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AEC Applications – Division of Facilities & Transit

CTDOT InRoads SS2 Survey for Designers Workshop

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CTDOT – AEC Applications

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Thanks !

Thanks go to all that contributed to the creation of this document, especially to Jeff Beckwith for his survey expertise, assistance in the field and classroom.

The support and help has been invaluable and is appreciated beyond measures.

Gabriele Hallock

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Preface

Overview

The goals of the CTDOT InRoads V8i Survey for Designers Workshop are:

To give the designer a working understanding of how survey information is gathered in the field including shot placement, breakline and survey limits.

To improve communication between the Survey and Design units when placing a survey request.

To understand the InRoads workflow, as it relates to how points taken in the field become a DTM and how the MicroStation survey file is created.

To gain a better understanding of the existing DTM including viewing triangles and contours.

The CTDOT InRoads V8i Survey for Designers Guide will identify standard resource files, configurations, and CAD functions used in the creation survey data.

The material covered in this guide does not replace the need for other references and training regarding InRoads software. Additional publications and training may be needed for further clarification of CAD procedures and functions. The intent of this guide is not to prevent or limit individual initiatives and engineering judgment. Rather, it is meant to document standard digital design procedures currently in practice at CTDOT.

The information provided in this guide is subject to change as technology and experience warrant. Therefore, this guide will be updated as major revisions in design software and CTDOT DDE policies occur.

Distribution

This manual, in its entirety, may be freely copied and distributed for the purpose of providing a consistent guide to InRoads Design requirements of the Connecticut Department of Transportation. This manual is available on the web.

Trademarks

"*MicroStation*" and "*InRoads*", are registered trademarks of Bentley Systems, Incorporated. Other trade names, computer protocols, and file formats mentioned in this manual are the trademarks of their respective owners. In no event will the appearance of any graphic, description of a graphic, picture, screen display, or any other method of conveying meaning, be considered to impair the rights of the respective owners.

Prerequisites:

The required prerequisites for installing and using InRoads V8i are listed below.

MicroStation V8i SS 2 Version 08.11.07.492 or higher,

MicroStation V8i SS 3 Version 08.11.09.397 or higher,

InRoads V8i SS2 Version 08.11.07.428 or higher,

This is not configured to work with OpenRoads (InRoads V8i SS 3)

Online Application Help

As mentioned earlier, this manual is not intended to be a sole source of information for the InRoads user. InRoads software has extensive online help available through Help on the InRoads Menu Bar. Additionally, when using the different InRoads dialog boxes, each box has a Help button. These buttons link directly to information specific to the InRoads process being performed. It is generally expected that new or even seasoned InRoads users will need to reference the online help regularly. The best solution to a problem usually requires testing and selecting from multiple options. Practice and experience using InRoads is the key to becoming a proficient InRoads user. Also, InRoads Help contains a media library with video presentations and examples of standard workflows.

In addition, there is other outside InRoads learning resources for CTDOT users. CTDOT employees can access the internet for help and training on the Bentley Learning Web site:

<u>http://www.bentley.com/en-US/Training/</u>, or call Bentley directly at *1-800-778-4277* only for SELECTservices or all others call 1-800-BENTLEY. To access these learning resources from Bentley Systems, Inc., CTDOT employees should contact AEC Applications to have a Bentley SELECT-ID issued to them. However, Consultant Engineering firms need to purchase their own training subscriptions directly through Bentley.

CTDOT AEC Applications has setup InRoads preferences and standardized CTDOT InRoads practices in an effort make using InRoads as productive as possible. If you have questions regarding this manual or the CTDOT InRoads preference files, please contact:

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Section 1 Orientation to InRoads Survey

InRoads Survey provides a vehicle for data transfer and reduction from total stations, GPS, and other raw data sources. It includes a complete set of tools for adjustments, data analysis and editing of raw input data. Also included are tools for coordinate geometry and DTM display. InRoads Survey allows you to save data in geometry and DTM file types for further usage by other applications within the InRoads product group. InRoads Survey has resource files that have been configured with CTDOT standards.

MicroStation is the platform application which allows InRoads data to be displayed. MicroStation and InRoads applications both work together to provide users with CAD functions. For example, InRoads uses MicroStation files to display CAD graphics for a DTM. This guide will outline the InRoads commands that are available to view, display and present InRoads design data in CAD files.

1.1 InRoads File Types

The InRoads road design process uses several different file types. All InRoads data is stored in external files. The CAD file is used to view a graphical representation of the design data, but the graphics files do not store the InRoads Data. For example, if the graphics that represent the horizontal alignment are deleted, the InRoads geometry file is not modified.

The following InRoads resource files have been configured for the V8i Environment:

Preference File (*.xin) - This file contains the control settings of all the dialog boxes within InRoads. The settings for surface, geometry and survey tools have all been confined to one .xin file, replacing the previous two .ini files, .fxp and .fwf files. This is the main source of standardization where all InRoads design and graphical output are configured to meet CTDOT standards.

Template Library (*.itl) – This file contains a storage area for typical sections. A template is comprised of a series of points and components that represent breakline features. These are processed later using the Roadway Designer command. Roadway features that have been processed are then saved to the design surface. CTDOT has two standard .itl files; one for roadway use and the other for airport taxiway and runway uses.

Style Sheet (*.xsl) - All style sheets have been provided by Bentley and are located on the local hard drive, in the Inroads directory under Civil/XML Data. The View XML Reports command allows users to select an .xsl style sheet, which specifies the exact information to pull from the .xml file and how to format it. To further clarify, the .xml file contains raw or computed data; the .xsl file specifies how to format the data into a report.

Drafting Notes (*.dft) - This file is used to enhance the production of final drawings. Use the commands across the design session to place intelligent annotation notes on features and geometry, in the plan, profile, and cross section views, as well as at the intersection of two alignments.

Pay Items (*.mdb) - This file is used with Quantity Manager. Quantity formulas and CTDOT pay items are stored in this Microsoft Access database.

Drainage Structures (*.dat) - This file is used with InRoads Storm and Sanitary. This file has been configured with CTDOT standard drainage structure information, including sizes, shapes, materials, and many other parameters.

Rainfall Table (*.idf) - This file is used with InRoads Storm and Sanitary. This file contains a table of Rainfall/Time of Concentration data that conforms to CTDOT drainage standards.

The following InRoads files need to be created for the project design:

Projects (*.rwk) - This file contains directory and file information for loading and saving InRoads data files. Once the project file is open, all of the specific project files are also opened.

Surfaces (*.dtm) - A Digital Terrain Model (DTM) file is a surface where existing ground and design terrain surface models are stored.

Geometry Projects (*.alg) – This file contains coordinate geometry and alignment information for a specific geometric project.

Survey Data (*.fwd) – This InRoads Survey Fieldbook data file is created by importing survey data from a field data collector.

XML Data (*.xml) - The XML Reports command, available as an application add-in under Tools on the pull down menu, generates XML data files. The XML files are not reports, but contain data that can be formatted into reports by using the View XML Reports command. XML data files are ASCII files that are not formatted as a report for direct viewing. A report is the output generated when users display data from an XML file using the View XML Reports command.

1.2 Resource File Storage Location

The latest versions of all V8i resource files will be kept in the workspace under InRoads_V8i _RSC. The newest V8 level structure resource files will be found in the folder V8_Environment.

1.3 Project Defaults

An organized work environment along with a standardized file management system provides a consistent way to maintain digital design data. These measures decrease the chance that users will create and/or work with incorrect InRoads files. File management also eliminates the creation of multiple copies of the same file. Therefore, a standardized file management system greatly increases productivity by ensuring the availability of correct InRoads files and eliminating duplicate files.

By setting up the project defaults and creating a project file, users can quickly load all files needed for project design. Additionally, the project file helps coworkers load and analyze current design data. The Project Defaults command is used to open resource files including the preferences file (.xin) and drafting

file. This command is also used to set up default directories for all file types that can be accessed through the File/Open and File/Save As dialog boxes. These include Project (.rwk), Surface (.dtm), Geometry (.alg) and Survey Data (.fwd). All other files, which are opened or saved throughout the InRoads program, use the Project Default Directory setting. The project default file directories are stored in the computer's registry on the local hard drive.

