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MAY 21-25, 2006
CHARLOTTE, NORTH CAROLINA, U.S.

JUNE 11-15, 2006
PRAGUE, CZECH REPUBLIC

C1TNC104, C1TNC305, C1TNC312


C2TNC103

Introduction to InRoads Fundamentals

Hands-on class sponsored by the Bentley Institute

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1 Introduction

In this chapter the basic InRoads functionality and interface will be discussed. The topics discussed include:

- InRoads Products
- Starting InRoads
- InRoads Interface
- Toolbars
- Dialog Boxes and Target Buttons
- Application Add-Ins

InRoads Products

The InRoads family of products are powerful civil engineering tools that facilitate workflow and enable free movement of projects between MicroStation and AutoCAD. Data can be exchanged between departments, clients or suppliers without translation issues.

The InRoads product line includes InRoads, InRoads Bridge, InRoads Site, InRoads Storm & Sanitary, InRoads Survey and InRail. These products run independently or simultaneously.

The MicroStation Civil Extension is either a subset of InRoads or Geopak which allows MicroStation users to expand the features of MicroStation while complementing GEOPAK or InRoads workflows. The MicroStation Civil Extension is available at no additional cost to MicroStation Subscribers.

The following topics are intended to provide insight into concepts, functions and terminologies relating to the tools used to accomplish basic roadway design tasks. These topics provide a basic overview and will not describe all aspects of each tool or tool setting in extended detail. Additional information regarding dialog box settings and tool definitions is available in InRoads Help, which will be discussed later in this chapter.

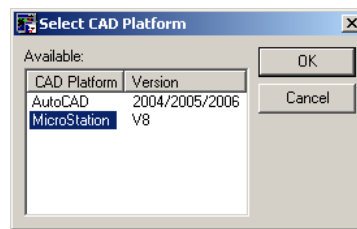
Starting InRoads

InRoads Setup

InRoads is a window based program that interfaces directly with CAD platforms such as MicroStation and AutoCAD. InRoads provides a number of ways to change the startup configuration for specific project requirements.

Selecting a CAD Platform

Before InRoads can be started, a CAD platform must first be selected. To select the default CAD platform, select Start > Programs > Bentley Civil Engineering > Select CAD Platform.



Launching InRoads

You can launch InRoads using one of the following methods:

- Select Bentley > InRoads Group from the Windows Start menu, then select the InRoads item.
- Double Click on the InRoads Shortcut created on your desktop
- If already in MicroStation you can launch InRoads by selecting Utilities > MDL Applications and selecting Civustmk.ma from the c:\Program Files\Bentley\Civil\Bin folder
- If already in AutoCAD you can launch InRoads by selecting CivACAD2004MK from the c:\Bentley\Program Files\Bentley\Civil\Bin folder. The actual name of the application file to load may vary slightly depending on what version is installed on your system.

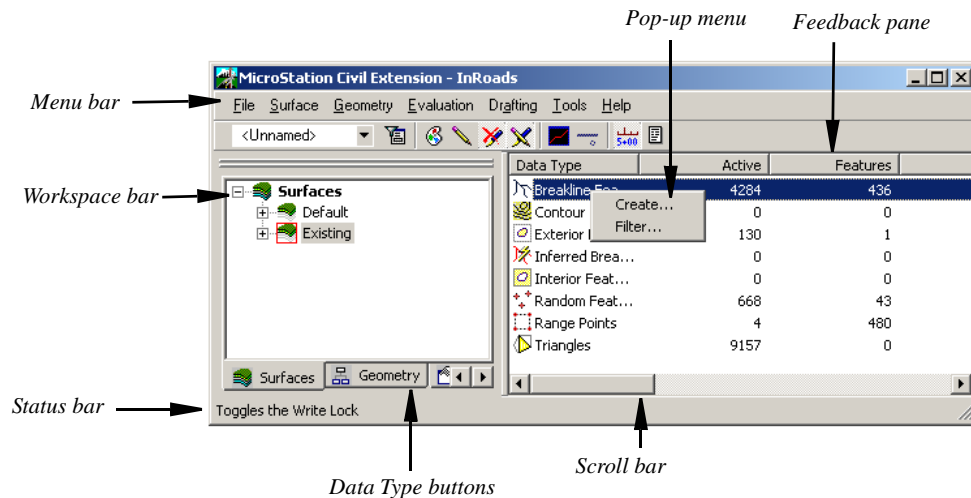
Specifying the Default Directory

Upon installation, the default location for opening files is the data directory of the product, typically C:\Program Files\Bentley\Civil\Data. You can specify a different location for InRoads to look by first creating a shortcut on your desktop. Then right-click on the shortcut and select Properties from the pop-up menu. In the target field of the Shortcut, key in the desired directory.

InRoads Interface

InRoads Explorer

Once InRoads has been launched, the InRoads Explorer displays. The InRoads Explorer is the means by which InRoads design tools are accessed. Details related to design data that is loaded can be reviewed, edited, or processed.



InRoads Explorer

The InRoads Explorer is divided into four major parts: Workspace bar, Feedback pane, Menu bar, and Status bar. Each part of the InRoads Explorer is described below.

Workspace bar - The Workspace bar is the control center for all InRoads project data. The Data Type buttons along the bottom of the Workspace bar are used to select the type of project data displayed in the Workspace bar. The most common data types are Surfaces and Geometry. Depending on the project needs, however, additional data types (such as Survey, Typical Sections, Roadways, or Drainage) may be used.

The hierarchal view of the data shown in the Workspace bar has controls to view components of the data. For instance, selecting the plus sign adjacent to each surface displays the feature types contained in the surface.

The red box indicates the “active” data. Making data “active” is an important function in InRoads and will be discussed in a later section.

Feedback pane - The Feedback pane displays details about the data selected in the Workspace bar. For example, when the Cogo Buffer is selected in the Workspace bar, all of the points and their coordinates in the Cogo Buffer are displayed in the Feedback pane.

Menu bar - The Menu bar contains menus for all of the tools available for the active InRoads modules. The InRoads software is composed of several modules including InRoads, InRoads Survey, InRoads Storm & Sanitary, InRoads Site, InRoads Bridge, and InRail. In addition, there are optional add-in components that can be activated as necessary. Therefore, the menus displayed will vary depending on which modules and add-in components are active.

When using the InRoads module there are eight menus: File, Surface, Geometry, Modeler, Evaluation, Drafting, Tools and Help. Each main menu contains the viewing and editing commands related to them. For example, any commands related to editing or viewing a surface can be found on the Surface menu. Likewise, commands related to evaluating a model, such as Cross Sections or Profiles, are found on the Evaluation menu.

Many menus are shared across multiple InRoads modules. For example, when using InRoads Survey, the File, Surface, Geometry, Evaluation, Tools, and Help menus are still present. However, some menu items that do not pertain to Surveying are not shown and some additional menu choices are added.

Status Bar - The Status bar is the location where InRoads messages, prompts, and errors are displayed. If InRoads requires that something be located or identified graphically, prompts display on the MicroStation Status Bar.

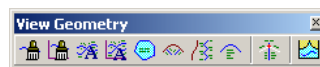
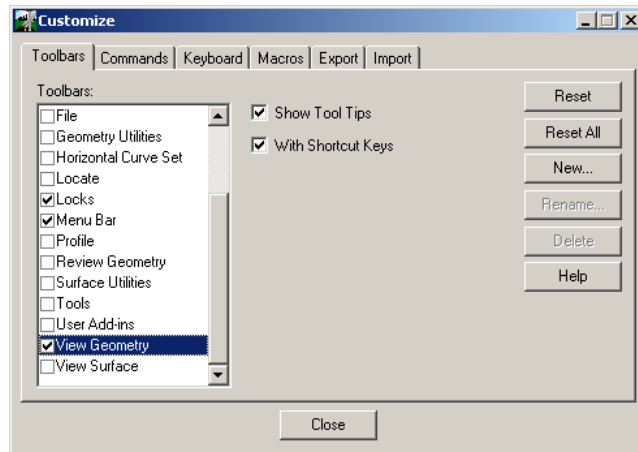
Scroll bars - When resizing the InRoads Explorer, some data may not be visible either in the Workspace bar or Feedback pane. Scroll bars enable viewing of additional data.

Pop-up menus - The InRoads Explorer enables access to functions by way of context sensitive Pop-up menus. These menus display when clicking the right mouse button anywhere in the InRoads Explorer. Menu options may differ depending on the item selected.

- ① TIP: Right-click on the data type in the Workspace bar to easily select a different data type.

Toolbars

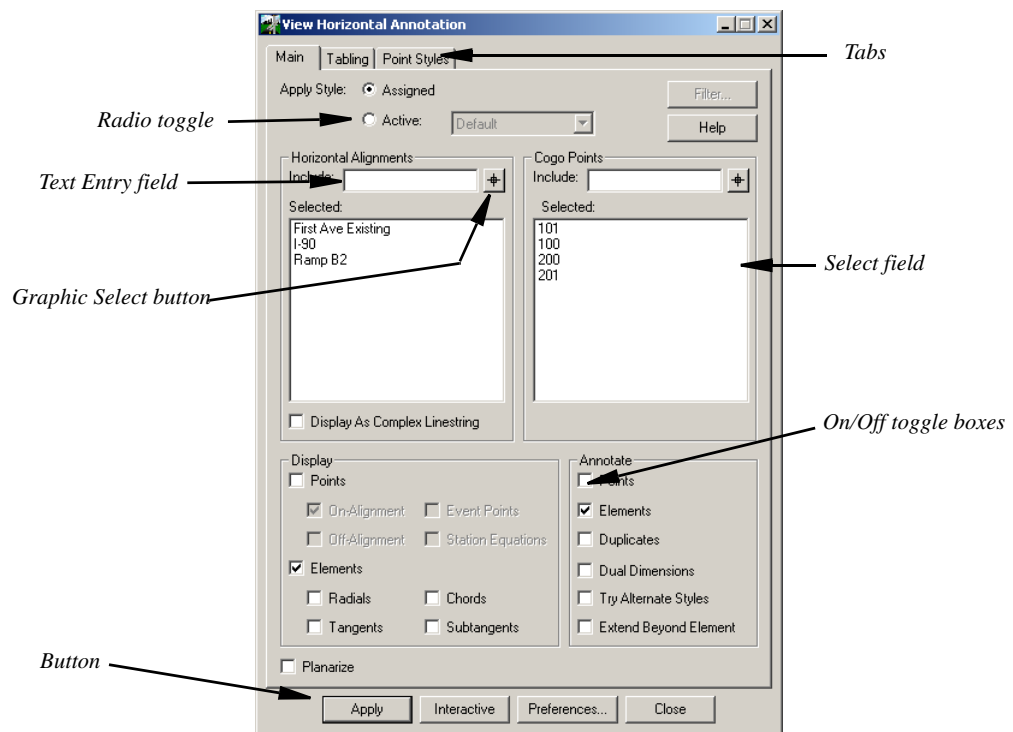
Commands can be accessed from the Menu bar or through toolbars. InRoads comes with built-in toolbars that can be docked in the InRoads Explorer. To open InRoads toolbars, select Tools > Customize from the InRoads menu. On the *Toolbars* tab of the Customize dialog box, select the check box next to the toolbar name to be displayed.



Opening the Design Surface toolbox from the Customize dialog box

Dialog Boxes

When a tool is selected using a tool button or from the InRoads menu, a dialog box will likely display from which more options relating to the command can be specified. The following example identifies the controls and functions that are common to many InRoads dialog boxes.



Sample dialog box

Tabs - The tabs are used to access additional categories of settings related to each tool.

Radio toggle - A group of options in which only one can be selected have radio toggles. Selecting an option deselects all other options in that group.

Text Entry field - A Text Entry field is used to enter text. In most Text Entry fields, wildcard characters can be used. For example, to select all alignments, an * can be entered. To select all alignments that begin with the letter b, enter b*. Another method for entering data in a text entry field is to use the Graphic Select or Target button.

Graphic Select button - Also called the Target button, the Graphic Select button is used to select location data from the CAD file such as a Cogo point, surface feature,

or an alignment. The Graphic Select button can also be used to pick distances, angles and bearings.

Select fields - Select fields have a list of more than one item from which to choose. The arrow next to the box indicates that there are other possible selections.

Toggle boxes - Toggle boxes can be independently enabled or disabled. If a toggle is light gray in color, the toggle is deactivated and unavailable as a means of selection. Toggle boxes become deactivated when their functionality is not relevant based on another setting.

Buttons - Buttons generally appear at the bottom or right side of a dialog box and are used to either process a command, save/recall settings or preferences, or close the dialog box. Depending on the tool, an Apply and/or OK button may be present. The function of these buttons is to:

Apply – Process the dialog box contents

OK – Process the dialog box contents and close the dialog box

Each dialog box also typically includes a Help button and may include other buttons to access additional functionality.

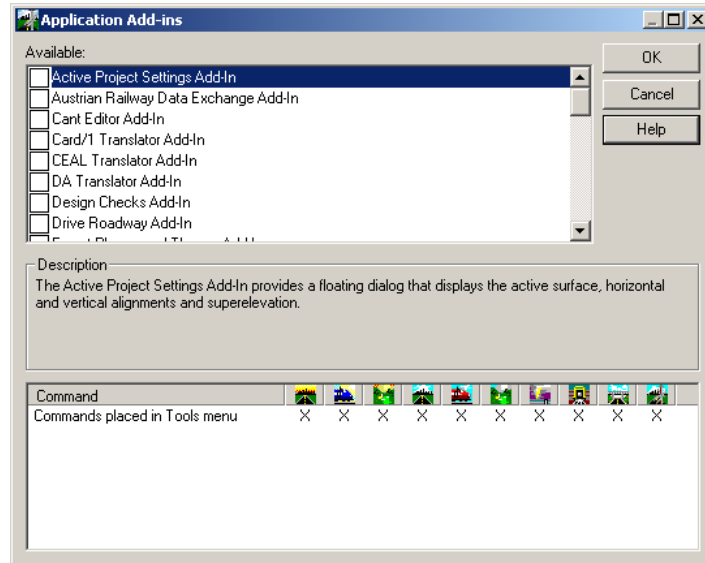
Application Add-Ins

Application Add-Ins are used to add other tools and applications to the InRoads interface. Depending on the tool being added, new items appear in existing InRoads menus, or a new item is inserted in the main InRoads menu bar. To access the Application Add-Ins dialog box, select Tools > Application Add-Ins from the InRoads menu.

Using the *Application Add-Ins* tool, multiple InRoads modules can be run simultaneously in one interface. For instance, if InRoads is running and Storm & Sanitary is also needed, simply select the item from the list in the Application Add-ins dialog box. A new menu item called Drainage appears on the main InRoads menu bar.

- ❶ A valid license is required for all InRoads modules activated through the *Application Add-Ins* tool.

To unload a menu item, simply uncheck the item that you wish to unload from the list, and it will no longer be available in the menu.



Application Add-ins dialog box

The Command area at the bottom of the Application Add-Ins dialog box shows the InRoads modules (InRoads, InRoads Survey, InRoads Storm & Sanitary, etc.) that include licensing for the highlighted add-in.

If an X appears under an InRoads module icon, the selected add-in is licensed for that module. For instance, as shown in the illustration above, the Active Project Settings Add-In is available for all the InRoads modules. To the left of the icons, the Command column indicates where the add-in will appear in the InRoads menu.

2 File Operations

In this Chapter topics related to InRoads file operations will be discussed. The topics discussed include:

- InRoads File Types
- File Operations
- Saving Data
- InRoads Options

InRoads File Types

The InRoads road design process uses several different file types. Understanding the purpose of each is important to understanding how InRoads functions. Below is a list of the primary file types used in the road design process. Additional file types are introduced when other InRoads modules are invoked.

Project Data Files

Surface File (.dtm) – Stores point, breakline, boundary, and triangle data defining existing ground and design surfaces. Multiple surface files may be open at the same time.

Geometry File (.alg) – Stores geometric data such as horizontal and vertical alignments, COGO points, and superelevation definitions. Multiple geometry files may be open for editing at the same time.

Template Library (.itl) – Stores templates made up of components. The components of a template can be open or closed. A simple closed component is used typically to represent a section of pavement. An end condition is a special open-shaped component which define how side slopes are designed. Only one template library may be open for editing at a given time.

Roadway Design File (.ird) – Stores information defining which templates are applied at which station along an alignment. Only one roadway design file may be open for editing at a given time.

XML Data (.xml) – Stores the bulk data required to build InRoads reports. See the Style Sheet files below for additional information.

Group Storage Files

Project File (.rwk) – An easy method to load and save a number of InRoads data files in a single operation. No InRoads data is stored in this file, it is just an ASCII file that lists the other InRoads data files (.ini, .alg, .dtm, .tml, .rwl) used for a project.

Resource Files

InRoads Preference files control how data will appear when it is displayed in the CAD file. Preference files store data related settings and dialog box settings for later retrieval. Listed below are just a few of the parameters that are stored in preference files.

- How a surface will appear when viewed in plan profile and cross section.
- How geometry, such as alignments and points, will appear when viewed in plan and profile.
- How Profile and Cross Section grid spacing, text labels and axis symbology will appear.
- Parameters and values that have been entered and selected in dialog box fields, which can be saved for later recall (for example, annotation related parameters such as viewing stationing and curve data).
- Numerous settings are saved to the InRoads preference file and provide a powerful means by which to implement project specific and company standards.

Preference (.xin) – Stores the preferences accessible on each dialog box, feature style definitions, and named symbology definitions. Also stores preferences for geometric (point, line, curve, and spiral) elements. These style definitions are used when the geometric elements are displayed in the graphics file.

Drafting Notes (.dft) – Stores note definitions created with the various note placement tools found on the Drafting menu.

Style Sheets (.xsl) – A definition file that formats data in an .xml file into a finished report.

File Operations

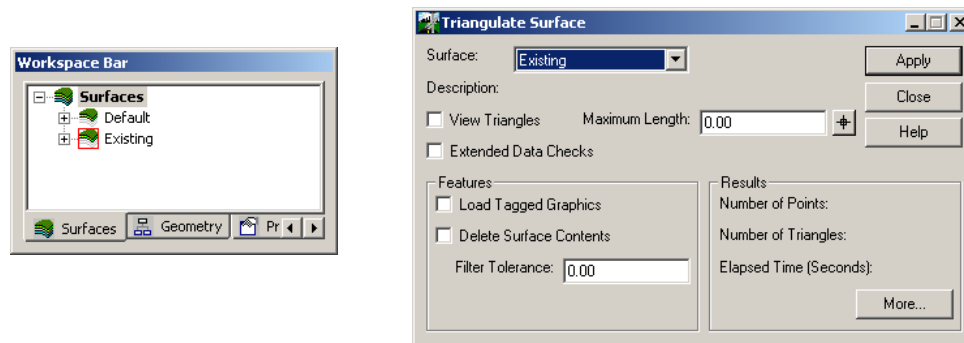
All InRoads data is stored in external files. Files that are “open” in InRoads for editing are stored in virtual memory. Graphical representations of the data are viewed using the MicroStation. Using MicroStation tools to modify graphical representations of InRoads data (such as contours or triangles) has no effect on the InRoads data. Likewise, using the MicroStation delete tool to remove graphics does not affect the InRoads data. For example, if the graphics that represent a surface (such as contours or triangles) are deleted, the InRoads .dtm file is not modified.

Opening Files

InRoads files are opened by selecting File > Open from the InRoads menu. This “loads” the file to virtual memory and makes it available for modification and evaluation.

When an InRoads data file is open, it is visible in the Workspace bar of the InRoads Explorer. In cases where more than one type of data can be loaded, a red box appears around the icon representing the “Active” file. Operations are performed on the active file.

For instance, when using the *Triangulate Surface* tool, there is a list box to choose the appropriate surface to triangulate. Surfaces that are currently loaded are available to choose. Unless a different surface is selected, the “Active” surface automatically displays as “selected” in the list.



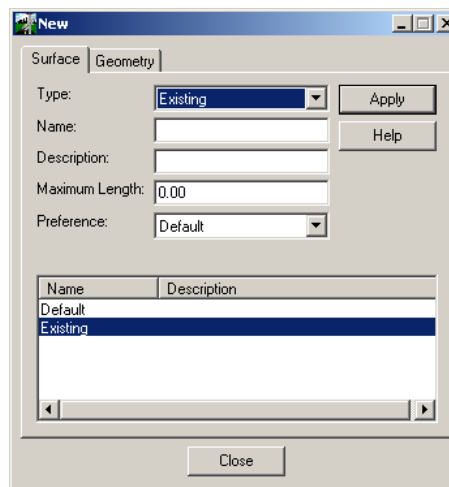
Workspace bar (from InRoads Explorer) and Triangulate Surface dialog box

In the illustration above, three surfaces are loaded in InRoads: Default, and Existing. The active surface is Existing. To change the active surface, right-click on the surface in the Workspace bar and select *Set Active* from the Pop-up menu.

Creating New Files

New InRoads files can be created by selecting *File > New* from the InRoads menu. In the New dialog box, use the tabs to select the data type to create. Next, key in the desired name, complete the other parameters, and select the Apply button. Data types for all currently loaded InRoads modules will be present. The data appears in the Workspace bar of the InRoads Explorer. This means that this data is currently in virtual memory, or “loaded” in InRoads.

This tool does not create or store the InRoads data to the computer hard drive; it only exists in virtual (or temporary) memory. **Unless saved as described below, the InRoads data will be lost when InRoads is closed.**



New dialog box

- ① When InRoads starts, a blank data file named “default” is loaded for each data type. The “default” data files enable immediate use of InRoads without first creating data files using the *New* tool. The best practice, however, is to use the *New* tool to create the data type with a meaningful Name and Description.

Saving Files

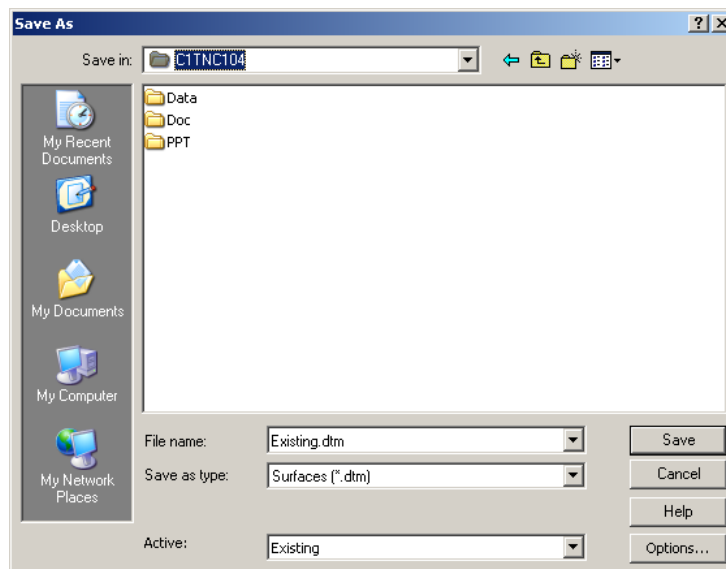
InRoads data files are not saved automatically. Any data created or changed is stored in virtual memory until it is saved to disk.

It is important to note that when an InRoads file is created, the name specified is the internal name of the file, which will appear in the Workspace bar. When the file is saved to disk, the name used is the external name. This name, along with the file

extension, is shown in the Windows Explorer or when the *File > Open* option is selected. The internal and external file name can be different, but it is recommended that they be the same whenever practical.

To save an InRoads file to disk that has not previously been saved, use the following procedure.

- 1 Select *File > Save As* from the InRoads menu.
- 2 Select the appropriate *file type* from the *Save as type* field.
- 3 Enter the *File Name* to create.
- 4 Click **Save**.



Save As dialog box

Previously Saved Files

There are two methods to resave previously saved InRoads data file.

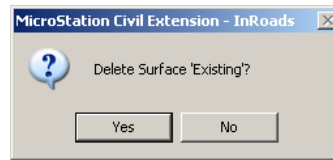
- Set the InRoads Data File to save as the Active file for that data type. Select the *File > Save > {File Type}* menu item.
- Right-click on the data file to be saved in the Workspace bar and select the *Save* option.

Using either method, a confirmation message showing the path and file saved displays in the InRoads Status bar.

Deleting InRoads Files

To remove a file from the InRoads Explorer, right-click on the file name in the Workspace bar, then select Delete from the Pop-up menu. This removes the data from virtual memory. If the file has been previously saved to disk the InRoads data is preserved in the disk file. If the InRoads data has not been saved to disk, the data is lost.

An alert box confirming the deletion of the InRoads data is displayed prior to the removal of the data.

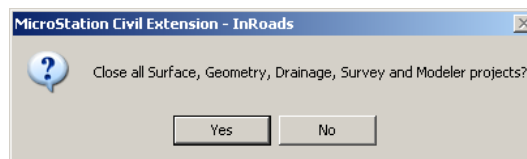


Confirmation dialog box

Closing InRoads Files

A file can also be removed from the InRoads explorer by selecting File > Close from the InRoads explorer menu. If the file has been previously saved to disk the InRoads data is preserved in the disk file. If the InRoads data has not been saved to disk, the data is lost. Each InRoads data file can be closed separately or all the InRoads data files can be closed at one time by selecting File > Close > All.

An alert box confirming the closure of the InRoads data is displayed prior to the removal of the data.

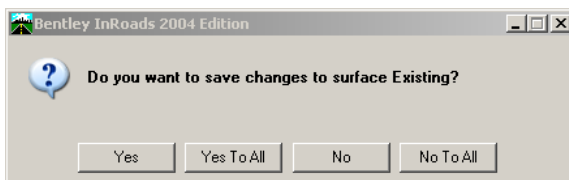


Multiple configurations of Project Defaults can be created and saved under different names for later retrieval. The *Project Defaults* tool is run by selecting *File > Project Defaults*.

The Set Project Defaults dialog is used to set up the initial location for loading/saving all files for a project. The path for all file types can be set to the same location or separate paths can be set for each file types.

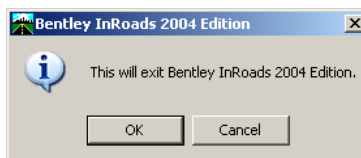
Exiting InRoads

To exit InRoads select *File > Exit* from the InRoads menu. If data that is currently loaded in InRoads that has not been saved to disk an alert appears allowing the data to be saved. Click **Yes** to save only the InRoads data shown in the alert. Click **Yes to All** to save all currently loaded InRoads data. If the file has not been previously saved to disk, the Save As dialog box appears to specify the name and location to save the file.



InRoads question dialog box

Another method to exit InRoads is by selecting the "Close" icon indicated by an "X" in the top right corner of the InRoads Explorer. When this method is used to exit InRoads, an alert dialog box confirming the intent to exit InRoads appears.



InRoads question dialog box

Saving Data

When an InRoads data file is created or loaded from disk, it resides in the computer's memory. Data written to the data file while using InRoads is not saved to the hard drive. That data is held in memory until a command is executed to save the data to disk. Because the data resides in two possible locations, disk and memory, there are two file names.

The *Internal* file name is the name given to a data type when it is created in InRoads with the File > New tool. This is the name that appears in the InRoads dialog boxes.

