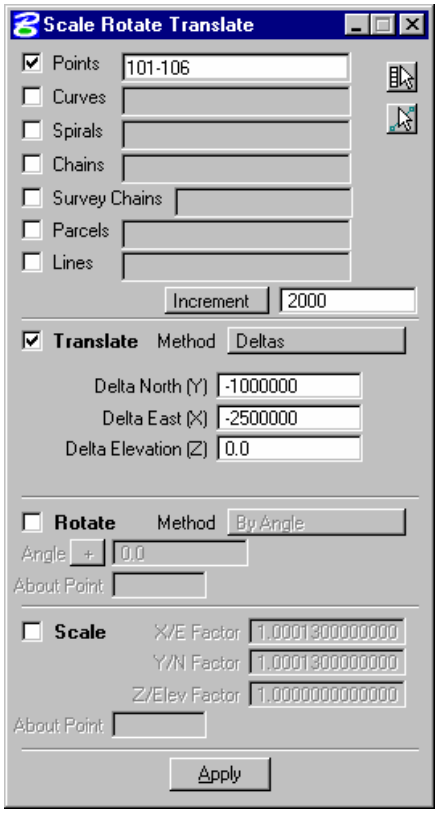


Name	Y	X	Feature	Elevation
101	1102185.3514	3373988.3763	DEFAULT	284.6210
102	1102414.8400	3373993.1157	DEFAULT	280.9930
103	1102941.7560	3374350.8122	DEFAULT	278.3020
104	1103073.1938	3374429.3342	DEFAULT	275.8890
105	1114134.9775	3370866.0732	DEFAULT	346.1440
106	1106546.1961	3371909.7121	DEFAULT	304.4390
1101	1102328.6355	3374426.9948		284.6210
1102	1102558.1539	3374431.7348		280.9930
1103	1103085.1385	3374789.4779		278.3020
1104	1103216.5933	3374868.0100		275.8890
1105	1114279.8150	3371304.2858		346.1440
1106	1106690.0471	3372348.0604		304.4390

> *CONVERTING IMPERIAL PROJECT COORDINATES*

Note It may be desirable to create a copy of the GPK file at this point since we are going to create Imperial coordinates.

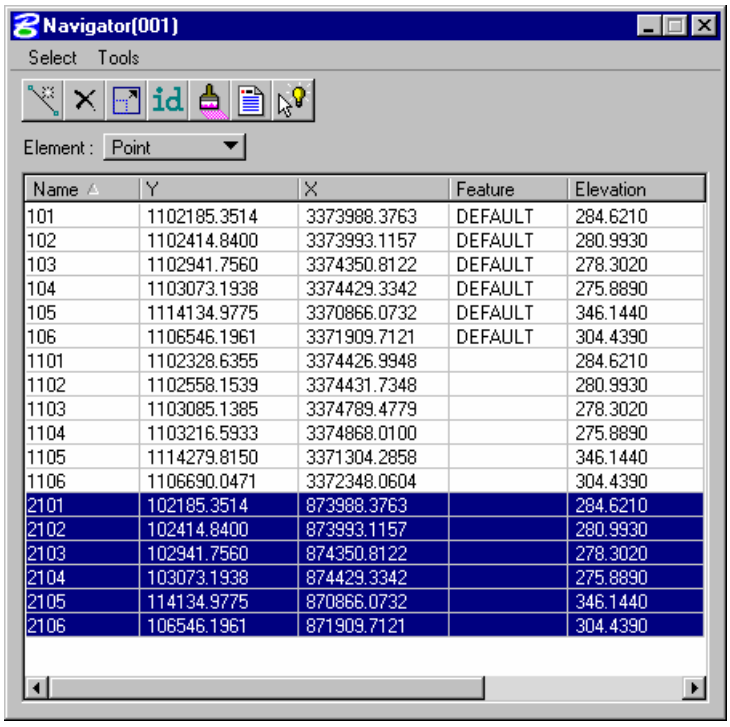
1. In the Translation and Rotation dialog change the Increment value to 2000 in order to preserve the original points.
2. Toggle OFF the Scale option and toggle ON the Translate option.



Note Be sure to use the original points 101-106.

3. Click ***Apply*** to translate the points.
4. Toggle OFF the Translate option and toggle ON the Scale option.

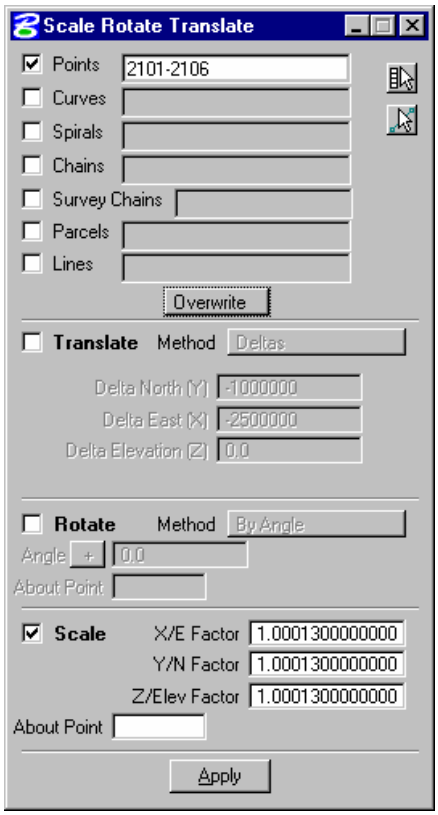
5. In ***Navigator*** highlight the 2000 range points.



