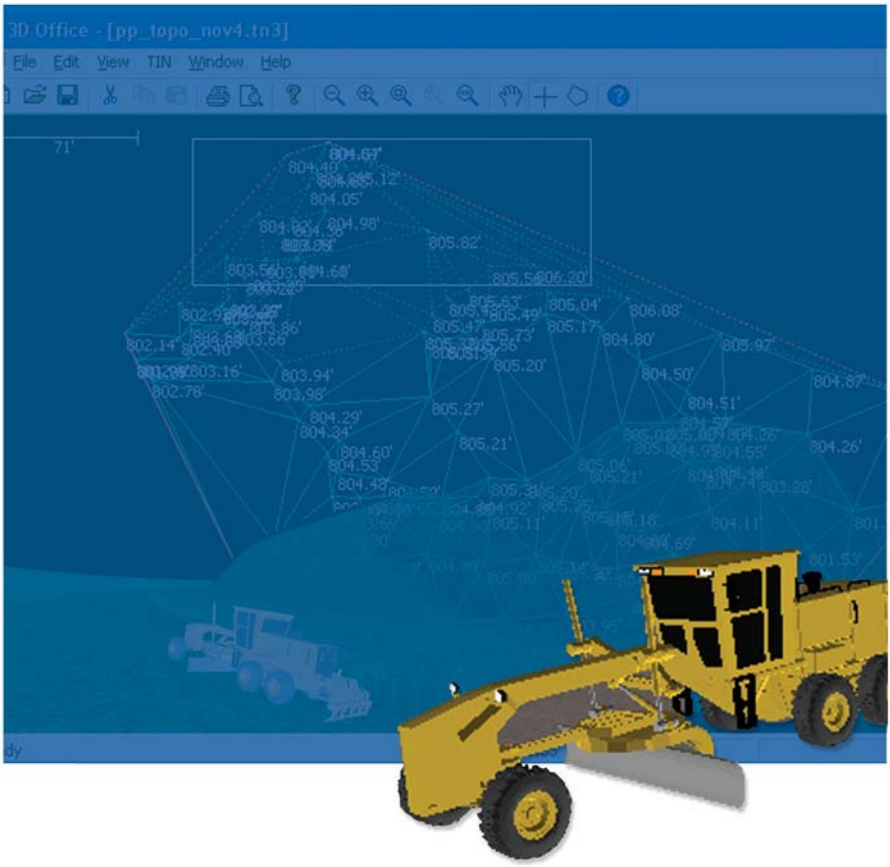
TOPCON

3D-Office

Office Software



Reference Guide

TOPCON
POSITIONING SYSTEMS

3D-Office™ Reference Guide

Part Number 7010-0684
Rev C

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Notes:

Preface

Thank you for purchasing your Topcon receiver, survey product or accessory (the “Product”). The materials available in this manual (the “Manual”) have been prepared by Topcon Positioning Systems, Inc. (“TPS”) for owners of Topcon products. This Manual is designed to assist owners with the use of software (the “Software”) to be used with the Product and its use is subject to these terms and conditions (the “Terms and Conditions”).

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Manual Conventions

This manual uses the following conventions:

Example	Description
File ▸ Exit	Click the **File** menu and click **Exit**.
Enter	Click the button labeled Enter.
Topo	Indicates the name of a dialog box or screen.
Notes	Indicates a field on a dialog box or screen, or a tab within a dialog box or screen.

Further information to note about the configuration, maintenance, or setup of a system.

Supplementary information that can help you configure, maintain, or set up a system.

Supplementary information that can have an affect on system operation, system performance, measurements, or personal safety.

Notification that an action has the potential to adversely affect system operation, system performance, data integrity, or personal health.

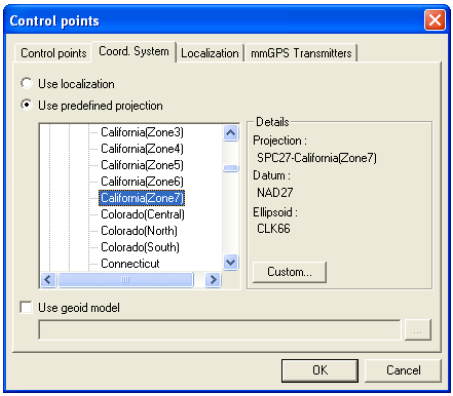
Notification that an action *will* result in system damage, loss of data, loss of warranty, or personal injury.

What's New with 3D-Office

The following list briefly describes new features and functions for the latest version of 3D-Office.

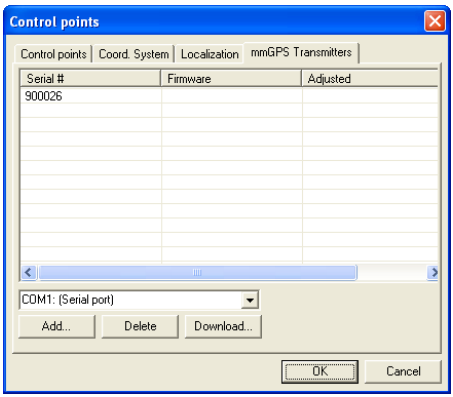
Projection, Datum, and Geoid Support

- A number of projections and geoids are included with the installation.
  See "Using Coordinate System Data" on page 2-20 for details.
- Custom projections and datums are supported via a 3D Project or 3D Control file.
  See "Creating a Custom Projection or Datum" on page 2-21 for details.



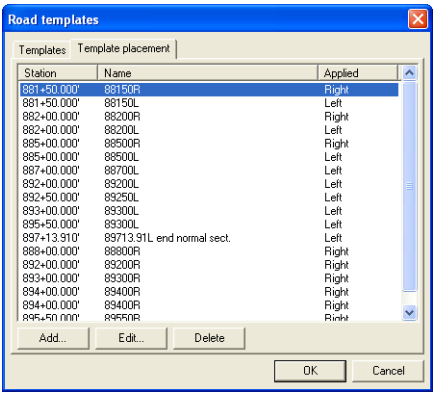
mmGPS Transmitter Support

- If a control point file included mmGPS transmitter information, this data can viewed.
- If the computer and mmGPS transmitter are connected, firmware and adjustment data can be uploaded.
  See "Viewing and Adding mmGPS Transmitter Information" on page 2-27 for details.



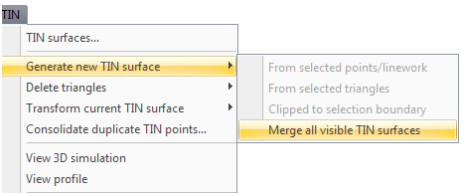
Template Placement Function Moved

For alignments, the template placement function is now included as a tab on the Road templates dialog box.



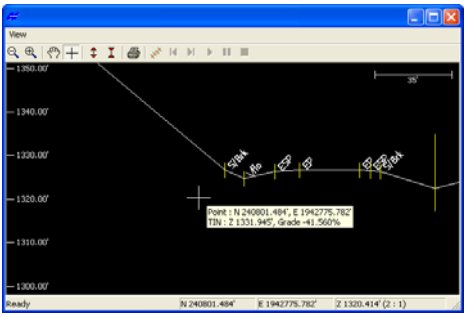
Merge TIN Surfaces

A new function that merges all visible TIN surfaces into one.
See "Merging TIN Surfaces" on page 5-8 for details.



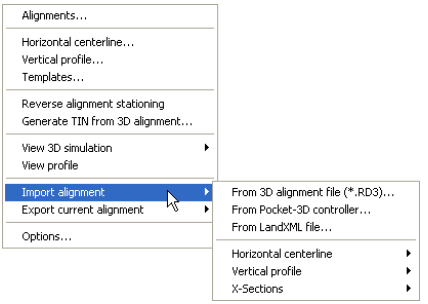
Alignment Profile

A profile of the alignment can be viewed.
See "Viewing a Profile of the Alignment" on page 6-39 for details.



Alignment Elements Import

In a 3D Project file, horizontal centerlines, vertical profiles, and x-sections can be imported from various file formats.
See "Importing Alignment Features" on page 6-8 for details.



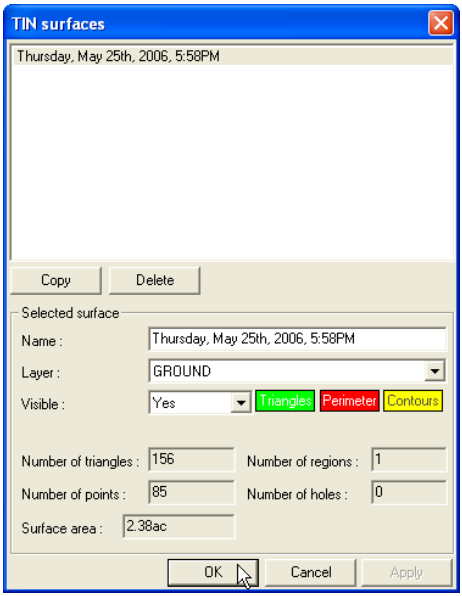
Surface Parameters

For TIN, Alignment, Plane and Grid surfaces, parameters are located/have been relocated on the corresponding surfaces dialog box.

From here, the surface name, layer, and visibility can be edited. The surface's properties can be viewed or edited.

See one of the following sections for details.

- "Viewing and Editing TIN Surfaces" on page 5-10
- "Viewing and Editing Alignments" on page 6-15
- "Working with Plane Surfaces" on page 7-5
- "Viewing Grid Information" on page 8-10

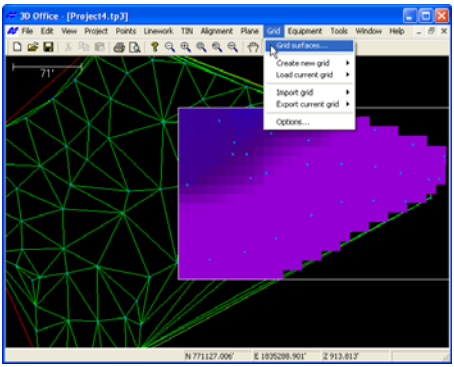


Grid Surface Support

Grid surfaces are now supported, and include the following functions:

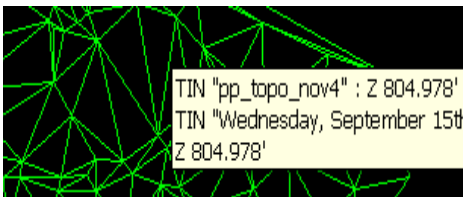
- View, edit, copy, delete grids
- Create a grid
- Load grid data from a TIN surface
- Import/export grids
- View machine pass information

See Chapter 8 for details.



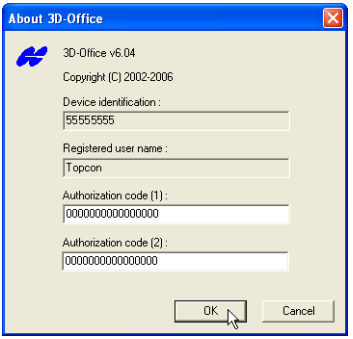
Surface Tooltips

Drag the cursor anywhere within the surface to display the elevation. See "Showing Surface Elevations" on page 6-3 for details.



Update Authorization Codes

Occasionally, authorization codes can be purchased to upgrade or update a current copy of 3D-Office. See "About 3D-Office" on page 1-25 for details.



Introduction

Welcome to 3D-Office™, Topcon's fully featured 3DMC software for machine control applications.

With 3D-Office, you can create, edit, import/export, design, and prepare files for any jobsite. Many of these files can be exported to the System Five-3D control box and Pocket-3D for immediate use in the field. 3D-Office imports files from the System Five-3D control box and Pocket-3D for office evaluation.

Installing 3D-Office

3D-Office comes on a CD to install on a computer. Table 1-1 lists the system requirements needed to properly use this software on a computer; optional accessories include CF card access to transfer files between the computer and System Five-3D control box.

Table 1-1. 3D-Office System Requirements

• Microsoft® Windows 98/NT/ 2000/XP	• 2MB of available hard-disk space (3MB recommended)
• 128MB of RAM	• CD-ROM drive

1. Insert the 3DMC Software CD into the CD-ROM drive of the computer.
2. Navigate to the CD-ROM drive's folder and double-click the **3D-Office folder** to open it.
3. Double-click the **Setup.exe icon** (Figure 1-1) to begin the installation process.

Figure 1-1. 3D-Office Setup.exe Icon

4. Select a new destination folder or keep the default folder in which to install 3D-Office, and press **Next** (Figure 1-2).
5. After reading the License Agreement, press “I accept...” and press **Next**. The installation process begins (Figure 1-2).

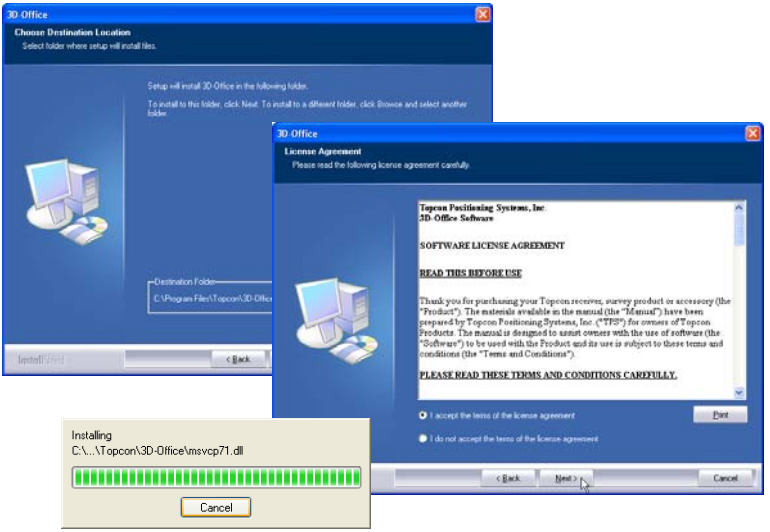


Figure 1-2. Install 3D-Office

6. Press **Finish** to exit the installation wizard. The wizard also creates a shortcut to 3D-Office (Figure 1-3), placing it on the computer’s Desktop.

Figure 1-3. 3D-Office Shortcut

Uninstalling 3D-Office

1. Navigate to the computer's ***add/remove programs*** dialog box (press the Start button ▸ Settings ▸ Control Panel ▸ Add or Remove Programs) and remove the Topcon 3D-Office program.
2. Press **Yes** at the confirmation (Figure 1-4).

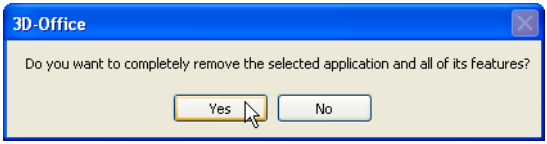


Figure 1-4. Remove 3D-Office?

The ***Setup Status*** dialog box briefly displays, showing the uninstall progress.

3. Press **OK** to acknowledge the removal of 3D-Office (Figure 1-5).

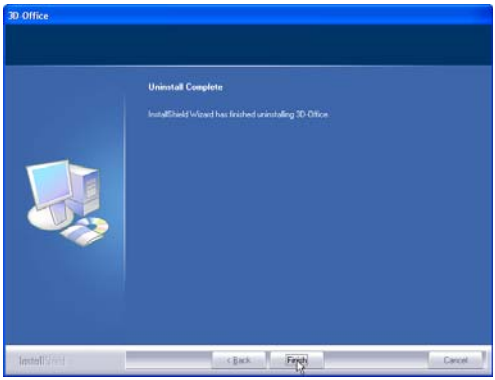


Figure 1-5. 3D-Office Successfully Removed

Starting 3D-Office

To start 3D-Office, click one of the following:

- **Start ▸ Programs ▸ Topcon ▸ 3D-Office**
- **Topcon 3D-Office shortcut**

Upon initial startup, 3D-Office requires authorization codes to start (Figure 1-6). Record the device identification number and contact your Topcon Dealer with the following information to receive authorization codes:

- Device identification
- Company name
- Contact name
- Company address
- Contact phone number
- Contact email address
- Software Type (3D-Office)

Once you receive the authorization codes, enter them and press **OK** to open 3D-Office (Figure 1-6). When opening 3D_Office for the first time, a new project file displays. See “File Operations” on page 1-18 for details on creating, opening, and saving projects.

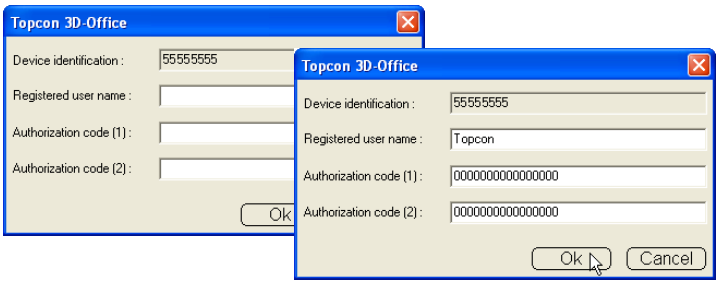


Figure 1-6. Enter Access Code

Once entered, the authorization codes can be located and changed on the ***About 3D-Office*** screen. See “About 3D-Office” on page 1-25 for more details on viewing/changing authorization codes.

Getting Acquainted

This section introduces the various menus, buttons, and windows used for viewing, managing, and editing project files.

Main Screen

The 3D-Office main screen (Figure 1-7) has the following components:

- Title bar – displays the name of the file
- Menu bar – contains drop-down menus for the various functions, and depends on type of file being displayed
- Toolbar – contains shortcut buttons to frequently used functions
- System buttons – minimizes, maximizes, and closes windows and dialog boxes
- Status bar – displays informative messages about the program's status, as well as cursor/selection-tool coordinates
- Plan View – shows a graphical representation of the data available in the current file

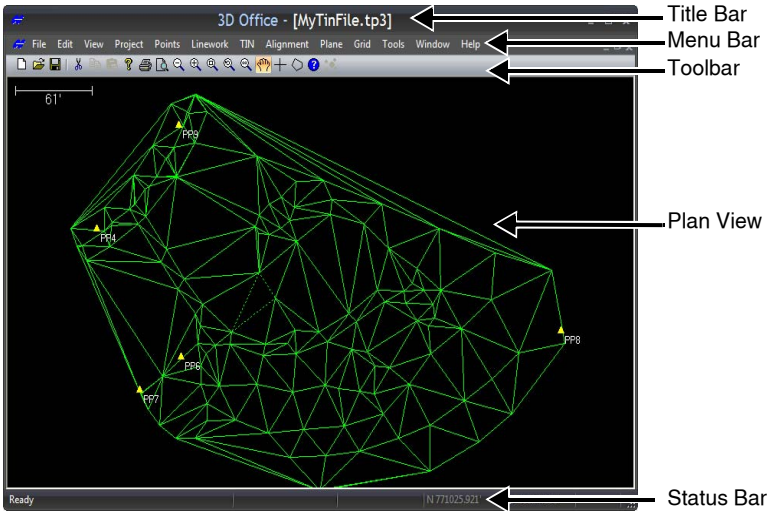


Figure 1-7. 3D-Office Main Screen

Menu Bar

Depending on the type of file open in 3D-Office, the menu bar displays different menus. Figure 1-8 describes the menu bar for 3D-Office file types.

Figure 1-8. Menu Bar for Project Files

Table 1-2 The following table lists the menu bar for other file types.

Table 1-2. Types of Menus

File Type	Toolbar Type
3D Office file (*.tp3)	See Figure 1-8 above.
Control file (*.gc3)	File Edit View Project Window Help
TIN surface (*.tn3)	File Edit View TIN Tools Window Help
Alignment (*.rd3)	File Edit View Alignment Tools Window Help
Points (*.pt3)	File Edit View Points Window Help
Linework (*.ln3)	File Edit View Linework Window Help
Plane surface (*.pl3)	File Edit View Plane Tools Window Help
Cut/fill plot (*.cf3)	File Edit View Cut/Fill Window Help
Grid surface (*.gd3)	File Edit View Grid Tools Window Help

Table 1-3 describes the menu options available in each menu. Some menu options change, depending upon the file type open.

Table 1-3. 3D-Office Menu Options

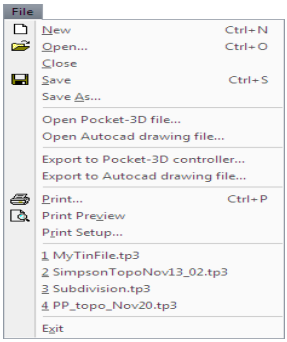
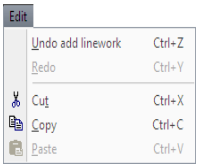
Menu	Functions
File 	Available for all file types, in general the File menu provides the following functions: • opens, saves, and closes a 3D-Office file • opens a file from a Pocket-3D controller or another program's file type • closes the active file • prints the contents of the current plan view • defines variables for printing active Project or Cut/Fill files • provides fast access to recently opened files • exits and closes 3D-Office
Edit 	Available for all file types, in general the Edit menu provides the following functions: • allows a redo or undo of the last operation • cuts, copies, or pastes information • inverts selected/un-selected data in TIN surface files

Table 1-3. 3D-Office Menu Options (Continued)

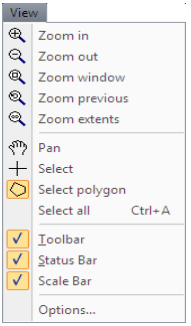
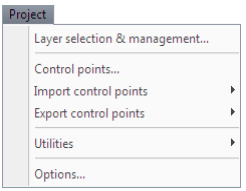
Menu	Functions
View  In 3D simulation view, the View menu has specific functions for controlling the simulation. See “3D-view and Profile View Menu Bars” on page 1-14 for details.	Available for all file types, in general the View menu provides the following functions: • zooms in by 200% and zooms out by 50% on the display screen • zooms to a part of the design area indicated with a drawn window • displays the previous view magnification • displays the entire extents of the design area • sets the selection cursor to *Select* or *Pan* mode • selects points and lines or triangles for some file types • sets the view status for the Toolbar, Scale bar, and Status bar • sets unit options for some file types
Project  	Available for 3D Project (*.tp3), the Project menu provides the following functions. For Control (*.gc3) files, only the “Control points” menu option is available. • sets and manages layer properties • displays control point and GPS localization information • imports and exports control points • calculates map-projection coordinates • defines a custom projection • sets unit options for Project files

Table 1-3. 3D-Office Menu Options (Continued)

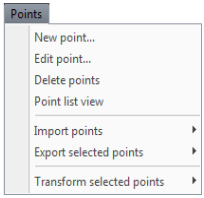
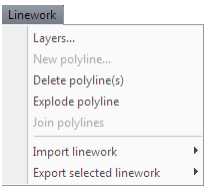
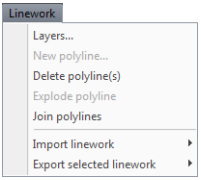
Menu	Functions
Points 	Available for 3D Project (*.tp3) and Points (*.pt3) files, the Points menu provides the following: • sets layer properties • adds, edits, and deletes points • displays the point list • imports and exports control points • transforms coordinates • sets unit options for Project files
Linework (.tp3)  (.ln3) 	Available for 3D Project (*.tp3) and Linework files (*.ln3) files, the Linework menu provides the following functions. For Linework (*.ln3) files, this menu also views and edits layers. • creates a new polyline • drapes selected polyline entities to the TIN • deletes selected polylines • converts polylines to a new alignment • imports linework files • exports selected linework

Table 1-3. 3D-Office Menu Options (Continued)

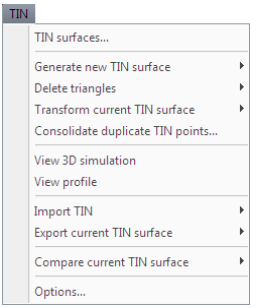
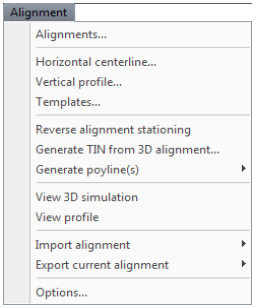
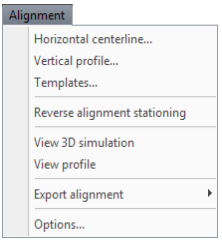
Menu	Functions
TIN 	Available for 3D Project (*.tp3) and TIN surface (*.tn3) files, the TIN menu provides the following functions: • displays TIN surface information • generates new TIN surfaces • deletes triangles • transforms the current TIN surface • consolidates duplicate TIN points • displays a 3D representation of the TIN surface • displays a profile through the TIN surface • imports and exports TIN surfaces • compares the current TIN surface with another surface • sets TIN unit options
Alignment (.tp3)  .rd3 	Available for 3D Project (*.tp3) and Alignment (*.rd3) files, the Alignment menu provides the following functions. (Only some menu items are available for *.rd3 files). • displays alignment information • configures horizontal elements, vertical curves, and template placement • creates, edits, and places templates • reverses alignment stationing • generates a TIN surface from alignment information • displays a 3D representation of the alignment • displays a profile of the alignment surface • imports alignment information, horizontal centerlines, vertical profiles, and cross-sections • exports alignment information • sets alignment profile and plan view options

Table 1-3. 3D-Office Menu Options (Continued)

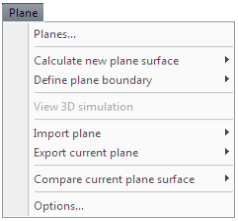
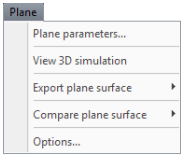
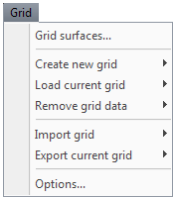
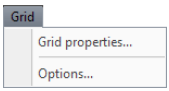
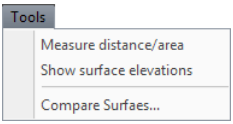
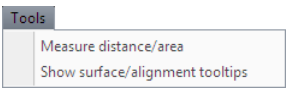
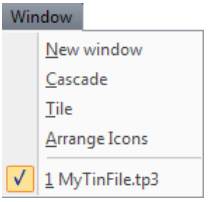
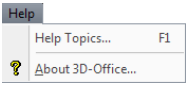
Menu	Functions
Plane (.tp3)  (.pl3)  	Available for 3D Project (*.tp3) and Plane surface (*.pl3) files, the Plane menu provides the following functions: • displays plane information • sets plane parameters • calculates new plane surfaces • defines plane boundaries • imports and exports plane surfaces • compares a plane surface with another surface type • sets plane options
Grid menu   	Available for 3D Project (*.tp3) and Grid surface (*.gd3) files, the Grid menu provides the following functions: • displays grid surface information • creates a new grid • removes all grid data • loads a current grid surface • imports and exports a grid surface • sets grid surface options
Tools menu   	Available for 3D Project (*.tp3) files, 3D TIN (*.tn3), 3D Alignment (*.rd3), 3D Plane (*.pl3), and 3D Grid (*.gd3) files, the Tools menu provides the following functions: • computes the distance between points and areas of polygons • shows surface elevations (depending on the view) • shows surface/alignment tool tips (depending on the view) • compares surfaces (depending on the view)

Table 1-3. 3D-Office Menu Options (Continued)

Menu	Functions
Window menu 	Available for all file types, the Window menu provides the following functions: • opens the current file in a new window any changes made in the new window are made in all windows of the same file • arranges open files in cascade (stacked) view and arranges icons • arranges open files in tile (adjacent) view and arranges icons • lists all open files the active file is marked with a check mark
Help menu 	Available for all file types, the Help provides the following functions: • opens on-line help topics • gives 3D-Office version and copyright date information.

Standard Toolbar

The standard toolbar for 3D-Office (Figure 1-9) contains buttons for frequently used functions.

Figure 1-9. 3D-Office Toolbar

Upon start-up, the toolbar displays beneath the menu bar.

- To display or hide the Toolbar, click **View ▸ Toolbar**.
- To move the Toolbar, press and hold the “grab bar” on the left of the Toolbar, then drag the Toolbar to a new location and release the mouse button.

Table 1-4 describes the function of the various buttons on the Toolbar.

Table 1-4. Standard Toolbar Button Functions

Button	Description	Button	Description
	New – Creates a new 3D Project file.		Zoom Out – Zooms out from the map by 50%.
	Open – Opens an existing 3D project file.		Zoom In – Zooms in on the map by 200%.
	Save – Saves the active project or file to current folder.		Zoom window – Zooms to a rectangular area drawn in the Plan View.
	Cut – Removes the selected information from the page or window, placing it on the Windows® clipboard.		Zoom previous – Displays the last magnification of the Plan View.
	Copy – Copies selected information from the page or window, placing it on the Windows clipboard.		Zoom extents – Displays the entire design area.
	Paste points – Places selected information from the Windows clipboard (points only) to the current cursor position.		Pan – Changes the cursor to a “hand” to “grab” and manipulate the map.
	About – Displays the ***About 3D-Office*** dialog box.		Select – Changes the cursor to a crosshairs with which to click and select individual entities, or to click and drag over an area, creating a rectangle that selects enclosed entities.
	Print – Prints the Plan View.		Select polygon – Changes the cursor to a crosshairs with which to draw a polygon around the entities to select.
	Print preview – Displays how the Plan View will look when printed.		Entity Information – Displays a text editor window containing information about selected entities.

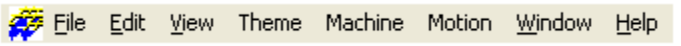
Table 1-4. Standard Toolbar Button Functions (Continued)

Button	Description	Button	Description
	Zoom Out – Zooms out from the map by 50%.		Site Link – allows you to transfer files, project, data, and messages to other 3D-Office, 3DMC, and Pocket-3D users on the jobsite. NOTE: You must be connected to a Site-Link service (provided directly by Topcon or through a Site-Link server hosted on the job). Other features include remote desktop support for 3DMC machine operators, the transfer of RTK corrections across the Site-Link connection, and real-time collaborative as-build mapping. NOTE: The availability of this machine configuration is controlled by OAF.

3D-view and Profile View Menu Bars

The 3D-view and Profile view menu bars for 3D-Office (Figure 1-10) include menus for controlling the view and the machine. The available menus depend on the type of view selected.

Solid Model 3D Simulation Menu Bar



Profile Menu Bar

Wireframe 3D Simulation Menu Bar

Figure 1-10. 3D-view and Profile View Menu Bars

The menu bar for solid model simulations (TIN and alignment) has the following menu selections:

- File and Edit menus – have standard menu selections

- View menu – zooms in and out, selects topography information to display, selects the view in relation to the cab, applies grid and contour interval options
- Theme menu – changes the look of the “ground” in the simulation
- Machine menu – changes the machine displayed in the simulation
- Motion menu – plays log files, follows the road alignment during movement, monitors machine movement during real time
- Window and Help menus – have standard menu selections

The menu bar for Profile views shows only the View menu selection for zooming in/out, using the pan or select pointer, and exaggerating/decreasing the vertical view.

The menu bar for basic wireframe simulations (alignment) has the following menu selections:

- File and Edit menus – have standard menu selections
- View menu – zooms in/out, rotates the view left/right, decreases/increases the viewing angle, provides machine image controls
- Alignment menu – has plan, profile, and 3D simulation view options
- Window and Help menus – have standard menu selections

3D-view and Profile View Toolbars

The 3D-view toolbars for 3D-Office (Figure 1-11) includes buttons for controlling the view and machine. The available buttons depend on the type of 3D simulation, either solid model or wireframe.