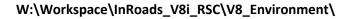
The following two methods, automated method and conventional method, can be used for setting up project defaults:

- The **automated method** based on variables, only has one configuration name. Files are opened and paths are driven by the project user's selection when opening MicroStation. Users can set a windows system environment variable to define a project working directory. Use Project Defaults to set the variable name using the syntax, \$(variable) or %variable%.
- The **conventional method** allows each project to have its own Configuration Name based on hard-coded paths. When a particular configuration is saved and users exit the dialog, that configuration is remembered as the "Current" configuration. The next time InRoads is accessed all the directory paths are set according to the last configuration used. If the project has been changed, users will need to select the corresponding project configurations. This means a configuration name will be needed for every project that the user is working on.

1.4 Start Up - Lab 1

A. Open Windows Explorer and Browse to your projects folder, example: X:\999_Student_HIS##. Within your project folder create the folder SURVEY under the 'Highways' setting for this workflow only.

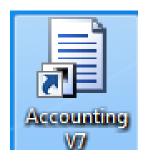
B. Again in *Windows Explorer* and **Browse** to the *CTDOT V8i workspace*, **copy** the following files to the SURVEY folder just created, example: X:\999_Student_HIS##\Highways\SURVEY\.



Organize 🔻 Burn New folder				
-	^	Name	Date modified	-
🔀 Libraries		🔒 cell	9/17/2014 10:18 AM	1
Documents		Style Sheets	4/9/2014 1:45 PM	1
J Music		aecitem11.xml	8/14/2013 2:29 PM	1
Pictures		CT_civil.XIN	2/2/2015 1:35 PM	
Videos		CT_Drainage_Report.rpl	12/6/2010 2:12 PM	1
		CT_notes.dft	12/6/2010 2:12 PM	1
Computer		CT_rainfall.idf	3/14/2011 11:42 AM	1
SDisk (C:)		CT_runoff.dat	12/6/2010 2:12 PM	1
Data (D:) DGS CSurveys (DOT-SDCENG01V) (F:)		CT_structures.dat	12/6/2010 2:12 PM	

→ CT_civil.XIN & CT_notes.dft

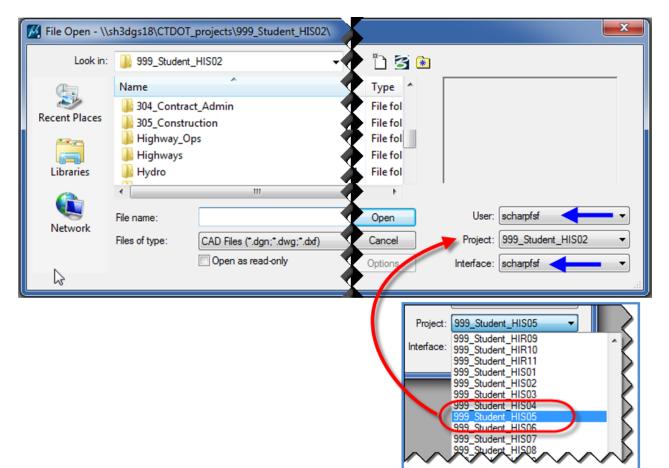
C. Double-Click on the Accounting icon located on your desktop.



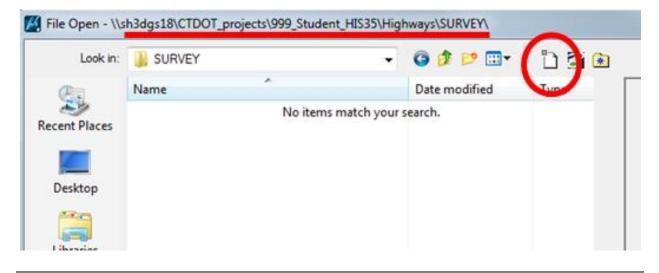
D. Select the "MicroStation" program under Run Program to open MicroStation. From Available Accounts pick **OVERHEAD**, for this class only. No Resource Type: needs to be picked. Click **Start**.

CT DOT Accounting Menu
File Help
Run Program: MicroStation V8i 🚽 Start
Elapsed Time: Inactive Version 7.0 Close
Selected Account: OVERHEAD
Frequently Used Accounts OVERHEAD DOTS7107-0001-0105CN-IN010 DOTS7197-0002-0125PE-PE01C DOTS7197-0002-0127CN-IN010 DOTS7197-0004-0098PE-PE01V DOTS7197-0004-0116PE-PE010 DOTS7197-0004-0127PE-PE01V DOTS7197-0004-0122PE-PE01C DOTS7197-0004-0132PE-PE01C DOTS7197-0004-0132PE-PE01C DOTS7197-0004-0132PE-PE01C DOTS7197-0004-0132CN-IN010 TOTS7197-0004-0132CN-IN010
Clear Frequently Used Accounts Configure Discipline
Resource Type:
Limit to Project #: Filter Show All Projects
Instructions: Select a program to run, then click 'Start'
User: HallockGa Computer: DOT-WH3AEC13

E. In the File Open box, <u>pick your</u> interface and user preferences, then pick your project folder, all training folders start with: **999_Student_HIS** and a two digit number. The instructor will assign you your project.



F. Go to the **Survey** folder and select the **"New File"** icon to create a new MicroStation file.



G. In the New dialog box select 'Browse' button and go to:

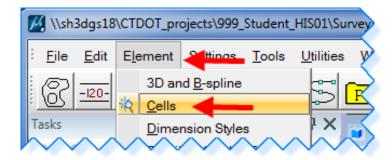
W:\CTDOT_Standards\Workspace\Standards\seed\SV_Design_Civil_3D_V8i.dgn and click Open. Back in the 'New' dialog box type in a file name (SVY_HWY_DEMO_2015.dgn) and select the Save button.

Mew - \\sh3dg	s18\CTDOT_proj	ects\999_Student_HIS35\Highways	SURVEY	×
Save in:	SURVEY	•	G 🤌 📂 🛄 -	3 🖻
Ca	Name	*	Date modified	Туре
Recent Places		No items match your s	earch.	
Network	Image: File name: Image: Compare the sector of the secto	III SVY_HWY_DEMO_2015 MicroStation DGN Files (*.dgn) rkspace\Standards\seed\SV_Desig		Save Cancel Browse

H. In the 'File Open' dialog box select the file that was just created (SVY_HWY_DEMO_2015.dgn) and select the **Open** button. MicroStation will open.

Look in	n: 📕 SURVEY	.	🗿 🎓 📂 🛄 •	1 🗟 🕻
(F)	Name	*	Date modified	Туре
2	SVY_HWY	_DEMO_2015.dgn	9/30/2015 9:58 AM	Bentley M
cent Places				
Computer				
Computer	•	tit		
Computer	 ✓ File name: 	TT SVY_HWY_DEMO_2015.dgn		• Open
				Open Cancel

I. From the MicroStation main menu select **Element > Cells.**



J. On the Cell Library Dialog box select File > Attach File... > Attach Cell Library. Browse to W:\Workspace\InRoads_V8i_RSC\V8_Environment\cell\ and select SV_V8_LEVELS_40e.cel, double-click or click Open. Close the cell library box. In MicroStation click on File > Save Settings.