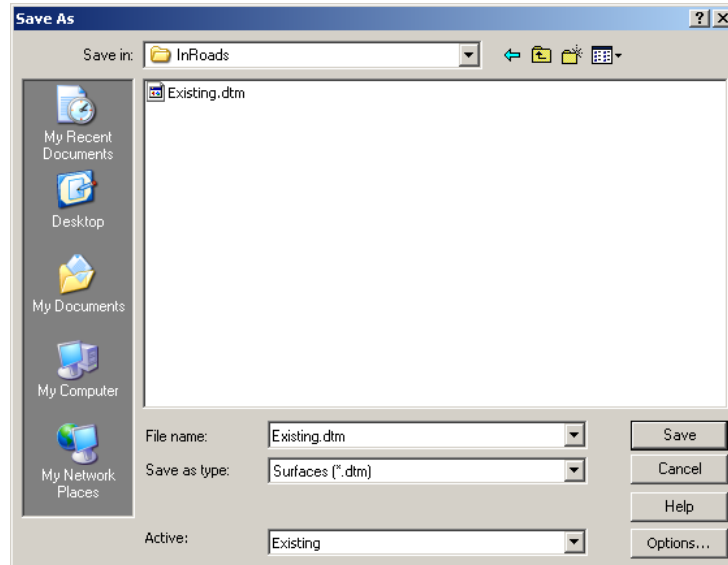
The *External* file name is the name given to the data type when it is stored on the disk. This is the file that has the extensions defined above such as .alg for geometry files.

Why does InRoads have two file names? Previous versions of Windows only supported file names with a maximum of 8 characters plus a 3 character extension. This is known as 8.3 file format. For most, eight letters is not enough to describe the files purpose. InRoads added the independent Internal file to overcome this limitation.

Although it is not required, it is recommended to use the same name for both the Internal and the External file names.

InRoads data files are saved using the File > Save As tool. When invoked, the Save As dialog box appears. Select the type of file to save from the *Save as type* pick list. Once the type is selected, choose the Internal file name to save from the *Active* pick

list. The *File Name* field is automatically populated with the Internal file name plus the appropriate file extension.

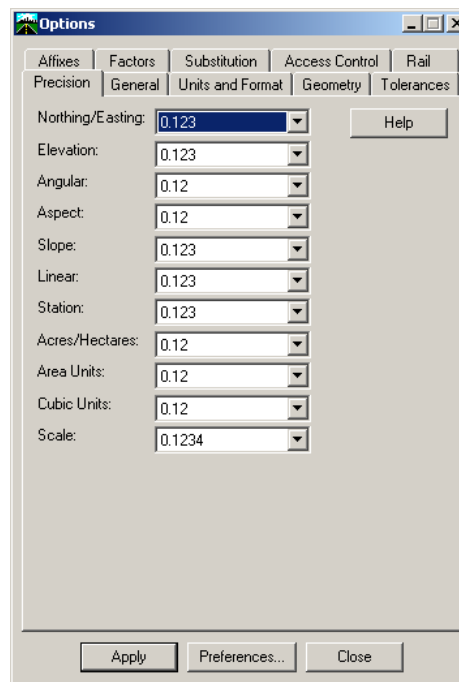


The Save As dialog box

Right-click on the Internal file name of any data type in the InRoads Explorer to open a shortcut menu that has a link to the Save As tool.

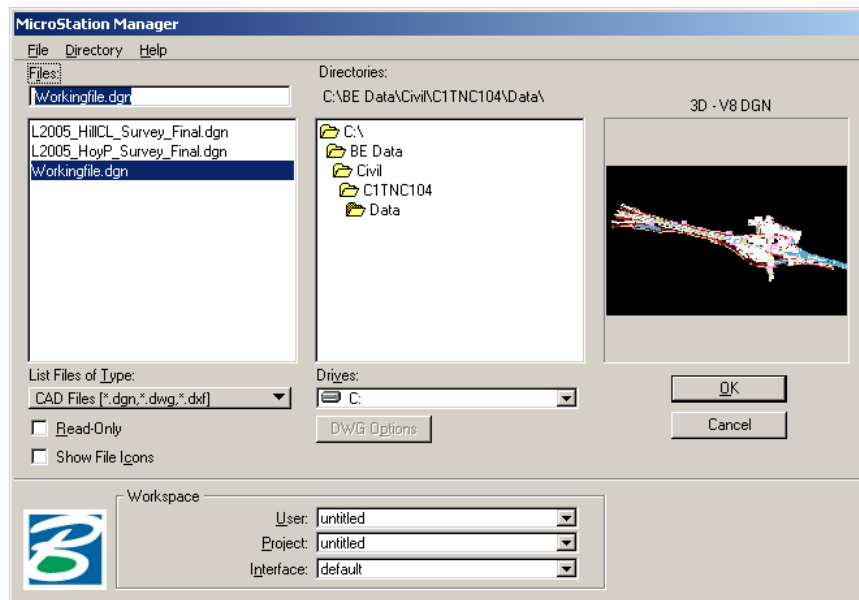
Options

General InRoads Parameters are set using the Options tool (*Tools > Options*). The Options dialog box has multiple tabs that can be used to modify such settings as Units, Formats, Scales, Precision (number of decimal places), as well as other general settings that affect the look and feel of InRoads dialog boxes and tools.



 **EXERCISE: LOADING INROADS DATA**

- 1 Double Click on the InRoads Civil Extension Icon
- 2 The MicroStation Manager dialog box appears.
- 3 Set the directory to C:\BE Data\{Course #}\Data
Where {Course #} is the folder specified by your instructor.
- 4 Select the file Workingfile.dgn



- 5 Click OK to open the file.
- 6 MicroStation and InRoads are activated.

Loading the Preference File

When InRoads starts, two required files are a preference file and a geometry style file. If a Project Default is not set or if the file listed in the Project Default is no longer located in the directory specified, InRoads will load the file

C:\Program Files\Bentley\Civil\Data\civil.xin

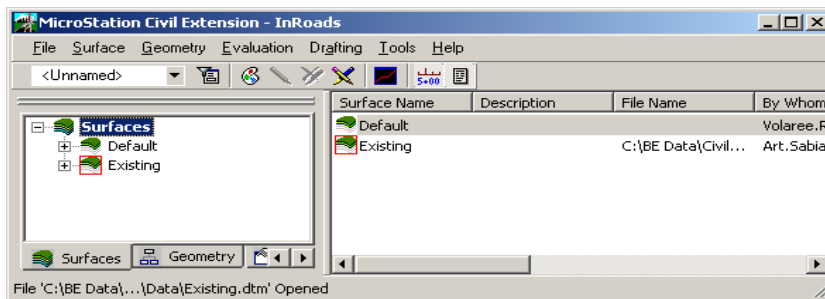
- 1 In the InRoads Explorer select File > Open from InRoads Menu
- 2 Set the Files of type option to Preferences (*.xin)
- 3 Load the file Civil.xin from the C:\BE Data\{Course #}\Data folder.
- 4 In the File > Open dialog, select the file Civil.xin

Loading Survey Data DTM Surface

The existing surfaces provided by the survey group also need to be loaded.

- 1 Using the File > Open tool, load the file **Existing.dtm** from the C:\BE Data\{Course #}\Data folder.

The preference file and one surface have been loaded into InRoads.



- 2 Select File > Close > Surfaces from the InRoads menu.
- 3 In the Close All Surfaces prompt, click Yes.

3 Viewing Surfaces

In this Chapter topics related to viewing InRoads Surfaces will be discussed. The topics discussed include:

- Introduction to locks
- Surface Overview
- The InRoads DTM
- Surface Files
- Surface Properties
- View Surface Tools

Introduction to Locks

InRoads locks control how InRoads tools behave when viewing, selecting or evaluating data. Because locks affect nearly every tool in InRoads, it is important to understand how locks work. Below is a brief introduction to the locks.

InRoads has two basic types of locks. There are locks that have an enabled/disabled state. There are also locks that switch between two or three different modes, but are always active.

Locks Toolbar


Locks are accessed by selecting Tools > Locks from the InRoads menu. However, since the status or mode of the locks is frequently adjusted while running InRoads, the best practice is to display the Locks toolbar for easy access to the locks. The Locks toolbar is displayed by selecting Tools > Locks > Toolbar.



Locks toolbar

A lock is enabled when the button appears depressed. Visually, the button will have a lighter background when depressed or enabled. In the above example, the Style, Write, and Station locks are enabled. Three of the locks cannot be enabled or disabled. Instead, the Pen/Pencil, Locate, and Snap locks are always enabled, but can be toggged between multiple modes. The graphic icon of the lock changes when it is set to a different mode.

Locks



Write Lock  – The Write lock controls how InRoads generates graphics. There are two modes for this lock; enabled (display and write) or disabled (display-only).

Enabled - Graphics created by the InRoads tools are written to the CAD file. The view of the graphics is modified using the CAD viewing tools such as Zoom and Window. The graphics remain in the CAD file until deleted using the CAD Delete command or an InRoads tool to regenerate the graphics (see Pen/Pencil lock).


Disabled - Graphics generated by InRoads are temporary. They appear in the CAD file in a display-only mode. That is, the generated graphics display, but are not written to the CAD file. Using any of the CAD viewing tools removes the graphics from the display because the elements have not been written to the drawing file.


The display-only mode is useful for viewing large amounts of data and then quickly removing that data from the screen. Since the display-only mode does not write graphics to the CAD file, this mode also keeps the size of the CAD files smaller.

- ① An easy way to determine if the Write lock is enabled is to look at the Pen/Pencil and the Delete Ink locks that are just to the left of the Write lock on the toolbar. When the Write lock is disabled, the Pen/Pencil and Delete Ink locks display as grey toned. When the Write lock is enabled, the Pen/Pencil and Delete Ink locks display in color.

Pen/Pencil Lock   – The Pencil/Pen lock controls what happens when graphics are redisplayed from InRoads. For example, when surface or geometry graphics are redisplayed, the setting of this lock determines if the previously displayed graphics is deleted prior to creating the new graphics.

The Pencil/Pen lock is only available when the Write lock is enabled. Also, the Pencil/Pen lock only applies to plan display. It does not apply to cross sections or profiles. There are two modes for this lock; Pen mode or Pencil mode.

Pen  – Graphics created in the CAD file are permanent and will not be deleted the next time InRoads is used to draw the same graphic. This is analogous to drawing in “ink” on a paper whereby the ink is not typically deleted when new graphics are added.


Pencil  – Graphics created in the CAD file are permanent but will automatically be deleted the next time INRoads is used to draw the same graphics. This is analogous to drawing with a pencil on paper whereby the pencil is easily removed when new graphics are added.

For example, consider a workflow where a single alignment is revised and displayed numerous times.

- 1 Lock is set to Pen mode.
- 2 Alignment is displayed.
- 3 Alignment is revised.
- 4 Lock is set to Pencil mode.
- 5 Alignment is displayed second time.




Both the original and the new alignment display exist in the CAD file. Even though the current mode is Pencil, this has no impact on the alignment drawn in step 2. The alignment graphics are controlled by the setting of the lock when those graphics were created and thus are Pen or “ink” graphics, which are not deleted automatically.

- 6 Alignment is revised.
 - 7 Alignment is displayed a third time.
 - 8 The original alignment drawing in step 2 and the new alignment drawn in step 7 are both displayed in the CAD file. The alignment drawn in step 5 is automatically deleted before the new alignment is drawn because the lock was set to Pencil mode when the second alignment was drawn.
- ① Most InRoads users use the Pencil mode most of the time. Use of the Pen mode is limited to special situations.

Delete Ink Lock  – The Delete Ink lock controls whether graphics displayed in Pen mode are deleted when new graphics are drawn. This lock affects the behavior of the Pen/Pencil lock when set to Pen mode. There are two modes for this lock: enabled or disabled.


Enabled – Graphics drawn in “ink” using Pen mode are automatically deleted when new graphics are drawn. In other words, when this lock is enabled, graphics drawn in Pen mode behave the same as graphics drawn in Pencil mode.





Disabled – Graphics drawn in “ink” using the Pen mode are not deleted when new graphics are drawn. InRoads operates as described in the Pen/Pencil lock section.

Locate Lock   – The Locate lock determines whether to snap to graphics displayed in the CAD file or to snap to the position occupied by an InRoads feature in the active surface when a target button is used to specify a position in the graphics file. Target buttons are found throughout the interface. Each button is indicated by the crosshair icon. 

There are two modes for this lock: Locate Graphics or Locate Feature.


Locate Graphics  – This seeks the nearest displayed graphics.


Locate Feature  – This seeks the position of the nearest feature in the active surface. The feature does not need to be displayed graphically to be located and will be located if it exists in the DTM.


Snap Lock    – The Snap lock controls how InRoads snaps to geometry points or elements in the active geometry project when a target button is used to specify a position in the graphics file. Target buttons are found throughout the interface. Each button is indicated by the crosshair icon. 


There are three modes for this lock: No Snap, Point Snap, or Element Snap.

Toggleing on the Point icon (icon to far left) enables snapping to geometry points. Toggleing on the Element icon (middle Icon) enables snapping to geometry elements (Line, Arc, Spiral). Toggleing on the None icon (icon to the right), indicates that InRoads will not snap to geometry points or geometry elements.

No Snap  – InRoads does not try to locate the nearest geometry point or element. The graphically selected coordinate or element is selected.

Point Snap  – This enables users to snap to a point in the active geometry. Use this lock to aid the placement process of geometry elements. For example, when a target button in a dialog box is selected followed by clicking in the CAD file, InRoads will locate the closest geometry point to the graphic location selected. The coordinates of the closest geometry point, not the graphic location, are returned. The geometry point does not need to be displayed graphically to be located.


Element Snap  – This enables users to snap to a geometry element (line, arc, spiral) in the geometry project. Use this lock to aid in using the direction, distance, length, radius, and/or angle of an existing geometry element to design a new element. The software snaps to the element nearest the data point placed in the CAD file.

Station Lock  – The Station lock controls how InRoads determines station intervals when a horizontal alignment begins at an odd-numbered station. This lock applies to InRoads tools such as generating cross sections, running the Roadway Modeler, or generating station based reports.

There are two modes for this lock: enabled or disabled.

Enabled – If the first station is an odd-numbered station, the software forces all subsequent stations to even-numbered stations. For example, if the first station is 2+38 and the station interval is defined as 50, the software performs the command action at stations 2+38, 2+50, 3+00, 3+50,


Disabled – The software does not force stations to even-numbered stations if the first station is an odd-numbered station. For example, if the first station is 2+38 and the station interval is defined as 50, the software performs the command action at stations 2+38, 2+88, 3+38, 3+88,

Report Lock  – The Report lock controls whether or not the command displays output in a dialog box as command calculations are performed.

There are two modes for this lock: enabled or disabled.

Enabled – The command processes, stores results and display the results in an output dialog box.

Disabled – The command processes and stores results without displaying them in an output dialog box.


Feature Filter Lock  – The Feature Filter lock provides the ability to limit or filter the InRoads Surface and/or InRoads Survey features affected by InRoads tools. For example, a feature filter can be used to limit the surface features available for display and manipulation to only those that define pavement edges. Limiting the available or active features makes it easier to process just the desired data.

This lock works in conjunction with the Feature Selection Filter (*Surface > Feature > Feature Selection Filter*) for surfaces, and the Survey Feature Filter (*Survey > Survey Feature Filter*) for InRoads survey data. These tools are covered in detail in later chapters that focus on the respective functions.

There are two modes for this lock: enabled or disabled.

Enabled – This applies the active Feature Selection Filter and Survey Feature Filter. Only those features that satisfy the filters are available for processing and display.

Disabled – This ignores the active Feature Selection Filter and Survey Feature Filter. All features in the active surface or survey Fieldbook are available for processing and display.

Style Lock  – The Style lock controls where InRoads reads the display preferences for the *View Surface* and *Annotate Cross Section* tools. The effect of the Style lock is different for each of the tools as described below. For both sets of tools, the lock has two modes: enabled or disabled.

View Surface Tools

The *View Surface* tools such as parameters, triangles and contours use the Style lock to determine if the Tools dialog box is displayed.

Enabled – No dialog box appears for the selected tool. InRoads determines the symbology to use to create the graphics by searching in the following order:

If the active surface has a named symbology preference specified in the Surface Properties dialog box (*Surface > Surface Properties*) and the *View Surface* tool has a saved preference of the same name, the symbology definitions in the saved preference are used.

If the *View Surface* tool has a saved preference matching the name of the preferred preference in the options (*Tools > Options*), it is used.

The default saved preference for the *View Surface* tool is used.

Disabled – A dialog box for the selected tool appears when it is activated. The symbology for all graphics created by the tool is defined in the dialog box.

Annotate Cross Section Tools

Enabled – The symbology for the point, segment, and feature annotation is taken from the named symbology specified in the Surface Properties dialog box (*Surface > Surface Properties*).

Disabled – The symbology is taken from the feature style associated with each feature in the surface. Because each feature can have a unique feature style, it is possible for the annotation for each feature to be displayed with different symbology. The InRoads road design process uses several different file types. Understanding the purpose of each is important to understanding how InRoads functions. Below is a list of the primary file types used in the road design process. Additional file types are introduced when other InRoads modules are invoked.

Surface Overview

Surface vs. Digital Terrain Model

InRoads uses the terms *surface* and *digital terrain model* interchangeably. There is no difference between the two. Both terms refer to a triangulated model representing a physical surface such as existing ground or proposed pavement.

Current versions of InRoads software typically use the term *surface* instead of *digital terrain model* or *DTM*. However, many other software applications refer to their models as *digital terrain models*. Therefore, both terms are used interchangeably.

Digital Terrain Model Overview

What is a Digital Terrain Model?

A digital terrain model (DTM) is an electronic approximation of the ground surface for a given area. Stated another way, it is a database of coordinates (often linked together into line strings or shapes) that represent real world objects.

Why is a DTM an approximation and not an accurate model? To find this answer, first consider how many points are on a single grain of sand. The answer is an infinite number, assuming the points are infinitely small. To physically or electronically model a grain of sand, it is necessary to define the size of point used in the model. Based on the point size, sufficient sampling of the grain of sand can be made to define an approximate model of the grain of sand. However, the model can always be more accurate by defining a smaller point size.

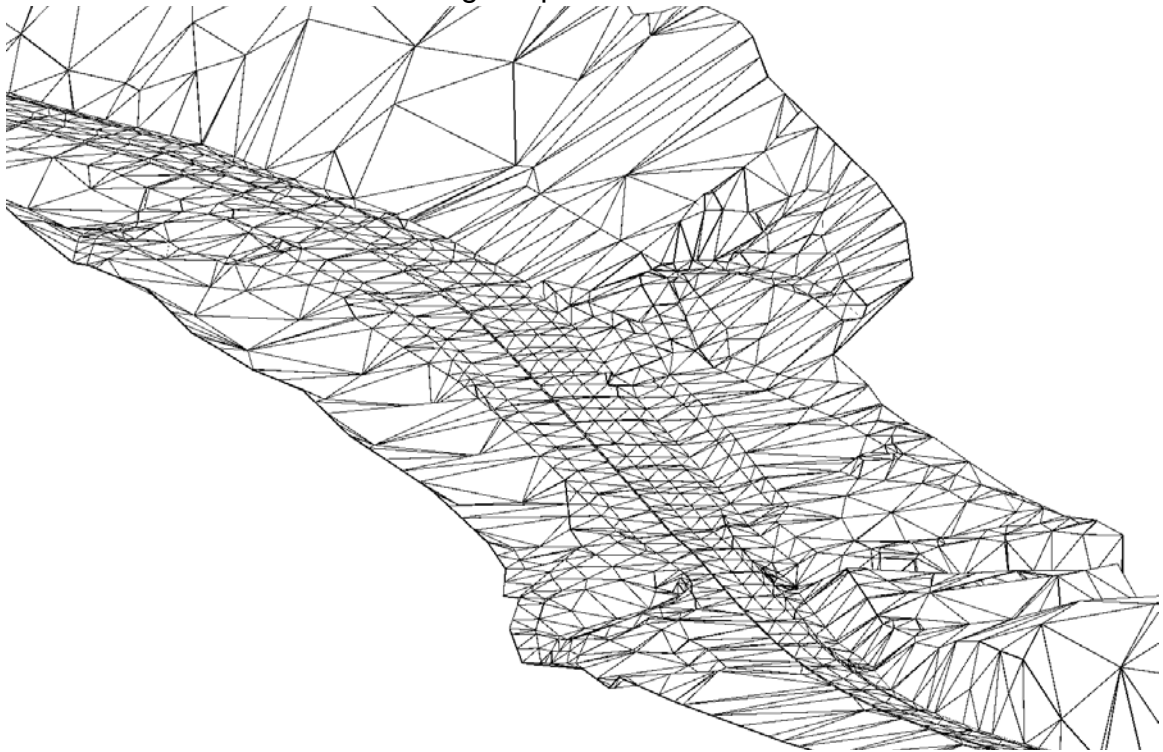
Creating a DTM is very similar to modeling a grain of sand, just on a bigger scale. The DTM is defined by a series of points, just like the model of the grain of sand. Understanding the relationship between the DTM point definitions and accuracy of the DTM is the key to understanding how to create and work with accurate DTMs.

The InRoads DTM

Many different software packages use DTMs to store terrain data and most do it in a similar fashion. Although the algorithm used to triangulate the surface may vary, the basic definition is similar using points, line strings, and shapes.

Some civil design tools use a Triangulated Irregular Network (TIN) as their DTM model. While the TIN model provides an accurate terrain model, it is limited in its usage beyond the model. The coordinate points, line strings, and shapes are loaded into the DTM and triangulated. However, once loaded, this DTM does not store any information about the origin or purpose of each coordinate. For example, the DTM cannot distinguish between a line string representing a curb and a line string representing a fence. Since the DTM cannot tell one line string from another, the DTM cannot graphically display the individual DTM elements symbolized to represent the purpose of the element.

However, the InRoads DTM is different. It is a *feature based* DTM. A feature based DTM not only stores the coordinate data, it stores feature data (structure and appearance) with each element stored in the DTM. Since the feature data is included with the elements in the DTM, each element is evaluated or displayed using appropriate symbology. For example, when the DTM features are displayed, a water line will look different from an edge of pavement or a curb line.



The InRoads DTM also stores data that does not contribute to the terrain surface, but is valuable to the design process. For example, the location of a culvert, waterline, or guardrail can be stored in the DTM even though these elements should not be included in the surface model. Since the DTM stores the true three-dimensional location of all points, utility or planimetric data is also stored in its true three-dimensional location.

There are many benefits to storing data in the DTM that does not contribute to the terrain surface. First, any data in the DTM can be displayed in a plan view, profile view or cross section view. Therefore, it is very simple to show the location of a waterline or guardrail in the plan view, as well as on the profiles and cross sections if the data is included in the DTM. Another use of including the data in the DTM is for design decisions. For example, if the right-of-way line is stored in the DTM, the roadway modeler can make decisions to determine the best side slope so that the toe of the slope does not fall outside of the right-of-way.

What is a Feature?

In InRoads, a feature defines the *structure* and *appearance* of elements.

Which elements? In InRoads, features relate to elements stored within a DTM and to survey data when using InRoads Survey. Since the survey data is a common source of the DTM, the two components are closely related.

Structure – The *structure* component of the feature defines how the points behave and relate to one another. Using a feature, points with the same characteristics and purpose are grouped to electronically replicate real world objects. For example, consider a collection of survey points collected along the flow line and the back of a curb and gutter section. If each point is independent of each other point, the resulting DTM may not accurately model the curb face because the triangulation routine does not understand how the points relate to one another. However, when the points are grouped as a feature, the points more accurately model the curb face by defining a line string along the flow line and another line string along the back of the curb.

Appearance – The *appearance* component of the feature defines the symbology (color, weight, and so on) used to display the coordinate points. If required per the structure component of the definition, the symbology of lines connecting the coordinate points is also defined by the feature.

Other examples of features are the edge of a roadway or the bottom of a ditch. These features represent either the existing or the proposed roadway. These examples of features are all linear connected features (flow line of a gutter or edge of a roadway). However, features can also contain related points that are not linearly connected. For example, all trees or random elevation shots on a project can be collected into a single feature. Although each tree is its own object and is represented individually in the drawings as a cell, the trees are all grouped into a single feature in the DTM for easier tracking and management of the data.

InRoads features are at the core of virtually every InRoads process from importing survey data, through design, cross sections, profiles, and reporting. Features are the backbone of the InRoads DTM.

InRoads Feature Terminology

InRoads and InRoads Survey use the term “feature” to refer to different components of the software. Below are brief definitions of feature as it applies to different uses that will be encountered when using InRoads.

Survey Feature – Survey features define how elements appear in the graphics file when they are imported from raw data sources, such as data collectors, and processed with InRoads Survey.

In addition to the appearance definition, the survey feature also contains parameters about the contents and purpose of the survey data. Examples are how a point should be connected to previous points and which codes a surveyor uses to collect a point that InRoads will interpret as this feature.

Survey features are defined in a Survey Feature Table file which has a default extension of *.fwf*.

Feature Code – Feature code is the code a surveyor enters into a data collector to identify a point. The feature code is matched to the survey feature name when the survey data is imported using InRoads Survey.

Feature – InRoads uses the term *feature* to refer to the contents of a DTM. Every coordinate in a DTM is part of a feature. The features within the DTM define how each point behaves and how it influences the triangulated model resulting from the DTM. The DTM feature indirectly defines the appearance of the graphics by linking to a *feature style*.

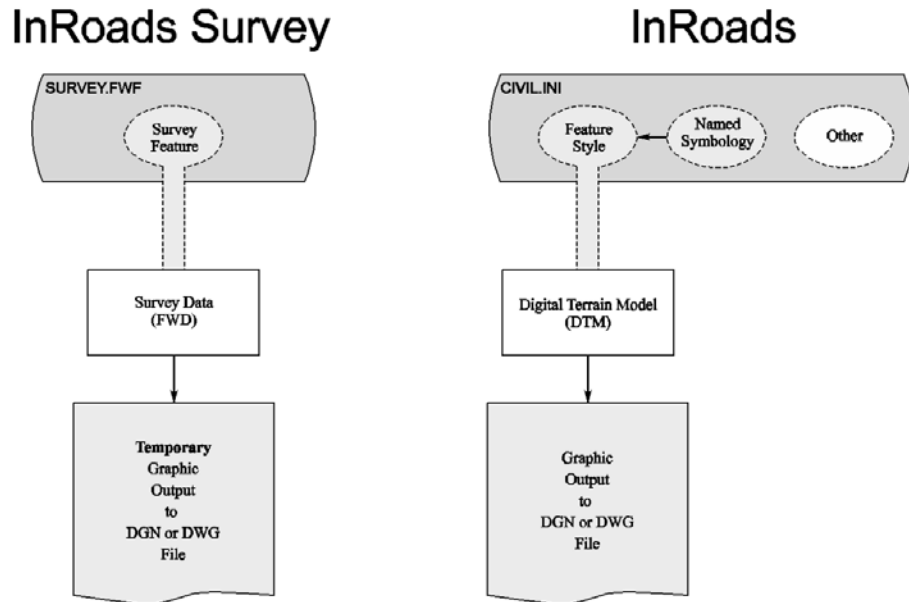
Features are stored in the Surface or DTM file which has a default extension of *.dtm*.

Feature Style – Feature styles define how a point or a series of points are displayed in the graphics file. For example, whether the feature displays in plan view, profile view, or cross section view. The feature style links to a *named symbology* definition that defines the appearance of the graphics.