Solid Model 3D Simulation Toolbar

Wireframe 3D Simulation Toolbar

Profile View Toolbar

Figure 1-11. 3D-view Toolbars

Upon start-up, the toolbar displays beneath the menu bar.

- To display or hide the Toolbar, click **View ▸ Toolbar**.
- To move the Toolbar, click and hold the "grab bar" on the left of the Toolbar, then drag the Toolbar to a new location and release the mouse button.

Table 1-5 The following table describes the various buttons on the 3D-view toolbars.

Table 1-5. 3D-View Toolbar Button Functions

Button	Description	Button	Description
	Zoom In – zooms in on the 3D-view by 200%		Zoom Out – zooms out on the 3D-view by 50%
Solid Model Simulation		**Wireframe Simulation**	
	Rewind – during logfile playback, rewinds the logfile		Slow down – slows down the movement of the machine
	Fast forward – during logfile playback, speeds up the logfile		Speed up – starts and speeds up the movement of the machine
	Play – during logfile playback, plays the logfile		Rotate view left

Table 1-5. 3D-View Toolbar Button Functions (Continued)

Button	Description	Button	Description
	Pause – during logfile playback, pauses the logfile		Rotate view right
	Stop – stops the logfile playback		Lowers the viewing angle
	Record – during real-time monitoring, creates a logfile for the machine		Raises the viewing angle
			Stop – in a wireframe simulation, stops the movement of the machine
Profile View			
	Pan – changes the cursor to a “hand” with which to “grab” and move the map		Exaggerates the vertical scale
	Select – at the location of the crosshairs, Point, TIN, and Grade information display in a tip box.		Decreases the vertical scale
	Snap to Station – rotates the profile line perpendicular to the center line, positioning it up the alignment		Rewind – during logfile playback, rewinds the logfile
	Fast forward – during logfile playback, speeds up the logfile		Play – during logfile playback, plays the logfile
	Pause – during logfile playback, pauses the logfile		Stop – stops the logfile playback

File Operations

From the File menu, you can create, open, and save project files. You can also preview and print the display window, as well as enter title block information for any printed material.

The following sections describe opening and saving files, printing the display, and using the Print Setup feature.

Opening a File

3D-Office opens the following types of files:

- 3D Project (*.tp3)
- Control file (*.gc3)
- TIN surface (*.tn3)
- Alignment surface (*.rd3)
- Linework (*.ln3)
- REB Triangle file (*.REB)
- Points file (*.pt3)
- Plane surface (*.pl3)
- Cut/fill plot (*.cf3)
- Grid surface (*.gd3)
- AutoCAD (*.dwg/*.dxf)

By default, these files are saved to the last selected folder on the computer's hard drive. However, files can be saved to and opened from any selected folder.

1. To open a file, do one of the following:
   - click **File ▸ Open**
   - press **File** then a recently opened file
   - press the **Open** button on the toolbar
   - press **Ctrl+O**

2. On the ***Open*** dialog box, navigate to the location of the file, select the file type, select the desired file, and press **Open** (Figure 1-12).

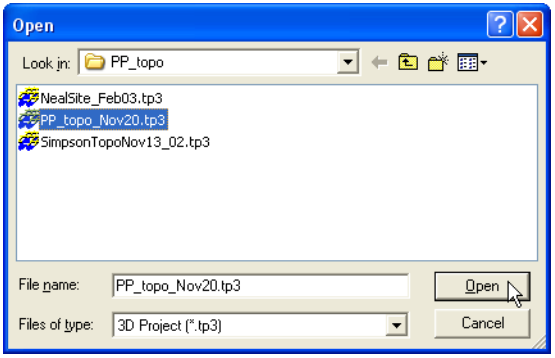


Figure 1-12. Select File to Open

Saving a File

To save a file, do one of the following:

- Click **File ▸ Save**
- Press the **Save** button on the toolbar
- Press **Ctrl+S**

When closing a file or closing 3D-Office after making changes to the current file, a *Save changes* confirmation displays.

Press **Yes**, to save the changes and complete the operation (Figure 1-13).

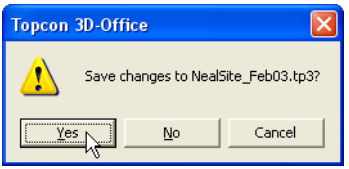


Figure 1-13. Save Changes

To save the file under a different name or to a different location,

press **File ▸ Save As**. Navigate to the location in which to save the file, enter a name for the file, then press **Save** (Figure 1-14).

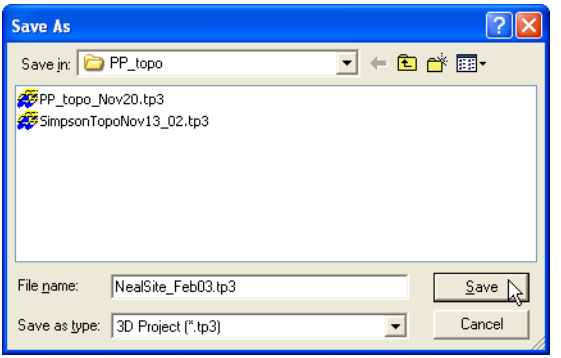


Figure 1-14. Save File with a Different Name or in Another Location

Save the file as a variant of the original file to keep a backup copy or to track progress.

Printing the Display

Before printing, view the display using Print Preview (see “Print Preview” on page 1-21 for details).

To print the Plan View, do one of the following:

- click **File ▸ Print**
- press the **Print** button on the toolbar
- press **Ctrl+P**

The current view prints, along with a title block (see “Print Preview of the Plan View” on page 1-21 for setting title block information).

Print Preview Use the Print Preview function to see how printed information will look on paper. Use this preview to check orientation, font size, etc.

Depending on the parameters previously set in the Print dialog box, the Print Preview will be in either portrait or landscape orientation.

To view the print preview, click **File ▸ Print Preview** or press the **Print Preview** button on the toolbar.

The ***print preview*** dialog box displays the graphic/information that will be printed (Figure 1-15).

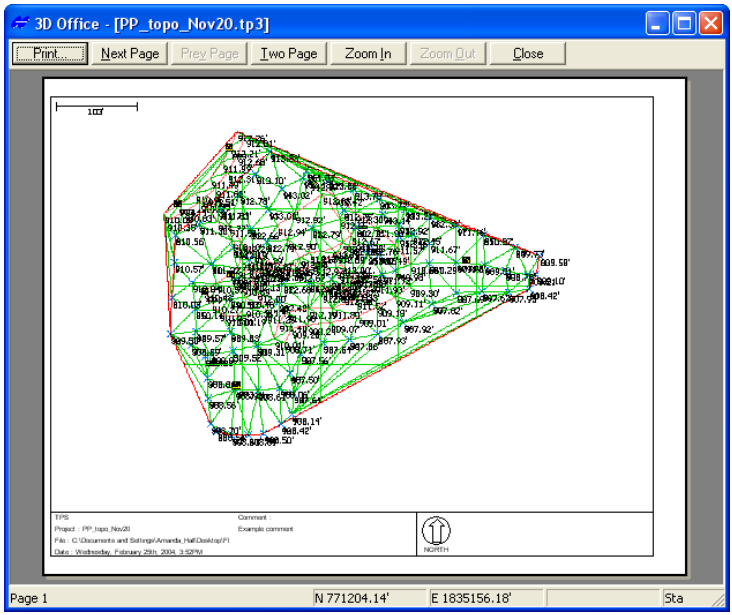


Figure 1-15. Print Preview of the Plan View

Print Setup The Print Setup feature sets title block information and the size for text and map fonts. The title block information applied here is a global field and will be applied to all printed information.

Click **File ▸ Print Setup** to change title block information printed with display views.

Use the ***Print setup*** dialog box (Figure 1-16) to set the following:

- Company name – enter owner/user information to include in the title block
- Comment – enter desired information to include in the Comment area of the title block, such as the jobsite or location
- Text font – sets the text size in reports and title blocks
- Map font – sets the text size for entities viewed in the plan view, such as point names, coordinates, etc.

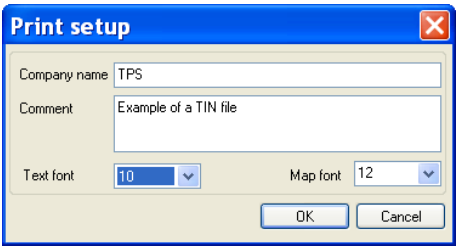


Figure 1-16. Print Setup

Help Topics

Click **Help ▸ Help Topics** to get help on any menu item that requires more information (Figure 1-17 on page 1-23).

Contents Tab: On the *Contents* tab, click on the topic of your choice to display a list of topics for further research on whatever topic you need help with.

Index Tab: On the *Index* tab, enter a "keyword" in the *Type in the keyword to find* field below to find help on a specific menu item.

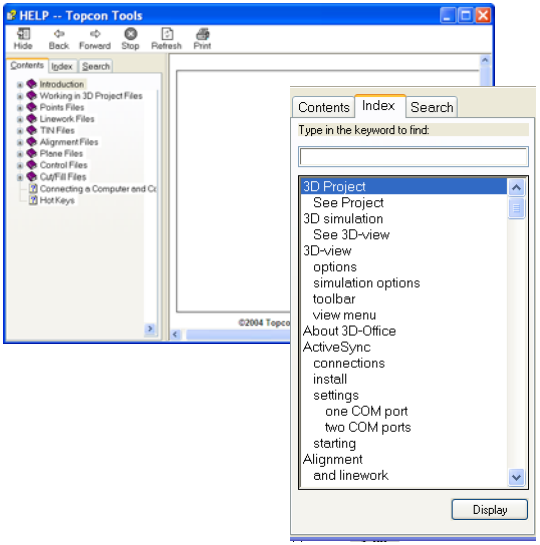


Figure 1-17. Help Topics for 3D-Office – Contents/Index Tabs

Search Tab: On the Search tab, enter a "keyword" in the *Type in the keyword to find* field below (Figure 1-18 on page 1-24).

- **List Topics** – press to display a list of topics related to the keyword previously entered in the field above.
- Select Topic to display – displays the topics related to the keyword entered above.
- Display Window (box to the right) – displays detailed information on the selected topic.

Figure 1-18. Help Menu – Search Tab

Help Topic Toolbar

Table 1-6. Help Topic Toolbar

Icon	Command	Description
	Hide	Hides the first column of information (Contents, Index, and Search tabs)
	Back	Press to go back one level to the last item selected.
	Forward	Press to go forward to the next topic.
	Stop	Press to stop the current command.
	Refresh	Press to collapse back to level one of any given topic.
	Print	Press to print the information on display in the display window to the right.

About 3D-Office

The About 3D-Office dialog box (Help ▸ About 3D-Office) contains the following information:

- Software version
- Copyright date

On the ***About 3D-Office*** dialog box, press **Authorization**. The ***Topcon 3D-Office*** dialog box contains (Figure 1-19 on page 1-25) the following information:

- Device identification number
- Authorization codes

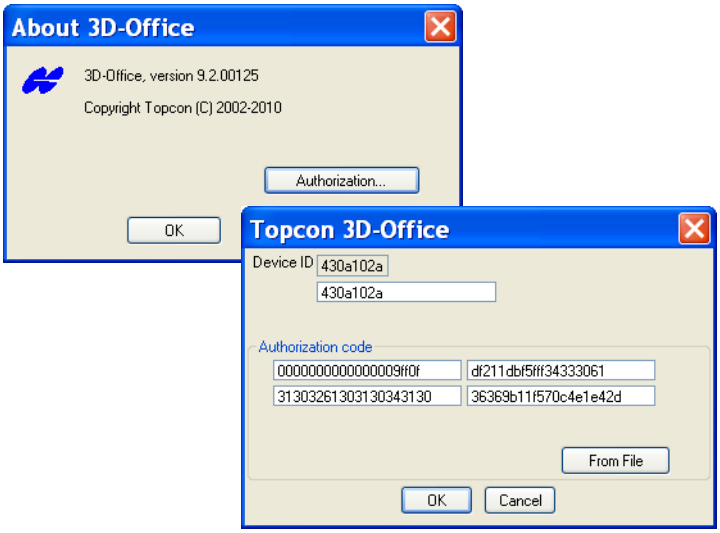


Figure 1-19. About 3D-Office.

Occasionally, upgraded or different functionality may be required for different authorization codes to become active.

Contact your Topcon Dealer with the following information to receive authorization codes:

- Device identification
- Company name
- Contact name
- Company address
- Contact phone number
- Contact email address
- Software Type (3D-Office)

3. Click **Help ▸ About 3D-Office**.
4. Press **Authorization** on the ***About 3D-Office*** dialog box and enter the new authorization codes (Figure 1-19 on page 1-25).
5. Press **From File** on the ***Topcon 3D-Office*** dialog box to copy authorization codes directly onto the GX-60 via a USB file.
6. Close and re-open 3D-Office to activate the updated codes.

Project Files

3D Project files provide a way to incorporate the various individual components of a jobsite into a single, cohesive file.

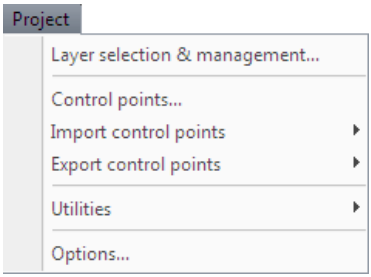


Figure 2-1. 3D Project Menu

Much of the functionality available in 3D Project files is the same as in other respective file types. However, 3D Project files provide certain features useful to working with multiple sets of different information and 3D Project specific functions, including the following:

- selecting and managing layers
- calculating map-projection coordinates
- working with polylines
- creating, managing, and transforming TIN surfaces
- creating and managing plane surfaces
- creating machine configuration files
- setting units for the 3D Project

The following sections provide the procedures on functions specific to 3D Project files, as well as some features useful for working with multiple file types. When 3D-Office first opens, an empty 3D Project displays.

- To create a new 3D Project file, click **File ▸ New**.
- To open a current 3D Project file, click **File ▸ Open**. Navigate to the location of the file, select a *.tp3 file, and click **Open**.

For working with data sets in a 3D Project file or with individual file types, see chapters 3 through 9.

Importing Control Points

Follow these steps to import control points from a 3D Control Point file into a 3D Project file.

1. With a 3D Project file open, click **Project ▸ Import control points ▸ From 3D control file (*.GC3)**.
2. On the ***Open*** dialog box, navigate to the location of the desired file, select it, and click **Open** (Figure 2-2). The information from the selected file is added to the 3D Project file.

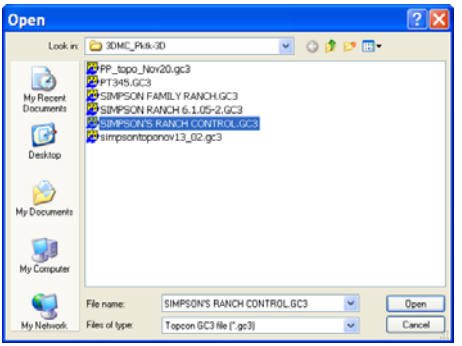


Figure 2-2. Open 3D Control Point File

Importing Control Points from Pocket-3D Controller

Follow these steps to import control points from a Pocket-3D controller into a 3D Project file.

1. Connect the Pocket-3D controller to the computer and turn on the controller (see Appendix A for details). Run Pocket-3D on the controller.
2. With a 3D Project or 3D control Points file open, click **Projects ▸ Import control points ▸ From Pocket-3D controller**.

   3D-Office connects with the Pocket-3D controller and retrieves *.pt3 files.
3. On the ***Pocket-3D files*** dialog box, select the file to import and click **Open** (Figure 2-3). The file type is automatically selected.

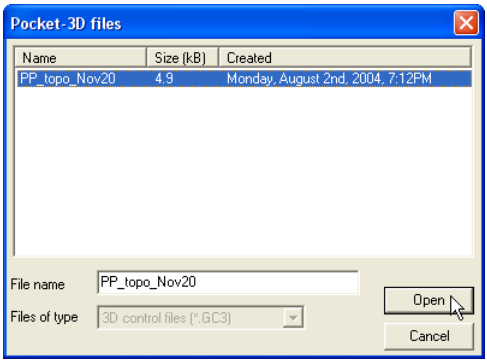


Figure 2-3. Open Control Points File From a Pocket-3D Controller

Importing Control Points from a Text File

Follow these steps to import control points from a text 3D control point file into a 3D Project file.

1. With a 3D Project file open, click **Project ▸ Import control points ▸ From text file**.

2. On the ***Select custom format*** dialog box, select the format type and click **Next** (Figure 2-4). See "Creating Custom Import/ Export Formats for Text Files" on page 2-13 for details on creating or editing import formats.

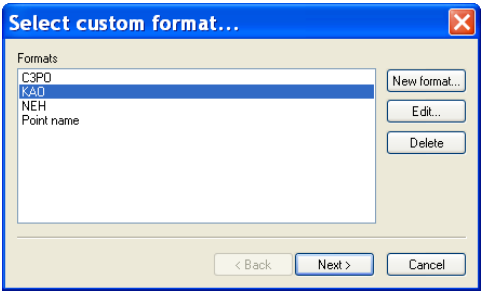


Figure 2-4. Select Format Type

3. On the ***Import points from text file*** dialog box, click **Browse**. Navigate to and select the desired *.txt file and click **Open**.
4. Click **Finish** to import the control points (Figure 2-5). The information from the selected file is added to the 3D Project file.

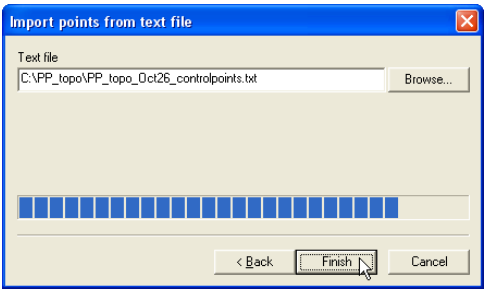


Figure 2-5. Open Control Point Text File

Opening a Control Point File

1. To open a control point file click **File ▸ Open**.
2. On the ***Open*** dialog box, navigate to the location of the file, select the file type as Control file (*.GC3), select the desired file, and click **Open** (Figure 2-6 on page 2-5).

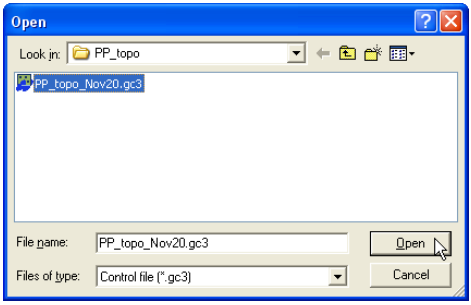


Figure 2-6. Open Control File

Opening a Pocket-3D File

If a Pocket-3D controller and the computer are connected, 3D-Office will open control point files directly from the controller. Once opened, the file can be exported to other files or saved to the computer. See Appendix A for details on connecting a computer and controller.

1. Click **File ▸ Open Pocket-3D file**.
2. On the ***Pocket-3D files*** dialog box, select the file type (*.GC3) and the desired file, then click **Open** (Figure 2-7).

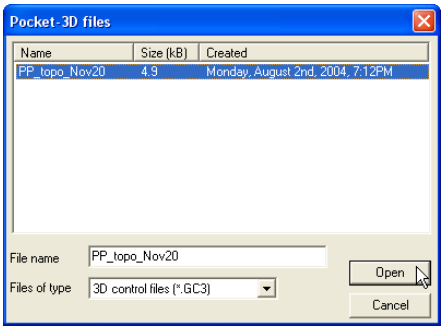


Figure 2-7. Select File and Click Open

The Pocket-3D control point file opens in 3D-Office.

Trimble File to import a Trimble proprietary control point file into a Pocket-3D file, click **Project ▸ Import control points ▸ From Trimble file (*.DC).**

Viewing Selected Control Point Information

The **information** button in 3D-Office opens a text file that displays various details about the selected entity or entities.

1. Using the select tool, click on or draw a rectangle around the desired point(s), then click the activated **Information** button (Figure 2-8).

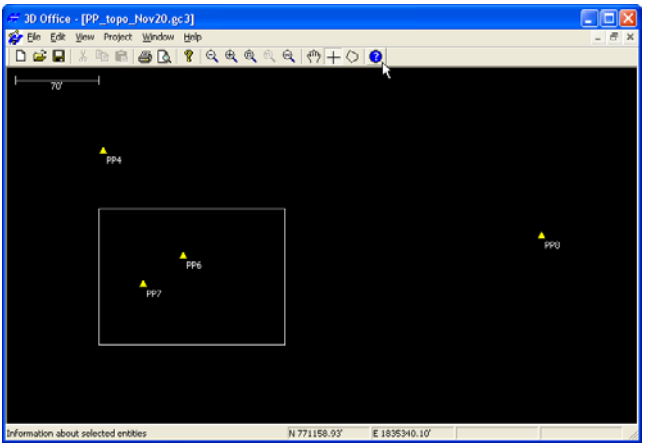


Figure 2-8. Select Control Point(s) – Press the Information Button

2. Press the activated **information** button (Figure 2-9 on page 2-7) on the toolbar.

A text file opens, to display information on the selected control points (Figure 2-9). Any modification of this text file has no affect on the values stored in the control file.

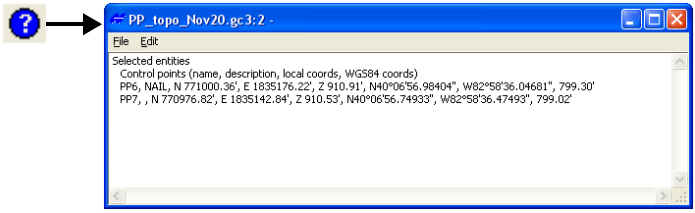


Figure 2-9. Information on Selected Entities

3. To save the information as a text file, click **File ▸ Save as**, enter a name and select a location for the file, then click **Save** (Figure 2-10).

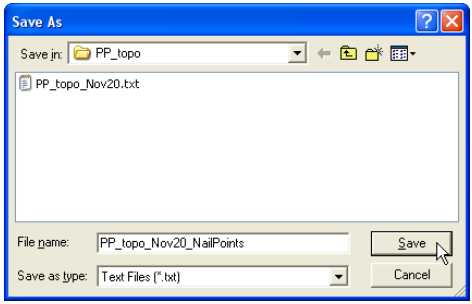


Figure 2-10. Save Control Point Information to a Text File

4. To copy the information to the clipboard, highlight the desired information and click **Edit ▸ Copy**.

Managing Control Points

Control points are surveyed points on or around a job site that provide reference coordinates for the project. As a project advances and changes, the current control points may need to be added to, revised or even removed.

To view the list of control points for adding, editing or deleting, click **Project ▸ Control points**. The ***Control points*** dialog box has the following four tabs (Figure 2-11 on page 2-9):

- The *Control points* tab lists all control points in the file and their respective information. The description is optional. The horizontal and vertical errors represent the fit between the project coordinates and the GPS coordinates. They should be within acceptable tolerances for the jobsite.

  See the following sections for adding, editing, or deleting control points.

- The *Coord System* tab selects to use localization or projection data for the job, and if a geoid is used for the job. A custom projection can be created.

  See “Using Coordinate System Data” on page 2-20 for details on this tab.

- The *Localization* tab displays tab displays the results of a localization computation. The fields on this tab are read-only and displays the numerical results of the localization computation.

  See “Viewing GPS Localization Information” on page 2-25 for details on this tab.

- The *mmGPS Transmitters* tab displays serial number and firmware revision of transmitters loaded into 3D-Office or included with the control point file. The adjustment status of the transmitter also displays. A new transmitter can be added, and if connected to the computer, a transmitter’s information can be loaded.

  See “Viewing and Adding mmGPS Transmitter Information” on page 2-27 for details on this tab.

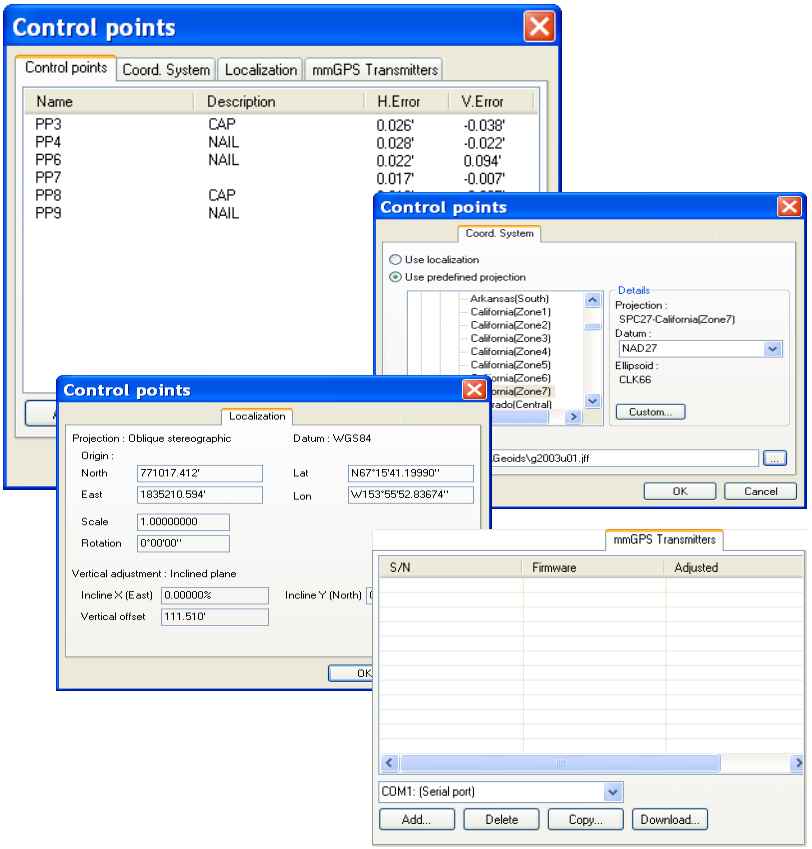


Figure 2-11. Control Points Dialog Box Information Tabs

Adding Control Points

To add control points to the project, do the following:

1. Click **Project ▸ Control points**
2. Press **Add** on the *Control points* tab (Figure 2-12 on page 2-10).
3. Enter the following parameters and press **OK** (Figure 2-12 on page 2-10):
   - Name – enter a name for the control point.
   - Description – describe the control point (optional).

- *North/East/Elevation* – enter project coordinates (North, East, Elev) for the new control point.
- *Use this point for horizontal localization* – check mark this box to enable horizontal localization.
- *Use this point for vertical localization* – check mark this box to enable vertical localization.

  NOTE: In general, these boxes should be enabled for each point. However, certain scenarios may require only one of the localization check boxes to be enabled. For example, the project surveyor may indicate a certain Control Point has an elevation error or find the vertical error for a Control Point to be out of the tolerance range after localizing.
- *WGS84* coordinates – enter *latitude*, *longitude*, and *height* WGS84 coordinates for the new control point.

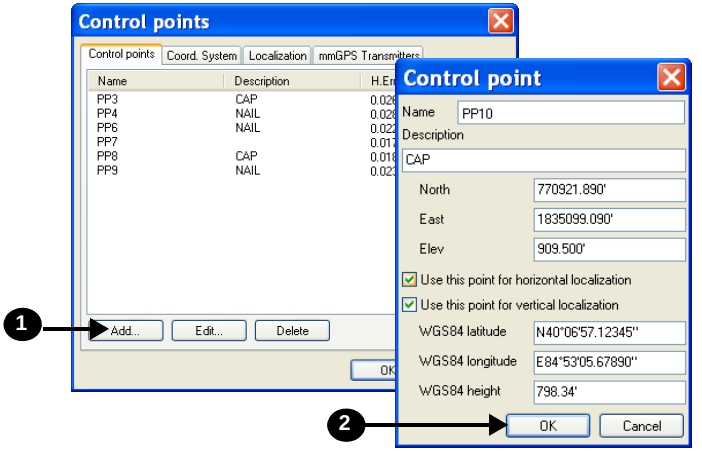


Figure 2-12. Add Control Point

The new control point is added to the control points list and a new localization is automatically computed.

4. Press **OK** to view the new control point on the Plan View (Figure 2-13 on page 2-11).

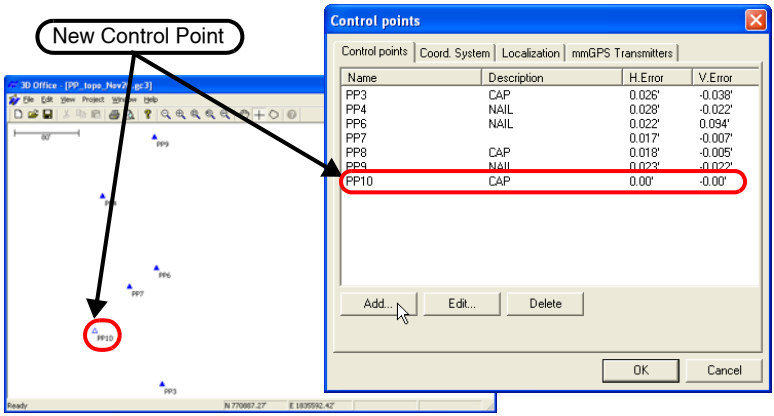


Figure 2-13. Control Point Added to File

Click **Cancel** on the ***Control points*** dialog box to leave the file unchanged, without adding the new control point. Or, after closing the dialog box, click **Edit ▸ Undo edit control points** to return the file to its original state.

Editing Control Points

You can edit the name, description, coordinates, and localization for any control point. Editing coordinates will cause an automatic recomputation of the localization.

1. Click **Project ▸ Control points**.
2. On the *Control points* tab, highlight the control point to change, and press **Edit** (Figure 2-14 on page 2-12) to edit the desired parameters.
3. Press **OK** (Figure 2-14 on page 2-12) to save your changes.

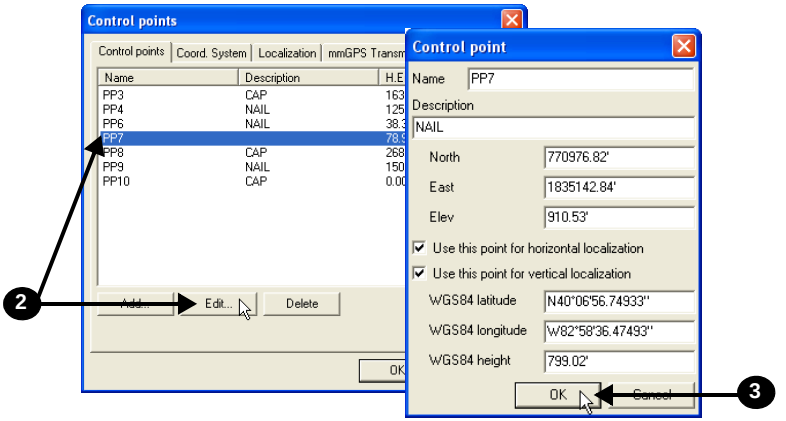


Figure 2-14. Edit Control Point

4. To abandon edits made, either press **Cancel** on the ***Control points*** dialog box to leave the file unchanged, without applying the edits to the control point or click **Edit ▸ Undo edit control points** after closing the dialog box to return the file to its original state.