Name	Y	X	Feature	Elevation
101	1102185.3514	3373988.3763	DEFAULT	284.6210
102	1102414.8400	3373993.1157	DEFAULT	280.9930
103	1102941.7560	3374350.8122	DEFAULT	278.3020
104	1103073.1938	3374429.3342	DEFAULT	275.8890
105	1114134.9775	3370866.0732	DEFAULT	346.1440
106	1106546.1961	3371909.7121	DEFAULT	304.4390
1101	1102328.6355	3374426.9948		284.6210
1102	1102558.1539	3374431.7348		280.9930
1103	1103085.1385	3374789.4779		278.3020
1104	1103216.5933	3374868.0100		275.8890
1105	1114279.8150	3371304.2858		346.1440
1106	1106690.0471	3372348.0604		304.4390
2101	102185.3514	873988.3763		284.6210
2102	102414.8400	873993.1157		280.9930
2103	102941.7560	874350.8122		278.3020
2104	103073.1938	874429.3342		275.8890
2105	114134.9775	870866.0732		346.1440
2106	106546.1961	871909.7121		304.4390

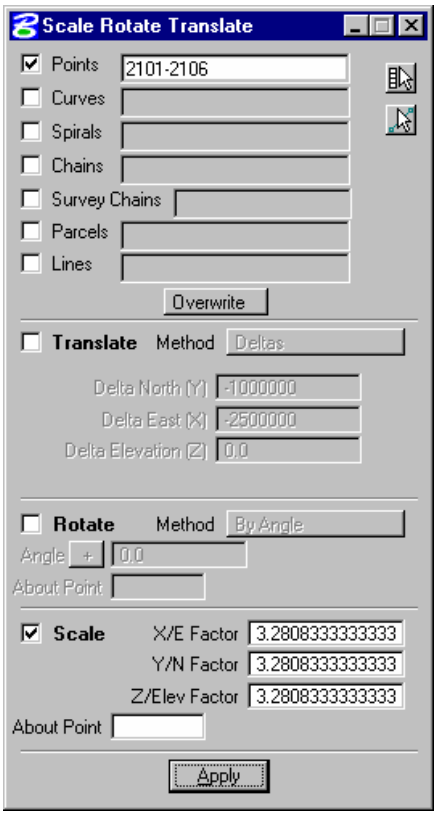
6. Use the icon at the top of the ***Translate and Rotate*** dialog to bring in the point numbers.
7. Change the toggle from ***Increment*** to ***Overwrite***.