Feature styles and named symbology are both stored in the InRoads Preference file. This default name for this file is *civil.ini*.

Feature Type – The feature type defines the structure of the feature which can be individual points, linear or a closed area. This definition controls how features affect the triangulated model.

The following illustration shows the relationship of InRoads features and the associated feature preferences in InRoads Survey and InRoads software.



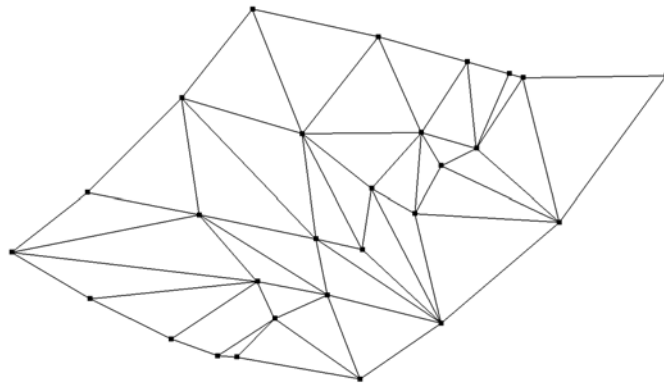
Relationship between InRoads features

The illustration shows two distinctly separate uses of Features within the InRoads software.

Feature Types

A common component of Survey features and DTM features is the *feature type* or *point type* the feature represents (InRoads uses both names interchangeably). A feature defines the structure of the coordinate points that belong to the feature. Ultimately, the coordinate points are used to create a DTM. The feature type specifies how the coordinate points are interpreted and related to each other within the DTM. InRoads supports five point types: Random, Breakline, Contour, Interior Boundary, Exterior Boundary, and Do Not Triangulate.

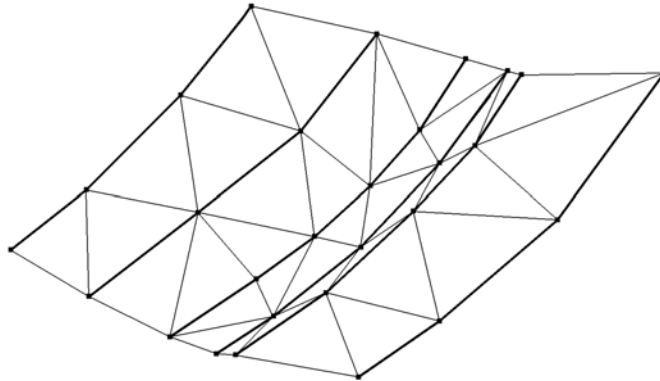
Random Points – Random points, also called spot points, represent non-uniformly spaced points that have no directly relationship to other points. When a triangle model is created from random points, the DTM system determines how to connect the points. Triangulating random points typically results in a less accurate model than one created using breakline point types. Random points are typically used to supplement breaklines.



Random points triangulated

Breakline Points – Breakline points represent a linear discontinuity in a surface such as a ridge, ditch, edge of pavement, or curb. The breakline feature type specifies that all points in the feature are connected as a linear segment. When the DTM model is created, the triangles are formed so that no triangle crosses any breakline segment. Therefore, the breakline holds a linear relationship that might otherwise be lost during triangulation.

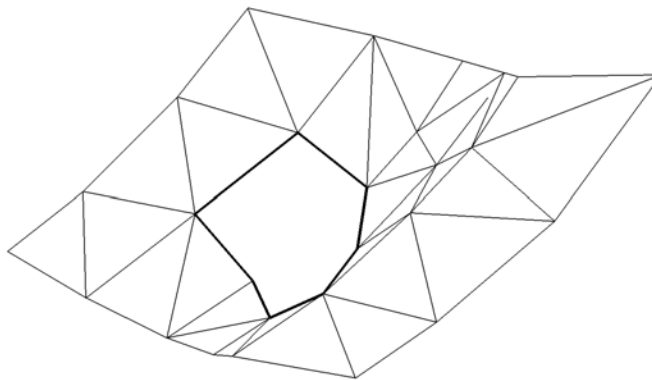
In the following illustration, the random points are replaced by breaklines passing through the same locations as the random points. The resulting triangles more accurately model the linear relationship of this segment of a roadway.



Breakline points triangulated

Contour Points – Contour points behave exactly the same as breaklines. Contour points are special breaklines where all of the points in each contour line are at the same elevation.

Interior Boundary Points – Interior boundary points represent undefined areas in a DTM. For example, the footprint of a building or body of water is specified as an interior boundary. No triangles are created inside the interior boundary. The interior boundary must be a closed shape. A DTM can have more than one interior boundary, but they must not overlap.



Interior Boundary points triangulated

Exterior Boundary Points – Exterior boundary points represent the outer extent of the DTM. No triangles can exist outside of the exterior boundary. The exterior boundary must be a closed shape. Only one exterior boundary can exist in a DTM.

Do Not Triangulate – Sometimes it is desirable to include points in a DTM that do not influence the surface model. For example, underground utilities and other planimetrics can be included in the DTM even though they do not contribute to the surface model.

Why include points in the DTM that do not contribute to the surface model?

InRoads can display any feature in the DTM in plan, profile, or cross section views. Therefore, including planimetric features such as utilities and fences in the DTM allows those elements to be easily shown on cross sections and profile views as well as in the plan view display.

How Features are Defined

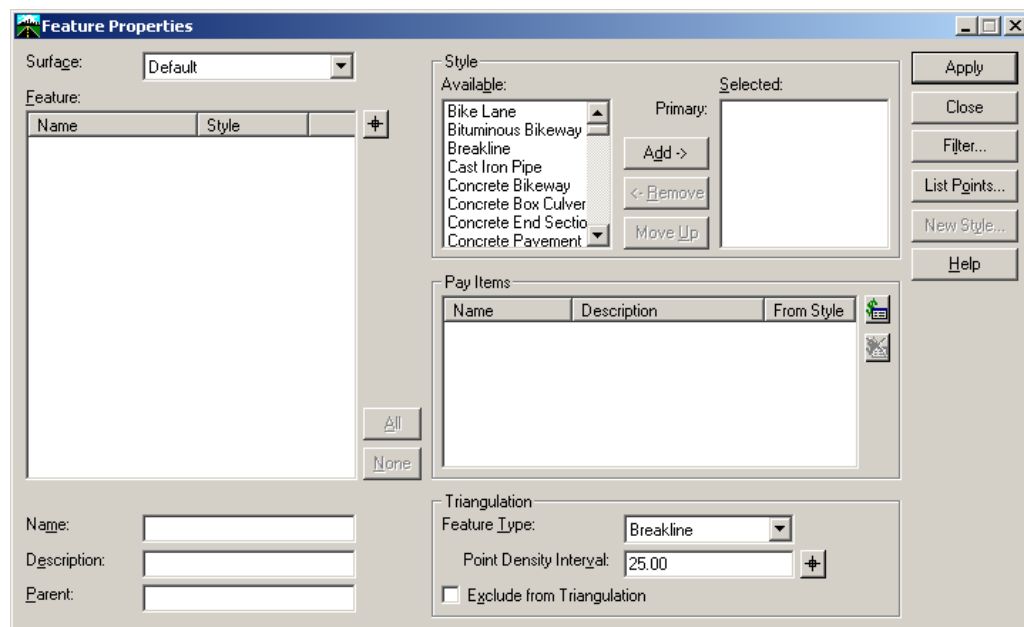
InRoads uses the term *feature* to describe an element in a DTM file. Every element in the DTM belongs to one and only one feature. A feature is a named *set* of coordinate points in a DTM. By itself, a coordinate point is just that, a single location in space unrelated to all other points. However, when a set of related points is grouped into a feature the result has far more meaning than the points themselves.

The grouping defines which points to connect together, the linear relationship of the points, and the order of the points. Most importantly, the feature identifies the purpose (structure) and graphical display (appearance) of the points.

Although the feature is stored in the DTM, not all of the feature *parameters* are stored in the DTM. The feature parameters are stored in both the DTM and the civil.ini file. The feature parameters are distributed across the two files so that common parameters can be reused without duplicate setup.

Feature Properties

The *Feature Properties* tool is used to view and edit the parameters of a feature stored in the DTM file.



Sample Feature Properties dialog box

A list of individual features stored in the surface are displayed on the Tools dialog box. Remember, all coordinate points used for a DTM must be stored in a feature. It is common to have multiple features in a DTM that represent the same type of element in the surface. However, all features must have a unique name. For example, in a surface, there might be four edge of pavement features named EOP1, EOP2, EOP3, and EOP4. Each one represents a different edge of pavement.

Each feature has a feature style linked to the respective feature. In the example, all four edge of pavement features are linked to the feature style named EOP. In this case, the feature name and the style name were substantially similar. However, the names do not need to be the same or similar.

Surface Files

Creating a Surface

A new blank surface is created using the *File > New* tool and selecting the Surface tab. This tool only creates the surface in memory; it does not save the surface to disk. That must be done as described in the following section.

The name specified when creating a new surface is the “internal” name. This is the name that is visible in the InRoads Explorer and other dialog boxes. Although it is recommended that it should be, the internal name and the disk name of a surface are not required to be the same.

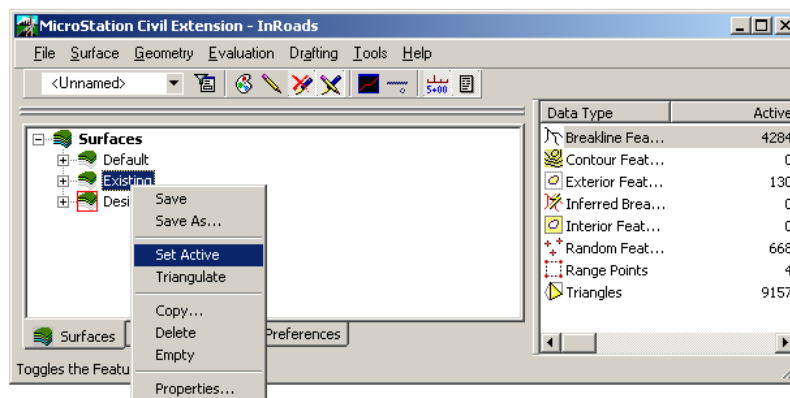
InRoads can have more than one surface in memory at a time. These surfaces are tracked by their internal name given when creating the DTM. No two surfaces can have the same internal name. Names are case sensitive, so Existing is not the same surface as EXISTING.

Setting the Active Surface

Whenever a Surface is loaded or created in InRoads, a red box appears around the icon representing “Active” surface. Operations are performed in the active surface.

When a surface tool is selected, surfaces that are currently loaded may be available to choose. Unless a different surface is selected, the “Active” surface automatically displays as “selected” in the list.

To make a surface active, simply right mouse click on the surface name in the workspace area of the InRoads explorer and select Set Active from the pop-up menu. Or select Surface > Active Surface from the InRoads menu, select the surface from the list, then click Apply to make it active.



Setting a Surface Active

Saving Surface Data

Once the surface is created it must be saved to disk. By default, surfaces have a *.dtm* extension. When saving the surface, it is recommended that the same name be used for the surface file as the internal surface name. For example, a surface named Existing will be saved out as Existing.dtm.

Surfaces and Locks

There are three InRoads locks that are important when working with surfaces: the Write lock, the Feature Filter lock, and the Style lock. For a discussion on these locks, please see the beginning portion of this chapter.

Surface Properties

The Surface Properties dialog box gives a general overview of the surface data and display properties. The name and surface type, as well as the total number of each feature type, and triangle total can be reviewed in the Main tab. The elevation range of points in the surface is also easily visible in the surface properties. In the Advanced tab, controls are available which allow the appearance of the surface in profile and cross section to be modified. To access the surface properties, select Surface > Surface Properties or Right-Click on the name of the surface in the workspace area of the InRoads Explorer and select Properties from the shortcut menu.

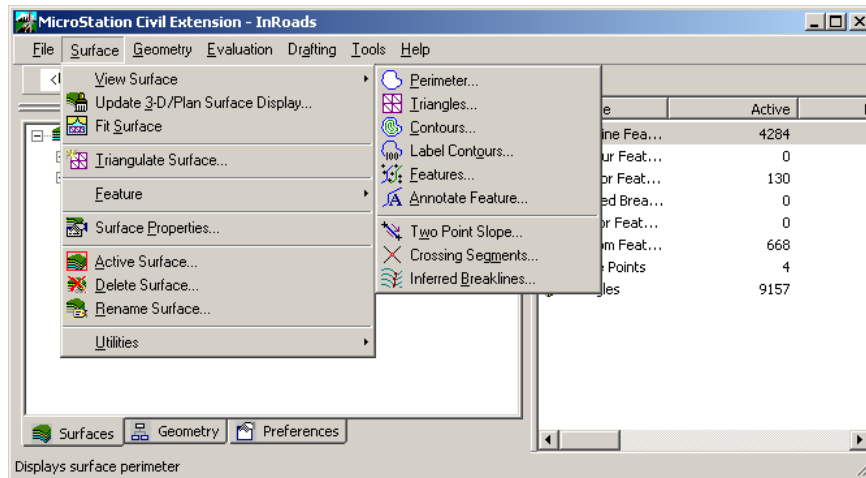
The preference option is used to assign a preference name to the surface, which controls how a surface will appear when using the View Surface tools and the Style Lock is on.

Data Totals				
	Active	Features	Deleted	Total
Random:	668	43	347	1015
Breakline:	4284	436	116	4400
Contour:	0	0	0	0
Inferred:	0		0	0
Interior:	0	0	0	0
Exterior:	130	1	0	130
All Points:	5082	492	463	5545
Triangles:	9157		133	9290

Surface Properties dialog box

View Surface Tools

The View surface tools allow surface data to be displayed as graphics in the CADD file and provide an excellent means of surface analysis and visualization. The view surface tools also work in conjunction with the locks mentioned earlier in the chapter, which control how the graphics are displayed, refreshed, and removed. To access the View Surface tools, select Surface > View Surface from the menu.



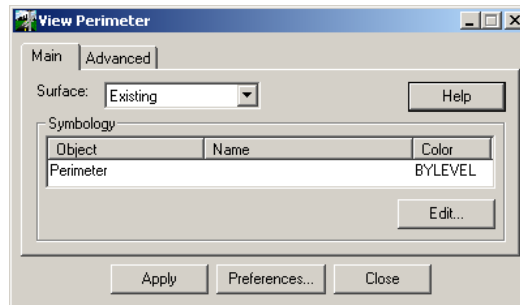
Sample Feature Properties dialog box

View Perimeter

The View perimeter tool displays the outermost edge of the triangulated surface as a closed shape in the CADD file.

This command computes the perimeter of the active surface in one of two ways. If an exterior boundary exists for the surface, the command displays it as the perimeter because no valid triangles exist outside of this closed shape. If an exterior boundary does not exist, the software works its way around the edge of the model, making sure not to use any deleted triangles. This path is displayed as the perimeter.

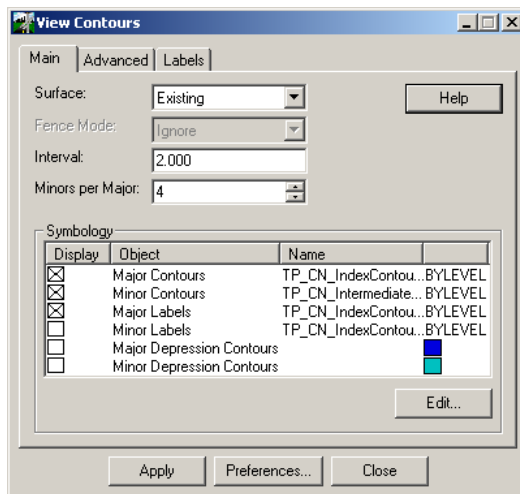
To View a surface perimeter, select Surface > View Surface > Perimeter, select the surface from the list, then click Apply.



View Contours

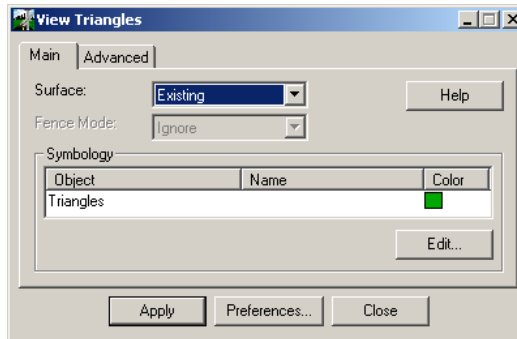
The View contour tool displays contour lines in the CADD file for the active surface. Major and minor contour lines are displayed per the interval specified in the main tab. Contour elevations can be labeled as well. The contours are computed by interpolating the points along the edges of each triangle and connecting the points.

To view the contours of a given surface, select Surface > View Surface > Contours, select the surface from the list, then click Apply.



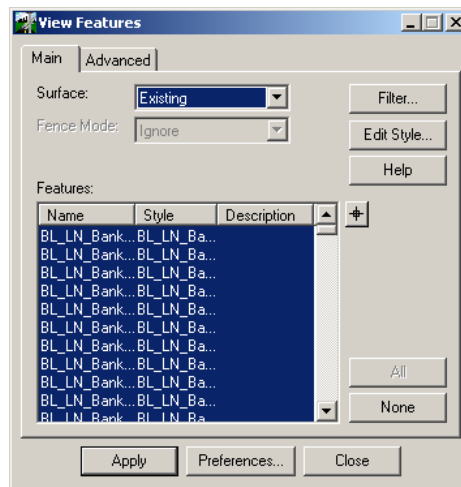
View Triangles

The View Triangle tool displays all or a portion the triangles that are contained in a given surface in the CADD file. The appearance of the triangles can be controlled by editing the symbology in the main tab. To view the triangles of a surface, select Surface > View Surface > Triangles, select the surface, then click Apply.



View Features

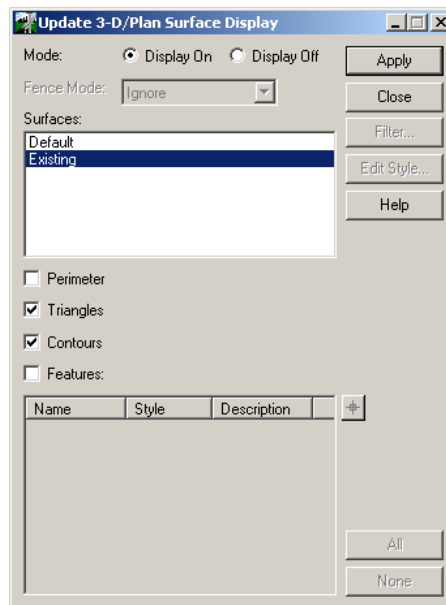
Each feature of a given surface, such as breaklines, random points, boundaries etc. can be displayed in plan view by using the View features tool. How each feature is displayed is controlled by the symbology assigned to the feature style. If a feature shows up gray in the list, it means the plan display is disabled for that feature style. To edit a feature style, click on the name of the feature and click the Edit Style button. To display features select the feature from the list, then click the Apply button.



Update 3D Plan Surface Display

The Update 3D Plan Surface Display is used to display or remove surface data from the file. More than one surface can be selected at a time and more than one type of data ie. contours, triangles can be displayed or removed in one step. The Mode option is used to control whether surface data is turned on or off.

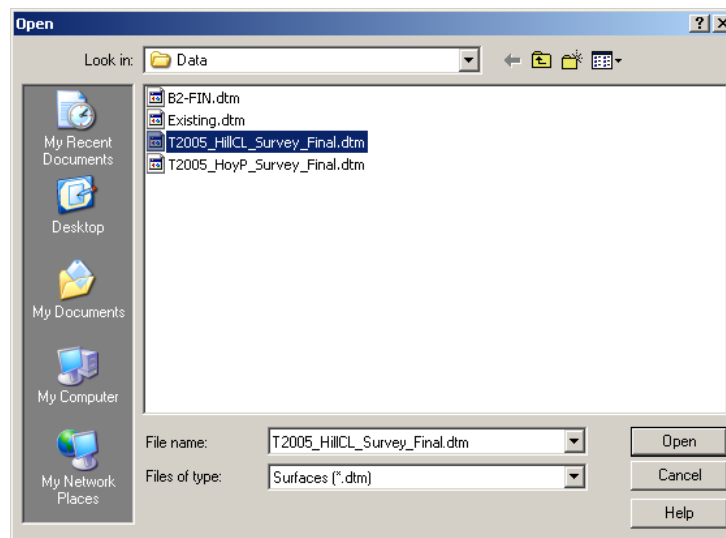
The surfaces area displays all the surfaces that are currently loaded and ready to be selected. Below the surfaces area, controls are available which allow data to be inabled or disabled. When data such as contours are enabled, it can either be turned on or off (depending on the mode). To run the command, click the Apply button.



 **EXERCISE-SURFACE REVIEW AND DISPLAY**

Loading a Survey Data DTM Surface

- 1 From the InRoads menu, select File > Open.
- 2 Browse to the folder C:\BE Data\{Course #}\Data\
- 3 Set the Files of type to **Surfaces (*.dtm)**
- 4 Select the file T2005_HillCL_Survey_Final.dtm

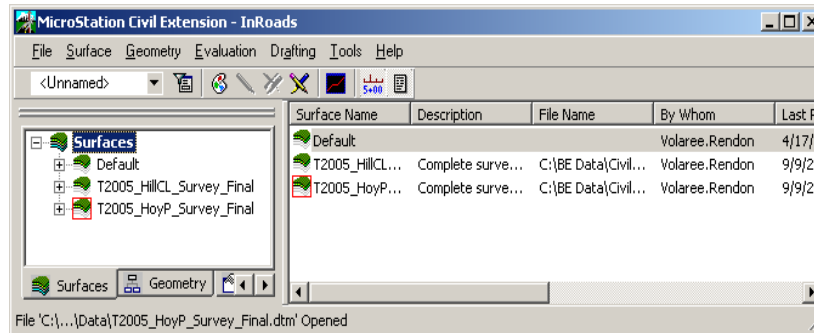


InRoads File Open dialog

- 5 Click **Open**. The DTM is loaded into InRoads.
 - ① Notice that the dialog box does not close so that additional surfaces can be loaded if necessary.
 - 6 Select the file T2005_HoyP_Survey_Final.dtm
 - 7 Click **Open**.
 - 8 Click **Cancel** to close the dialog box.
 - ① In a later exercise we will learn to setup InRoads so that several files can be opened simultaneously.
- There are now two surface files in InRoads memory. The last file open is now the active surface.

- 1 Review the InRoads Explorer dialog box.
- 2 Select the **Surfaces** tab on the bottom of the Workspace bar on the left side of the dialog box.

There are now three surfaces loaded in InRoads. The Default surface is created when InRoads starts. The other two surfaces are those that were loaded in the previous steps.



InRoads Explorer showing two surfaces loaded

The T2005_HoyP_Survey_Final surface is the active surface. The active surface is identified by the red box around the surface icon in the InRoads Explorer.

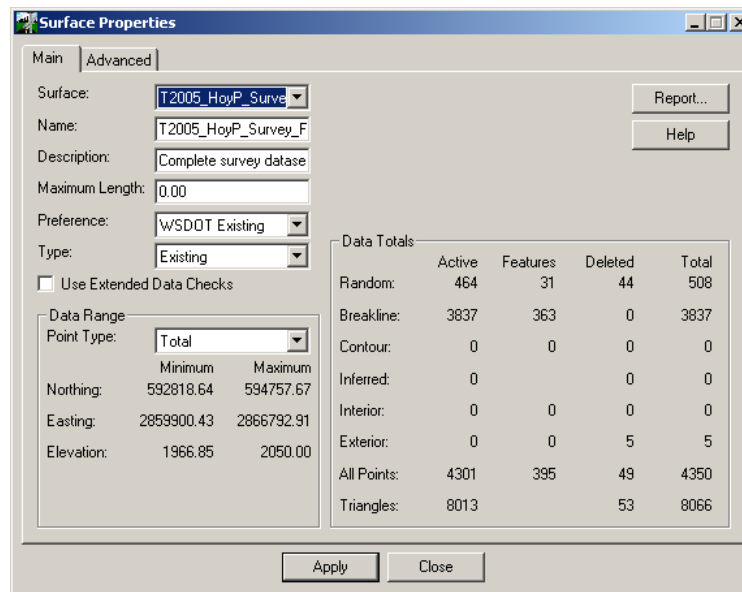
The active surface defines which surface data is edited or viewed when the appropriate tools are invoked. The active surface is redefined with the Surface > Active Surface tool or by right-clicking on the desired surface name and selecting *Set Active* from the shortcut menu.

Review Surface Properties

Immediately after loading a surface it is a good idea to review the surface's properties. This is a quick check to verify the surface.

- 1 Select Surface > Surface Properties.

The Surface Properties dialog box appears.



Surface Properties dialog box

- 2 Review the Minimum and Maximum coordinate in the lower left corner of the dialog box.
- 3 Check that the coordinates are in the correct area of the project. Make sure to check the elevation range. This is an easy method to spot elevation bust problems in the surface.
- 4 Also review the Data Totals section on the right. Most surfaces will contain random and breakline points. If these are missing, there might be a problem. Verify that the surface contains triangles. If not, it will need to be triangulated.
- 5 Change the *Surface* option to the T2005_HillCL_Survey_Final.
- 6 Review the contents of this surface.
- 7 Close the Surface Properties dialog box.

Set Active Surface

When the surface was changed in the Surface Properties dialog box, it also changed the active surface.

- 1 Right-click on the T2005_HoyP_Survey_Final surface in the InRoads Explorer.
- 2 Select **Set Active**.
- 3 The T2005_HoyP_Survey_Final surface is now the active surface.

Write Lock

Before displaying any graphics the Write lock needs to be understood. The Write lock defines if the graphics is created in the CAD file or only temporarily displayed on the screen. When InRoads generates graphics and the Write lock is disabled, the graphics are temporary and will “disappear” when any view commands (fit, zoom, refresh) are performed in the graphics software.

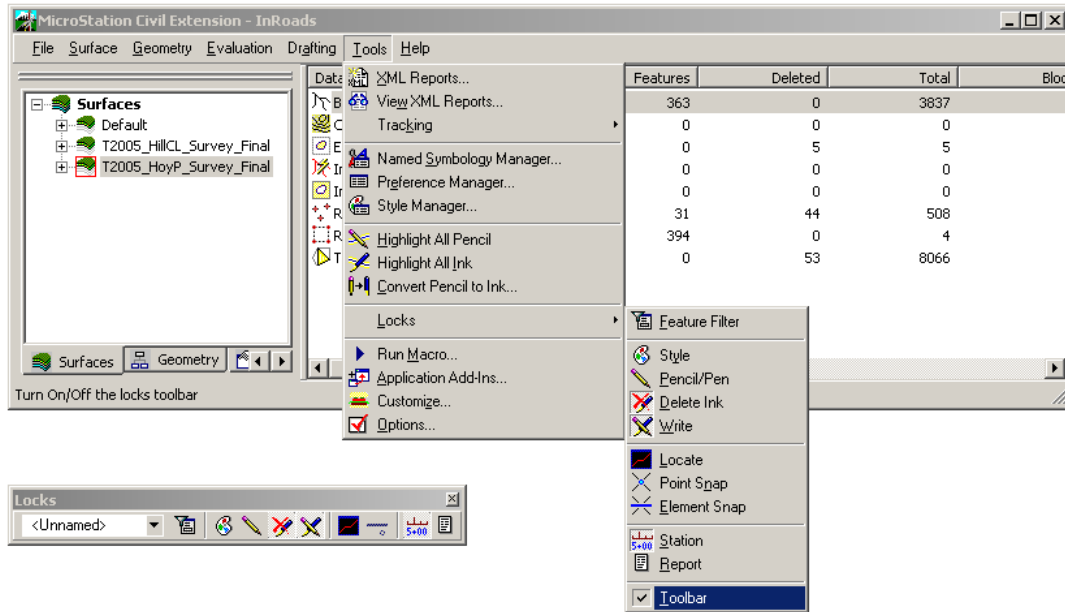
So in other words, any graphics that InRoads generates when the Write lock is disabled are only temporary graphics. If the Write lock is enabled, the graphics are written to the CAD file so a view command will not cause the InRoads' displayed graphics to disappear. The Write lock only affects InRoads generated graphics, anything done within MicroStation, like Place Line, is not affected.