Deleting Control Points

Deleting a control point will remove it from the control point file and cause an automatic recomputation of the localization.

1. Click **Project ▸ Control points**.
2. Highlight the control point to delete on the ***Control points*** dialog box.
3. Press **Delete** (Figure 2-15 on page 2-13).
4. Click **Yes** on the confirmation screen.

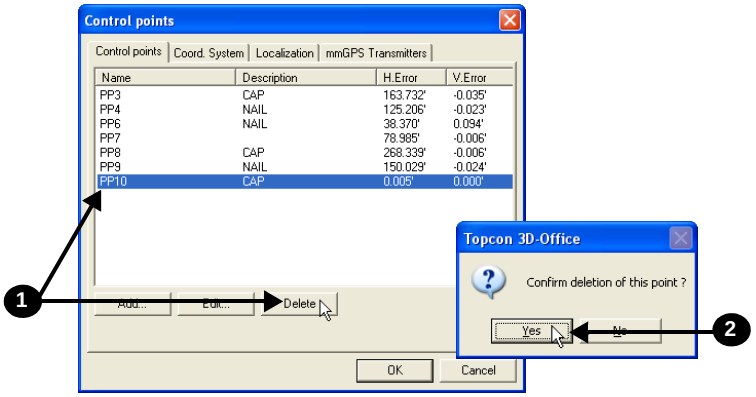


Figure 2-15. Select the Control Point to Delete and Confirm

Creating Custom Import/Export Formats for Text Files

Import/Export formats for text files provide the information needed to identify specific elements so that the import/export process runs as intended. Text files (*.txt) provide a simple format for exchanging point information between software and platforms. Import/export formats are independent of project files and can be created or accessed when importing/exporting text files.

1. Click **Project ▸ Export control points ▸ To text file**. The ***Select custom format*** dialog box displays (Figure 2-16 on page 2-14).
2. Press **New format**.

3. On the ***Custom format definition*** dialog box, type a name for the new format and an extension of the file, then press **Add** on the *Line items* tab (Figure 2-16 on page 2-14).

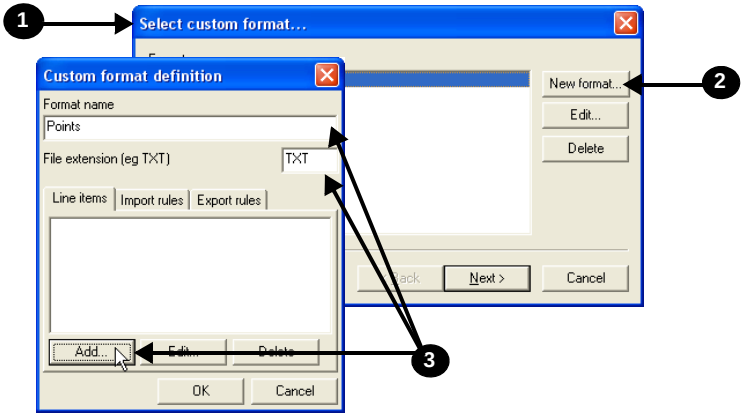


Figure 2-16. Create New Format

4. Select a line item *Type* and enter the desired parameters for the new format, then press **OK**. The available parameters depend on the type of line item selected (Figure 2-17).
5. For each additional line item, repeat step 3 (Figure 2-17).

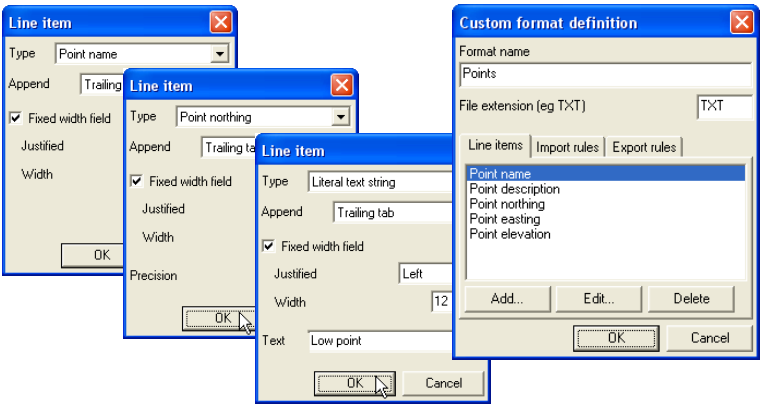


Figure 2-17. Add Line Items to Format

6. Press the *Import rules* tab, then press **Add**. Select the desired *Rule* and enter the applicable *Number of header/prefixed lines* to skip (Figure 2-18 on page 2-15).

7. Click **OK** (Figure 2-18).

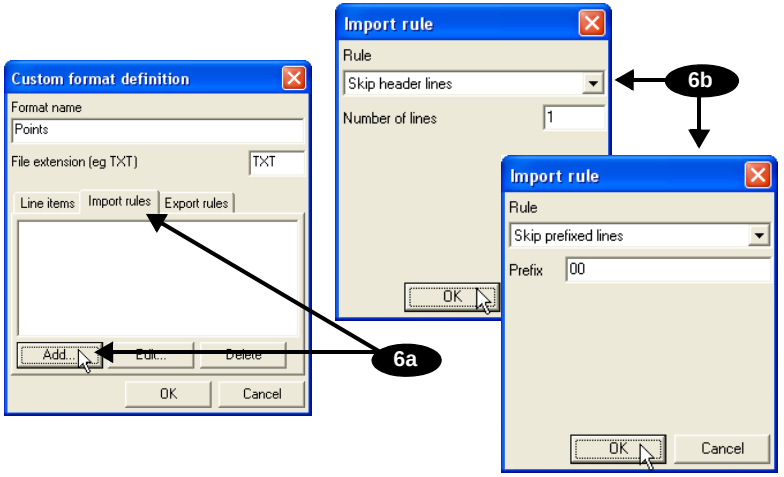


Figure 2-18. Add Import Rules

8. Repeat step 6 for each import rule.
9. Press the *Export rules* tab, then press **Add**. Select the desired *Rule* and type a number to start at for points with no number. Click **OK** (Figure 2-19).

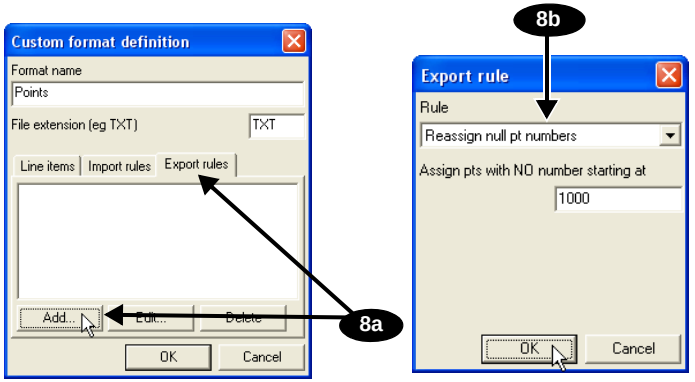


Figure 2-19. Enter Export Rules

10. Repeat step 8 for each export rule.

11. After adding the desired *Line items*, *Import rules,* and *Export rules*, click **OK** to save the new format (Figure 2-20).

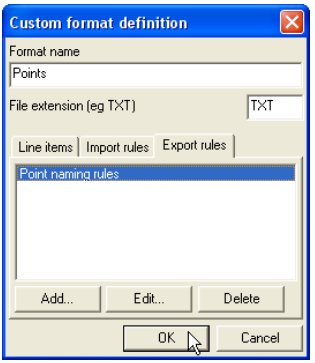


Figure 2-20. Save the New Format

The newly created format can be used for subsequent import/export operations.

Managing Layers

3D Project files may consist of imported data sets, such as points, linework, alignments, etc., as well as any layers associated with the data file. Each 3D Project layer is identified with a name and color.

To view, add, or edit layers, click **Project ▸ Layer selection & management**. The ***View layers*** dialog box lists each layer in the 3D Project file (Figure 2-21 on page 2-17).

The enable/disable box next to each layer name indicates whether or not the layer's contents display on the Plan View.

See the following sections for details on adding a layer, deleting a layer, setting layer colors, or setting point labels.

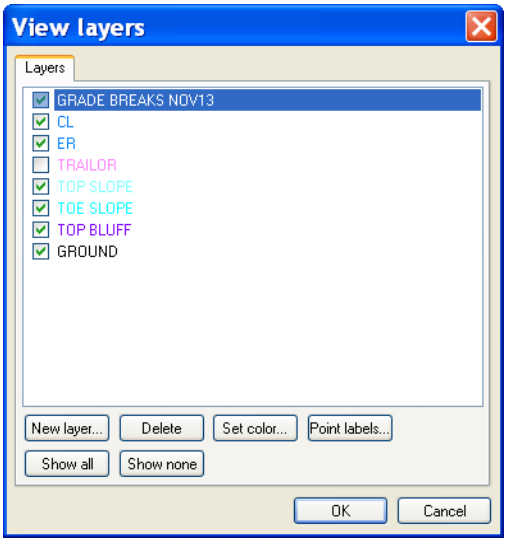


Figure 2-21. View Linework Layers

Adding a Layer

Multiple layers are useful for distinguishing between various land and project features.

1. On the ***View layers*** dialog box (Figure 2-22 on page 2-18), press **New layer**.
2. Type a name for the layer and press **Enter**. A new layer entry appears in the layer list.

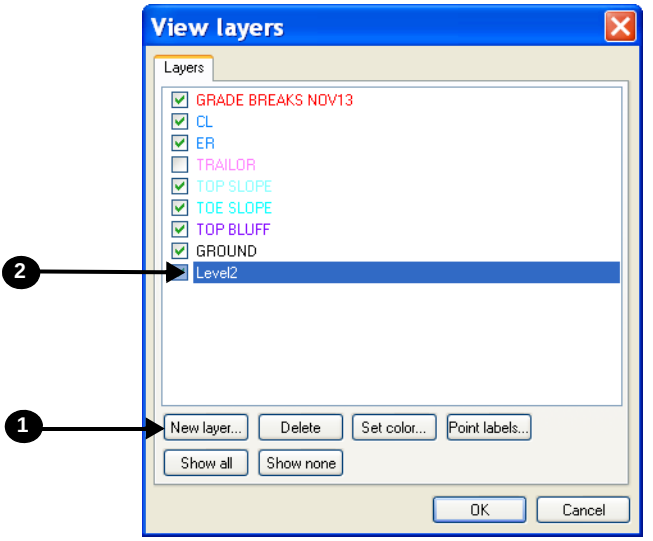


Figure 2-22. Add New Layer to 3D Project

When added, the new layer is "empty" until entities are manually added or imported. Use the following procedures below to edit a layer's color or point attributes.

Deleting a Layer

Only delete a layer when the data it contains will never be needed again. If needed, save a backup copy of the file before deleting layers.

NOTICE Deleting a layer will also delete all of its contents.

1. On the ***View layers*** dialog box (Figure 2-24 on page 2-20), click the desired layer, then press **Delete**.

Click **OK** at the confirmation.

Setting Layer Color

Setting a unique color to individual layers in a 3D Project file helps to quickly differentiate between layers.

1. On the ***View layers*** dialog box, click the desired layer, then press **Set color**.
2. Select a color from the ***Color*** dialog box and press **OK** (Figure 2-23 on page 2-19).

   The color of the layer's name changes to the selected color and the layer's information will appear in this color on the Plan View.

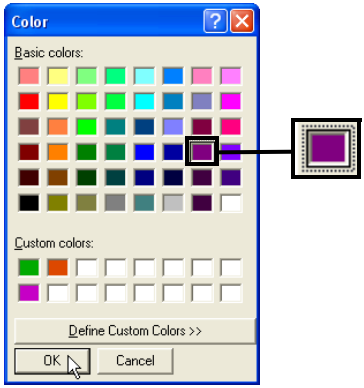


Figure 2-23. Select Layer's Color

3. To select a color not shown in the ***Basic colors*** grid, press **Define Custom Colors**. Define the custom color, then press **Add to Custom Colors** to save for future projects.

Displaying Point Labels

Displaying point labels can help to identify points in the plan view.

1. On the ***View layers*** dialog box (Figure 2-22 on page 2-18), click the desired layer, then press **Point labels**.

2. On the ***Point labels*** dialog box (Figure 2-24), check the desired label settings for the layer(s) and press **OK**.

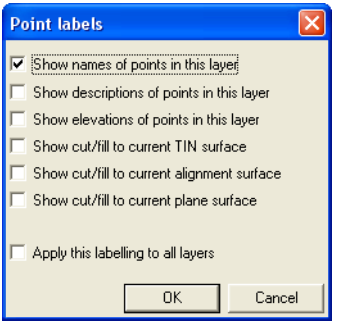


Figure 2-24. Select Point Labeling Parameters for Layer

- **Show all –** press to enable to display all layers on the Plan View.
- **Show none –** press to disable all layers from being shown on the Plan View.

Using Coordinate System Data

Coordinate system data represents the relationship between local positions and real-world global positions. The project can use coordinate data from either a projection or a localization.

Applying a Projection

3D-Office comes loaded with a number of projections from around the world. A projection contains the pre-defined transformation data that is used for the conversions between local and global positions.

1. Click **Project ▸ Control points**.
2. On the *Coordinate System* tab, enable "*Use predefined projection*".
3. Navigate through the projection tree to select the projection for the applicable geographical area.

   There will be a listing of *projection*, *datum*, and *elevation* information (Figure 2-25 on page 2-21).
4. If applying a geoid, check mark the *Use geoid model* box.

5. Press the **browse** button. See “Applying a Geoid” on page 2-22 for details.
6. Press **OK** to save the setting(s) and apply them to the project (Figure 2-25).

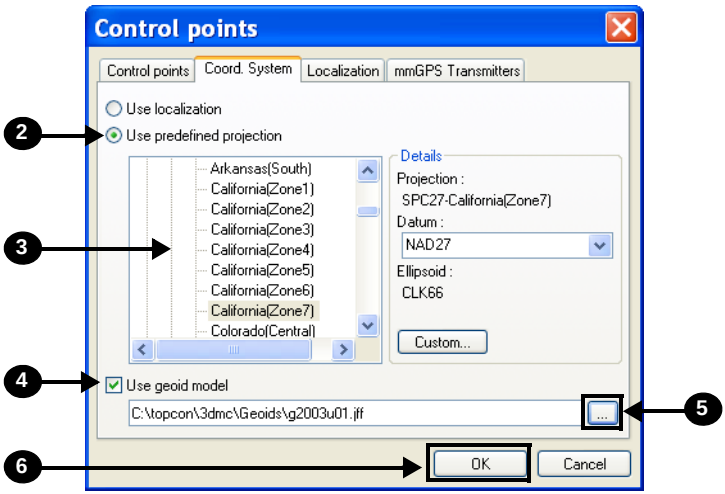


Figure 2-25. Select Projection

Creating a Custom Projection or Datum

A custom projection or datum can be created if no suitable pre-defined projections exists in the list.

1. Click **Project ▸ Control points**.
2. On the ***Custom Projection Definition*** dialog box (Figure 2-26 on page 2-22), enter the following parameters to define the custom projection:
   - Name – enter a name for the projection
   - Projection type – select a projection type from the drop-down list.
   - Central meridian – enter a value for the meridian
   - Scale – enter a value for the scale
   - Origin latitude – enter a parameter for latitude

- Origin easting/northing – enter easting/northing parameters

  NOTE: You can enter new parameters or keep the default values.
- Region – enter a description of the region (optional)
- Note – enter and notes (optional) about the custom projection
- Datum – select a datum from the drop-down list or press the **Browse** button ... to create a custom datum (see "Creating a Custom Datum" below).

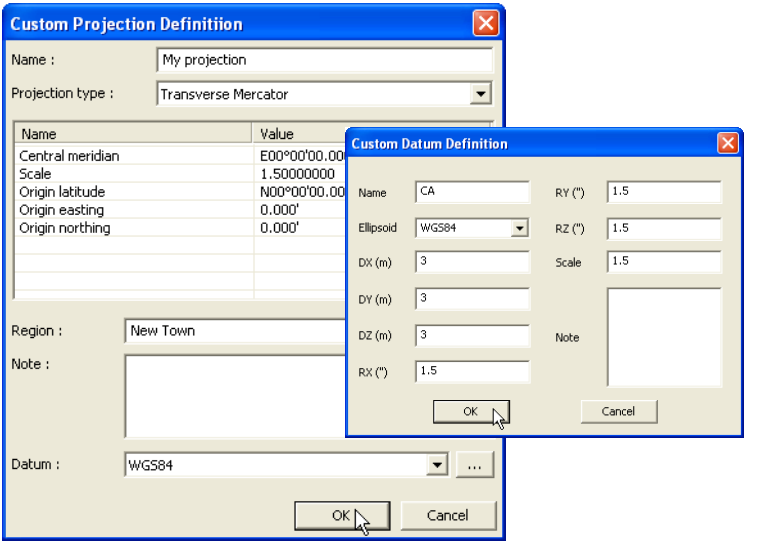


Figure 2-26. Create Custom Projection and/or Datum

Applying a Geoid

A geoid model can be used to transform the ellipsoidal heights measured by GPS (purely geometrical) to heights that are based on a physical reference surface, such as mean sea level. Over small regions there is little difference between the two reference surfaces, but for large projects the differences may be unacceptable. Working with a geoid model when surveying with GPS will ensure proper point measurements.

Geoid models for the United States have been developed by the National Geodetic Survey (NGS). The most recent model is called Geoid 2003. To keep the file size smaller, the continental United States is divided into a grid with eight zones; each zone has a geoid. Use the following grid (click the image to view a larger version) to help you determine the geoid file to use for your project (Chapter 2). For Geoid 2003, the files are numbered “g2003u01” to “g2003u08” to correspond to grids 1 to 8. Contact your local representative or Topcon Support with questions.

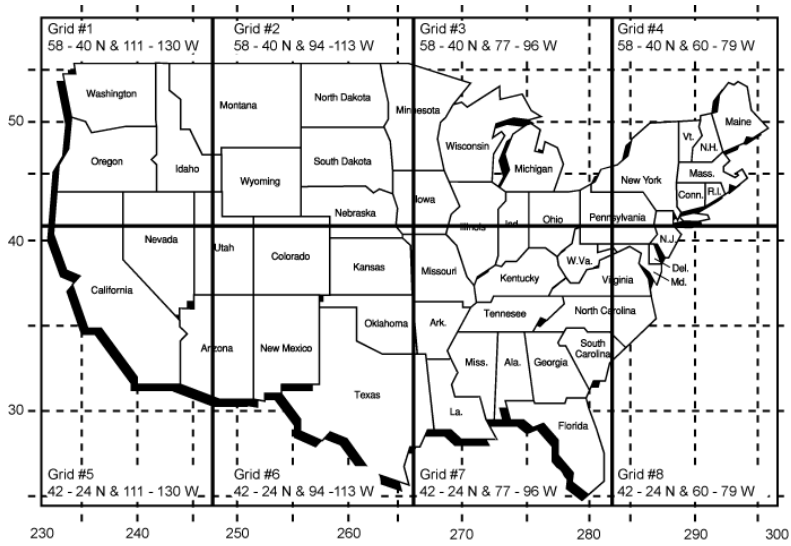


Figure 2-27. Geoid Grid for US

Before applying geoid files, you must do the following:

- Only new projects can be assigned geoid files. If the file already has data (other than the master benchmark), the geoid function will be disabled.
- If the geoid file cannot be found when opening a project, a warning displays.

1. Press **OK (**Figure 2-26 on page 2-22**)**, then browse to the location of the geoid to update the folder where 3D-Office will find the geoid file.

2. Press **Cancel** (Figure 2-26 on page 2-22) to open the file without the geoid. Note that the warning will continue to display each time the project is opened.
   - Once a project contains data, the geoid cannot be changed.
   - Geoid files must be in the Topcon proprietary format (*.gff or *.jff). The latest files for the US and Australia are included on the software CD. Files from other sources can be converted to a *gff* format using the Topcon Tools (or Topcon Link) program.

1. Click **Project ▸ Control points**.

   The ***Control points*** dialog box displays (Figure 2-28).

2. On the *Coordinate System* tab:
   - Use geoid model – check mark this box to apply a geoid model.
   - **browse** button – press to select a geoid file.

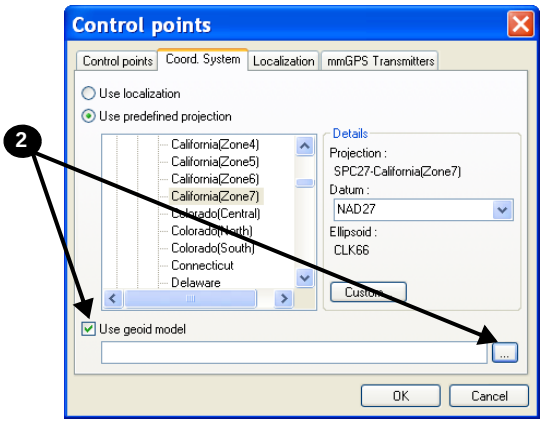


Figure 2-28. View Geoids

3. Navigate to the location of the geoid file.
4. Highlight the desired file and press **Open** (Figure 2-29 on page 2-25).
5. Press **OK** to save the setting(s) and apply them to the project (Figure 2-29 on page 2-25).

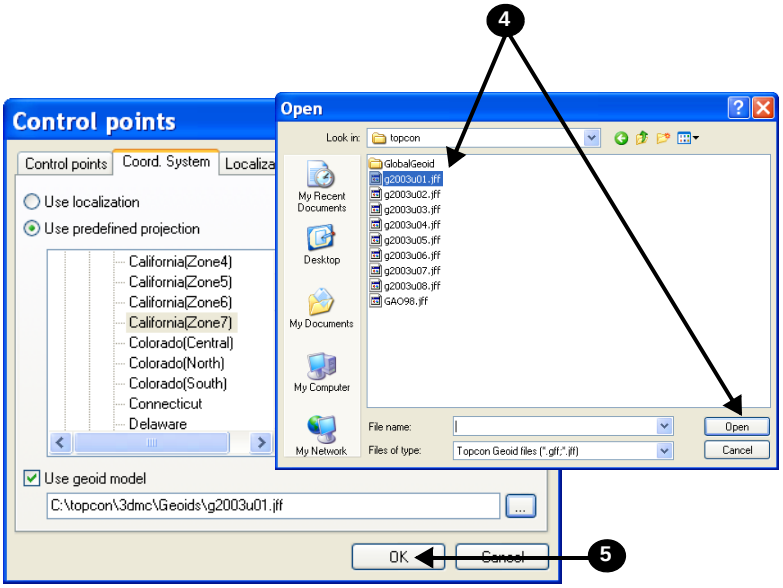


Figure 2-29. Apply Geoid File

Viewing GPS Localization Information

Localization is a mathematical transformation between global GPS coordinates and local project coordinates. If a project contains a localization, the localization information displays in the ***Control points*** dialog box.

1. Click **Project ▸ Control points**.

   The ***Control points*** dialog box displays (Figure 2-30 on page 2-26).

2. On the *Localization* tab, view the following localization parameters (Figure 2-30 on page 2-26):
   - The *Projection* and *Datum* used for the localization.
   - The horizontal coordinates of the *Origin* for both the project *(North/East)* and GPS *(Lat/Lon)* coordinate systems.

- The *Scale* difference (Vertical adjustment) between the project and GPS coordinate systems.
- The *Rotation* angle between the project and GPS coordinate systems.
- The inclination (in percent) of the horizontal plane with respect to the X (East) and Y (North) axis, and the Vertical offset of the two coordinate system along the vertical axis.

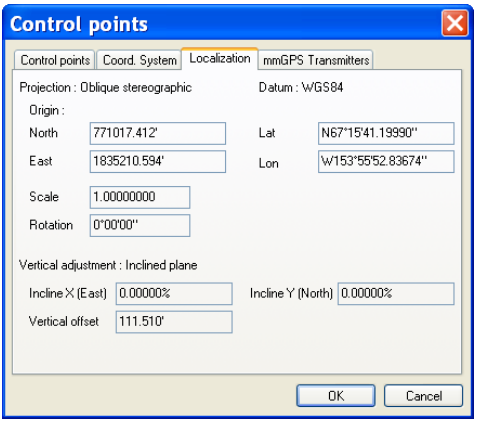


Figure 2-30. GPS Localization Information

Principles of GPS Localization

GPS systems are capable of precise positioning, but the positions computed are relative to a global reference system defined in terms of geographic latitude, longitude and height above a reference ellipsoid. To be useful for local site work, global GPS coordinates need to be transformed into local site coordinates, defined in terms of a distance north and east of some origin point and some distance above an elevation datum. These north, east, and elevation coordinates (NEZ) may be those of a regional coordinate system—for example, a state plane system in the United States—or they may be arbitrarily defined. NEZ coordinates must be defined in terms of the construction design data. In either case, a mathematical conversion is necessary to transform global GPS coordinates into NEZ coordinates, relative to the local coordinate system. The transformation process is commonly known as “localization”.

The basic approach to calculating the mathematical transformation is to provide pairs of point coordinates for each control point on the project. A point pair consists of:

- local NEZ coordinates for the point
- global latitude, longitude, and height coordinates for the point (measured as described in this section).

These pairs of points are needed to calculate a precise mathematical formula for transforming all global GPS coordinates generated in the GPS receiver to local NEZ coordinates for a particular project.

The following steps ensure a high-quality localization suitable for centimeter-level surveying.

- First, the local control points must be precisely measured. The quality of measurements directly affects the results of the localization.
- Second, the control points need to be located more or less evenly around the site. Generally, the more uniformly dispersed the control points the better. In contrast, if they are clustered together, the results will be less than ideal.

  A good rule of thumb is to place control points evenly around the perimeter of the site or grading area. While not directly related to the quality of the localization, points should be placed in areas having easy access and few obstructions.
- GPS localization requires a minimum of three control points, but at least four or more well placed points should be used for better results.

Viewing and Adding mmGPS Transmitter Information

Millimeter GPS (mmGPS) combines the elevation accuracy of a laser with the horizontal and vertical accuracy of GPS+ receivers to provide millimeter accuracy while grading or surveying. The system provides multiple rover support for machine and pole mounted sensors.

3D-Office can either display transmitter information when included with a control point file or load new transmitters and respective information.

1. Click **Project ▸ Control points**.

   The ***Control points*** dialog box displays (Figure 2-31).

2. On the *mmGPS Transmitters* tab, view the following information loaded mmGPS transmitters (Figure 2-31):
   - *Serial number* – enter up to four digits.
   - *Firmware* revision – tells what firmware version is used.
   - *Adjusted* – tells whether or not the transmitter has been calibrated.

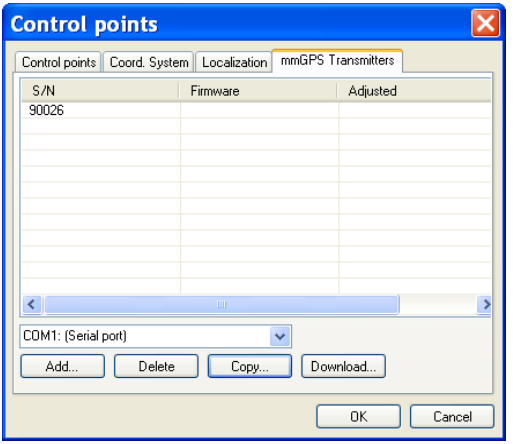


Figure 2-31. mmGPS Transmitter Information

Adding a mmGPS Transmitter

1. Click **Project ▸ Control points**.

   The ***Control points*** dialog box displays.

2. On the *mmGPS Transmitters* tab, press **Add.**
3. Enter the serial number of the new transmitter and press **Enter** (Figure 2-32 on page 2-29).

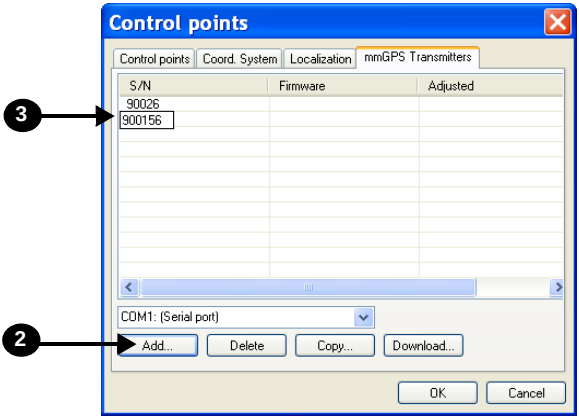


Figure 2-32. Add New Transmitter

Downloading mmGPS Transmitter Calibration Data

Calibration data for mmGPS transmitters includes firmware revision and any adjustment (calibration) performed to fix errors in incline in the self-leveling mechanism of the transmitter. The adjustment process applies an offset to the transmitter.

1. Connect a mmGPS transmitter to the computer running 3D-Office (refer to the transmitter's documentation for details). Turn on the transmitter.
2. In 3D-Office, click **Project ▸ Control points**.

   The ***Control points*** dialog box displays (Figure 2-33 on page 2-30).
3. On the *mmGPS Transmitters* tab, select the same COM port of the computer that is connected to the transmitter.
4. Select a transmitter and press **Download**.
5. Click **Ok** at the confirmation (Figure 2-33 on page 2-30).

   3D-Office connects to the mmGPS transmitters and downloads calibration data.

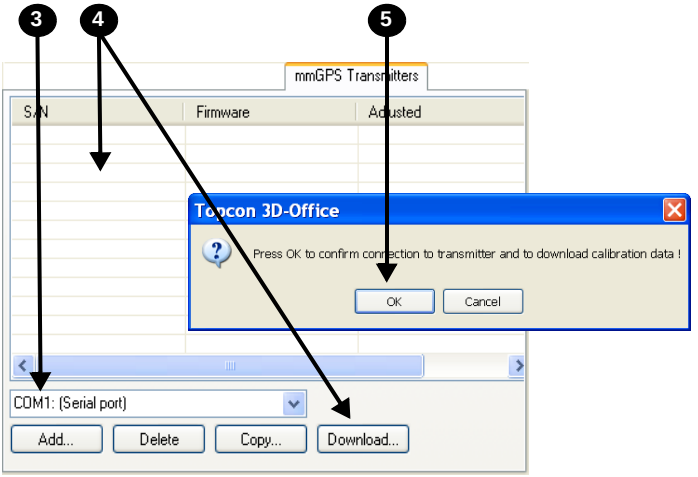


Figure 2-33. Download Transmitter Calibration Data

Calculating Coordinates

The coordinate calculator utility in 3D Project files calculates map projection (grid) coordinates if given geodetic coordinates, and vice versa. 3D-Office calculates coordinates either directly using known geodetic coordinates or inversely using a known grid system.

If applying a geoid model to the elevation computations, a geoid file (*.gff) must be available. A geoid file provides information about the separation between the purely geometric, ellipsoidal representation of the earth and the physical model of the earth that closely approximates mean sea level (the geoid). For example, use a geoid model to obtain approximate mean sea level heights from GPS measured ellipsoidal heights.