3	Cell Library: [\cell\	SV_V8_LEVELS_40e.cel]		
F	<u>F</u> ile			\supset
	Use Shared Cells	Display All Cells	In Path	
	Name	Description	Туре	4
	AAVER		Grph	$ \rightarrow $
	APOINT	ACTIVE PT FOR LOCATION	Grph	\leq
	ARROW	ASSUMED NORTH ARROW	Grph	
	ARRWBO	BOHNDARY-MARABROW	Grpb	\sim

K. From the MicroStation main menu select **Applications > InRoads Group > Activate InRoads Suite** and InRoads will open. Make sure **'Survey'** is on the InRoads main menu.

urvey\SV_Ground_File.dgn [3D - V8 DGN] - MicroStation V8i (SELECTseries 3)
Tools Utilities Workspace Applications Window Help Location Survey Traffic Notes
ROWL_TX • InRoads Group • Activate Rail Track View 1, 3D Design Activate InRoads • Activate InRoads • Activate InRoads • Activate Site
Bentley InRoads Suite V8i (SELECTseries 2)
File Surface Geometry Bridge Drainage Survey Evaluation Modeler Drafting Quantities Tools Help
<unnamed> 🔹 🚡 😻 🚳 🔪 🏏 🔛 📰 👘</unnamed>
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

L. To set-up the project defaults we will be using the <u>conventional method</u>. From the InRoads main menu select File > Project Defaults. The 'Set Project Defaults' dialog box will appear. Click New... In the 'New Configuration' box type in: SVY_HWY_Demo_2015. Click OK.

New	Configuration	
Name:	SVY_HWY_Demo_2015	ОК
		Cancel
		Help
Ļ	<u> </u>	

M. Back in the Set Project Defaults box, under the 'Default Preferences' **Click** within the **Preferences (*XIN)** field and Click on **Browse**, go to:

#### X:\999_Student_HIS##\Highway\SURVEY\CT_civil.XIN and click Open.

N. Now click within the Drafting Notes (*dft) field and click on Browse, go to:

X:\999_Student_HIS##\Highway\SURVEY\CT_notes.dft and click Open.

Configuration Name:	SVY_HWY_DEMO_2015	Apply
Default Preferences		Close
		New
Preferences (* xin):	T_projects\999_Student_HIS35\Highways\SURVEY\CT_civil.XIN	Copy
Turnouts (*.bd):		Rename
Drainage Structures (*.da	at):	Delete
Rainfall Data (*.idf):		Browse
Bridge Sections (*.bd):		Import
Drafting Notes (*.dft): Pay Items (*.mdb):	T_projects\999_Student_HIS35\Highways\SURVEY\CT_notes.dft	Export

**O.** Now we will set the 'Default Directory Paths' for our project. Click within the **Project Default Directory:** field, click the **Browse** button and go to your project folder:

X:\999_Student_HISxx\Highway\SURVEY\; click Open. Now copy this line into the other fields. See Figure below, your Set Project Defaults box should look same.

Configuration Name:	SVY_HWY_DEMO_2015	Apply
Default Preferences		0,000
		New
Preferences (* xin):	T_projects\999_Student_HIS35\Highways\SURVEY\CT_civi	LXIN Copy
Tumouts (*.bxt):		Rename
Drainage Structures (*.dat)		Delete
Rainfall Data (*.idf):		Browse
Bridge Sections (*.bt):		Import
Drafting Notes (*.dft):	T_projects\999_Student_HIS35\Highways\SURVEY\CT_note	A DISTANCE DOCTOR
Pay Items (*.mdb):		
Site Modeler Options (*.spf	):	Help
Project Default Directory:	\\sh3dgs18\CTDOT_projects\999_Student_HIS35\Highways	\SURVEY\
		SOUTHER .
Report Directory:	\\sh3dgs18\CTDOT_projects\999_Student_HIS35\Highways	\SURVEY\
Report Directory: Projects (*.rwk):	\\sh3dgs18\CTDOT_projects\999_Student_HIS35\Highways	\SURVEY\ \SURVEY\
Report Directory: Projects (*.rwk): Surfaces (*.dtm):	\\sh3dgs18\CTDOT_projects\999_Student_HIS35\Highways \\sh3dgs18\CTDOT_projects\999_Student_HIS35\Highways	\SURVEY\ \SURVEY\ \SURVEY\
Report Directory: Projects (*.rwk): Surfaces (*.dtm): Geometry Projects (*.alg):	\\sh3dgs18\CTDOT_projects\999_Student_HIS35\Highways	\SURVEY\ \SURVEY\ \SURVEY\
Report Directory: Projects (*.rwk): Surfaces (*.dtm): Geometry Projects (*.alg): Template Libraries (*.itl):	\\sh3dgs18\CTDOT_projects\999_Student_HIS35\Highways \\sh3dgs18\CTDOT_projects\999_Student_HIS35\Highways	\SURVEY\ \SURVEY\ \SURVEY\
Report Directory: Projects (*.rwk): Surfaces (*.dtm): Geometry Projects (*.alg): Template Libraries (*.itl): Roadway Design (*.ird):	\\sh3dgs18\CTDOT_projects\999_Student_HIS35\Highways \\sh3dgs18\CTDOT_projects\999_Student_HIS35\Highways \\sh3dgs18\CTDOT_projects\999_Student_HIS35\Highways	\SURVEY\ \SURVEY\ \SURVEY\ \SURVEY\
Report Directory: Projects (*.rwk): Surfaces (*.dtm): Geometry Projects (*.alg): Template Libraries (*.itl):	\\sh3dgs18\CTDOT_projects\999_Student_HIS35\Highways \\sh3dgs18\CTDOT_projects\999_Student_HIS35\Highways	\SURVEY\ \SURVEY\ \SURVEY\ \SURVEY\
Report Directory: Projects (*.rwk): Surfaces (*.dtm): Geometry Projects (*.alg): Template Libraries (*.itl): Roadway Design (*.ird): Survey Data (*.fwd):	\\sh3dgs18\CTDOT_projects\999_Student_HIS35\Highways \\sh3dgs18\CTDOT_projects\999_Student_HIS35\Highways \\sh3dgs18\CTDOT_projects\999_Student_HIS35\Highways \\sh3dgs18\CTDOT_projects\999_Student_HIS35\Highways	\SURVEY\ \SURVEY\ \SURVEY\ \SURVEY\
Report Directory: Projects (*.rwk): Surfaces (*.dtm): Geometry Projects (*.alg): Template Libraries (*.itl): Roadway Design (*.ird): Survey Data (*.fwd): Drainage (*.sdb):	\\sh3dgs18\CTDOT_projects\999_Student_HIS35\Highways \\sh3dgs18\CTDOT_projects\999_Student_HIS35\Highways \\sh3dgs18\CTDOT_projects\999_Student_HIS35\Highways \\sh3dgs18\CTDOT_projects\999_Student_HIS35\Highways C:\Bentley_V8\Civil\InRoads Group V8.11\XML Data\en\	\SURVEY\ \SURVEY\ \SURVEY\ \SURVEY\
Report Directory: Projects (*.rwk): Surfaces (*.dtm): Geometry Projects (*.alg): Template Libraries (*.itl): Roadway Design (*.ird): Survey Data (*.fwd): Drainage (*.sdb): Style Sheet (*.xsl):	\\sh3dgs18\CTDOT_projects\999_Student_HIS35\Highways \\sh3dgs18\CTDOT_projects\999_Student_HIS35\Highways \\sh3dgs18\CTDOT_projects\999_Student_HIS35\Highways \\sh3dgs18\CTDOT_projects\999_Student_HIS35\Highways C:\Bentley_V8\Crvil\InRoads Group V8.11\XML Data\en\	\SURVEY\ \SURVEY\ \SURVEY\ \SURVEY\
Report Directory: Projects (*.rwk): Surfaces (*.dtm): Geometry Projects (*.alg): Template Libraries (*.itl): Roadway Design (*.ird): Survey Data (*.fwd): Drainage (*.sdb): Style Sheet (*.xsl): Quantity Manager (*.mdb):	\\sh3dgs18\CTDOT_projects\999_Student_HIS35\Highways \\sh3dgs18\CTDOT_projects\999_Student_HIS35\Highways \\sh3dgs18\CTDOT_projects\999_Student_HIS35\Highways \\sh3dgs18\CTDOT_projects\999_Student_HIS35\Highways C:\Bentley_V8\Crvil\InRoads Group V8.11\XML Data\en\	\SURVEY\ \SURVEY\ \SURVEY\ \SURVEY\