The Lock Toolbar

It is convenient to display the InRoads Lock toolbar docked to the InRoads Explorer. This allows much easier access to the locks than using the pull down menus.

- 1 From the InRoads menu select Tools > Locks > Toolbar.

If there is a check mark next to *Toolbar*, then the *Locks* toolbar is already displayed. If there is no check mark, select the menu item to have the Locks toolbar displayed.



InRoads Explorer showing the Locks toolbar

- ① Selecting *Tools > Locks > Toolbar* is the same as selecting *Tools > Customize* and toggling on *Locks* on the *Toolbar* tab.
- 2 Drag the *Locks* toolbar and dock it to the InRoads Explorer just below the pull down menu if it is not already there.

Using the Write Lock

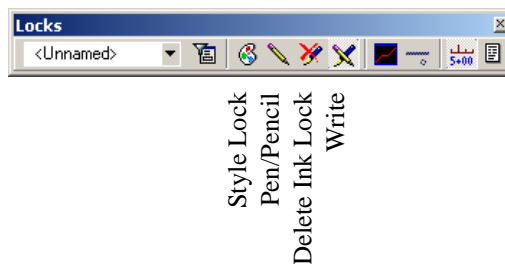
Which is the Write lock and how do I know it is on?

Good question. The Write lock is located at about the middle of the buttons on the Locks toolbar. Graphically it looks like a pen and pencil crossed.

When the Write lock is enabled, it appears depressed and has a lighter background. In addition, the two buttons to the left will be active and displayed in color.

When the Write lock is disabled, it does not appear depressed and has a darker background. Another easy way to tell the Write lock is disabled is that the two buttons to the immediate left of it are grayed out when it is disabled.

- 1 Enable the *Write* lock.



Locks Toolbar with Write lock enabled

- 2 Disable the *Write* lock.



Locks Toolbar with Write lock disabled

Three buttons to the left of the *Write* lock is the *Style* lock.

The Style lock is used with surfaces. Surfaces can have preferences associated with them. When a view surface tool is used with the Style lock enabled, the dialog box for the command will not be displayed, but rather your surface data will be displayed in the graphics file without any further input from you. The Style lock bypasses the dialog box and displays the active surface, automatically determining what symbology to use.

- 3 Enable the *Style* lock if it is not already enabled.

The background of the Style lock will be a lighter color and the button will appear depressed when it is enabled.

Surface Display

- 1 Select Surface > View Surface > Contours.

What just happened? No prompt or dialog boxes appeared and the graphic contours were created. How did InRoads know what to do? Because the Style lock is enabled, the contours displayed using predefined preference associated with the surface. The contours are created for the active surface.

- 2 Fit the graphic view.

Notice that the contours disappear. The data that created the contours is not gone, just the graphics have disappeared. This happened because the Write lock was disabled when the graphics were created so they were defined as temporary graphics.

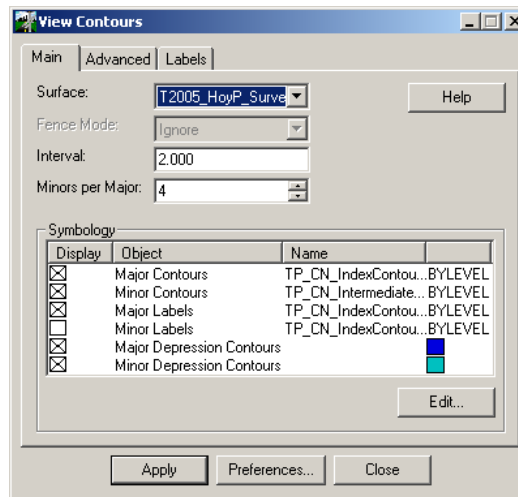
3 Disable the Style lock.

Both the Write lock and the Style lock should be disabled.

The Contour dialog

1 Select Surface > View Surface > Contours.

The View Contours dialog box appears because the Style lock is now disabled. When the Style lock is enabled, InRoads uses predefined preference settings instead of displaying the dialog box.



The View Contours dialog box

2 Click **Apply**.

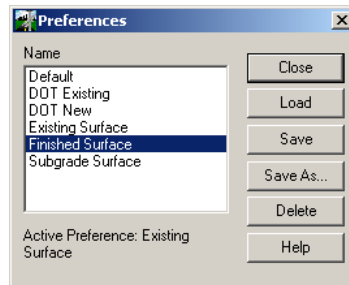
3 The contours display again.

4 Fit the graphic view.

5 Again, the contours disappear because the Write lock is still disabled.

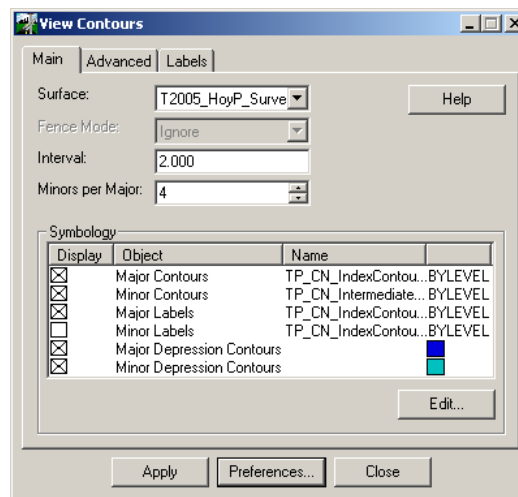
Loading a Preference

- 1 With the *View Contours* dialog box still open, click **Preferences**.



Preferences dialog box

- 2 Select the Preference named Finished Surface.
- 3 Click **Load**.
- 4 The preference is loaded into the View Contours dialog box. The preference contains stored definitions for all of the options and parameters in the dialog box.
- 5 Click **Close** to close the preference dialog box.



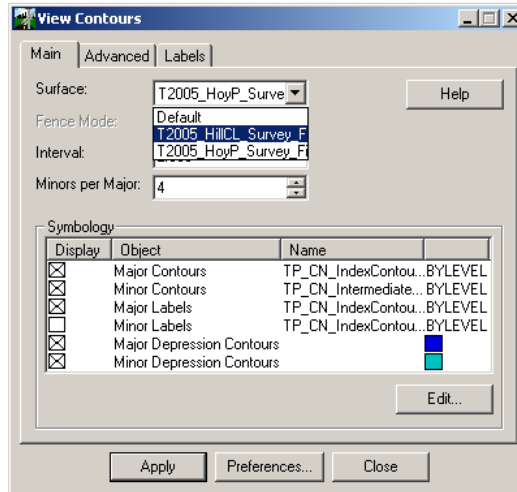
View Contours dialog box after loading the Finished Surface preference

- 6 Click **Apply** on the View Contours dialog box.
- 7 The contours display differently from before.
- 8 Update the graphic view. The contours disappear again because the Write lock is still disabled.

Changing the surface displayed

So far all that has been displayed is the surface T2005_HoyP_Survey_Final. Next you are going to change the surface and see what the other surface looks like.

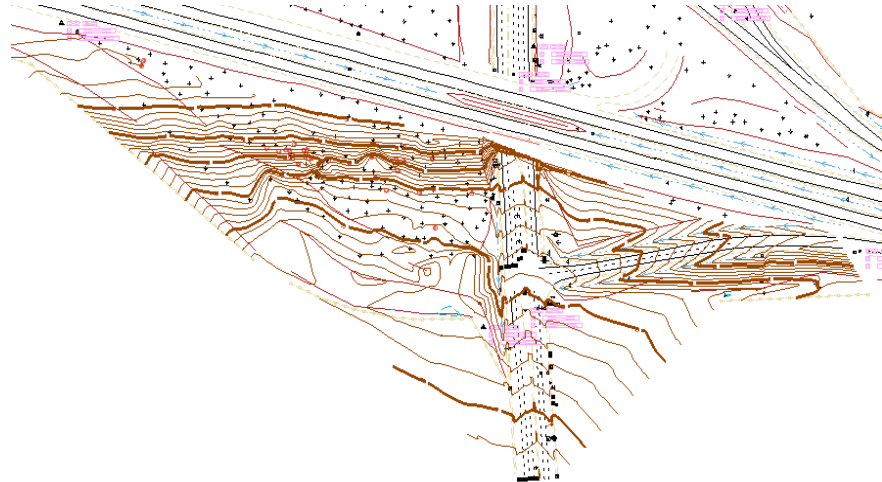
- 1 With the View Contours dialog box still open, change the *Surface* option to T2005_HillCL_Survey_Final.



The View Contours Dialog box while changing the Surface to display

- 2 Click **Apply**.
- 3 The contours for the southern half of the interchange display.
- 4 Zoom in or window area around where the contours are displayed.
- 5 Yes, the contours will disappear.

- Click **Apply** again.



View of the contours for surface L2005_HillCL_Survey_Final

- Update the graphic view.

Enabling the Write Lock

- Enable the *Write* lock.

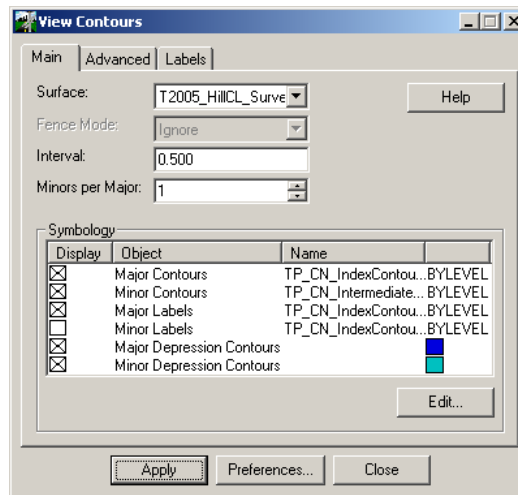


*Locks toolbar set with Write lock enabled,
Pencil mode enabled and the Style lock disabled*

- Toggle the *Pen/Pencil* toggle to *Pencil* mode.
- Click **Apply** on the View Contours dialog box.
- Update the graphic view.
- Notice that the contours do not disappear this time. They are written to the design file because the Write lock was enabled when they were created. But what is the Pencil toggle? With Pencil, if the display setting are changed and the same item is re-displayed, the graphics will erase automatically before being redrawn.

Changing the Contour Interval

- 1 On the View Contour dialog box, change the *Interval* to 0.50.
- 2 Set the *Minors per Major* to 1.

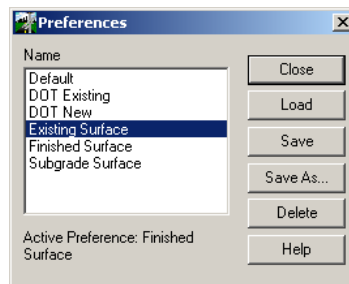


Modified Interval and Minors per Major options

- 3 Click **Apply**.
- 4 Notice that the old contours are erased before the new ones are displayed.

Resetting the display preference

- 1 With the View Contours dialog box still up, click **Preferences**.



Preferences dialog box

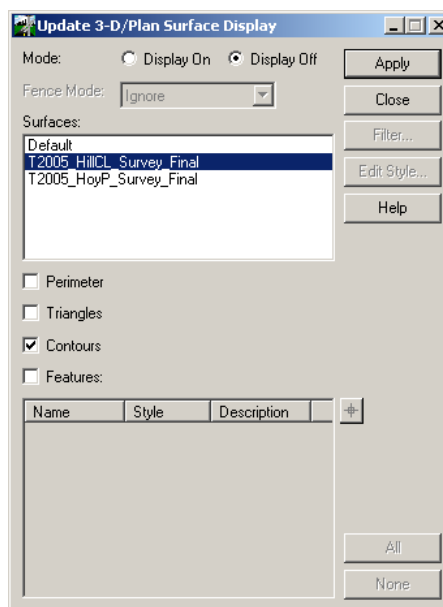
- 2 Select the *Preference* named Existing Surface.
- 3 Click **Load**
- 4 Close the Preferences dialog box.
- 5 Click **Apply** on the View Contours dialog box.

- 6 Again, notice that the old contours are erased before the new ones are displayed. The new contours display using the original display.
- 7 Close the View Contour dialog box.

Deleting Surface Display Graphics

As with many things with InRoads there are a few ways of doing things. To delete the displayed contours, the MicroStation *Delete Element* tool could be used. There is also an InRoads tool that will do the same.

- 1 Select Surface > Update 3-D/Plan Surface Display.
- 2 Set the *Mode* to **Display Off**.
- 3 Enable the *Contours* option.
- 4 Select the Surface T2005_HillCL_Survey_Final



Update 3-D/Plan Surface Display

- 5 Click **Apply**
- 6 The contours are erased.
- 7 Close the Update 3-D/Plan Surface Display dialog box.
- 8 Although it would have been as easy to use the MicroStation Delete Element tool to delete the contours in this situation, that will not necessarily be true as the design gets more complex and contains more graphics. This tool is useful in

those situations when graphics cannot easily be selected. In addition, this tool can be used to create the contour or other surface display graphics.

- 9 Now it is your turn
- 10 Try the Surface > View Surface > Triangles and Surface > View Surface > Perimeter tools.
- 11 Experiment with the Write lock. Enable and disable the lock to control the triangle and perimeter displays.
- 12 Select File > Close > Surfaces. Click the Yes button in the Close All Surfaces dialog box.

4 Viewing Geometry

In this Chapter topics related to viewing Viewing Geometry will be discussed. The topics discussed include:

- What is a Geometry Project
- Loading a Geometry Project
- Viewing Geometry
- Profiles
- Viewing Vertical Alignments
- Geometry Reports

The Geometry Project

What is a Geometry Project File?

The geometry file contains geometry elements, which include coordinate geometry points, horizontal alignments, and vertical alignments. The geometry file is frequently referred to as the geometry project.

In InRail, the geometry project also contains rail specific components such as cant alignments and turnout geometry. When saved to disk, the geometry file has a *.alg* extension. Think of it as an abbreviation for alignment.

In addition to the geometry elements, the geometry file also stores stationing information for the alignments including the starting station, station equations, as well as important points along the alignment know as Event Points.

Event Points are a method to locate important locations along an alignment. These points are either based on a station and offset or on fixed coordinates. The station and offset method allows the point to move as the alignment definition is changed. Fixed coordinate event points do not move when the alignment is changed. These

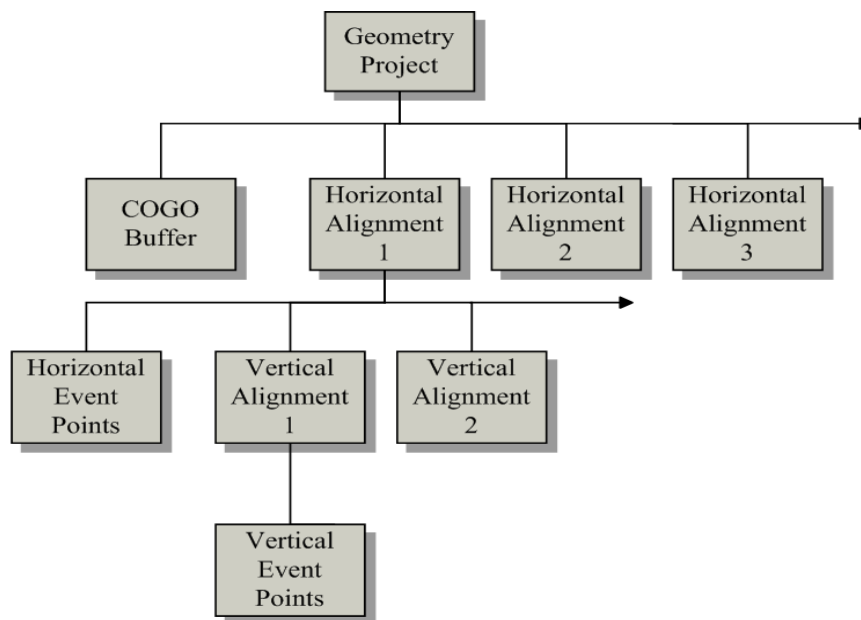
points are not necessary Cogo (coordinate geometry) points but they are points in the geometry file that have a coordinate associated with them.

What is the Geometry Project File structure?

A geometry project is similar in concept to a database. It stores and organizes point information. There may be several geometry projects opened in InRoads, but only one can receive input at a time. This is called the active geometry project.

A geometry project is organized into hierarchal categories starting with the Cogo point buffer and horizontal alignments. Only one alignment can be manipulated within a project at a time. This is the active alignment.

Vertical alignments, horizontal alignment event points, stored as subordinates or children to horizontal alignments. Vertical event points are children to vertical alignments. The purpose of the parent-child hierarchical structure is to avoid confusion or mistakes that can occur if a vertical alignment is used with an non-matching horizontal alignment.



Geometry Project organizational chart

As shown in the diagram above, multiple horizontal alignments can exist in a geometry project. Each horizontal alignment can have multiple vertical alignments.

Each horizontal alignment must have a unique name. Geometry names are case sensitive. What an alignment is named is up to the user but it is recommended that the names of the alignments give a clue to what the alignment is. An good example would be the following alignment names:

- I65 NB Alt 1
- I65 SB Alt 1
- I65 NB Alt 2
- Oak Street

Even though the following are legitimate alignment names, it is recommended that they not be used in a single geometry project because confusion might occur.

- oak street
- OAK STREET
- OaK StREET

Every Geometry project has two names. One name is used and seen when the geometry project file is opened in InRoads. The other name is the name see when listing geometry files on a disk drive. By default, the name that is displayed when the files are listed on the storage media, or hard drive of the computer, has a *.alg* extension. These two names, the one that InRoads displays and the file on the hard drive, do not have to be the same. However, it is recommended that the names be the same. If there is a Project Identification Number used for the project like 1345-2005 then a good choice for the Internal geometry project name is *1345-2005* and *1345-2005.alg* for the geometry file name on the disk drive. This will lead to less confusion especially months after a project is done or if someone unfamiliar with the project needs to use the files.

Storing Geometry Points

It is important to understand that InRoads has two primary storage locations for coordinate data within the geometry project. Some points are stored in an area called the Cogo Point Buffer while others are stored in the horizontal alignment definitions. The creation method determines where a geometry point is stored.

Cogo Point Buffer

The Cogo point buffer stores geometry points. Geometry points are named coordinate points that can be used for geometric calculations or alignments.

All Cogo points must have an alphanumeric or numeric name.

All InRoads Cogo points are stored with three coordinates, the Northing, Easting and Elevation (or X, Y, and Z, if you prefer). However, the elevation can be set to 0 when working in a 2-dimensional environment or with data that does not have a known elevation.

When Cogo points are used in a horizontal alignment that has an associated vertical alignment, the Cogo points do not inherit the elevation of the vertical alignment. The points can be updated with the vertical alignment elevation but it is not automatic. In other words, the elevation the point is created at remains the same in the geometry project unless it is updated.

- ① It is suggested that Cogo points that will be used in an alignment be named using numeric names only. Otherwise there is the possibility of getting an *Invalid Cogo description* error. The reason that alpha characters are not suggested for alignments is because the characters L, R, S, M, and C have special meaning to alignments which if used in the point name can confuse the software.

Most traditional Cogo commands like *Locate* and *Fit Curve* automatically create points in the Cogo buffer. However, some commands like *Traverse* and *Locate* do not always behave as one might expect.

The *Traverse* command has four options that define where a point is stored. The *To Cogo Buffer* and *Radial* options store the points in the Cogo buffer as single points. The *Before Alignment* or *After Alignment* options create points in the active horizontal alignment. All four methods create points with names.

Horizontal Alignment Points

If the point is created using one of the horizontal alignment commands, the point is automatically stored in a horizontal alignment, not in the Cogo buffer.

Unlike a Cogo point, horizontal alignment points do not require a name. InRoads allows this capability because alignments typically contain many points that are referenced by their station location, not a point name. Only those points that need to be named are stored in the Cogo buffer. This multi-location storage model also keeps the Cogo buffer cleaner and easier to use by not including all of the PC, PT, PI, ... points from each horizontal alignment.

Converting Between Point Types

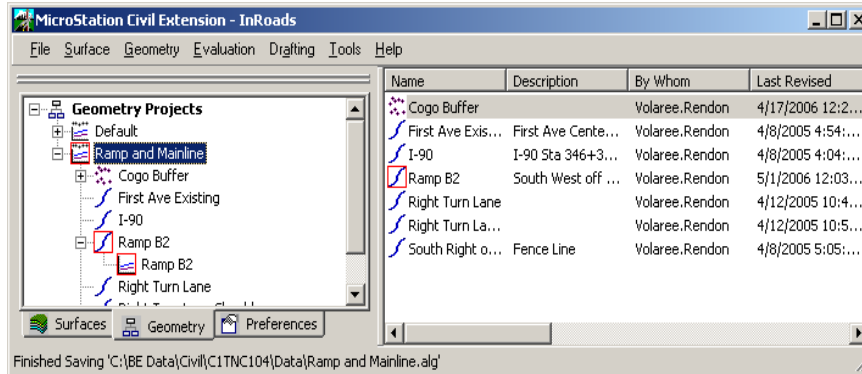
InRoads includes geometry tools to create Cogo points from horizontal alignment points as well as define alignments from Cogo points. Therefore, there is no limitation in how the points are stored, it is simply a method developed to be most flexible to the needs of InRoads users.

Loading a Geometry Project

To load a geometry project, select File > Open. More than one geometry project can be loaded into InRoads at a time. When a geometry project is loaded, the name of the geometry project will be visible in the workspace bar of the InRoads explorer, when the Geometry data type button is selected.

Like Surfaces, the Active geometry project is indicated by the red rectangle around the icon. With a geometry project however, "children" of the geometry project such as the horizontal alignment can be made "active".

In turn, “children” of the Horizontal alignment can then be made active such as the vertical alignment.

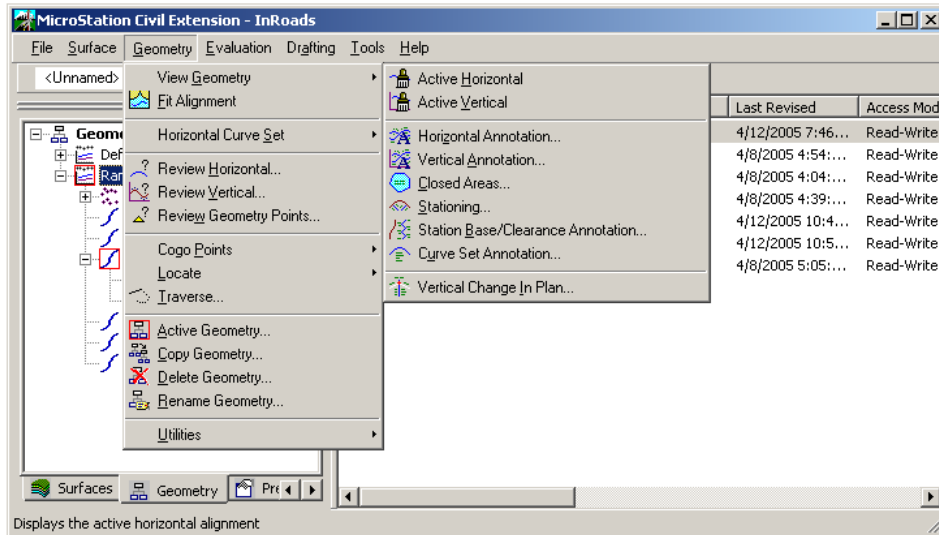


The horizontal and vertical alignment

In the example above, the active horizontal alignment is Ramp B2. The Ramp B2 horizontal alignment has one vertical alignment, which is also set active.

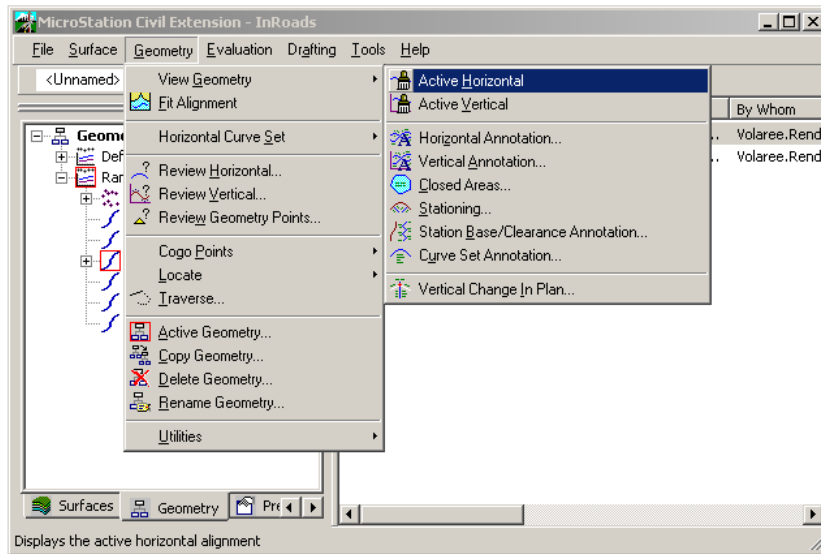
Viewing Geometry Tools

The view geometry tools can be used to display and annotate geometry data in the CADD file. The geometry viewing tools can be accessed by selecting Geometry > View Geometry.



View Active Horizontal

The View Active Horizontal tool displays the active horizontal alignment. It is important to remember that this tool only displays the linear element representing the alignment, and does not label or display alignment stationing. To view the active horizontal alignment, select **Geometry > View Geometry > Active Horizontal** or right click on the name of the horizontal alignment and select **View** from the shortcut menu.

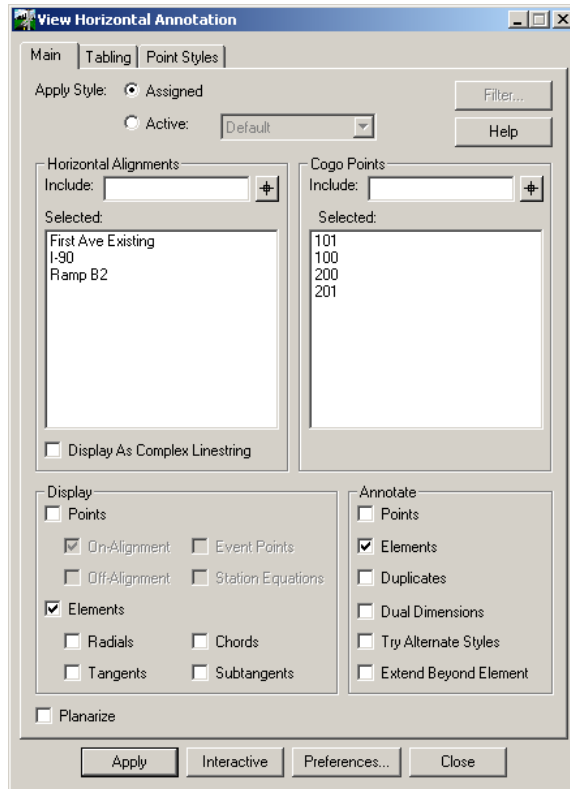


Selecting Geometry > View Geometry Active Horizontal

- ❗ A profile must be created before the View Active Vertical tool can be used. This tool will be covered in a later section.