Geodetic/Grid Coordinate Calculations

There are two types of coordinate calculations: Geodetic Grid direct and Geodetic Grid reverse. A direct geodetic grid calculates geodetic

coordinates based on given geodetic coordinates. A reverse geodetic grid calculates geodetic coordinates based on given grid coordinates.

1. To calculate geodetic and grid coordinate calculations, click **Project ▸ Utilities ▸ Coordinate calculator**.

On the ***Coordinate calculator*** dialog box, do the following:

2. Click on a Projection from the *Coordinate system* panel.

   The *Projection* and *Ellipsoid* fields to the right are populated.

3. In the *Coordinate* field, select how you want the coordinates to appear on the *Grid coordinates* panel below, either as *North-East-Elev, East-North-Elev, X-Y-Z,* or *X-Y-Z (South azimuth*).

4. Press **Browse** to select a Geoid file to use in the calculation (optional).

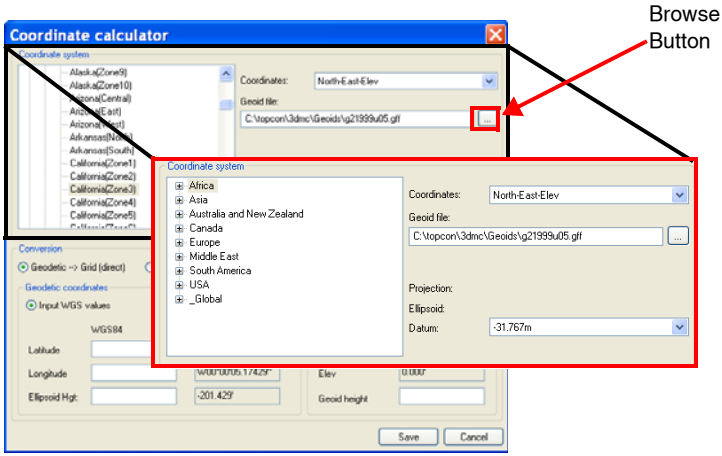


Figure 2-34. Select Projection, Geoid, and Transformation

On the *Conversion* panel (Figure 2-35 on page 2-32):

5. Enable *Geodetic --> Grid (direct)*:

   - Enable either *Input WGS values* or I*nput "local" datum values*,

     – For WGS values, enter the *Latitude*, *Longitude*, and *Ellipsoid Hgt* value in each entry box.

       The input format for latitude and longitude is DDD.MMSSssss. Use negative values for West longitude and South latitude.

Enter the Ellipsoid Height in the same unit currently set for distances in the project.

– For Local datum values, press **Convert**.

3D-Office calculates the corresponding geodetic coordinates (Figure 2-35 on page 2-32) and the grid coordinates (*Latitude/Longitude/Ellipsoid Hgt)* based on the selected projection.

6. Enable *Grid --> Geodetic (inverse)*:
   - Select the projection had the geoid (optional) to use in the calculation (Figure 2-35).
   - Enter the XY grid coordinates and the elevation ().

     If a geoid file has been specified, leave the Geoid height field blank; 3D-Office will enter the geoid height as determined from the geoid file.

     If a geoid model is unavailable, manually enter the geoid height. If you do not know the value, leave the space blank.
   - Press **Convert.**

     3D-Office calculates the corresponding geodetic coordinates *North/East/Elev* (based on the selected projection) and the *Geoid height* coordinate, if applicable.

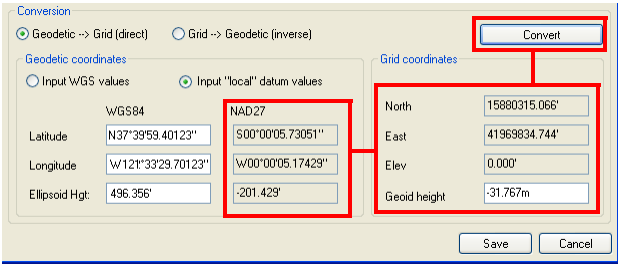


Figure 2-35. Coordinate Calculator – Conversion Panel

7. Press **Save** to save the calculated grid coordinates as a text file (Figure 2-36 on page 2-33)

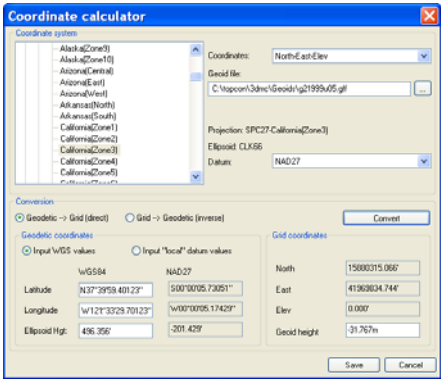


Figure 2-36. All Coordinates Calculated

Creating a Custom Projection

You can create a custom projection if the one you want is not available.

1. Click **Project ▸ Utilities ▸ Custom projection**.

   The ***Custom Datum Definition*** dialog box displays (Figure 2-37 on page 2-34).

2. Enter parameters to define the custom projection (Figure 2-37 on page 2-34):
   - Name – enter a name for the projection
   - Projection type – select a projection type from the drop-down list.
   - Central meridian – enter a value for the meridian
   - Scale – enter a value for the scale
   - Origin latitude – enter a parameter for latitude
   - Origin easting/northing – enter easting/northing parameters

     NOTE: You can enter new parameters or keep the default values (Figure 2-37 on page 2-34)
   - Region – enter a description of the region (optional)
   - Note – enter and notes (optional) about the custom projection

- Datum – select a datum from the drop-down list or press the **Browse** button ... to create a custom datum (see "Creating a Custom Datum" below).

3. Click **Ok** to save the custom projection (Figure 2-37).

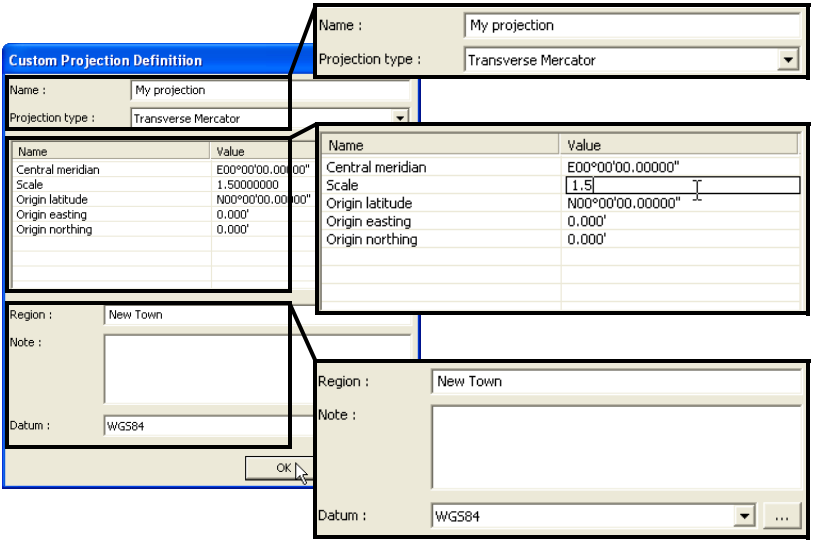


Figure 2-37. Create Custom Projection

Creating a Custom Datum If a desired datum is not available, you can create a custom datum.

1. Click **Project ▸ Utilities ▸ Custom projection**.
2. Click the **Browse** button ... (Figure 2-38 on page 2-35) to select a name for the datum. The ***Custom Datum Definition*** dialog box displays.
3. Enter the following information on the ***Custom Datum Definition*** dialog box (Figure 2-38 on page 2-35):
   - Name – enter a name for the datum
   - Ellipsoid – select the ellipsoid used to create the datum
   - DX(m), DY(m), DZ(m) – enter the ellipsoid's shift parameters
   - RX("), RY("), RZ(") – enter the ellipsoid's angle rotation parameters

- Scale – enter the scale by which to adjust the ellipsoid
- Notes – type any notes about the datum (if preferred)

These parameters (shifts, rotations, and scale) specify a coordinate transformation from the new datum to the selected ellipsoid (WGS-84) using the following equation:

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{WGS-84} = \begin{bmatrix} DX \\ DY \\ DZ \end{bmatrix} + (1 + Scale \cdot 10^{-6}) \cdot \begin{bmatrix} 1 & RZ & -RY \\ -RZ & 1 & RX \\ RY & -RX & 1 \end{bmatrix} \cdot \begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{new-datum}$$

4. Click **Ok** to save the datum and return to the previous screen.

Custom datums will be available in the Datum list on the ***Custom Projection Definition*** dialog box (Figure 2-38).

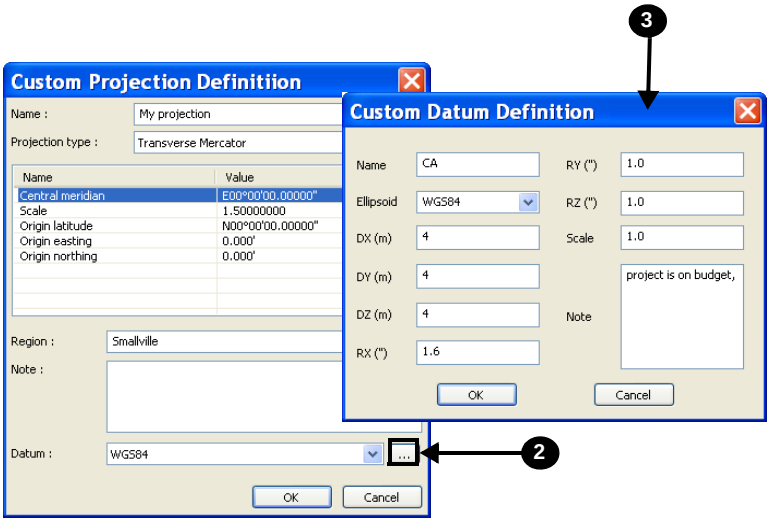


Figure 2-38. Create Custom Project/Datum

Setting Project Units

The ***Project options*** dialog box (Figure 2-39 on page 2-37) sets the type of units to use for various quantities used in a 3D Project. When importing data contained in ASCII text, 3D-Office considers the data to be in the same units as that assigned to the project. To view or set the units for 3D Projects, click **Project ▸ Options**.

On the *Units* tab, select the following information and click **OK** to apply the options to the file (Figure 2-39 on page 2-37):

- Distance – select the linear unit to use for distances and coordinates, either *Meters*, *US Survey feet, International feet,* or *Feet+Inches* from the drop-down list.

  If using Feet+Inches, all values will show as 1'11"1/2 where 12 inches equal 1 foot and any value smaller than an inch will show as a fraction of an inch.

- Decimal Places – select the decimal places to use for numbers with fractions of a measurement, from 0 to 4 decimal places from the drop-down list.
- Angles – select the angle unit to use, either *DD°MM'SS", NDD°MM'SS"E, Gons,* or *DD.DDDD°* from the drop-down list.
- Grade – select the grade format to use, either *Percent (%), Run : Rise,* or *Rise : Run* from the drop-down list.
- Area – select the area unit to use, either *Square meters, Square feet, Acres,* or *Hectares*.
- Volume – select the volume unit to use, either *Cubic meters* or *Cubic yards* from the drop-down list.
- Coordinate – select the coordinate order to display in 3D-Office, either *North-East-Elev, East-North-Elev, X-Y-Z,* or *X-Y-Z South azimuth* from the drop-down list.
- Stationing – select the stationing format to use, either *100.000, 1+00.000, 10+0.000,* or *1+000.000* from the drop-down list.

On the *Comments* tab (Figure 2-39 on page 2-37), type any comments you might have concerning the project (optional).

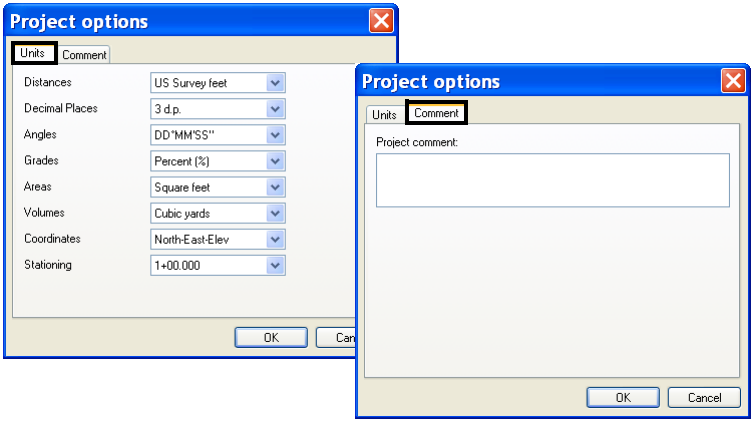


Figure 2-39. Set Project Units for 3D Project

Notes:

Point Files

Points are an integral part of a job file and may represent topographic information, control coordinates, “as-build” information, etc. 3D-Office can use points to generate linework, alignments, surfaces, and TINs.

Importing and Opening Point Files

3D-Office can read point records from several file types. Points in 3D-Office can be assigned to layers, exported to various file format types, edited, transformed, displayed, and printed.

3D-Office imports points into 3D Project files from four file types:

- 3D point files (*.pt3) on a computer
- 3D point files (*.pt3) on a Pocket-3D controller
- AutoCAD® files (*.dwg or *.dxf)
- Text files (*.txt)

Importing into a 3D Project or 3D Point File

Follow these steps to import points from a 3D Points file into a 3D Project file or 3D Points file.

1. With a 3D Project or 3D Points file open, click **Points ▸ Import points ▸ From 3D point file (*.pt3)**.
2. Navigate to the location of the desired file, select it, and click **Open** (Figure 3-1 on page 3-2).

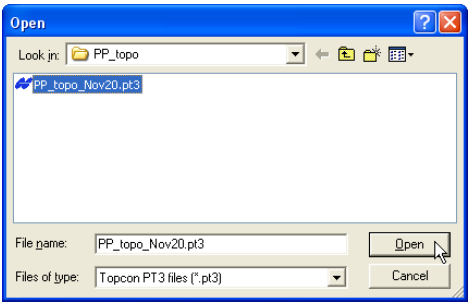


Figure 3-1. Open 3D Point File

The point data from the selected file is added to the 3D Project or 3D Points file.

Importing Points from Pocket-3D

Follow these steps to import a points from a Pocket-3D controller into either a 3D Project file or a 3D Points file.

1. Connect the Pocket-3D controller to the computer and turn on the controller (see Appendix A for details). Run Pocket-3D on the controller.
2. With a 3D Project or 3D Points file open, click **Points ▸ Import points ▸ From Pocket-3D controller**. 3D-Office connects with the Pocket-3D controller and retrieves *.pt3 files.
3. On the ***Pocket-3D files*** dialog box, select the file to import and click **Open** (Figure 3-2 on page 3-3). The file type is automatically selected.

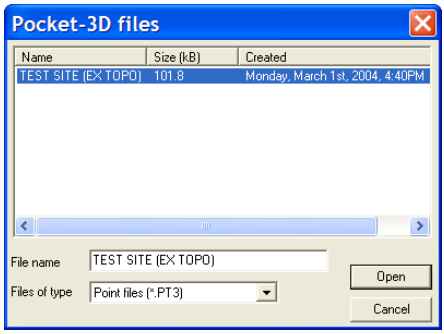


Figure 3-2. Select and Open Pocket-3D Point File

The point data from the selected file is added to the 3D Project or 3D Points file.

Importing Points from an AutoCAD File

Follow these steps to import points from an AutoCAD dwg/dxf file into either a 3D Project file or a 3D Points file.

1. With a 3D Project or 3D Points file open, click **Points ▸ Import points ▸ From AutoCAD file**.
2. Navigate to the location of the desired file, select it, and click **Open** (Figure 3-3).

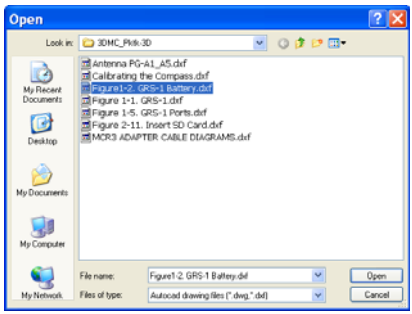


Figure 3-3. Open AutoCAD 3D Points File

The point data from the selected file is added to the 3D Project or 3D Points file.

Importing Points from a Text File

Follow these steps to import points from a text file into either a 3D Project file or 3D Points file.

1. With a 3D Project or 3D Points file open, click **Points ▸ Import points ▸ From text file**.
2. On the ***Select custom format*** dialog box, select the format type and click **Next** (Figure 3-4). See "Creating Custom Import/ Export Formats for Text Files" on page 2-13 for details on creating or editing import formats.

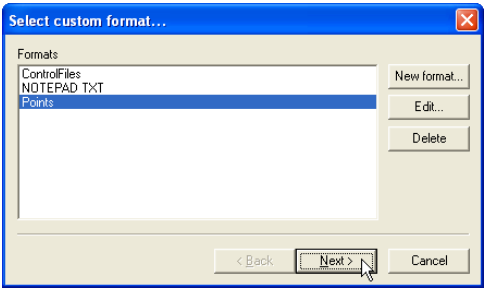


Figure 3-4. Select Format Type

3. Click **Browse**.

   The ***Import points from text file*** dialog box displays (Figure 3-5 on page 3-5).
4. Navigate to and select the desired *.txt file and click **Open**.
5. Enter a name for a new layer or select a current layer to add the points to. If the imported text file includes a layer field as part of its record definition, select *Layer specified as line item*.
6. Click **Finish** to import the points (Figure 3-5).

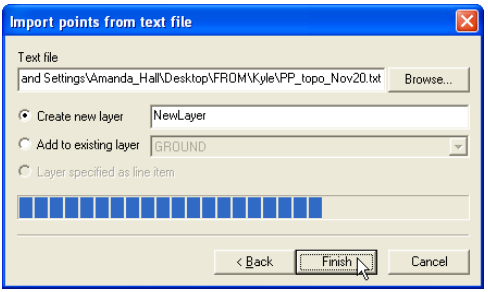


Figure 3-5. Open Point Text File

Opening a Points File

1. To open a 3D Points file click **File ▸ Open**.
2. On the ***Open*** dialog box, navigate to the location of the file, select the file type as Points (*.pt3), select the desired file, and click **Open** (Figure 3-6).

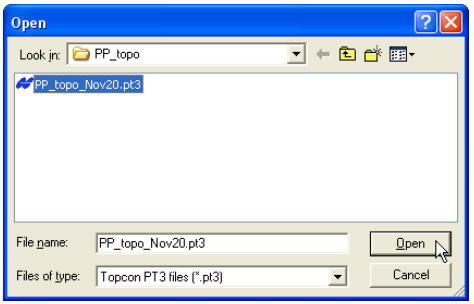


Figure 3-6. Open 3D Points File

Opening a Pocket-3D Point File

If a Pocket-3D controller and the computer are connected, 3D-Office can open points files directly from the controller. Once opened, the file can be exported to other files or saved to the computer. See Appendix A for details on connecting a computer and controller.

1. Click **File ▸ Open Pocket-3D file**.

2. On the ***Pocket-3D files*** dialog box, select the file type (*.pt3) and the desired file, then click **Open** (Figure 3-7).

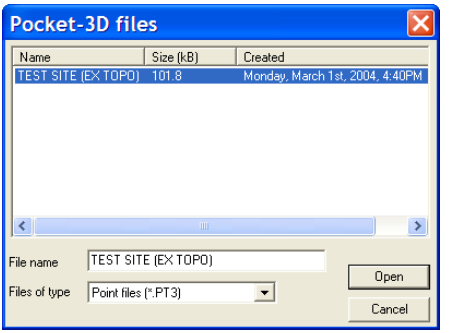


Figure 3-7. Select File and Click Open

Opening an AutoCAD File

From a 3D Project file, 3D-Office can import points, linework, and text information from an AutoCAD (*.dwg or *.dxf) file.

1. Click **File ▸ Open AutoCAD drawing file**.
2. On the ***Open*** dialog box, select the desired file and click **Open** (Figure 3-8). The AutoCAD entities are imported into 3D-Office.

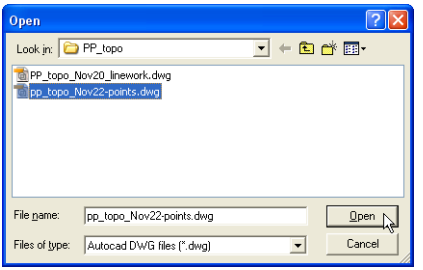


Figure 3-8. Select File and Click Open

Viewing Information

Points are assigned three-dimensional coordinates in the project's coordinate system. 3D-Office provides an interface for viewing, editing, transforming, and printing points, and for saving points to a text file.

Point List View

To view a list of all points in the file, click **Points ▸ Point list view**. The ***point list*** opens in separate window and displays the following information about all points in the file (except localization control points) (Figure 3-9):

- Select – indicates if the point is selected or selects a point
- Pt. # – the number of the point
- Description – an optional description of the point
- Layer – the layer in which the point is located
- Northing (Y) – the north coordinate of the point in the project system
- Easting (X) – the east coordinate of the point in the project system
- Elevation (Z) – the elevation of the point
- Created (local time) – the date and time the point was collected, imported, or added

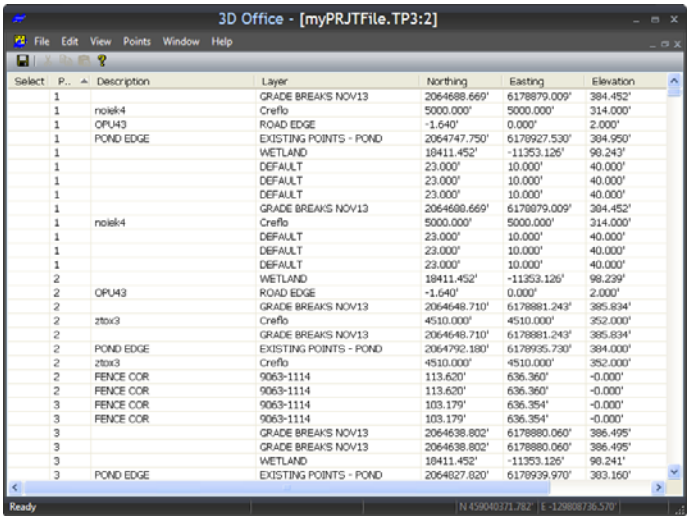


Figure 3-9. Point List

For the ***point list*** window, the toolbar is modified and provides only save, cut, copy, paste, and about buttons. See “Working with Points” on page 3-11 for details on adding, editing, and deleting points.

Any changes made in the point list are reflected in the plan view and the primary file.

Points selected in the list are also selected in the plan view, and vice versa. Click Window ▸ Cascade for side-by-side viewing of selected points in the point list and plan view.

Text File View

3D-Office can open a text editor window for viewing data associated with the selected entities.

1. Select the entities (points, lines, TIN triangles) to view information on:
   - click the entities
   - use the select tool to select a group of entities
2. Click the activated **Information** button on the toolbar. A text editor window opens to display relevant information about the selected entities (Figure 3-10).

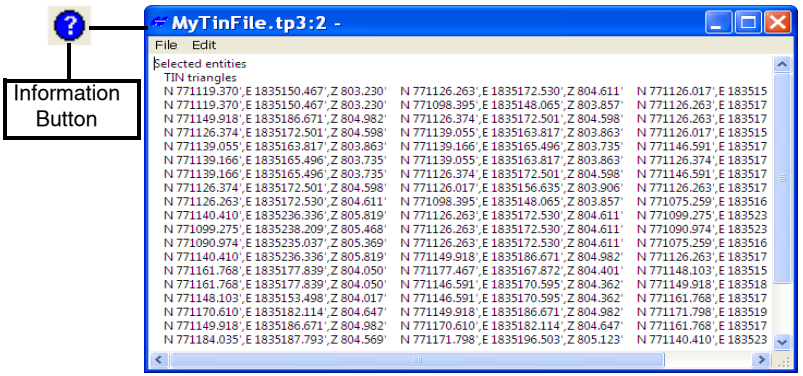


Figure 3-10. Click Information Button and View Selected Entities

3. To save the information as a text file, click **File ▸ Save as**. On the ***Save As*** dialog box, type a name for the file or keep the default

file name. Navigate to the location in which to save the file and click **Save**.

Managing Point Layers

Point files can be divided into layers of points, where each layer is assigned a name and color.

To view, add, or edit layers, click **Points ▸ Layers**. The ***View layers*** dialog box displays each layer in the points file and it's display status on the Plan View (Figure 3-11 on page 3-10).

- Enable/disable the box next to each layer name by placing a check mark next to it. If a check mark is next to the layer name (enabled), it will display on the Plan View.
- **New layer** – press to add a new layer by entering a name in the new layer box.

  Multiple layers are useful for distinguishing between the various land and project features.

  When added, the new layer is "empty" until points are manually added or imported. See "Importing and Opening Point Files" on page 3-1 for importing points to a layer.
- **Delete** – press to remove the highlighted layer.

NOTICE Deleting a layer will also delete all of its contents.

- **Set Color** – press to display the ***Color*** screen to select a color for each layer to quickly differentiate between layers.

  The layer's points on the Plan View will appear in this color.
- **Point labels** – press to display the ***Point labels*** dialog box (Figure 3-11 on page 3-10).
  - Show names of points in this layer: check mark this box to display the name of all points in the layer.
  - Show descriptions of points in this layer: check mark this box to show description of points on the main screen.

– Show elevations of points in this layer: check mark this box to show point elevations on the highlighted layer.

– Show cut/fill to current TIN surface: check mark this box to view the cut/fill on the TIN surface.

– Show cut/fill current alignment surface: check mark this box to view the cut/fill on the alignment surface.

– Show cut/fill current plane surface: check mark this box to view the cut/fill on the plane surface.

– Apply this labelling to all layers.

- **Show all** – press to display all layers in Plan View.
- **Show non**e – press to hide all layers in Plan View.

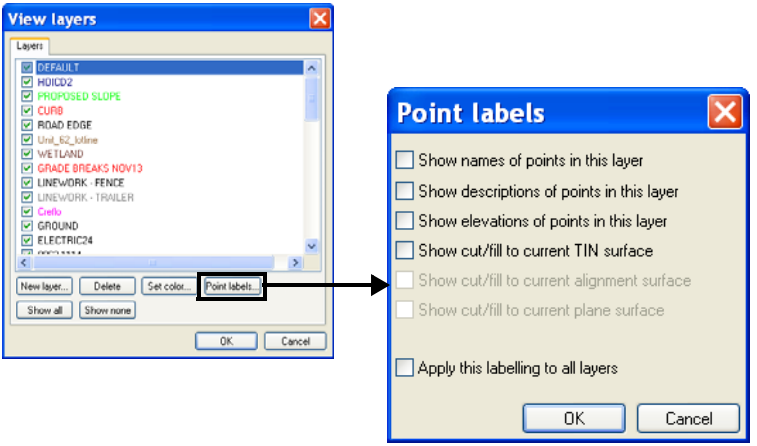


Figure 3-11. View Point Layers

Working with Points

Points can be added, deleted, or edited from both the point list view and the plan view. Points can also be transformed from the plan view.

After making changes to a point file, save it as a version of the original to track progress.

Adding Points

1. To add a new point to the point file, click **Points ▸ New point**.
2. On the ***Add/edit point*** dialog box, enter the following information for the new point and click **OK** (Figure 3-12):
   - Type a *Number* and *Description* (optional) for the point.
   - Select a *Layer* from the drop-down list.
   - Enter the *North* (*X*), *East* (*Y*), and *Elev* (*Z*) coordinates.

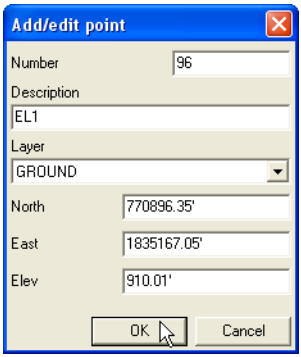


Figure 3-12. Add New Point

Editing Points

1. To edit a point, highlight the desired point in the Plan View or point list and click **Points ▸ Edit point**.
2. On the ***Add/edit point*** dialog box, edit the desired information and click **OK** (Figure 3-12).

Deleting Points

To delete points, highlight the desired point(s) in either the point list or plan view and click **Points ▸ Delete points** or press **Delete** on the keyboard.

Click **Edit ▸ Undo delete entities** to retrieve the deleted points.

Adjusting Point Elevations

The elevation adjustment is a translation along the vertical axis. Point elevations may need to be adjusted for various reasons, for example:

- The surveyor may have assigned an arbitrary elevation to the control points for the initial survey and later will want to translate the survey to a “true” or “known” elevation.
- A mistake may have been made in the height of the antenna, and the elevations will need to be corrected accordingly. If this occurred on one day of a multi-day survey, then only a subset of the data will need to be adjusted.

Use caution with this routine, especially when operating on a subset of the data.

1. In the point list view or plan view, check mark the desired point(s) to adjust (press **Ctrl+A** to select all points) and click **Points ▸ Transform coordinates ▸ Adjust elevations**.
2. On the ***Adjust elevations*** dialog box, type the number to add to or subtract from the current elevation and click **OK** (Figure 3-13). Use a minus sign to subtract an elevation value.

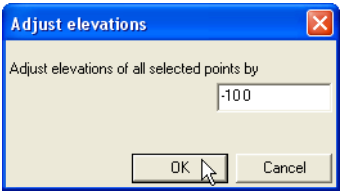


Figure 3-13. Enter Elevation Adjustment Number

Figure 3-14 shows before and after views of this process.

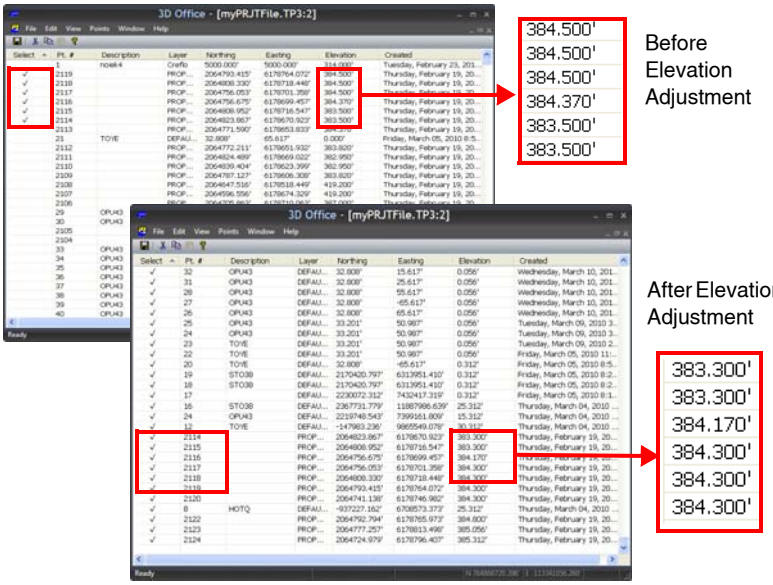


Figure 3-14. Before and After Adjust Elevation Process

Converting Coordinates to Feet or Meters

Rather than simply changing the linear unit that displays in the project, the convert coordinates to feet/meters function changes the units associated with the numerical values of the coordinates. For example, this function is used to change a coordinate value of 3.000m to 3.000 feet, or vise versa. This might be necessary, for example, when a text file with point data in units of meters is imported into 3D-Office but the units in 3D-Office are set to feet. In this case, the units associated with the coordinate values are in error and must be corrected.

