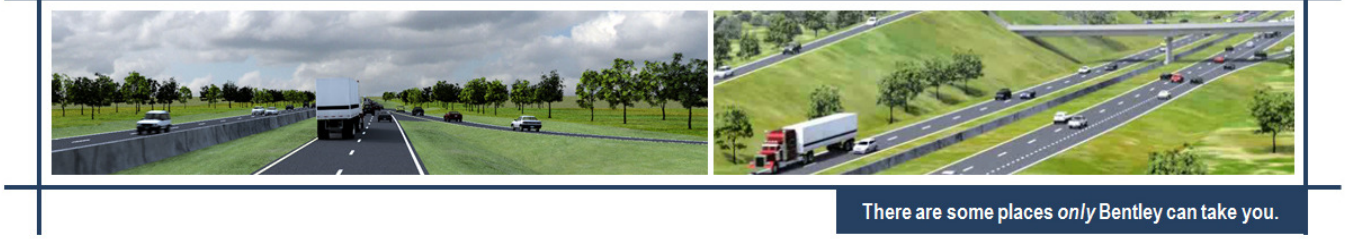

Bentley Civil Guide

V8i SELECTseries 3

Transitioning to Bentley Civil Survey

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Preface

In this guide, we will set up a Bentley Civil Survey "environment" and review or create all relevant resources. Depending on your current software, you may already have these tasks completed. In these cases, a review would be prudent, and then move onto the next task. In some cases, the tasks do not have to be completed in the same order as in the guide or can be done simultaneously.

The target audience is CAD support staff, CAD Managers or power users. As its goal is the set-up of Bentley Civil Survey, it is not intended as an end user guide.

This guide is equally applicable for the MX, InRoads or GEOPAK families of products. Each product contains the identical Bentley Civil Survey toolset and identical workflow. However, the transitioning tasks may vary, so the differences will be identified.

Keep in mind that there is no ONE correct way to transition to Bentley Civil Survey. This guide presents suggestions and best practices and it is the responsibility of each organization to determine how they fit into your standard policies, procedures and operations.

Note	Prerequisite Knowledge Level: Participant should have a basic understanding of survey principles and be fluent in the set-up and minimal use of one of the Bentley Power products or CAD and the native application (MX, InRoads or GEOPAK).

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Chapter 1: Getting Started

OVERVIEW

This guide is developed to assist organizations transitioning to Bentley Civil Survey SELECT series 3. Depending on your current version, you may already have some steps completed. If so, just skip over them and continue with the next section.

Whether you are using GEOPAK Survey, InRoads Survey, or Data Acquisition, you will find transitioning to SELECT series 3 is the same procedures. Whether there are deviations based on current product (such as linking Survey Features), the guide shows all three, therefore, select the one that is appropriate for you.

There is not just one way to set-up a survey environment, so utilize the guide to step through the processes and note where you may need to review your current environment. Your workflows and business processes will ultimately guide your decisions.

NEW FEATURES / ENHANCEMENTS

Many new important tools / processes that are in Bentley Civil Survey that was not in native products include:

- Reporting using style sheets
- Media File attachments
- Message Center Icons/sprites
- Use of most MS edit commands on Survey elements
- VBA support
- Navigation tools from the grid
- Importing of Geodetic data now supported

PERSONNEL REQUIREMENTS

The target audience for this guide is the administrative / support staff responsible for CAD applications. It requires knowledge and permissions for administrative set-up such as workspaces, creation of seed files and other resources. It does not require extensive knowledge of actual running of the software. In some of the sections, it requires knowledge of your organization's survey workflows and standards. In these areas, it is advisable to work with a colleague who is an expert in these areas, but again, ability to run the software is not critical.

PREREQUISITES

In order to plan a successful transition, a wide variety of current data / standards is helpful. This includes:

- SMD, XIN, PSS, or other current features database
- Current collection codes used in the field (includes point codes, linking codes, etc.)
- Sample of each type of survey data, i.e. one per equipment type, or data type (topo, drainage, utilities, etc.)
- ASCII file with all survey features for testing
- MicroStation resources - Cell libraries, custom line styles, level libraries, current DGNlibs
- Current training materials which may outline current workflows

In some cases, the information is needed to upgrade to SELECT series 3, some is needed for testing, while other data is needed for reference only. You may want to use the Examples – Civil workspace as a starting point, rather than beginning from scratch.

GENERAL CHECKLIST

The general tasks for transitioning into Bentley Civil Survey include:

- Create or review work spaces.
- Create MicroStation resources: levels, element templates – existing terrain, observation, control.
- Review coordinate systems.
- Set up or modify seed files.
- Review configuration variables.
- Review data collection requirements (i.e., feature codes, etc.).
- Address survey features in DGN Lib.
- Define survey settings within DGN Lib(s).
- Pre-deployment Testing.

Note that you may not have to do all these tasks, depending on the product you are currently using. The order of these tasks may vary, and several can be done simultaneously, depending on resources.

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Chapter 2: Workspaces

OVERVIEW OF CIVIL WORKSPACE

A workspace is a custom MicroStation environment or configuration. By selecting a workspace, you customize your Civil product (and MicroStation) for a specific discipline, project, or task. The workspace contains directories (or pointers) for DGN files and libraries, seed files, cell libraries, symbology resources, configuration variables, and so on.

Workspaces can be set up on an enterprise, site, or project level. You may want to set up a workspace specifically for surveys. If you have not set up workspaces before, or are unfamiliar with some of its aspects, you may want to review our civil example workspace. This is delivered by default with all product installs.

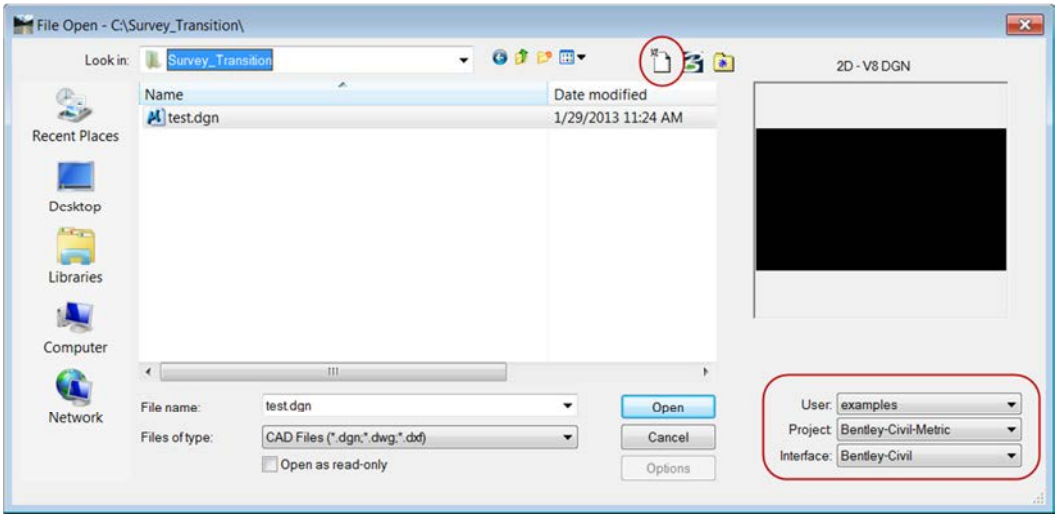
Accessing the Civil Workspace

Objective:

We'll utilize the workspace for general review and set-up. Again, if you have your own workspace, you may want to utilize that or make comparisons to see what is different.

Procedure:

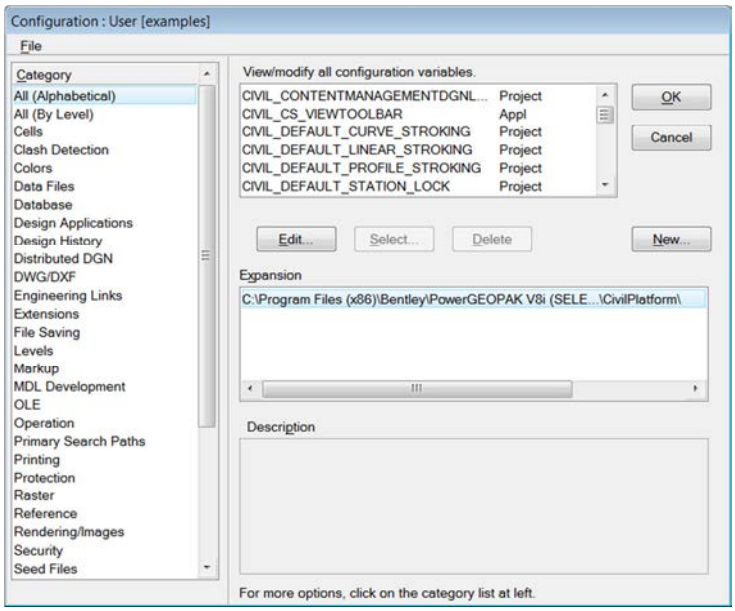
1. Double-click the Bentley Civil icon (any Inroads, GEOPAK or MX product) on your desktop.



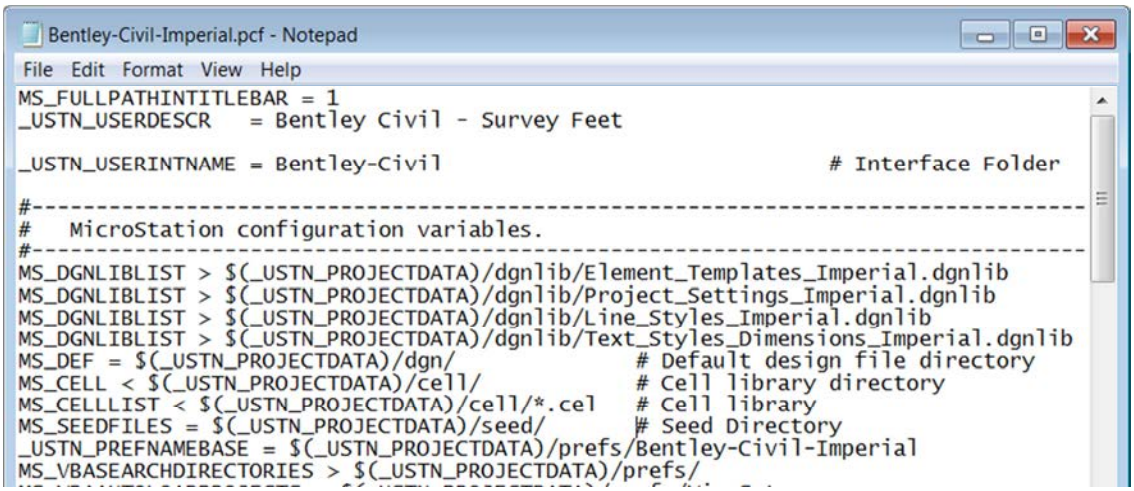
2. In the File Open dialog, set the following (lower right corner):

FIELD	ENTRY
User	Examples
Project	Bentley-Civil-Metric or Bentley-Civil-Imperial
Interface	Bentley-Civil

3. At the top of the File Open dialog, click **New File**.
4. Create a folder at c:\ named Survey_Transition and a file named *test.dgn*.
5. Click **Open**.
6. Select **Workspace > Configuration** from the main menu bar.



7. Scroll down the list and review the Civil configuration variables. Consult the help file to see descriptions and possible values (covered later in chapter 6).
8. In Windows Explorer, Navigate to: *C:\ProgramData\Bentley*Civil_Product_Name*\WorkSpace\Projects\Examples*. The example pcf files and associated sample folders are located here.
9. Using any text editor, open either *Bentley-Civil-Metric.pcf* or *Bentley-Civil-Imperial.pcf*.



10. Note there are sections for generic MicroStation and Civil, along with product specific variables. The workspace knows what product you are using and sets the appropriate variables. As this is a general workspace for all users, they may be information that is not needed for surveys (for example, superelevation). Rather than delete it, just ignore it, as it will not be utilized by the software.

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Chapter 3: MicroStation Resources for Surveys

OVERVIEW

SELECT series 3 has added functionality in Surveys and terrain models where new or revised MicroStation resources may be needed. These include:

- Levels
- Text styles
- Element templates

The general workflow is to create levels first, then create element templates, and from those you can create feature definitions. If text styles are to be used in the feature definition creations, you will want to create those after doing the levels.

DGN LIBRARIES

A DGN library, sometimes referred to as a DGNLib, contains data that is shared throughout files and among users. These shared resources consist of things that you define and name, which are used as standards by members of a workgroup.

The shared resources in a DGN library are created using MicroStation and Civil tools, the same way they are created in a DGN file. MicroStation examples include: fonts, cells, levels, text styles, etc. A complete list can be found in the MicroStation help. Civil examples include Feature Definitions (including Survey Features), and Design Standards.

Each cell, level, feature definition or standard and so on defined in a DGN library has a unique name that identifies it. When you use a cell, level, line style, text style, feature definition or design standard from a DGN library, it is copied to your open DGN file and is given the same name. This allows you to compare the local resource to the DGN library resource with the same name, to see if the contents of the DGN library have changed, to see if the local resource is out of sync with the DGN library resource, and to selectively apply updates to the local resource.

In addition to promoting the sharing of data and standards, DGN libraries provide other advantages:

- They provide structure, yet allow for exceptions when needed. You start with the resources from a DGN library, but they are not “locked” to prohibit you from changing them. You can make changes to the local resources as required by your customers.
- DGN libraries allow administrators to create shared resources in one place and to distribute them to many users. Having a central location for resources makes the maintenance and management of them easier.
- When you edit a DGN library you can use Edit > Undo and Edit > Redo. For example, because menu customizations are stored in DGN libraries, you can use Edit > Undo and Edit > Redo while using the Customize dialog.

If you are part of a small organization, you may want to store all of your resources in one DGN library, which is simpler and requires less administration. If you are part of a larger company with resources for different disciplines and different projects, it makes sense to place them in multiple DGN libraries according to discipline or project.

Many shared resources are stored in "ustation.dgnlib", which is delivered with the product. In addition, many of the Civil DGNlibs are provided in the Civil Imperial and Metric workspaces, also delivered in the product.

We could create both text styles and element templates in the same DGNLib. How the DGNLibs are set up and what specific standards are contained in each one is up to the individual manager or organization that is creating them.

LEVELS

The levels can be created in an individual DGNLib, or they can be created in your standard DGNLib with all levels from other functional groups. The area of interest is terrain models. Feature definitions or element templates can be used to display terrain models in various configurations, i.e., contours, just triangles, triangles and borders, etc. Therefore, you may want to add levels for these additional options. Since the options are customized for your organization, you may want to review what the various functional groups might want to see for some standard terrain model displays. Note the users can always set their own options, so focus on standard options that would be commonly used.

TEXT STYLES

Text styles are named sets of text attributes, such as font, width, height, and color that allow you to place text within a model or workspace in a consistent and automated manner. Element templates can use text styles for additional standardization text styles specified in the DGN Lib are copied to the local file. When used, they are not automatically updated when the DGN Lib version changes. Keep in mind text elements can be placed without text styles. One example for the use of text styles is in terrain model contour labeling.

Exercise: Create Text Style

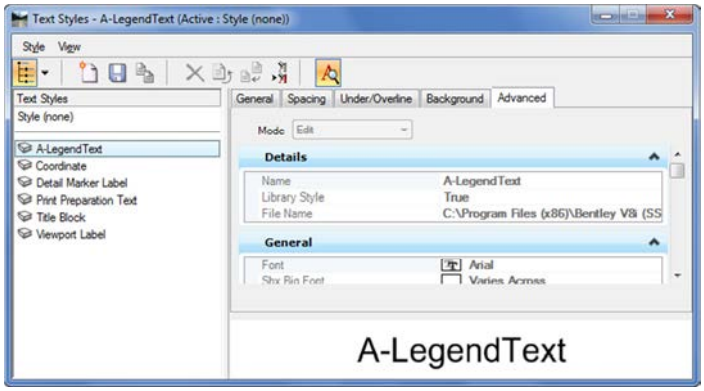
Exercise Objective:

We will create a new text style within MicroStation to be used for labeling contours and we'll create this text style in a DGN Library.

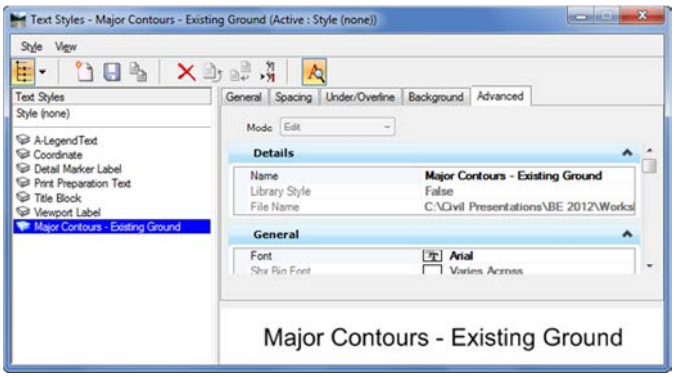
Procedure:

1. Create a new file called *TextStyles.dgnlib*.

2. Open the Text Style dialog using *Element > Text Styles*.



3. Use the Style > New menu option to create a new text style *"Major Contours – Existing Ground".*



4. Select the General tab, setting the following:

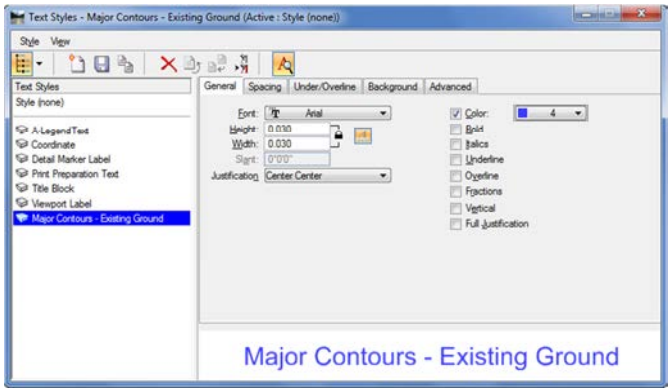
   Color = Blue

   Text Height = 0.03

   Text Width = 0.03

   Justification = Center Center

   All other toggles should be disabled.



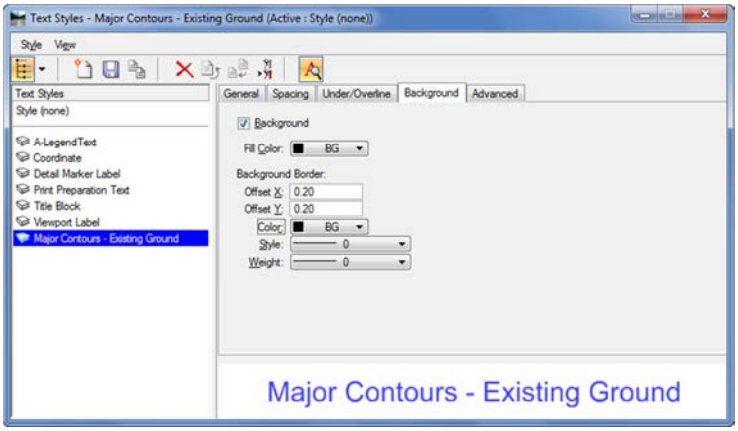
5. Select the *Background* tab, setting the following:

   Fill Color = BG (Select the 'B' on the color picker)

   Offset X = 0.02

   Offset Y = 0.02

Color = BG (Select the ‘B’ on the color picker)



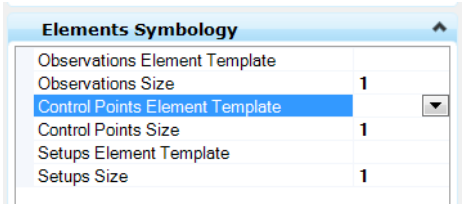
6. Exit the dialog and save settings.

ELEMENT TEMPLATES

An element template is a component of a DGN library that defines properties of elements. Element templates can used as part of a Civil feature definition which can be applied to existing elements or for element placement. The primary purpose of element templates is to increase consistency when drawing.

Note	The use of MicroStation element templates to control civil artifacts is a new concept in Bentley Civil V8*i* SELECTseries3, one which we’ll introduce here within the context of their use in DGN Libraries.

Element templates can be used within feature definitions, terrain models, and profiles. Within survey, they can also be used to define observations, setups, and control points. Note that the survey entities do not utilize text, therefore, text styles are not needed in their element templates.



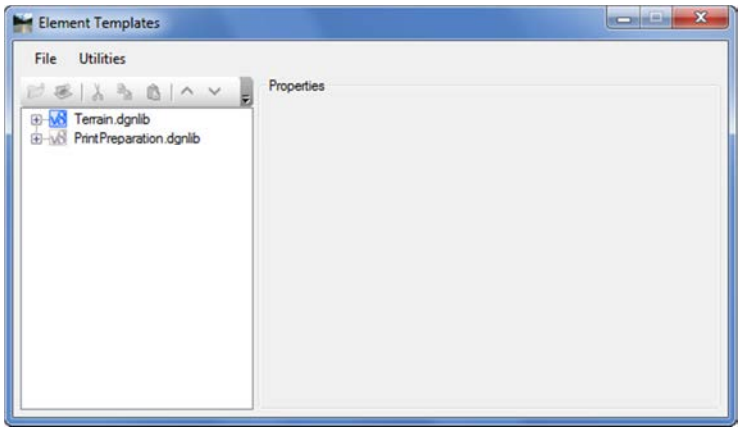
Exercise: Create Element Templates

Exercise Objective:

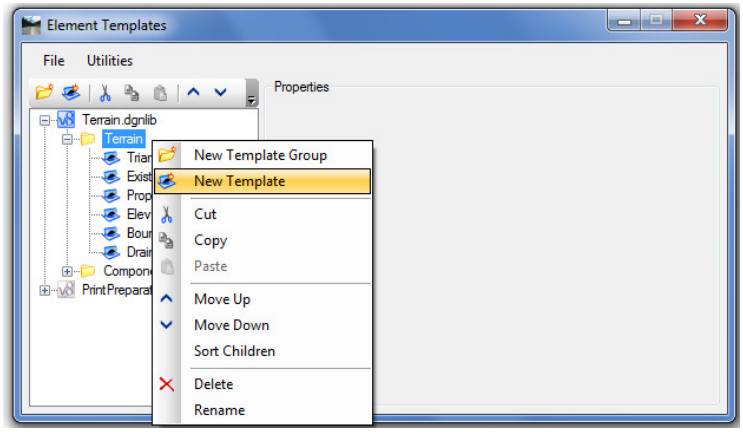
Continue to familiarize ourselves with DGN Libraries while at the same time introducing Element Templates.

Procedure:

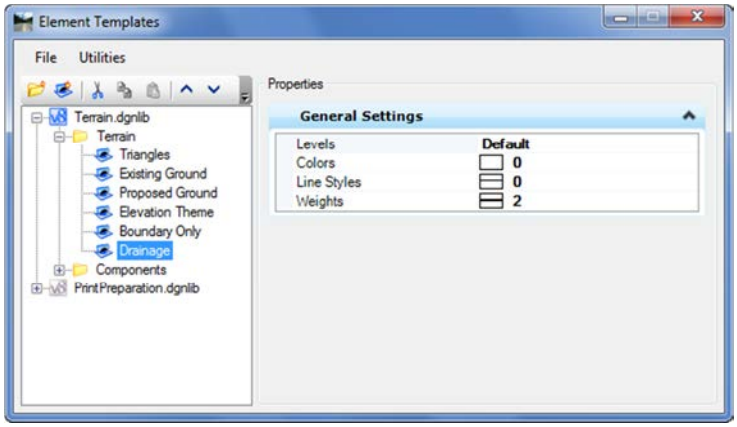
1. Create a new file *Terrain.dgnlib*.
2. Open the Element Templates dialog using ***Element > Element* Templates**.



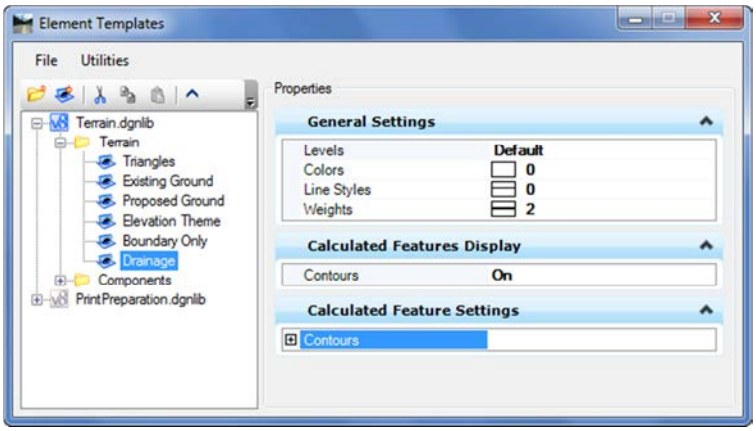
3. Expand the tree for *Terrain.dgnlib*.
4. Right-click on the category Terrain and select **New Template**.



5. Name the New Template ‘Drainage’.



6. Right-Click on Drainage and select *Add* > *Terrain Model* > *Contours*. This will add new options to the dialog.



7. Expand the Contours tree and set the following:

Major Interval = 5

Minor Interval = 1

Major Contours

Color = Blue

Display Text = Yes

Text Style = Major Contours – Existing Ground

Text Interval = 200

Minor Contours

Color = Red

Display Text = No

8. Repeat steps 3-5 to create a second element template named “Survey”.
9. Expand the Contours tree and set the following:

Major Interval = 10

Minor Interval = 2

Major Contours

Color = Green

Display Text = No

Minor Contours

Color = Orange

Display Text = No

10. Close the dialog.

CHAPTER SUMMARY

In this chapter, we have introduced the ability to use Element Templates to control the display and labeling of Terrain Models. We have also shown how to create these in a DGN Library along with other standards such as text styles, so that these standards can be stored and maintained in a central location and then distributed across an organization.

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Chapter 4: Coordinate Systems

OVERVIEW

MicroStation V8i introduced the ability to assign Geographic Coordinate Systems (GCS) to design file models. This functionality allows the user to specify the position of the design contents on the earth´s surface. Once that position is established, the design can then be easily coordinated with other data for which the geographic location is also known. With civil operations, this can be very useful since civil applications can make use of this GCS when importing data in order to ascertain the location of the imported data and perform a re-projection if required.

SETTING THE GCS

During the setup of your survey environment, along with general deployment, it is prudent to determine how you want to handle Geographic Coordinate Systems. If your organization uses a limited number of GCS within, then you may want to set it in your seed file. One example may be state plane coordinates. However, if you have numerous GSC's, you may not want to create numerous seed files in order to have one set to each GCS. In this case, a better option is to train your users how to set the geographic court system.

You may want to identify those GCS is better used within your organization. Looking at the generic list of default GCS provided with your install, it is rather lengthy. There are three options on how you can customize your GCS, so your users see what they need, not all of them. This can be done by utilizing favorites. Deleting the unwanted projections is not an option.

Keep in mind, setting the GCS is a MicroStation option, not a civil option.

USING FAVORITES TO MANAGE GCS

The favorites is pointed to by the variable: MS_GEOCOORDINATE_FAVORITESFILES.

Note the MicroStation help states: "Directory set aside for quick access to geographic coordinate systems. The contents of this directory appear in the Favorites folder on the Select Geographic Coordinate System dialog´s Library tab." In fact, it is a file that is pointed to, not a directory.

By default it is here: *$(_USTN_HOMEROOT)GeoCoordFavorites.xml*. If you are using the default installation, the following path is used: *c:\Users\firstname.lastname\AppData\Local\Bentley\CivilProductName\8.11***\GeoCoordFavorites.xml.*

There are two options to manage Favorites on an enterprise basis. The simplest approach is to simply right click on the top level of the Favorites file icon and select "Create New Subgroup" to create a folder beneath it. You can make further subgroups in the hierarchy as well.