View Horizontal Annotation

The View Horizontal Annotation tool can be used to display both the active horizontal alignment and alignment labels, such as curve data and distance and bearing of linear elements. The View Horizontal annotation tool can also be used to annotate multiple alignments and cogo points in one step.

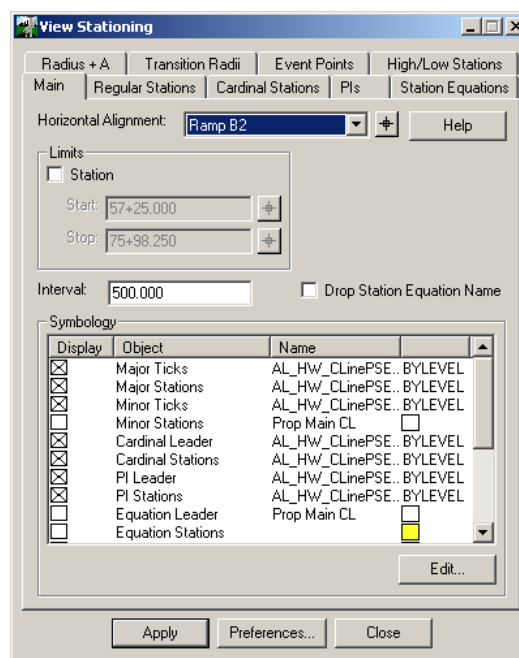


The View Horizontal Annotation dialog box

View Stationing

The View Stationing tool displays the stationing of the active horizontal alignment. A drop down list and target button is available to specify the alignment to in which to display station annotation. The Limits area allows a station range to be set in which the station text will only be displayed. The distance between stations can be controlled with the Interval option. The appearance of different stationing parameters such as major stations, minor stations, cardinal stations, leaders, ticks etc. can all be controlled in the symbology area.

To view alignment stationing, select Geometry > View Geometry > Stationing.



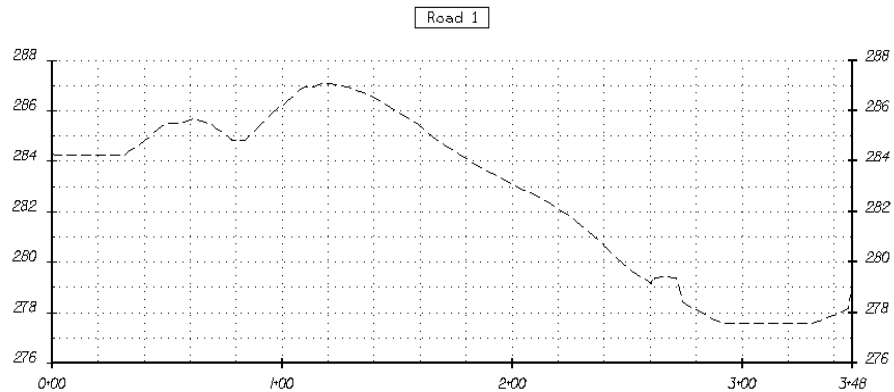
The View Stationing dialog box

Viewing Geometry and Locks

There are three InRoads locks that are important when working with surfaces: the Write lock, the Pen/Pencil Lock, and the Station lock. For a discussion on these locks, please see the Viewing Surfaces chapter.

Profiles

A Profile is a series of elevations extracted along a baseline at a specified station interval. In InRoads, the Profile is comprised of two parts, the profile window and profile data. The profile window refers to the graphics representing the bottom, left and right axes, and grid lines. The profile data is typically a line that refers to the terrain model elevation information. The profile data is updated with new surface information as it is obtained.



Example of an InRoads Profile

Multiple plots of profile data representing different surfaces can be displayed in a single InRoads profile window.

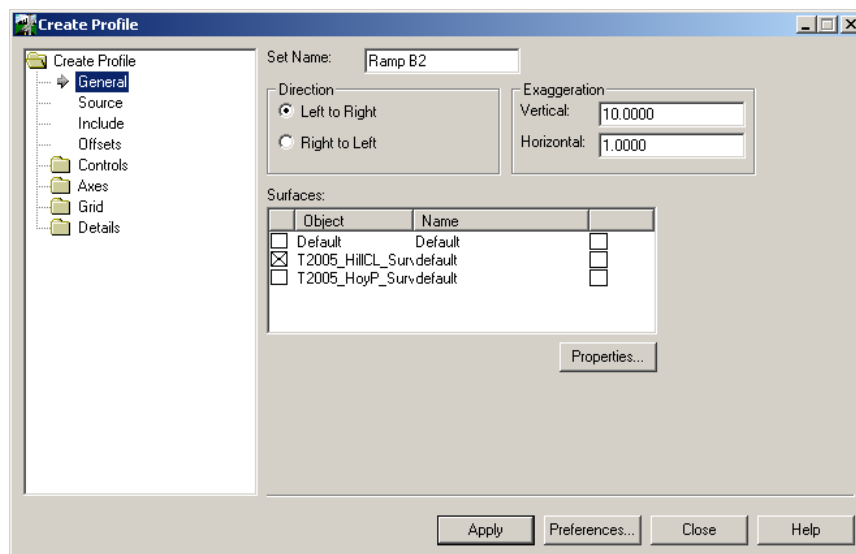
After a profile is created, existing vertical alignments can be displayed or new vertical alignments designed within the window.

Creating a Profile

A profile is created using the *Create Profile* tool (*Evaluation > Profile > Create Profile*) from the InRoads menu.

The *Main* tab of the Create Profile dialog box defines the path the profile follows, as well as the surfaces to display on the profile. Define the path the profile follows using one of the four methods provided in the Source section of the dialog box.

A profile can follow a horizontal alignment if one exists. Otherwise, the profile can follow a graphic line from the CAD file, an interactively defined multiple point line, or the path can be read from an ASCII file. The Multipoint option is useful for stream profiles as well as non-corridor projects, such as retention ponds or building sites.



Main tab of the Create Profile dialog box

Profile Sets

When a profile is created, a unique name is assigned to it. The name of the profile is entered in the *Set Name* field. Set Name defaults to the active horizontal alignment name. Having a unique name for each profile allows InRoads to track different profiles when more than one exists in a CAD file. The desired profile is identified by name (or by selecting it graphically) by other profile tools, such as *Annotate Profile*.
Profile Symbology

The profile Symbology area at the bottom of the Create Profile dialog box specifies which surfaces to display in the profile window. More than one surface at a time can be displayed by selecting the check box next to each surface name.

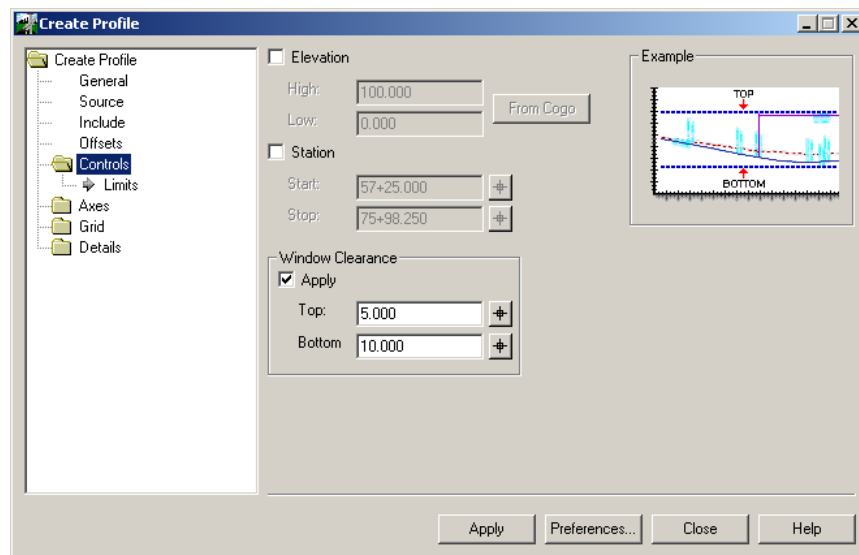
The symbology used to display the surface in the profile is not defined in the Create Profile dialog box. Instead, this symbology is defined as part of the surface. Use the *Properties* Button to modify the surface symbology definitions. This will open the Surface Properties dialog box. The profile definitions are located on the Advanced tab of the dialog box. Here, the Named Symbology that defines how the surface will appear in a cross section and profile is defined.

Profile Controls

The *Controls* folder on the Create Profile dialog box includes controls for the station and elevation limits, clearance and exaggeration of the profile.

The *Elevation* and *Station* limits can be enabled or disabled. When enabled, they limit the size of the profile to the specified range.

When enabled, the *Window Clearance* option specifies additional grid above and below the calculated elevation range in the profile window.

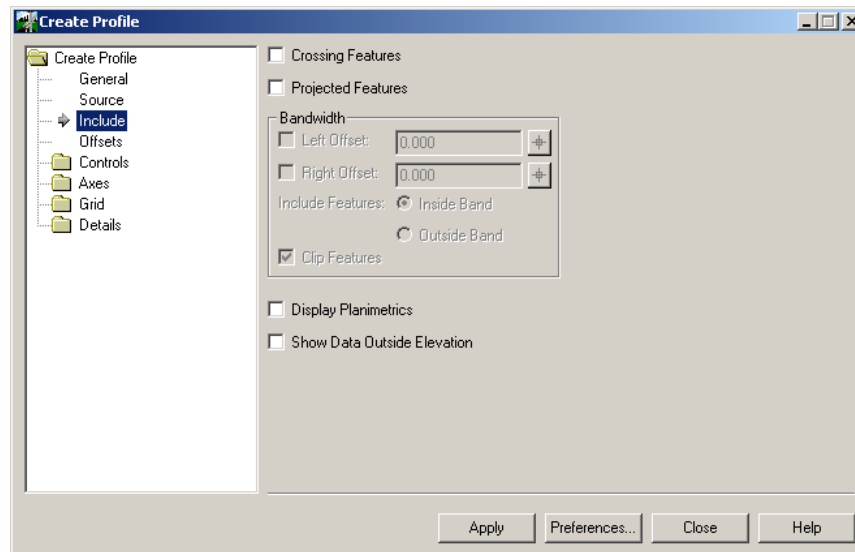


Controls folder of the Create Profile dialog box

Displaying Features in Profiles

The *Features* tab of the Create Profile dialog box is used to display surface features on the profile. Surface features include triangulated features, such as edges of roadway and ditches, as well as features excluded from triangulation, such as underground utilities.

Crossing and projected features can be displayed on the profile. The crossing feature option displays a symbol at the location a feature crosses the profile path. The projected feature option displays features offset from the profile baseline by projecting them onto the profile window. They are displayed as linear graphics along the profile.



Features tab of the Create Profile dialog box

To display features in profiles, the Crossing Features or Projected Features option must be enabled.

Profile Bandwidth

The *Profile Bandwidth* options restrict which features (or portions of features) are projected onto a profile based on their offset from the profile location.

The profile bandwidth is defined by two offsets from the profile. The values define the left and right edges of the bandwidth envelope. Negative offset values are left of the profile, and positive values are right of the profile. For example, to restrict the features to those within 15 feet of the profile, define the Left Offset as -15.0' and the Right Offset as 15.0'

If only one offset is defined, the bandwidth is infinite on the opposite side. For example, if the Left Offset is defined as -15.0' and the Right Offset is disabled, all features within 15' of the left side of the profile and all features, regardless of their offset, on the right side of the profile are projected onto the profile.

Both values can be positive or negative if only a bandwidth on one side of the profile is desired.

The bandwidth option also includes the ability to specify whether the features inside the bandwidth envelope or those outside the bandwidth envelope are to be projected onto the profile.

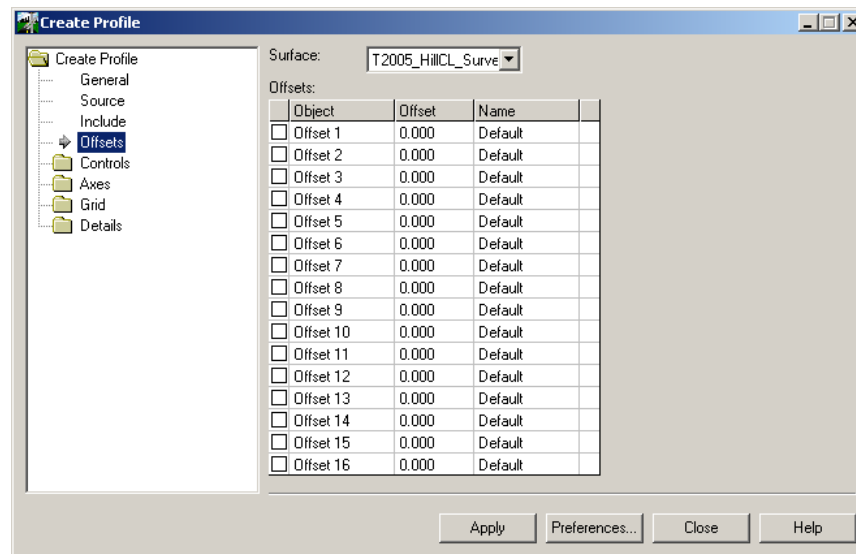
The final parameter is *Clip Features*. If Clip Feature is enabled, only the portions of the features that exist inside or outside the bandwidth envelope (depending on whether the Inside Band or Outside Band option is selected) are displayed. If Clip Features is disabled, any feature that has at least some portion inside or outside the bandwidth envelope (depending on whether the Inside Band or Outside Band option is selected) is displayed in its entirety.

The Bandwidth options are only available when the Projected Features option is enabled and one or more Projected Features are selected.

Profile Offsets

The *Offsets* tab is used to extract surface data at a specified offset from the baseline. The drop-down list contains names of the surfaces that are currently loaded. To display an offset, enable the check box for the respective offset in the *Symbology* area.

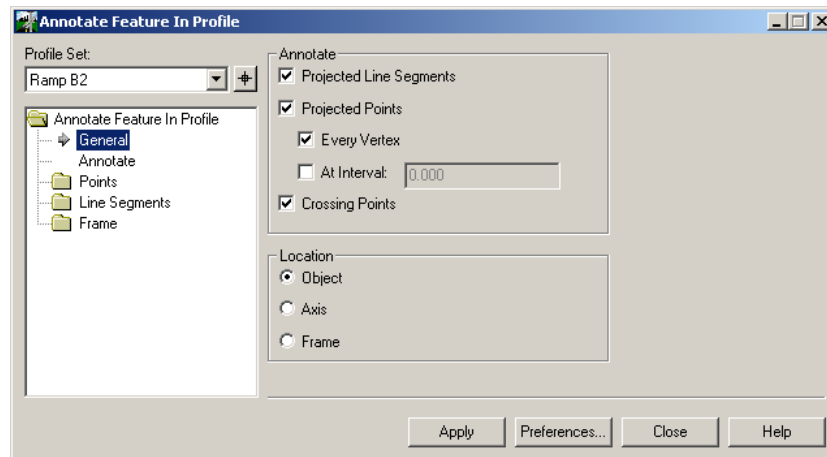
The offset distances and symbology cannot be defined in the Create Profile dialog box. These are defined on the Advanced tab of the Surface Properties dialog box. Otherwise, the tool is invoked by selecting *Surface > Surface Properties*.



Offsets folder of the create profile dialog box

Annotating Profile Features

Features displayed in a profile can be annotated with the *Annotate Feature in Profile* tool (*Evaluation > Profile > Annotate Feature in Profile*). Point and line segment features can be annotated with parameters such as station, offset, elevation, length, and feature name. The feature must exist in the profile window before it can be annotated.

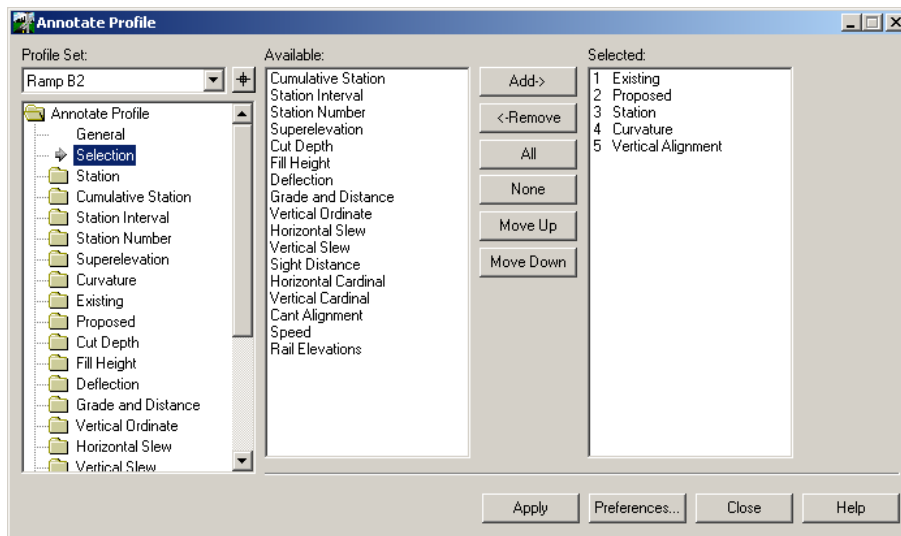


The Main tab of the Annotate Feature in Profile dialog box

Profile Annotation

The *Annotate Profile* tool (*Evaluation > Profile > Annotate Profile*) is used to annotate vertical alignments on, above, or below a profile window. There are numerous types of annotations available. Some of the most useful annotations are listed below.

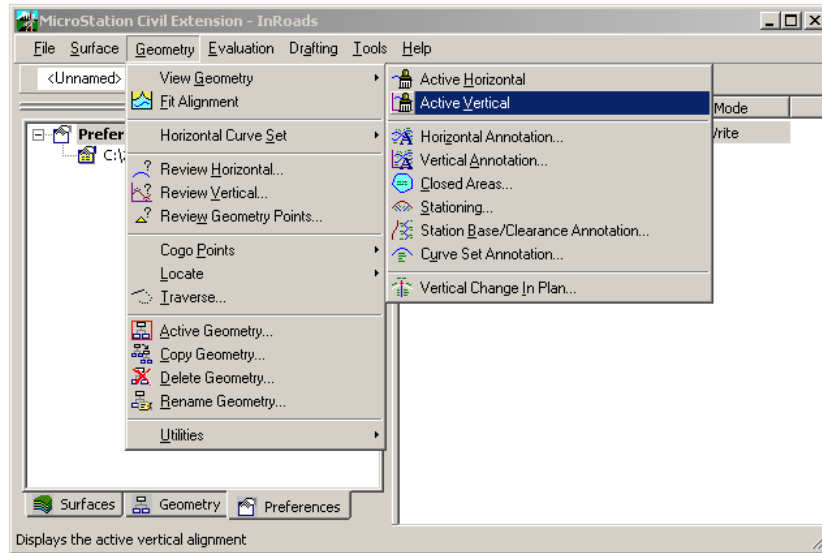
- Station (cumulative, interval, or number)
- Superelevation Diagram
- Curvature Diagram
- Elevation (existing or proposed)
- Cut Depth or Fill Height
- Template Names and Backbone Widths
- Site Distance
- Design Speed



Main tab of the Annotate Profile dialog box

Viewing Vertical Alignments

After a profile is created, an existing vertical alignment can be displayed in the profile window. To view an existing vertical alignment Select Geometry > View Geometry > Active Vertical, or right click on the vertical alignment name and select View from the shortcut menu.



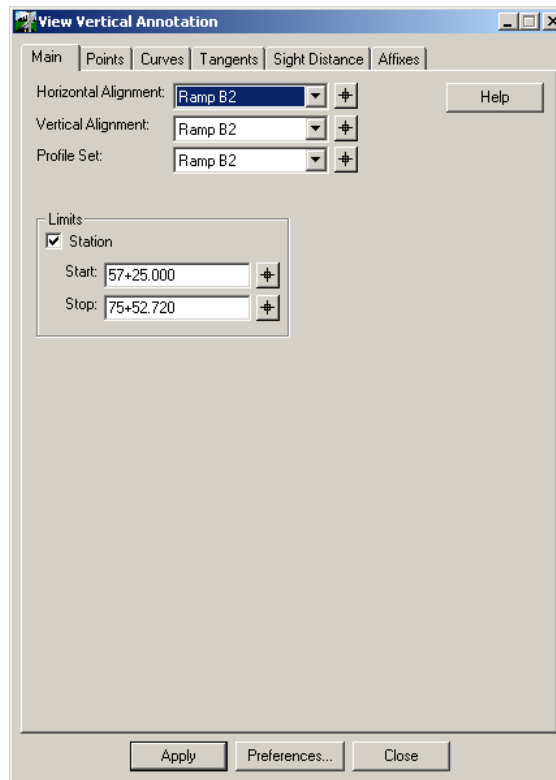
Selecting View Active Vertical

- ① This tool will only display the vertical alignment linear elements and will not annotate the alignment.

View Vertical Annotation

The View Vertical Annotation tool is used to view and annotate a vertical alignment within an existing profile window. To access the View Vertical Annotation tool, Select Geometry > View Geometry > Vertical Annotation. The Limits option is used to specify the station range that will be used to annotate the vertical alignment. Numerous types of annotation are available and includes the following:

- Vertical Curves
- Site Distances
- Tangent Slopes and Lengths
- Vertical PI, PC and PT Stations

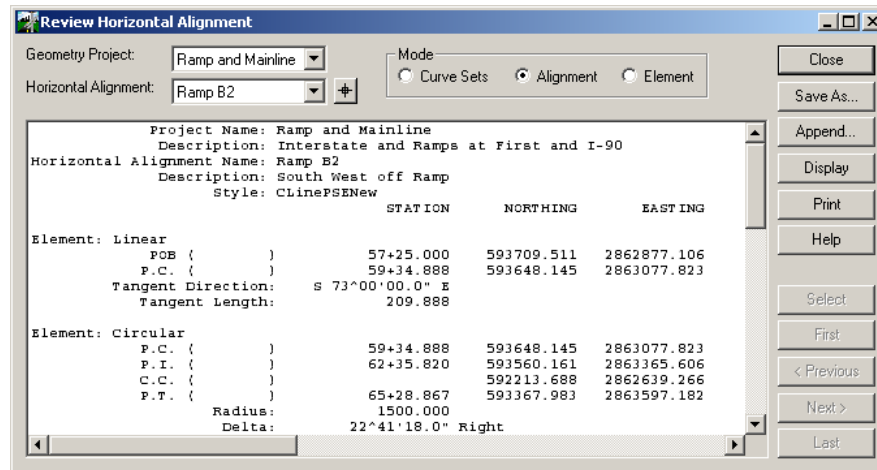


Geometry Reports

Fixed Format or “quick” geometry reports

Fixed Format reports can be viewed for an active horizontal or vertical alignment. Select Geometry > Review Horizontal to display a fixed format horizontal alignment report. Select Geometry > Review Vertical to display a fixed format vertical alignment report. When this tool is selected a dialog box will display showing the alignment information.

The data that is displayed can be printed and saved to a text file, or displayed as text in the CADD file. The Mode Options can be used to display different alignment information, such as curve data or just one element at a time. If the Element Option is selected, the Next, Previous, First, Last and Select Buttons become available.



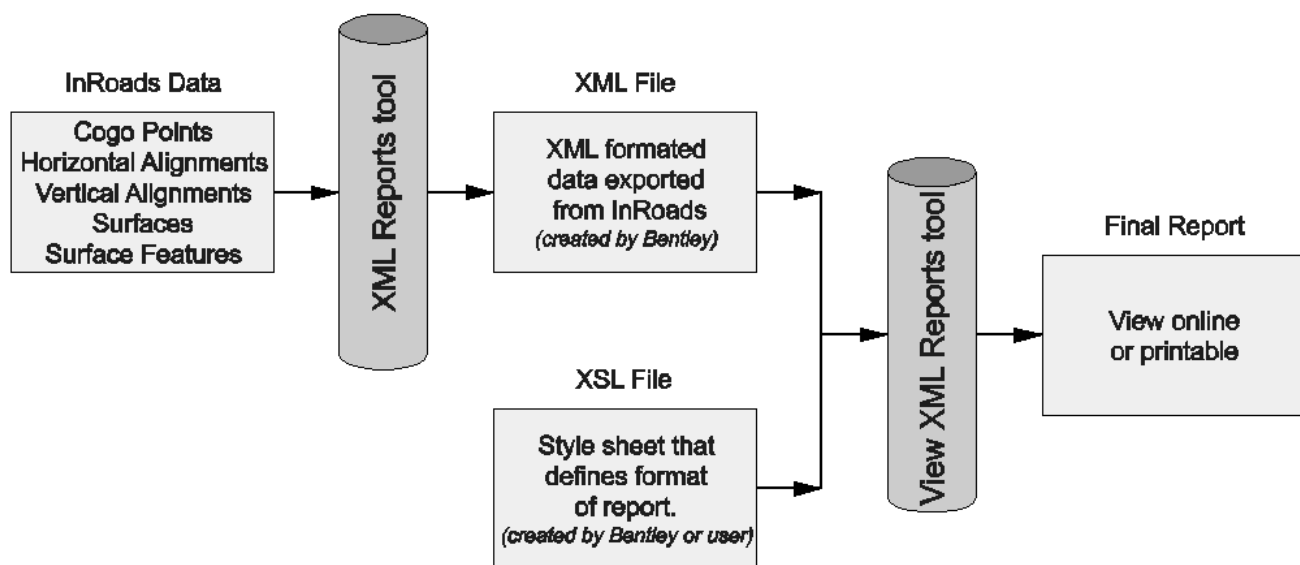
XML Reports

Creating XML Reports

Overview

The XML tools are an add-in application and must be activated before they can be used. Once activated, there are two XML reporting tools added to the *Tools* menu: XML Reports and View XML Reports.

The *XML Reports* tool creates the XML data file from InRoads data such as surfaces and alignments. This tool has many different options to control what data is written to the XML data file. The second tool, *View XML Reports* (Bentley InRoads Report Browser), formats the report by reading the data from an XML file and the report structure from an XSL file. The result is the final report. The following illustration show the process of creating a Report using XML.



XML Report generation process in InRoads

XML Reports Tool

The XML Reports tool extracts data from InRoads and builds an XML data file that in turn is formatted into a report. Not all of the data in the XML data file needs to be used in the XML report.

The XML Reports dialog box is divided into seven tabs. Each tab corresponds to a different type of data that is exported to the XML data file.