Use caution with this routine, especially when operating on a subset of the data.

1. In the point list view or plan view, check mark the desired point(s) to convert (press **Ctrl+A** to select all points) and click **Points ▸ Transform coordinates ▸ Feet/meters conversion**.
2. On the ***Convert feet/meters*** dialog box, check mark the desired new units from the drop-down list and click **OK**. For *Custom scale factor*, enter the scale factor and click **OK** (Figure 3-15).

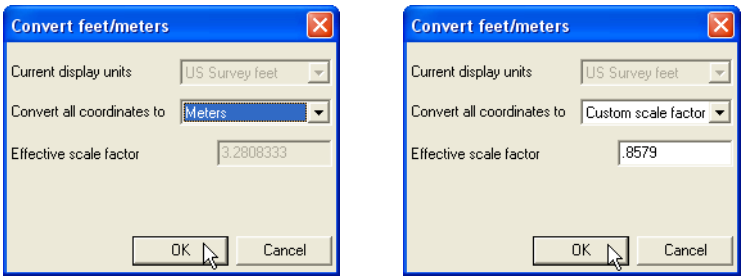


Figure 3-15. Select Conversion Type

Figure 3-16 shows before and after views of this process.

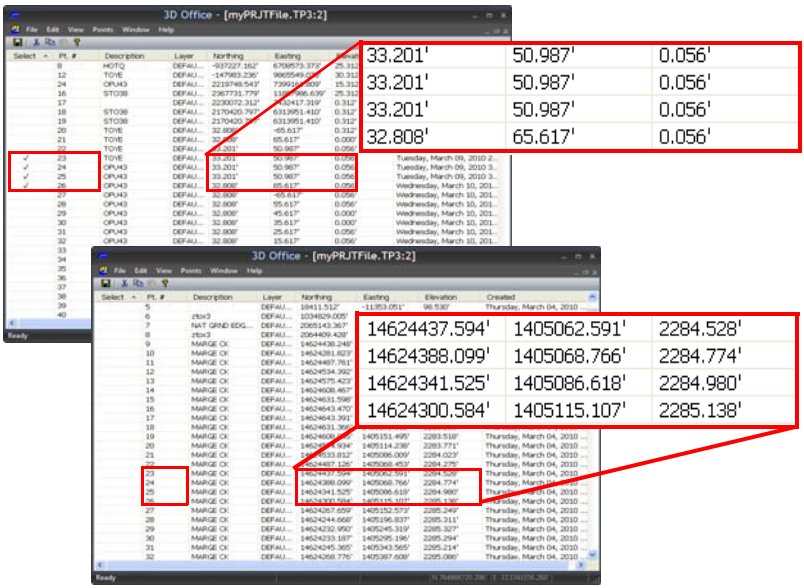


Figure 3-16. Before and After Coordinate Conversion Process

Translating Point Coordinates

Point translations are shifts along the X (East), Y (North), and Z (Elevation) axes. Typically, point translations are done on the entire data set, if at all, rather than on a subset of points.

Use caution with this routine, especially when operating on a subset of the data, since data will be PERMANENTLY changed.

1. In the point list view or plan view, check mark the desired point(s) to translate (press **Ctrl+A** to select all points) and click **Points ▸ Transform coordinates ▸ Translate in XYZ**.
2. On the ***Translation*** dialog box, enter the desired *North*, *East*, and *Elev* translation values, then click **OK** (Figure 3-17).

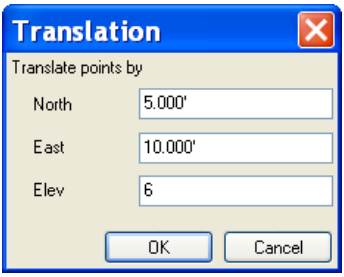


Figure 3-17. Enter XYZ Translation Values

Figure 3-18 shows before and after views of this process.

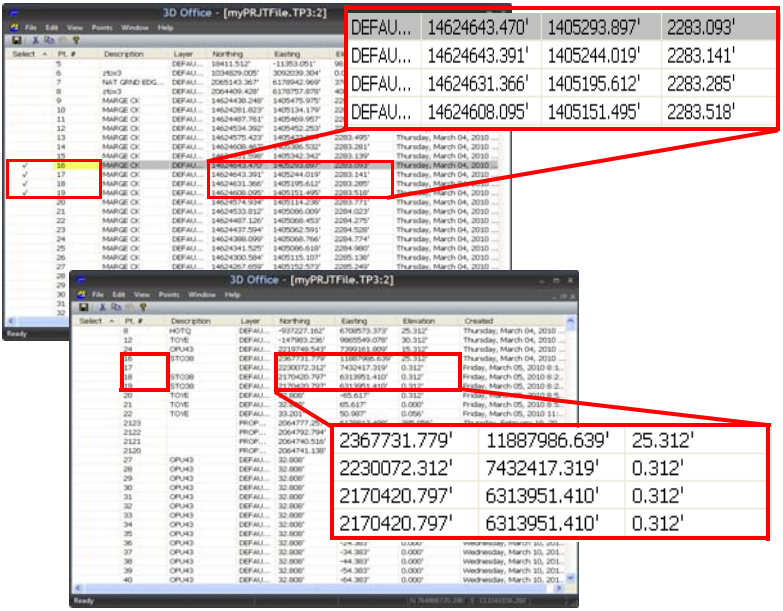


Figure 3-18. Before and After XYZ Translation Process

Setting Unit Options See “Setting Project Units” on page 2-35 for details on the *Units* tab to set the type of units for the various project quantities.

Exporting Points

3D-Office exports points from a 3D Point file or 3D Project file to point files (*.pt3) and text files, as well as a Pocket-3D controller.

Exporting Points to a 3D Point File

Use this process to keep copies of files or to track progress.

1. Select the points to export and click **Points ▸ Export selected points ▸ To 3D point file (*.pt3)**.
2. On the ***Save As*** dialog box, do one of the following (Figure 3-19 on page 3-17):

- To export to another point file, navigate to the location of the file and select it, then click **Save**,
- To save to a new file, navigate to the desired folder, type a name for the new file, and click **Save**.

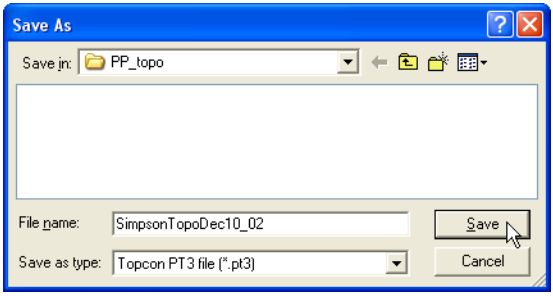


Figure 3-19. Save Point File

The selected points are added to the existing or new 3D point file.

Exporting Points to a Pocket-3D Controller

1. Connect the Pocket-3D controller to the computer and turn on the controller. See Appendix A for details.
2. Select the points to export and click **Points ▸ Export selected points ▸ To Pocket-3D controller**. 3D-Office connects with the Pocket-3D controller.
3. On the ***Pocket-3D files*** dialog box, do one of the following and click **Save** (Figure 3-20 on page 3-18):
   - Select a file to overwrite.
   - Enter a new file name or keep the default file name to save a new file to the controller's memory.

   The file type is automatically selected.

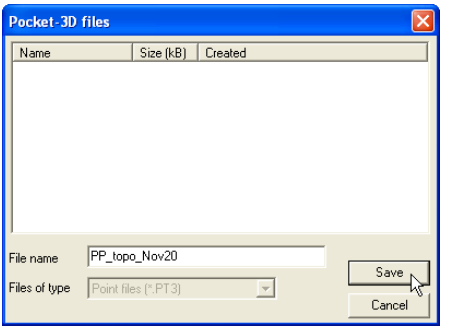


Figure 3-20. Save File to Pocket-3D Controller

The selected points data is saved in the specified folder on the Pocket-3D controller.

Exporting Points to a Text File

1. Select the points to export and click **Points ▸ Export selected points ▸ To text file**.
2. Select the format type and click **Next** (Figure 3-21). See "Creating Custom Import/Export Formats for Text Files" on page 2-13 for creating new or editing current formats (Figure 3-21).

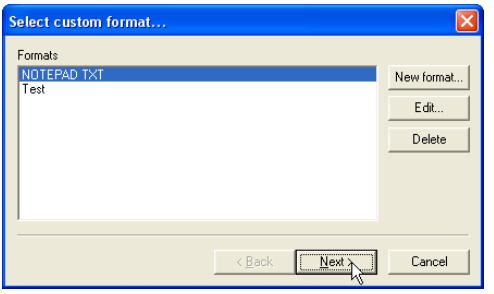


Figure 3-21. Select Custom Format

3. Click **Browse**. Navigate to the desired location in which to save the file, select a current file to replace or type a name for a new file. Click **Save**.

4. Enable the view results box to automatically open the text file when the export completes. If needed, select the desired *Viewer*.
5. Click **Finish** to export the selected points to a text file (Figure 3-22).

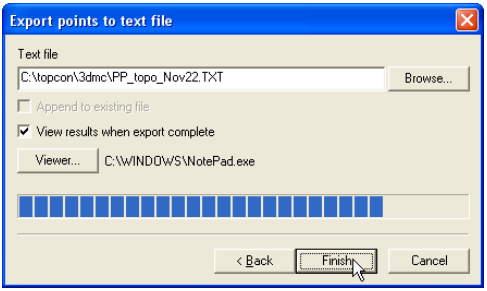


Figure 3-22. Exporting Points to Text File

If the view results box was checked, the selected text editor opens and displays the exported points (Figure 3-23).

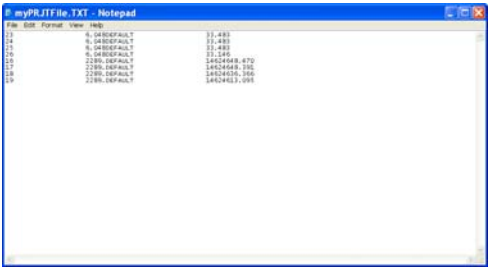


Figure 3-23. Exported Points Displayed in Text Editor

Notes:

Linework Files

Linework files contain layers comprised of polyline entities, where each layer is assigned a name and color. A polyline is a series of continuous line segments that may represent features or objects within the project, such as building pads, curbs and sidewalks, top and toes of slopes, or the boundary of the project. With 3D-Office, linework can be transformed into points and alignments.

Importing and Opening Linework

3D-Office can read linework files from several formats. Linework in 3D-Office can be assigned to layers, draped onto TINs, converted to alignments, edited, deleted, and exported to various file format types.

3D-Office recognizes linework from three file types:

- 3D linework files (*.ln3)
- Pocket-3D controller files
  See “Importing Linework from Pocket-3D” on page 4-2 for import details.
- AutoCAD® files
  See “Importing from an AutoCAD File” on page 4-3 for import details.

Importing Linework into a 3D Project File

Follow these steps to import linework from a 3D Linework file into a 3D Project file.

1. With a 3D Project file open, click **Linework ▸ Import linework ▸ From 3D linework file (*.ln3)**.
2. On the ***Open*** dialog box, navigate to the location of the desired file, select it, and click **Open** (Figure 4-1).

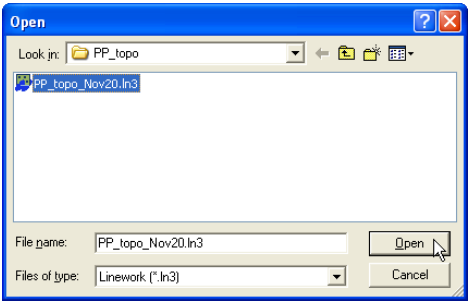


Figure 4-1. Open 3D Linework File

Importing Linework from Pocket-3D

Follow these steps to import a Pocket-3D controller linework file into a 3D Project file.

1. Connect the Pocket-3D controller to the computer and turn on the controller (see Appendix A for details). Run Pocket-3D on the controller.
2. With a 3D Project file open, click **Linework ▸ Import linework ▸ From Pocket-3D controller**.

   3D-Office connects with the Pocket-3D controller and retrieves *.ln3 linework files.
3. On the ***Pocket-3D files*** dialog box, select the file to import and click **Open** (Figure 4-2 on page 4-3). The file type is automatically selected.

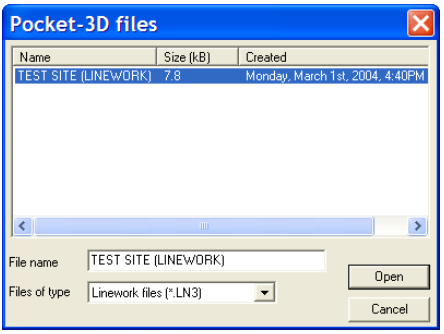


Figure 4-2. Open Pocket-3D Linework File

Importing Linework from an AutoCAD File

Follow these steps to import linework from an AutoCAD (dwg or dxf) file into either a 3D Project file or a 3D Linework file. All associated layers defined in the AutoCAD file will be imported.

1. With a 3D Project or 3D Linework file open, click **Linework ▸ Import linework ▸ From AutoCAD file**.
2. On the ***Open*** dialog box, navigate to the location of the desired file, select it, and click Open (Figure 4-3).

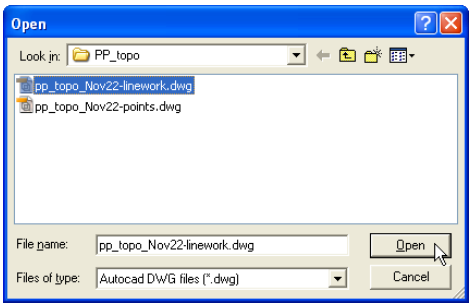


Figure 4-3. Open AutoCAD 3D Linework File

Opening a Linework File

1. To open a 3D linework file, click **File ▸ Open**.
2. On the ***Open*** dialog box, navigate to the location of the file, select the file type as Linework (*.ln3), select the desired file, and click **Open** (Figure 4-4).

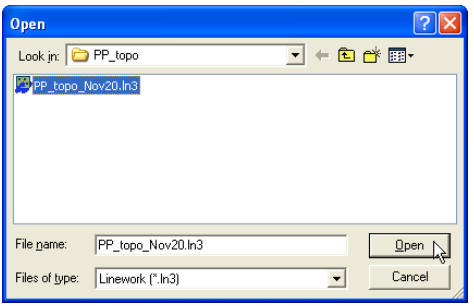


Figure 4-4. Open 3D Linework File

Opening a Pocket-3D Linework File

If a Pocket-3D controller and the computer are connected, 3D-Office can open linework files directly from the controller. Once opened, the file can be exported to other files or saved to the computer. See Appendix A for details on connecting a computer and controller.

1. Click **File ▸ Open Pocket-3D file**.
2. On the ***Pocket-3D files*** dialog box, select the file type (*.ln3) and the desired file, then click **Open** (Figure 4-5).

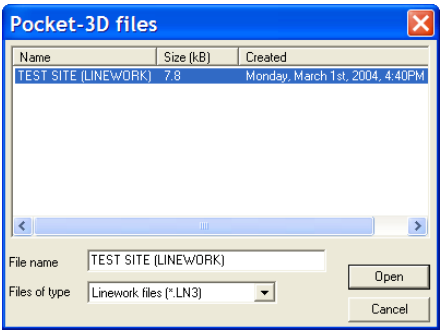


Figure 4-5. Select File and Click Open

Creating Linework

The polygon selection tool can be used to create polylines in a 3D Project file. With 3D-Office, linework can be transformed into points and alignments.

1. To add a new polyline to the file, click the polygon selection tool, then click on the screen to begin the polyline. Click at subsequent locations to create the end point or corner points (Figure 4-6).
2. Click once at the end-point, then do one of the following:
   - right click and click **New polyline** on the pop-up menu (Figure 4-6)
   - click **Linework ▸ New polyline**

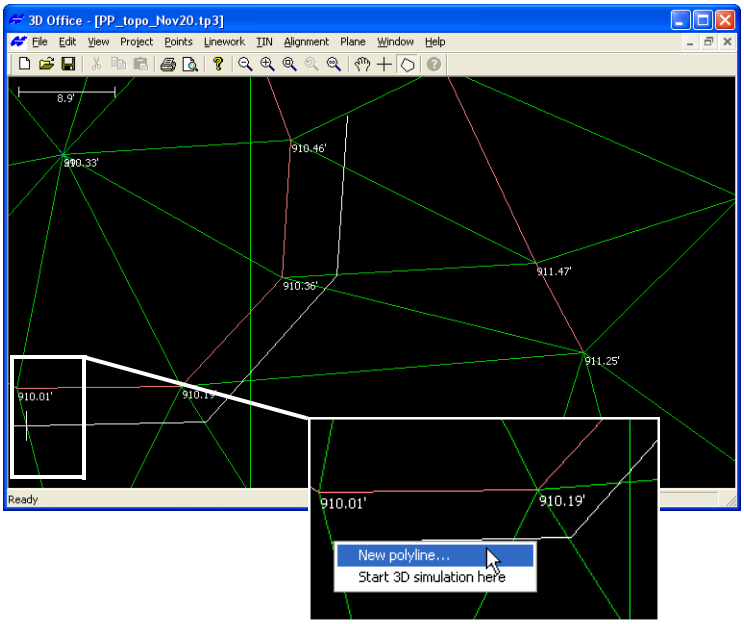


Figure 4-6. Trace New Polyline with Polygon Tool and Add to File

3. On the ***Polyline*** dialog box, select the layer in which to enter the new polyline and enter an elevation for the polyline, then click **OK** (Figure 4-7).

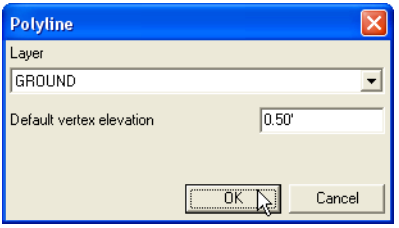


Figure 4-7. Enter New Polyline Parameters

The new polyline is stored as linework in the file. The elevation entered in the dialog box is assigned to all vertices of the new polyline.

Draping Polylines onto TIN

The drape polyline to TIN function allows a polyline to be created across the current TIN model. Using this function, the elevations of the polyline vertices are derived from the TIN model. Thus, the polyline is "draped onto the TIN model".

1. After drawing a polyline in the plan view, use the Selection tool to select the new polyline. Click **Linework ▸ Drape polyline(s) onto TIN**.
2. Click **OK** to create new TIN vertices (Figure 4-8).

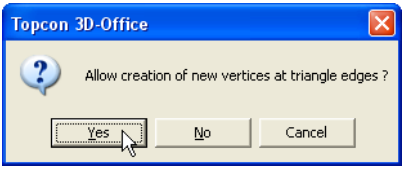


Figure 4-8. Create New Vertices at Triangle Edges

3D Office will redraw the portion of the TIN surface that changed, adding vertices to the TIN surface along the new polyline.

Deleting Polylines

1. To delete polylines from the file, use the *Selection* tool and click the desired polylines.
2. Press **Delete** or click **Linework ▸ Delete polyline(s)**.

Viewing Linework Information

Linework information can be viewed using a text editor that displays the layer the linework resides in, the number of vertices in the linework, and the coordinates for the vertices of the selected linework. This information can be saved as a text file for reference.

1. Do the following to view information on selected linework:
   - click on the individual linework OR
   - use the select tool to select a group of linework
2. Click the activated **Information** button on the toolbar or right-click on the mouse and click **Properties**. A text file opens, displaying linework properties. (Figure 4-9).

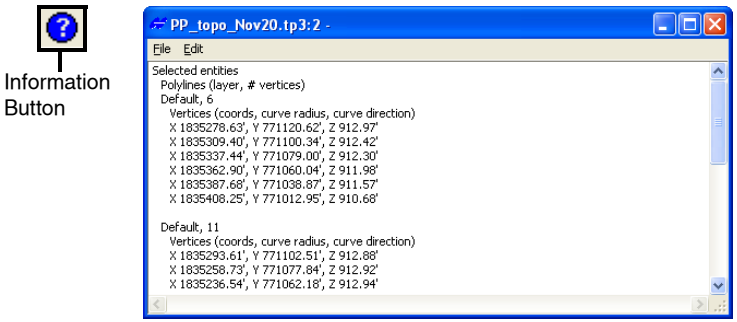


Figure 4-9. Click Information Button and View Selected Entities

3. To save the information as a text file, click **File ▸ Save as**. On the ***Save As*** dialog box, type a name for the file or keep the default file name. Navigate to the location in which to save the file and click **Save**.

Managing Linework Layers

To view, add, or edit layers, click **Linework ▸ Layers**. The ***View layers*** dialog box displays each layer in the linework file.

For details on using the ***View Layer*** dialog box, see “Managing Layers” on page 2-16.

Setting Unit Options

To set unit options in a Linework file, click **View ▸ Options**. The ***Project options*** dialog box displays and sets the type of units to use for the various quantities used in the 3D Linework file.

The ***Project options*** dialog box also has the same fields as for 3D Project files. See “Setting Project Units” on page 2-15 for details on the *Units* tab.

Exporting Linework

If you made changes to a linework file, you can export the changed file to a new linework file, or replace a current file with the new information.

Export versions of the file to track progress.

Exporting Linework to a File

The following steps describe exporting linework to a 3D Linework file (*.ln3).

1. Select the linework to export and click **Linework ▸ Export selected linework ▸ To 3D linework file**.

2. On the ***Save As*** dialog box, type a name for the new linework file or select a linework file to replace. Click **OK** to export the file (Figure 4-10).

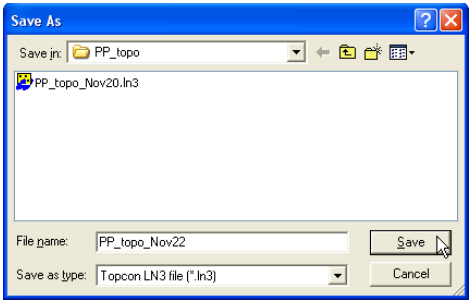


Figure 4-10. Export Linework to 3D Linework File

Exporting Linework to a Pocket-3D Controller

To use the linework file in the field, export it to a Pocket-3D controller.

1. Connect the Pocket-3D controller to the computer and turn on the controller (see Appendix A for details). Run Pocket-3D on the controller.
2. Select the linework to export and click **Linework ▸ Export selected linework ▸ To Pocket-3D controller**.
3. On the ***Pocket-3D files*** dialog box, do one of the following and click **Save** (Figure 4-11 on page 4-10):
   - Select an existing file to replace.
   - Enter a new file name or keep the default file name.

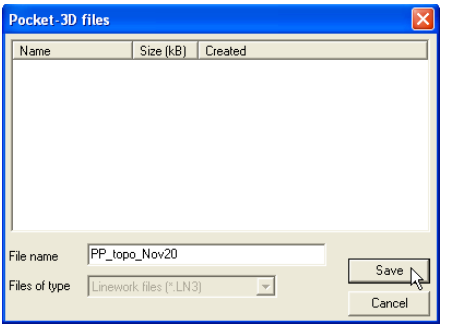


Figure 4-11. Export Linework File to Pocket-3D Controller

Exporting Linework to an AutoCAD File

Follow these steps to import linework from an AutoCAD (dwg or dxf) file into either a 3D Project file or a 3D Linework file. All associated layers defined in the AutoCAD file will be imported.

1. With a 3D Project or 3D Linework file open, click **Linework ▸ Export selected linework ▸ To Autocad file**.

On the ***Open*** dialog box, navigate to the location of the desired file, highlight it, and press **Open.**

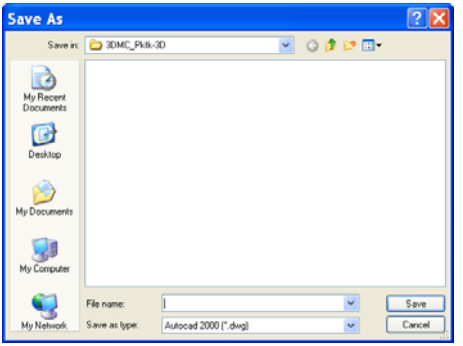


Figure 4-12. Export Linework to AutoCAD

TIN Files

A TIN (Triangulated Irregular Network) model can be used to represent an irregular land surface. The model is derived from a set of points and edges (optional). 3D-Office can generate a TIN from existing point/line data, or it can read an existing TIN model from an outside source, such as an AutoCAD® file. A TIN model of the existing ground can be used to display cut and fill information and earth volume quantities with respect to a design surface.

Importing and Opening a TIN Surface

3D-Office opens/imports a TIN model for displaying, editing, exporting, and comparing to other surfaces. TIN options can also be set in 3D-Office.

3D-Office recognizes TIN surfaces from four file types:

- 3D TIN files (*.tn3)
  See “Importing a TIN Surface” on page 5-2.
- Pocket-3D controller files
  See “Importing from Pocket-3D” on page 5-2 for import details.
- AutoCAD files
  See “Importing from an AutoCAD File” on page 5-3 for import details.
- REB triangle files
  See “Importing an REB Triangle File” on page 5-4 for import details.

Importing a TIN Surface

Follow these steps to import a TIN surface from a 3D TIN file into a 3D Project file.

1. With a 3D Project file open, click **TIN ▸ Import TIN ▸ From 3D TIN file (*.TN3)**.
2. On the ***Open*** dialog box, navigate to the location of the desired file, select it, and click **Open** (Figure 5-1). The TIN surface from the selected file is added to the 3D Project file.

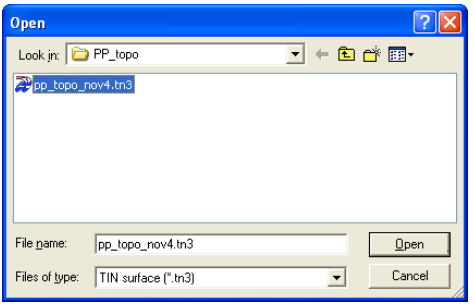


Figure 5-1. Open 3D TIN File

Importing from Pocket-3D

Follow these steps to import a Pocket-3D controller TIN file into a 3D Project file.

1. Connect the Pocket-3D controller to the computer and turn on the controller (see Appendix A for details). Run Pocket-3D on the controller.
2. With a 3D Project file open, click **TIN ▸ Import alignment ▸ From Pocket-3D controller**. 3D-Office connects with the Pocket-3D controller.
3. On the ***Pocket-3D files*** dialog box, select the file to import and press **Open** (Figure 5-2 on page 5-3). The file type is automatically selected.

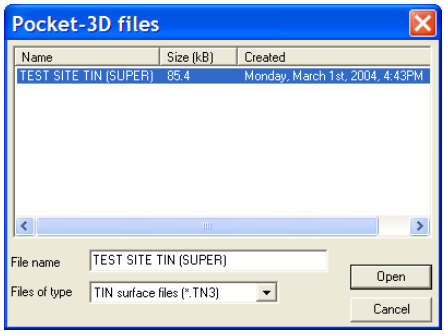


Figure 5-2. Select and Open Pocket-3D TIN File

The information from the selected file is added to the 3D Project file.

Importing from an AutoCAD File

Follow these steps to import a TIN surface from an Autocad (*dwg/dxf*) file into a 3D Project file.

1. With a 3D Project file open, click **TIN ▸ Import TIN ▸ From AutoCAD file**.
2. On the ***Open*** dialog box, navigate to the location of the desired file, select it, and press **Open** (Figure 5-3). The information from the selected file is added to the 3D Project file.

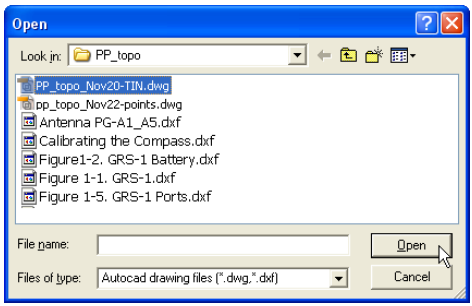


Figure 5-3. Open AutoCAD 3D TIN File

Importing an REB Triangle File

Follow these steps to import a TIN surface from an REB triangle file (*.reb) into a 3D Project file.

1. With a 3D Project file open, click **TIN ▸ Import TIN ▸ From REB triangle file (*.REB)**.
2. On the ***Open*** dialog box, navigate to the location of the desired file, select it, and press **Open** (Figure 5-4). The information from the selected file is added to the 3D Project file.

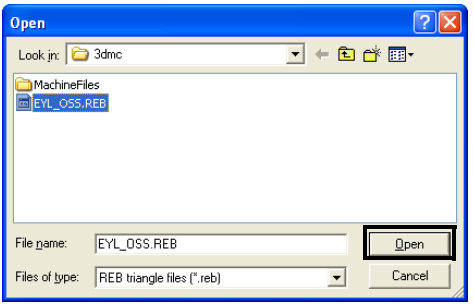


Figure 5-4. Open REB Triangle File

Opening a TIN Surface File

1. To open a 3D TIN surface file, click **File ▸ Open**.
2. On the ***Open*** dialog box, navigate to the location of the file, select the file type as TIN surface (*.tn3), select the desired file, and press **Open** (Figure 5-5).

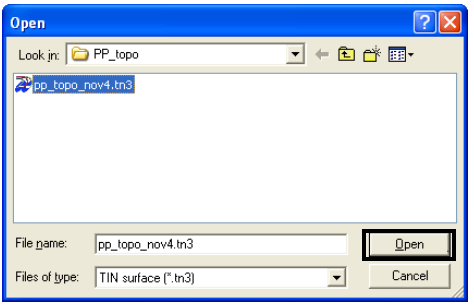


Figure 5-5. Open 3D TIN Surface File

Opening a Pocket-3D TIN File

If a Pocket-3D controller is connected to the computer, 3D-Office can open TIN surface files directly from the controller. Once opened, the file can be exported to other files or saved to the computer. See Appendix A for details on connecting a computer and controller.

1. Click **File ▸ Open Pocket-3D file**.
2. On the ***Pocket-3D files*** dialog box, select the file type (*.tn3) and the desired file, then press **Open** (Figure 5-6).

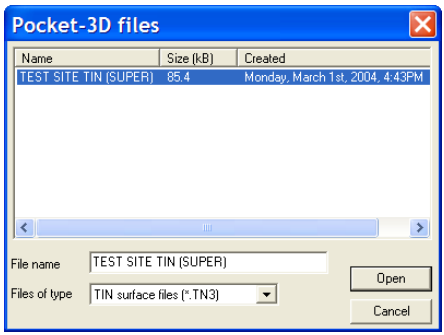


Figure 5-6. Select File and Click Open

Creating a TIN Surface File

In many applications, an elevation of the terrain or a cut/fill to a design surface is needed at an arbitrary location within the project. 3D-Office can provide this information based on a TIN model generated from the project point-data. A design surface TIN is useful for stakeout and grading, and is an essential model for 3DMC.