The second option is to put multiple favorites files in the MS_GEOCOORDINATE_FAVORITESFILES configuration variable, with the file names separated by semicolons.

The first option is easier for a DOT to implement. The second option is really for an engineering company that wants to get favorites files from more than one DOT.

A third option is for the user to control their own favorites. In that case, the users just need to point the variable to an empty file and MicroStation will add the coordinates as they are favorited.

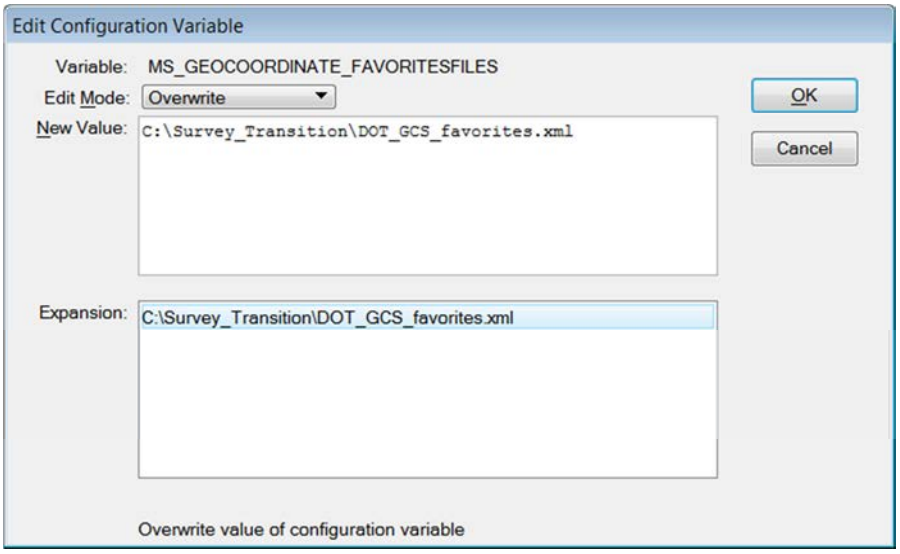
Exercise: Setting up Favorites File

Objective:

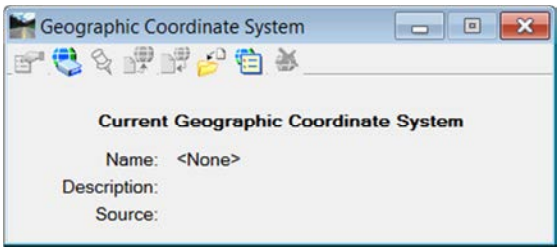
Set up the xml favorites file for enterprise standardization. We'll create 2 groups with 3 Favorites in each. The two groups could represent districts or units within your organization that utilize different GCS. Another option is to set up one for Imperial projects and one for Metric projects.

Procedure:

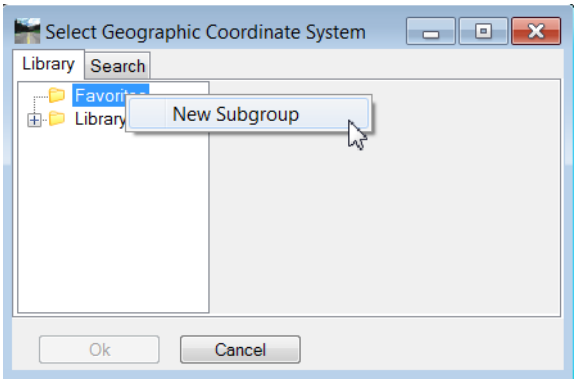
1. Using Windows Explorer, copy your default GeoCoordFavorites.xml to a working directory and rename to reflect your organization. We'll use *DOT_GCS_favorites.xml*.
2. Open the file *test.dgnlib*.
3. Select **Workspace > Configuration** from the MicroStation main menu bar.
4. Scroll down to MS_GEOCOORDINATE_FAVORITESFILES, and edit to your working test directory and file from step 1.



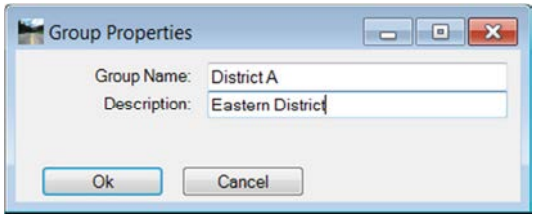
5. Click **OK** to close the Configuration dialog.
6. When prompted to save changes to the configuration file, click **Yes**.
7. Exit the file and re-enter for the configuration variable to take effect.
8. Select **Tools> Geographic > Select** from the main MicroStation menu.



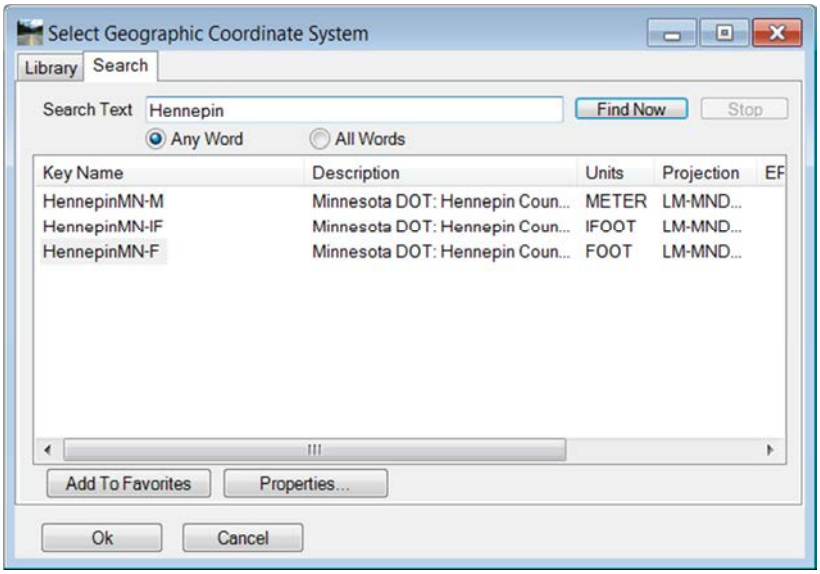
9. Select the Select Library tool (second from the left).
10. Highlight Favorite, then right-click and select New Subgroup.



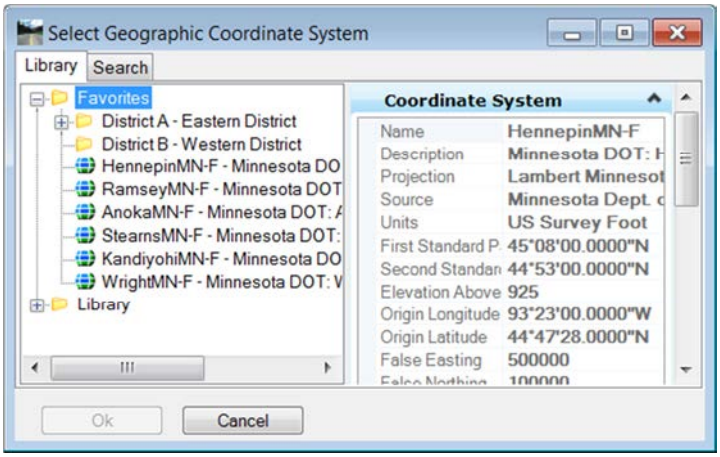
11. Create a group called District A. Repeat the process and create another subgroup called District B. Add a description, if desired.



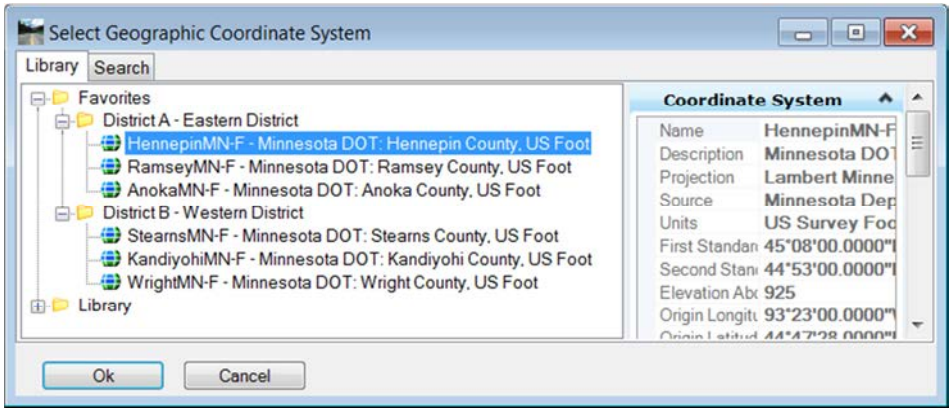
12. Click on the Search tab to find the entries you want to use.
13. In the Search Text field, enter part or all of the desired text. Then click Find Now to view the entries. (Note you may also search through the hierarchy in within the Library tab.) Once the entries are displayed, highlight the desired Key Name, and click Add to Favorites. Note that there are three entries with the same name, but the units are different! Select carefully. In this, we're using U.S. Survey foot, which is the last entry in the list.



14. Continue selecting until you have all six entries saved to Favorites, then click the Library tab again.

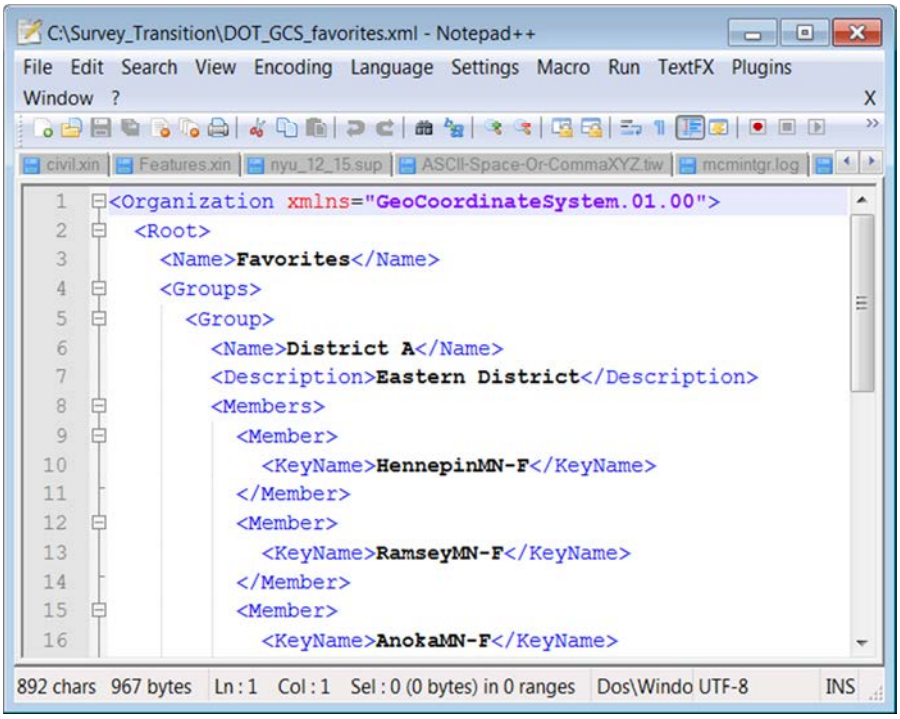


15. While the counties were saved to Favorites, they are under the main entry, rather than our groups. This is easy to fix, just highlight one of the entries, right-click and select Cut (or Copy if you need it in both districts. Then click on the Subgroup and paste. Move Hennepin, Ramsey and Anoka to District A, and Stearns, Kandiyohi, and Wright to District B.



16. Click **OK** to complete the Favorites and close the dialog. Note your design file working units should match the units of your selection. If not, a Warning message is displayed.

17. Using a text editor, open the XML file in your working directory. The Favorites have been written into the file.



18. The XML can be moved to a central location and the configuration variable can be set up in your workspace.

CHAPTER SUMMARY

In this chapter, you have reviewed your organization's use of GCS to determine how many are utilized. Once that number has been determined, it can influence whether to include the GCS as part of your seed files or not. You also need to decide if you want to include some type of management using Favorites or let the users control the GCS usage.

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Chapter 5: Seed Files

OVERVIEW

Seed files have always been an important part of a MicroStation configuration. The power of the seed file is that it can be used to standardize drawings as every new file that you create will have the same attributes (e.g. global origin, color table, cell library attachments, working units, views, etc.) as those that are in the seed file. In Bentley Civil V8*i* SELECTseries 3, there are certain civil settings and attributes that you will want to consider setting in your design file. These include:

- Settings > Design File > Civil Formatting
- Workspace > Preferences (seed file or preferences)
- Annotation Scale

Note	Note it is not necessary to re-create your seed files from scratch, if you are currently using Bentley V8*i*. If you are using a V7 version or earlier, it is desirable to create your seed files from scratch.

2D OR 3D FILES / MODELS

Generally, survey data can be placed in a 3-D MicroStation file or model. This facilitates the creation and placement of terrain models, drainage data, and other survey features where the elevation is important.

However, keep in mind the limitation if you are working with horizontal geometry. Horizontal geometry utilizes 2-D elements, therefore, if you are using existing alignments or edges of pavement, you may want to flatten your 3-D survey file into 2-D for usage of those particular elements.

Set Up Seed File

Objective:

Create a seed file for use with SELECT series 3 Survey tools. Note if you already have seed files, you may want to review them to see what needs to be updated, rather than creating a new one.

Procedure:

1. Select **File > New** from the MicroStation main menu, create a new file *seed.dgn*. You will have to change the seed file from 2D to 3D. Make sure you are selecting the correct units as indicated in the file name (metric or imperial).
2. Select **Settings > Design File Settings**.
3. Highlight Working Units. Set the appropriate units.
4. Highlight **Civil Formatting**.
5. Set the desired values in each section.

6. Click **OK** to close the dialog.
7. Select **File > Save Settings** to retain the settings.

Set up Graphical Coordinate System (optional)

Objective:

If you have decided to set the GCS with in your seed file, now is the time to do it. If you are not setting the GCS within your seed file, skip this exercise and leave the GCS undefined.

Procedure:

1. Continue in *seed.dgn*.
2. Select **Tools >Geographic > Select Geographic Coordinate System** from the main MicroStation menu.
3. Select the **From Library** icon, second from the left.
4. Select the desired GCS, then click **OK**. The selected GCS is displayed in the dialog.
5. Select **File >Save Settings** to retain the GCS.

ANNOTATION SCALE

Annotation Scale allows a user to set the default scale factor within a particular design file model. This scale is then applied to any text, line styles and cells (if the cells are enabled to recognize the annotation scale) that are drawn in the model.

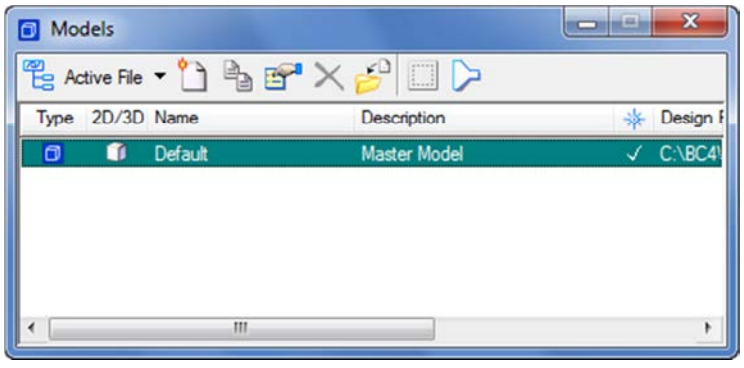
Exercise: Assign Annotation Scale

Exercise Objective:

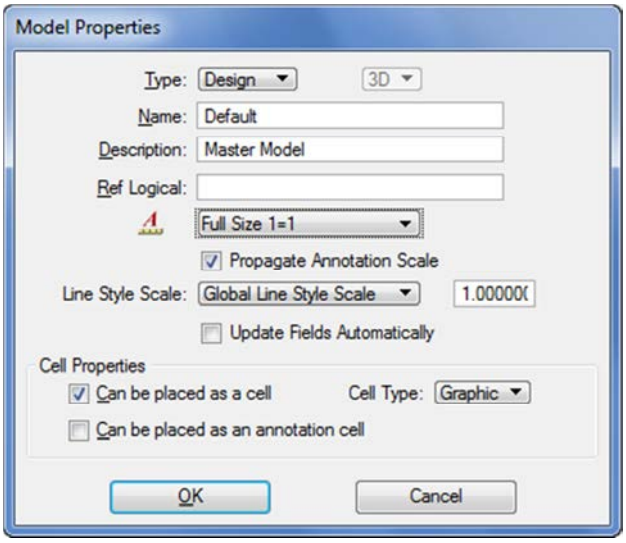
Familiarize ourselves with Annotation Scales and the ability to assign them to a design file model.

Procedure:

1. Continue in *seed.dgn*.
2. Click **File > Models** to open the *Models* dialog.



3. On the dialog, click the *Edit Model Properties* icon to open the Model Properties dialog.



4. Change the Annotation Scale from *Full Size 1=1* to *1"=50'* using the pick list.
5. Click **OK** to close the Model Properties dialog.
6. Close the Models dialog.
7. Select **File >Save Settings** to retain the settings.

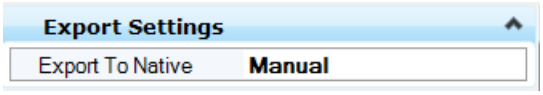
CIVIL FORMATTING OPTIONS

Most MicroStation users are very familiar with the Settings > Design File dialog, which allows you to control the settings of such things as Active Scale, Angle Readout and Working Units, to name just a few. In Bentley Civil V8i SELECTseries 3, there is now an option for civil settings that allows the same degree of control over civil annotation within the design file.

Next, we'll review the options we have to control civil formatting using the Settings > Design File dialog and how those options can be set in the seed file.

Below is a brief description of each option and its functionality.

EXPORT TO NATIVE

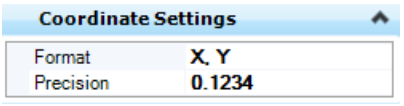


"Export to Native" is a functionality within Bentley Civil V8i SELECTseries 3 that allows the user to keep a version of the native geometry database (.GPK, .ALG, .FIL) in synch with civil geometry stored within the design file. For example, when enabled the user can store an alignment in the design file and that alignment will be automatically stored in the native geometry database as well. Delete that alignment from the design file, and that alignment will be deleted from the native geometry database. This "Export to Native" functionality is feature based in that the option to "Export to native" must be set to "true" or "false" for each particular feature.

This option in the Design File Settings dialog controls whether Civil Geometry is exported to the native database automatically or not. When set to "Use Feature Setting", then any civil geometry elements will be exported to the native database when stored with a feature that has the Export to Native option set to "true". When set to Manual, Civil Geometry elements can only be exported to

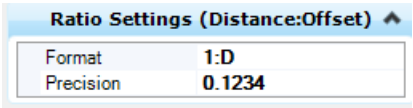
the native database via a manual export, regardless of whether the feature being used allows for it or not.

COORDINATE SETTINGS



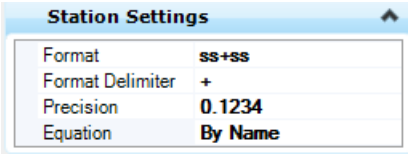
This option allows the user to control the display and precision of their coordinates within any of the civil dialogs. In addition, this setting also controls how any inputted coordinates will be interpreted. For example, if set to "X, Y" then all coordinates will be interpreted and displayed as being in the "X, Y" format. If set to "Nothing, Easting" then the same would apply. Note the displayed elevation for survey data utilizes the MicroStation's accuracy setting, while all X,Y data uses the Civil Formatting settings.

RATIO SETTINGS (DISTANCE: OFFSET)



This option allows the user to control the display and precision of their ratios within any of the civil dialogs. In addition, this setting also controls how any inputted ratios will be interpreted. For example, if set to "1:D" then all ratios will be interpreted and displayed in this format (e.g. 1:100, 1:50, etc.). If set to "D:1" then the ratios would be similarly displayed and interpreted (e.g. 5:1, 10:1, etc.).

STATION SETTINGS

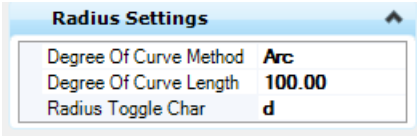


Here, the user can control the format, delimiter and precision of the station values to be used and displayed in the civil dialogs. In addition, there are two options to control how equations are represented within the station values.

By Name – This is the standards InRoads presentation (A100+00, B105+00, etc.).

By Index – This is the standard GEOPAK presentation (100+00 R 1, 105+00 R 2, etc.).

RADIUS SETTINGS

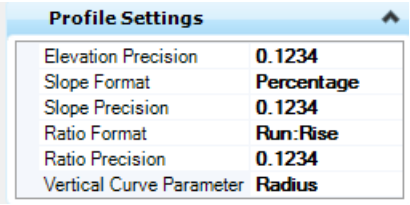


Degrees of Curve Method – Two options are available, Arc and Chord.

Degree of Curve Length – This sets the standard definition of a 1^ curve.

Radius Toggle Char – This allows the user to specify which character will be used within the civil dialogs to 'toggle' between a radius definition and a degree of curve definition.

PROFILE SETTINGS



This option allows the user to control the precision and display/input formats of slopes and ratios within a profile context. In addition, the default Vertical Curve Parameter Format (Radius, K Value or M Value) can be set as well.

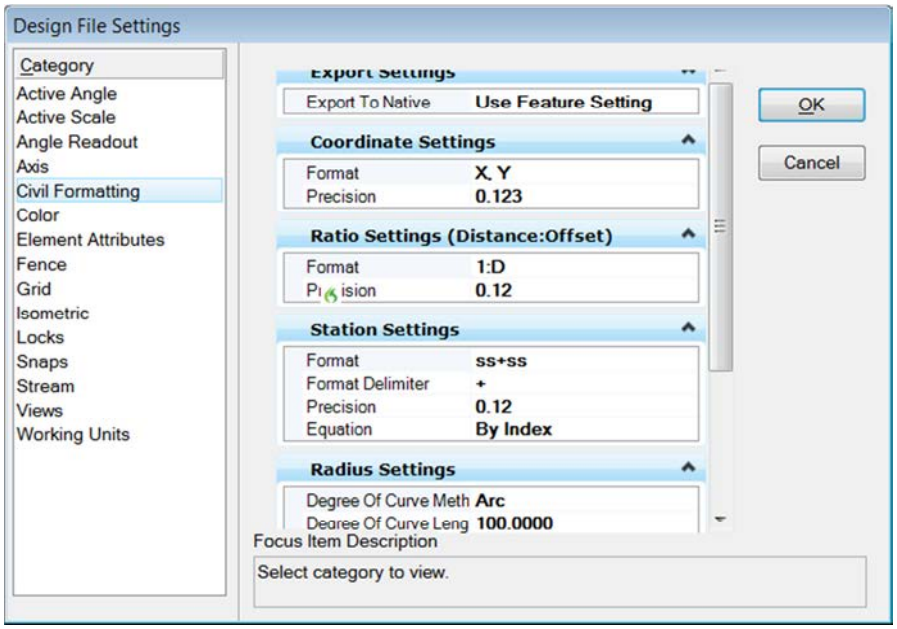
Exercise: Set the Civil Formatting Options in Design File Settings

Exercise Objective:

Familiarize ourselves with Civil Formatting options within Design File Settings and the assign them to the seed file.

Procedure:

1. Continue in *seed.dgn*.
2. Select **Settings > Design File** from the main MicroStation menu.



3. Highlight **Civil Formatting**.
4. Set the appropriate settings in each section, then click **OK** to close the dialog. For Survey functions, focus on **Export Settings**, **Coordinate Settings**, and **Station Settings**.
5. Select **File >Save Settings** to retain the settings.

WORKSPACE > PREFERENCES > CIVIL FORMATTING

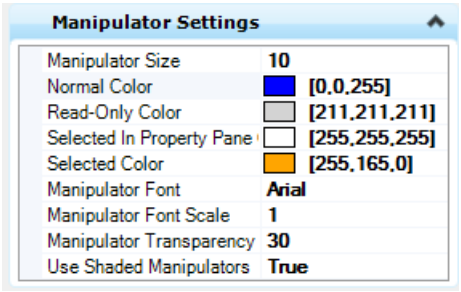
Finally, we'll review the options we have to control civil formatting under the Workspace > Preferences dialog and how those options can be set in the seed file.

Whereas the MicroStation Design File Settings allow for the configuring of standards within a design file that can be propagated throughout an organization, the Workspace Preferences are more geared toward the individual user. In other words, they allow each user to control settings such as the look and feel of MicroStation – things that a user may prefer but don't have an overall effect on the project data.

In the same vein, civil formatting options have been added to Workspace Preferences in Bentley Civil V8i SELECTseries 3. These are option that have no overall effect on the generated design data, but are geared more toward the look and feel of civil on a user level.

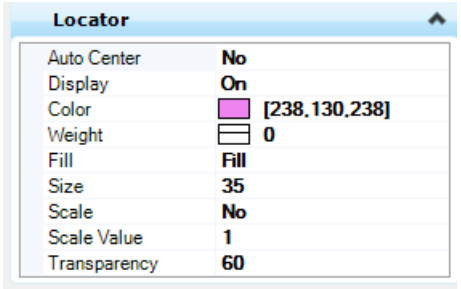
Although geared more toward individual users, an organization may want to set some of these as default values in their seed files.

MANIPULATOR SETTINGS



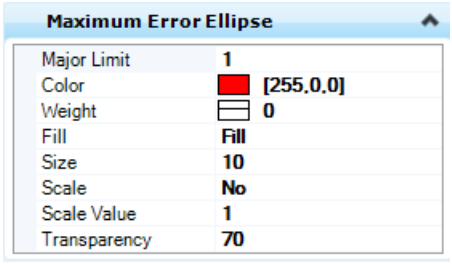
These settings allow the user to control the settings and symbology of the civil geometry manipulators and any associated text.

SURVEY LOCATOR



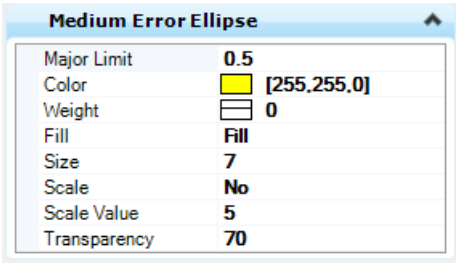
This setting is used by the Survey tools to control the display and symbology of the locator.

MAXIMUM ERROR ELLIPSE



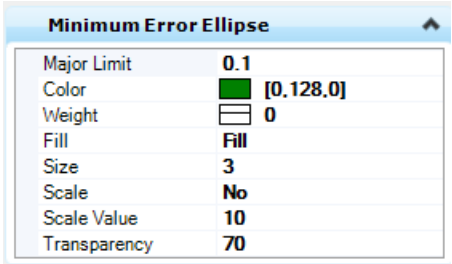
Survey only – This setting allows the user to specify a major error ellipse value with regard to the standard deviation resulting from a Least Squares Adjustment. Any standard deviation exceeding this limit would result in a graphical flag based on this symbology.

MEDIUM ERROR ELLIPSE



Survey only – This setting allows the user to specify a medium error ellipse value with regard to the standard deviation resulting from a Least Squares Adjustment. Any standard deviation exceeding this limit would result in a graphical flag based on this symbology.

MINIMUM ERROR ELLIPSE



Survey only – This setting allows the user to specify a minimum error ellipse value with regard to the standard deviation resulting from a Least Squares Adjustment. Any standard deviation exceeding this limit would result in a graphical flag based on this symbology.