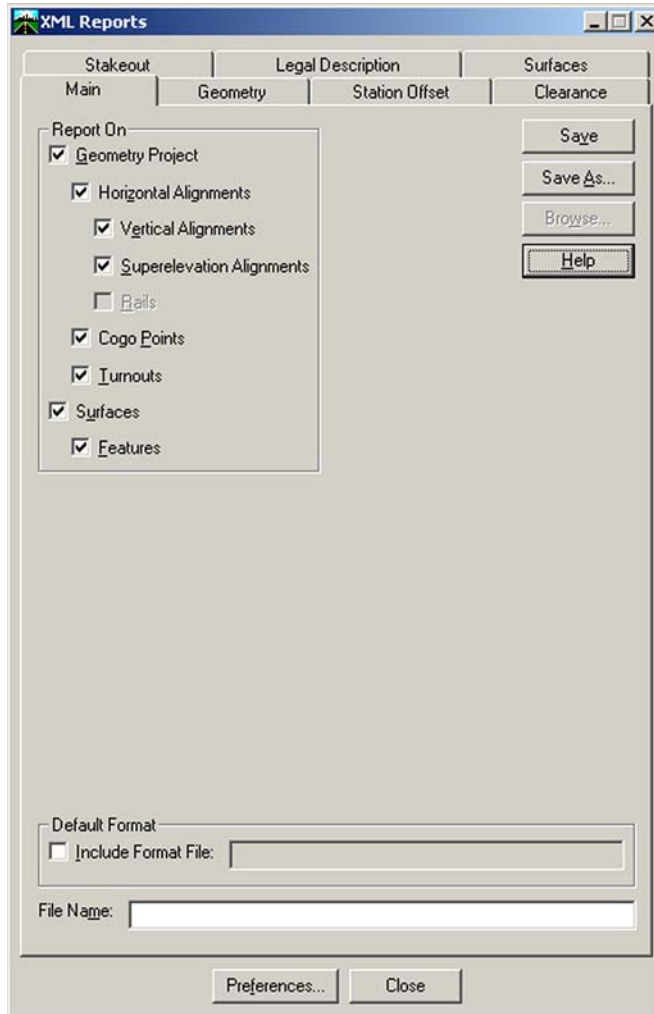
The name and location of the XML data file is specified in the File Name field at the bottom of the dialog box. The File Name field is displayed on all seven tabs.

Main Tab

The Main tab creates an XML data file containing data from the active geometry project and from all loaded surfaces. The check boxes allow you to control which areas of the geometry project are written to the XML data file and if surface data is saved with or without feature information.

Using the Main tab, individual alignment and surfaces cannot be saved to the XML data file. Exporting everything to the XML data file may be convenient for report building because all data is contained in a single XML file and is ready for formatting. However, because the XML data file is an ASCII text file, writing large quantities of

data to it can be slow. Therefore, it is recommended to only write the necessary data to the XML data file using one of the other tabs whenever possible.

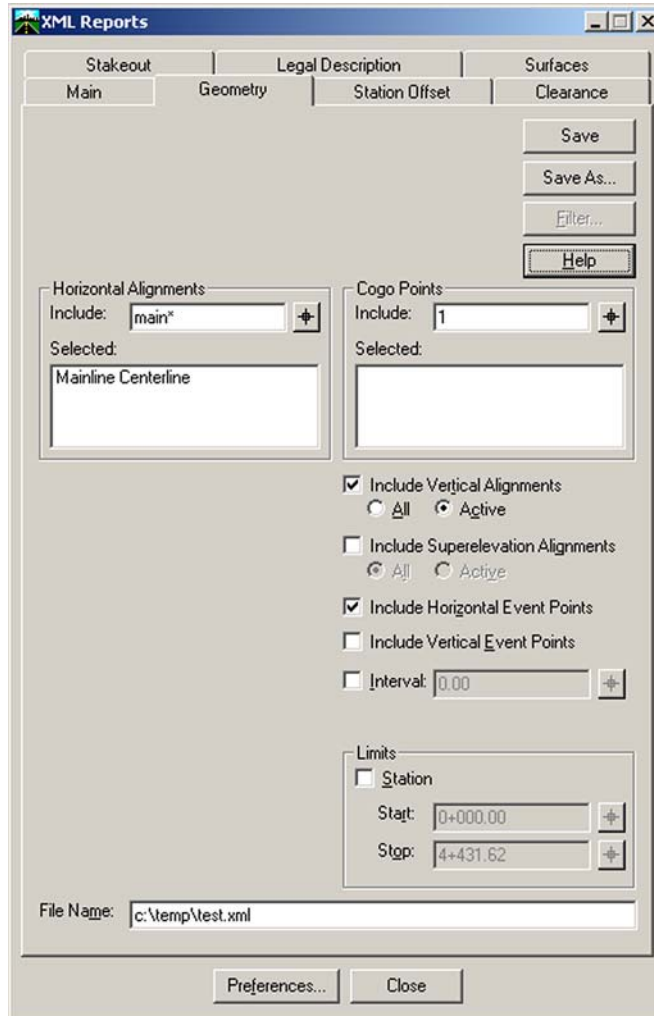


Main tab of the XML Reports dialog box

Geometry Tab

The Geometry tab creates an XML data file containing data from the active geometry project. However, unlike the Main tab, the Geometry tab allows the selection of which horizontal alignments and Cogo points are written to the data file. In addition,

you can select when to include other information such as vertical alignments, superelevation, and event points.



Geometry tab of the XML Reports dialog box

When enabled, the Interval field adds additional points, called computed event points, to the XML data file. The field specifies the distance between the points. Computed event points are calculated along each selected horizontal alignment.

The Limits option restricts the station range of data written to the XML data file for horizontal alignments, vertical alignments and event points. Cogo points are not affected by this option.

Several reports resulting from Geometry data are shown below.

Horizontal Alignment and Events Report

Report Created: 11/30/2002
Time: 8:14pm

Project: 8.4 Update **Input Grid Factor:** 1.000000

Description: InRoads v8.2 to v8.4 Update Training

File Name: C:\InRoads Training\8.4 Update\Lab 04\8.4 Update.alg

Last Revised: Dan.Ahern 11/30/2002 2:21:10 PM

Alignment Name: Mainline Centerline
Alignment Description:
Alignment Style: default

		<u>Station</u>	<u>Offset</u>	<u>Northing</u>	<u>Easting</u>
Element: Linear					
POB	(100)	0+00.000		23284.610	39193.620
TS	()	8+32.238		23949.271	39694.464
Tangential Direction:		N 36°59'57.3" E			
Tangential Length:		832.238			
Element: Clothoid					
TS	()	8+32.238		23949.271	39694.464
SPI	()			23986.572	39722.572
SC	()	9+02.238		24003.336	39738.852
Entrance Radius:		0.000			
Exit Radius:		280.000			
Length:		70.000			
Angle:		7.2° Right			
Constant:		140.000			
Long Tangent:		46.705			
Short Tangent:		23.368			

Horizontal Alignment report

List Coordinates Report

Report Created: 11/30/2002
Time: 8:13pm

Project: 8.4 Update **Input Grid Factor:** 1.000000

Description: InRoads v8.2 to v8.4 Update Training

File Name: C:\InRoads Training\8.4 Update\Lab 04\8.4 Update.alg

Last Revised: Dan.Ahern 11/30/2002 2:21:10 PM

Alignment Name: Mainline Centerline

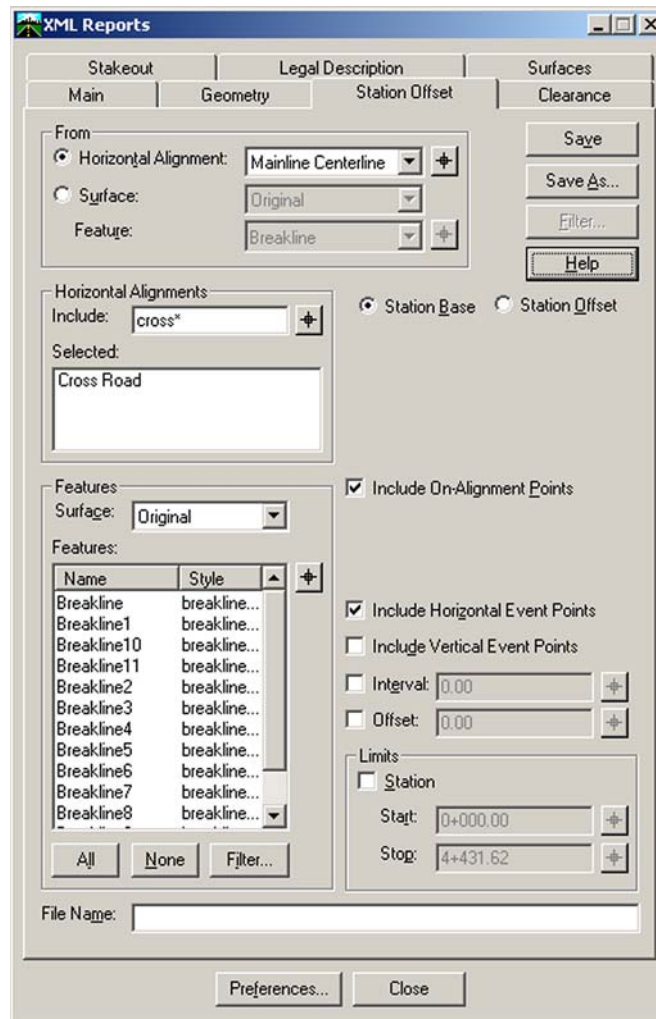
<u>Point Name</u>	<u>Type</u>	<u>Northing</u>	<u>Easting</u>	<u>Elevation</u>	<u>Style</u>
100	POB	23284.610	39193.620	0.000	default
	TS	23949.271	39694.464	0.000	default
	SPI	23986.572	39722.572	0.000	default
	SC	24003.336	39738.852	0.000	default
	PI	24057.128	39791.092	0.000	

List Coordinates report

Station Offset Tab

The Station Offset tab creates an XML data file that contains station and offset data. The offsets are calculated from a single base alignment or surface feature. Offsets can be calculated to any number of offset alignments and/or features.

The offset is always measured from and perpendicular to the base alignment or feature. The stationing is measured along the base alignment/feature when Station Base is selected and along the offset alignment/feature when Station Offset is selected.



Station Offset tab of the XML Reports dialog box

When enabled, the Interval defines the distance between each offset measurement. The Offset option causes the offset distance to be measured to a point offset by the

distance specified from the offset alignment or feature. When disabled, the offset distance is measured to the offset alignment or feature.

Several reports resulting from Station Offset data are shown below. This is only a small sample of the type of reports that can be created.

Station Base Report

Report Created: 11/30/2002
Time: 8:22pm

Project: 8.4 Update **Input Grid Factor:** 1.000000

Description: InRoads v8.2 to v8.4 Update Training

File Name: C:\nRoads Training\8.4 Update\Lab 04\8.4 Update.alg

Last Revised: Dan.Ahern 11/30/2002 2:21:10 PM

Baseline (Active) Alignment: Mainline Centerline

----- Baseline Alignment -----			----- Offset Alignment -----		
Station	Distance to Offset Point	Radial Direction	Station	Distance to Offset Point	Radial Direction
Offset (Specified) Alignment: Cross Road					
22+00.000	0.000	S 8°41'33.9" E	0+39.497	-2070.331	S 18°09'57.4" W
22+50.000	0.000	S 8°41'33.9" E	0+95.543	-2045.010	S 18°09'57.4" W
34+78.290	0.000	S 41°27'42.4" E	1+51.589	-2004.480	S 18°09'57.4" W
35+06.628	0.000	S 41°27'42.4" E	2+07.635	-1956.126	S 18°09'57.4" W
35+34.965	0.000	S 41°27'42.4" E	2+63.681	-1907.772	S 18°09'57.4" W
35+63.303	0.000	S 41°27'42.4" E	3+19.727	-1859.418	S 18°09'57.4" W
35+91.641	0.000	S 41°27'42.4" E	3+75.773	-1811.064	S 18°09'57.4" W
36+19.979	0.000	S 41°27'42.4" E	4+31.819	-1762.709	S 18°09'57.4" W
36+48.317	0.000	S 41°27'42.4" E	4+87.865	-1714.355	S 18°09'57.4" W

Sample Station Offset report

Station and Offset Along Single Alignment Report

Report Created: 11/30/2002
Time: 8:24pm

Project: 8.4 Update **Input Grid Factor:** 1.000000

Description: InRoads v8.2 to v8.4 Update Training

File Name: C:\nRoads Training\8.4 Update\Lab 04\8.4 Update.alg

Last Revised: Dan.Ahern 11/30/2002 2:21:10 PM

Alignment Name: Mainline Centerline
Alignment Description:
Alignment Style: default

Point Type	Station	Radial Direction	----- Specified Alignment -----		
			Northing	Easting	Elevation
POT	22+00.000	S 8°41'33.9" E	24254.470	41000.683	2780.987
POT	22+50.000	S 8°41'33.9" E	24262.026	41050.108	2780.339
POT	34+78.290	S 41°27'42.4" E	24269.583	41099.534	2792.420
POT	35+06.628	S 41°27'42.4" E	24277.140	41148.960	2792.627
POT	35+34.965	S 41°27'42.4" E	24284.697	41198.385	2792.820
POT	35+63.303	S 41°27'42.4" E	24292.254	41247.811	2793.000
POT	35+91.641	S 41°27'42.4" E	24299.810	41297.237	2793.166
POT	36+19.979	S 41°27'42.4" E	24307.367	41346.662	2793.319
POT	36+48.317	S 41°27'42.4" E	24314.924	41396.088	2793.458
POT	36+76.654	S 41°27'42.4" E	24322.481	41445.514	2793.584
POT	37+04.992	S 41°27'42.4" E	24330.038	41494.939	2793.697
POT	37+32.317	S 41°27'42.4" E	24337.324	41544.599	2793.793

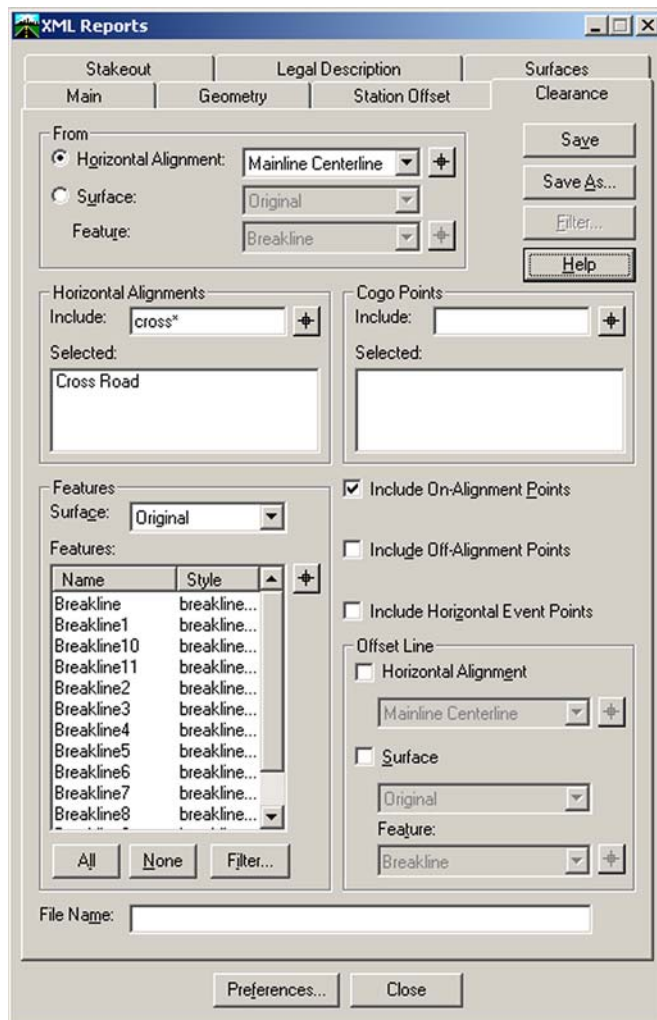
Station Offset report along a single alignment

Clearance Tab

The Clearance tab creates an XML data file containing clearance values. The clearance data file contains the distance from various points (cardinal points along alignments, feature points, and Cogo points) to the selected (From) alignment or feature. Each point is projected to the alignment/feature to determine a station and an offset.

Clearance information for multiple alignments, features, and Cogo points can be created in a single XML data file.

The clearance data file contains one clearance value for each point, unless an optional offset line is defined. When an offset line is used, the data file contains two clearance values for each point.



Clearance tab of the XML Reports dialog box

A sample report resulting from Clearance data is shown below.

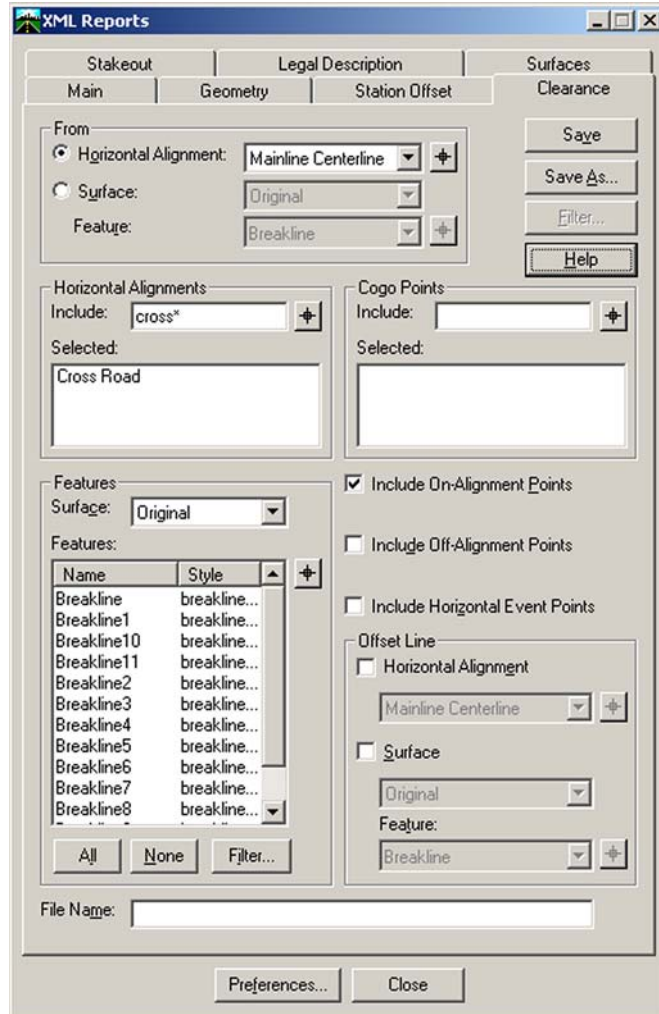
Clearance Report						
Project: 8.4 Update			Report Created: 11/30/2002 Time: 8:28pm			
Description: InRoads v8.2 to v8.4 Update Training			Input Grid Factor: 1.000000			
File Name: C:\InRoads Training\8.4 Update\Lab 04\8.4 Update.alg						
Last Revised: Dan.Ahern 11/30/2002 2:21:10 PM						
Baseline Alignment: Mainline Centerline						
Offset Point	Baseline Station	Offset	----- Offset Point -----			Radial Direction
			Northing	Easting	Elevation	
	21+64.764	-2088.175	26313.332	40650.253	0.000	S 8°41'33.9" E
	38+66.621	-1341.851	26026.621	41524.042	0.000	S 41°27'42.4" E
	39+27.781	-1002.989	25813.173	41794.242	0.000	S 41°27'42.4" E
	39+27.781	-1002.989	25813.173	41794.242	0.000	S 41°27'42.4" E
	38+20.136	-608.655	25446.386	41974.670	0.000	S 41°27'42.4" E
	33+72.051	-254.853	24884.561	41873.135	0.000	S 41°27'42.4" E
	33+15.981	-154.201	24772.008	41897.760	0.000	S 41°27'42.4" E
	30+69.360	2085.580	22923.607	43188.453	0.000	S 41°27'42.4" E

Clearance report

Stakeout Tab

The Stakeout tab creates an XML data file containing stakeout information. The stakeout can be computed from either a base alignment or an occupied point/

backsight point combination. Stakeout information for multiple alignments, features, and Cogo points can be written to the data file at once.



Clearance tab of the XML Reports dialog box

The Interval option defines the distance along the alignments and features between points computed in the stakeout data file. The Offset option causes stakeout data to be computed for points offset from the selected features and alignments by the specified value. A negative value is offset to the left and a positive value is offset to the right looking up station.

A sample stakeout report is shown below.

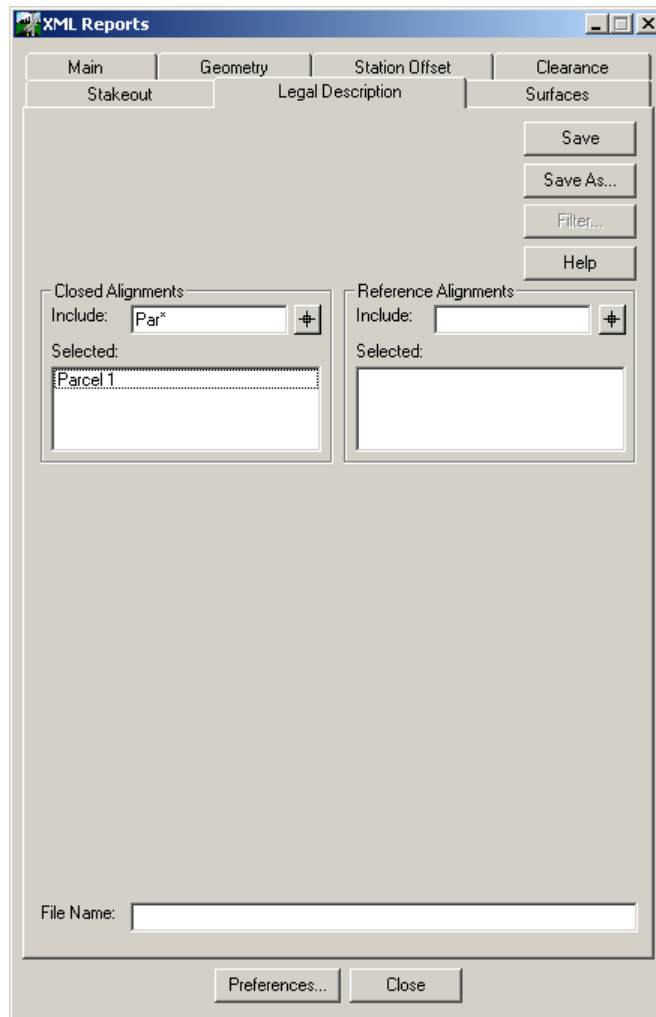
Centerline Stakeout Report						
Project: 8.4 Update			Report Created: 11/30/2002 Time: 8:32pm			
Description: InRoads v6.2 to v6.4 Update Training			Input Grid Factor: 1.000000			
File Name: C:\InRoads Training\8.4 Update\Lab 04\8.4 Update.alg						
Last Revised: Dan.Ahern 11/30/2002 8:31:02 PM						
Centerline Alignment: Mainline Centerline						
Offset From Centerline	BS	OC	FS Station	Angle Right	Distance	
0.000	501	500	0+00.000	189.5°	2898.421	
0.000	501	500	8+32.238	198.5°	2164.929	
0.000	501	500	9+02.238	199.5°	2105.044	
0.000	501	500	10+48.768	200.3°	1963.488	
0.000	501	500	11+18.768	200.1°	1894.086	
0.000	501	500	27+48.213	156.4°	397.990	
0.000	501	500	28+18.213	147.7°	358.088	
0.000	501	500	29+08.353	135.4°	302.310	
0.000	501	500	29+78.353	124.5°	256.605	
0.000	501	500	44+31.624	5.9°	1312.920	

Stakeout report

Legal Description Tab

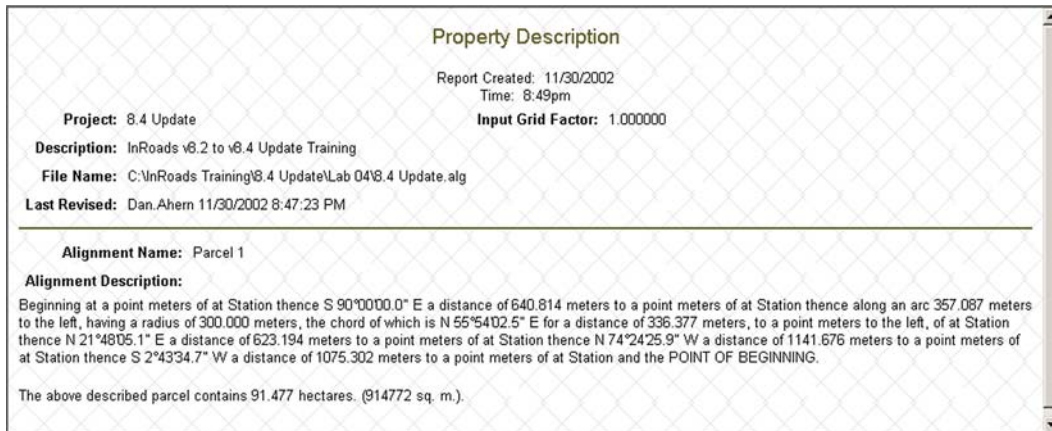
The Legal Description tab creates an XML data file containing information on closed alignments and features. The two types of features that are considered closed features are interior boundaries and exterior boundaries.

Optionally, one or more reference alignments can be specified. When reference alignments are included, a legal reference element is added at the start and end point of each reported element. The legal reference contains the name of the closest reference alignment along with the corresponding station and offset of the point.



Clearance tab of the XML Reports dialog box

A sample property description is shown below.

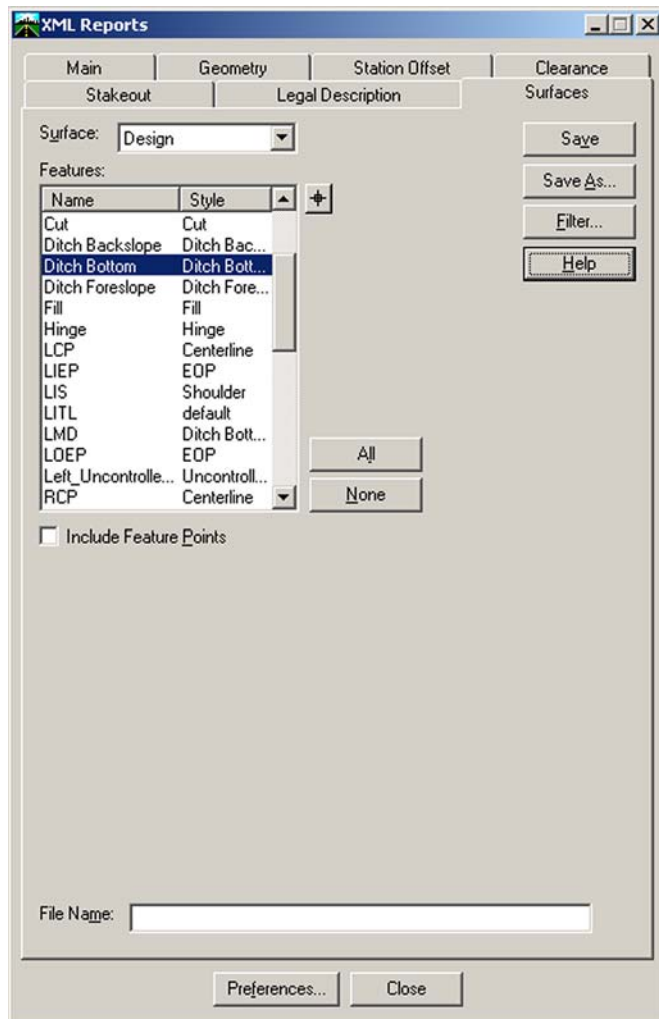


Property Description report.