TIN surfaces can only be created in 3D Project files and 3D TIN files.

Creating a TIN Surface File from a 3D Alignment

3D-Office offers a powerful tool to generate a TIN model from a 3D Alignment. This is useful for comparing the existing terrain surface to

a road design surface, thus providing a means to compute cut and fill volume quantities.

1. From a 3D Project file that contains both a horizontal and vertical alignment, click **Alignment ▸ Generate TIN from 3D alignment**.
2. On the ***Generate TIN surface*** dialog box, select the desired generation parameter, and click **OK** (Figure 5-7).
   - *Generate points using regular sampling interval* – generates a TIN having more uniformly shaped triangles. This option may take longer to generate the TIN. Enter the sampling interval in the project's units.
   - *Generate points only where necessary* – may reduce the size of the TIN file. Triangle vertices will be generated at the alignment definition points and as necessary to maintain the break lines implied in the alignment definition.
   - *Maximum arc/chord separation* – sets the maximum separation distance between the straight side of the triangle and the arc of a curve. A smaller separation value will create triangle edges that will more closely approximate the curve (but this will also create more, and smaller, triangles).

   3D-Office generates a TIN model from the points of the alignment.

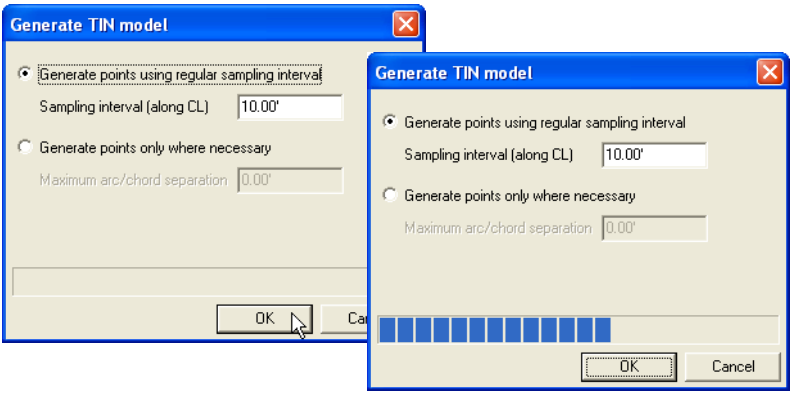


Figure 5-7. Select TIN Generation Parameters and Generate TIN Model

Creating a TIN Surface From Selected Points/Linework

3D-Office permits graphical selection of point and line data for TIN generation. This is very useful for generating a TIN model from an imported data set, for example, survey data. All selected points become vertices of the TIN mesh, and all selected lines appear as edges in the mesh. Thus the selected lines function as "breaklines;" that is, they will not be crossed by any other edges in the TIN mesh. The default boundary of the TIN is the so-called convex hull, a unique mathematical boundary for any point set. See "Creating a TIN Surface Clipped to the Selection Polygon" on page 5-8 for an alternate way to define the TIN boundary.

1. From a 3D Project file that contains points and/or linework, use the selection tool to select the elements from which to generate the TIN model. Press **Ctrl+A** to select all elements in the 3D Project.
2. Click **TIN ▸ Generate new TIN surface ▸ From selected points/linework**.

3D-Office generates a TIN model from the selected points and/or linework.

Creating a TIN Surface From Selected Triangles

3D-Office permits graphical selection of triangle data for TIN generation. This is useful for creating a TIN surface that is a subset of an existing TIN surface.

1. From a 3D Project file that contains triangles, use the selection tool to select the triangles from which to generate the TIN model.
2. Click **TIN ▸ Generate new TIN surface ▸ From selected triangles**.

3D-Office generates a TIN model from the selected triangles.

Creating a TIN Surface Clipped to the Selection Polygon

Rather than using the convex hull of the point set to define the TIN boundary, this function will clip the TIN model to the perimeter defined using the selection polygon. This provides an easy way to customize the boundary of the TIN model.

1. From a 3D Project file that contains points and/or linework, use the selection tool to select the elements from which to generate the TIN model.
2. Press **Ctrl+A** to select all elements in the 3D Project.
3. Click **TIN ▸ Generate new TIN surface ▸ Clipped to selection boundary**.

   3D-Office generates a TIN model from the selected points and/or linework, clipped to the selection polygon.

Merging TIN Surfaces

You can now merge all visible TIN surfaces together into one surface.

Click **TIN ▸ Generate new TIN surface ▸ Merge all visible TIN surfaces**.

3D-Office will merge all visible active surfaces into one new surface.

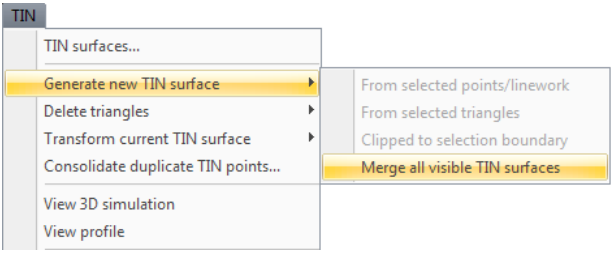


Figure 5-8. Merge TIN Surfaces

Viewing Triangle Information

TIN (Triangulated Irregular Network) surface files are comprised of a mesh of non-overlapping triangles computed from irregularly spaced points with x, y coordinates. 3D-Office opens a text file for viewing TIN triangle information.

1. Select the TIN triangles on which to view information:
   - click the individual triangle(s)
   - use the select tool to select a group of triangles
2. Click the activated **Information** button on the toolbar. A text editor window opens, displaying the coordinates for the three points of each selected triangle (Figure 5-9).

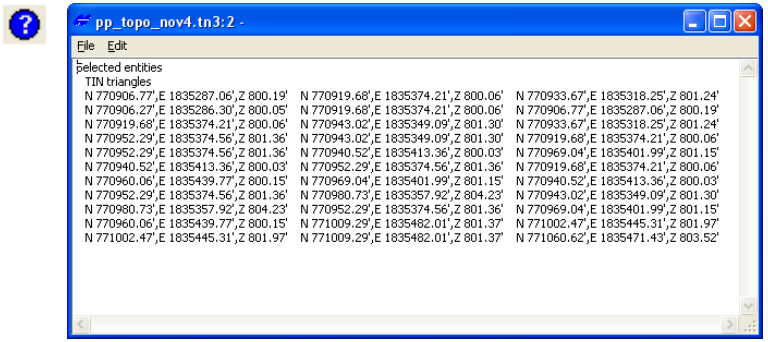


Figure 5-9. Click Information Button to View Selected Entities

3. To save the information as a text file, click **File ▸ Save as**. On the ***Save As*** dialog box, type a name for the file or keep the default file name. Navigate to the location in which to save the file and click **Save**.

Viewing and Editing TIN Surfaces

Viewing the TIN model may be helpful for getting a feel of how the point and line data are used to represent the physical land surface. The view can also be used to select triangles to delete. Triangles might be deleted in order to trim the model along its perimeter or to otherwise reduce the model size. Long, narrow triangles can also be removed if desired.

To view 3D Project's TIN surfaces, click **TIN ▸ TIN surfaces**. The ***TIN surfaces*** dialog box displays the following information about the selected TIN surface (Figure 5-10 on page 5-11):

- TIN surfaces – a listing of all TIN surfaces in the 3D Project file.
- Name – the name of the selected/current TIN surface.
- Layer – the layer in which the TIN surface exists. Click the drop-down box to change the layer for the currently selected TIN surface.
- Visible – whether or not the triangles, perimeter, and contours of the TIN surface are visible, or if these element are visible by layer.
- TIN element color boxes – the color of the TIN element (triangle, perimeter, and contour). Click the button to change the element's color.
- Number of triangles – the number of triangles on the TIN model.
- Number of points – the number of points in the TIN model.
- Number of regions – the number of regions in the TIN model.
- Number of holes – the number of holes in the TIN model.
- Surface area – the surface area of the TIN model in the project's unit.

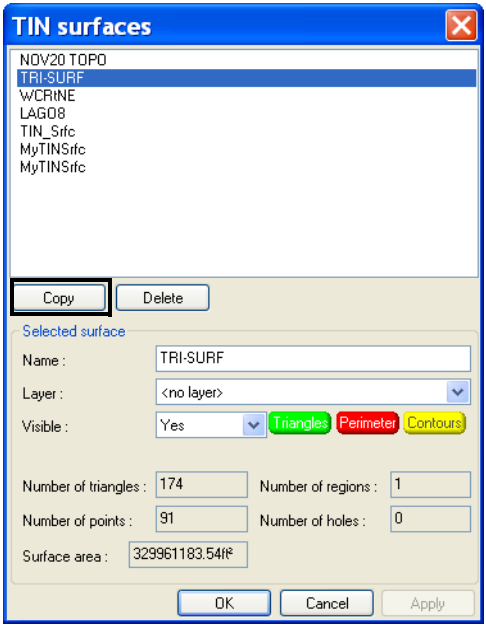


Figure 5-10. TIN Surfaces

Editing a TIN Surface

1. On the ***TIN surfaces*** dialog box (in a 3D project file, click **TIN ▸ Tin surfaces**), select the TIN surface to edit (Figure 5-10).
2. Change or edit the following parameters as needed:
   - The name of the TIN surface.
   - The layer in which the TIN surface exists.
   - If the elements of the TIN surface are visible, not visible, or visible by position in a layer.
   - The color of the triangles, perimeter, or contours of the TIN surface (click the element's button and select a new color).
3. Click **OK** to save the changes and apply then to the selected surface.

Copying a TIN Surface

The copy function provides a way to produce multiple versions of a TIN surface, which may be useful for reducing an existing TIN into one or more sub-regions. Selecting a TIN surface and clicking **OK** will display the TIN in the design view.

1. On the ***TIN surfaces*** dialog box, select the TIN surface to copy and click **Copy** (Figure 5-11).
2. Type a unique name for the new TIN surface and press **Enter** (Figure 5-11).

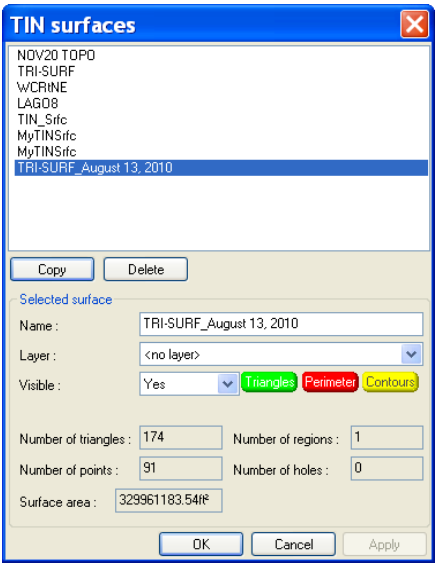


Figure 5-11. Copy and Name TIN Surface

3. Make any desired changes as described in "Editing a TIN Surface" on page 5-11.
4. To view or edit the copied TIN, select it and click **OK**.

From here, you can make changes to the TIN surface, then export it for use in another file. See "Working with TIN Surfaces" on page 5-13 for editing the TIN surface.

Deleting a TIN Surface

Only delete a surface when the data it contains will never be needed again. If necessary, save a backup copy of the file before deleting surfaces.

NOTICE Deleting a surface will also delete all of its contents.

1. On the ***TIN surfaces*** dialog box, select the TIN surface to delete and click **Delete**.
2. Click **OK** to confirm the deletion (Figure 5-12).

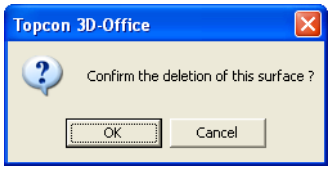


Figure 5-12. Delete TIN Surface

To undo the deletion, click **Edit ▸ Undo edit TIN surfaces** or press **Ctrl+Z**.

Working with TIN Surfaces

3D-Office provides the power to easily view, edit, and import/export TIN surfaces. The following sections describe the TIN editing functions.

Deleting Triangles with Long Sides

Before deleting information, make a backup copy of the file. This function affects the current TIN surface. If deleted triangles fall within the interior of the mesh, a red border replaces the outer edge of the deleted triangles, indicating a boundary around the "hole" left by deleted triangles.

1. If needed, select the desired TIN surface (click **TIN ▸ TIN surfaces**, select the surface and click **OK**).

2. Click **TIN ▸ Delete triangles ▸ With long sides**.
3. Enter a length to delete triangles with at least one edge greater than the entered value (Figure 5-13). 3D-Office deletes all triangles that have at least one edge as long as the length.

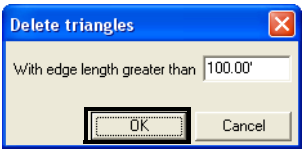


Figure 5-13. Delete Triangles with an Edge Greater Than...

3D-Office automatically regenerates the surface.

Figure 5-14 shows before and after screen shots of this process.

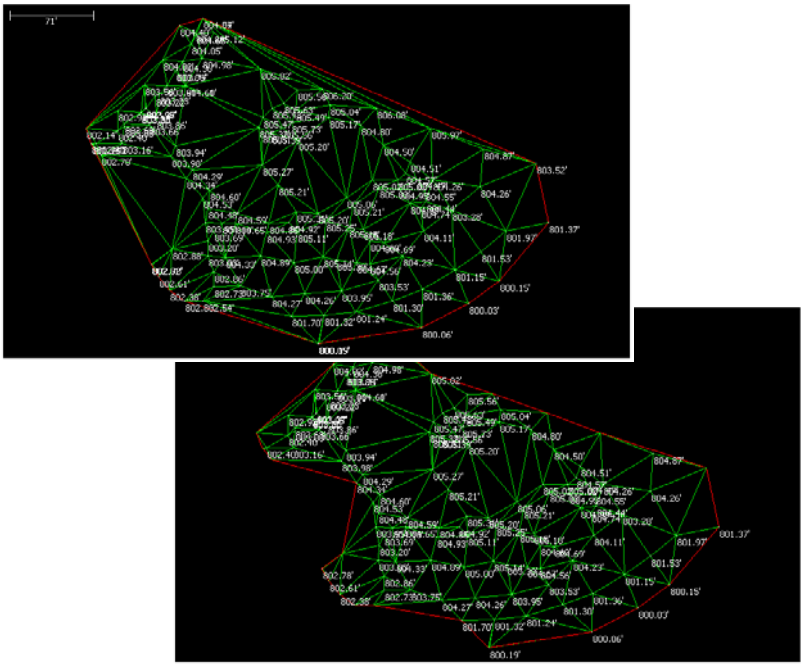


Figure 5-14. Before and After Deleting Triangles with Long Sides

Deleting Triangles

If deleting interior triangles, a red border replaces the outer edge of the deleted triangles, indicating a boundary around the “hole” left by deleted triangles.

This function affects the current TIN surface.

1. Using the select tool, click or draw a rectangle around the triangles to delete.
2. Click **TIN ▸ Delete triangles ▸ Selected** or press **Delete** on the keyboard. 3D-Office deletes the selected triangles.

   3D-Office automatically regenerates the surface.

Figure 5-15 shows before and after screen shots of this process.

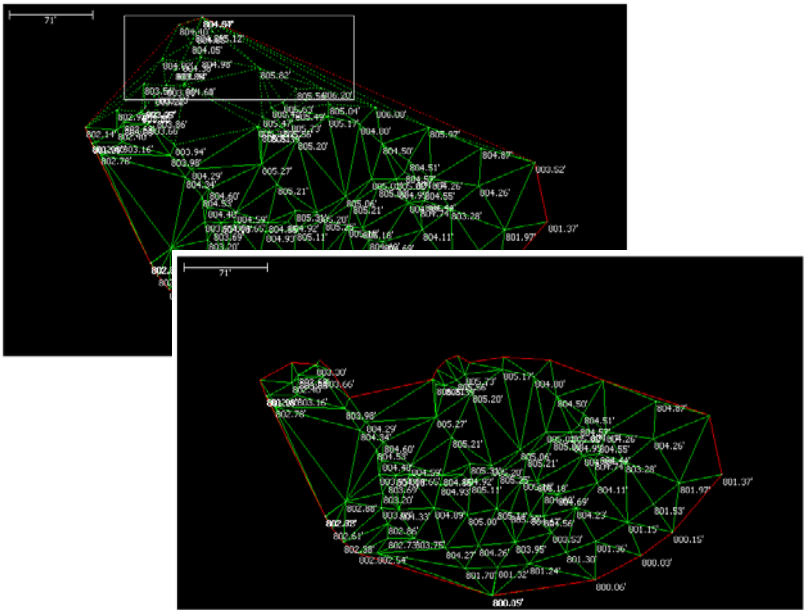


Figure 5-15. Before and After Deleting Selected Triangles

Consolidating Duplicate TIN Points

Some data sets may contain points that are so close to their neighbors that they can be considered duplicates and unnecessary. Such points will cause small or narrow triangles in the TIN mesh. The consolidate duplicate points function removes one of the “duplicate” points.

The consolidate duplicate TIN points option is only available in 3D Project files, not 3D TIN files. This function affects the current TIN surface.

1. From a 3D Project with a TIN model, click **TIN ▸ Consolidate duplicate TIN points**.
2. Enter the tolerance value and click **OK** (Figure 5-16). The tolerance value specifies the 3D distance used to consider two point to be duplicates. 3D-Office consolidates duplicate points (removing one of them from the TIN data set) and regenerates the TIN model.

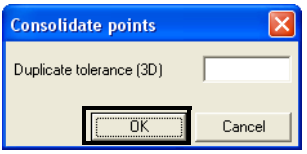


Figure 5-16. Enter the Duplicate Tolerance of Points

Viewing a 3D Simulation of the TIN Surface

The 3D-views in 3D-Office use lines and colors to give a three-dimensional perception of a field or pad on a two-dimensional screen. Using the 3D view can help to visualize what the topography or design surface looks like.

To view a simulation of the TIN surface, click **TIN ▸ View 3D simulation**. A new window opens to display an interactive, 3-dimensional, simulation of the TIN surface (Figure 5-17 on page 5-17).

- Click and hold on the screen to have the pointer rotate the view.

- The arrow keys on the keyboard control the motion of the machine: up arrow is forward, down arrow is backward, left and right arrows rotate the “ground” accordingly.
- On a mouse with a scroll wheel, use the scroll wheel to zoom in/out.
- See “3D-view and Profile View Menu Bars” on page 1-14 for details on the menus and menu items.
- See “3D-view and Profile View Toolbars” on page 1-16 for details on the 3D-view toolbar.

To play a machine log file, click **Motion ▸ Playback from log file** and select the machine log file (*.ml3) for the job. The machine on the 3D-view will move as the machine at the jobsite moved.

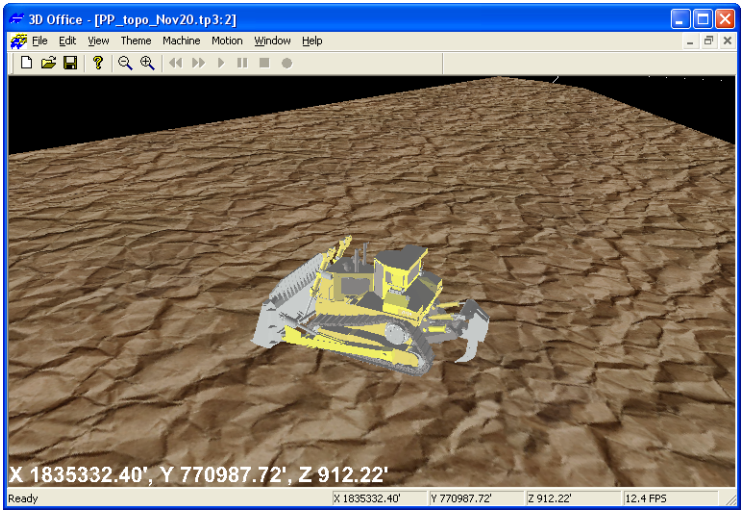


Figure 5-17. TIN Simulation

Viewing a Profile of the TIN Surface

The profile view is a powerful tool for visualizing cut and fill heights along a line through the TIN model and can be used for the following:

- to check clearances between the design surface and existing gas lines, or other utility lines, of known depth
- to determine the grade of the design or existing surface along a line

The profile can be viewed statically or dynamically by dragging the profile line across the field.

1. To view a profile of the field, click **TIN ▸ View profile**. A check mark displays next to the menu option.
2. In the Plan View, click a location at which to begin the profile. Stretch the line across the field and click once to end it (Figure 5-18).

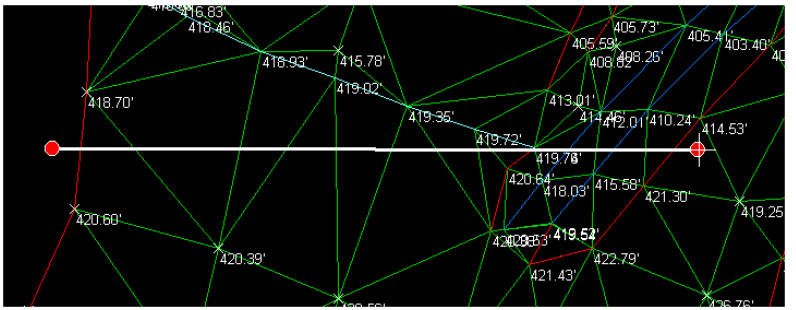


Figure 5-18. Profile View

The Profile View displays (Figure 5-19 on page 5-19) the following information:

- elevation tic marks on the left of the view window
- a cross section of the current TIN
- a pop-up box showing XY point coordinates, TIN 'Z' coordinates, and grade at the point of the crosshair
- a horizontal scale bar

- cross hair coordinates in the status bar

  The vertical exaggeration is shown as a ratio next to the elevation in the status bar on the far right.

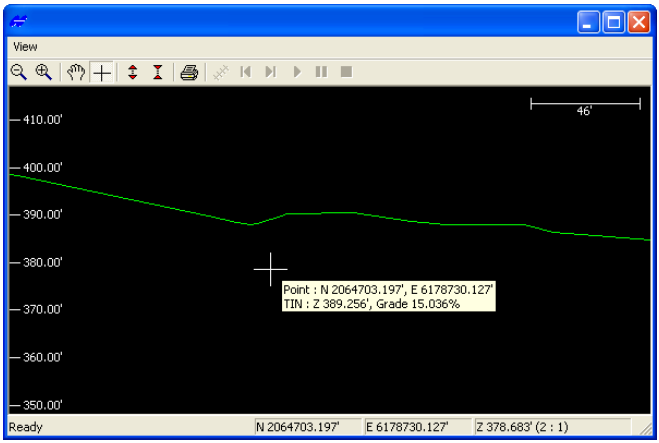


Figure 5-19. Profile View

3. On the ***View*** dialog box (Figure 5-19), use the toolbar to manipulate the view. See "3D-view and Profile View Toolbars" on page 1-16 for information on the toolbar buttons.
4. To change the position of the profile view, click in the Plan View, then click, "grab" and "drag" the start or end point of the profile line in the Design View to a new position. The "grabbed" point is green while being moved. The Profile View changes accordingly.

   Or, you can "grab" the line and shift it without changing its direction or length.

Closing the Profile View exits the profile function. Repeat steps 1 through 3 to display the profile view again.

5. To quit this function, press **Esc**.

Comparing Surfaces

When 3D-Office compares two surfaces, it computes the volume of cut and fill between the surfaces, the area of intersection between the surfaces, and the maximum and minimum cut and fill heights between the surfaces. Such information is useful for documenting excavation progress on a job.

Comparing Surfaces in 3D Project Files

The 3D Project file must have a TIN surface and at least one other surface (TIN, plane, or alignment) for this option to be available.

1. With a 3D Project file open, click **TIN ▸ Compare current TIN surface ▸ With 3D surface file**.
2. Select the *Surface of type* to compare with from the drop-down list (Figure 5-20).
3. If more that one surface type exists, select the desired surface from the surface list.
4. Click **OK**.

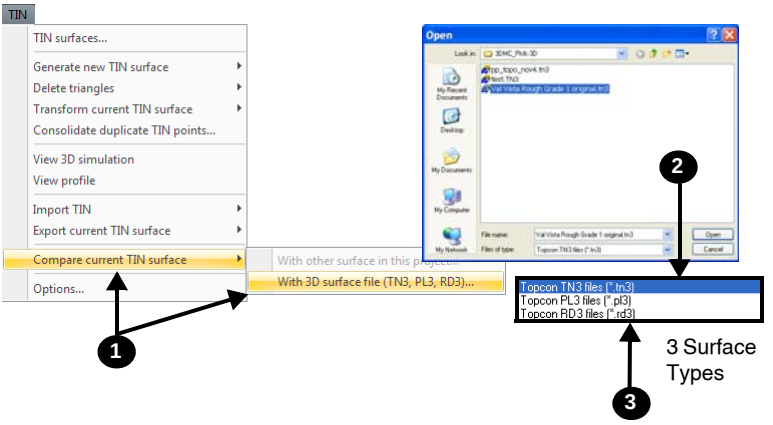


Figure 5-20. Compare Surfaces in 3D Project File

Comparing 3D Surface Files

1. With a TIN surface file or a 3D Project file open, click **TIN ▸ Compare TIN surface ▸ With 3D surface file** or **TIN ▸ Compare current TIN surface ▸ With 3D surface file**.
2. On the ***Open*** dialog box, navigate to the location of the desired file, select the file type (either TIN, Plane, or RD3 alignment), and click **Open** (Figure 5-21).

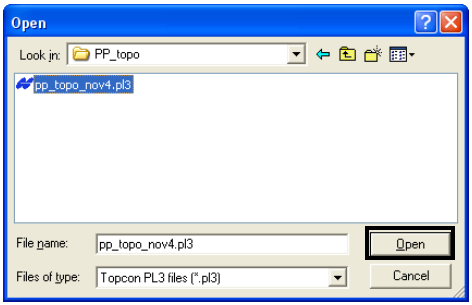


Figure 5-21. Open File to Compare With

3D-Office compares two surfaces and opens a cut/fill view to display the comparison between the two surfaces (Figure 5-22).

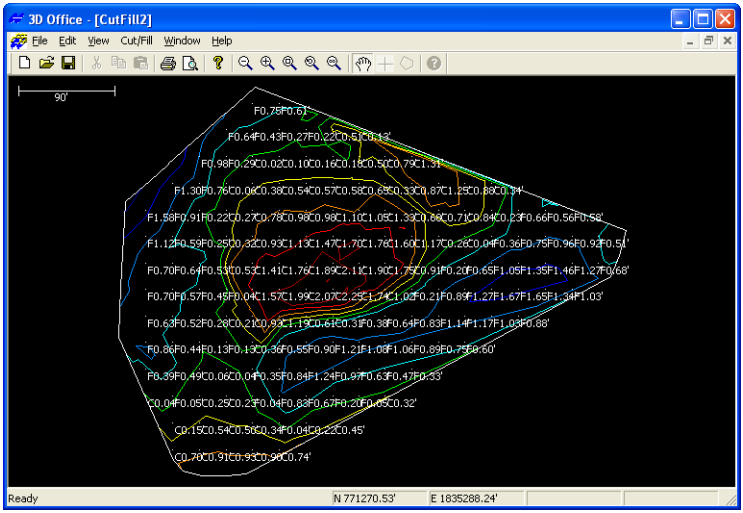


Figure 5-22. Cut/fill File for Compared Surfaces

3. View the cut/fill information. See “Cut/Fill Files” on page 9-1 for details on cut/fill surface files.
   - If needed, re-compare the surfaces after making changes tot he original surfaces (for example, changing plane parameters or deleting triangles in a TIN file).
   - Save the cut/fill file. Click **File ▸ Save as**, navigate to the desired located, type a name for the file, and click **Save**.

Setting TIN Surface View Options

The ***TIN options*** dialog box (Figure 5-23 on page 5-23) sets plan view parameters and TIN computation parameters.

1. Click **TIN ▸ Options**.

   The ***TIN options*** dialog box displays (Figure 5-23 on page 5-23).
2. On the *Plan view* tab, enable/disable the desired parameters (Figure 5-23 on page 5-23).
   - Enable or disable the *Show triangle edges*, *Show boundaries*, and *Show point elevations* as needed.
   - Enable *Show contours* and enter a parameter for the contour interval to display the contours of the TIN surface.
   - Enable *Use colors* to display the contour lines as colors associated with an elevation as shown in the color chart.
3. Click the *Triangulation* tab and enable/disable the desired parameters (Figure 5-23 on page 5-23).
   - Select either “Divide and conquer” or “Incremental” for the *Triangulation algorithm*. The default “Divide and conquer” selection is usually sufficient.
   - Enable *Ok to generate and add interpolated points to data set* as needed. Use this function if the length of linework segments included in the TIN model were generally longer than the length of the typical triangle edge. Otherwise, long line segments included in the TIN might cause long, narrow

triangles along the linework. If enabling this parameter, select the desired sub-parameters.

4. Press **OK** to apply the view and triangulation options to the TIN file.

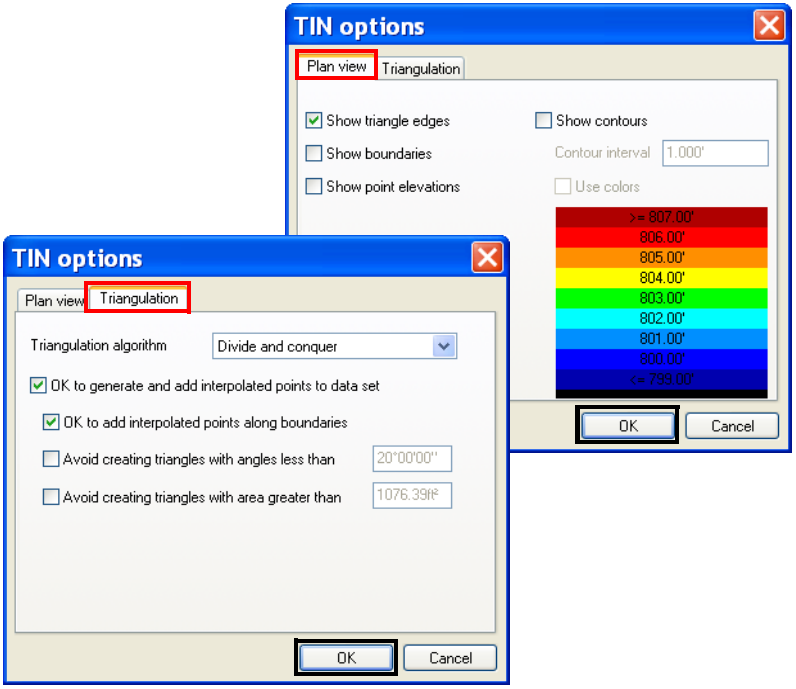


Figure 5-23. Set Plan View and Triangulation Options

Setting Unit Options

The ***Project options*** dialog box sets the type of units to use for the various quantities used in the 3D Project.

To set unit options in a TIN file, click **View ▸ Options**. The dialog box that displays has the same fields as for 3D Project files. See “Setting Project Units” on page 2-35 for details on the *Units* tab.