Exercise: Set the Civil Formatting Options In Workspace Preferences

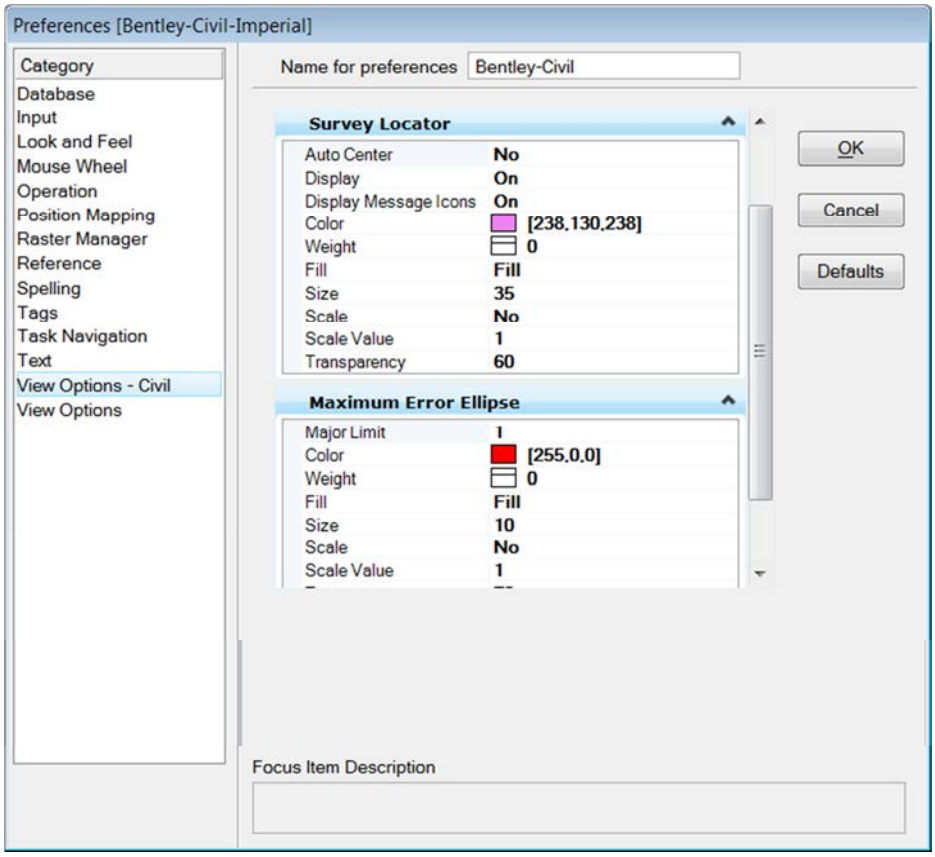
Exercise Objective:

Familiarize ourselves with Civil Formatting options within the Workspace Preferences and the assign them to the seed file.

Procedure:

1. Continue in *seed.dgn*.

2. Select **Workspace > Preferences** from the main MicroStation menu.
3. Highlight **View Options - Civil**.



4. Set the appropriate settings in the **Survey Locator**, and **Error Ellipse** sections, **then** click **OK** to close the dialog.
5. Select **File >Save Settings** to retain the settings.

CHAPTER SUMMARY

In this chapter, we have set up a new seed file or reviewed your current seed file. This includes checking the working units first, setting the geographic coordinate system, if needed, and reviewing various preferences and civil formatting settings.

Keep in mind that to cover all the requirements of your survey personnel (and other users), multiple seed files may be needed. However, the creation procedure is the same for all seed files.

Chapter 6: Configuration Variables

OVERVIEW

All Bentley Civil products use configuration variable files to get values for settings that vary from system to system and from user to user.

For example, the product needs to find its main resource file. Rather than always looking for a file named "ustation.rsc" in a specific directory, it expands the configuration variable MS_RSRC (defined in the configuration variable file) to get a filename and location. That way (assuming the configuration variable file is correct) the product finds the file regardless of its name and location.

Each configuration variable has two parts — its name and its definition. Variable definitions can be literal strings or combinations of strings and references to other variables.

An important part of being able to control your standards and preferences within an organization is the use of these configuration variables. Bentley Civil V8*i* SELECTseries3 contains several new configuration variables that allow you to control such items as the location of preferences to the specifics of a survey tool. It may be prudent to review your current configuration variables as many are still in use.

SELECTSERIES3 CONFIGURATION VARIABLES

First, let's look at a list of the new survey-related Civil configuration variables in SELECTseries 3 with a brief description of each one. Not all of these variables will be set or even used by every organization, but they are all listed here for your convenience. Keep in mind some of these settings impact areas outside of Surveys.

CONFIGURATION VARIABLE	DESCRIPTION
CIVIL_XIN_FILE	Defines the default XIN file. (InRoads only)
CIVIL_CIVILSETTINGS_READONLY	If set to a value of 1, all standards, preferences or features that come from a DGN Library are persisted as read-only in the active file.
CIVIL_SURVEY_DISABLE_DIVIDE_BY_TWELVE	If set to a value of 1, this variable indicates that the sizes read from a GEOPAK SMD XML file should not be divided by 12 when linked into Survey Feature Definitions. (Applicable for GEOPAK XML SMD files in an English environment only)
CIVIL_SURVEY_ELEVATION_POSITION_FIVE_ANGLE	If set to a value of 1, allow the elevation annotation to be rotated by the angle specified when the label position is set to position 5. (GEOPAK XML SMD only)
CIVIL_SURVEY_USERTIW_FOLDER	Defines an alternate directory where user .TIW files can be located.
CIVIL_SURVEY_STYLEFILE	Defines the Style file that is linked in the Survey Feature definitions. Available options are an XIN from InRoads, an XML from a GEOPAK SMD or a PSS from MX.
CIVIL_SURVEY_SURVEYOPTIONS_NAME	As the XIN can contain multiple instances of Survey Options, this allows the

	definition of a particular Survey Options to apply when reading the XIN file. If this variable is not defined, then the LAST occurrence of the Survey Options is used. (InRoads only)
CIVIL_SURVEY_GEOID_BINFILE_FOLDER	Defines an alternate directory where the GEOID BIN files may be located. If not set, the standard GEOID BIN location is used.
CIVIL_REPORTS_DIRECTORY	If the variable is set to a valid directory location, then the software looks at this specific location to locate the XML reports. If this variable is NOT set or it's set to an invalid location, then the software would look at the location where Civil installs the reports by default. NOTE: If the InRoads Project Default XSL location is defined then that is used before CIVIL_REPORTS_DIRECTORY. This maintains continuity for InRoads users.
CIVIL_CONTENTMANAGEMENTDGNLIBLIST	This variable defines both the directory and specific file name of the feature definitions DGN Library.
CIVIL_PROJECTSETTINGSDGNLIBLIST	This variable defines both the directory and specific file name of the project settings DGN Library.
CIVIL_CIVILTMDGNLIBLIST	This variable defines both the directory and specific file name of the terrain model filters DGN Library.
CIVIL_SURVEY_APPEND_ATTRIBUTES_TO_DESCRIPTIONS	If this variable is set (=1) then any attributes associated with a point during the import process will be written to the point's DESCRIPTION field as well as the attribute field. By populating the DESCRIPTION field, the data can be annotated graphically as the DESCRIPTION. The ATTRIBUTE field cannot be annotated.

CURRENT CONFIGURATION VARIABLES

Next, let's look at a list of the current Survey-related configuration variables with a brief description of each one. Not all of these variables will be set or even used by every organization, but they are all listed here for your convenience. Note while transitioning to Bentley Survey Select series 3, you will need to leave any variable currently in use, until all users have transitioned.

VARIABLES STILL USED IN SELECT SERIES 3

CONFIGURATION VARIABLE	DESCRIPTION
CIVIL_XIN_FILE	Defines the default XIN file. (InRoads only)
GPK_SURVMNGR_SMDFILE	Denotes the default SMD file as well as the default directory for SMD files. When initially invoking the Survey Manager, this SMD file appears in the Path dialog. Moreover, when selecting File > Open, the directory tree is set where this SMD file resides, even if another SMD file from another directory is the current SMD. Not setting this configuration variable would cause Survey Manager to initially look for ...\GEOPAK\bin\default.smd. Subsequent searches would start in the same directory as the current SMD file.

CHAPTER SUMMARY

At the conclusion of this chapter, you should have a list of current and new configuration variables and the appropriate setting(s) for your organization.

Chapter 7: Data Collection Requirements

OVERVIEW

Bentley Civil Survey supports a variety of data collector formats with unreduced data and most any ASCII file containing reduced survey data or even just XYZ data. Features include embedded linking, feature, and control codes, linking together shots based upon defined chains, comments and support for the situation where the user does not have a "continuation" linking code for each shot but wants these shots connected.

The ASCII files need not conform to any particular structure or format other than a requirement that each point entry be restricted to a single row. The ASCII file should not contain more than one point per row. Similarly, multiple rows should not be required to define a single point code.

Within the row containing point code data, virtually no restrictions are placed on the arrangement and separation of survey data. Individual data items (point code, x-coordinate, y-coordinate, z-coordinate, point number) can be arranged in either free form or column formats. In addition, extraneous information may be present in the row and ignored by Bentley Civil. Data items in the free form format can be separated by spaces, commas, dashes, etc.

Two pieces of information are required to load (process) survey data:

- select the survey file(s)
- identify the file format

Note	The critical task is setting up the standard formats used at your organization (if they are not in the examples provided) and add them to the pick list for your survey users. You want to focus on the standard formats, as the users can always add a project-specific format that is rarely used. This format file, along with other project settings we'll add later, determine what is processed and how the final results display.

SET-UP AND USE OF TIW FILES

Each format is stored within a Text Import Wizard (*.TIW) file and by default are located in *C:\ProgramData\Bentley\Civil\SurveyTools\8.11.9\en\Data*. To find them on your machine, just search for *.TIW.

The TIW files delivered with the install are just a variety of examples to help get users started. They include data collector formats as well as ASCII coordinate data files. In these tasks, you need the set of common formatted files used within your organization. It is also prudent to collaborate with surveyors within your organization who are very knowledgeable on how your organization collects data, i.e., feature codes, equipment types, processing work flows. It is not necessary that they know how to run the software, data collection knowledge is paramount.

Note	The file format for TIW has not changed in SELECT series 3. Therefore, if you have previously created TIW files for your data formats, it is not necessary to recreated them.

The general workflow is: (These steps will be repeated for each data format in your standard collection.)

- Determine if you have previously created a TIW file for the data.
- Determine if the file is from a data collector or ASCII coordinate files. If data is post-processed within the data collector software, you'll probably have just the coordinate files. If it is raw data from the data collector, you'll need the brand / model of equipment, and control information (which may be in a separate file). Raw data processing will include Least Network Squares adjustment, based on project settings.
- Review the list of samples to determine if your data matches one of the provided formats. If it potentially matches, note the name of the TIW file, set it aside and move to the next format. If not, mark it for TIW file creation and move on. Note the TIW are ASCII and can be opened with any text editor to see the details of the format. If you cannot find your data collector brand / model in the samples, contact Bentley to determine if the data collector is supported.

Most organizations will set a path for the TIW files (so you can have them on a server, rather than installed on every machine; as it's easier to change). You may want to remove the TIW files from the pick list that your users would never use (such as those for data collector equipment brands that are not used within your organization), and add those that fit your business needs. In that way, your users will only see what is applicable for them, rather than the entire list. In the ASCII formats, both NE and XY coordinate options are provided as customers use either format.

To view the available TIW files, we can access the folder via Windows Explorer, however, we can also see them in the Project Explorer. As we will be using the Project Explorer extensively in later exercises, you may want to get familiar with it now.

PROJECT EXPLORER

Project Explorer is a standard dialog with tree views for Links and Files for managing data in the current MicroStation project. This capability has been expanded to manage civil data by adding tabs for Survey, Civil Model and Civil Standards. Two tabs are critical for survey environment set-up / testing:

- Survey – used extensively by users for processing, reviewing and manipulating data. In this guide, it will be used for the testing tasks, emulating the user experience.
- Civil Standards – used to define civil standards to be used by Survey users. In this guide, it will be used for defining project settings, data collection formats and other important survey standards.

Note	Understanding the Project Explorer is paramount, as many of the settings and standards need to be created / reviewed / edited within it.

The Project Explorer is accessible from MicroStation > File > Project Explorer or from the Primary Tool Bar. There are settings to control which tabs are displayed and you will be using the dialog. If the Project Explorer is not visible on your Primary Toolbar then right-click on the toolbar and toggle on Project Explorer. This command can be docked on either the left of right side of the screen in a pinned or unpinned state. Please open the command and leave the dialog on the desktop undocked.

The first step in the hierarchy is design file. Any design files attached to this design file will also appear in the tree view. When present a plus (+) to the left of an item indicates additional information in the tree.

Each item has a selection of actions available by right-clicking ranging from commands to properties that are appropriate actions for that data type.

CIVIL STANDARDS

The Civil Standards tab provides access to features and settings stored in DGNLIB or design files.

The top level has the current design file and Libraries. Libraries are the collection of DGNLib files that are associated with the MicroStation project. As settings and standards are used, they are copied into the design file.

Under the Design File and Libraries are the following sections:

- Civil Cells – a collection that can be placed as a whole
- Design Standards – include curve tables for horizontal and vertical curves by speed
- Feature Management – holds the collection of features
- Filters – contains filters and filter groups for import from graphics
- Project Settings – contain Corridor and Survey settings
- Roundabouts – contains the list of roundabouts available for placement

Note	For Survey, we will focus on Project Settings and Feature Management.

Exercise: Set-up of Project Settings in Project Explorer

Exercise Objective:

Familiarize yourself with Project Explorer's Civil Standards tabs for review / set-up of Survey standards.

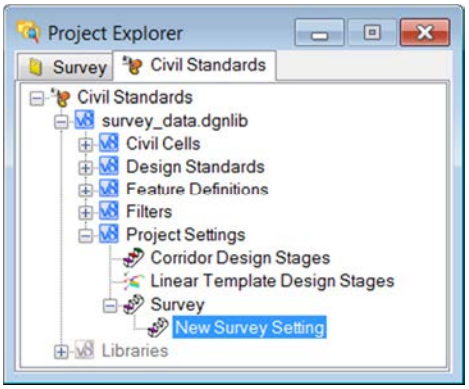
Procedure:

1. Select **File > New** from the MicroStation main menu, create a new DGNLib file *survey_data.dgnlib*. Be sure to use your seed file created or reviewed in the previous chapter.

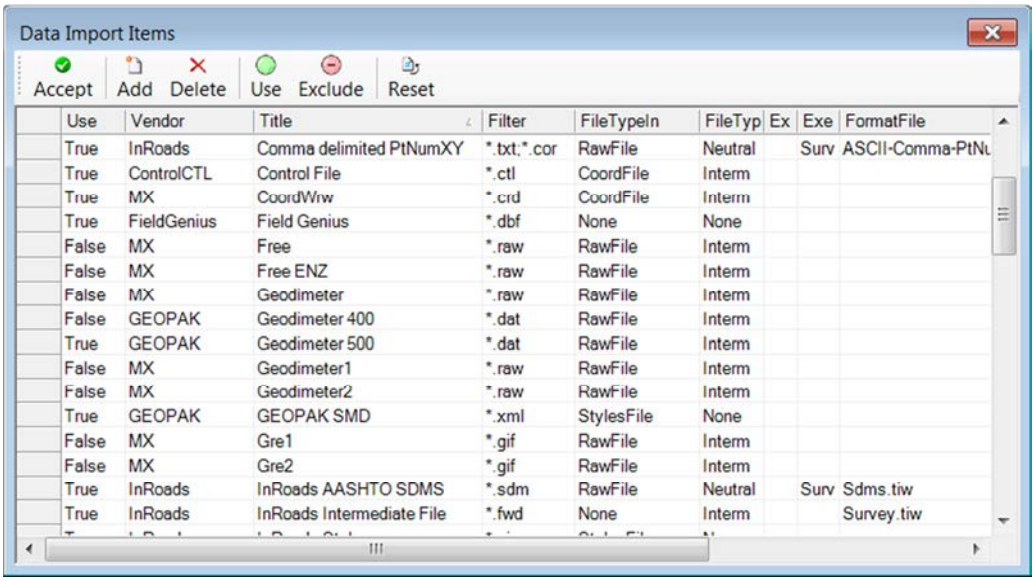
   The tabs that are visible in Project Explorer can be configured in each design file.
2. Open **File > Project Explorer** to view the options. At the top you see the various tabs set to true.
3. Open **MicroStation > Settings > Project Explorer** to view the options. At the top you see the various tabs set to true.
4. Change the **File**, **Links**, and **Civil Model** tabs to False since we are not going to use them; and then click **OK**. On the dismissal of the Settings, the Project Explorer changes and the File, Link and Civil Model tabs are no longer available.

Hint	In dialogs which have True/False or On/Off instead of clicking on the drop down item and selecting the state you can change binary state items by double clicking on the name.
5. Select the **Civil Standards** tab.
6. Expand **Project** Settings by clicking on the + to the left of the item.

7. Highlight Survey, right-click and select **New** from the pop-up menu.



8. Highlight **New Survey Setting**, right-click and select **Properties**.
9. Expand the **Data File Parsing** section by clicking on the down arrow on the right side of the section header.
10. On the **Data Import Items** line, right-click on the File button to the right side of the field. This opens the **Data Import Items** dialog.



Use	Vendor	Title	Filter	FileTypeIn	FileTyp	Ex	Exe	FormatFile
True	InRoads	Comma delimited PtNumXY	*.txt;*.cor	RawFile	Neutral		Surv	ASCII-Comma-PtNu
True	ControlCTL	Control File	*.ctl	CoordFile	Interm			
True	MX	CoordWrw	*.crd	CoordFile	Interm			
True	FieldGenius	Field Genius	*.dbf	None	None			
False	MX	Free	*.raw	RawFile	Interm			
False	MX	Free ENZ	*.raw	RawFile	Interm			
False	MX	Geodimeter	*.raw	RawFile	Interm			
False	GEOPAK	Geodimeter 400	*.dat	RawFile	Interm			
True	GEOPAK	Geodimeter 500	*.dat	RawFile	Interm			
False	MX	Geodimeter1	*.raw	RawFile	Interm			
False	MX	Geodimeter2	*.raw	RawFile	Interm			
True	GEOPAK	GEOPAK SMD	*.xml	StylesFile	None			
False	MX	Gre1	*.gif	RawFile	Interm			
False	MX	Gre2	*.gif	RawFile	Interm			
True	InRoads	InRoads AASHTO SDMS	*.sdm	RawFile	Neutral		Surv	Sdms.tiw
True	InRoads	InRoads Intermediate File	*.fwd	None	Interm			Survey.tiw

In this dialog, we can see the **Title** column contains the description of each of the TIW files and the **Format File** column contains the TIW file name. Note that some of the raw files do not have a format file. These formats are built into the software, so no TIW file is needed.

Review Data Files and Categorize

Objective:

The objective of this exercise is to review each data format and categorize it. The result should be four separate stacks of data:

- Raw data collector files with associated TIW file.
- Raw data collector files with no TIW file.
- Coordinate files with associated TIW file.

- Coordinate files with no associated TIW file.

Keep in mind this is our preliminary assessment. If a file is in the wrong category, we can reassess during the testing phase.

Procedure:

1. Continue in *survey_data.dgnlib*. The Data Import Items dialog should already be open from within Project Explorer. This was done in the previous exercise.
2. Let's look at raw data files first. Using your first data format file, scan the Title column to see if there is a match. For example, if it's a raw file and you have Geodimeter, you'll have to know whether it Geodimeter 400 or Geodimeter 500. . There are also numerous formats, for example, for Topcon. Your surveyor can provide this information. Once you've found the correct title, look in the format file column to see if there is an associated TIW file. If there is, open the file with any text editor. You can view the specifics of each piece of data to determine if it's a match for your data. If it is a match, note the name of the title and moved to the next continue the process for all your raw data files.
3. Next, let's look at the coordinate files, in ASCII format. Double-click on the format file column, which will sort the data. This will put all the ASCII file formatted files together for easy viewing. Then, again, one file at a time, determine if there is a file that meets your format. If you are unsure, you may want to open the TIW file to review the details of each data item. If the format matches your file, make a note of the name and moved to the next file. If not, make a note, the file and format will need to be added. Repeat the process for all data formats. At the conclusion of this step, all data formats should be classified into those with associated TIW files and those without.

CHAPTER SUMMARY

At the conclusion of this chapter, you should have reviewed all your data collection datasets and determined the status of TIW files.

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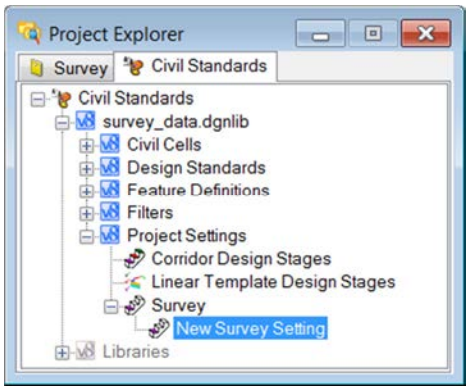
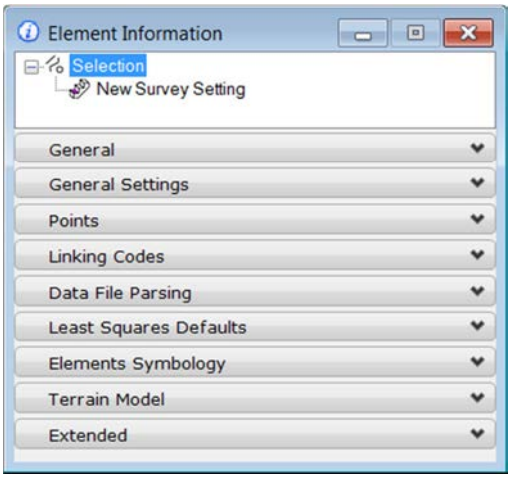
Chapter 8: Managing Project Settings

OVERVIEW

Now that we've completed the general review of our TIW File requirements, we need to step back for a moment to look at more generic project settings. Therefore, let's look at Project Settings > Survey within Civil Standards.



By right-clicking and selecting Properties, we see the project settings.



We can ignore the General and Extended categories, as there are no user inputs in these sections. However, we have seven other sections of settings to review. As we review, you'll want to make notes on the settings for your organization.

ONE SETTING OR SEVERAL?

In order to review our TIW files, we created a survey setting. The question is, will one setting. suffice, or do we need multiple settings? In order to answer that question, we need to review what settings are included. It's not based just on the TIW file settings, but several other sections of settings as well. These include linking codes, lease network squares adjustment default values, and

terrain model information. If we need different values within the sections, then we will need to create a second setting. The user will specify one setting for each DGN file, not for each field book. Therefore, it is preferential to minimize the number of settings. On another factor to take into consideration is if the various datasets are to be interfaced together. For example, in order to edit the data from various files, it is desirable to use the same setting.

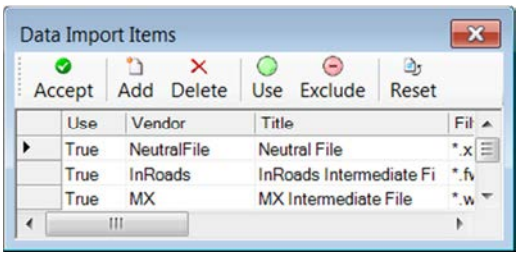
EDITING OPTIONS

While many of the settings are toggles or from pick list, other settings require a table format. These tables are all set up the same for ease of use. These tables can be found in:

- Data Import Items
- VBA Feature Macros
- Validating Rules
- Control Point Features
- Feature Exclusions.
- Substitute Strings

In all cases, the table is accessed by clicking on the far right side of the adjacent cell. One example table is depicted below. The icons at the top of the table provide tools for editing. Scrollbars are provided in the bottom in the right side.

Note The number and content of columns in each table varies depending on the type of table.



ICON / TOOL	DESCRIPTION
Accept	This is crucial. When you have completed your edits, you must click **Accept** in order to retain them. Clicking **Accept** also closes the dialog. If you close the dialog without accepting, all current edits are lost.
Add / New	Includes a blank line at the bottom of the list for additional types. Once the line is added, the appropriate fields can be edited.
Delete	Removes the selected line from the list. Highlight the line (s) to be deleted. Note small black triangle in the leftmost column indicates the selected line. Click **Delete**. Although the lines are deleted from the display, they are not actually deleted until Accept is clicked.
Use (Data Import Items Only)	Sets Use column to True, which exposes the data item to the user. This can also be accomplished by the toggle in the Use column.
Exclude (Data Import Items Only)	Sets Use column to False, which hides the data item to the user. This can also be accomplished by the toggle in the Use column. This is a good method to hide infrequently used data items without deleting them.
Reset (Data Import Items Only)	Resets the entire list to default values, bringing back default lines that may have been deleted, and changing edited settings back to their defaults. Use this setting. Cautiously, as your edited changes may be lost

SETTINGS OPTIONS

Let's look at each section to review the various options. Small exercises are included for setting more complex options, however, you may want to wait until you have reviewed all options, then create your Project Settings.

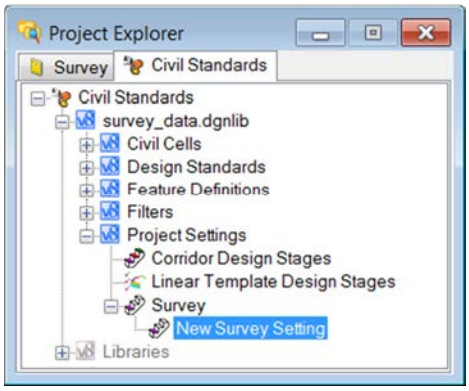
Set Up for Project Settings

Objective:

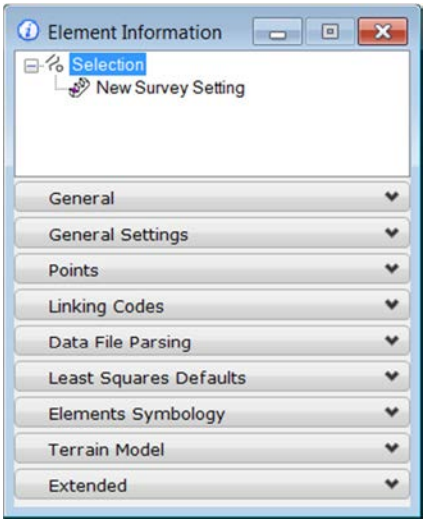
The objective of this exercise is to open Project Settings so we can make adjustments wherever needed in the subsequent sections. Therefore, subsequent exercises will assume your DGN Lib file is active and that Project Settings is open and ready for editing.

Procedure:

1. Open DGNLib file *survey_data.dgnlib*. This was created in the previous chapter.
2. Open **File > Project Explorer**.
3. Select the **Civil Standards** tab.

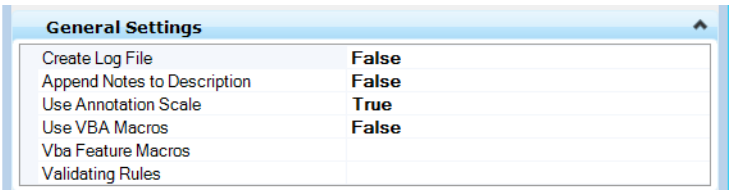


4. Expand **Project** Settings by clicking on the + to the left of the item.
5. Highlight **New Survey Setting**, right-click and select **Properties**.



You are now ready to begin editing any of the Settings sections. They can be done in any order.