- P. For Style Sheet (*xsl): Browse to: C:\Bentley_V8i\Civil\InRoads Group V8.11\XML Data\en\, click Open. All paths have been set. Now click on Apply and Close.
- Q. From the InRoads Menu Bar "reselect" File > Project Defaults. At the bottom of the dialog box select Survey for the Preferred Preference. Click Apply and Close. One more time open Project Defaults to ensure Preferred Preferences are set to Survey.

ive Only Name: Survey   Default	Only Name: Survey

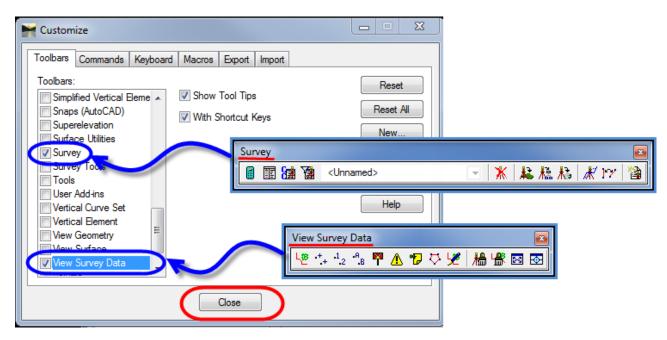
R. Next from the InRoads Menu Bar select File > Project Options.... At the bottom select
 Preferences... The Preferences should already be set to Survey. Close both.

lerances Fa	ctors	Abbreviations	Rail	Sight Distance
Precision	Gener	al Units an	d Format	Geometry
orthing/Easting	0.12	2	•	Help
evation:	0.1		-	
ngular:	0.1		•	
spect:	0		•	
ope:	0.12	2	•	
near:	0.12	23	•	
ation:	0		•	
cres/Hectares:	0.12	2	•	
ea Units:	0.12	2	•	
ubic Units:	0.1		•	
cale:	0.12	234	•	
		Na Fa Hi R	Preferen me: acilities ghway OW OW Railro Jovey	vad
		Su	urvey_100 urvey_20_ urvey_80_	Scale
		Ac	tive Prefe	rence: Survey

S. On the InRoads Interface right click next to Help and select **Locks**. One more time and select **Customize...**.



T. On the Customize dialog box toggle on **Survey** and **View Survey Data** and click **Close**. Dock the InRoads Menus.



U. You completed Lab 1 - Start Up.

# Section 2 Electronic Survey Data

## 2.1 Importing Survey Data - Lab 2

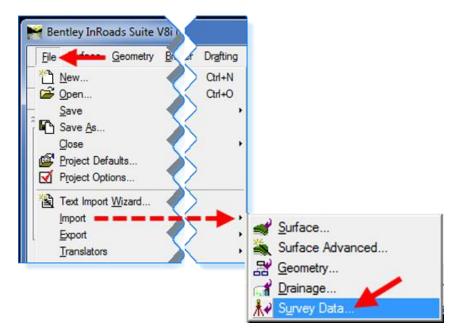
A. In InRoads Menu/Interface select File > New., click on the Survey Data tab. In the name field type in: SVY_HWY_Demo_2015. Click Apply and Close. In your InRoads interface click on the Survey tab (bottom of interface) under Survey Data your file should show.

New 🗖 🗉 🔤 💌	Bentley InRoads Suite V8i (SELECTseries 2)
	<u>File Surface Geometry Bridge Drainage Survey</u>
Surface Geometry Drainage Survey Data	<unnamed> 🗾 😴 🚳</unnamed>
Apply	📓 🏗 🖼 🆼 <unnamed></unnamed>
Name: SVY_HWY_Demo_2015	Station K
	Survey Data
Existing Type In:	SVY_HWY_Demo_2015
Book 1	
	🛕 Survey 🚧 Templates 🚺 🔶 🧃
Close	Toggles the Feature Highlight Lock

B. Now you have to save your survey data (*fwd) file. From the InRoads menu select File > Save As, for Save as type: select Survey Data (*fwd) from the pull down menu. For Active: select SVY_HWY_Demo_2015. This should populate the 'File name:' with:
 SVY_HWY_Demo_2015.fwd. Click on Save, then Click Cancel to close the box.

Mave As			×
Save in:		- 🕝 🤌 🖾 -	
(Han	Name	Date modified	Туре
Recent Places	No items	match your search.	
Computer			
() Network	File name: SVY_HWY_DEMO_2	2015.fwd	► Save
Network	Save as type: Survey Data (*.fwd)	<b></b>	Cancel
	Active:		Help
	Active: SVY_HWY_DEMO_20	15 •	

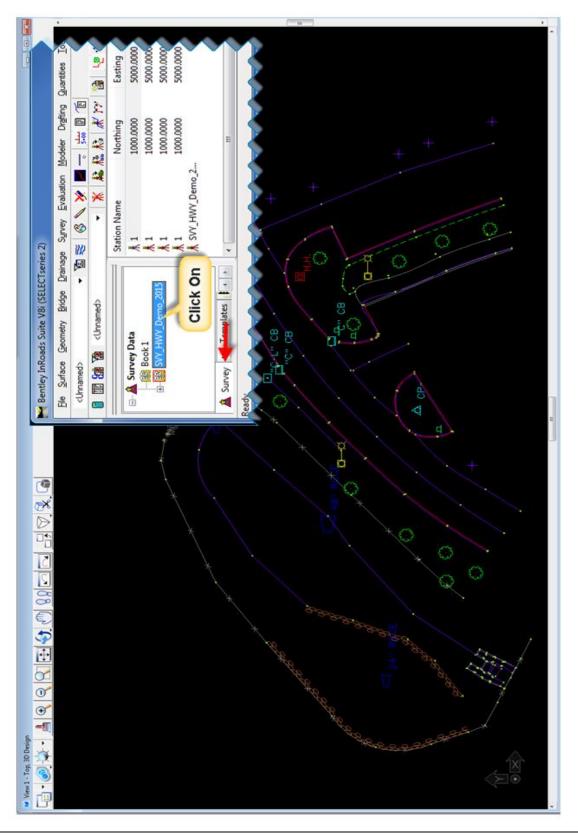
C. Next you will import survey data to your field book. Click on File > Import > Survey Data...



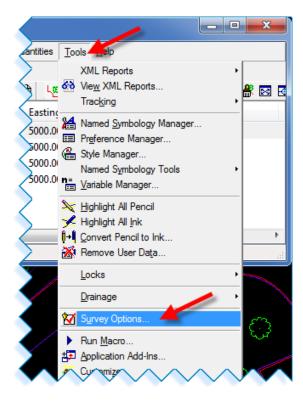
D. In the Import box, find your project folder in the 'Look in:' box and go to your project s Survey folder, for this lab: X:\999_Student_HIS##\Highway\SURVEY. Next for 'Files of type:' select TDS(*rw5) (1); highlight/select the file: SVY_HWY_Demo_2015.RW5 (2); now click on Import (3). The Import box will disappear and reappear. After the Import box reappears click Close.

Mark Import				×
Look in:	퉬 _Eng_Data	•	G 🏚 📂 🛄 -	
æ	Name	*	Date modified	Туре
Recent Places	lnRoads_Fiel		8/26/2015 11:09 AM	File folder
Recent Places	🃗 InRoads_Tra	verse	8/26/2015 11:09 AM	File folder
2	SVY_HWY_D	emo_2015.RW5	11/20/2008 10:36	RW5 File
Desktop				
Network	•	III	3	•
Network	File name:	SVY_HWY_Demo_2015.RW5		Import
	Files of type:	TDS(*.rw5)	-	Close
1	Template:		- C	orrections
_	Linear Units:	US Feet		Options
	Angular Units:	DDD.MMSS		Delete
				Help

E. In the InRoads menu, click on your Survey Data: **SVY_HWY_Demo_2015** and it should populate. Also in your MicroStation view your survey should show, zoom in to better see it.