Exporting a TIN Surface

If you made changes to a TIN surface, you can export the changed surface to a new TIN file, or replace an existing file with the new information.

Export versions of the file to track progress.

Exporting a TIN Surface to a TIN Surface File

1. Select **TIN ▸ Export current TIN surface ▸ To 3D TIN file (*.TN3)**.
2. On the ***Save As*** dialog box, do one of the following (Figure 5-24):
   - To export to an existing TIN file, navigate to the location of the file and select it, then click **Save** (the contents of the existing file are replaced).
   - To save to a new file, navigate to the desired folder, type a name for the new file, and click **Save**.

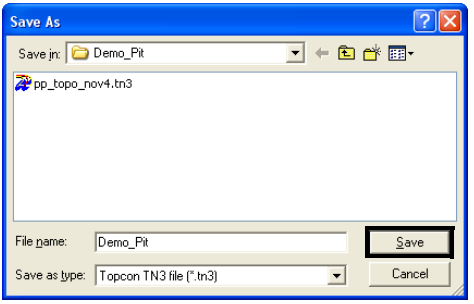


Figure 5-24. Save TIN Surface File

The selected TIN surface overwrites the existing file or creates a new 3D TIN surface file.

Exporting a TIN Surface to Pocket-3D

To use the TIN surface file in the field, export it to a Pocket-3D controller.

1. Connect the Pocket-3D controller to the computer and turn on the controller (see Appendix A for details). Run Pocket-3D on the controller.
2. With a TIN surface file or 3D Project open, click **TIN ▸ Export TIN surface ▸ To Pocket-3D controller** or **TIN ▸ Export current TIN surface ▸ To Pocket-3D controller**.
3. On the ***Pocket-3D files*** dialog box, do one of the following and click **Save** (Figure 5-25):
   - Select an existing file to replace.
   - Enter a new file name or keep the default file name.

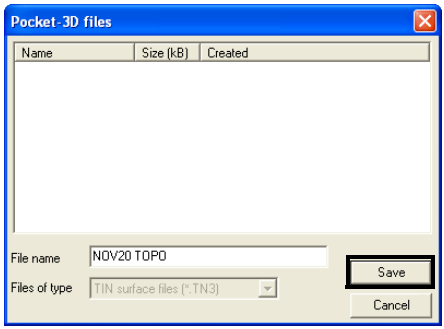


Figure 5-25. Save TIN Surface File to Pocket-3D Controller

Notes:

Alignment Files

An alignment defines the route of a road, utility line, water way, etc., and is typically comprised of both horizontal and vertical elements. Also, an alignment may include cross-sectional information. This chapter The following topics describe creating alignments and how alignments are used in 3D-Office.

Opening an Alignment File in 3D-Office

1. Click **File** ▸ **Open** to open a 3D alignment file.
2. On the ***Open*** dialog box, navigate to the location of the file, select the file type as Alignment (*.rd3), select the desired file, and click **Open** (Figure 6-12).

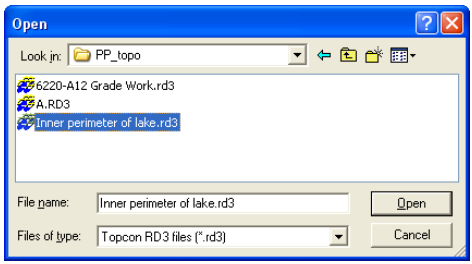


Figure 6-1. Open 3D Alignment File

Tools Menu Options

On the Tools menu in 3D-Office, you can compute the distance between points and areas of polygons, show the elevation of a selected surface, and you can compare surfaces of two or more alignment files.

Measuring the Distance/Area of the Alignment

1. To measure (compute) the distance/area of a selected point on the alignment surface, click **Tools ▸ Measure distance/area** (Figure 6-2).

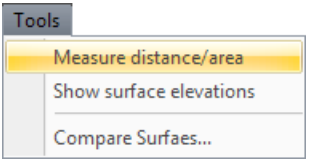


Figure 6-2.

The pop-up to measure the Length/Bearing of a selected point on the alignment surface displays (Figure 6-3).

2. Double-click on the mouse to select the points you want to measure.

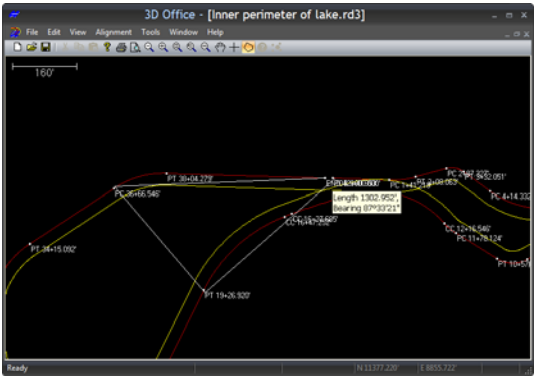


Figure 6-3. Measure DIstance/Area of Selected Point(s)

3. Press the **Esc** key to end the routine.

Showing Surface Elevations

1. To display the elevation anywhere within the alignment, click **Tools ▸ Show surface elevations** (Figure 6-4).

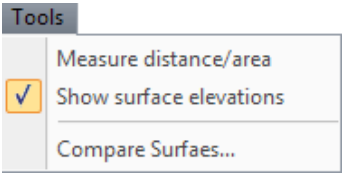


Figure 6-4. Check Elevations to All Surfaces

2. Drag the cursor anywhere within the surface to display the elevation (Figure 6-5).

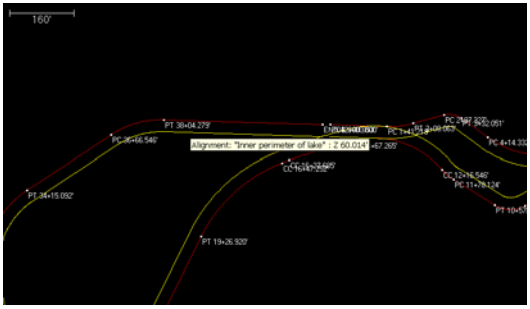


Figure 6-5. Show Surface Elevation for Alignment

3. Click **Tools ▸ Show surface elevations** to end the routine.

Comparing Alignment Surfaces

To compare grid surfaces in an alignment file, click **Tools ▸ Compare surfaces.**

The ***Grid Surfaces*** dialog box displays (Figure 6-6 on page 6-4).

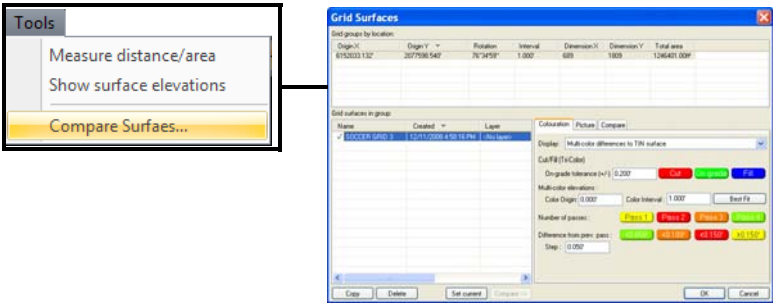


Figure 6-6. Compare Grid Surfaces

See “Viewing Grid Information” on page 8-10 and Figure 8-15 on page 8-11 for more information on this dialog box.

Importing and Opening an Alignment

3D-Office opens three dimensional alignment files for viewing and editing horizontal centerlines and vertical profiles, creating and applying templates, viewing a vertical profile or 3D simulation, exporting an alignment, or setting alignment options.

3D-Office imports alignments into 3D Project files from three file types:

- 3D alignment files (*.rd3)
  See “Importing an Alignment” on page 6-5 for details.
- Pocket-3D controller files
  See “Importing from Pocket-3D” on page 6-6 for details.
- LandXML files
  See “Importing a LandXML Alignment File” on page 6-6 for details.

On the ***Open*** dialog box, navigate to the location of the file, select the file type as Alignment (*.rd3), select the desired file, and click **Open** (Figure 6-12).

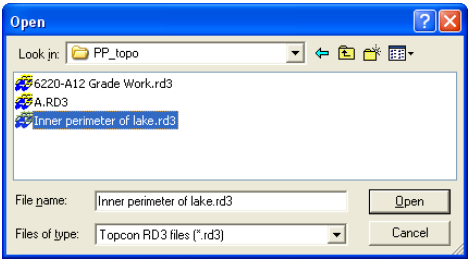


Figure 6-7. Open 3D Alignment File

Importing an Alignment

Follow these steps to import an alignment from a 3D alignment file into a 3D Project file.

1. With a 3D Project open, click **Alignment ▸ Import alignment ▸ From 3D alignment file (*.RD3)**.
2. On the ***Open*** dialog box, navigate to the location of the desired file, select it, and click **Open** (Figure 6-8). The alignment from the selected file is added to the 3D Project file.

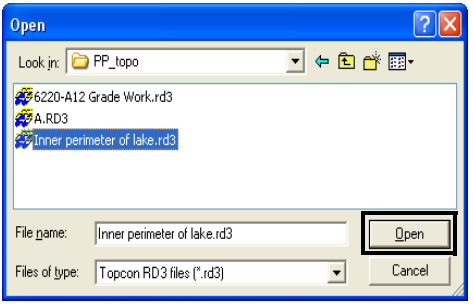


Figure 6-8. Import 3D Alignment File

Importing from Pocket-3D

Follow these steps to import an alignment from a Pocket-3D controller into a 3D Project file.

1. Connect the Pocket-3D controller to the computer and turn on the controller. See Appendix A for details. Run Pocket-3D on the controller.
2. With a 3D Project open, click **Alignment ▸ Import alignment ▸ From Pocket-3D controller**. 3D-Office connects with the Pocket-3D controller and retrieves alignment files.
3. On the ***Pocket-3D files*** dialog box, select the file to import and click **Open** (Figure 6-9). The file type is automatically selected. The alignment information from the selected file is added to the 3D Project file.

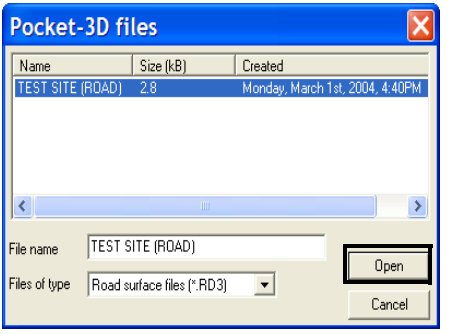


Figure 6-9. Select and Open Pocket-3D Alignment File

Importing a LandXML Alignment File

Follow these steps to import an alignment from a LandXML file into a 3D Project file.

1. With a 3D Project file open, click **Alignment ▸ Import alignment ▸ From LandXML file**.

2. On the ***Open*** dialog box, navigate to the location of the desired file, select it, and click **Open** (Figure 6-10).

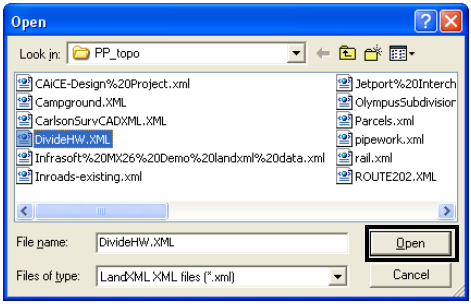


Figure 6-10. Open LandXML File

3. On the ***Import LandXML alignment(s)*** dialog box, select the desired alignment(s) (Figure 6-11 on page 6-8) and press **Open**.
   - Click the desired alignment(s).
   - Hold down the **Shift** key to select groups of alignments.
   - Hold down the **Ctrl** key to select separate alignments.
   - Press **Select All** to select all available alignments. The button toggles to a **Select First** button to select only the first alignment.

   When selecting all alignments, any cross-section surfaces associated with the selected alignments will display in the bottom pane.
4. If the alignment selected in the top pane contains cross-section surfaces, click **Import <CrossSectionSurf> as TIN surfaces** to select/de-select the desired surfaces in the bottom pane.

   By default, all cross-section surfaces will be imported as TIN surfaces. Uncheck the box to prevent the surface from being imported.

   The selected alignments from the LandXML file are added to the 3D Project file.

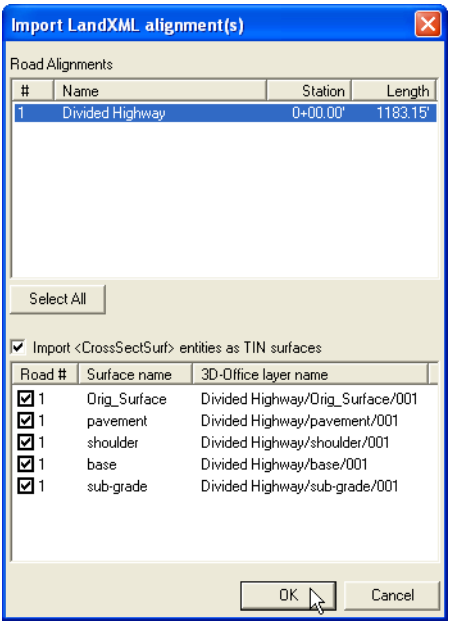


Figure 6-11. Select LandXML Alignment(s)

Importing Alignment Features

A 3D Project file can import horizontal centerlines, vertical profiles, and cross sections from other files types.

To import a horizontal centerline, click Alignment ▸ Import alignment ▸ Horizontal centerline ▸ From CLIP file (*.plt). Navigate to and select the *.*PLT* CLIP file and click **Open**.

To import a vertical profile, click Alignment ▸ Import alignment ▸ Vertical profile ▸ From CLIP file (*.*ALZ*). Navigate to and select the *.*ALZ* CLIP file and click **Open**.

To import a cross section, click Alignment ▸ Import alignment ▸ X-section ▸ <file type>. Navigate to and select the desired file and click **Open**. Cross sections can be imported from ISPOL files (*.sc1), CLIP files (*.trv), and InRoads files (*.soe).

Opening an Alignment in 3D-Office

1. Click **File ▸ Open** to open a 3D alignment file.
2. On the ***Open*** dialog box, navigate to the location of the file, select the file type as Alignment (*.rd3), select the desired file, and press **Open** (Figure 6-12).

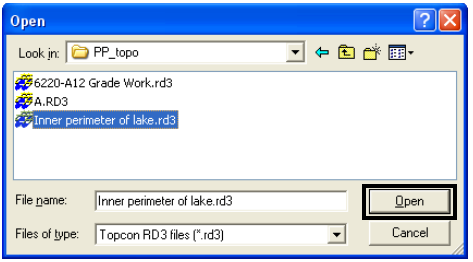


Figure 6-12. Open 3D Alignment File

Opening a Pocket-3D Alignment File

If a Pocket-3D controller is connected to a computer, 3D-Office can open alignment files directly from the controller. Once opened, the file can be exported to other files or saved to the computer.

1. Connect the Pocket-3D controller to the computer and turn on the controller. See Appendix A for details.
2. Click **File ▸ Open Pocket-3D file**.
3. On the ***Pocket-3D files*** dialog box, select the file type (*.rd3) and the desired file, then click **Open** (Figure 6-13). The Pocket-3D alignment file opens in 3D-Office.

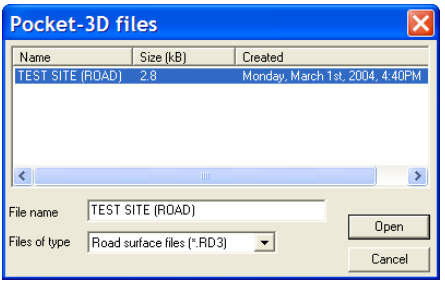


Figure 6-13. Select File and Click Open

Creating and Editing an Alignment in a 3D Project File

The following sections give details on creating an alignment in a 3D Project file using imported linework or user-drawn polylines. Steps for creating and applying basic road templates are also given.

A layer must exist before creating an alignment. See “Managing Layers” on page 2-16 for layer information.

Creating a Polyline

An alignment can be created from either a newly drawn polyline or imported linework.

- If drawing a polyline, see “Creating Linework” on page 4-5.
- If importing linework, see “Importing and Opening Linework” on page 4-1.

1. With the selection tool, select the polyline or linework and click **Linework ▸ Convert polyline(s) to alignment**.
2. Enter a name for the new alignment and the connectivity tolerance for multiple polylines, then click **OK** (Figure 6-14). Selected polylines whose end points are within the tolerance from each other will be linked in the new alignment definition.

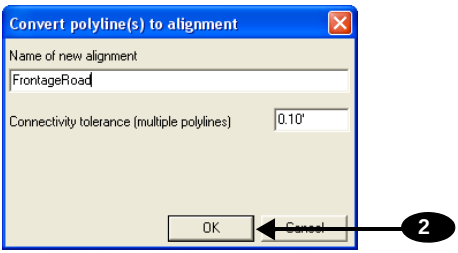


Figure 6-14. Set New Alignment Parameters

Creating Feature Line Templates

1. Click **Alignment ▸ Templates** and press **Add** on the *Road templates* dialog box (Figure 6-15).

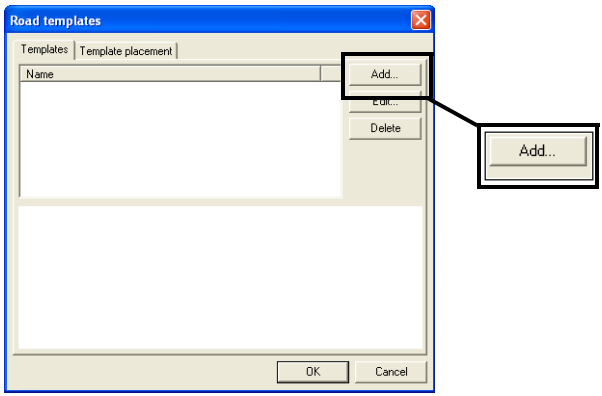


Figure 6-15. Add Feature Line Template

2. Enter a name for the template and press **Add** on the ***Edit template*** dialog box. Select the first element type as *Offset from CL*, enter the *H.Dist* and *V.Dist* values, and press **OK** (Figure 6-16).

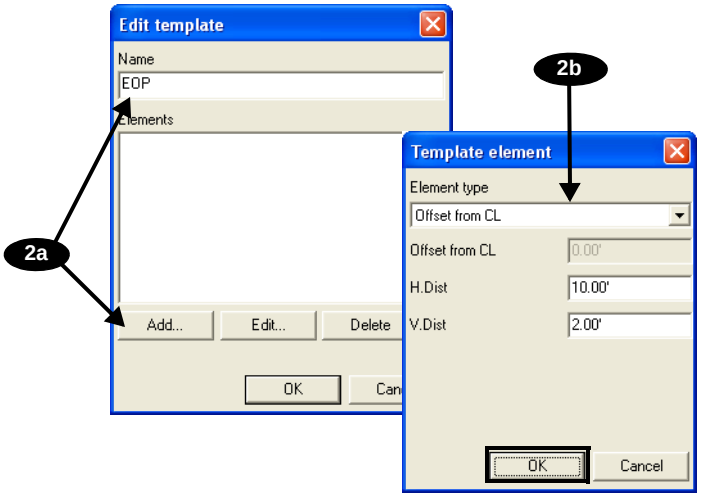


Figure 6-16. Set First Template Element

3. Press **Add** to enter further elements, selecting from the Grade, H.Dist & V.Dist, Curb, and Side slope as needed (Figure 6-17). Click **OK** to save the element.

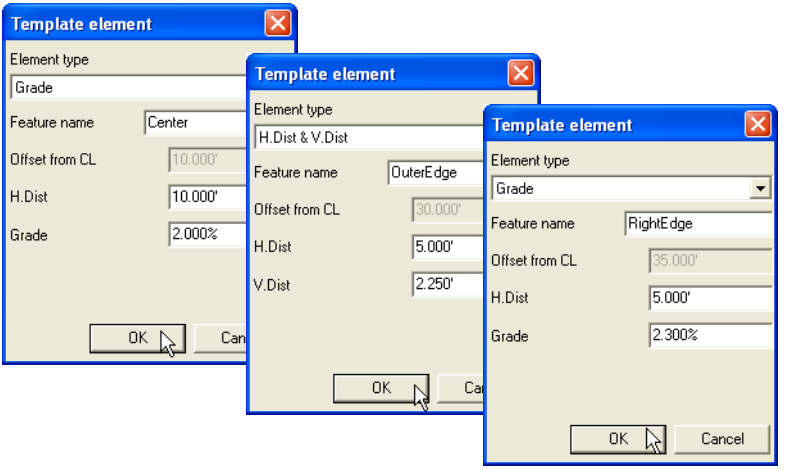


Figure 6-17. Add Templates Elements

4. Press **OK** to save template. Press **OK** again to save the template to the file (Figure 6-18).

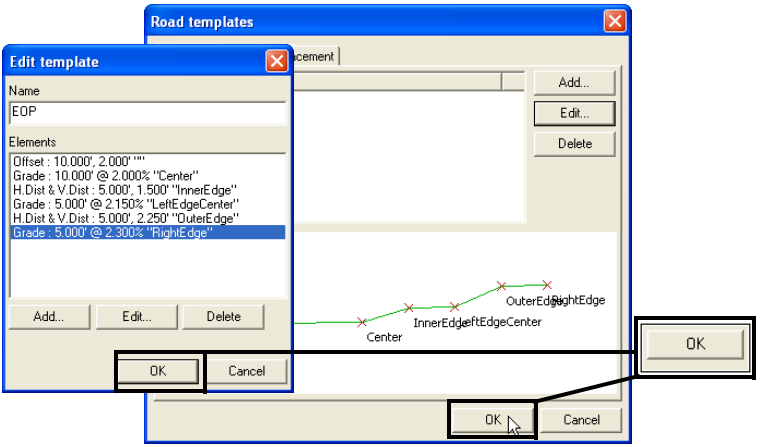


Figure 6-18. Save Template

Placing a Road Template

1. Click **Alignment ▸ Templates** and click the *Template placements* tab. Then press **Add** (Figure 6-19).

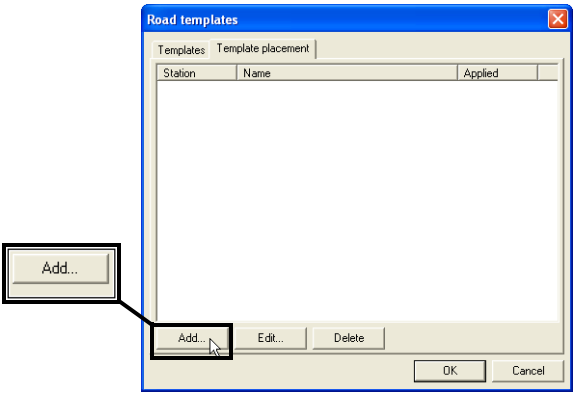


Figure 6-19. Place Road Templates

2. Select the *Template*, the *Side of centerline to apply it to*, and the *Station* to start at. Then press **OK** (Figure 6-20).

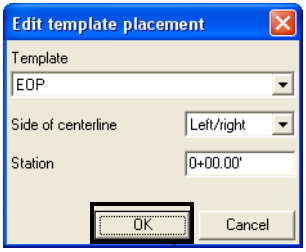


Figure 6-20. Apply Template to Centerline

3. Press **OK** on the ***Road template placement*** dialog box to place the template and view the result on the Plan View (Figure 6-21 on page 6-14). If needed, set view options to view template information (see “Setting View Options” on page 6-41 for details).

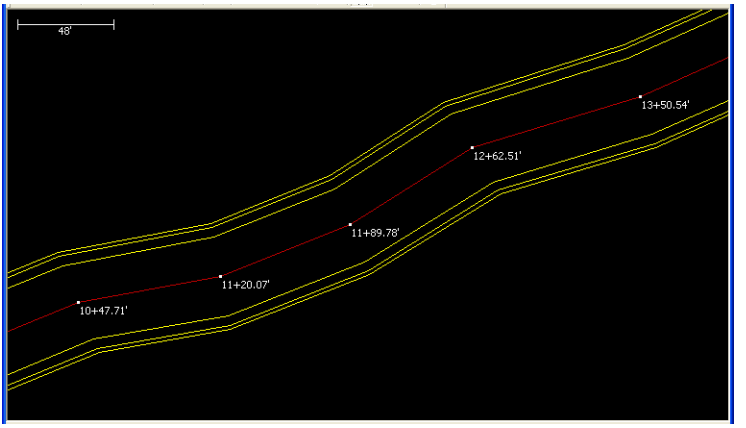


Figure 6-21. Alignment with Templates

Editing Templates

1. Click **Alignment** ▸ **Templates**.
2. Select the template and press **Edit**.
3. Press **Add** to add more elements, or select an element and click **Edit** to change its parameters.
4. When finished, press **OK** until the main screen appears. The changes are automatically applied to the alignment file.

Using Multiple Templates

Use multiple templates for a complicated project with frequent or sudden changes—for example, when the road narrows and widens at spots along the way, or in grade changes.

1. Follow the steps in “Creating Feature Line Templates” on page 6-11 for each new template.
2. When finished, apply the templates as seen in “Placing a Road Template” on page 6-13.

All templates within a single alignment must have the same number of elements on the respective road sides.

Viewing and Editing Alignments

To view an existing alignment in a 3D Project, click **Alignment ▸ Alignments**. The ***Alignments*** dialog box (Figure 6-22) lists all existing alignments in the 3D Project.

- Select an alignment to view its name, layer information, and station properties in the lower part of the dialog box.
- Press **OK** to display the selected alignment in the plan view.

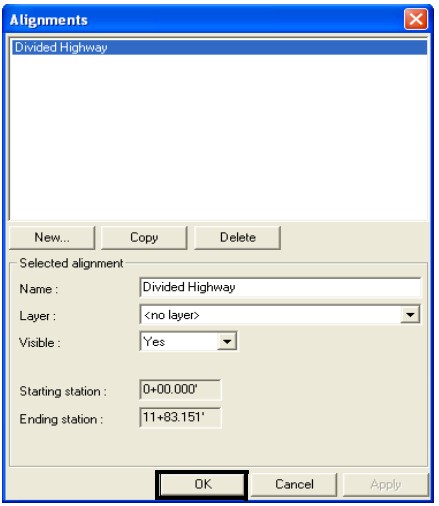


Figure 6-22. Alignments in 3D Project

The Alignments option is only available in 3D Project files, not 3D Alignment files.

Copying an Alignment

The copy function is useful for creating a new alignment that has components common to an existing alignment.

Selecting an alignment and pressing **OK** will display that version on the Plan View. From there, the current alignment can be edited and exported for use in other files.

1. On the ***Alignments*** dialog box, select the alignment to copy and press **Copy** (Figure 6-23).
2. Type a unique name for the new alignment and press **Enter** or click elsewhere on the screen (Figure 6-23).

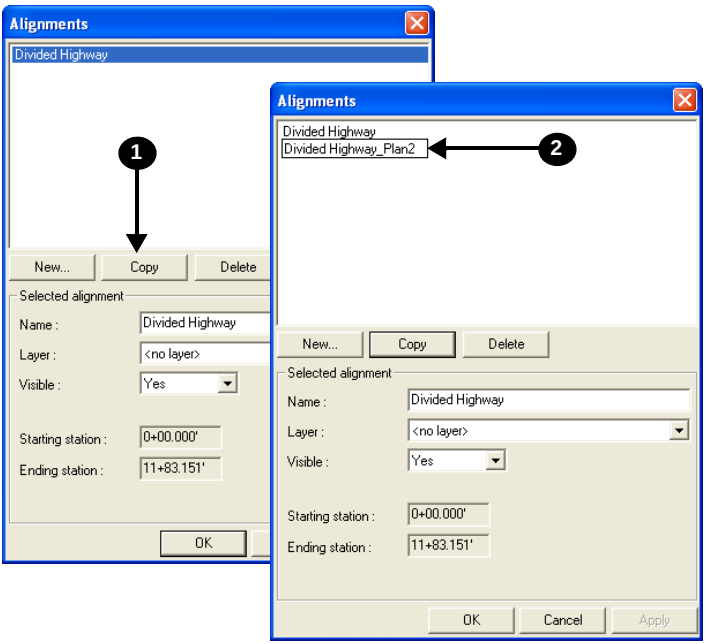


Figure 6-23. Copy and Name Alignment

3. Make layer and visibility changes to the selected, new alignment as applicable. Or rename it if needed.
4. If needed, select the new alignment and press **OK** to view it on the Plan View.

Deleting an Alignment

Delete an alignment only when the data it contains will never be needed again. If necessary, save a backup copy of the file before deleting alignments.

NOTICE

Deleting an alignment will also delete all of its contents.

1. On the ***Alignments*** dialog box, select the alignment to delete and press **Delete** (Figure 6-24).
2. Press **OK** to confirm the deletion (Figure 6-24).

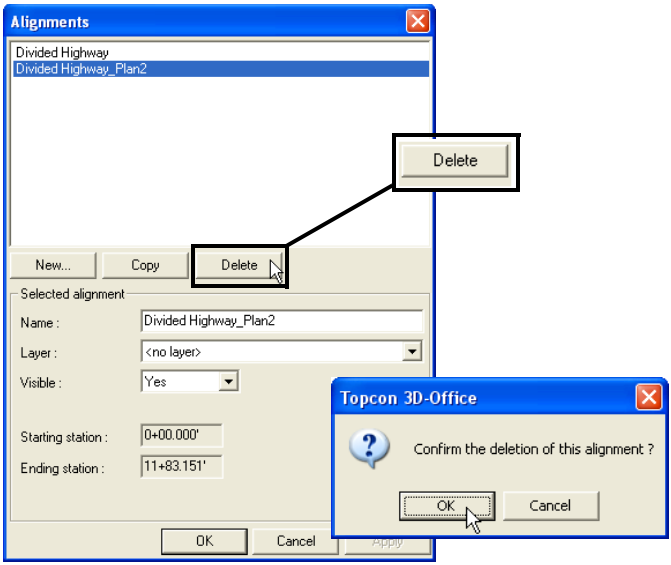


Figure 6-24. Delete Alignment

To undo the deletion, click **Edit ▸ Undo edit alignments** or press **Ctrl+Z**.

Horizontal Elements

Horizontal elements define the location of the alignment in the horizontal plane. Horizontal elements consist of straight segments, curves, and spiral curves. Each segment has an associated beginning and ending station, beginning and ending coordinates, and curve parameters (if it is a curve).

To view, add, or edit horizontal elements, click **Alignment ▸ Horizontal centerline**. The ***horizontal alignment table*** displays along with the plan view. The table contains the following information about each horizontal element in the alignment file (Figure 6-25 on page 6-19):

- Start station – the starting station of the element
- Element – the element type; either Straight, Curve PC-PT, Spiral TS-SC, or Spiral SC-ST
- Curve Dir – the direction of the curve; either left or right
- Length – the length of the element in the project units
- Radius In/Out – the radius of the curve or spiral
- Start E(X), Start N(Y) – the horizontal coordinates of the beginning point of the element
- Start Azi – the starting azimuth (direction) of the element
- End station – the ending station of the element

To import a horizontal centerline, see “Importing Alignment Features” on page 6-8.