GENERAL SETTINGS



The General Settings are detailed in the table below:

SETTING	DESCRIPTION
Create Log File	True specifies to create a history log of changes, everything. The ASCII log is named after the current MicroStation model (in our case default) with a .log extension and placed in working directory by default. Subsequent sessions are appended to the log file, as long as the option is set to True. When set to False, no log is created.
Append Notes to Description	If set to True, it uses the data collector note field and appends to the point's description field. If set to False, the note from the data collector will be ignored.
Use Annotation Scale	True or False – If set to True, the text sizes set within the XIN or XML file are adjust based on the Annotation Scale in the active file. If set to False, no adjustment is made and text sizes are based only on the XIN or SML file.
Use VBA Macros	True specifies to use a VBA application to perform advanced functions on survey data. Set to False if you do not want any VBA macros to perform. This works in conjunction with the VBA Feature Macros option.
VBA Feature Macros	Click in the adjacent cell then click the browse button to open the VBA Feature Macros dialog. Choose from the available macros then click accept to deploy the selection.
Validating Rules	Click in the adjacent cell then click the browse button to open the Validations dialog. Choose from the available rules then click accept to deploy the selection. For example, you can set limits on elevations or coordinates, rod heights, etc. to conform to your organization. If an elevation is outside your range, a warning or error message is displayed.

Setting and Using VBA Macros

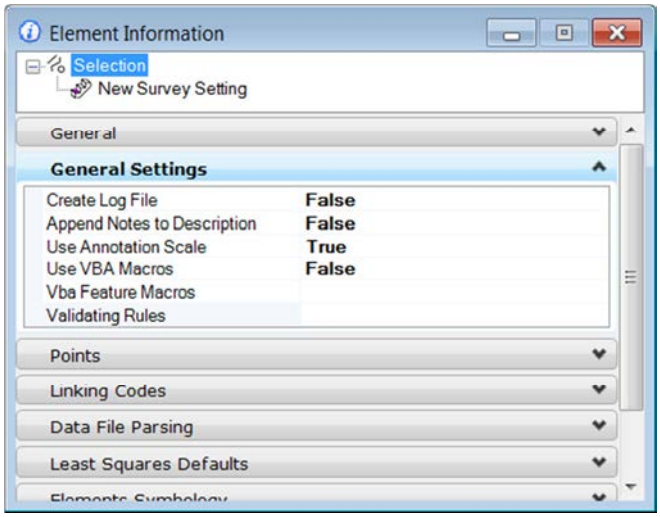
Objective:

In this exercise, we will learn how to set a feature to utilize a VBA macro. One VBA provided in the default install is smartsolids.mvba, which extrudes linear features (such as pipes) in the 3D model.

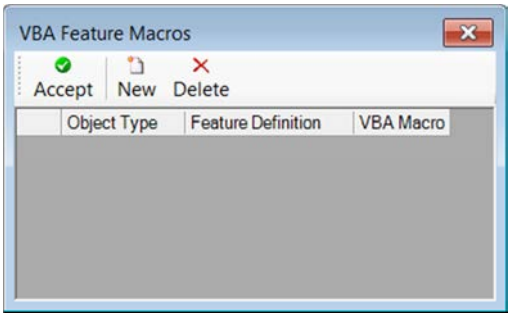
Procedure:

1. Continue in the DGNLib file *survey_data.dgnlib*. This was created in the previous chapter; the Project Explorer was opened to Civil Standards and Survey Project Settings.

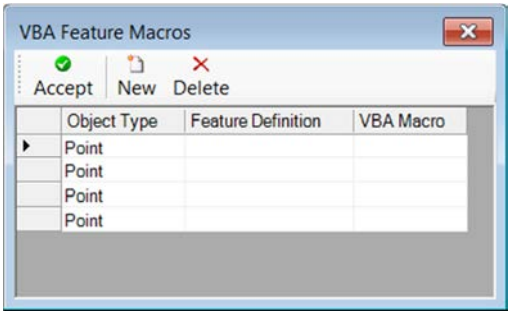
2. Expand the **General Settings** section by clicking on the black arrow on the right side of the section header.



3. Toggle **Use VBA Macros** to True.
4. Click in the cell to the right of **VBA Feature Macros**.

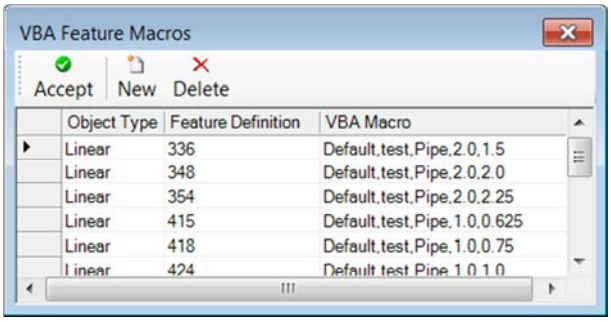


5. Click **New** to add a new line to the table. Note, you may add several lines at one time.



6. Select the **Object Type**, either Point or Line.

7. Add the Feature Definition that will prompt running of the VBA. For example, if you are running the VBA on all pipes, then include the Feature Definition for each pipe. Then add the VBA macro and its parameters. This is dependent upon the VBA.



8. Be sure to tab out of the last field you enter. Do NOT close the dialog by clicking the X in the upper right-hand corner! You must click **Accept** in order to save your data, which also closes the dialog.

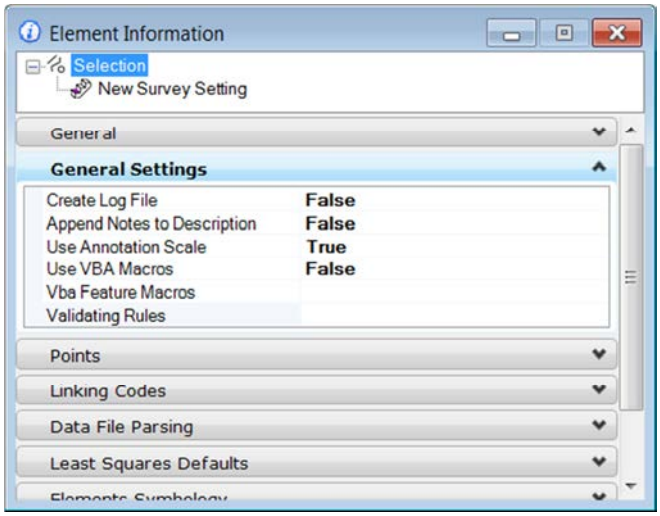
Setting and Using Validating Rules

Objective:

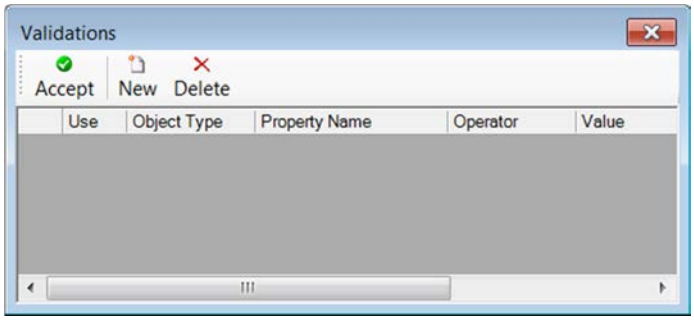
In this exercise, we will set up some validating rules. These include rod height warning messages, elevations outside of your organization's range, or perhaps a coordinate range.

Procedure:

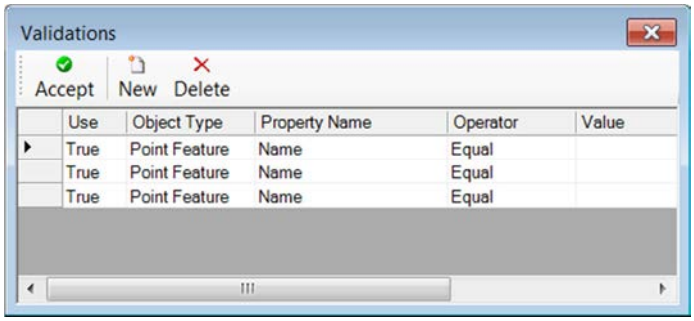
1. Continue in the DGNLib file *survey_data.dgnlib*. This was created in the previous chapter; the Project Explorer was opened to Civil Standards and Survey Project Settings.
2. Expand the General Settings section by clicking on the black arrow on the right side of the section header.



3. Click in the cell to the right of **Validating Rules**.



4. Click **New** to add a new line to the table. Note, you may add several lines at one time.



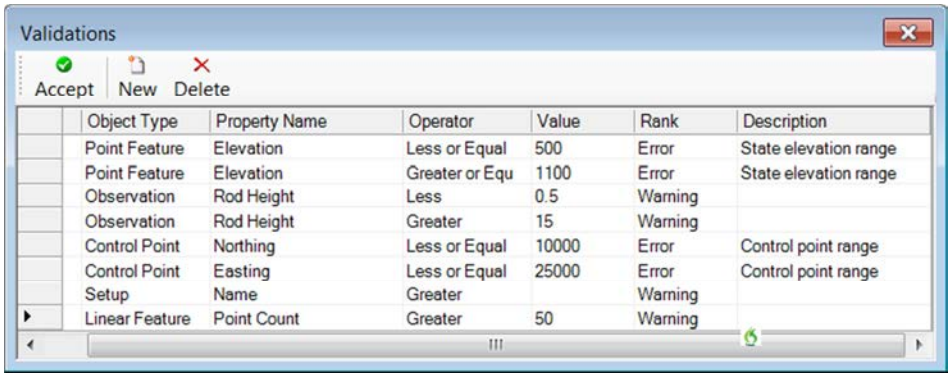
5. Set the Use to True, then select the Object Type: Control Point, Setup, Observation, Point Feature or Linear Feature.

6. Next, select the Property Name that defines what will be validated. Note the Property Name options vary depending upon the Object Type selected.

PROPERTY NAME	OBJECT TYPE				
	CONTROL POINT	OBSERVATION	SET UP	LINEAR FEATURE	POINT FEATURE
Name	X	X		X	X
Feature Definition		X		X	X
Description		X		X	X
Easting	X				X
Northing	X				X
Elevation	X				X
Length				X	
Point Count				X	
Rod Height		X			
Horizontal Angle		X			
Vertical Angle		X			
Slope Distance		X			
Tolerance		X			
Height			X		
Circle			X		
Backsight direction			X		
Backsight Type			X		
Occupy			X		
Occupy Feature Definition			X		
Occupy Easting			X		
Occupy Northing			X		
Occupy Elevation			X		
Backsight			X		
Backsight Feature Definition			X		
Backsight Easting			X		
Backsight Northing			X		
Backsight Elevation			X		

7. Select the Operator from the list: List, Greater, Less or Equal, Greater or Equal, Equal, Not Equal, Contains, Between, Begins With, or Ends With.
8. Enter the appropriate Value.
9. Enter the (optional) Description.

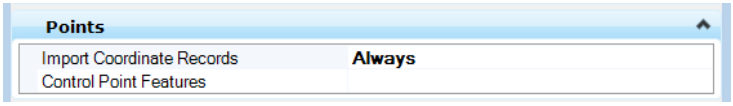
10. Continuing entering validating rules. One example is depicted below.



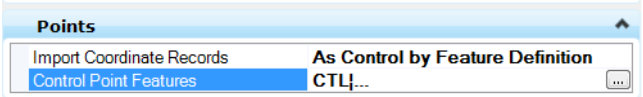
Object Type	Property Name	Operator	Value	Rank	Description
Point Feature	Elevation	Less or Equal	500	Error	State elevation range
Point Feature	Elevation	Greater or Equ	1100	Error	State elevation range
Observation	Rod Height	Less	0.5	Warning	
Observation	Rod Height	Greater	15	Warning	
Control Point	Northing	Less or Equal	10000	Error	Control point range
Control Point	Easting	Less or Equal	25000	Error	Control point range
Setup	Name	Greater		Warning	
Linear Feature	Point Count	Greater	50	Warning	

11. Be sure to tab out of the last field you enter. Do NOT close the dialog by clicking the X in the upper right-hand corner! You must click **Accept** in order to save your data, which also closes the dialog.

POINTS



Two options are supported in the Points section.

OPTION	DESCRIPTION
Import Coordinate Records	Always - Any collected coordinates are also loaded in addition to angles and distances Never - Collected coordinates are never loaded; only angles and distances. As Control - All collected coordinates are also loaded in addition to angles and distances. The coordinates are used as control points for the network least squares processing. As Control by Feature Definition - Collected coordinates whose feature code is defined in the Control Point Feature dialog are also loaded in addition to angles and distances. The coordinates are used as control points for the network least squares processing.
Control Point Features	This dialog works in conjunction with the As Control by Feature Definition. Click in the adjacent cell then click the browse button to open the Control Point Features dialog. Click Add to add a line to the dialog. Enter the feature of the Control Point and tab. Add as many features as desired, then be sure to Accept to store the entry and close the dialog. If the dialog is closed without Accepting, all current additions or changes are lost. 

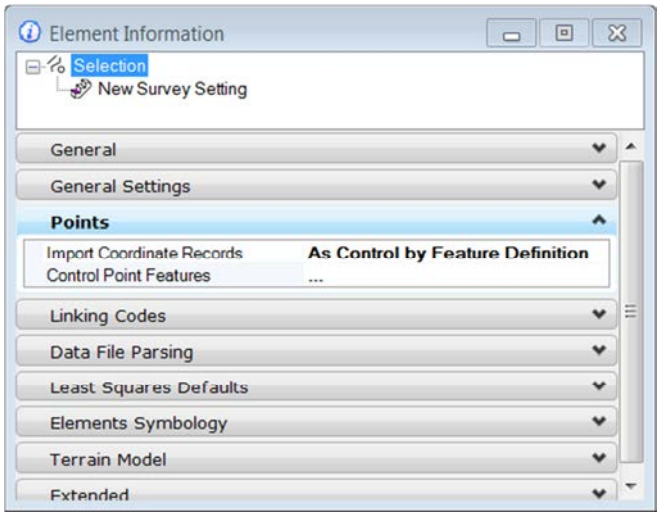
Setting Control Point Features

Objective:

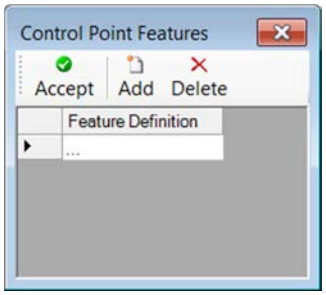
In this exercise, we will add several feature definitions as control points.

Procedure:

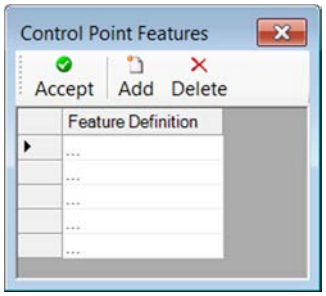
1. Continue in the DGNLib file *survey_data.dgnlib*. This was created in the previous chapter; the Project Explorer was opened to Civil Standards and Survey Project Settings.
2. Expand the Points section by clicking on the black arrow on the right side of the section header.



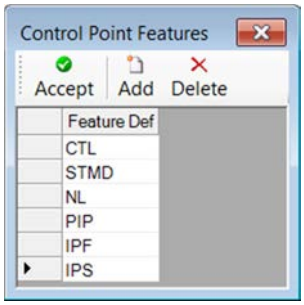
3. Click in the cell to the right of **Control Point Features**.



4. Click **New** to add a new line to the table. Note, you may add several lines at one time.

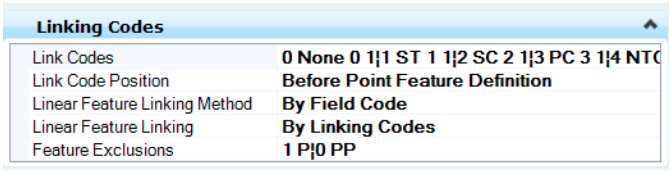


5. Add each Feature Definition which will be used for control.



6. Do NOT close the dialog by clicking the X in the upper right-hand corner! You must click **Accept** in order to save your data, which also closes the dialog.

LINKING CODES



The three options provided within the Linking Codes section enable a wide variety of options which will cover most organizations. If you are currently using capital Bentley Survey, you should be able to use your current linking codes set up with no change in your data collection methods. However, if you are using an older version, you may want to review some of the options to see if you can enhance your data collection codes. If you do not have legacy settings, you may want to adopt the DA Linking codes options as they are more robust.

Warning	Linking codes CANNOT contain ANY part of a feature (example ST link code and STEPS) causes problems.

LEGACY GEOPAK LINKING CODES

Legacy GEOPAK Survey creates linear elements of the linear data if linking codes are used in the field while collecting the data. Linking codes are special characters prepended to the feature in the field. GEOPAK Survey (in the downloaded raw mode) supports the following default linking codes. Note the codes are user definable.

OPTIONS (DEFAULTS)	DESCRIPTION
BL*	Begin Line
EL*	End Line (not necessary)
CL*	Close Figure
PC*	Begin Curve (tangent to previous line)
OC*	Point on Curve (begin/end non-tangent curve)
PT*	End Curve (tangent to next line)
CC*	Point of Compound or Reverse curve
CF*	Curve Fit (spline fit to irregular curves)

These codes can be upper or lower case. Below is a sample sequence:

Point Description

```
5 BL*CURB1 BL*SW1 WV
6 CURB1
7 SW1 PP
8 PC*CURB1
10 PT*CURB1
11 CURB1 SW1
12 OC*SW1
13 SW1
14 SW1
15 SW1
16 OC*SW1
17 CL*SW1
18 BL*CURB1
```

Note Spaces between the code, asterisk, and line description: (BL * SW1) are supported.

IMPORTANT: Lines are connected by the order of point numbers. The point numbers do not have to be sequential, but they must be in increasing order. Since the actual mapping is produced by the reduced coordinate file and not the raw data file, the point numbers determine the sequence, not the order of field location (order of shots in raw data file).

In the above example, point 5 begins two lines, CURB1 and SW1. CURB1 and SW1 are Line Description(s). A line description must be a whole word (no spaces). WV (Water Valve) is not the beginning of a line because it is not preceded by a BL*'. The following lines will be drawn:

First Line (CURB1): 5 to 6 to 8 (begin curve tangent from 6 to 8) to 10 (end curve tangent from 10 to 11). Since 18 begins a new CURB1, point 11 is the end of the first line (the EL code is not necessary to end a line).

Second Line (SW1): 6 to 7 to 11 to 12 (begin non-tangent circular curve), through points on curve 13,14,15, to 16 (end non-tangent curve) to 17 (CL closes figure). Points 13-15 are used to define the curve.

ALL LINES MUST START WITH A BL* or the equivalent user-defined begin line code. No lines will be connected to a point unless the point description matches a BL* LINE DESCRIPTION.

Note Combining codes and line descriptions within a single point description is supported.

For example,

Point Description

```
BL*SW1 BL*CURB1
```

The above example begins a SW1 line and a CURB1 line.

Chain Names: The survey chain name is derived from the feature. In the above example 2 chains are created, CURB1 and SW1. In the case where another chain is started (BL* CURB1) and that name has already been used, then the name will be incremented by 1. The chain name in this case will be CURB1-1.

CALC Points: For shots that are double coded as above, the raw data for that shot is duplicated and stored with a point named CALCXX, beginning with CALC1. This allows the double coded shots to represent two features with different geometry codes. For example, one feature may be a straight

line while the other feature is a curve. The CALC points are numbered sequentially even between multiple sets of data in the same directory. A file named CALCPTS.NUM is located in the projected directory and contains the next available CALC point number. The creation of these CALC points takes place in the conversion from Raw Data to OBS.

LEGACY DA OR INROADS SURVEY LINKING AND CONTROL CODES

Data collected in field survey data can use linking codes to enable creation of and geometry changes for linear features as the data is processed.

Control Codes provide the ability to enable special treatment of specific points to be automatically implemented during the data processing.

Linking codes can be Alpha or Numeric values. Control codes can only possess Alpha values.

LINKING CODES

Note Linking Codes can be Alpha or Numeric values. They can be before or after the Field code. They must be separated from the Field code with a space.

LINKING CODE	DESCRIPTION
Start	Begins creating a Linear Feature
StartPC	Starts a linear feature in Arc Mode
ArcPC	Specifies the beginning of a tangential arc or curve within a Linear Feature
NonTanPC	Beginning of a non-tangential arc or curve within a Linear Feature
ArcSingle	Creates a three point arc with previous and next points (does not work at beginning or end of a Linear Feature)
ArcToArc	Ends previous tangent arc and begins another tangent arc (must be preceded by ArcPC)
NonTanPT	End of a non-tangential arc or curve within a Linear Feature
ArcPT	End of a tangential arc or curve within a Linear Feature
ArcToggle	Toggles between NonTanPC and NonTanPT (depends on pairing)
End	Ends the linear feature (not necessary in most cases)
CloseShape	Closes the ends of the linear feature by adding right angle at both ends and intersecting
Close	Closes the Linear Feature back to the first point

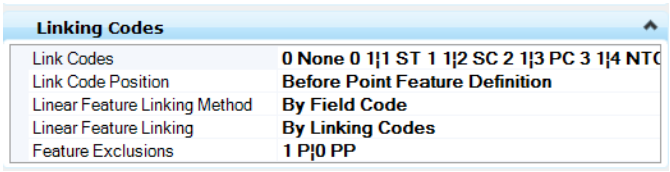
CONTROL CODES

Control codes must be assigned after the Field code. Control codes can only be Alpha values. Control and Linking codes can both be used on the same point as long as the Control code is last. Control codes must be separated from the Field or Linking code with a space.

CONTROL CODES	DESCRIPTION
CircleDiameter	Draws a circle of specified diameter around this point (must be within Linear Feature)
CircleRadius	Draws a circle with specified radius around this point (must be within Linear Feature)
RectangleWidth	Draws a rectangle from two points and specified width (must be within Linear Feature)
TapeDistance	Applies field measured distances to the Linear Feature. All measurements are applied 90 degrees from previous segment. Positive values turn right, and negative values turn left. (must be within Linear Feature)
JoinPoint	Joins this point to specified point name (does NOT have to be in linear feature)

NewTemplate	Same as InRoads TMPL Consecutive Start codes will get this linear feature paralleled and translated based off of initial points
Elevation	Sets the Elevation of this point
UpDown	Changes final elevation coordinate of point by value entered
LeftRight	Changes final coordinate of point by adjusting left (-) or right (+) of measured observation by value entered
FrontBack	Changes final coordinate of point by adding or subtracting a distance from the measured distance
AttributeName	One method of getting attributes for a point (pairs with Value)
AttributeValue	One method of getting attributes for a point (pairs with Name)
AttributeArray	One method of getting attributes for a point (Names and Value in array)
TerrainSpot	Include in DTM as spot
TerrainNoSpot	Do not Include in DTM
TerrainBreak	include in DTM as break
TerrainNoBreak	do not include in DTM

REVIEWING OR SETTING UP LINKING CODES



Five options needs to be defined while setting up the Linking Codes:

- Link Codes - sets the actual codes.
- Link Code Position - sets the position of the code.
- Linear Feature Linking Method – defines how to link using the field code.
- Linear Feature Linking - defines how to link using either linking codes or point list.
- Feature Exclusions – defines feature definitions that are not used when creating linear features.

LINK CODES

The first section is very important as it defines the linking codes. The default provided with the install may be sufficient in many cases as it's the Bentley DA default from SELECT series 2. Therefore, it may be easier to tweak the default for your customization rather than starting from scratch.

Setting Linking Codes

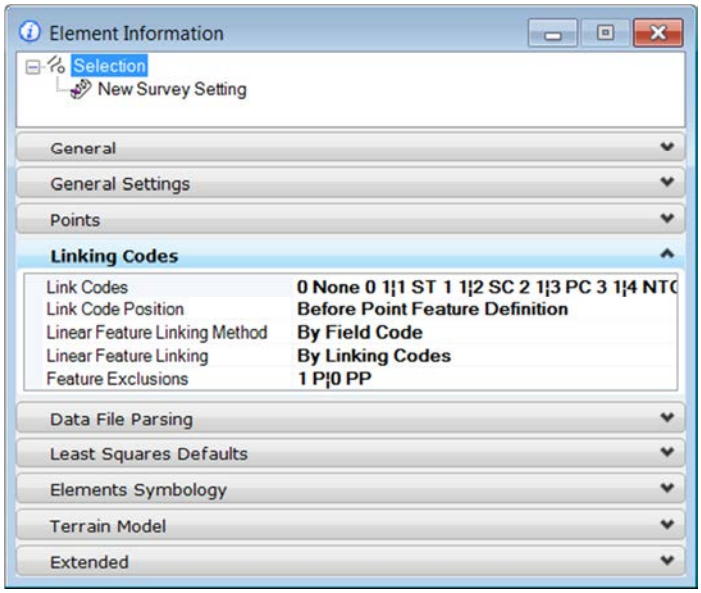
Objective:

In this exercise, we will review / edit linking codes.

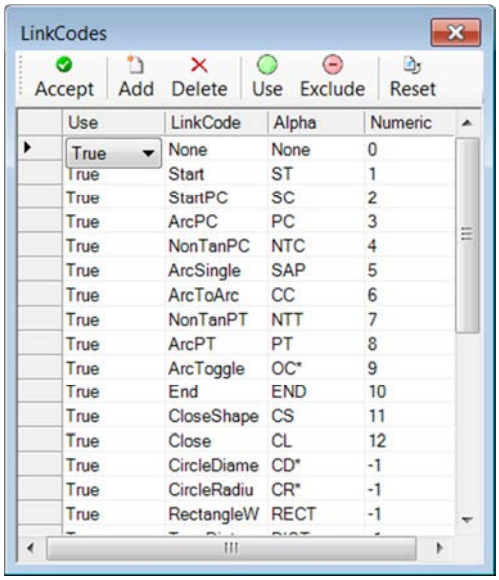
Procedure:

1. Continue in the DGNLib file *survey_data.dgnlib*. This was created in the previous chapter; the Project Explorer was opened to Civil Standards and Survey Project Settings.

2. Expand the **Linking Codes** section by clicking on the black arrow on the right side of the section header.



3. Click in the cell to the right of **Link Codes**.



The default link codes and associated data are displayed.

4. Edit the information to conform to your organizational standards. If you are using legacy GEOPAK codes, you need to add them to the list. You may also want to turn the Use Column to False for link codes you are not using.
5. Do NOT close the dialog by clicking the X in the upper right-hand corner! You must click **Accept** in order to save your data, which also closes the dialog.

LINK CODE POSITION

To assign a Link Code Position, click Link Code Position then select from the menu.

OPTIONS	DESCRIPTION
Before Point Feature Definition	Employs a link code prior to the Field codes
After Point Feature Definition	Employs a link code after the Field codes

LINEAR FEATURE LINKING METHOD

To set the Linking Method, click Linear Feature Link Method then select from the menu.

CONTROL CODES	DESCRIPTION
By Field Code	Expects that the ”start” code for the Linear Features has been assigned in the field and is configured in the Link Codes settings.
By Consecutive Field Code	Creates a new Linear Feature when a series of consecutive same field codes are encountered in the imported data. This option does not expect the start code to be included in the field coding. Note that any other linking codes or control codes encountered within the data set will be honored.
Connect All Matching Field Codes	Creates a Linear Feature for each specific field code that is encountered in the imported data. This option does not expect the start code to be included in the field coding. Note that any other linking codes or control codes encountered within the data set will still be honored.

Example of Linked Consecutive Features

Discrete, consecutive runs of the same feature code will be automatically strung together.

Example Code sequence:

```
CL
CL
CL
EP
EP
CL
CL
CL
EP
```

The above coding sequence would create two (2) distinct ”CL” Linear Features of 3 points and one EP feature of 2 points. The final EP would not make a linear feature, because there is no consecutive matching feature.

Note Any feature codes entered in Feature Exclusion list would not be considered for Consecutive Linking.

Example of Matching Non-Consecutive Features

Non-consecutive runs of the same feature code will be automatically strung together in the order they are collected. This does, in effect, require that all linear features in the collected data must be uniquely identified to provide a quality result.

Example Code Sequence:

```
CL01
CL01
CL02
EP01
CL01
```

```
BC01
CL02
CL01
EP01
```

The above coding sequence would create linear features for CL01, CL02, and EP01.

BC01 would not make a linear feature, because there are no matching codes within the data.