F. In the InRoads menu click on **Tools > Survey Options...** see figure below to set your Survey Options box.



Markey Options				x
General Units S	ymbology Correc	tions	Observation Standard Deviation	
Chord Height:	0.001000	]		
Point Seed:	1123	ĺ	Help	
Figure Seed:	100	ĺ	Top	
Cell Scale:	1.0000	]		
Text Scale:	1.0000	Field	<u>dbook Audit Trail F</u> ile Name:	
Line Scale:	1.0000	0	N or OFF	
File Options	Errors	<b>S</b>	Save Computed Coordinates	
Log Code Error	s 🖌	A	Add/Edit Audit Trail	
Convert Numer	ic Codes to Corres	spondir	ing Alpha Codes on Import	
View Options				51
Automatic Refr	esh	S	Segregate Text by Symbology Level	
Automatic Upda	ate of Surface			
Planimetric Setting	s			-1
Use Custom Op	erations	V A	Attach Default Tags	
Use Symbols		<b>V</b> A	Attach Attribute Tags	
Use Cells	OFF			
Include Custom	Operations, Symb	ools an	nd Cells in Single Cell	
	OK Pre	ferenc	ces Cancel	

# 2.2 Fixing Code Errors

#### 2.2.1 Fieldbook Data Dialog Box

This command lets you manage your field data. You can add, edit, delete, and find stations and observations with the resizable Fieldbook Data dialog box. The <u>Stations List</u> contains occupied stations. Selecting a station in the Stations List affects the Observations List. The <u>Observations List</u> contains observations that were shot from the station points.

#### 2.2.1.1 Stations List

**Station Name** - indicates the name of the occupied station. Stations are listed in the order in which they were gathered in the field.

**Northing** - indicates the northing coordinate for each station.

**Easting** - indicates the easting coordinate for each station.

Elevation - indicates the elevation for each station.

**Code** - indicates the control code associated with each station.

**<u>Status</u>** indicates the relevant status code(s) for each station. The status codes are:

- **N** the point has <u>Notes</u>.
- **E** the point has been <u>E</u>dited.
- **F** the point is a keyed-in (<u>Fixed</u>) coordinate.
- **A** the point has <u>A</u>ttributes.
- **V** at least one of the attributes has a <u>V</u>alue.

I - an Inserted point.

C - an adjusted point.

Backsight Point - indicates the name of the backsight point for the selected station.

Backsight Direction - indicates the backsight direction from either a north or south azimuth

**Instrument Height** - indicates the instrument height for each station.

**Notes** - indicates notes for the selected station.

Attributes - indicates attributes for the selected station.

#### 2.2.1.2 Observations List

Point Name indicates the name of the observation. When you open or import a survey data file, if a fixed point is encountered that has the same name but different coordinates from a previously encountered fixed point, the name of the second occurrence of the point is assigned a suffix of _1. The suffix for each subsequent occurrence is incremented (_2, _3, and so on).

Northing - indicates the northing coordinate for each point.

**Easting** - indicates the easting coordinate for each point.

**Elevation** - indicates the elevation for each point.

**Code** - indicates the feature code(s) associated with each observation.

<u>Status</u> indicates the relevant status code(s) for each observation. The status codes are:

- **N** the point has <u>N</u>otes.
- **E** the point has been <u>E</u>dited.
- **F** the point is a keyed-in (<u>Fixed</u>) coordinate.
- **A** the point has <u>A</u>ttributes.
- $\mathbf{V}$  at least one of the attributes has a <u>V</u>alue.
- I an Inserted point.
- C an adjusted point.

Horizontal Observation - indicates the horizontal angle for each observed point.

Vertical Observation - indicates the vertical angle for each observed point.

**Slope Distance** - indicates the slope distance to each observed point.

Target Height - indicates the height of the prism above the observed point.

**Notes** - indicates notes for the selected observation.

Attributes - indicates attributes for the selected observation.

## 2.2.2 Point Codes

Each station or observation in the field book is assigned a point code. The point code consists of two parts, an alpha/numeric code and a control code. By assigning an alpha/numeric code to a particular station or observation, that point will be associated to one or more styles listed in the Style Manager (part of the *.XIN file). By assigning a control code to a station or observation the construction of the planimetric graphics (arcs and line segments) related to that point are determined. The process of combining alpha/numeric codes with control codes is called point coding. Surveyors typically record point codes in the field. In *InRoads Survey*, the point codes are activated from the Field Book Data dialog box by right-clicking in the Stations list or the Observations list. The alpha/numeric codes and control codes embedded in the field book data, act in concert to define the construction and symbology of planimetric figures.

**Control Codes** describe geometric relationships among stations/observations in the field book. There are 15 control codes in *InRoads Survey*. Control Codes entered incorrectly in the field can to be edited and fixed in the Field book.

Feature	Description	Control Code
Start	Start a line	ST
Close	Close an object	CL
Point of Curvature	Start a curve	PC
Point of Tangency	End a curve	PT
Exclude from Triangulation	No DTM information	DNC
Random	Random point type in surfaces generated by Survey Data to Survey	RND
Rectangle	Form a rectangle based on two shot points and a taped distance	RECT
Close Rectangle	Close a rectangle based on three shot points	CLSR
Nontangent Curve	Use in conjunction with the PC and PT to specify a nontangent curve	NT
Join Point	Join to a specified point number	JPT
Join Nearest Code	Join to the nearest previously shot specified code	JNC
Distance	Form a closed or open shape based on two shot points and taped distances	DIST
Template	Set up a template to run multiple linear features	TMPL
Cross Section Code	Cross section code	XS
Add to Adjustment Set	Defines a foresight unknown point to be included with adjustments data	ADJ
Extend Arc	Closes an arc with another arc based on three field points, creating a circle	EXTARC

#### 2.2.3 Style Manager and Alpha/Numeric codes

The XIN file allows the user to create a feature usable by all areas of the product. Survey point data is typically composed of two key aspects:

- Point location (Northing, Easting and Elevation)
- Physical characteristics of the object being recorded (Style Manager).

Each Survey Style has been predefined with CTDOT standard properties including:

- Named Symbology (color, line weight, line style, cell, text size and font)
- Codes Alpha Codes and a Numeric Code.
- Custom Operations

A style is associated with a particular station or observation in the field book only when the appropriate *alpha/numeric code* is used and the *CTDOT XIN* is loaded. A point entered in the field with the incorrect code will not have the correct style or have no style associated to it when it is imported into the InRoads Fieldbook.

The object's physical characteristics are modeled in the style. In other words, styles define symbology (and more) for representing various real-world objects.

**Example** – Suppose a utility pole was shot at a certain point. The surveyor wishes to place a cell to represent the utility pole in the CAD file at the point location. A style has been created that controls which cell is placed at the point, the cell scale, rotation of the cell, level of the cell, and so on.

**Example** – Suppose a series of points representing an edge of pavement has been collected. A style has been created that controls the color and line style of the graphics representing the edge of pavement.

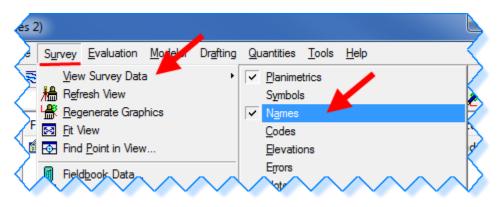
The previous examples contain what are considered generic properties (cell, line style, level, color, and so on). The surveyor often records more specific physical characteristics, and the style can model these specific characteristics using attributes and custom operations, as in the following example.

**Example** – Suppose a manhole was shot at a certain point. In addition to a cell at the point, the surveyor records an ID number of the manhole, as well as incoming and outgoing invert elevation. A style has been made that controls the cell, and also recognizes three specific attributes (manhole ID number, invert in, and invert out). Then using custom operations in *InRoads Survey*, data related to the three attributes can be displayed for each manhole shot.

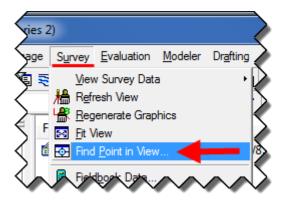
Associating stations/observations with styles is part of the process called point coding.