Surfaces Tab

The Surfaces tab creates an XML data file containing information about the features in the selected surface.

The features included in the XML data file are selected from the feature list. When the Include Feature Points option is enabled, the coordinates of the points that define each feature are included in the data file. When this option is disabled, the data file will contain information about each selected feature (including how many points compose the feature), but will not describe every point specifically.



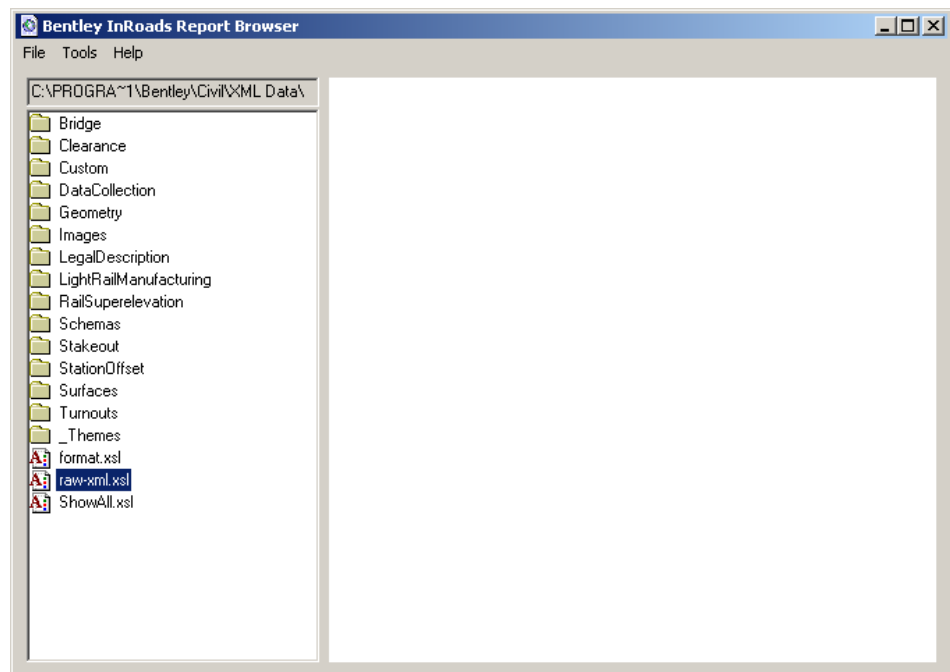
Surface tab of the XML Reports dialog box

Viewing XML Reports

After an XML data file is created, a report is created from the data. The report is created by applying an style sheet (XSL file) to the XML data. The XSL file defines the format of the report. An HTML interpreter such as Internet Explorer is used to display the resulting report.

InRoads includes the *Bentley InRoads Report Browser* to interpret XSL and view reports generated from XML data. This tool will open automatically when an XML file is created using the XML Reports tool or it can be open by selecting *Tools > View XML Reports*.

When activated, the Bentley InRoads Report Browser page is blank as shown below.



Blank Bentley InRoads Report Browser window

There are only four options on this page.

The XML data file can be opened using *File > Open*.

On the left of the window is a listing of XSL files used to format a report.

Selecting *File > Print Preview* opens a new window displaying the results of the report without the header and footer information that appear on this window.

The *Tool > Format Options* define the precision (number of decimal places) of reported values, station formats, and so on.

Source

When the Bentley InRoads Report Browser is opened directly from the XML Reports tool, then the source XML data is already defined. If opening the Bentley InRoads Report Browser page by selecting *Tools > View XML Reports*, the source XML file must be opened manually. To open the source file, select *File > Open*. The data in the XML data file must be compatible with the XSL file specified in the Format field or no report is created.

Format

The format field specifies the XSL or style sheet that defines the format of the report. InRoads delivers a wide variety of style sheets for common report formats. The delivered style sheets are located in one of the XML Data folders within the software installation folder. By default InRoads installs to the folder C:\Program Files\Bentley\Civil\.

Within the XML Data folders there are sub-folders organizing the XSL files by type.

In its simplest form, a style sheet is a list of instructions that tell a display device how to format XML documents and their content. Several style sheets can exist for a document allowing that document to be rendered by a wide range of formatting devices from Web browsers to printers, XSL can be thought of as a language that can do the following:

- Transform XML into HTML
- Filter and sort XML data
- Address parts of an XML document
- Format XML data based on the data value, like displaying negative numbers in red

XSL files can also be developed and customized for your specific needs.

Format Options

The format options (*{Tools > View XML Reports >}Tools > Format Options*) define the number of decimal places and format for different values that appear in the reports. Not all reports contain all of the format options listed.

When a format option is changed, the report immediately updates.

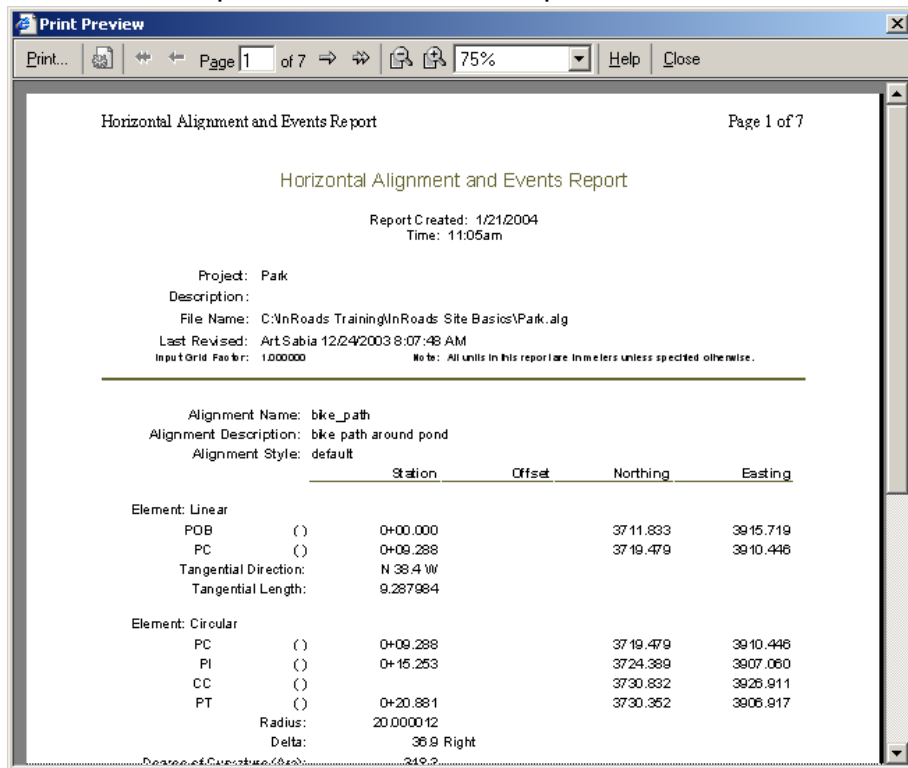
	Mode	Precision	Format
Northing/Easting:		0.123	
Elevation:		0.123	
Angular:	Grads	0.1	ddd°mm'ss.s''
Slope:		0.1	0.5
Linear:		0.123456	
Station:		0.123	ss+ss.ss
Acres/Hectares:		0.123	
Area Units:		0	
Cubic Units:		0	
Direction:	Bearings	0.1	ddd°mm'ss.s''

Format Options window

Output Friendly Version

The Bentley InRoads Report Browser window is designed for on-screen viewing of XML reports. The *File > Print Preview* command is used to see what the file will look like when it is printed. When *File > Print Preview* is selected, a new window appears

displaying the report with no other peripheral headers, footers, and so on. From the Print Preview window, the report can be sent to the printer.



Print Preview window

On the Bentley InRoads Report Browser, the options to print and save the file are available on the File menu. To get the best results, always save the file to either a

Text or Web Page, HTML only format. The Web Page, HTML only format can be edited with Microsoft Word or Excel.

The screenshot shows an Excel spreadsheet with the following content:

List Coordinates Report

Report Created: 3/9/2005
Time: 11:17am

Project: Lab
Description: Road alignments for InRoads
File Name: C:\Train\LAB.ALG
Last Revised: Volaree.Rendon 3/8/2005 4:48:42 PM
Input Grid Factor: 1
Note: All units in this report are in meters unless specified otherwise.

Alignment Name: new

Point Name	Type	Northing	Easting	Elevation	Style
150	POB	3328.34	3150.72	291.15	default
	TS	3337.6	3154.85	291.45	default
	SPI	3368.05	3168.44	292.45	default
	SC	3382.66	3176.49	292.95	default
	PI	3534.79	3260.22	294.28	
	CC	3237.99	3439.3	0	default
	CS	3537.94	3433.85	288.93	default
	SPI	3538.25	3450.52	288.33	default
	ST	3536.08	3483.8	287.3	default
	PC	3521.23	3711.41	282.61	default
	PI	3514.55	3813.71	280.71	

The List Coordinates report in Excel

If saved in HTML format, the file can also be viewed directly in the browser window.

The screenshot shows a Microsoft Internet Explorer browser window displaying the 'List Coordinates Report' as an HTML file. The content is identical to the Excel spreadsheet shown above.

List Coordinates Report

Report Created: 3/9/2005
Time: 11:17am

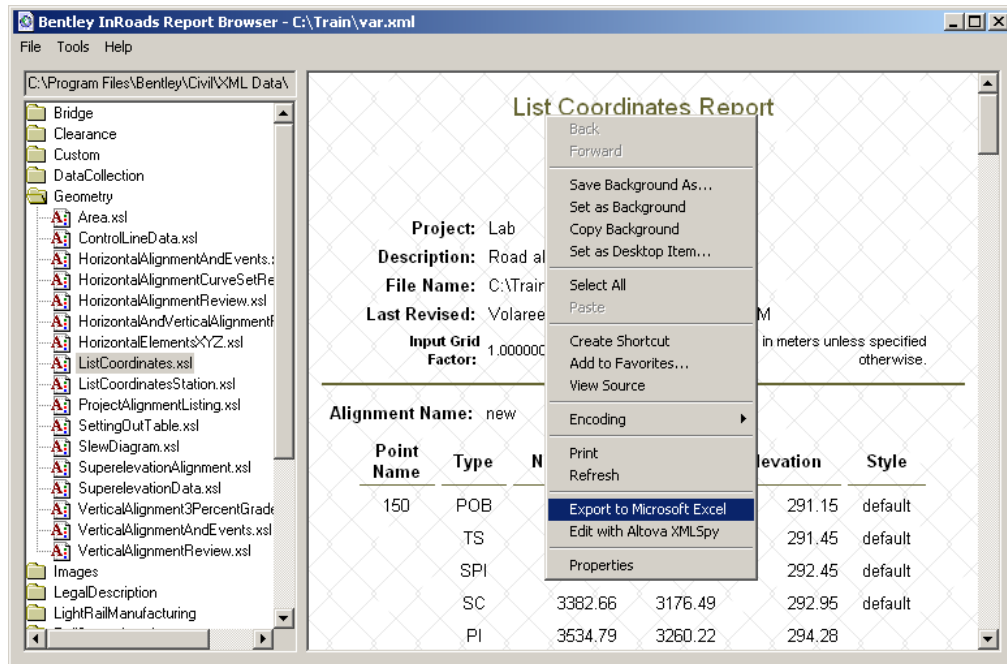
Project: Lab
Description: Road alignments for InRoads
File Name: C:\Train\LAB.ALG
Last Revised: Volaree.Rendon 3/8/2005 4:48:42 PM
Input Grid Factor: 1.000000
Note: All units in this report are in meters unless specified otherwise.

Alignment Name: new

Point Name	Type	Northing	Easting	Elevation	Style
150	POB	3328.34	3150.72	291.15	default
	TS	3337.60	3154.85	291.45	default
	SPI	3368.05	3168.44	292.45	default
	SC	3382.66	3176.49	292.95	default
	PI	3534.79	3260.22	294.28	

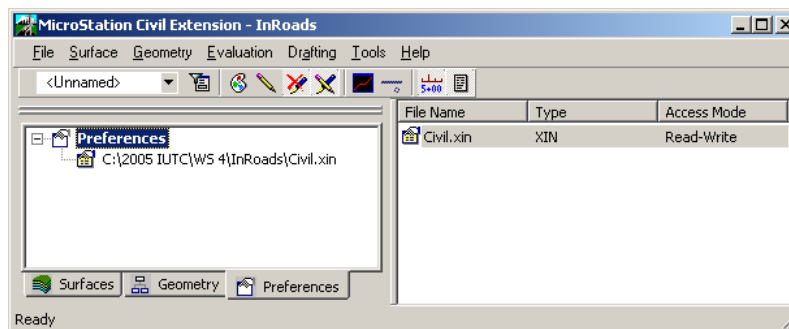
The List Coordinates report in Internet Explorer

A report can be exported to Microsoft Excel by right-clicking in the right pane of the report browser. In the shortcut menu, select *Export to Microsoft Excel*. Once this option is selected, The text will be automatically be imported into Excel.



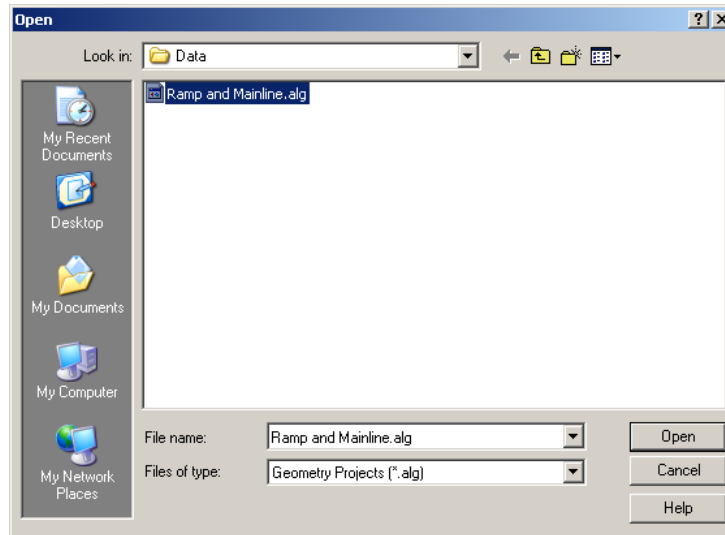
 **EXERCISE-VIEWING GEOMETRY**
Annotate the Horizontal Alignment

- 1 Continue in the design file *workingfile.dgn* in the C:\BE Data\{Course #}\Data Folder.
- 2 Click the **Preferences** data type button in the bottom of the InRoads explorer and verify *Civil.xin* is loaded from the C:\BE Data\{Course #}\Data Folder.

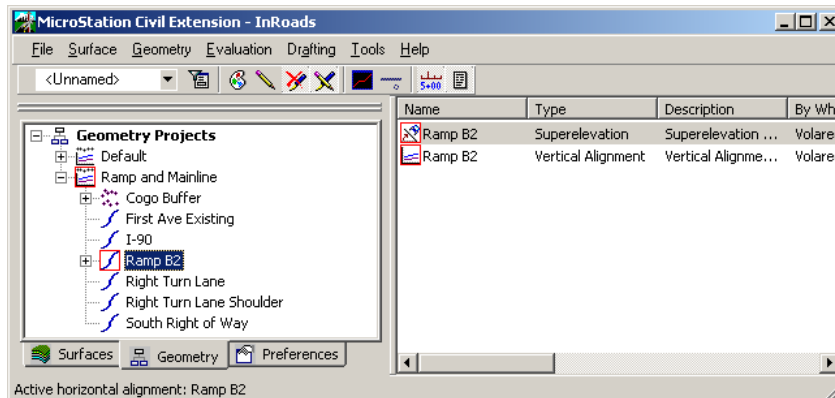


- 3 If it is not currently loaded, select File > Open in the InRoads menu and open the file *Civil.xin* in the C:\BE Data\{Course #}\Data Folder
- 4 Select File > Open and change the files of type to **Surface (*.dtm)**
- 5 Browse to the path C:\BE Data\{Course #}\Data
- 6 Select the file *Existing.dtm*, then click **Open**.

- 7 Change the Files of type to Geometry (*.alg)
- 8 Browse to the patch *C:\BE Data\{Course #}\Data*
- 9 Select the file *Ramp and Mainline.alg*, then click **Open**.

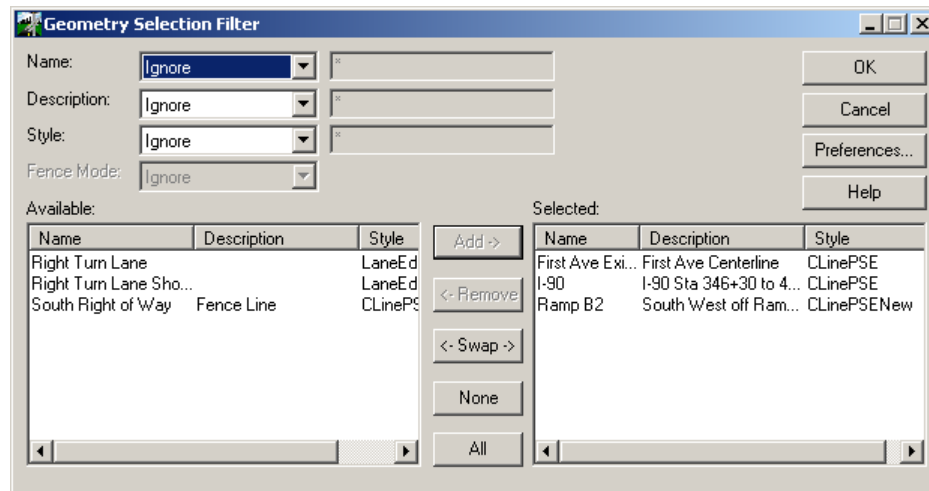


- 10 Click **Cancel**.
- 11 In the bottom left of the InRoads explorer, click the Geometry data type button. The Geometry project that was just open is now visible.
- 12 Right click on the name Ramp and Mainline and select **Set Active** from the shortcut menu.
- 13 Click on the plus sign next to the name Ramp and Mainline to expand the Geometry project.



The Ramp and Mainline Geometry Project

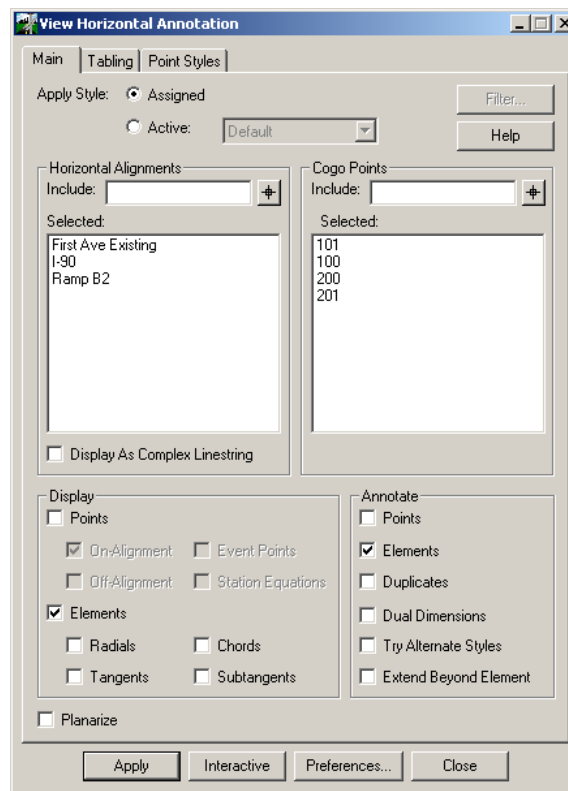
- 14 Right-Click on the Ramp B2 alignment name and select Set Active from the shortcut menu.
- 15 Enable the Write Lock.
- 16 Select Geometry > View Geometry > Horizontal Annotation
- 17 Click in the *Include* field under Horizontal Alignments, then click the **Filter** button
- 18 Hold the ctrl key down on the keyboard and select **First Ave Exist, I-90** and **Ramp B2** from the *Available* field.



- 19 Click **Add**, then click **OK**.
- 20 Click in the *Include* field under *Cogo Points*.
- 21 Click the **Filter** button.
- 22 Hold the ctrl key down on the keyboard and In the Available field Click **100,100,200,201** then click the **Add** button.
- 23 Click **OK**.

24 In the *Display* area, enable **Points**, **On Alignment** and **Elements**.

25 In the *Annotate* area, enable **Points** and **Elements**.



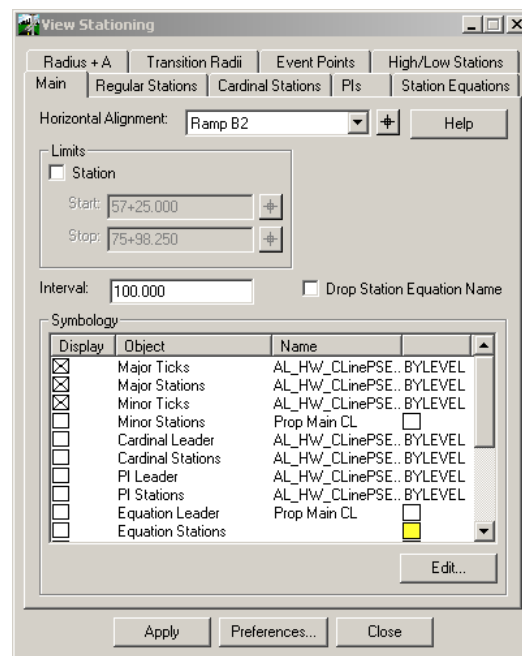
26 Disable all other options.

27 Click **Apply**.

28 Close the View Horizontal Annotation dialog box.

Viewing Stationing

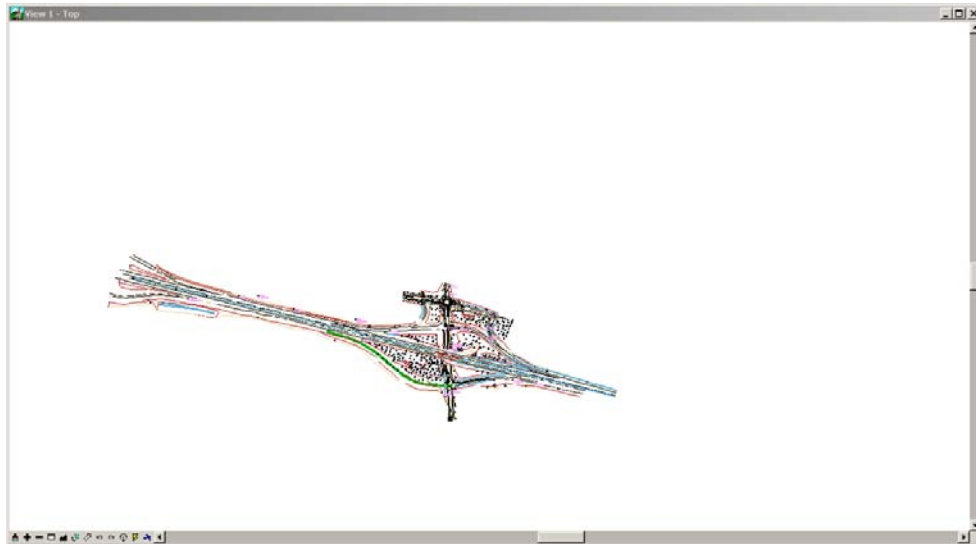
- 1 Enable the Station Lock
- 2 Select Geometry > View Geometry > Stationing
- 3 Click **Preferences**.
- 4 Select **DOT New**, then click **Load**.
- 5 Close the Preferences dialog box.
- 6 In the Horizontal Alignment field, select **Ramp B2**.



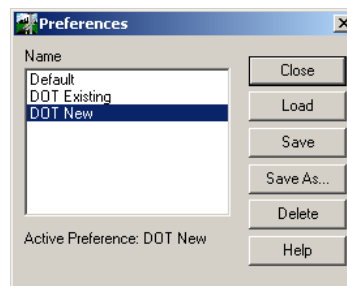
- 7 For the Interval, Key in 100.
- 8 Click **Apply**.
- 9 Close the View Stationing dialog box.

Creating a Profile

- 1 Use the Zoom Out tool in MicroStation so that the view is similar to the illustration below.

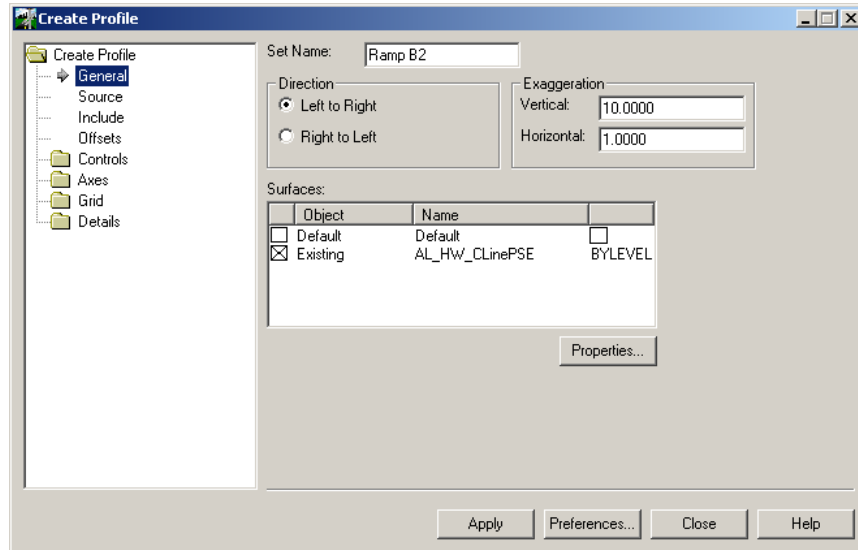


- 2 Select Evaluation > Profile > Create Profile
- 3 Click the **Preferences** button.
- 4 Select the **DOT New** Preference, then click **Load**.

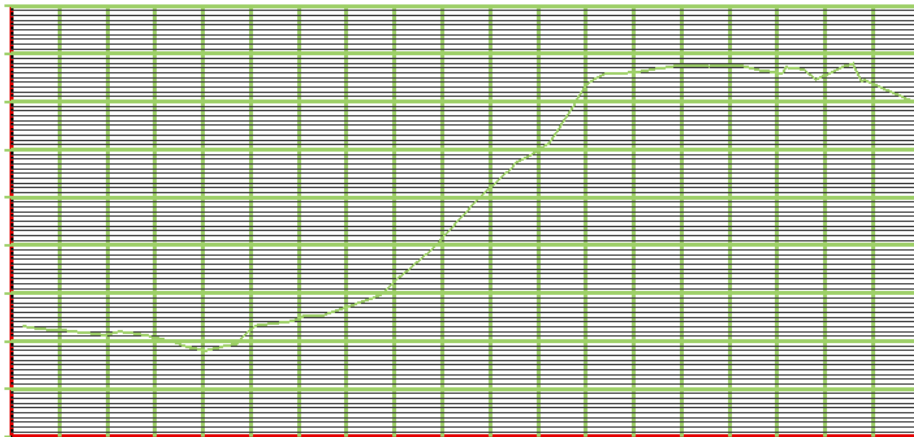


- 5 Close the Preferences dialog box.