Note	Any feature codes entered in Feature Exclusion list would not be considered for Non-Consecutive Linking.

LINEAR FEATURE LINKING

To set the Linear Feature Linking, click Linear Feature Linking then select from the menu. Each has advantages and disadvantages.

OPTIONS	DESCRIPTION
By Linking Codes	Creates Dynamic Link linear features and has a property type of GeneratedByLinking.
Force Point List Features	Forces create Point List type linear features instead of the default Dynamic Link linear features.

FEATURE EXCLUSION

Feature Exclusion is utilized in conjunction with the Linking Methods to assign specific codes that will NOT be connected by linear features. Example codes may be ground shots, power poles, manholes, etc.

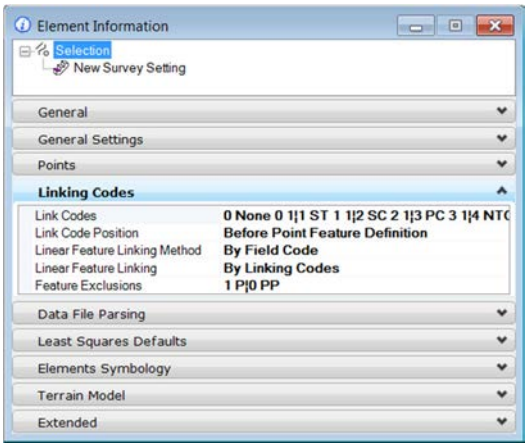
Setting Feature Exclusion

Objective:

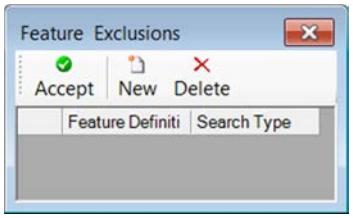
In this exercise, we will add several feature exclusions.

Procedure:

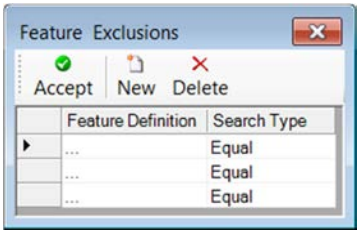
1. Continue in the DGNLib file *survey_data.dgnlib*. This was created in the previous chapter; the Project Explorer was opened to Civil Standards and Survey Project Settings.
2. Expand the **Linking Codes** section by clicking on the black arrow on the right side of the section header.



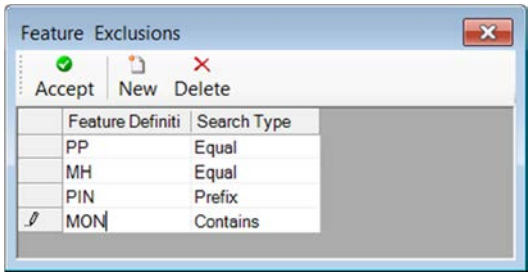
3. Click in the cell to the right of **Feature Exclusions**.



4. Click **New** to add a new line to the table. Note, you may add several lines at one time.



5. Add each Feature Definition which will be excluded. Specify the exact code (Equal), the code prefix, the code suffix or characters that codes contain to exclude from Linear Feature creation.

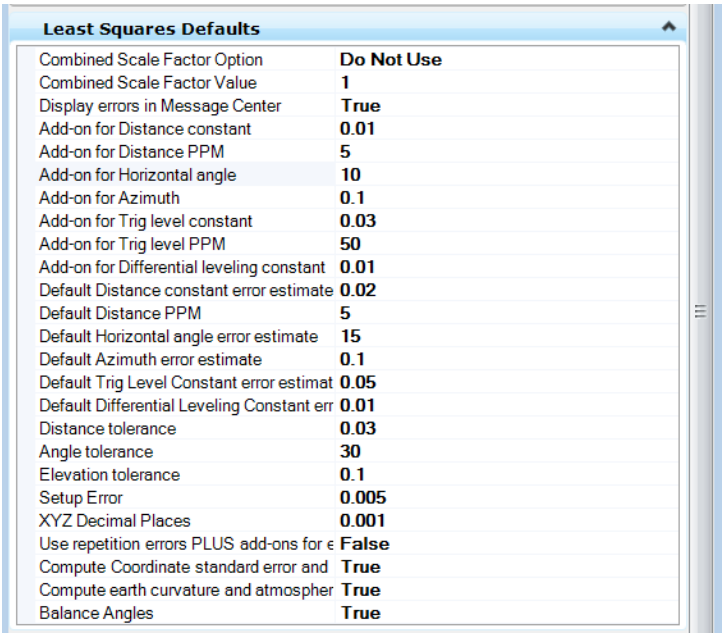


6. Do NOT close the dialog by clicking the X in the upper right-hand corner! You must click **Accept** in order to save your data, which also closes the dialog.

LEAST SQUARES DEFAULTS

Least Squares adjustments and blunder detection may be applied to survey raw data. The adjustments and reports are automatic when the Adjustments box is checked. The adjustments and adjustment settings apply to the entire field book. Traverse data will not be adjusted unless there are control points stored.

This section contains the defaults utilize when a least squares adjustment is processed.

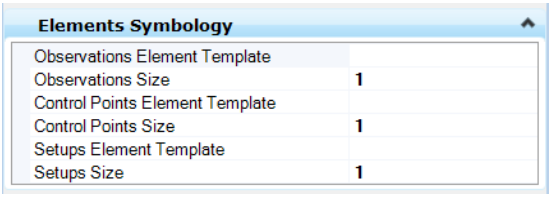


Most of these settings are device-dependent. For example, the Distance constant is dependent on the device used to measure distances. Most modern electronic distance measuring (EDM) equipment has an inherent accuracy of 0.01 - 0.02 feet.

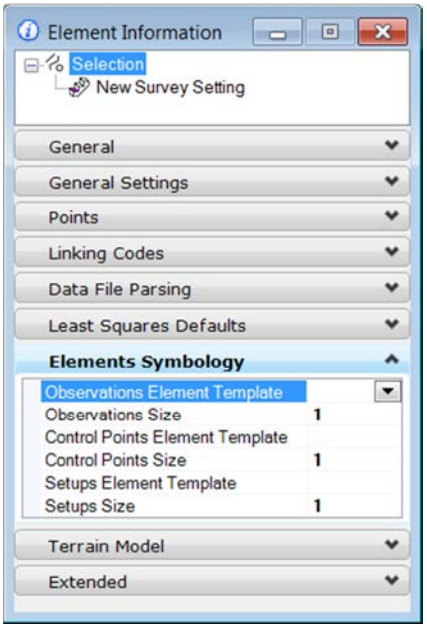
OPTIONS	DESCRIPTION
Combined Scale Factor Option	Select Do Not Use, Compute From Control Points, Compute For Each Observation, Use Manual Combined Factor
Combined Scale Factor Value	Specifies the Combined Scale Factor Value.
Display errors in Message Center	True or False
Add-on for Distance Constant	Accuracy of measured distances based on a set of redundant measurements
Add-on for Distance PPM	The parts per million correction for measured distances based on the principle that an error will be proportional to the length of the line. This is device dependent as well, but not to be confused with the corrective PPM applied for atmospheric conditions on the instrument itself.
Add-on for Horizontal angle	Inherent accuracy of measured angles based on a set of redundant measurements
Add-on for Azimuth	Accuracy of azimuth - This is not the same as angle accuracy; it is based on the accuracy of a predefined direction used as a backsight.
Add-on for Trig level constant	Accuracy of elevations measured with total station distance/vertical angle calculations
Add-on for Trig level PPM	Parts per million additive for measured trig elevations. As with Distance PPM, this is based on the length of the error being proportional to the length of the line.
Add-on for Differential leveling Constant	Accuracy of elevations derived from differential levels, using leveling instrument and leveling rod and taking into consideration that backsights and foresights are equal in length and that readings are taken to a rod held plumb.
Default Distance error estimate	The computed factor applied to a set of measured distances based on the precision or repeatability of those measurements as related to predefined coordinates used to control the traverse

Default Distance PPM	The corrective factor that is actually applied according to the Error Distant Constant
Default Horizontal angle error estimate	The computed factor applied to a set of measured angles based on the precision or repeatability of those measurements as related to predefined coordinates used to control the traverse
Default Azimuth error estimate	The corrective factor that is applied according to the repeated angular measurements in the traverse and the actual Azimuth direction as determined by predefined coordinates
Default Trig Level Constant error estimate4	The corrective factor that is applied according to the repeated angular measurements in the traverse and the actual elevations generated as determined by predefined coordinates
Default Differential Leveling Constant	The corrective factor that is applied according to the determined error in balancing a level run based on predefined bench mark values
Distance tolerance	Total estimated distance error for the length of the traverse based on adjusted distances compared to averaged distances and predefined coordinates for the closing distance
Angle tolerance	Total estimated Angular error for the traverse based on adjusted angles compared to averaged angles and predefined coordinates for the closing direction
Elevation tolerance	Total elevation difference for trigonometric elevations based on adjusted elevations compared to averaged elevations and predefined elevation values at the closing point.
Setup Error	Estimated systematic error inherent when setting up over a point.
XYZ decimal places	Number of decimal places used in reports.
Use repetition error PLUS add-ons for error estimation	True value sets the error estimates as a function of the standard error in the mean plus user defined additions which are defined by constant and ppm add-ons values. False value sets the error estimates generated only by user supplied constant and ppm input error values. Default values only, no add-ons will be added.
Compute Coordinate standard error and error ellipses	If set to True, Survey computes the coordinate standard errors and error ellipses. Errors based on user-defined tolerances are displayed using the Elipses Settings in Workspace > Preferences > View Options – Civil.
Compute earth curvature and atmospheric refraction	True or False to correct for earth curvature - Most modern instruments only account for the Earth's curvature and refraction when computing and exporting coordinates, as that factor is used in generating coordinate values internally. If only raw data is imported, the angles and distances recorded and exported in the raw data file are NOT corrected for curvature and refraction. This should be turned on when using raw data and running any form of adjustment.
Balance Angles	True or False - Angles are automatically balanced as part of the Least Squares Adjustment proves.

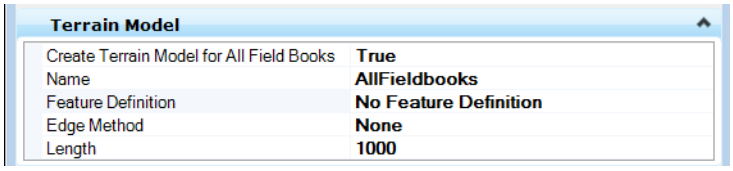
ELEMENTS SYMBOLOGY



OPTIONS	DESCRIPTION
Observations Element Template	Select an Element Template used for drawing / displaying Observations.
Observations Size	Multipler for size, i.e., 2 would be twice the size, 0.5 would be half size.
Control Points Element Template	Select an Element Template used for drawing / displaying Control Points.
Control Points Size	Multipler for size, i.e., 2 would be twice the size, 0.5 would be half size.
Setups Element Template	Select an Element Template used for drawing / displaying Setups.
Setups Size	Multipler for size, i.e., 2 would be twice the size, 0.5 would be half size.



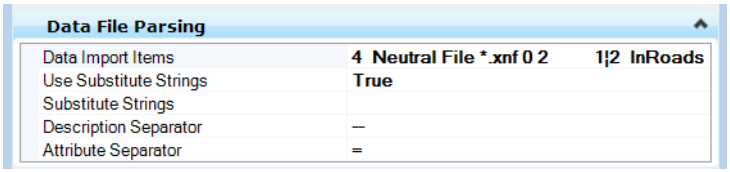
TERRAIN MODEL



Five options are supported in the Terrain Model section. The most critical option is whether to automatically create terrain models, or whether the users want to control went terrain models are made. If the field book data requires a lot of editing, the user may not want the terrain model created, as it would be constantly updating. Other options include parameters for the created terrain model.

OPTIONS	DESCRIPTION
Create Terrain Model for All Field Books	When set to True, the terrain model is automatically created whenever data is loaded into a field book. When set to False, the user needs to create the terrain model at the appropriate time.
Name	Name of the created terrain model.
Feature Definition	Default Feature Definition to be used when Survey creates terrain models. Keep in mind, the user can always assign a different Feature Definition at any time.
Edge Method	Method used during the creation of the terrain model relating to external triangles. None-No external triangles are dissolved. Remove Slivers-Long, thin triangles are dissolved based on a formula hard coded within the software. There are no user defined parameters. Max Triangle Length-External triangles whose external edge is longer in length than the specified distance are dissolved. The side option does not apply to internal triangles, only those on the edge of the model.
Length	Value of the maximum length of the triangle edge used during the creation of the terrain, when the Edge Method is set to Max Triangle Length.

DATA FILE PARSING



The Data File Pursing section is critical, as it defines the format of the datasets the surveyors load. We will utilize the information gathered in the previous chapter relating to TIW files. This section also identifies substitution string information and separators.

DATA IMPORT ITEMS

The Data Import Items dialog defines new file types to be imported as well as enabling or disabling certain file types. The extensions defined in the Filter column of the Data Import Item dialog play an important role in Bentley Civil Survey. Whenever a file is dragged and dropped or a file is opened via Load File, the file extension of the file being loaded is compared to all of the filters in the Data Import Item dialog. Any rows that are FALSE will not be considered for that file filter. If a file is being imported that has multiple matching rows for the Filter, then the user is prompted to select the desired file conversion type.

OPTIONS	DESCRIPTION
Use	Use indicates if the Data Import Item should be used when new files are loaded. If set to FALSE then this parser or file interpreter will not be used. If set to TRUE, then this parser may be used.
Vendor	Indicates the origin of the file parser or the file interpreter.
Title	Title is the title of the file parser or interpreter.
Filter	Filter is the extension of the file being loaded. Multiple extensions can be specified by separating them with a semi-colon (;) such as *.RW5;*.RAW.
File Type Input	File Type In indicates the source file type being processed.
File Type Output	File Type Out indicates the output file type that the parser creates from the input file. The Neutral file is the common internal file type that Civil Survey uses in most cases.
Executable Path	Executable Path If an external parser is defined in the Executable field, then this path indicates the location where the executable is located.

Executable	Executable is an alternate, user developed, parser program that can be used to parse files that Civil Survey cannot parse.
Format File	Format File specifies a TIW (Text Input Wizard) file that Civil Survey uses to parse the data.
Projection Name In	Projection Name In indicates the coordinate projection system of the source file. The name is the same name used in MicroStation Geographic Coordinate System dialog.
Projection Name Out	Projection Name Out indicates the coordinate projection system of the destination file. The name is the same name used in MicroStation Geographic Coordinate System dialog.

Leica and Trimble will be processed differently with survey tools than in native applications. Most native parsers are still available, but some have been replaced.

Mapping will not match 100% for any of the three existing products, but is as close as possible.

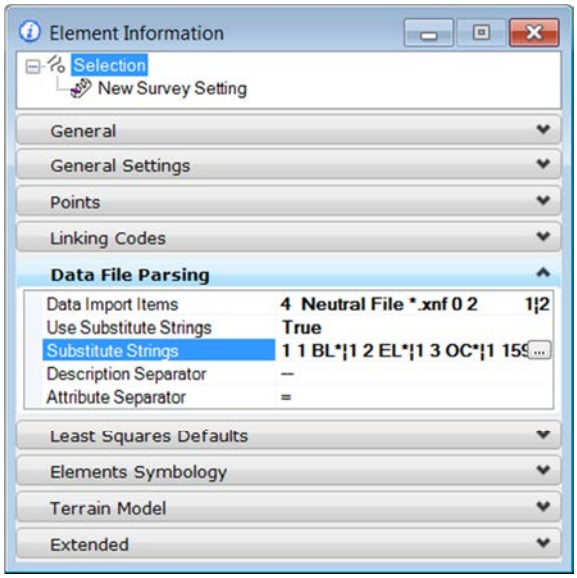
Setting Data Import Items

Objective:

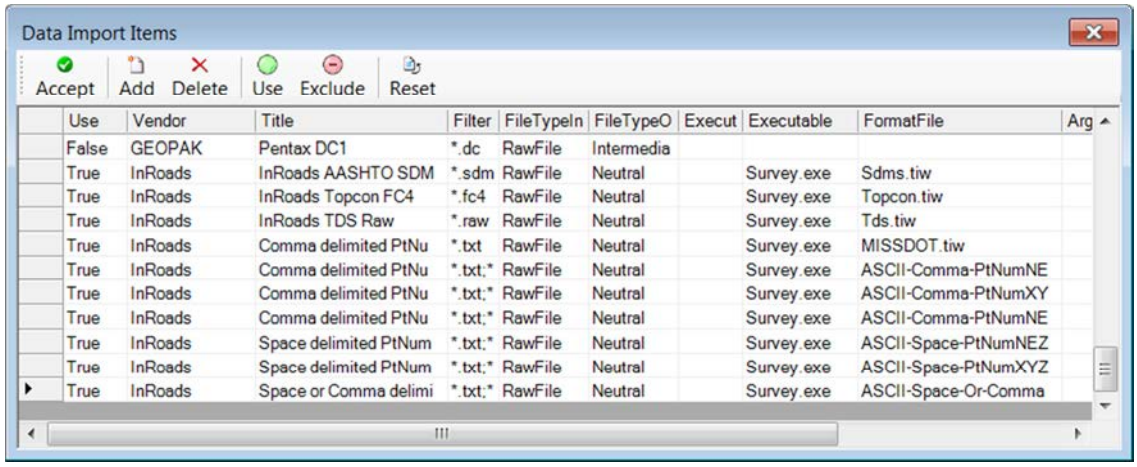
In this exercise, we will review editing and setting up a new TIW file.

Procedure:

1. Continue in the DGNLib file *survey_data.dgnlib*. This was created in the previous chapter; the Project Explorer was opened to Civil Standards and Survey Project Settings.
2. Expand the **Data File Parsing** section by clicking on the black arrow on the right side of the section header.

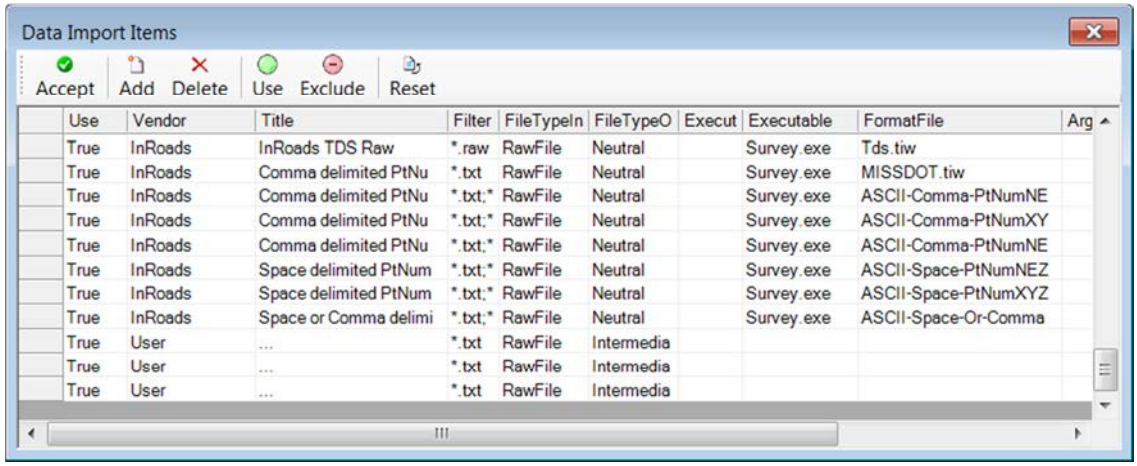


3. Click in the cell to the right of **Data Import Items**.



Use	Vendor	Title	Filter	FileTypeIn	FileTypeO	Execut	Executable	FormatFile	Arg
False	GEOPAK	Pentax DC1	*.dc	RawFile	Intermedia				
True	InRoads	InRoads AASHTO SDM	*.sdm	RawFile	Neutral		Survey.exe	Sdms.tiw	
True	InRoads	InRoads Topcon FC4	*.fc4	RawFile	Neutral		Survey.exe	Topcon.tiw	
True	InRoads	InRoads TDS Raw	*.raw	RawFile	Neutral		Survey.exe	Tds.tiw	
True	InRoads	Comma delimited PtNu	*.txt	RawFile	Neutral		Survey.exe	MISSDOT.tiw	
True	InRoads	Comma delimited PtNu	*.txt;*	RawFile	Neutral		Survey.exe	ASCII-Comma-PtNumNE	
True	InRoads	Comma delimited PtNu	*.txt;*	RawFile	Neutral		Survey.exe	ASCII-Comma-PtNumXY	
True	InRoads	Comma delimited PtNu	*.txt;*	RawFile	Neutral		Survey.exe	ASCII-Comma-PtNumNE	
True	InRoads	Space delimited PtNum	*.txt;*	RawFile	Neutral		Survey.exe	ASCII-Space-PtNumNEZ	
True	InRoads	Space delimited PtNum	*.txt;*	RawFile	Neutral		Survey.exe	ASCII-Space-PtNumXYZ	
True	InRoads	Space or Comma delimi	*.txt;*	RawFile	Neutral		Survey.exe	ASCII-Space-Or-Comma	

4. Click **New** to add a new line to the table, which has some fields already populated. These are just defaults, and can be changed as needed. Note, you may add several lines at one time. You also may need to stretch the dialog and adjust column widths to see the Executable and Format File columns.



Use	Vendor	Title	Filter	FileTypeIn	FileTypeO	Execut	Executable	FormatFile	Arg
True	InRoads	InRoads TDS Raw	*.raw	RawFile	Neutral		Survey.exe	Tds.tiw	
True	InRoads	Comma delimited PtNu	*.txt	RawFile	Neutral		Survey.exe	MISSDOT.tiw	
True	InRoads	Comma delimited PtNu	*.txt;*	RawFile	Neutral		Survey.exe	ASCII-Comma-PtNumNE	
True	InRoads	Comma delimited PtNu	*.txt;*	RawFile	Neutral		Survey.exe	ASCII-Comma-PtNumXY	
True	InRoads	Comma delimited PtNu	*.txt;*	RawFile	Neutral		Survey.exe	ASCII-Comma-PtNumNE	
True	InRoads	Space delimited PtNum	*.txt;*	RawFile	Neutral		Survey.exe	ASCII-Space-PtNumNEZ	
True	InRoads	Space delimited PtNum	*.txt;*	RawFile	Neutral		Survey.exe	ASCII-Space-PtNumXYZ	
True	InRoads	Space or Comma delimi	*.txt;*	RawFile	Neutral		Survey.exe	ASCII-Space-Or-Comma	
True	User	...	*.txt	RawFile	Intermedia				
True	User	...	*.txt	RawFile	Intermedia				
True	User	...	*.txt	RawFile	Intermedia				

5. Add each of your TIW files (one per line) that are not already in the list. Populate the fields:
   - Use: True
   - Vendor: <use your Vendor name>
   - Title: <use your own Title here>
   - Filter: <use your own file filter here>, example, *.txt
   - FileTypeIn: Neutral
   - Executable Path: <leave blank>
   - Executable: survey.exe
   - FormatFile: <your TIW file>, example *.tiw click in the field and navigate to your standard TIW directory!

6. While in this dialog, you may want to do some cleanup. For example, the users will see all of the data import items listed for the appropriate extension. You may want to just delete those that are never used by your organization. Another option is to set the Use column to False.

7. Do NOT close the dialog by clicking the X in the upper right-hand corner! You must click **Accept** in order to save your data, which also closes the dialog.

SUBSTITUTION STRINGS

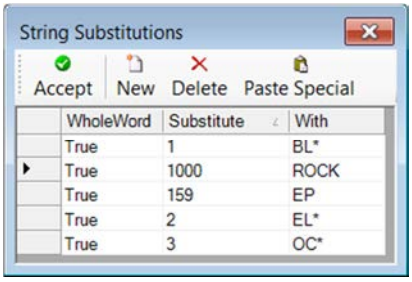
Substitution strings allow descriptions or codes to be entered and associated with a number or text string during the initial loading of a data file. Some older data collectors do not allow alpha codes so numeric codes are required. Another reason for using numeric codes is to save space. Most data collectors only allow 14-16 characters of input for codes. By using numeric codes, the length of the field required can be reduced.

Note	Substitution strings only work during initial loading; they are not used as data is edited or modified.

For example, if the Linking code in the raw data was recorded as 1 for the start of a line it will be replaced by whatever is set in the String Substitution dialog, which should be the same as the one set for Start in the Link Codes dialog. Generally, users in the field use this to save time, so instead of typing something like BL*EP, they type 1 EP. In this case they must set the option use substitute strings to True, then in the String Substitution dialog under substitute type 1 and under with type BL* and in the Link Codes dialog set START to BL*.

This also works for Point codes or description/feature definitions. Example, if a point code of an object on the standards is ROCK, but the user uses 1000 instead in the field to save time typing. The software replaces 1000 by ROCK which in turn matches what was set for that object in the Feature definition style file thus drawing those points with the selected preferences for ROCK.

Consider the following example:



Raw Data (Point Number Code)

```
10 1 159
11 FH
12 159
13 3 159
14 EP
15 3 159
16 2 159
```

Point 10 code gets translated to BL* EP, point 12 gets translated to EP, point 13 and 15 get translated to OC* EP and point 16 gets translated to EL* EP. Notice that each whole integer number contained within a description or point code gets translated to the corresponding String Substitution Table match. Nothing is done to point 11, as there are no numeric character candidates for substitution.

OPTIONS	DESCRIPTION
Use Substitute Strings	When set to True, the software performs a search and replace on the raw data before processing.
Substitute Strings	Substitute Strings allows descriptions or codes to be entered and associated with a number.]'

During loading, each whole number in the code field is compared to the substitution table. If a match is found then that code is replaced by the text value of that description.

Warning	InRoads users, feature codes should not contain linking code character strings. Use Substitute Strings to fix.

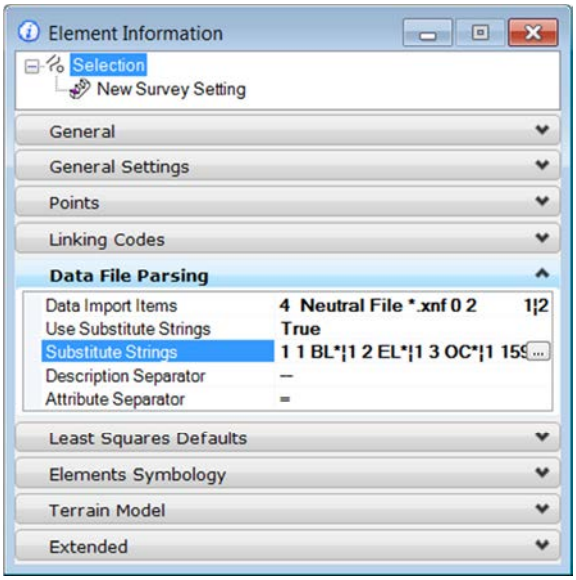
Define Substitution Strings

Objective:

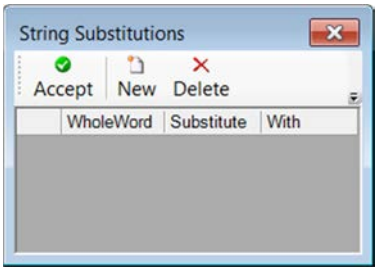
In this exercise, we will define various substitution strings.

Procedure:

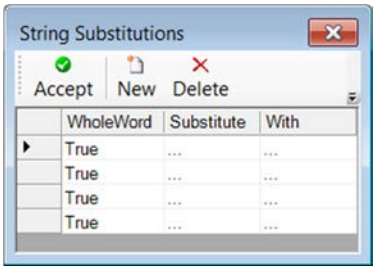
1. Continue in the DGNLib file *survey_data.dgnlib*. This was created in the previous chapter; the Project Explorer was opened to Civil Standards and Survey Project Settings.
2. Expand the **Data File Parsing** section by clicking on the black arrow on the right side of the section header.