8. Set the scaling options as shown below.

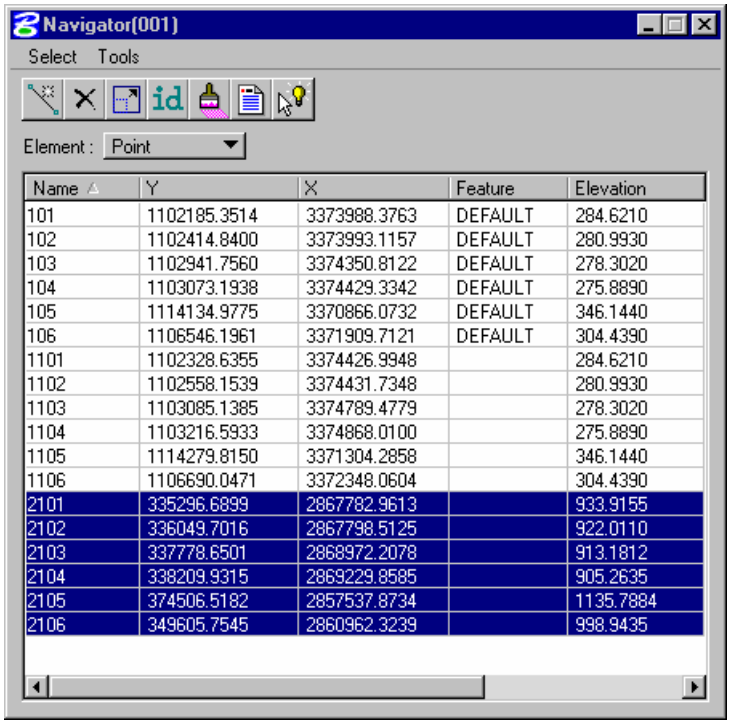


9. Click ***Apply*** to scale.

10. Now change the scaling options as shown below and scale again.



11. Review the points in ***Navigator***.

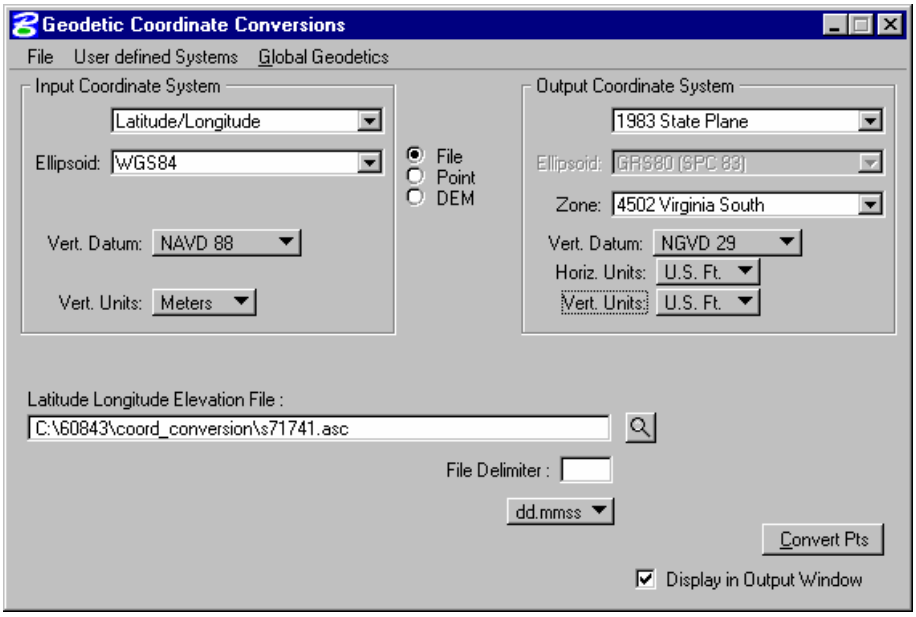


Name	Y	X	Feature	Elevation
101	1102185.3514	3373988.3763	DEFAULT	284.6210
102	1102414.8400	3373993.1157	DEFAULT	280.9930
103	1102941.7560	3374350.8122	DEFAULT	278.3020
104	1103073.1938	3374429.3342	DEFAULT	275.8890
105	1114134.9775	3370866.0732	DEFAULT	346.1440
106	1106546.1961	3371909.7121	DEFAULT	304.4390
1101	1102328.6355	3374426.9948		284.6210
1102	1102558.1539	3374431.7348		280.9930
1103	1103085.1385	3374789.4779		278.3020
1104	1103216.5933	3374868.0100		275.8890
1105	1114279.8150	3371304.2858		346.1440
1106	1106690.0471	3372348.0604		304.4390
2101	335296.6899	2867782.9613		933.9155
2102	336049.7016	2867798.5125		922.0110
2103	337778.6501	2868972.2078		913.1812
2104	338209.9315	2869229.8585		905.2635
2105	374506.5182	2857537.8734		1135.7884
2106	349605.7545	2860962.3239		998.9435