## 2.3 Edit Survey Data - Lab 3

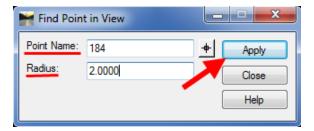
A. Select **Survey > View Survey Data** and **click** on **Names**. In the MicroStation view window the Point Names will now show. (Even when zoomed in they are very small.)



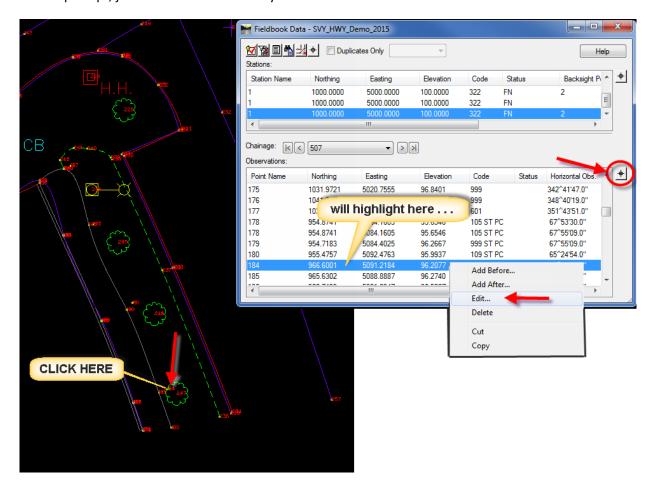
B. Select Survey > Find Point in View.



C. When the Find Point in View dialog appears, **enter** the **point number 184** and **radius: 2** (feet) and click **Apply**. This will center the point to the screen and everything that is within a 2 ft. radius.



- D. Select the **Survey > Fieldbook Data...** from the Survey Menu.
- E. After the Fieldbook Data dialog appears select the **'selector button' E** from the Observation section this will cause the dialog to minimize and InRoads will prompt you to identify a point. Data point near point # 184. The minimized dialog might be covering the prompt, just move it out of the way.



F. The Fieldbook Data dialog will display again with the point 184 selected. **Right-Click** on the highlighted line and select **Edit...** 

G. The **Edit Observation** dialog box will display. In the <u>Code field</u> after 507 type in **ST PC** and click **Apply**. **Click Close**.

Edit Observation					
Point Name:	184	<b>×</b>	Notes:		Apply
Туре:	Computed ~	]			Close
Horizontal Observation:	59^48'58.0"				Help
Vertical Observaton:	92^18'44.0"				
Slope Distance:	97 2200		Attributes:		
Code:	507 ST PC	)	Code	Name	Value
Target Height:	5.0000				
Northing:	966.6001	+			
Easting:	5091.2184	•			
Elevation:	96.2077	+			

<u>Note</u>: Planimetric figures in InRoads Survey are graphical representations of objects with linear characteristics as shown in this first edit. The Feature Style used for a row of shrubs is named SHRUB ROW and has been created with a Numeric code 507. To begin a planimetric figure on a particular station or observation, a code plus the designated start control code: **507 + ST PC** must be specified. Any subsequent station or observation containing the code 507 is included in the planimetric figure until another ST code is encountered.

Features like catch basins and manholes are not typically part of a planimetric figure because they are usually single shot points that have cells or attributes representation, so this point has no start code.



Now two more points will be edited.

- H. In the Fieldbook Data dialog box select the selector button from the Observation section, this will minimize the dialog once more and InRoads prompts you to identify a point. Data point near point # 198.
- I. Edit this point name and add PT NT after Code: 109.
- J. Edit point name 199, add PT NT after Code: 109 999.
- K. Edit point name 121, add PT after Code: 999.
- L. Edit point name 122, add PT after Code: 104.

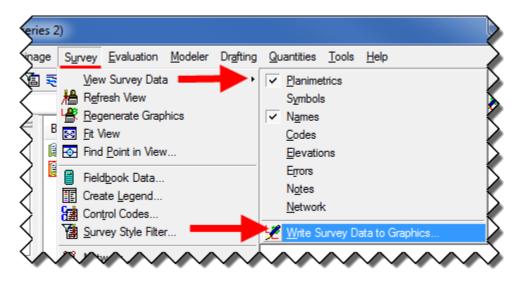
Edit Observation	Edit Observation
Point Name:       Image: 198       Image: 198         Type:       Computed       Image: 13^49'01.0"         Horizontal Observation:       13^49'01.0"         Vertical Observation:       92^25'23.0"         Slope Distance:       68 4400         Code:       109 PT NT         Targer Height:       5.0000	Point Name:       Image: Second
Hedit Observation	Edit Observation
Point Name: K 121	Point Name: K 122 >> >>
Horizontal Observation:	Horizontal Observation:
Vertical Observaton:	Vertical Observaton:
Slope Distance:	Slope Distance:
Code:         999 PT           Target Height:	Code: 104 PT Target Height: Northing: 1102.0160

# Section 3 Create Surface

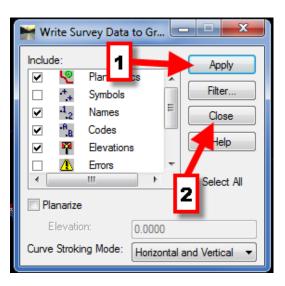
Now that we edited the points, we want to save the graphics to the design file.

## 3.1 Writing Survey Data to Graphics - *Lab 4*

A. Select Survey > View Survey Data > Write Survey Data to Graphics.



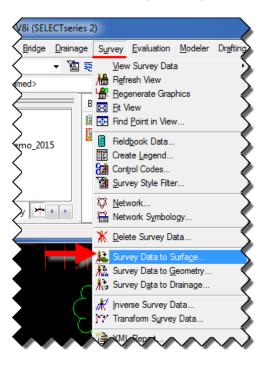
- B. Within the **Include:** field, select (check on): Planimetrics, Names, Codes, Elevations and Notes.
- C. Select **Apply** and then **Close**. This will write the graphics to the design file.



## 3.2 Survey Data to Surface – *Lab 5*

Now we will use our Fieldbook data (survey data) to create the existing surface (*.dtm).

A. From the InRoads main menu bar select Survey > Survey Data to Surface.



B. For Surface Name: input EXISTING. Toggle ON Always use: and select Style from pull-down. Toggle OFF Triangulate Surface. Your Survey Data to Surface box should look as the figure below. Click OK.

🐂 Survey Data To Surface 📃 💌						
Surface Name:		ОК				
Parent Name:	SVY_HWY_DEMO_2015	Cancel				
Description: TYPE-IN	Use Style Description	Filter				
Tolerance:	0.0000	Preferences				
Maximum Segment Length:	0.0000					
Curve Stroking Mode:	Horizontal and Vertical 💌	Help				
✓ Always Use:	Style 🔹	━				
🔲 Triangulate Surface 🧹						
Empty Surface						
Duplicate Names:						

C. Select Surface > Triangulate Surface, the dialog box opens. For Surface: select EXISTING and toggle ON Extended Data Checks. In the Results portion click on More....

🐂 Triangulate Surface 📃	
Surface:	Apply
Description:	Close
Maximum Length: 0.000 +	Help
Extended Data Checks     Lock Triangulation     Res. s     Number of Points:	
Number of Triangles:	More
Elapsed Time (Seconds).	

D. The Surface Properties dialog box opens. On the Main tab change the 'Preference:' to Survey.

Surface Propert	ies						
Main Advanced	i						
Surface:	EXISTING	•					Report
Name:	EXISTING						Help
Description:							
Maximum Length:	0.000						
Preference:	Survey	•					
Type:	Existing	•	- Data Totals -	Active	Features	Deleted	Total
Use Extended	Data Checks		Random:	154	34	0	154
📃 Lock Triangula	ition		Breakline:	4790	54	0	4790
Data Range			Contour:	0	0	0	0
Point Type:	Total	•	Inferred:	0		0	0
Northing:	Minimum 945.70	Maximum 1123.06	Interior:	0	0	0	0
Easting:	4823.31	5149.85	Exterior:	0	0	0	0
Elevation:	90.3	108.9	All Points:	4944	88	0	4944
	50.0	100.0	Triangles:	0		0	0
Apply Close							

- E. On the Advanced tab change Cross Section and Profile Symbology to EXISTING.
- F. Click Apply, after it processes click Close on the Surface Properties dialog box.