3. Click in the cell to the right of **Substitute Strings**.

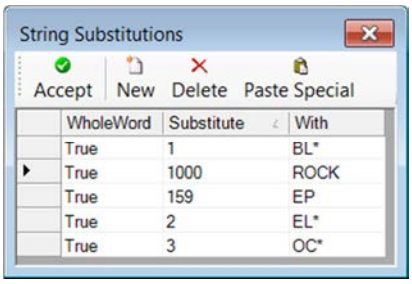


4. Click **New** to add a new line to the table. Note, you may add several lines at one time.



5. Add each String Substitution by completing the three fields (per line):
   - Whole Word require whole word matching, specify True or False
   - Substitute - search string to be replaced
   - With - string that replaces the search string

   One sample dialog is illustrated below:



6. Do NOT close the dialog by clicking the X in the upper right-hand corner! You must click **Accept** in order to save your data, which also closes the dialog.

SEPARATORS

Two separator options are supported in the project settings.

OPTIONS	DESCRIPTION
Description Separator	Character(s) utilized to separate feature data from the point description. Each character entered in the field is considered to be a Feature unless a specific comment delimiter is encountered. For example, the field code EP BROKEN would be considered a double coded shot representing two features, one EP and the other BROKEN. If the intention is to describe the feature with a description or comment, then define a Description delimiter and all characters following this delimiter will be treated as the point Description. Note the default is two hyphens.
Attribute Separator	Character(s) utilized to separate the feature from any point attributes.

CHAPTER SUMMARY

In this chapter, we covered the critical aspects of the Project Settings. This should be a major focus of the set up prior to testing and deployment of Bentley Civil Survey. Your DGN Lib file should now have a complete set of project settings. Once again, you may want to go back and review each section and adjust settings as needed. The exercises have demonstrated the more complex settings, while those that are toggles or key in fields were not illustrated.

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Chapter 9: Survey Features

DGN Libraries

As we have seen, many of the standards and preferences are located within DGN Libraries, commonly referred to as DGNLibs. DGN Libraries are design files typically used as a shared resource in order to store such things as cells, levels, text styles, etc. They allow administrators to store standards and features in one place and then distribute them to many users across an organization. MicroStation has used this functionality in previous releases and now the civil products will take advantage of this same functionality.

Set-Up of DGN Libs – One or Many

Administrators can store MicroStation and civil resources within a single DGN Lib for ease of updating in a single file. However, another option is to split into several DGN Libs; for example, MicroStation for levels, texts styles, and generic artifacts; one for Civil with its feature definitions, survey features, and Design Standards. Another option is to split according to what group is responsible for the information. Example may be MicroStation DGN Lib is controlled by the IT group, Design Standards may be controlled by your Standards Engineer, while Survey Project Settings may be controlled by your registered Land Surveyor. Keep in mind that your Survey settings do interact with generic feature definitions in that you can't have duplicate names. That is another consideration

Linking Legacy Settings

Bentley Civil products, GEOPAK, InRoads and MX each have files that define names of styles and how they are drawn in graphics. These files represent an investment in time and effort so the transfer of these styles to features in the DGNLIB is important. Specifically we are not importing the styles. The files are linked to features of the same name in the DGNLIB. These features are looking up symbology out of a .DDB, .PSS or .XIN file and placing graphics with those values.

Note	It is important to know that Survey styles are linked separately from generic (Design) features.

If you are linking survey features from GEOPAK, you cannot use the Survey Manager Database (SMD) directly. You must use the outputted XML format.

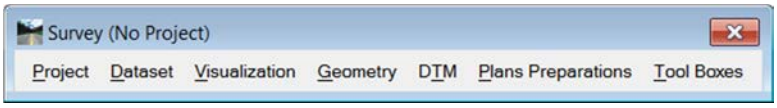
Creating the XML Formatted File From the GEOPAK SMD File

Objective:

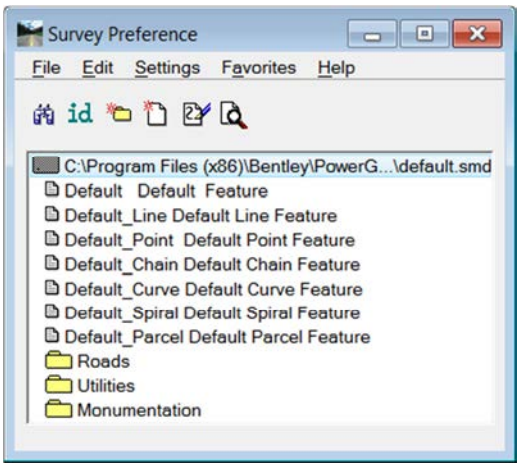
The objective of this exercise is to create the XML file from the legacy GEOPAK SMD file.

Procedure:

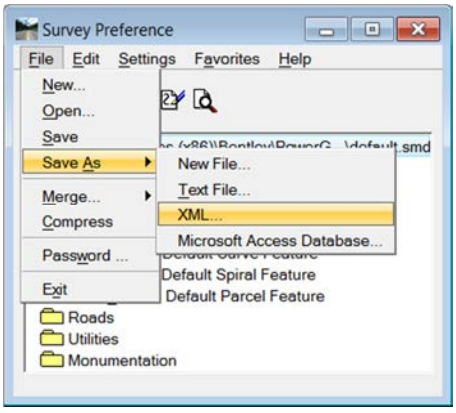
1. Open any MicroStation file.
2. Select **GEOPAK > SURVEY > Survey** from the main menu.



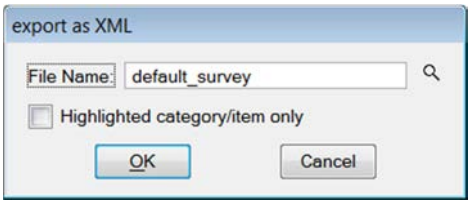
3. From the Survey menu bar, select **Visualization > Edit SMD Table**.



4. If the SMD table is not your default, change to the correct file by selecting **File >** Open and selecting the appropriate SMD.
5. To create the XML file, select **File >Save As > XML** from the Survey Preferences dialog.



6. Now we need to name the file. Note that the XML extension is not needed, as it is added automatically. By default, the entire SMD file is utilized. However, you may use only part of the SMD by utilizing the highlighted category/item only option. Simply highlight the category in the SMD, and then toggle on the option. Click **OK** to complete the process. The XML file will be created in the same directory where your active DGN file is located.



Exercise: Link Active Styles

Exercise Objective:

You will link the product files of your choice, review the properties and learn what changes are necessary to get the appropriate graphics. You will do this for both survey and design entries.

Getting Started

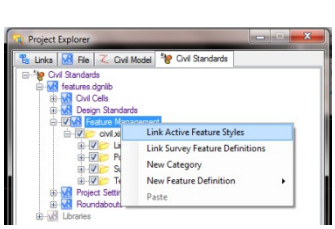
GEOPAK: Set the filter to .DDB and select the file from the data directory.

InRoads: Set the filter to .XIN and select the file from the data directory.

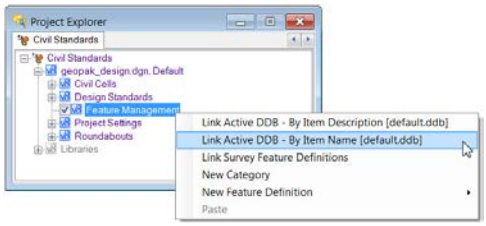
MX: Set the filter to .PSS and select the file MXRoad.pss from the data directory.

Procedure

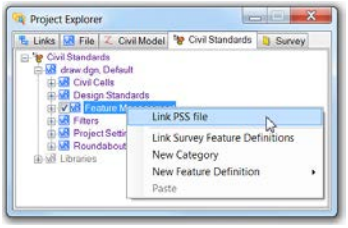
1. Create a new DGNLib called *features.dgnlib.*
2. Open the Project Explorer and the Civil Standards tab.
3. Click on the **Feature Management +**. There should be nothing under the entry.
4. Right-click on Feature Management and select **Link Active Feature Styles**. Note if you are using GEOPAK, Use Item Name option.



InRoads options



GEOPAK options



MX options

Upon selection the styles are read into the DGNLIB file as linear, point and surface features.

WHAT HAPPENED - INROADS?

The XIN was read.

- All feature names must be unique.
- Features have three types: Linear, Point and Surface.
- Survey features are linked separately.
- All styles which have the Geometry Line, Curve or Spiral defined on are added to the linear section.
- All styles which have the Surface setting for 3-D/Plan Display turned on are added to the linear section.
- All styles where the Geometry Points is defined are added to the Point section.
- All styles that have the Surface Setting for Components turned are added to the Surface section.
- Names are assigned in the order Surface > Linear > Point.

EXAMPLE

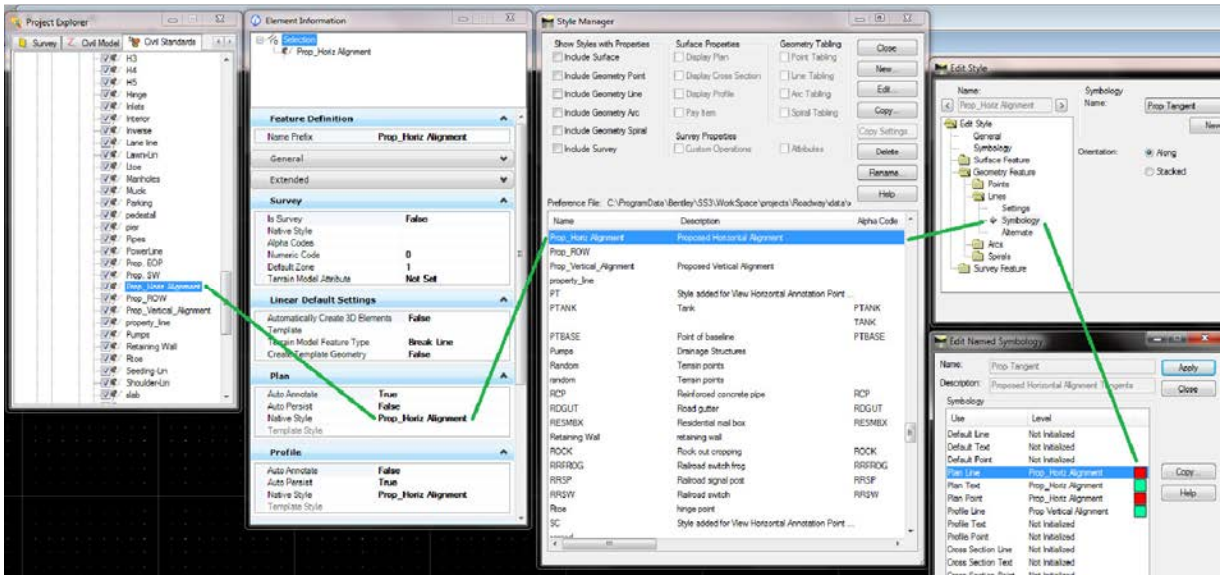
Pavement style fits all sections. Pavement is the name added to Surfaces, Pavement-Lin is added to Linear and Pavement-Pnt added to Points. If Pavement only had geometry defined in the XIN file then Pavement is the name in Linear and Pavement-Pnt is the name in Points.

INROADS MAPPING FOR LINKED STYLES

Feature	InRoads Style
Linear	Linked Style Symbology
Plan – Line	Geometry Line Plan Line
Plan – Curve	Geometry Curve Plan Line
Plan – Spiral	Geometry Spiral Plan Line
Profile – Line	Geometry Line Profile Line
Profile – Parabola	Geometry Curve Profile Line
Cross Section Point	Surface Cross Section Point
3D – Line	Surface Plan Line
Survey – Point	Survey Plan Point
Survey – Line	Survey Plan Line
Intersected Profile Point	Geometry Point Plan Point
Projected Profile Line	Surface Plan Line
Point	
3D – Plan	Geometry Point Plan Point
Surface	
Profile	
Cross Section	Surface Cross Section Line
3D	Element Template

HOW THE LINKING WORKS

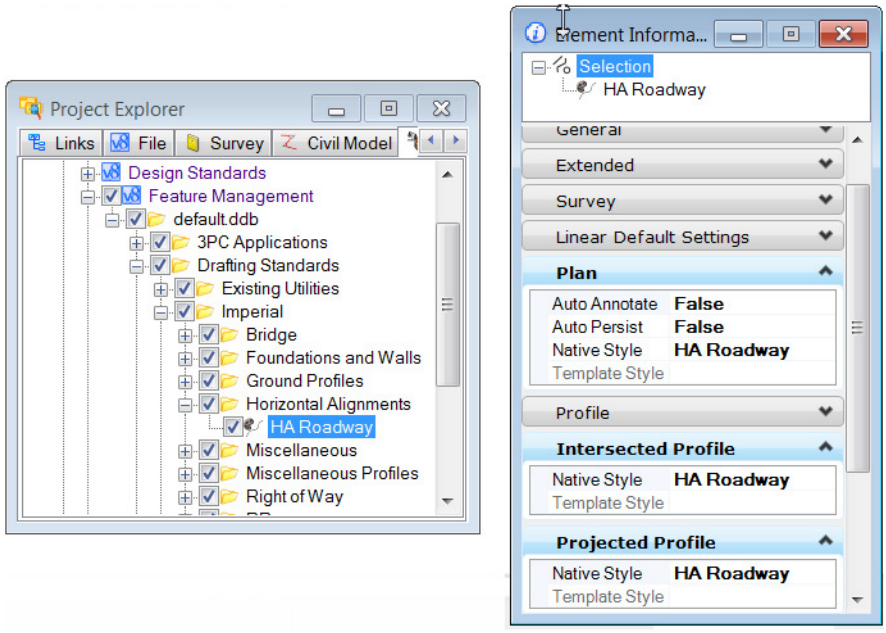
A native style is linked to a particular attribute such as Plan or 3D.



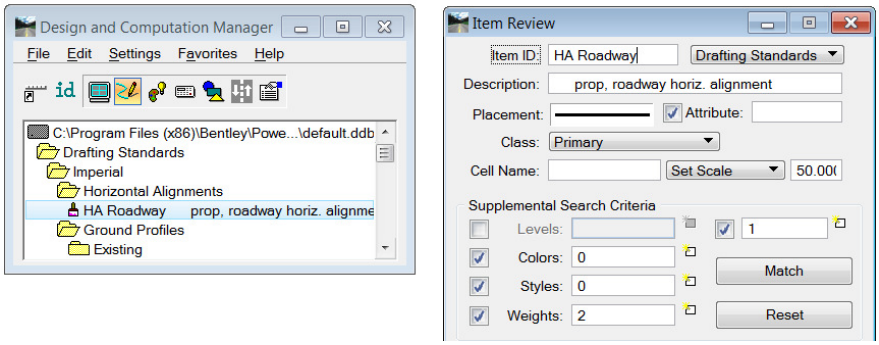
WHAT HAPPENED - GEOPAK?

The DDB was read.

- All feature names must be unique.
- Features have three types: Linear, Point and Surface.
- Survey features are linked separately to the Survey Manager Database (SMD) in XML format.
- Features may be linked to DDB Item Names or Item Descriptions. The Item Descriptions link is useful if the Item Name is simply a pay item number with no description.



Native Style in Project Manager Used in Plan and Several Profile Options



Native Style Relating to DD Item Name and Associated Settings

WHAT HAPPENED? - MX

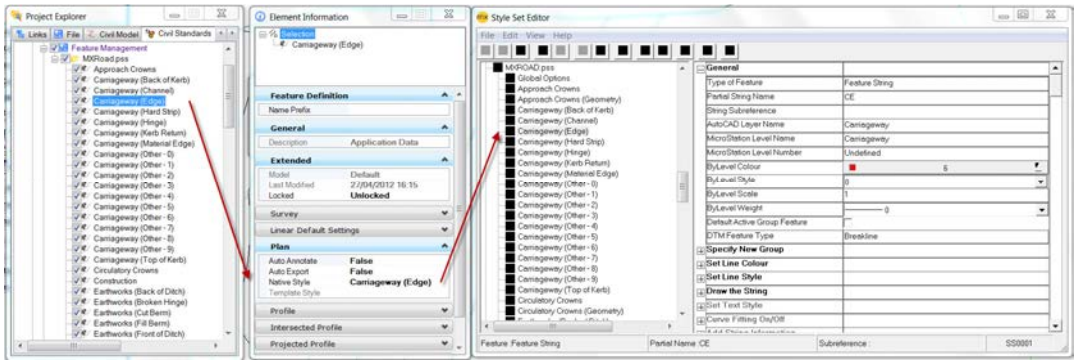
The PSS was read into a flat structure the same as we get in Style Set Editor.

Since a MX PSS only holds a single style representation and does not distinguish between plan / profile / section / 3d, by default the same style definition is applied to each persona. The persona styles can be modified later to take advantage of different display representations.

The MX string feature types are matched to the appropriate feature definitions from the following table:

FEATURE	SUPPORTED MX STRING TYPES	DEFAULT STYLE MAPPING
Surface	Cross Section strings Long Section Strings Triangulation Strings	MicroStation Element Template On import a new Element Template is created - Category (PSS name) > Feature Name Using feature style to define Level, color, linestyle, weight, material (if defined).
Linear	Feature Strings Interface Strings Master Strings Geometry Strings	PSS feature
Point	Survey Station Point Cadastre	PSS feature

Feature names must be unique and names are assigned in the order Surface > Linear > Point.



The PSS structure is 'flat' and so all features are initially loaded to match this historic flat feature definition structure. However this is an opportunity to categorize features into groups, possibly of similar features or into a method of your own choosing, too enhance the normal MX feature structure.

Example the MXRoad.pss could be imported and grouped with sub categories for all the different string features that fit the category like Carriageways / Shoulders / Alignments / Earthworks etc.

In this case, create a category called MXRoad and move all features under it.

LINKING SURVEY STYLES

Note the linking in the previous section did not include Survey. They are linked separately.

Link Survey Styles to DGNLib

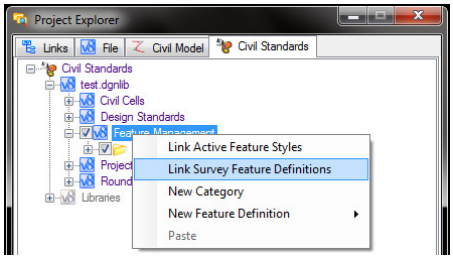
Objective:

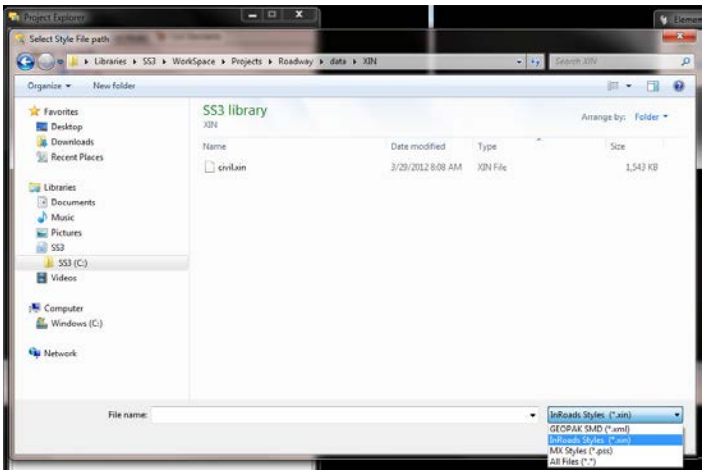
We will link the Survey styles to this DGNLIB.

Procedure:

The steps vary because the linked file is identified from disk as opposed to the loaded .XIN file.

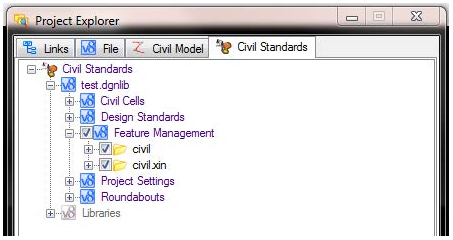
1. Continue in *features.dglib*.
2. Right-click menu on Feature Management and select **Link Survey Feature Definitions** from the pop-up menu.





This dialog allows you to select the three style files for GEOPAK, InRoads and MX.

InRoads: Select the … *data**standards**civil.xin* and then select Open to process this file into the DGNLIB file.



GEOPAK: Select … *data**standards**civil.xin smd.xml* (SMD file in xml format) and then select Open to process this file into the DGNLIB file.

MX: Create a new Category Simple Survey and Select the … *data**standards*\Simple Survey.pss.

Note The survey features are created if they did not exist in the previously imported files. If the feature does exist then the survey information is added to the existing feature.

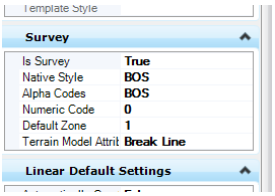


Figure 1 Survey Defined

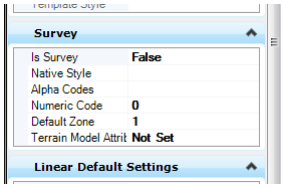


Figure 2 No Survey Defined

CHAPTER SUMMARY

These steps are how style files are linked to features in a DGNLIB. You did not transfer the symbology into the DGNLib. You have created entries that are linked back to the XML (of SMD)/PSS/XIN file where the native product symbology is defined or to element templates in a DGNLib.

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Chapter 10: Pre-Deployment Tasks

OVERVIEW

Now we have completed most of our setup tasks. This includes our DGN Lib's, seed files, and project settings. We've also set up our features. Our final tasks include critical testing, and setting up any T IW files that we need to customize. This is the time where we check our results, to ensure that our data is processed. This includes the correct cells for point features checking the linking codes to be sure our linear features are chained together properly, checking our feature definitions to ensure correct symbology. This will require some survey expertise to ensure the results are in compliance with your organization's business model. This final testing can also be utilized to confirm or adjust your survey workflow as needed. In most cases, workflow changes will not be necessary, however, it depends upon the current version you are using. The exercises in this chapter will emulate the workflows of your actual survey users, so you can use these as a starting point if you need training exercises or quick start information.

CREATE CUSTOM TIW FILES AND INCORPORATE INTO STANDARDS

One final task is to create the TIW file for any of the data import files that have not yet been addressed. Note to put into production is a three-step process:

- create the TIW file,
- move into the standard TIW folder,
- add to the Data Import Items dialog.

You must have the actual dataset file, not just a hard copy to complete this procedure.

Before you import a file using the Text Import Wizard, you define a general format, called a wizard, that can be used repeatedly to import any number of files of the same type. A wizard describes 1) the contents of each column of data, 2) whether the columns are fixed-width or are separated by delimiters, and 3) which rows to import.

A wizard is made up of one or more filters. Filters are sets of parameters that describe different groups of lines within the file to import. In many cases, a wizard will consist of a single filter. This is the case with uniform data files. In a uniform data file, all the data lines to be read are of the same format. Because of the consistency of format, a wizard needs only one filter to describe a uniform data file. When you define a wizard for importing a uniform data file, the wizard and the filter are one and the same.

Non-uniform data files, on the other hand, contain rows of various formats (different rows exhibit different formats) in a single data file. To accommodate multiple row-formats, a wizard must contain more than one filter. Specifically, a wizard needs one filter for each type of row-format to be accommodated. In the process of defining a wizard for importing a non-uniform data file, you define multiple filters that, taken together, constitute the wizard.

Create Custom TIW Files and Set Up for Production

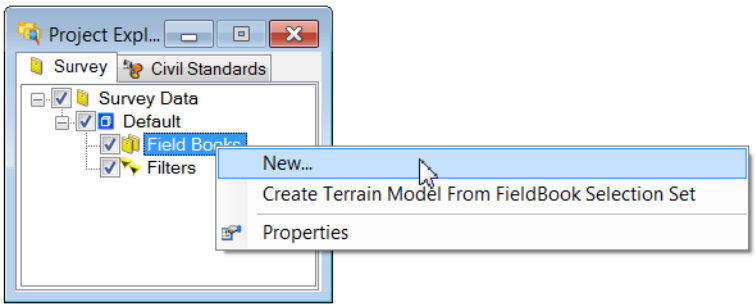
Objective:

The objective of this exercise is to create and deploy the TIW file for any of the data import files that have not yet been addressed. Repeat the process for all custom datasets. You can create all TIW files, then incorporate into the Data Import Items dialog.

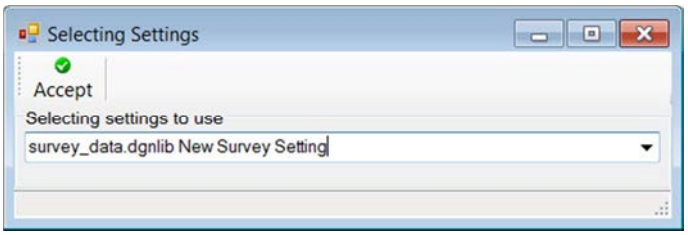
It is important to note that each file (not each field book) can have only one Survey Project settings. Once the Project Settings has been selected, it cannot be removed from the file. Therefore, it is the best practice to create the customized TIW files using a file other than the DGN Lib where the project settings are contained, if you have multiple Survey Project settings.

Procedure:

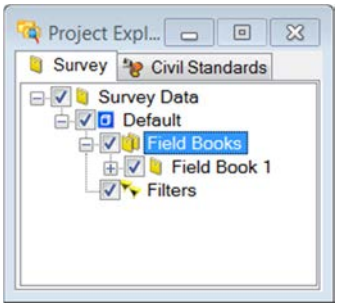
1. Open *test*.dgn*.
2. Open **File > Project Explorer**.
3. Select the **Survey** tab.
4. Expand Default by clicking on the plus sign.
5. Right–click **Field Books** and select **New…**



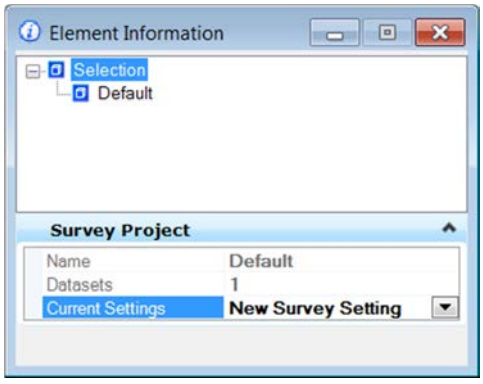
6. When prompted for the Selecting Settings, select the DGNLib you created with your Survey Project Settings and click **Accept**. If you do not see your DGNLib listed, your configuration variable is not set up properly. If you are not prompted for Selecting Settings, your file already has one assigned. In this case, create a new file for your seed file.



Field Book 1 has been added underneath Field Books. If necessary, expand Field Books by clicking on the + sign.

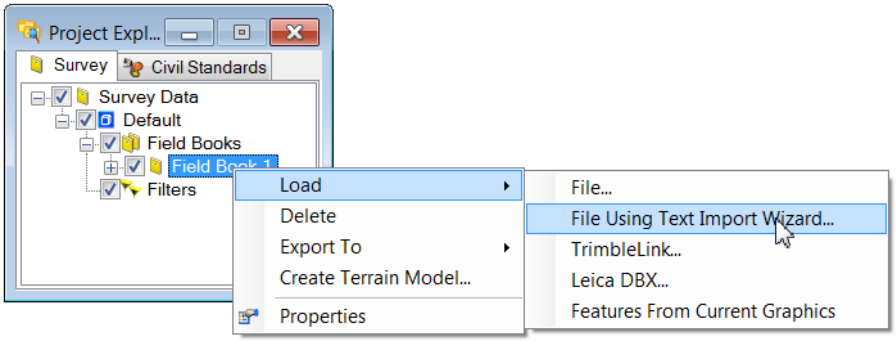


7. To verify the settings, highlight **Default**, right–click and select **Properties**.

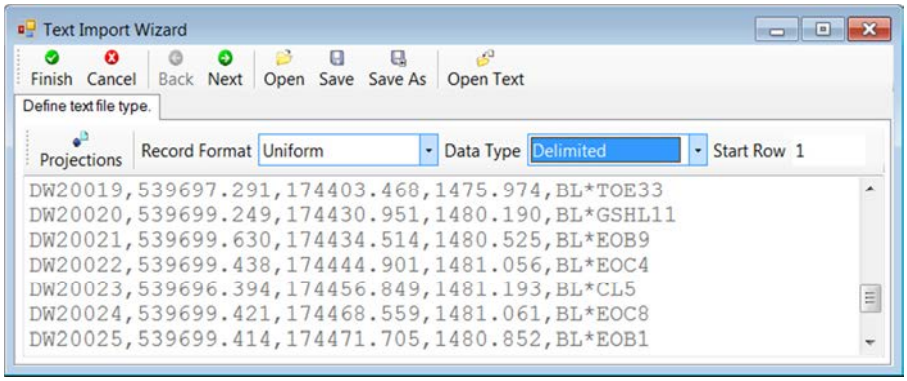


The name of your Current Settings is displayed.