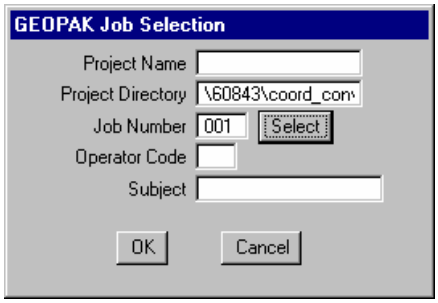
> *CONVERTING TO NGVD29*

1. In COGO set the ***Next Available Point*** to ***3001***.

2. Click ***Apply***.
3. Access the ***Geodetic Conversion*** application and make the settings as shown below.

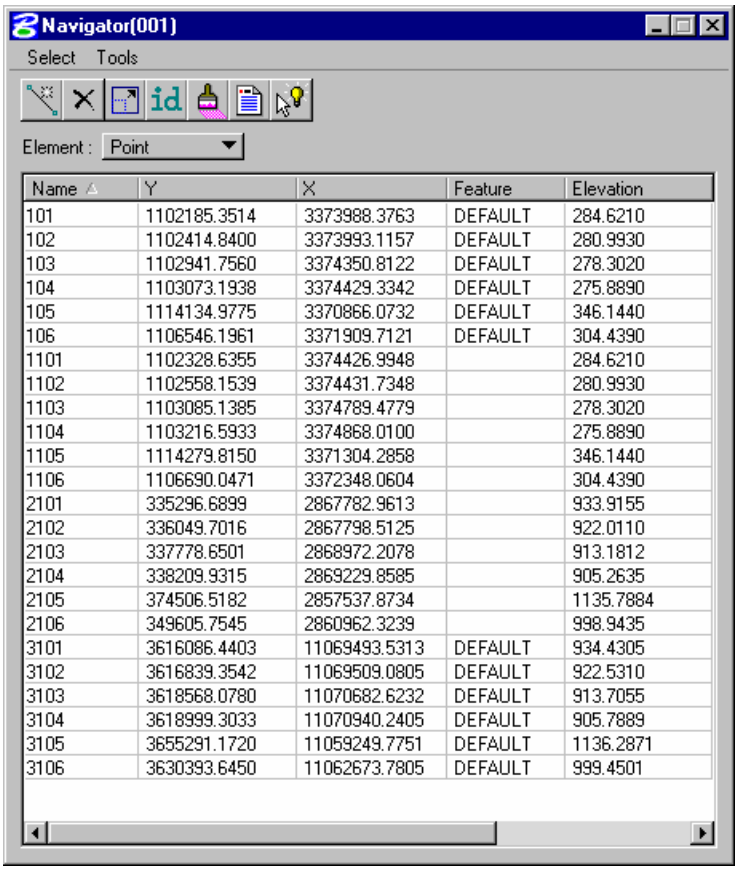


4. Select ***File > Output to GPK*** and select the gpk file.



5. Click ***OK***.
6. Click ***Convert Pts.***

7. Review the points in COGO.

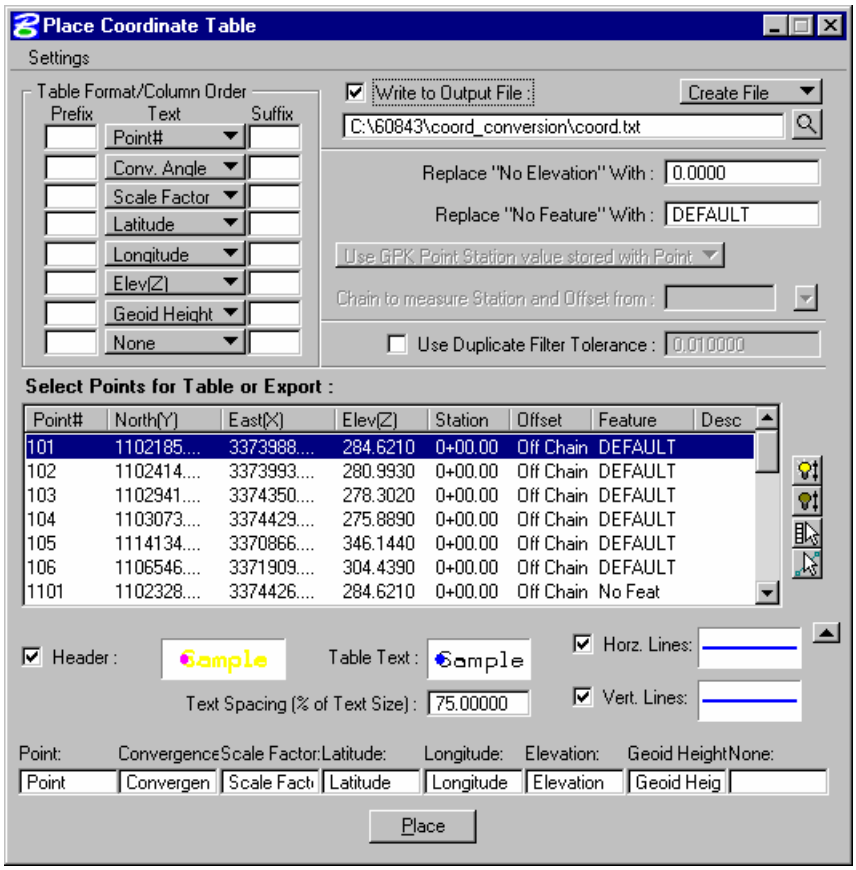


Name	Y	X	Feature	Elevation
101	1102185.3514	3373988.3763	DEFAULT	284.6210
102	1102414.8400	3373993.1157	DEFAULT	280.9930
103	1102941.7560	3374350.8122	DEFAULT	278.3020
104	1103073.1938	3374429.3342	DEFAULT	275.8890
105	1114134.9775	3370866.0732	DEFAULT	346.1440
106	1106546.1961	3371909.7121	DEFAULT	304.4390
1101	1102328.6355	3374426.9948		284.6210
1102	1102558.1539	3374431.7348		280.9930
1103	1103085.1385	3374789.4779		278.3020
1104	1103216.5933	3374868.0100		275.8890
1105	1114279.8150	3371304.2858		346.1440
1106	1106690.0471	3372348.0604		304.4390
2101	335296.6899	2867782.9613		933.9155
2102	336049.7016	2867798.5125		922.0110
2103	337778.6501	2868972.2078		913.1812
2104	338209.9315	2869229.8585		905.2635
2105	374506.5182	2857537.8734		1135.7884
2106	349605.7545	2860962.3239		998.9435
3101	3616086.4403	11069493.5313	DEFAULT	934.4305
3102	3616839.3542	11069509.0805	DEFAULT	922.5310
3103	3618568.0780	11070682.6232	DEFAULT	913.7055
3104	3618999.3033	11070940.2405	DEFAULT	905.7889
3105	3655291.1720	11059249.7751	DEFAULT	1136.2871
3106	3630393.6450	11062673.7805	DEFAULT	999.4501

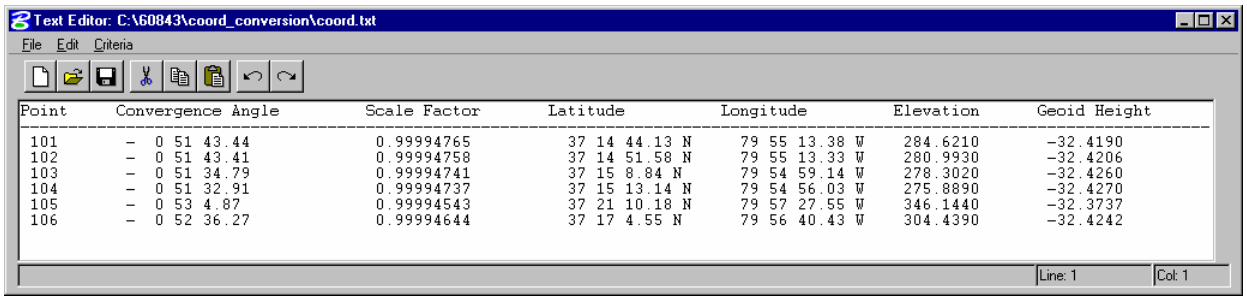
Note The XY for this range can be converted to whichever project they will be used with.