- 6 In the Surfaces area, enable **Existing**. This controls which surface will display in the profile window.

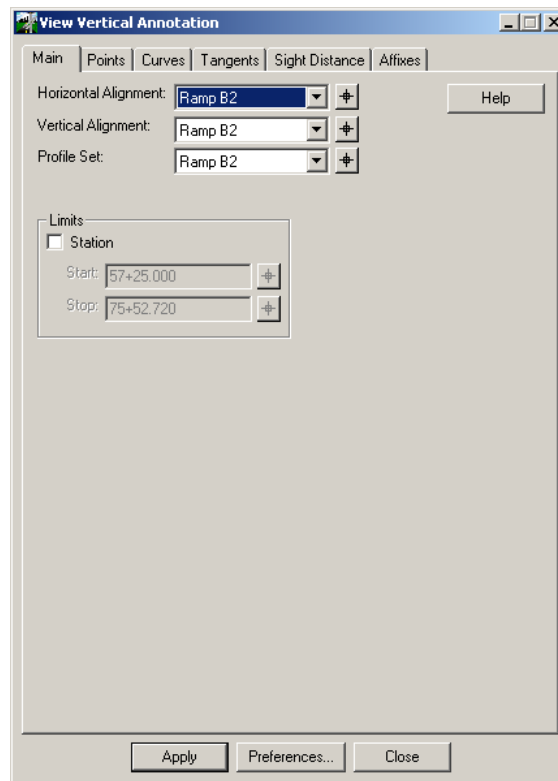


- 7 Click the *Source* option on the left.
- 8 Enable Alignment and select Ramp B2.
- 9 Click **Apply**. The Create Profile dialog box will collapse.
- 10 Click in the upper right corner of the MicroStation View 1.
- 11 The profile will display as shown in the illustration below. Click **Close**.



View Vertical Annotation

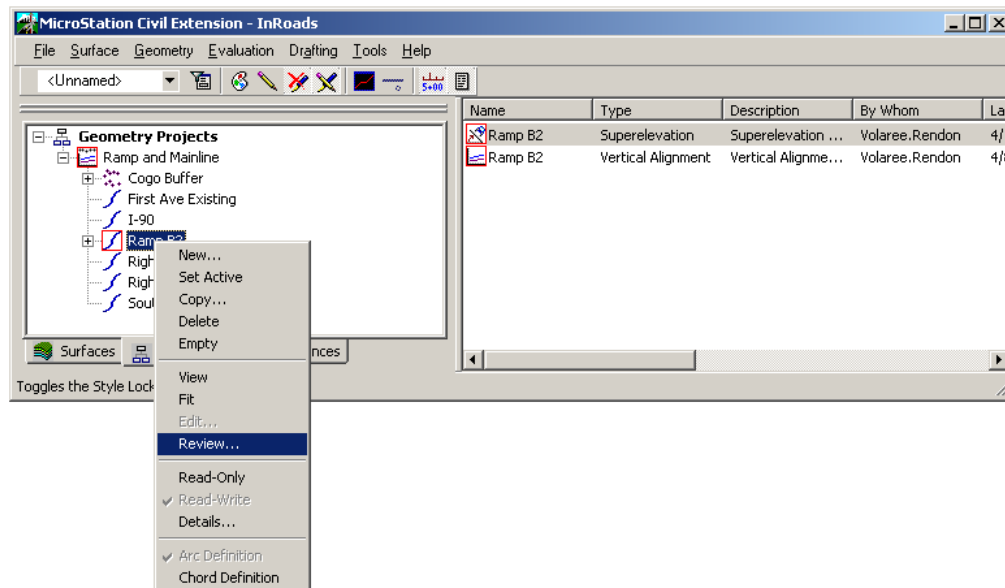
- 1 Select Geometry > View Geometry > Vertical Annotation.
- 2 Ensure that the *Horizontal*, *Vertical* and *Profile Set* all say Ramp B2.
- 3 Disable Station Limits.



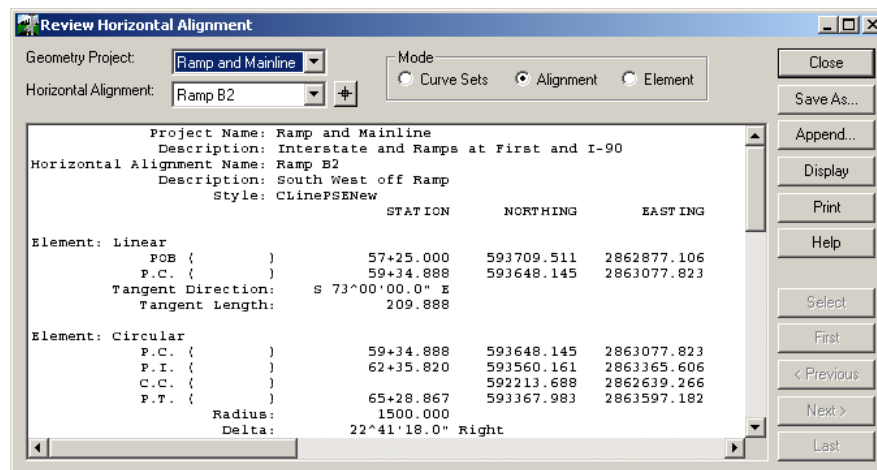
- 4 Load the **DOT New** Preference.
- 5 Click **Apply**.
- 6 Close the View Vertical Annotation dialog box.

Creating Geometry Reports

- 1 On the left side of the InRoads Explorer right click on Ramp B2 horizontal alignment and select **Review** from the shortcut menu.

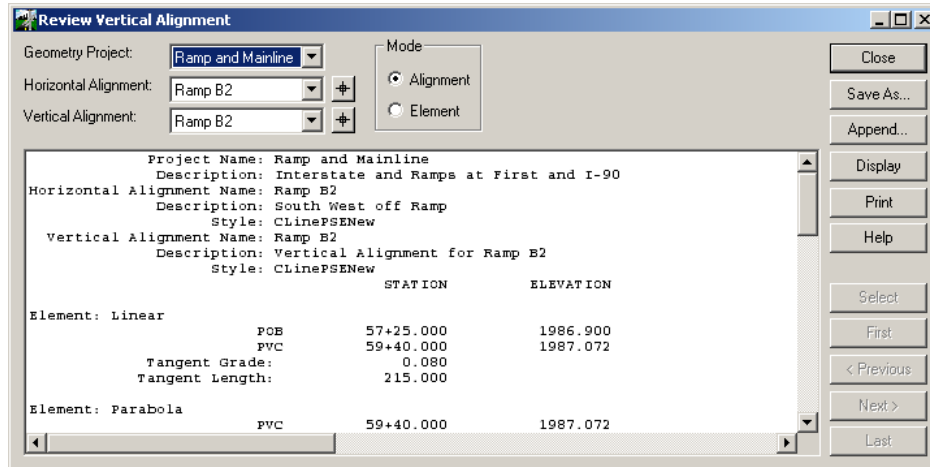


- 2 A fixed format horizontal alignment report displays as shown in the illustration below.



- 3 Close the Review Horizontal dialog box.

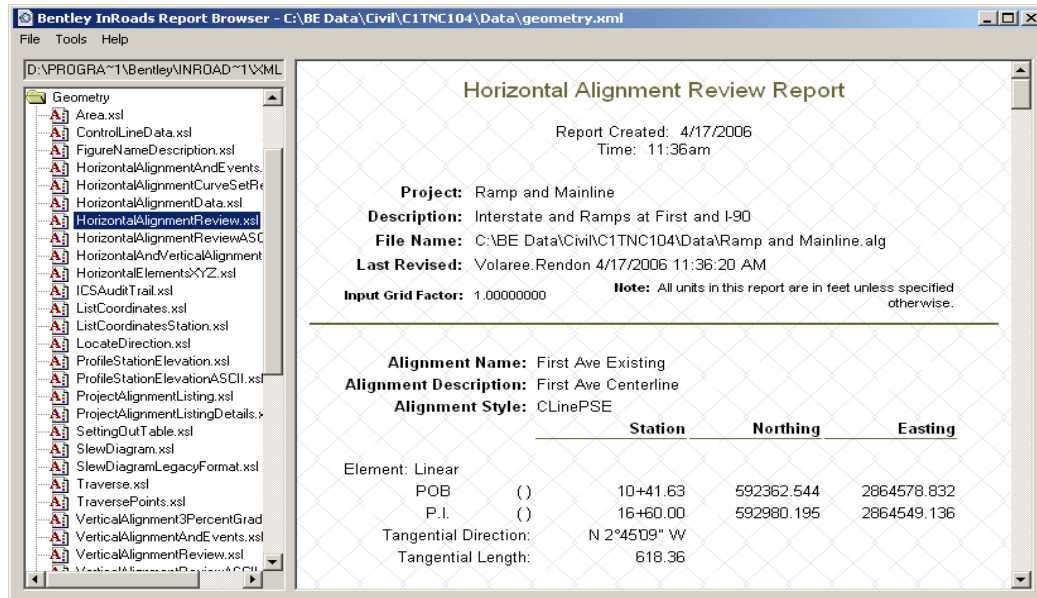
- 4 Select Geometry > Review Vertical from the InRoads menu. A fixed format vertical alignment report displays as shown in the illustration below.



XML Reporting

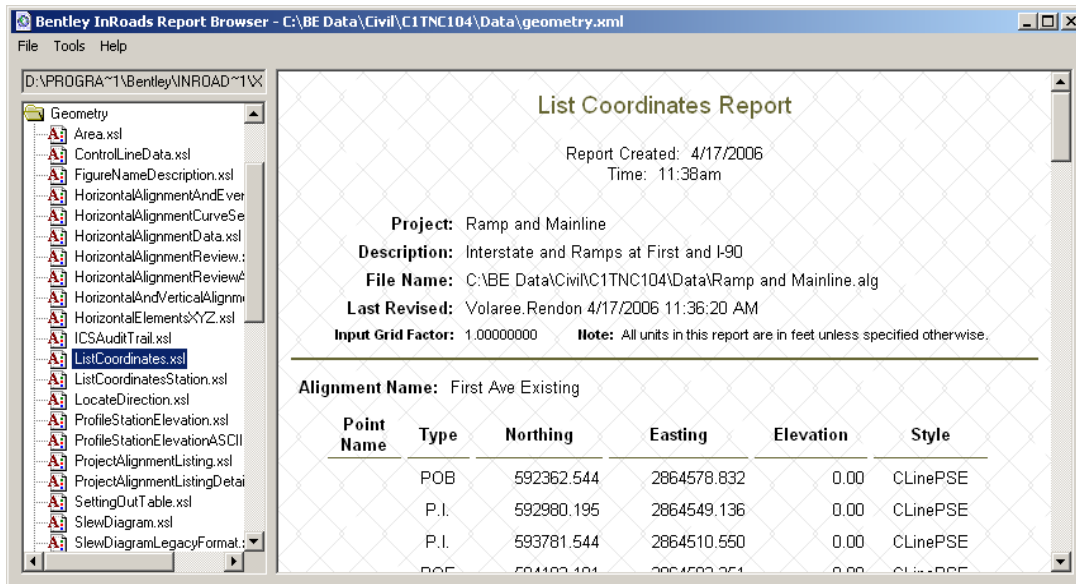
- 1 Select Reports > XML Reports. The XML report dialog box displays.
- 2 Click the *Main* tab.
- 3 In the Report On area, enable **Geometry Project, Horizontal Alignments, Vertical Alignments, and Cogo Points**. Disable all other options.
- 4 Click in the File Name field at the bottom of the dialog box, then click the **Save** Button.
- 5 In the Save As dialog box, browse to the C:\BE Data\{Course #}\Data\ folder.
- 6 In the File name field key in Geometry.xml
- 7 Click the **Save** button.

- 8 The XML Report Browser displays.
- 9 On the left, click the Geometry folder and select HorizontalAlignmentReview. A Horizontal Alignment Report displays as shown in the illustration below.



10 Select List Coordinates.xml

11 The List Coordinates report displays as shown in the illustration below.



12 Close the Report Browser dialog box.

5 Loading More Than One File at Once

In this Chapter, topics related to Loading multiple InRoads files will be discussed. The topics discussed include:

- Project Defaults
- The InRoads Project File

Project Defaults

Project Defaults define where items InRoads files are located as well as the default InRoads preferences to load when InRoads is started. For instance, to open a project file without using Project Defaults it is necessary to navigate to the folder that contains the file manually. If a Project Default Configuration existed for the project, InRoads could automatically navigate to the correct folder when the File > Open or File > Save command is executed.

Multiple Project Default Configurations can be created allowing an easy method to work on multiple projects. By selecting the correct Project Default Configuration, InRoads looks to the correct folders for the respective project and loads the correct preference files automatically.

Project Default Configurations are stored in the registry file on the computer. They can be exported to another computer to share a project setup as necessary.

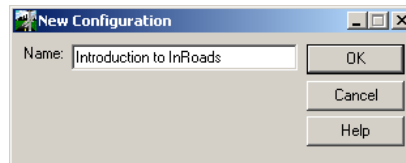


EXERCISE-CREATING A PROJECT CONFIGURATION

- 1 From the InRoads menu select File > Project Defaults.
- 2 The Set Project Defaults dialog box appears. Near the top of the dialog box is the Configuration selection pick list. An existing configuration is selected from this list and made active by clicking Apply. A new configuration is defined by clicking New.

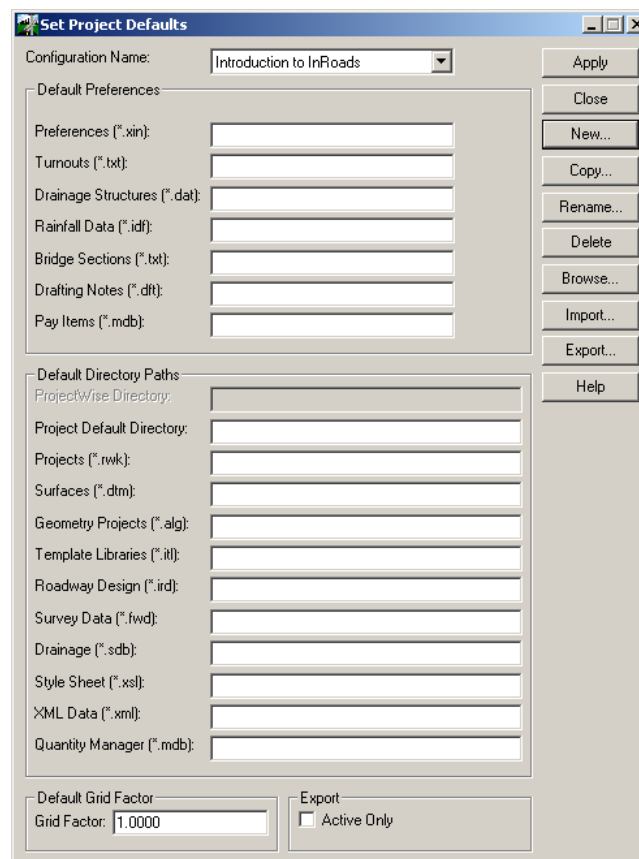
Create New Configuration

- 1 Click **New**.
- 2 Enter *Introduction to InRoads* in the New Configuration dialog box.



New Configuration dialog for Project Defaults

- 3 Click **OK**.
- 4 The Set Project Default dialog box updates with the new configuration name active. The remaining fields are blank since they have not yet been defined.



Project Defaults after creating a new configuration

The Set Project Defaults dialog box is divided into two primary sections: Default Preferences and Default Directory Paths.

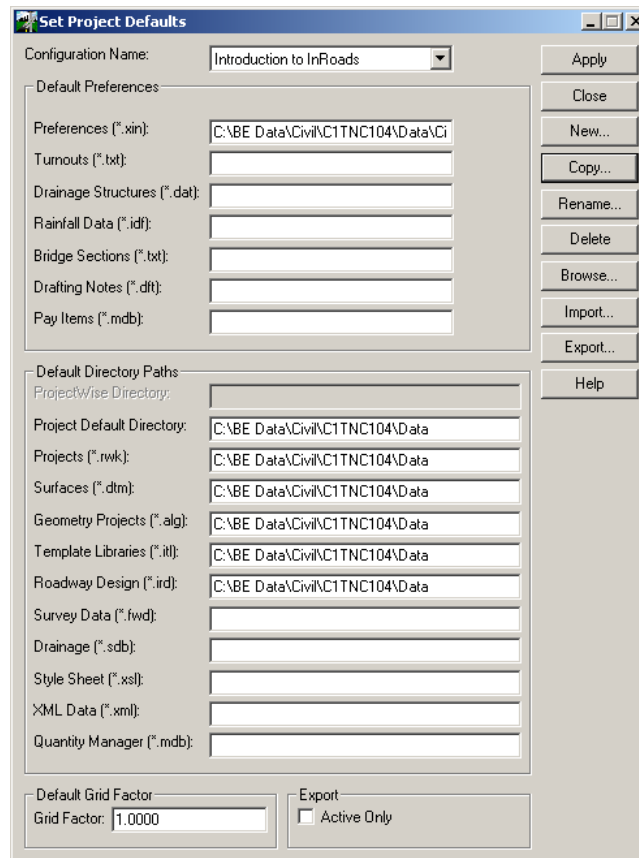
The *Default Preferences* identify InRoads preference files that are loaded when the Project Default configuration is loaded.

The *Default Directory Paths* identify folder locations where InRoads files are located. This section does not identify specific files, instead it lists folders where these types of files are located. The specific files to be loaded for a project are identified using a *Project (.rwk)* file as discussed later in this chapter.

Depending on which files will be actually utilized in your project, it is not necessary to define all of the entries.

- 1 Click in the *Preference (.xin)* field.
- 2 Click **Browse**.
- 3 Browse to and select *C:\BE Data\{Course #}\Data*
- 4 Click in the *Projects (.rwk)* field.
- 5 Click **Browse**.
- 6 Browse to the folder *C:\BE Data\{Course #}\Data*
- 7 Click **Open**.
- 8 Repeat steps 7 through 10 for the following definitions.

Table Property	Folder Name
Surfaces (*.dtm)	<i>c:\BE Data\{Course #}\Data\</i>
Geometry Project (*.alg)	<i>c:\BE Data\{Course #}\Data\</i>
Template Library (*.itl)	<i>c:\BE Data\{Course #}\Data\</i>
Roadway Design (*.ird)	<i>c:\BE Data\{Course #}\Data\</i>
XML Data (*.xml)	<i>c:\BE Data\{Course #}\Data\</i>



Sample Project Defaults

- 1 Click **Apply**.
- 2 InRoads will use these settings until they are changed. The specified preference files will automatically be loaded when InRoads is activated and the remaining folder locations will be the defaults when using the File > Open and File > Save tools.
- 3 Click **Close** to dismiss the dialog box.

InRoads Project File

InRoads Project files are one of the most useful production tools in the software. The project file does not actually contain any project data. Instead, it is an ASCII file listing the other InRoads data files used for the project. Instead of having to load and save each data file individually as was done in the first few chapters of this course, the Project file allows this to be done in a single operation.

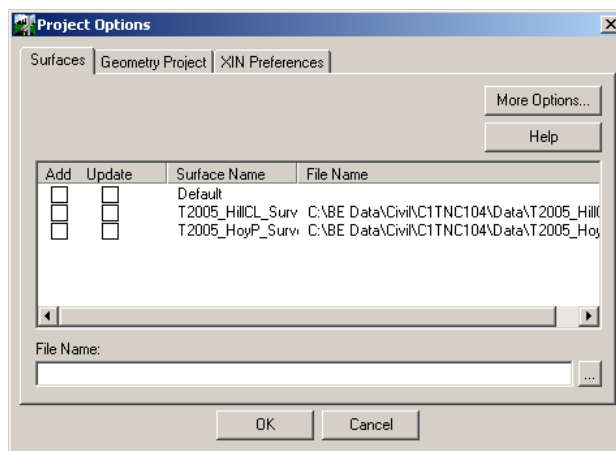
EXERCISE-CREATING PROJECT FILES

The project file can be created from within InRoads or with a text editor.

Before the Project file can be created, the data files must be loaded into InRoads. The preference files have already been loaded. The Existing surface was created and saved previously. Now all that is needed is to create the Project file.

- 1 Select File > Save As.
- 2 Set *Save as Type* to **Projects (*.rwk)**.
- 3 Click **Options**.

The Project Options dialog box appears. This dialog box defines which loaded data files are written to the Project file.

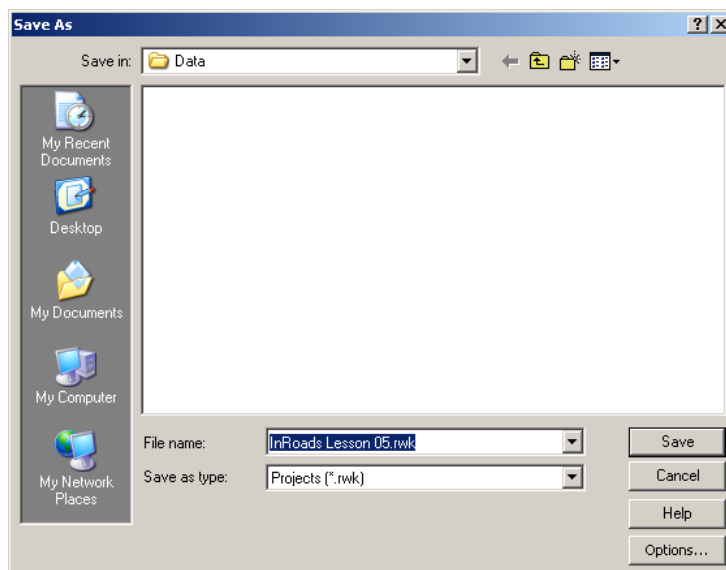


Project Options with the project surface selected

- 4 Select the **Surfaces** tab.
- 5 The one surface currently in memory is displayed. The Default surface is created by InRoads automatically when it is activated. The other surface was loaded in the beginning of this exercise, and the Existing surface was loaded in an earlier exercise. Click the check box in the **Add** column for the Existing surface.

- 6 A check in either column includes the data file in the project file. Which columns are checked tells InRoads how it can use the data files
- 7 A check mark in the *Add* column indicates the data file is loaded when the Project file is loaded or opened. However, that data is not saved to disk when the Project file is saved.
- 8 Since this is the existing survey data, it should not be changed during the design process.
- 9 Select the Geometry Tab.
- 10 Click the check box in the **Add** and **Update** column for the geometry project Ramp and Mainline
- 11 Select the **Preferences** tab.
- 12 Click the check box in the **Update** column for the preference file.
- 13 The check box in the Add column is automatically checked. Which columns are checked tells InRoads how it can use the data files
- 14 A check mark in the *Add* column indicates the data file is loaded when the Project file is loaded or opened.
- 15 A check mark in the *Update* column indicates the data file is saved when the Project file is saved. If this column is not checked, the data file is loaded into InRoads, but any changes to the data are not saved back to the disk drive. Essentially, the data is read only.
- 16 Click **OK**.
- 17 The Project Options dialog box closes.
- 18 In the Save As dialog box, browse to the C:\BE Data\{Course #}\Data\

19 Enter InRoads Lesson 05.rwk in the *File Name* field.



Saving IUTC Lesson 05 Project File

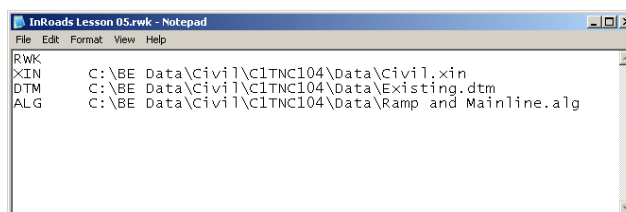
20 Click **Save**.

21 The project file is saved to the disk.

22 Exit the Save As tool.

Creating in Text Editor

A project file is an ASCII file that can be edited using a text editor such as Notepad. Opening the IUTC.rwk file created above in Notepad shows the contents to be the same data files stored in the project file.



The file T2005.rwk opened in Notepad

The first line in the file is an identifier marking this as a project file. The Next line starts with a three letter designator identifying the type of data file. In this case the file is a Preference file or a General settings file.

The next line that starts with GEO is Geometry style file.

The third line that starts with DTM is the surface file.

Following the three type identifier is the path and data file name. There must be at least one space between the identifier and the path. The file path can be entered as an explicit name, a relative path, or a logical path.

Explicit Name: c:\BE Data\C1TNC104\Data\Existing.dtm

Relative Path: .\InRoads\Existing.dtm

where the .\ means "from the active directory in the Open dialog box".

Logical Path: \\File Server\Projects\C1TNC104\Data\Existing.dtm

where Projects is the name of a share on the computer named File Server.

Below is listed the name of identifiers that might be seen in a project file:

RWK: Header, always will be on the first line of the Project File

GEN: General or Civil preference file

GEO: Geometry Style preference file

DTM: Surface file

ALG: Geometry file

RWL: Roadway library file

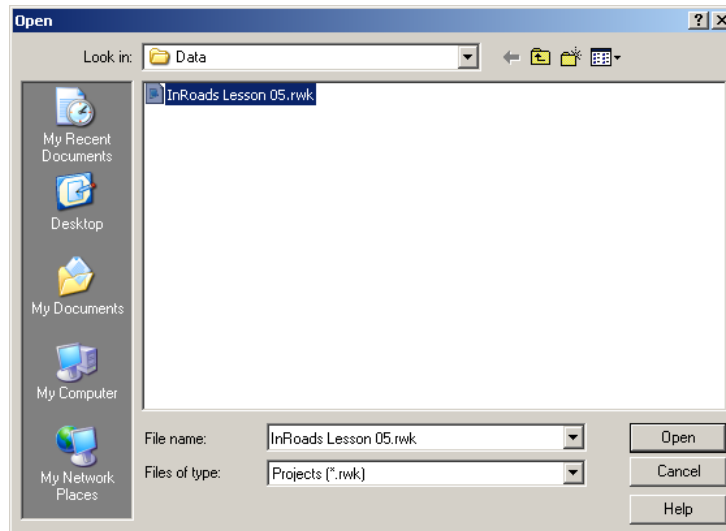
TML: Template library file

Reviewing the IUTC Lesson 05.rwk file, notice that the .dtm file has an N after the file path. The N indicates that this file is set to Add mode, but not Update in the Projects Options dialog box. This means that the file will be loaded, but not written back to the disk during the save operation.

Using Project Files

Once a project file is created, loading data files into an InRoads session becomes much easier. Simply open one project file and all of the associated data files automatically load.

- 1 Select File > Close > All from the InRoads menu. Click **Yes** at the prompt dialog box to close all files.
- 2 This will close all previously loaded data files.
- 3 In the InRoads Explorer select File > Open
- 4 Set the *Files of type* to **Projects (*.rwk)**.
- 5 Set the *Look in* folder to C:\BE Data\{Course #}\Data
- 6 Select the file InRoads Lesson 05.rwk



InRoads Open dialog box set to open a project file

- 7 Click **Open**.
- 8 Two preference files and one surface file are loaded into InRoads.
- 9 Close the dialog box.