🐂 Su	rfac	e Properties	5					<b>— — X</b>
Main	1	Advanced						
Su	urfac	e: EXIST	ring 🗸					
		Sections ology: EXIST			•	🔲 Use Fe	eatures Only	Help
	rofile /mbc	es plogy: EXIST			•	Cock S	Symbologies	
	fset 1:	Distance	Symbology	Color	Offset 9:	Distance	Symbolo	gy Color
		0.000	Default	▼		0.000	Default	<b>•</b>
	2:	0.000	Default		10:	0.000	Default	
:	3:	0.000	Default		11:	0.000	Default	<b>•</b>
4	4:	0.000	Default		12:	0.000	Default	
	5:	0.000	Default		13:	0.000	Default	
	6:	0.000	Default	-	14:	0.000	Default	<b>-</b>
	7:	0.000	Default		15:	0.000	Default	<b>-</b>
8	8:	0.000	Default	•	16:	0.000	Default	<b>-</b>
			6	Apply	Clo	se		
				. 1.1.1				

G. On the Triangulate Surface dialog box click Apply and Close. Close any error log that may open.

🐂 Triangulate Si	urface	
Surface:		Apply
Description:		Close
Maximum Length:	0.000 +	Help
Extended Data	Checks 📃 Lock Triangula	
Results		
Number of Points	s:	
Number of Trian	gles:	
Elapsed Time (S	econds):	More

- H. Save your field book. File > Save > Survey Data.
- I. On the InRoads interface click on the Surfaces tab.



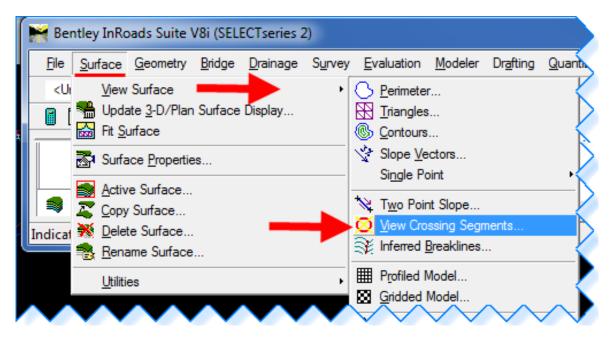
- J. Within the Surfaces, you will find your EXISTING surface. Right-click on your EXISTING surface and click Save As ....
- K. In the Save As dialog box, click on Active: select EXISTING. This will populate the File name: field.
- L. Click Save. Click Cancel to close the box.

Nave As			×
Save in:	URVEY -	G 🏚 🖻 🖽 🛪	
Recent Places	Name EXISTING.dtm	Date modified 10/6/2015 11:31 AM	Type DTM File
Computer	<		Þ
Network	File name: EXISTING.dtm Save as type: Surfaces (*dtm)	🤇	Save Cancel
	Active:		Help Options

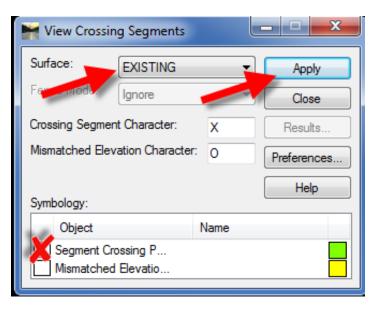
# Section 4 Surface Editing

## 4.1 Fixing Crossing Breaklines – Lab 6

- A. Now that we created an Existing surface we can close our field book. In the **Survey tab**, rightclick on the **Fieldbook > Close**. If a box to save changes pops up select **Yes**.
- B. Select Surface > View Surface > Crossing Segments.

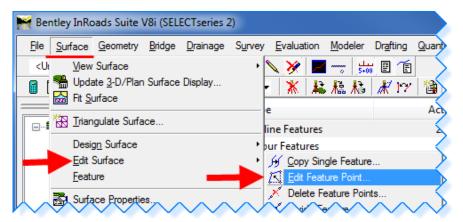


C. Select your EXISTING surface. Select Apply. Then Close.



- D. Within the MicroStation View Window you should see three (3) green crosses. These indicate where segments are crossing each other. Next we will fix this.

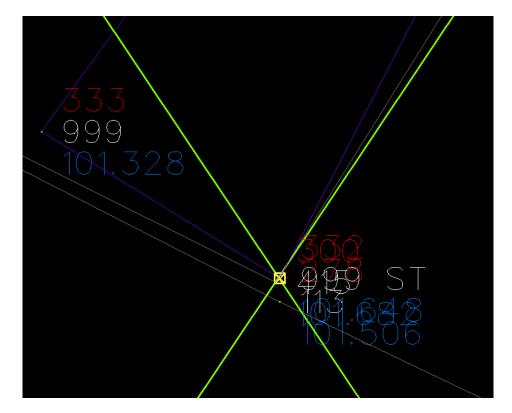
E. From the InRoads menu, select **Surface > Edit Surface > Edit Feature Point**.



F. Within the Edit Feature Point dialog box. Select the **pick button** for **Feature:** .

Surface:	Existing	Apply
Feature:	BRKLN-116	Close
Point:	k<1 of 17 ≥3+	Insert Filter
Center	View 🦱	Delete
Northing:	952.95	Leiete
Easting:	4866.34	More >>
Bevation:	101.648	Help

G. In the MicroStation view **zoom in** to the green crosses. **Select** the purple breakline feature at the bottom right of the spill way.



H. In the Edit Feature Point dialog box select the Target Button for the Northing and Easting coordinates and modify breakline to be within gabion spillway. Datapoint (left click) to a point within the gray spillway symbology. Select Apply. You have to repeat these steps for the second point. Delete the purple line and the green crosses outside of the spillway using the MicroStation delete tool.

- Edit the other errors (green crosses). Target the purple breakline feature (points 116, 117, 120 & 121) and toggle left/right to select the first crossing point.
- J. Target the **North/East coordinate** and modify the breakline to be behind the curbing, select **Apply**. For each crossing vertices along the feature select and modify each point making sure to click **Apply** after each point has been moved. Repeat until all points are behind the curb line.
- K. **Delete** the breakline (purple line) that is now incorrect and the green crosses using MicroStation delete tool.
- L. In InRoads select **Surface > Triangulate Surface** and select **Apply** and **Save** your surface.

## 4.2 Changing Surface Feature Properties – *Lab 7*

A. Select **Surface > Feature > Feature Properties**.

💓 Ber	ntley	/ InRo	ads Suite \	V8i (SELI	ECTseries 2	2)				
<u>F</u> ile	<u>S</u> u	face	Geometry	<u>B</u> ridge	<u>D</u> rainage	S <u>u</u> rvey	<u>E</u> valuation	<u>M</u> odeler	Dr <u>a</u> fting	Que
<ui< th=""><th><b>%</b></th><th></th><th>Surface ate <u>3</u>-D/Plan urface</th><th>Surface</th><th>Display</th><th>ŀ</th><th></th><th>   5==   橋 稔</th><th></th><th></th></ui<>	<b>%</b>		Surface ate <u>3</u> -D/Plan urface	Surface	Display	ŀ		5==   橋 稔		
	***		gulate Surfa	ce			ine Features			3
			g <u>n</u> Surface Surface ure			•	ur Features or Features	Properties		
	2	Surfa	ice <u>P</u> ropertie	s			E Feature			$\leq$
		_ Copy	e Surface Surface				Compone 🕼		es	$\leq$
Edits tl	-		te Surface ame Surface							5
		Utiliti	es~~~	$\sim$	$\sim$	$\sim$	~~~	$\sim$	~~	->

B. In the Feature Properties dialog box **click** on the **Selector button** in the 'Feature:' area.

	Feature Propertie:	5			
	Surface: EXIS	TING	•		Sty
	Feature:				Ave
	Name	Style	Description		AP
	BRKLN-116	BRKLN	BREAKLINE	$\sim$	A
	CBC-100	CBC	C CB		R
4	CPTDNG-100		CONTPOL TRAVER.	$\sim$	AP

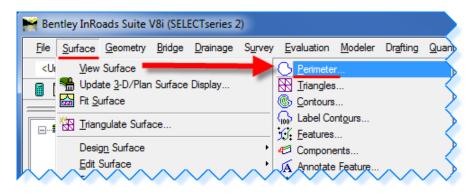
- C. Pick the chain link fence surrounding the sedimentation control pond in the MicroStation view.
- D. One of the chain link fence feature lines should highlight, select all chain link features (FECHLK) within the Feature Properties box. Change the Triangulation Feature Type: from Random to Breakline.