> ***REPORTING***

1. From the main Survey Menu bar select ***Plans Preparation > Place Coordinate Table***.
2. Make the settings as shown below.



3. Highlight the points 101-106.
4. Click the ***Place*** button.
5. Open and review the text file ***coord.txt***.



6. Exit MicroStation.

8 Least Squares Adjustments

OBJECTIVE

This session will focus on adjusting traverse data using the Network Least Squares Adjustment in GEOPAK Survey. Also covered will be how to export various geometrical components to Carlson.

INTRODUCTION

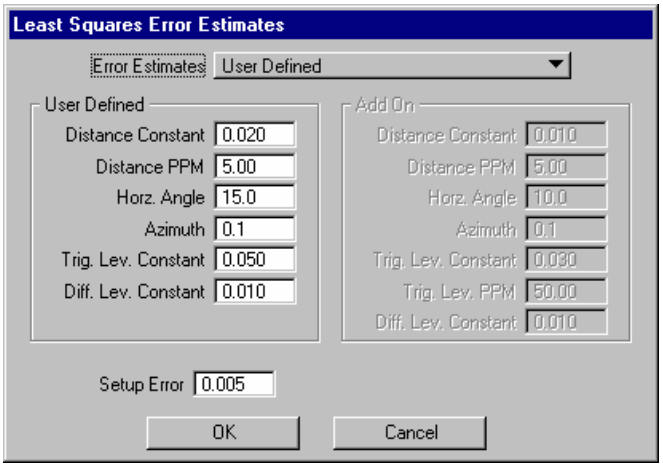
The tools used for adjust traverses are located within GEOPAK Survey. A survey project will retain all settings made regarding adjustment options.

NETWORK LEAST SQUARES

Least Squares allows the computation of coordinate standard errors and error ellipses. While this information can be of use, for many applications they are not required. If the **Compute coordinate standard errors or error ellipses** option is off, the Least Squares reduction process operates faster as less computations are necessary.

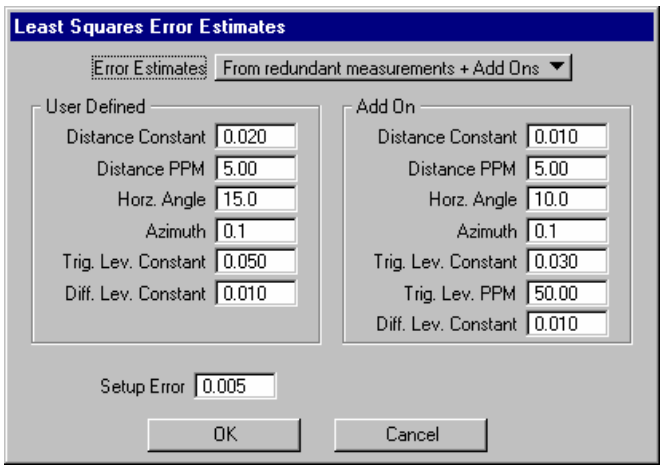
Robustness is a re-weighting technique used in least squares in an attempt to identify blunders. It is simple strategy, which uses the residuals (amount of adjustment), in making the weaker data have less effect on the adjustment by giving the weaker data larger error estimates.

In the process of reducing data, the error estimates can be automatically derived from repetition error or defined by user input. Pressing the Error Estimates button opens the dialog depicted below.



If the Error Estimates option is set to ***User Defined***, then these error estimates are utilized instead of error estimates automatically computed from repetition error. If ***From redundant measurements + Add Ons*** is selected, then the error estimates are automatically computed from repetition error.

The entered error estimates are utilized without any influence from repetition. That is, if a particular angle was measured multiple times, a single user defined error estimate will be used instead of one being computed from repetition error.



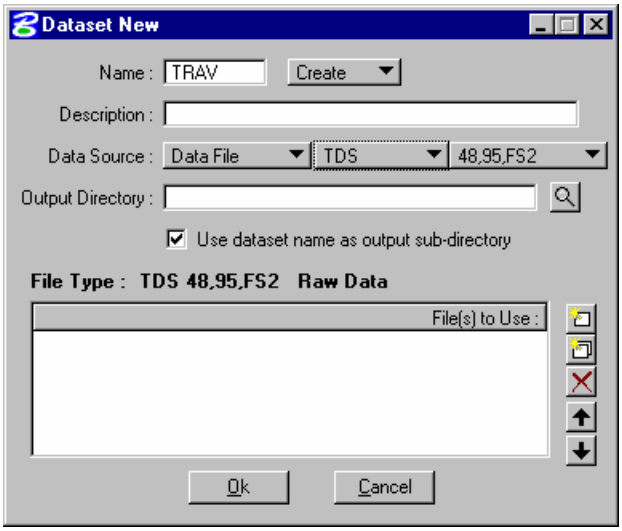
To the right of the Error Estimation group box is the Add-On group box. If the **From Redundant Measurements + Add Ons** is selected, then these values will be considered add-ons to the errors from repetition for least squares error estimation. For example, if a horizontal distance repetition error is 0.003 m and 0.003 m is specified as the Distance Constant add-on, then the error estimation for that shot will be 0.006 m. Notice that there is a separate constant for **Distance PPM** and **Trig Level PPM** since Trig Elev differences usually erode in accuracy quicker as a function of distance when compared to the horizontal distance.