8. Highlight Field Book 1, right–click and select Load >File Using Text Wizard...

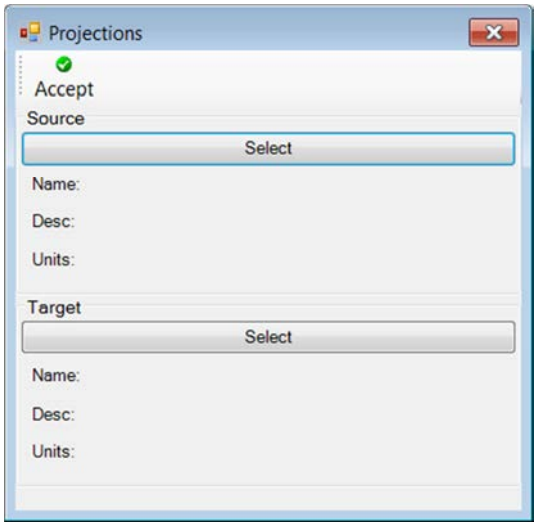


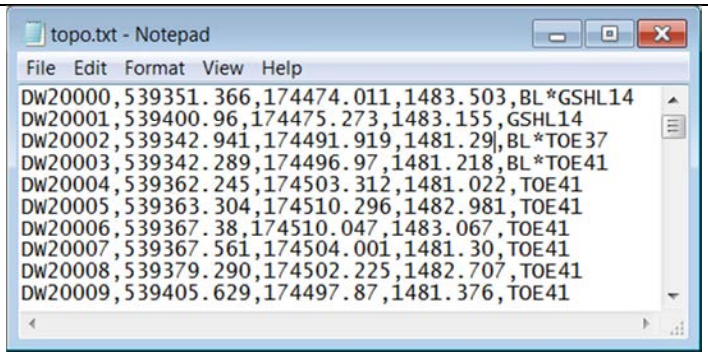
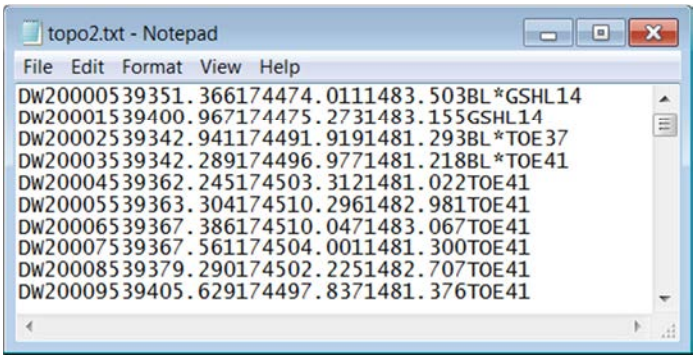
9. Navigate to your data set file, select the file and click **Open**. Note you may have to change the file filter to all files, if you don't see your file name in the correct folder.



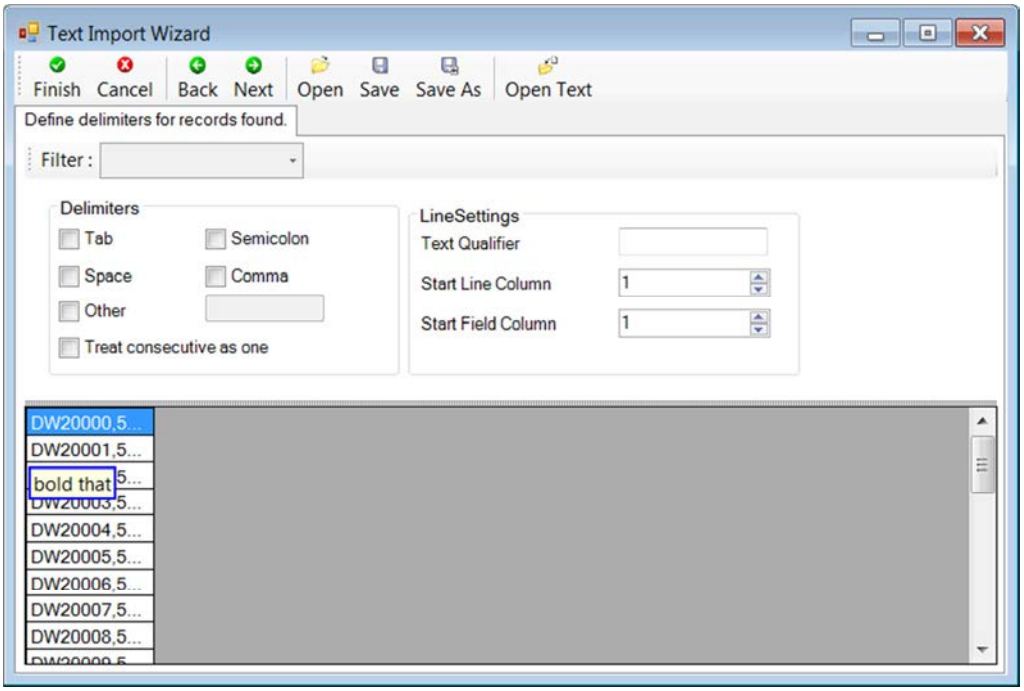
The Text Import Wizard dialog opens with the selected file displayed.

10. Several options for Text File Type need to be defined.

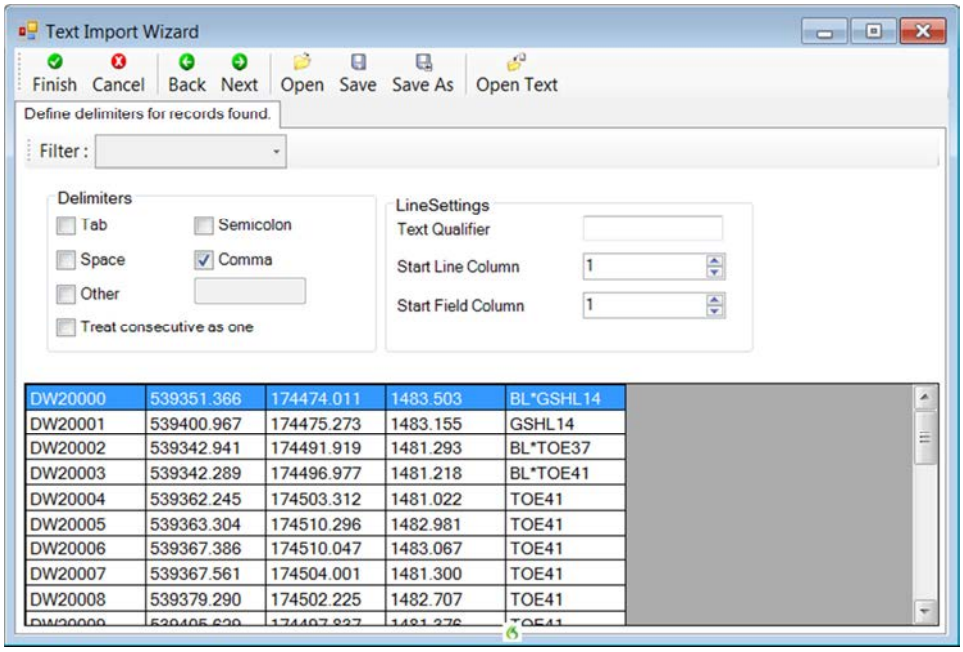
OPTION	DESCRIPTION
Projections	If you are using Projections, click the **Projections** button and enter Source and Target GCS data.  Remember to click **Accept** after populating the dialog to remember the information and close the dialog.
Record Format	If your data format is consistent from one line to the next, set the **Record Format** to Uniform. If not, set the **Record Format** to Nonuniform. In the case of multiple line formats, you'll need to set up filters for each variation.
Data Format	Specify if the file is organized according to a free form or a column based format. Delimited - With free form formats, data does not necessarily line up column wise; i.e., the decimal point for an x-coordinate does not always occupy the same column. Each individual data item is separated by some form of delimiter: space, comma, dash, semi-colon, etc.

	 Fixed - Column based formats, always line up column wise. With a column based format, spaces or other delimiters may not be found between individual data items. 
Start Row	If there are header rows before the actual data, determined the first row of data and set the start row number. If the entire file is raw data, set the start row 1.

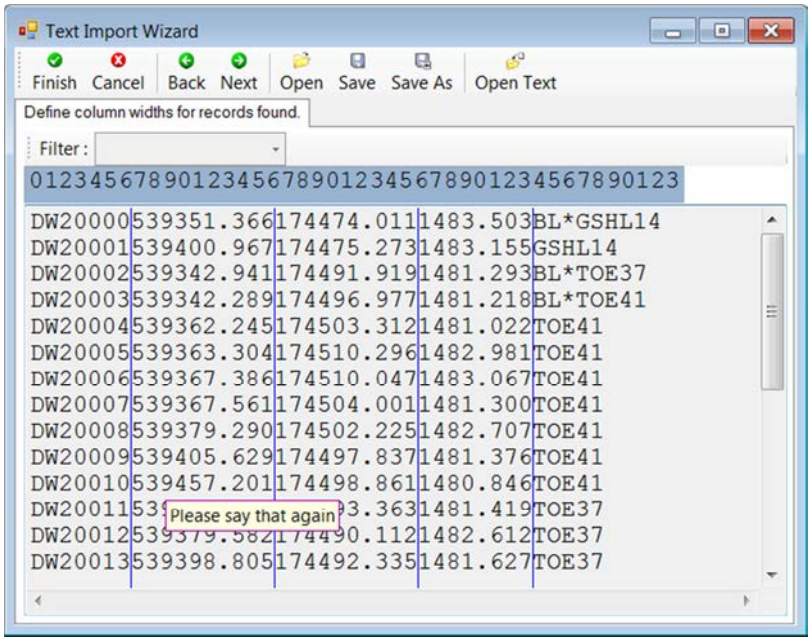
11. Click **Next** to proceed in the wizard. Note the wizard looks different, depending on the options selected in the previous wizard.
12. A. Let's look at delimited files first.



Toggle on the appropriate delimiter which expands the display area and separates the data into fields.

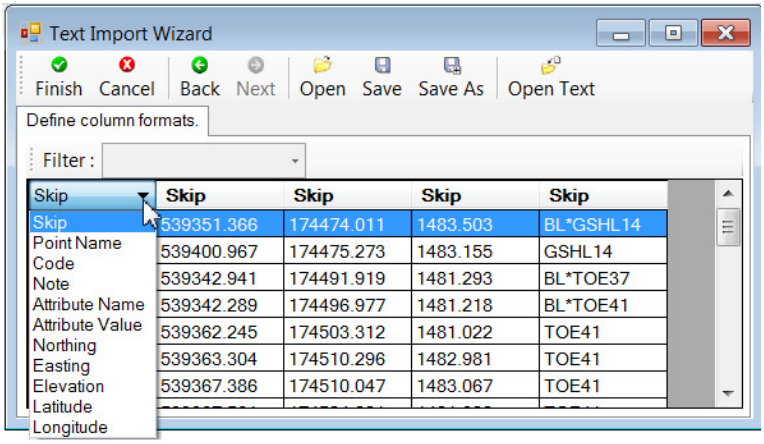


12 B. Next, let's look at fixed format. Initially, the display area shows the data file. The line directly above the display area shows the column numbers. Within the display area, click to indicate the separation of each field. Vertical demarcation lines are drawn wherever you click. If you make a mistake, click the line again for its removal.

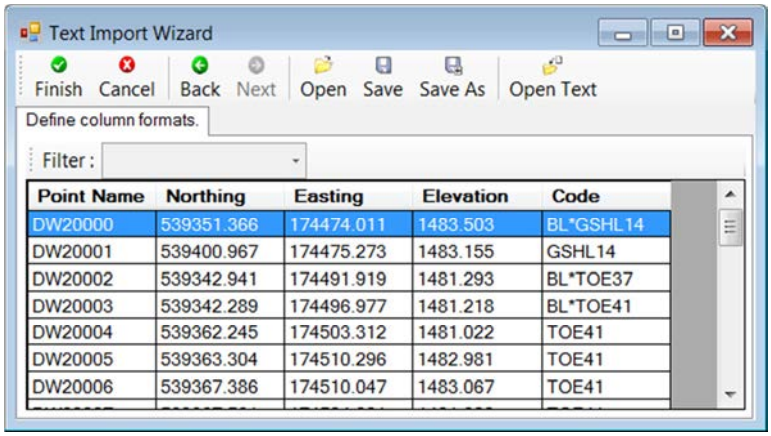


13. After the fields have been identified (whether delimited or fixed width), click **Next** to move ahead in the wizard.

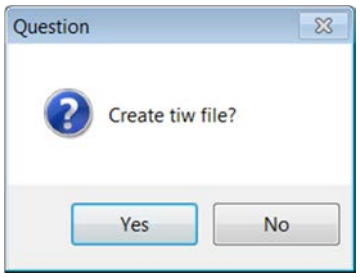
14. For each field, select the data type from the pick list. If the field is not to be used, leave it set to **Skip**.



One sample of a completed column formats is illustrated below.



15. Click **Finish**. When prompted to create a TIW file, click **Yes**.



16. In the Save Text Import Wizard File dialog, name the TIW File and place in the folder with your other customized TIW files specified by your configuration variable or place in the default directory.
17. When prompted to save TIW file format in import settings, click **No**. If we click yes, the TIW file format is added to the Project Settings in our active file. We want to add it into our DGN Lib instead.

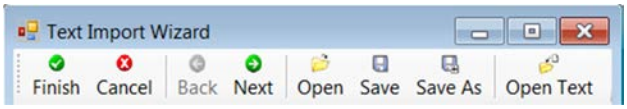
Note	We still need to add the TIW file into our data import items list. We will do that in the next exercise. But before we leave the wizard, let's look at a few more tips and tricks.

SAVING YOUR TIW FILE

The Text Import Wizard will not allow to you save a wizard until you specify, on the Step 3 dialog, at least the northing and the easting data columns (see the section called Columns Required for Import for details on which columns are required for each of the various data types). If you try to save a wizard before fulfilling the minimum requirements for a filter, the software will display an error message that attempts to describe specifically what requirements the wizard is failing to meet.

One you have defined at least one filter, you can save the wizard, even if you are in the process of defining an additional filter. (Recall that wizards for importing non-uniform files can comprise more than one filter.)

ADDITIONAL TOOLS IN THE WIZARD



Several tools located at the top of the Text Import Wizard are detailed in the table below.

TOOL	DESCRIPTION
Finish	Click for completion of Wizard
Cancel	Closes the current wizard without saving the current settings.
Back	Backs up one screen in the Wizard process.
Next	Moves forward one screen in the Wizard process.
Open	Open an existing TIW file for review / editing.
Save	Saves the current TIW file with the same name.
Save As	Saves the current TIW file to a new name.
Open Text	Opens a (dataset) file and displayed in the review area.

HOW MULTIPLE FILTERS OPERATE

This section describes how multiple filters are used to process a non-uniform data file, files whose various rows exhibit varying data formats.

Each filter that you define is added to the wizard by means of the Add button on the Text Import Wizard - Step 2 dialog. The order in which you add the filters is critical because the order determines which filter is applied to a particular line when that line satisfies more than one filter.

It is possible for a single line in a data file to satisfy the conditions of more than one filter.

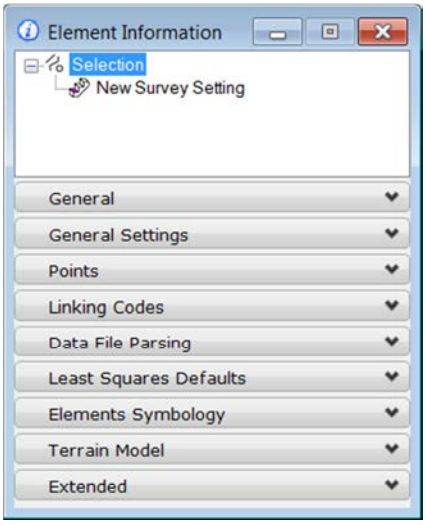
The wizard makes a single pass through the data file, reading one line at a time. To each line, the wizard applies the filters in the order in which they were added to the list on the Text Import Wizard - Step 2 dialog. The filters are applied one-at-a-time until one of them successfully matches the particular row of data, or until they all fail. A match occurs when a data line satisfies the filter's Include parameters, defined on the Text Import Wizard - Step 2 dialog.

Once a match occurs between the data line and a filter, the data line is imported according to all the parameters specified in the corresponding filter. After importing the data line, the wizard moves on to the next line in the data file. If no match occurs even after all filters have been attempted, the data line is ignored, and the wizard moves on to the next line in the data file.

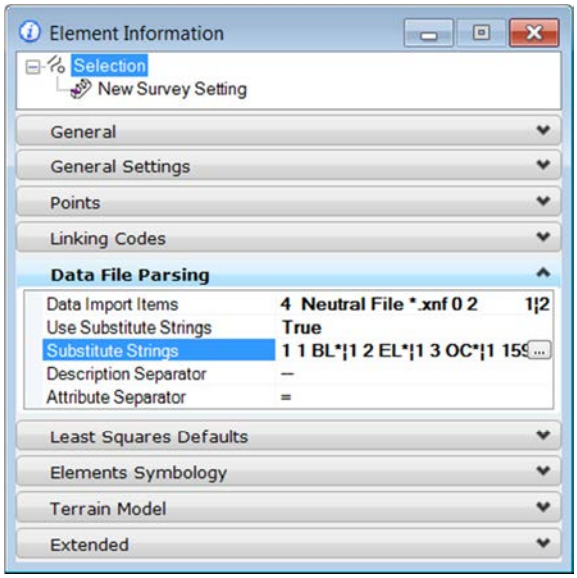
COMPLETING THE TIW FILE SET UP

Procedure:

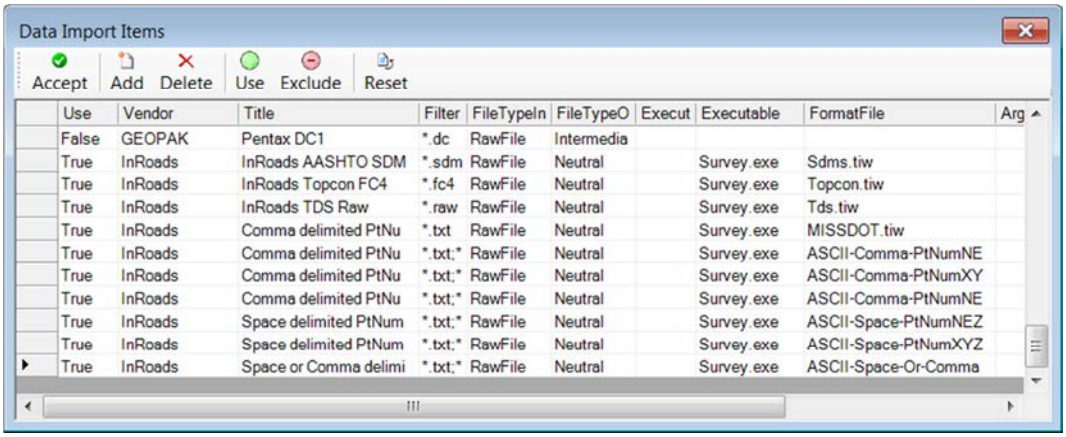
1. Open DGNLib file *survey_data.dgnlib*.
2. Open **File > Project Explorer** and select the **Civil Standards** tab.
3. Expand **Project** Settings by clicking on the + to the left of the item.
4. Highlight **New Survey Setting**, right-click and select **Properties**.



5. Expand the **Data File Parsing** section by clicking on the black arrow on the right side of the section header.

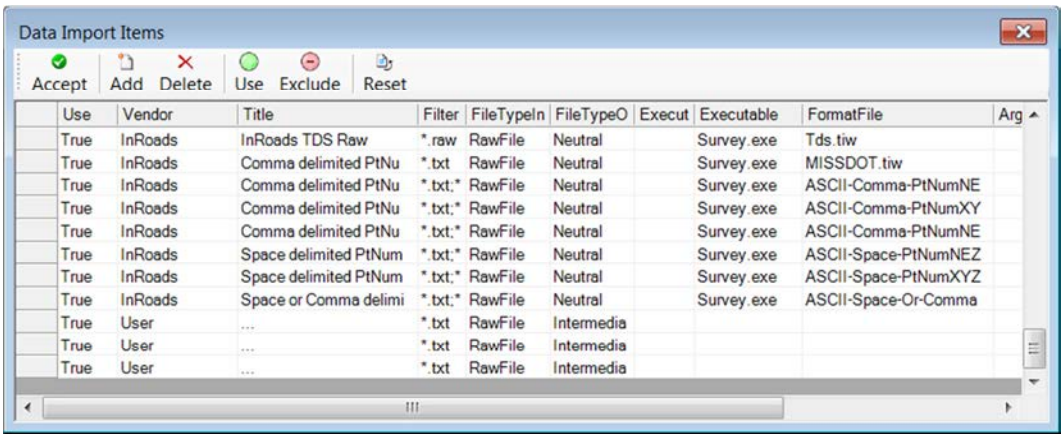


6. Click in the cell to the right of **Data Import Items**.



Use	Vendor	Title	Filter	FileTypeIn	FileTypeO	Execut	Executable	FormatFile	Arg
False	GEOPAK	Pentax DC1	*.dc	RawFile	Intermedia				
True	InRoads	InRoads AASHTO SDM	*.sdm	RawFile	Neutral		Survey.exe	Sdms.tiw	
True	InRoads	InRoads Topcon FC4	*.fc4	RawFile	Neutral		Survey.exe	Topcon.tiw	
True	InRoads	InRoads TDS Raw	*.raw	RawFile	Neutral		Survey.exe	Tds.tiw	
True	InRoads	Comma delimited PtNu	*.txt	RawFile	Neutral		Survey.exe	MISSDOT.tiw	
True	InRoads	Comma delimited PtNu	*.txt;*	RawFile	Neutral		Survey.exe	ASCII-Comma-PtNumNE	
True	InRoads	Comma delimited PtNu	*.txt;*	RawFile	Neutral		Survey.exe	ASCII-Comma-PtNumXY	
True	InRoads	Comma delimited PtNu	*.txt;*	RawFile	Neutral		Survey.exe	ASCII-Comma-PtNumNE	
True	InRoads	Space delimited PtNum	*.txt;*	RawFile	Neutral		Survey.exe	ASCII-Space-PtNumNEZ	
True	InRoads	Space delimited PtNum	*.txt;*	RawFile	Neutral		Survey.exe	ASCII-Space-PtNumXYZ	
True	InRoads	Space or Comma delimi	*.txt;*	RawFile	Neutral		Survey.exe	ASCII-Space-Or-Comma	

7. Click **New** to add a new line to the table, which has some fields already populated. These are just defaults, and can be changed as needed. Note, you may add several lines at one time. You also may need to stretch the dialog and adjust column widths to see the Executable and Format File columns.



Use	Vendor	Title	Filter	FileTypeIn	FileTypeO	Execut	Executable	FormatFile	Arg
True	InRoads	InRoads TDS Raw	*.raw	RawFile	Neutral		Survey.exe	Tds.tiw	
True	InRoads	Comma delimited PtNu	*.txt	RawFile	Neutral		Survey.exe	MISSDOT.tiw	
True	InRoads	Comma delimited PtNu	*.txt;*	RawFile	Neutral		Survey.exe	ASCII-Comma-PtNumNE	
True	InRoads	Comma delimited PtNu	*.txt;*	RawFile	Neutral		Survey.exe	ASCII-Comma-PtNumXY	
True	InRoads	Comma delimited PtNu	*.txt;*	RawFile	Neutral		Survey.exe	ASCII-Comma-PtNumNE	
True	InRoads	Space delimited PtNum	*.txt;*	RawFile	Neutral		Survey.exe	ASCII-Space-PtNumNEZ	
True	InRoads	Space delimited PtNum	*.txt;*	RawFile	Neutral		Survey.exe	ASCII-Space-PtNumXYZ	
True	InRoads	Space or Comma delimi	*.txt;*	RawFile	Neutral		Survey.exe	ASCII-Space-Or-Comma	
True	User	...	*.txt	RawFile	Intermedia				
True	User	...	*.txt	RawFile	Intermedia				
True	User	...	*.txt	RawFile	Intermedia				

8. Add each of your TIW files (one per line) that are not already in the list. Populate the fields:
   - Use: True
   - Vendor: <use your Vendor name>
   - Title: <use your own Title here>
   - Filter: <use your own file filter here>, example, *.txt
   - FileTypeIn: Neutral
   - Executable Path: <leave blank>
   - Executable: survey.exe
   - FormatFile: <your TIW file>, example *.tiw click in the field and navigate to your standard TIW directory!

9. While in this dialog, you may want to do some cleanup. For example, the users will see all of the data import items listed for the appropriate extension. You may want to just delete those that are never used by your organization. Another option is to set the Use column to False.
10. Do NOT close the dialog by clicking the X in the upper right-hand corner! You must click **Accept** in order to save your data, which also closes the dialog.

SETTING UP TESTING ENVIRONMENT

In this section, we need to pull together all of the various components that we have completed in setting up our environment. This includes testing our configuration variables, reviewing our seed files, and ensuring that the DGN Lib's are in place and pointers to them are working.

Note An exact match from your native survey mapping may not occur. We tried to match as much as possible, but variations will occur.

CONFIGURATION VARIABLES

In earlier chapters, we determined what configuration variables to use and the value appropriate for your organization. Now we need to incorporate those configuration variables into our workspace. Keep in mind they should be done in the workspace for your survey users, or on a project level or a site level basis.

To configuration variables are critical to the deployment of survey.

CONFIGURATION VARIABLE	DESCRIPTION
CIVIL_SURVEY_STYLEFILE	Defines the Style file that is linked in the Survey Feature definitions. Available options are an XIN from InRoads, an XML from a GEOPAK SMD or a PSS from MX.
CIVIL_SURVEY_USERTIW_FOLDER	Defines an alternate directory where user .TIW files can be located.

If the CIVIL_SURVEY_STYLEFILE variable is not defined, the user is prompted every time a survey DGN file is opened. In addition, any survey processing will not be drawn with the appropriate Survey Feature definitions.

The CIVIL_SURVEY_USERTIW_FOLDER configuration is optional but very helpful if you want to store the TIW files in a central location, rather than on each machine. The software will still use the default location to find the standard TIW files, such as those for raw files from various data collectors. The use of this variable will augment the selection by pointing to a folder on a central server.

Other important configuration variables are those that point to DGN Lib's and also the configuration variable for reports, if customize reports for surveys are used.