Feature Prop	,			<b>2</b> 1				
Surface:	EXISTING	•		Style Available:			(	Apply
Feature:				AAA CENTERLINE				Close
Name	Style	Description ^	+	APOINT			Â.	
BRKLN-116	BRKLN	BREAKLINE		ARWL				Filter
CBC-100	CBC	C CB		ARWR			+	Edit Style
CPTDNC-100	CPT	CONTROL TRAVER		ARWS			*	New Style
CRBBCL-100	CRBBCL	BIT CONCRETE LIP		Primary:				INEW Style
CRBBCL-101 CRBBCL-102	CRBBCL	BIT CONCRETE LIP BIT CONCRETE LIP		FECHLK			•	List Points
CRBBCL-102	CRBBCL	BIT CONCRETE LIP		Secondary:				Help
CRBBCL-104	CRBBCL	BIT CONCRETE LIP						
CRBCON-100	CRBCON	CONCRETE CURBI						
CULT-100	CULT	CULTIVATED AREA						
DAM-100	DAM	DAM		Pay Items				
FECHLK-100 FECHLK-101	FECHLK FECHLK	CHAIN LINK/WIRE CHAIN LINK/WIRE		-			٤.	
FECHLK-101	FECHLK	CHAIN LINK/WIRE		Name Desc	ription	From Style		
HH-100		HANDHOLE					2	
LGTSTD-100	LGTSTD	LUMINAIRE ON STA						
RCEFDNC-100	RCEF	15IN RCCE						
RCEIDNC-100	RCEI	24IN RCCE 🔻						
Name:				Triangulation				
Description:	CHAIN LINK/WIRE FE	INCE		Feature Type:	Breakline		_	
		INCL		Point Density Interval:	Random	+		
Parent:				Exclude from Triangula	Breakline	<u> </u>		
Refresh/Displ	ay in 3-D/Plan View			Exclude from mangula	Interior			
					Exterior		_	

- E. Select **Apply** and **Close**.
- F. In InRoads select **Surface > Triangulate Surface** and select **Apply** and **save** your surface.

## 4.3 View Surface Tools – Lab 8

- A. This lab shows InRoads users how to use the different viewing tools to display surface data including the perimeter, triangles, contours and contour elevations.
- B. Make sure the style lock is **OFF**. The style lock will allow the dialog box to appear.
- C. On the InRoads Main menu bar click on **Surface > View Surface > Perimeter**.



D. In the View Perimeter dialog box for Surface: select **EXISTING**. Then click the **Apply** button. Notice the line surrounding the parking lot; this is the limit of the existing surface.

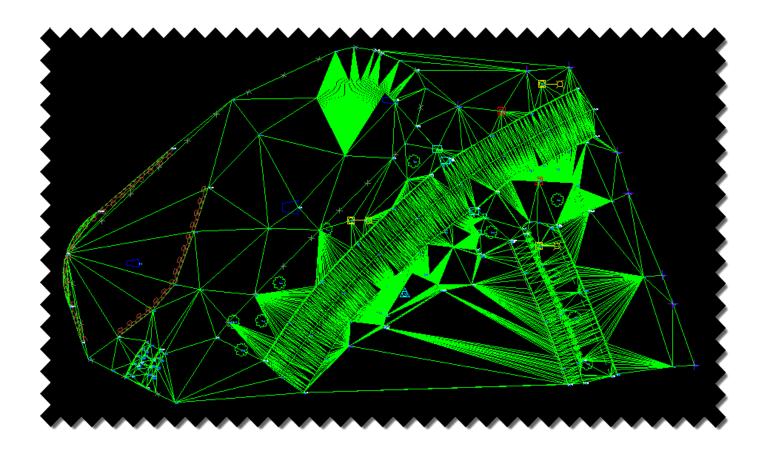
🐂 View P	erimeter		×
Surface:	EXISTING	•	Apply
			Close
			Preferences
Symbology	:		Help
Object		Name	
Perimeter			BYL

E. On the InRoads main menu click on Surface > View Surface > Triangles.

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F. In the View Triangles dialog box for Surface: select **EXISTING**. Then click **Apply**. Notice the triangles appearing in the parking lot.

🐂 View Triangle	es		×
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G. Looking at the triangles you can see some triangles need to be deleted. We will do this next, but first save your EXISTING surface.

- Manual Suite V8i (SELECTseries 2) File Surface Geometry Bridge Drainage Survey Evaluation Modeler Drafting Qua View Surface 🂓 📕 🚽 🛗 📳 💽 <Ur Here Strate Strate Display... Ӂ 膝 臆 稔 巌 112 ſ 🚵 Fit <u>S</u>urface 🖃 👔 Triangulate Surface... line Features Design Surface • bur Features Edit Surface ₩ Copy Single Feature... Eeature 🔣 Edit Feature Point... X Delete Feature Points... Surface Properties... Divide Feature... Extend Features... 📉 Intersect Features... Copy Portion of Surface... Merge Surfaces...
   # Transform Surface... 🔯 Delete <u>T</u>riangle 💑 Delete Triangles By Filter... ang Ed
- H. From the InRoads menu select **Surface > Edit Surface > Delete Triangle...**.

I. **Select** the **EXISTING** surface on the Delete Triangle dialog box. Click **Apply.** Now select the triangles you want to delete. See the figure below as guide.

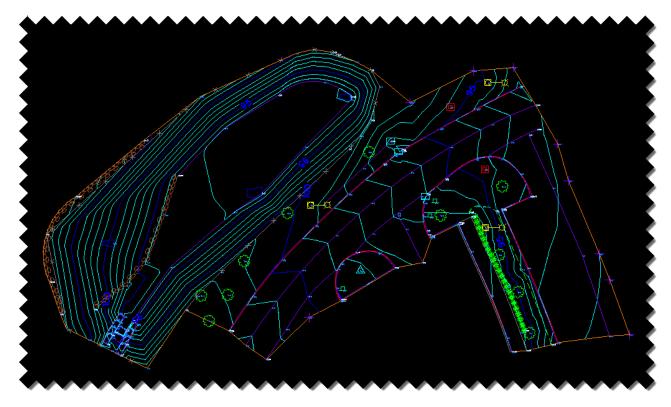


- J. Cancel out of the delete Triangle command. Save your EXISTING surface.
- K. Using MicroStation tools with **graphic group on delete** the display of the perimeter and triangles.
- L. **Redisplay** the perimeter and the triangles. View in MicroStation view. Then **delete** the triangles.
- M. On the InRoads main menu bar click on **Surface > View Surface > Contours**.

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N. The View Contours dialog box opens. Make sure Preferences... are set to Survey. On the Main tab ensure Minors per Major: is set to 4. Click on Major Contours, Minor Contours and Major Labels. Click Apply.

Kiew Contours								
Main Advanced Labels								
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Fence Mode:	Ignore		-					
Interval:	1.000							
Minors per Major:	4		-					
Symbology:								
Object		Name						
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Minor Contours		INTCON		BYL				
Major Labels		INDCON		BYL				
Minor Labels		Default		BYL				
Major Depressio	n Co	Default		BYL				
Minor Depressio	n Co	Default		BYL				
Apply Preferences Close								



O. After the contours display **Close** the View Contours box.

Exit out of your project making sure you save your work. Exit out of InRoads and MicroStation.