Located below the User Defined group box, the **Setup Error** is added to all horizontal angle and azimuth measurement error estimates, both from repetition and user defined, and is computed by the tangent inverse of the setup error divided by the length of the line. Shorter lines get a larger error added to them whereas long lines get essentially no additional error added to them. For example, a 0.005 setup error amounts to 21 seconds in 50 ft., 2 seconds in 500 ft., and 0.2 seconds in 5000 ft. Since the **Setup Error** is always applied, set it to 0.0 to force non-application if you do not want to use it. One may think of setup error as the ability to setup over a point with the tripod and optical plummet.

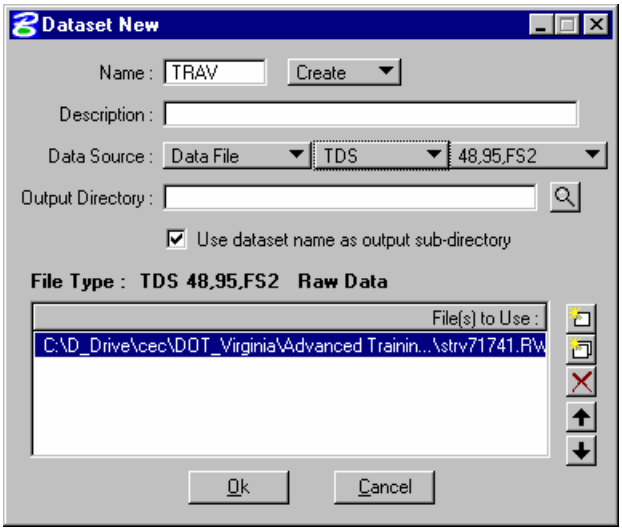
LAB EXERCISE: FIELD TRAVERSE

> *LEAST SQUARES ADJUSTMENT*

1. Open the MicroStation file ***c:\60843\coord_conversion\s71741.dgn***.
2. Access the survey project ***71741*** via GEOPAK Survey.
3. From the main Survey Menu bar select ***Dataset > New***.
4. Make the settings as shown below.