CONFIGURATION VARIABLE	DESCRIPTION
CIVIL_REPORTS_DIRECTORY	If the variable is set to a valid directory location, then the software looks at this specific location to locate the XML reports. If this variable is NOT set or it's set to an invalid location, then the software would look at the location where Civil installs the reports by default. NOTE: If the InRoads Project Default XSL location is defined then that is used before CIVIL_REPORTS_DIRECTORY. This maintains continuity for InRoads users.
CIVIL_CONTENTMANAGEMENTDGNLIBLIST	This variable defines both the directory and specific file name of the feature definitions DGN Library.
CIVIL_PROJECTSETTINGSDGNLIBLIST	This variable defines both the directory and specific file name of the project settings DGN Library.
CIVIL_CIVILTMDGNLIBLIST	This variable defines both the directory and specific file name of the terrain model filters DGN Library.

Add Configuration Variables to the Workspace

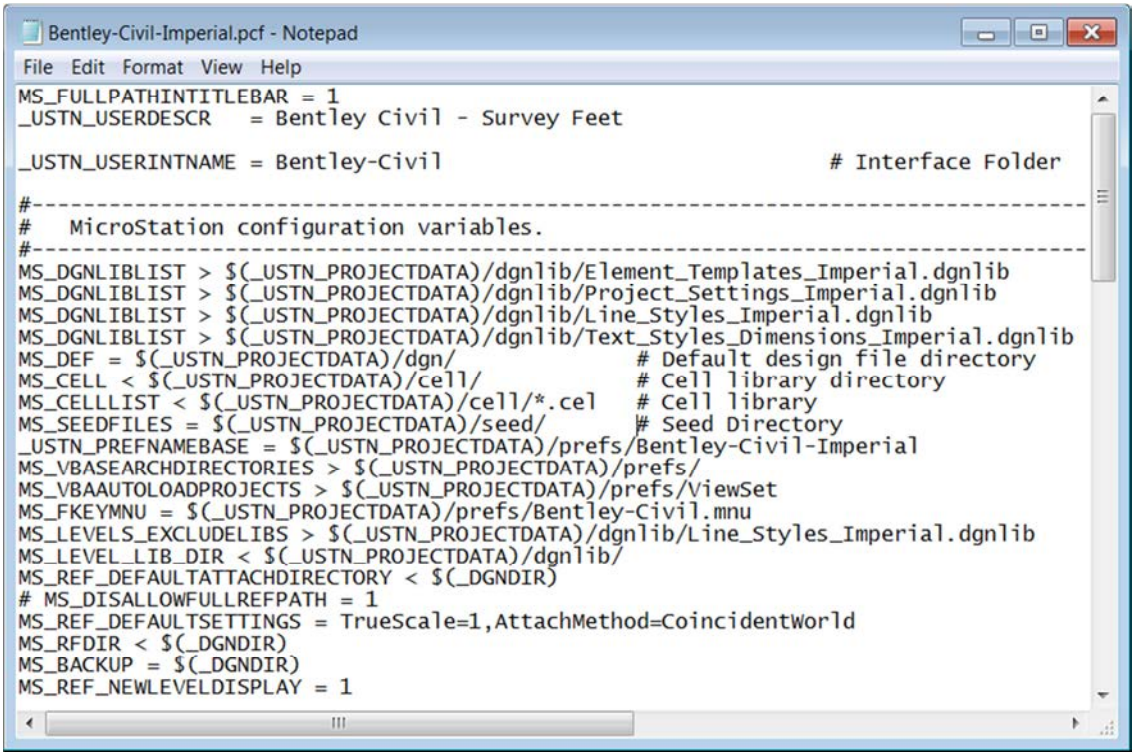
Objective:

The objective of this exercise is to add the configuration variables to the workspace and test. Note detailed instructions are not included, due to the wide variety of workspace set up options. Many of the configuration variables can be added within your seed file and saved to the PCF. In more direct option is to edit the PCF file, being careful with syntax. Refer back to chapter 6 entitled "Configuration Variables" and chapter 2 entitled "Workspaces".

Note	If you have your own workspace, you will want to utilize it.

Procedure:

1. In Windows Explorer, Navigate to: *C:\ProgramData\Bentley*Civil_Product_Name*\WorkSpace\Projects\Examples*. The example pcf files and associated sample folders are located here.
2. Using any text editor, open either *Bentley-Civil-Metric.pcf* or *Bentley-Civil-Imperial.pcf*.

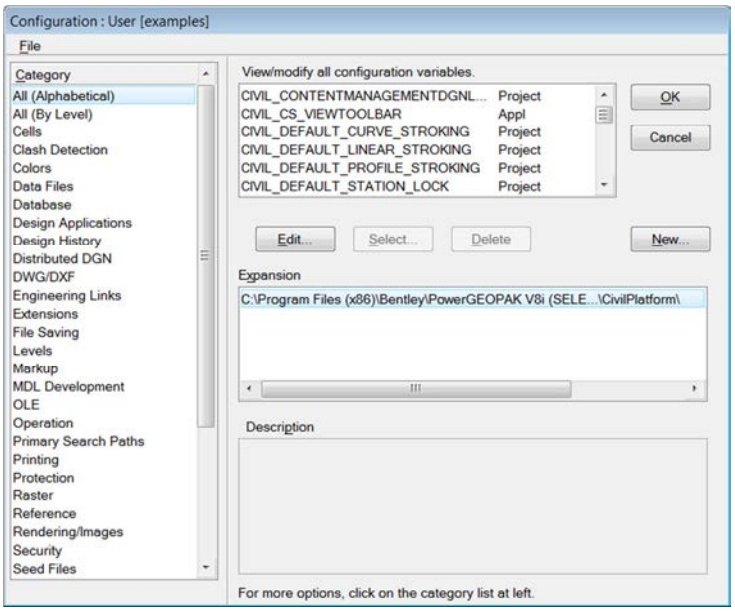


3. Add in your configuration variables and their values. To add comments, use the # symbol to begin the line. When complete, save the file.
4. Double-click the Bentley Civil icon (any Inroads, GEOPAK or MX product) on your desktop.

5. In the File Open dialog, set the following to access your configuration (lower right corner):

FIELD	ENTRY
User	Examples
Project	Bentley-Civil-Metric or Bentley-Civil-Imperial
Interface	Bentley-Civil

6. At the top of the File Open dialog, click **New File**.
7. In the folder *c:\Survey_Transition*, create a file named *test2.dgn*.
8. Click **Open**.
9. Select **Workspace > Configuration** from the main menu bar.



10. Scroll down the list and check the Civil configuration variables with your list. Consult the help file to see descriptions and possible values (covered in chapter 6).
11. Make any changes / corrections as needed. Keep in mind you may have to get in and out of the file for the changes to take effect.

Set up Final Testing Procedure – Seed Files

Objective:

The objective of this exercise is to check the file settings when creating a new file (using our seed file). Repeat this process for all seed files you've created.

Procedure:

1. Select **File > New** from the MicroStation main menu, create a new file *test*.dgn*. Make sure you are selecting the seed file you previously created for survey.
2. Select **Settings > Design File Settings**.
3. Highlight Working Units. Ensure the appropriate units are set.
4. Highlight **Civil Formatting**.
5. Ensure the desired values are set in each section, then click **OK** to close the dialog.

6. If you are setting the GCS in your seed files, select **Tools >Geographic > Select Geographic Coordinate System** from the main MicroStation menu.
7. Verify the displayed GCS, then close the dialog.
8. To check the Annotation Scale(if you are using), click **File > Models** to open the *Models* dialog.
9. Click the *Edit Model Properties* icon to open the Model Properties dialog.
10. Verify the Annotation Scale then click **OK** to close the Model Properties dialog.
11. Review / adjust the settings in Project Explorer. Currently, you may have only the Civil Standards and Survey tabs active. Your users will need the Civil Model (for terrain models) and may want Files and Links. Adjust at this time, the easiest solution is to open all tabs and let the users turn off what they do not want.
12. If any changes are needed, opened the seed file and make the changes. Then create a new file using the updated seed file and repeat the process.

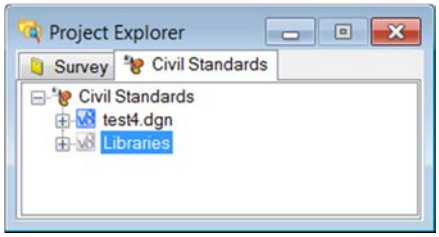
Set up Final Testing Procedure – DGN Libs

Objective:

The objective of this exercise is to check to ensure the DGN Lib pointers and files are correct.

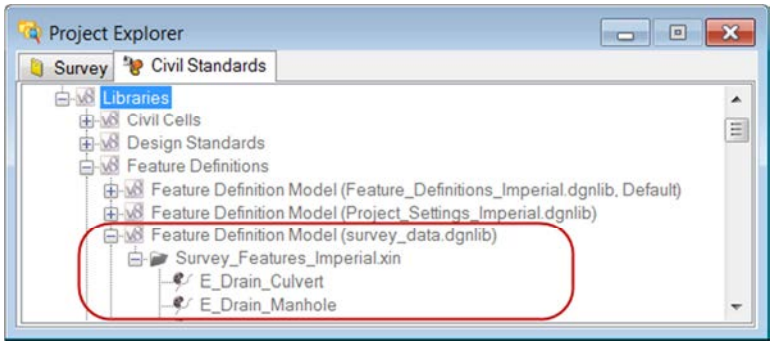
Procedure:

1. Select **File > New** from the MicroStation main menu, create a new file *test*.dgn*. Make sure you are selecting the seed file you previously created for survey. Open the file.
2. Open **File > Project Explorer** and select the **Civil Standards** tab. Note you should have two entries directly under Civil Standards: your active file AND Libraries.

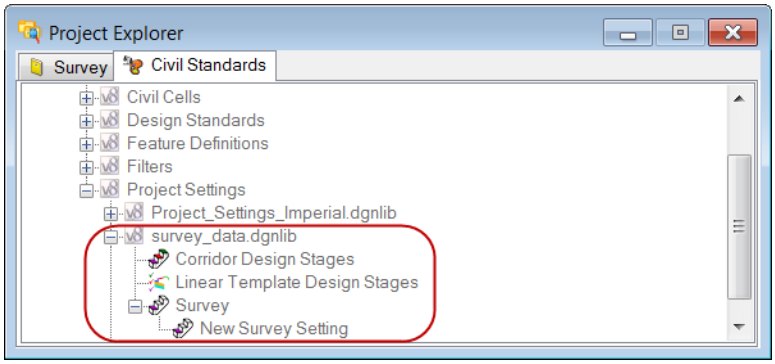


3. Expand **Libraries** by clicking on the + to the left of the item.
4. Expand **Feature Definitions** and locate the DGN Lib containing your survey feature definitions. Note there may be numerous DGN Lib files containing various other feature definitions.

5. Expand the DGN Lib to ensure the XIN or XML file is listed and contains feature definitions.



6. Scroll down and expand **Project Settings** and locate the DGN Lib containing your project settings.



7. Check any other DGN Libs that you have created and have set up pointers via configuration variables.

Final Testing Procedure – Data Collection

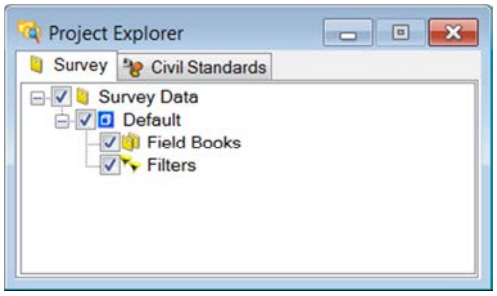
Objective:

The objective of this important exercise is to check that data processing is correct. It's not sufficient enough to just draw the data, but to verify features, linear connections, proper cells, etc. therefore, it is highly recommended to have your surveyors, standards personnel and power users all working on this final procedure.

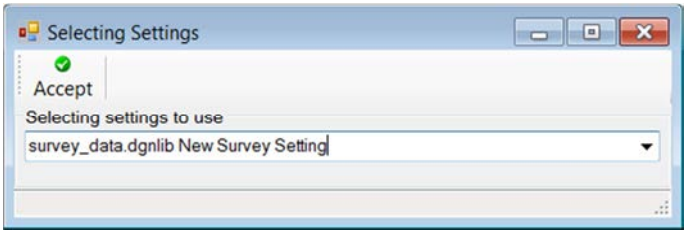
Procedure:

1. Select **File > New** from the MicroStation main menu, create a new file *test*.dgn*. Make sure you are utilizing the seed file you previously created for survey. Open the file.
2. Open **File > Project Explorer** and select the **Survey** tab.

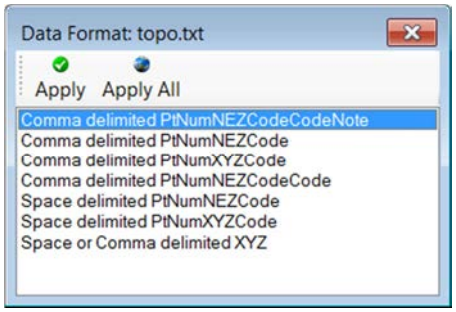
3. Expand **Default** by clicking on the plus sign.



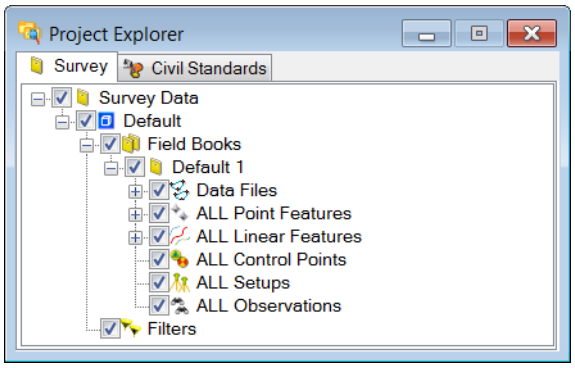
4. Drag and drop your dataset file into the Project Explorer.
5. When prompted for the Selecting Settings, select the DGNLib you created with your Survey Project Settings and click **Accept**. If you do not see your DGNLib listed, your configuration variable is not set up properly. If you are not prompted for Selecting Settings, your file already has one assigned. In this case, create a new file.



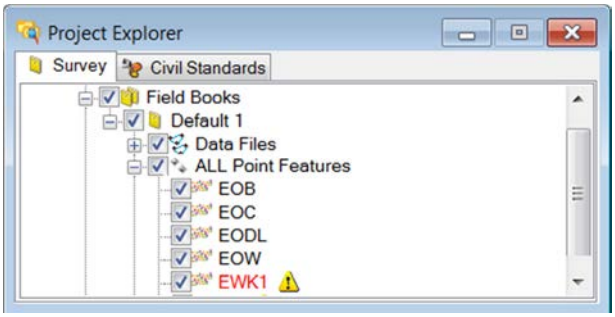
If you have multiple TIW files set up with your dataset file extension (for example *.txt), you'll be prompted to select the desired format. (If you only have one TIW file for the dataset file extension, you won't see this dialog.) Highlight and click **Apply**.



6. Default 1 has been added underneath Field Books. If necessary, expand Field Books by clicking on the + sign.



7. Expand ALL Point Features and review the points. Any that are shown in red with the warning triangle are not found and need to be addressed.



8. Repeat the process with the ALL Linear Features.
9. Review the drawing to ensure proper symbology, cells, etc. Make any changes / corrections to the appropriate resource and begin the process again with a clean seed file.
10. Repeat the process for all dataset files.

CHAPTER SUMMARY

We have now worked through how to transition to Bentley Civil Survey by setting up workspaces, creating seed files and DGN Libs, and setting up other resources.

Keep in mind that there is no ONE correct way to transition to Bentley Civil Survey. This guide presents suggestions and best practices and it is the responsibility of each organization to determine how they fit into your standard policies, procedures and operations.

It is impossible to cover all situations and all aspects of transitions in this guide. For specific questions, contact your Bentley personnel for assistance.

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Glossary

2D Point Feature	Contains no elevation (Z). 2D Point Features are defined and stored in plan model.
3D Geometry	3D geometry is created in 3D model by mathematically combining the horizontal and vertical geometry to create 3D elements. These 3D geometry elements in turn define a design model.
3D Model	This is created and managed automatically. User can interact with it but this is not usually required. The mathematical combination of Plan Geometry and Profile Geometry is stored in the 3D model.
3D Point Feature	3D points can be defined in plan model or 3D model. They are stored in 3D model but represented in both plan and 3D.
Active Object	The current object to which is added all geometry which is created.
Active Profile	Of the multiple possible profiles for an element, the active profile is the one used for design. The active profile is combined with the horizontal geometry to build a 3D element which is used in the 3D model.
Active Terrain Model	One terrain model can be designated as “Active”. The active terrain model is the one used to display “existing ground”; in other words the one which displays automatically in a profile model when it is opened. The active terrain model is also the one which is targeted by side slopes unless the template defines a different target by name.
ALG	A legacy (proprietary) InRoads file containing coordinate geometry information, superelevation, and alignment information for a specific geometry project.
Alignment	A linear feature which serves the special purpose of defining the centerline or baseline of a roadway.
Apply Linear Template	Applies a corridor template along a feature while hiding some of the complexity of creating a corridor.
Apply Surface Template	Applies a corridor template to a terrain model for the purpose of creating components (such as pavement layers) under the terrain model.
Arc Definition	Curve definition method generally used in roadway applications. The radius R is used to define the curve and is defined by the equation R=5729.58/D where the degree of curvature D is the central angle subtended by a 100-foot arc. Set in the Design File Settings > Civil Formatting under Radius Settings. *See also Chord Definition.*
Aspect	An angular measure of the direction that the face of a surface is oriented. The format of the value is dependent on angular settings In the DGN file.

Base Geometry	In many instances the geometry element will be trimmed. The original (or base), untrimmed element is always preserved as it is the storage for the rule.
Boundary (Terrain Model)	Used to constrain the external boundary of the terrain model. No triangles are created outside the boundary. In addition, any point data outside the boundary is ignored.
Break Line	A surface feature consisting of a collection of spatial coordinates that have an implied linear relationship. No triangle side (in the triangulated surface) can cross over a break line.
Break Void	A closed area of missing or obscured data that uses 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.
Cardinal Points	One of the points used to define the geometry of an alignment. Cardinal points include PC, PT, PI, and CC points for horizontal geometry and VPC, VPI and VPT for vertical geometry.
Centroid (triangle)	Geometric center of a triangle in a terrain model.
Chord Definition	Curve definition method generally used in railway applications. The radius R is used to define the curve, and is defined by the equation R=50/SIN(0.5*D) where the degree of curvature D is the central angle subtended by a 100-foot chord. *See also Arc Definition.*
Civil Cell	Used as a mechanism to preconfigure commonly used complex geometric layouts. These layouts will commonly be stored in DGNLIB files for reuse across multiple projects but it is possible and sometimes useful to store directly in an active DGN file for use in that single location. The civil cell will contain horizontal geometry and can also contain the vertical geometry.
Civil Message Center	Used to display a continuous updating log of Civil messages, including warnings and errors. As errors and warnings are resolved, they are removed from the list. New messages are added whenever the conditions warrant. Most messages relate to civil geometry, superelevation, and corridor modeling.
Civil Template	A civil design concept used most often for corridor modeling but also has other applications. The Civil Template defines the cross-sectional shape of the object being modeled. This cross-section is then “extruded along” a 3D geometry element to form the final model. The corridor template can create or target features such as road edges. The result is the creation of a corridor.
Clipping Reference	Clipping allows you to remove areas of overlap when working with multiple corridors in a single surface. For example, in a corridor intersected by a crossing roadway, clipping would be used to remove all overlapped features within the intersection.
Complex Terrain Model	A terrain model created by merging or appending two or more terrain models.

Context Toolbox	When an element is selected, hovering over the element provide a heads-up and context sensitive toolbar which pops up at the cursor. This toolbar provides a few of the most commonly used tools which operate on the element selected element type. The first tool in this toolbar is always Quick Properties.
Contour	A linear symbol representing points of equal elevation relative to a given datum.
Contour, Isopach	Contours of a delta terrain model which represent cut and fill values as contours, not elevations. A positive contour represents fill, while a negative contour is cut.
Contour, Major	The primary elevation line indicating a specific elevation in a surface model. Usually major contours are drawn with a heavier line weight or using a different color. Elevation text labels are usually drawn in association with major contours.
Contour, Minor	A secondary elevation line indicating a specific elevation in a surface model. Minor contours are often drawn without special color or weight indexing and without elevation text labels.
Corridor	A civil object used for modeling a roadway and is automatically managed by the corridor modeling tools.
Cross Section Model	DGN models (extracted perpendicular to defined horizontal geometry) with special station elevation coordinates defined and other specialized capabilities such as view exaggeration. Cross section stations match the interval in the template drop when a corridor is used as the basis. When horizontal geometry is utilized, the left / right offsets and interval are user-defined.
Curve Stroking	Stroking is the process of automatically adding shots to the terrain model or corridor by interpolating new shots from the curved sections of the data. This distance is used to interpolate new shots along the curved element in corridor processing and applying linear templates. This value is used as a perpendicular minimum distance from chords generated along the arc. Chords are drawn along the arc and the perpendicular distance is measured from the middle of each chord to the arc. If this distance is larger than the Curve Stroking, the process is repeated with a shorter chord length. This process is repeated until the end of the curve is reached. The flatter the curve, the fewer number of points will be calculated. The steeper the curve, the greater number of points that will be calculated.
DDB File	GEOPAK file (Design DataBase) which contains features definitions, associated symbology and annotation settings.
Delta Terrain Model	A surface containing data derived from the difference in elevation between two terrain models or a terrain model and a plane.
Dialog	The tool settings box for the active command. The dialog shows all available options for a command. For most civil commands, most of the time, the dialog can be hidden and ignored since the user is given all necessary instruction and inputs by way of the cursor prompt. The dialog is necessary for configuring command customizations.
Drape	The process of vertically projecting elements onto a surface so that the element elevations are defined by the surface.

Drape Void	A closed area of missing or obscured data where 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.
Element Template	MicroStation concept which allows preconfigured definitions for symbology and other miscellaneous display of MicroStation elements and civil features.
End Condition	A specialized component of a corridor template which provides information tie into active surface.
End Condition Exception	Used to modify the behavior of an end condition solution without requiring the use of additional template drops. When an end condition exception is added, it must be edited to change its behavior.
Export to Native	Option to automatically or manually push horizontal and vertical geometry into native products (InRoads - ALG, MX - PSS and GEOPAK - GPK).
Feature	A Feature is anything that can be seen or located and is a physical part of your design, representing a real world thing. A feature's definition is one of its properties. At any given time in the design process, the feature will have a Horizontal Geometry, a Vertical Geometry, 3D Geometry or a combination to define its location.
Feature Definition	Used to define options when creating features. These are the items which are created in advance, usually used across multiple projects and define symbology, annotation and quantities. The feature definition is assigned (usually) in the plan model and profile/3D feature definitions follow from there.
Feature Name	Each Feature can have a name.
Gap	When a feature is trimmed the part(s) which are invisible on the base geometry.
GPK	A legacy (proprietary) GEOPAK database containing coordinate geometry information.
Graphical Filter	Using in developing terrain models, an automated way of storing search settings for graphic elements when creating terrain models using 3D element. A graphical filter can be created for each feature (i.e., spots, breaks, voids) then the filters can be defined as a Graphical filter group.
Heads Up Prompt	Command instructions are given in a heads up and dynamic prompt which floats at the cursor.
Horizontal Geometry	The elements which define the horizontal layout of the design. These elements are 2D elements even if the DGN model is 3D. Horizontal Geometry may be points, lines, arcs, spirals, splines or any combination in a complex element.
Interval	When a feature is trimmed the part(s) which are visible on the base geometry.
Island	Closed area used to place within a void, i.e., islands in the middle of rivers, lakes, etc.

Key Station	Additional station added to the corridor to force processing at the particular location.
LIDAR	(Light Detection And Ranging) is an optical scanning technology which scans ground and other physical features to produce a 3D model.
Linear Feature	In plan model, composed of lines, arcs, spirals, splines or combinations of these. In profile model, composed of lines, parabola, splines or combinations of these.
Linear Stroking	Stroking is the process of automatically adding shots to the terrain model or corridor by interpolating new shots from the linear sections of the data. Linear stroking is measured along the element. Interpolated vertices are added whenever the distance between the vertices is greater than the linear stroking value (in master units).
Manipulators	The heads up, on-screen editing interface. Only the most common properties are presented in manipulators. Manipulators are in two types: graphical and text
Overlay Vertical Adjustment	Within Corridor Model, tool used to develop a vertical geometry (based on milling and overlay parameters) and apply to the corridor.
Parametric Constraints	Used to set up constraint value overrides for specified station ranges.
Plan Model	The usual DGN model, used for laying out horizontal geometry. Best practices will dictate that this is a 2D DGN model but 3D DGN model can be used. This is where geometric layouts and corridor definitions are kept. The geometric layouts are not only alignments but also edges, parking, striping, sidewalks, etc.
Point Features	Defined by a single X, Y (Z optional) location. A point need not be a feature. It may be defined as a non-featurized point by way of AccuDraw, Civil AccuDraw, Snap or a data point. Non featurized points are use to control the construction of Linear Features.
Point Cloud	A set of vertices in a 3D coordinate system and these vertices are defined the by X, Y and Z coordinates. Point clouds are usually created by 3D scanners. These devices measure a large number of points on the surface of an object and output a point cloud as a data file. The point cloud represents the visible surface of the object that has been scanned or digitized.
Point Control	Used to modify the behavior of points in a template. These controls take precedence (they override) over existing constraints on the point.
Project Explorer	MicroStation's interface for browsing elements in a DGN file. Extended by civil to accommodate specialized civil needs.
PSS File	MX file (Plans Style Set) which provides the graphical representation for the MX string features.
Reference Element	The rule for some geometry is a calculation from another element. This other element is the reference element.

Secondary Alignment	Used to modify the direction of cross section processing. By default, as any given station, the cross section is created orthogonal to the main alignment/feature. If a secondary alignment exists, then that portion of the cross section which lies outside the secondary alignment will be orthogonal to the secondary alignment instead of the main alignment.
SEP File / Method	Uses the superelevation settings which originated in GEOPAK.
SMD File	GEOPAK file (Survey Manager Database) which contains survey features definitions and associated element and textual settings.
Spot Elevation	A set of X, Y, Z coordinates representing a point on the terrain model surface. There is no implied relationship between regular points.
SRL File / Method	Uses the superelevation settings which originated in MX.
Superelevation Lane	The closed area defined by the superelevation tools used for the limits of transition calculations and pivoting location.
Superelevation Section	Area along a horizontal geometry element, where superelevation will be calculated.
Target Aliasing	Used to create the desired results when working with multiple surfaces without having to edit the template from the template library. Target aliases can also be used so that one corridor can target the solution of another corridor.
Template Drop	An area (usually defined by station limits) along a corridor to which a specific template is applied.
Template Library	A file that stores definitions for templates, generally with an ITL file extension.
Template Transition	The transition indicator occurs in the corridor between templates of differing names.
Terrain Model	A three-dimensional DGN element defined by spots, break lines, voids, holes, contours to model a surface on the earth.
Tooltips	When hovering the cursor over an element or a handle, a tooltip is shown which gives explanatory information.
Trace Slope	Upstream - The indicated path follows the steepest ascent from a user-defined point through the terrain model terminating at a high point or the edge of the terrain model. Downstream - The indicated path follows the steepest descent from a user-defined point through the terrain model terminating at a low point or the edge of the terrain model.
Vertical Alignment	A linear feature in profile model which serves the special purpose of defining the elevations of an alignment.
Vertical Geometry	The elements which define the vertical layout of a corresponding horizontal geometry element. These vertical elements are 2D and are stored in a profile model.

Void	Closed shape 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 surface. Therefore, they do not change the slope or elevations of the surface.
Watershed	Defined by either a low point within the terrain model or a low edge point along the terrain model edge, it's the closed area wherein all water would drain to the low point.
XIN File	InRoads file which contains features definitions, associated styles, annotation, and other settings.

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