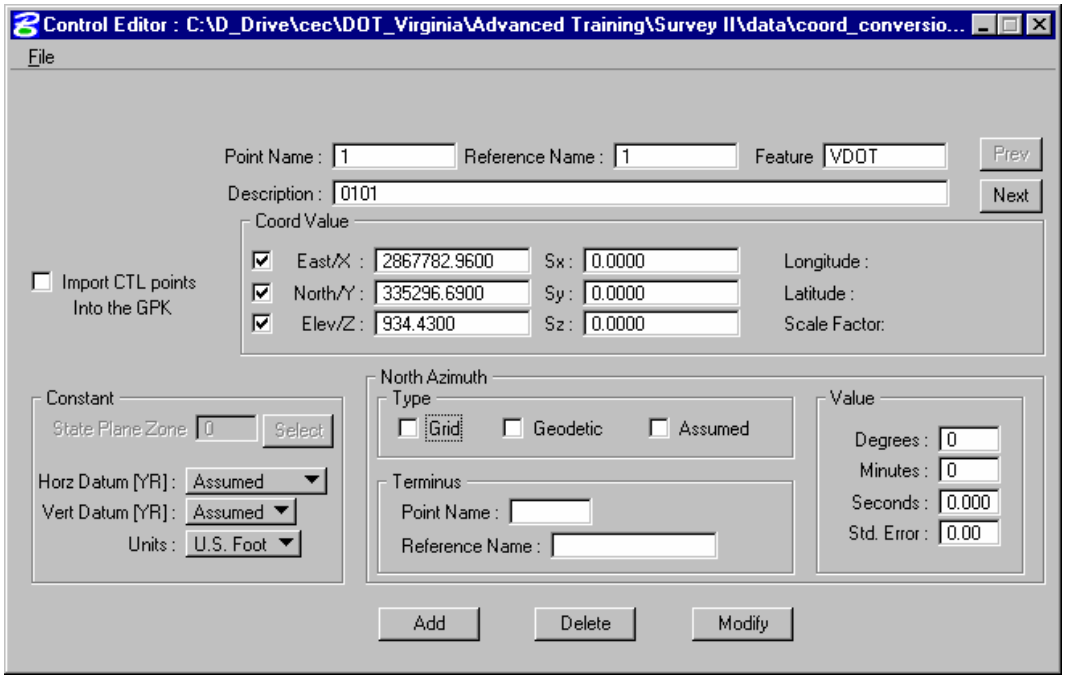


5. Use the ***Add Source File*** icon to select the file ***strv71741.RW5***.

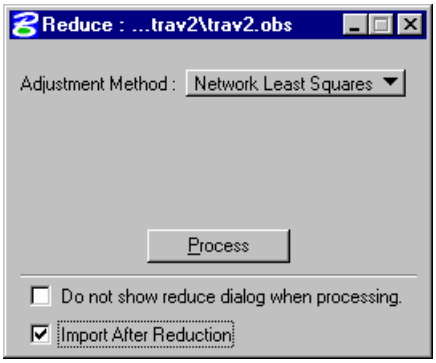


6. Click ***OK***.

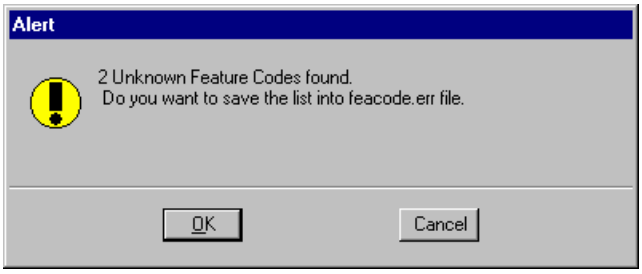
7. Select from the main Survey Menu bar ***Dataset*** > ***Control Editor***.



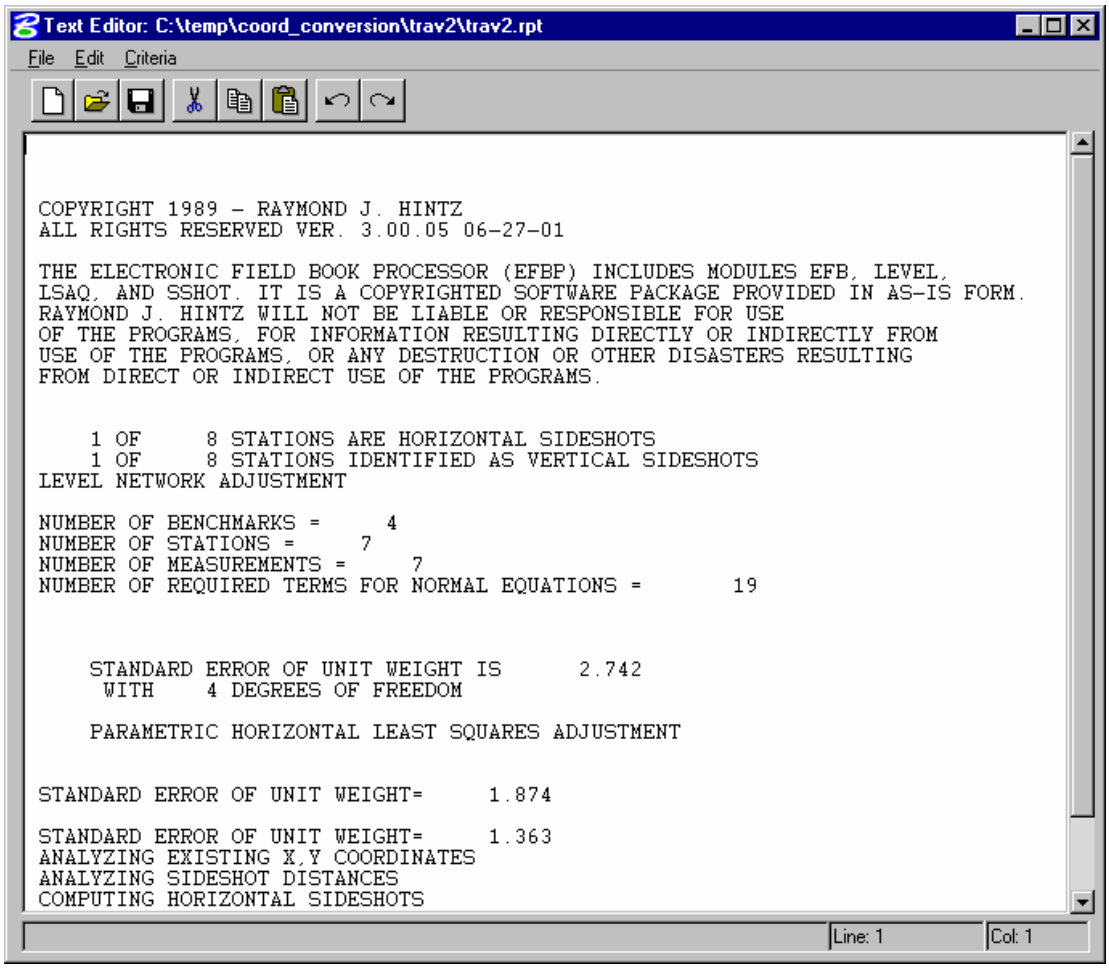
8. Review the control points in the ctl file..
9. Close the ***Control Editor***.
10. Select from the main Survey Menu bar ***Dataset*** > ***Reduce***.
11. Verify settings below and click ***Process*** on the reduction dialog.



12. Click ***OK*** on the following dialog.

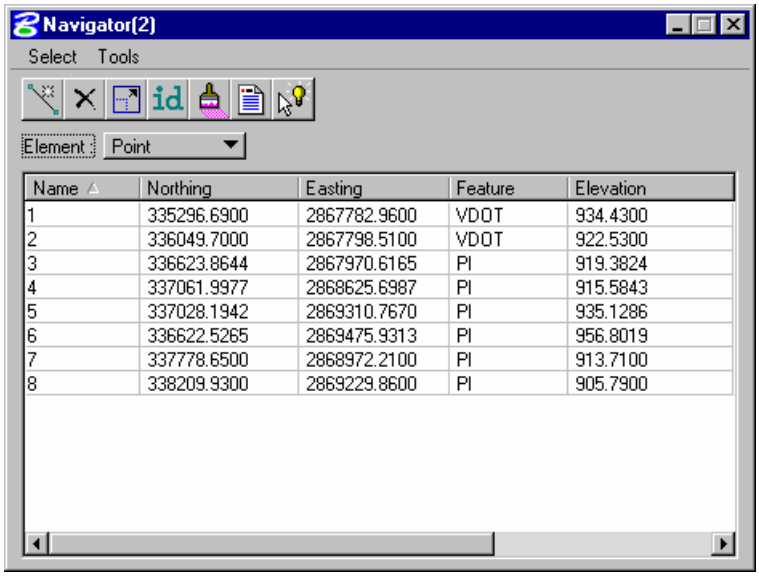


13. Review the reduction report.



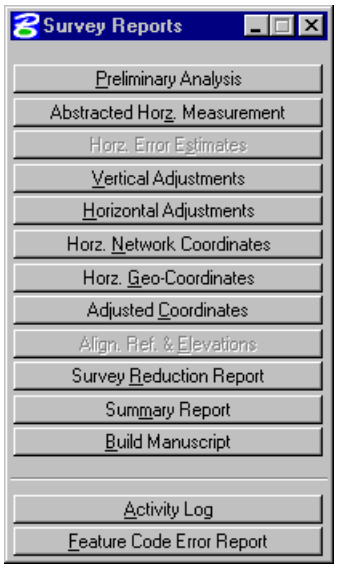
14. Close the report dialog.

15. From the main Survey Menu bar select ***Geometry*** > ***Navigator*** and review the points.



Name	Northing	Easting	Feature	Elevation
1	335296.6900	2867782.9600	VDOT	934.4300
2	336049.7000	2867798.5100	VDOT	922.5300
3	336623.8644	2867970.6165	PI	919.3824
4	337061.9977	2868625.6987	PI	915.5843
5	337028.1942	2869310.7670	PI	935.1286
6	336622.5265	2869475.9313	PI	956.8019
7	337778.6500	2868972.2100	PI	913.7100
8	338209.9300	2869229.8600	PI	905.7900

16. Using the reports located at ***Dataset*** **>** ***Review Reports***, review the horizontal and the vertical adjustment reports.

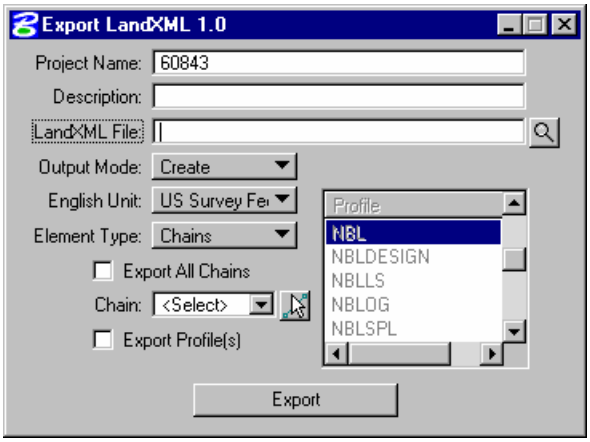


17. Close the report dialog.

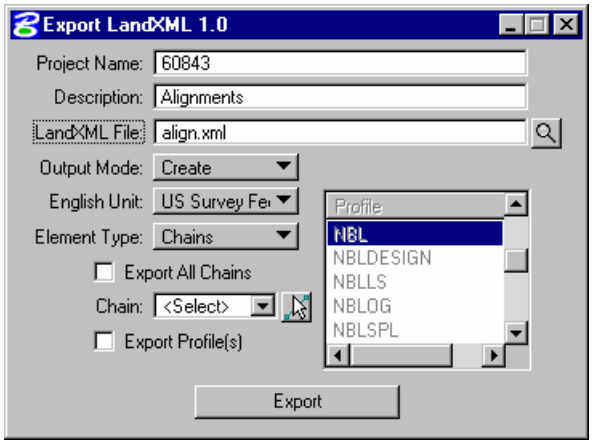
LAB EXERCISE: EXPORTING DATA

> *EXPORTING GEOMETRY*

1. Open the MicroStation file ***c:\60843\su60843.dgn***.
2. Open the project ***c:\60843\60843*** using GEOPAK Survey.
3. Use the User Name ***Mary***.
4. From the main Survey Menu bar select ***Geometry > Export > LandXML1.0 Geometry***.



5. Provide a Project Name, Description and export File Name.
6. Set the Output Mode to ***Create***.
7. Set the English Unit to ***Survey Feet***
8. Set the Element Type to ***Chains***



9. Use the ***Chain*** pulldown and select ***MAINLINE***
10. Click ***Export***.

Note	This *XML* file can now be downloaded into Carlson to create a CL file. This will give you access to horizontal alignment data without having to key it into Carlson.