Adding a Horizontal Element

When selecting elements on the ***horizontal alignment table***, fields highlighted in yellow can be edited; fields highlighted in red cannot be edited.

On the ***horizontal alignment table***, press **Add**. The new element is added at the end of the horizontal elements table (Figure 6-25).

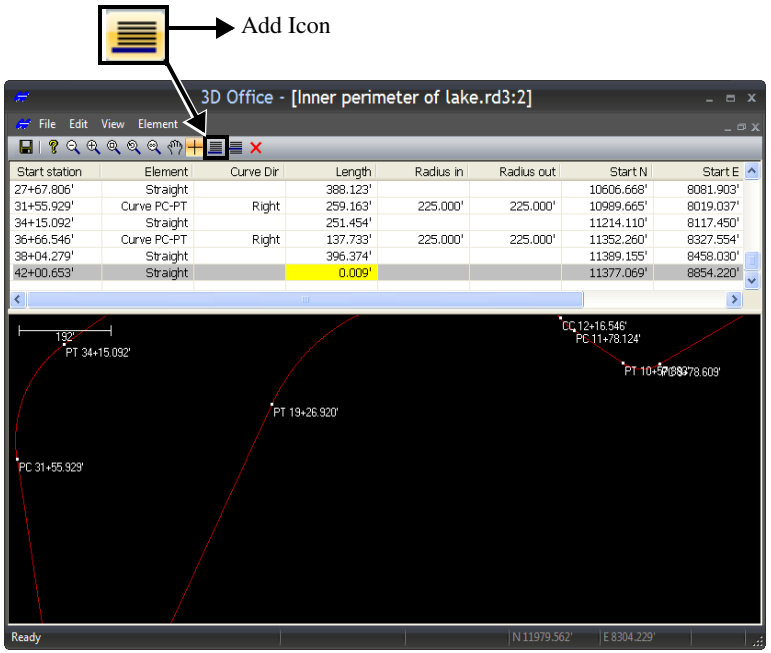


Figure 6-25. Add New Element

See “Editing a Horizontal Element” on page 6-21 for editing the element’s fields.

Inserting a Horizontal Element

An inserted element is placed above the selected element. Inserting an alignment element will affect all elements following the new element.

On the ***horizontal alignment table***, select an element to insert the new element before and press **Insert** (Figure 6-26).

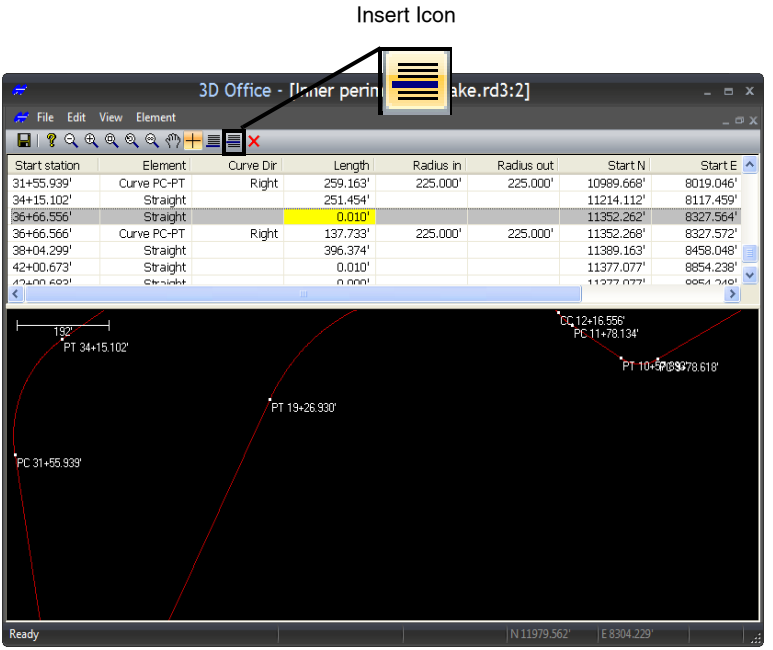


Figure 6-26. Insert New Element

See “Editing a Horizontal Element” on page 6-21 for editing the element’s fields.

Editing a Horizontal Element

The editable cells of the ***horizontal alignment table*** contain either drop-down lists or text entry boxes for editing horizontal element components.

Editable cells highlight in yellow; static cells highlight in red.

Except for the first record, *Start Station*, *Start X*, *Start Y*, and *End station* cannot be directly changed; however, they could be changed indirectly when editing fields they are based on.

To edit a horizontal element, double-click (or select and press **F2**) to place the table cell in edit mode (Figure 6-27).

- For drop-down lists, click the selection. Element types include *Straight, Curve PC-PT, Spiral TS-SC,* and *Spiral SC-ST*. Curve directions are either *Right* and *Left*.
- For text entry boxes, type the value and press **Enter**.

Any changes are reflected in the plan view below the table.

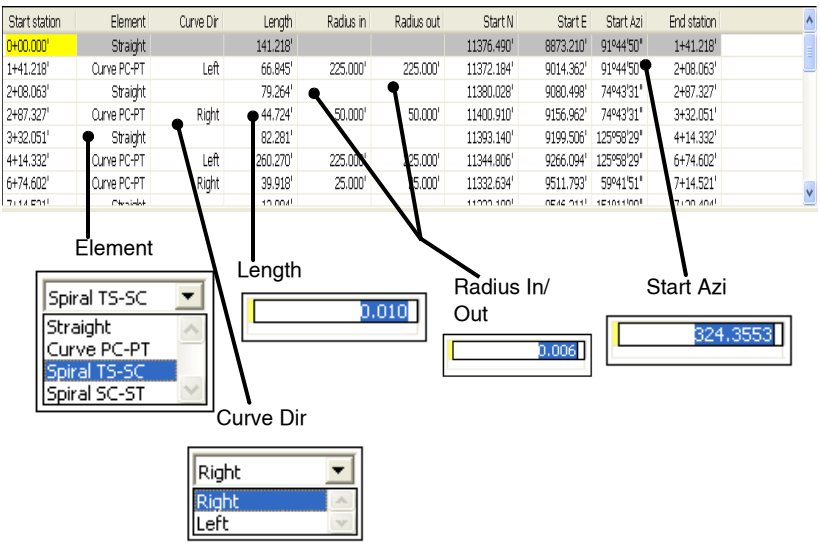


Figure 6-27. Edit Element

Deleting a Horizontal Element

To delete an element from the file, select the desired element from the ***horizontal alignment table*** and click **Delete**, or click **Element ▸ Delete ▸ Current record**. Deleting an alignment element will affect all following elements.

Click **Edit ▸ Undo delete element** to return the deleted element to the list.

Printing Horizontal Elements

When the ***horizontal alignment table*** displays, the File menu contains specific options for previewing and printing the table or graph (Figure 6-28).

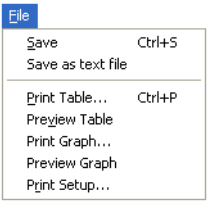


Figure 6-28. File Menu for Horizontal Elements List

Before printing, view the display by clicking **File > Preview Table**

Saving the Horizontal Alignment Table as a Text File

The File menu contains an option to save the horizontal elements list as a text file. Click **File ▸ Save as text file**, then save the file to the desired location using the ***Save As*** dialog box.

The text file will include all information shown in the table, as well as the date, file name, and road name.

Vertical Profile Elements

Vertical profile elements define the height component of the alignment. The elements are either constant-grade lines or (parabolic) vertical curves.

To view, add, edit, or copy vertical profiles, click **Alignment ▸ Vertical profile**. The ***vertical profile table*** displays along with the profile view. The table contains the following information about the vertical alignment (Figure 6-29):

- Element – the type of the vertical element
- Sta @ PVI – the station at the point of vertical intersection
- Elev @ PVI – the elevation at the point of vertical intersection
- Radius/K-value – ??
- Curve Length – only for vertical curve elements, the length of the vertical curve
- Grade @ PVT – displays the grade at the point of vertical tangency
- Grade @ PVC – displays the grade at the point of vertical curve

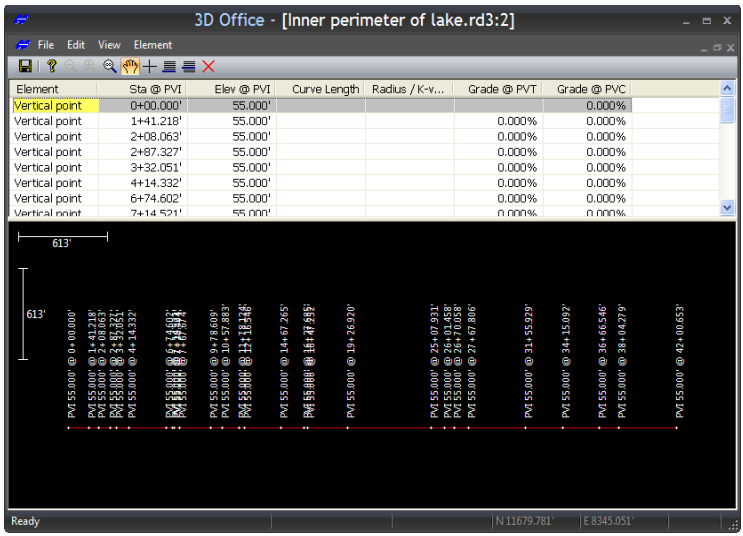


Figure 6-29. Vertical Alignments

To import a vertical profile, see “Importing Alignment Features” on page 6-8.

Adding a Profile Element

When adding a new vertical profile element, 3D-Office places the new record at the end of the table and highlights it for editing.

On the ***vertical profile table***:

Click ***Element Add*** on the **Add** icon. The new element is added to the end of the table (Figure 6-30).

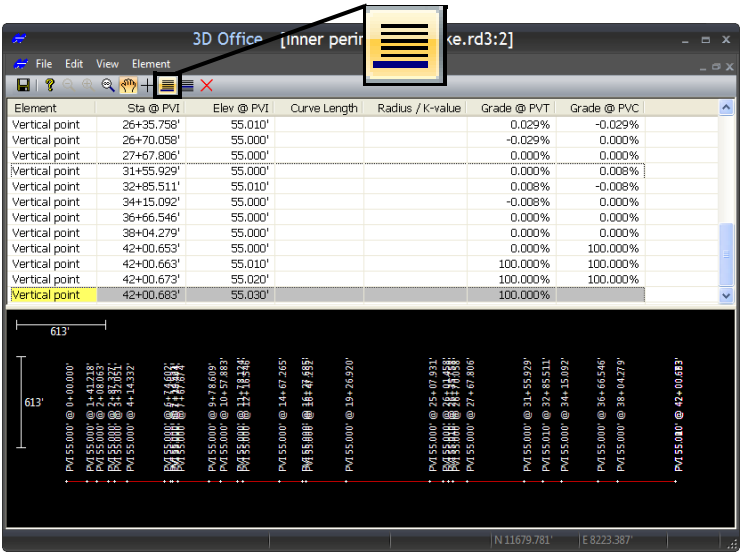


Figure 6-30. Add New Element

See “Editing a Vertical Profile Element” on page 6-26 for editing the element’s fields.

Inserting a Vertical Profile Element

An inserted curve is placed above the curve. Inserting an alignment element will affect all elements following the new element.

On the ***vertical profile table***:

To insert a new element, highlight an element and click **Element** ▸ **Insert** or click on the **Insert** icon (Figure 6-31).

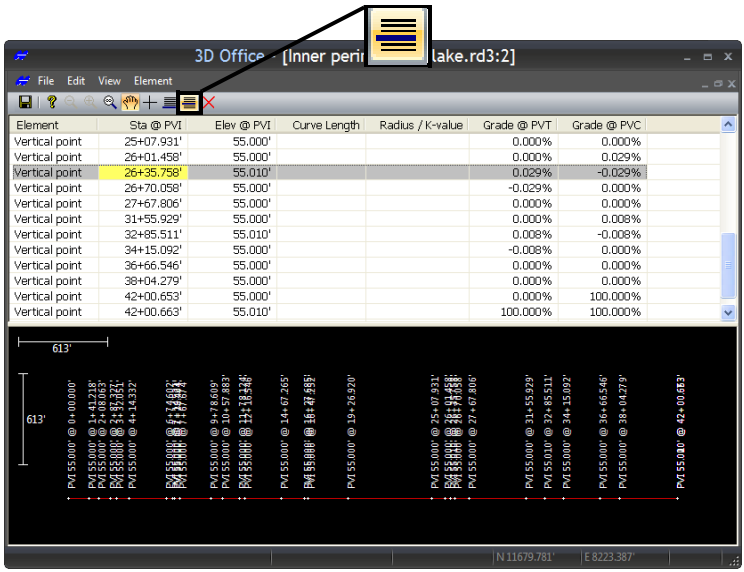


Figure 6-31. Insert New Element

See “Editing a Vertical Profile Element” on page 6-26 for editing the element’s fields.

Editing a Vertical Profile Element

The editable cells of the ***vertical profile table*** (Figure 6-32) contain either drop-down lists or text entry boxes for editing element components.

Editable cells highlight in yellow; static cells highlight in red.

NOTE: *Grade@PVT* and *Grade@PVC* cannot be directly changed; however, they can be changed indirectly by editing the fields that they are based on.

To edit a vertical profile element, double-click (or press **F2**) the desired cell to place the cell in edit mode (Figure 6-32).

- For drop-down lists, click the selection. Elements include Vertical point and Symbol parabola.
- For text entry boxes, type the value and press **Enter**.

Any changes are reflected in the plan view below the vertical curves table.

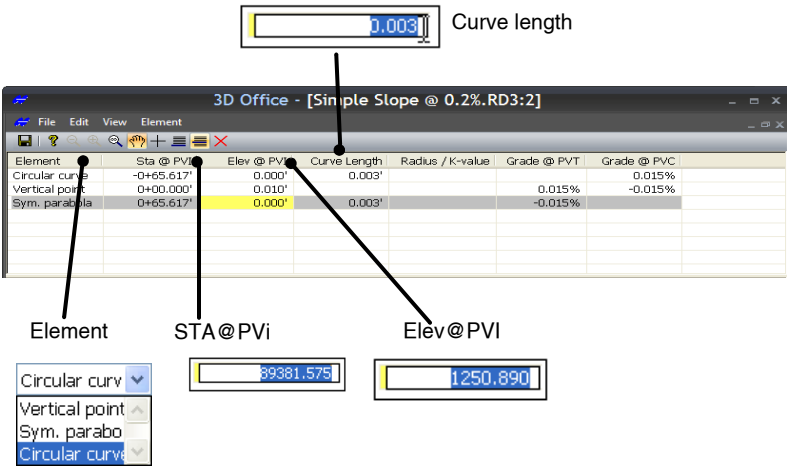


Figure 6-32. Edit Element

Deleting a Vertical Profile Element

To delete an element, select the desired element from the ***vertical profile table*** and press **Delete**, or click **Element ▸ Delete ▸ Current record**. Deleting an element will affect all following elements.

Click **Edit ▸ Undo delete element** to return the deleted element to the list.

Printing Vertical Profiles

When the ***vertical profile table*** dialog box displays (Figure 6-32 on page 6-26), the File menu contains specific options for previewing and printing the table or profile view (Figure 6-33).

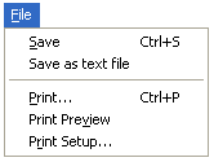


Figure 6-33. File Menu for Vertical Profile View

To print either view, click in the view to make it active, then click **File ▸ Print**.

Before printing, view the display using the Print Preview.

Saving the Vertical Profile Table as a Text File

To save the ***vertical profile table*** as a text file, click **File ▸ Save as text file**, then save the file to the desired location using the ***Save As*** dialog box.

The text file will include all information shown in the table, as well as the date, file name, and road name.

Templates

Templates provide a way to design and view the cross-sectional profile of a road or channel.

To view, add, or edit current road templates, click **Alignment ▸ Templates**. The ***Road templates*** dialog box (Figure 6-34) displays.

The *Templates* tab shows the following information about the available templates:

- The names of all available templates
- A graphical representation of the selected template

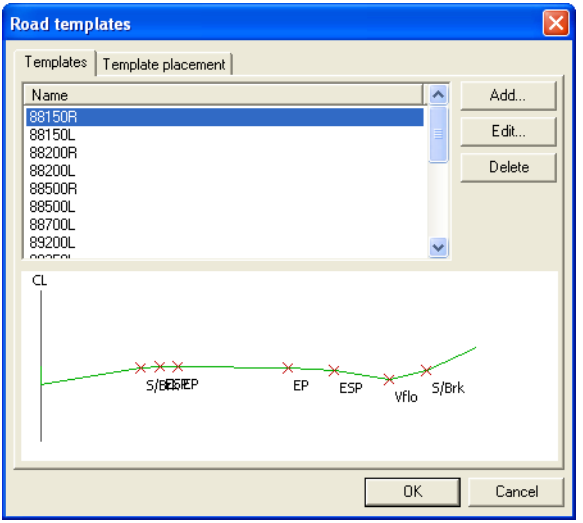


Figure 6-34. Road Templates

Adding a Template

The following procedure creates a new template definition. Once added, the template is available to place along the horizontal alignment.

1. On the ***Road templates*** dialog box (Figure 6-34), click **Add**.
2. On the ***Edit template*** dialog box (Figure 6-35 on page 6-29), type a name for the new template.

3. Click **Add** to add elements to the new template (Figure 6-35).

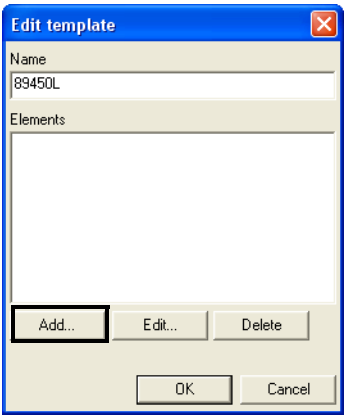


Figure 6-35. Enter Template Name and Add Element

4. On the ***Template element*** dialog box, select the type of element and enter the required information. The fields differ depending on the element selected (Figure 6-36 on page 6-30).
   - Element type – select an element type from the drop-down list, either *Offset from CL, Grade, H.Dist & V.Dist, Curb,* or *Side slope.*
   - Offset from CL – the offset from the centerline displays; the offset for the first element will always be Zero (0).
   - H.Dist – enter the horizontal distance of the element. For curbs, this can be zero or less than zero.
   - V.Dist – enter the vertical height of the element. For curbs, this can be zero or less than zero.
   - Grade – enter the grade of the element.
   - Curb grade – enter the curb grade of the element.
   - Ditch width – enter the ditch width of the element.
   - Cut slope – enter the cut slope of the element.
   - Fill slope –enter the fill slope of the element.
5. Click **OK** to add the element to the template.

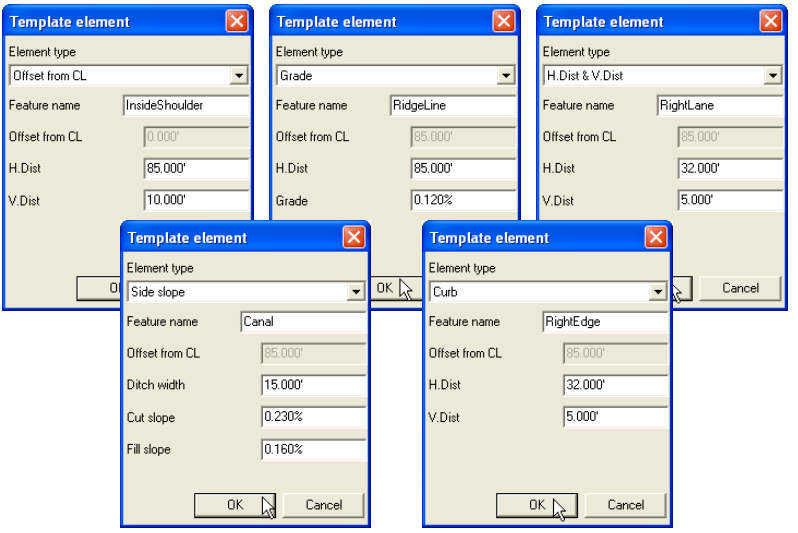


Figure 6-36. Template Element Dialog Boxes

6. To add other elements to the same template, press **Add** on the ***Edit template*** dialog box (Figure 6-35 on page 6-29) and repeat steps 3 and 4.
7. Review the elements as needed and press **OK** to add the template to the template list (Figure 6-37).

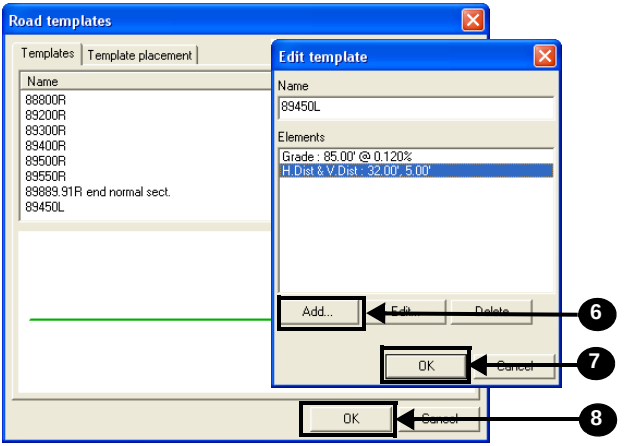


Figure 6-37. Add Template to Road Templates List

8. Click **OK** on the ***Road templates*** dialog box (Figure 6-37 on page 6-30) to apply the changes to the file.

Editing a Template

1. On the ***Road templates*** dialog box, select the template to edit and press **Edit**.
2. Select the element to edit and press **Edit** (Figure 6-38).

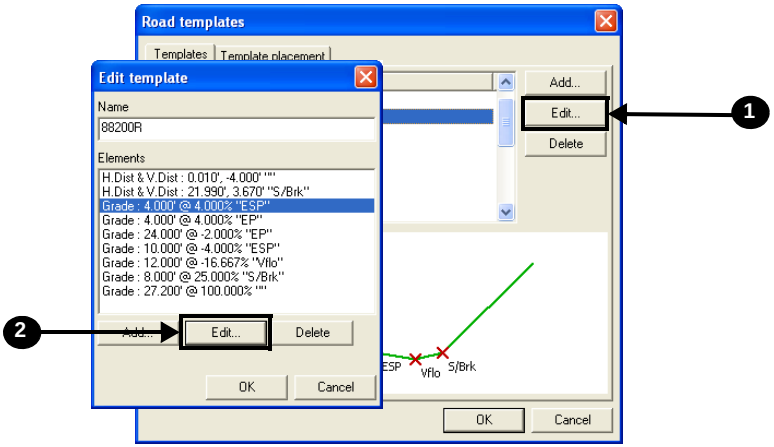


Figure 6-38. Select Template and Element to Edit

3. On the ***Template element*** dialog box, edit the desired parameters and press **OK** (Figure 6-39). The fields differ depending on the element type selected.

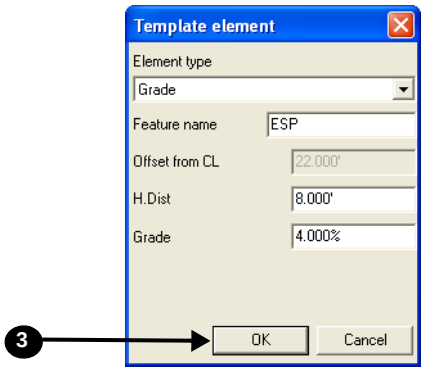


Figure 6-39. Edit Element Parameters and Update Template

4. Press **OK** to update the template. Review the elements as needed and press **OK** to update the template on the Roads template list (Figure 6-40).

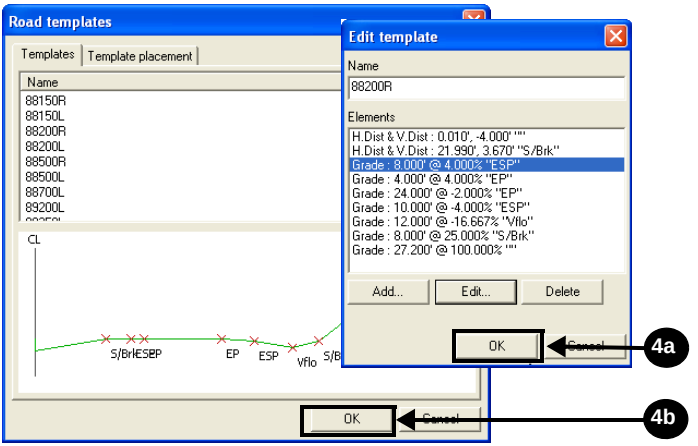


Figure 6-40. Update Template

5. Press **OK** on the ***Road templates*** dialog box to apply the changes to the file.

Deleting an Element

1. To delete an element from a template, select the template and press **Edit**. Then select the element and press **Delete** (Figure 6-41 on page 6-33).
2. Repeat step 1 to delete any other elements in the selected template.
3. Press **OK** to apply the changes to the template, then press **OK** to apply the changes to the file.

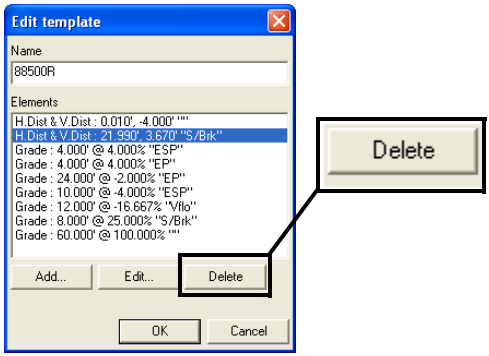


Figure 6-41. Delete Element

Deleting a Template

1. To delete a template, select the desired template and click **Delete** (Figure 6-42).
2. Press **OK** to apply the changes to the file.

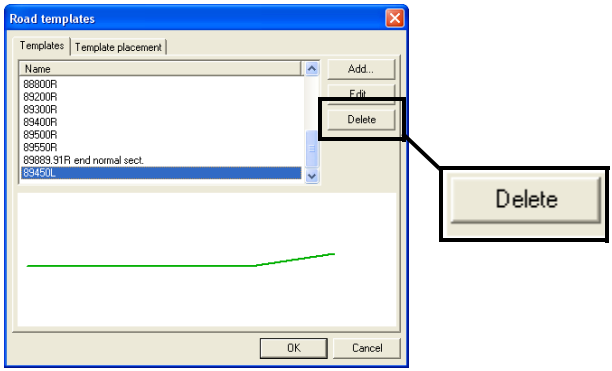


Figure 6-42. Delete Template

Placing a Road Template

Once a template has been created, it is available for placement along the road (alignment). Placing a template along the road defines where the various cross-sectional designs begin and end. See “Templates” on page 6-28 for creating a template.

To view, add, or edit the placement of road templates, click **Alignment ▸ Templates**.

The *Templates placement* tab displays the following information about the template used at each station (Figure 6-43):

- Station – the station at which the template is placed
- Name – the name of the template
- Applied – the side to which the template is applied; either *Left, Right,* or *Left/right* of the alignment

  NOTE: Left and right are based on the direction of increasing stationing

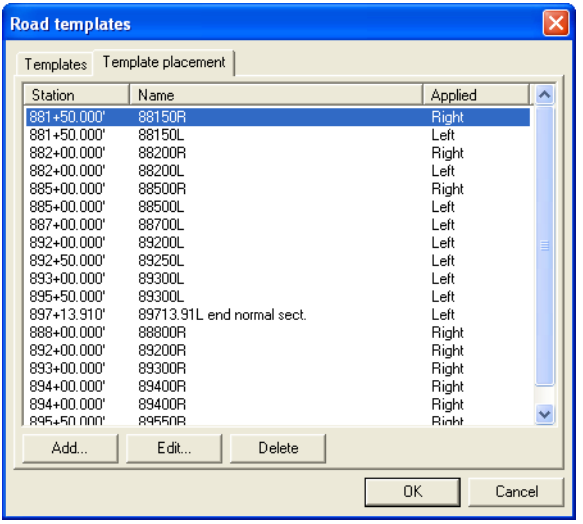


Figure 6-43. Road Templates – Template Placement Tab

Adding a Road Template Placement

1. To add a road template, press **Add**.
2. Select and enter the following on the ***Edit template placement*** dialog box and press **OK** (Figure 6-44):
   - Template – enter the name of the template or select one from the drop-down list.
   - Side of centerline – select the centerline side to apply the template to; select either *Left, Right,* or *Left/right*.
   - Station – enter the *Station* value as a single number.

   3D-Office will automatically convert to the station type (selected on the ***Units*** dialog box. See "Setting Project Units" on page 2-35.

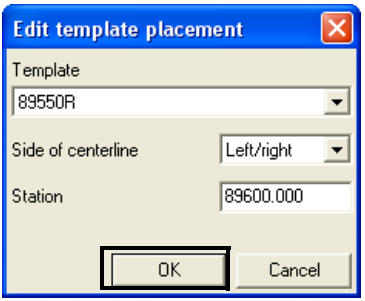


Figure 6-44. Enter Template Placement Information

3. Press **OK** on the ***Road template placement*** dialog box (Figure 6-44) to save and apply your changes.

Editing a Road Template Placement

1. On the *Template placement* tab, press **Edit**.
2. Edit the desired information on the ***Edit template placement*** dialog box and press **OK** (Figure 6-45):
   - Template – select the template to edit from the drop-down box.
   - Side of centerline – select which side to apply the template to, either *Left, Right,* or *Left/right*.
   - Station – enter the station value as a single number.

   3D-Office will automatically convert to the station type (selected on the ***Units*** dialog box) (Figure 6-44 on page 6-35).

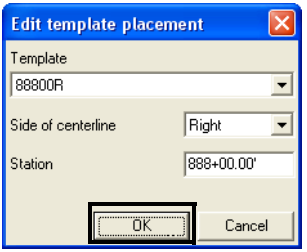


Figure 6-45. Enter Template Placement Information

3. Click **OK** on the ***Edit template placement*** dialog box to apply the changes to the file.

Deleting a Road Template Placement

1. To delete a template placement, highlight the desired template placement on the ***Road template placement*** dialog box (Figure 6-43 on page 6-34) and click **Delete**.
2. Press **OK** on the ***Road template placement*** dialog box to apply the changes to the file.

Viewing a 3D Simulation of the Alignment

The 3D views in 3D-Office use lines and colors to give a three-dimensional perception of a field or pad on a two-dimensional screen. 3D view will help you to visualize what the project terrain looks like. Any changes made in this view using the Road options menu selection will also be saved in the Plan view.

To view a wireframe simulation of the alignment, click **Alignment ▸ View 3D simulation ▸ Wire frame**. A new window opens to display an interactive, 3-dimensional simulation of movement along the alignment (Figure 6-46). For wire frame simulations, lines mark the centerline, horizontal alignments, vertical curves, and stations.

- The arrow keys on the keyboard control the motion of the machine: up arrow is *forward/go*, down arrow is *slow down/stop*.
- Use the **Alignment ▸ Options** menu to set the type of machine used in the simulation and simulation steering details (see “Setting View Options” on page 6-41 for details).

  See “3D-view and Profile View Toolbars” on page 1-16 for details on the 3D-view toolbar.

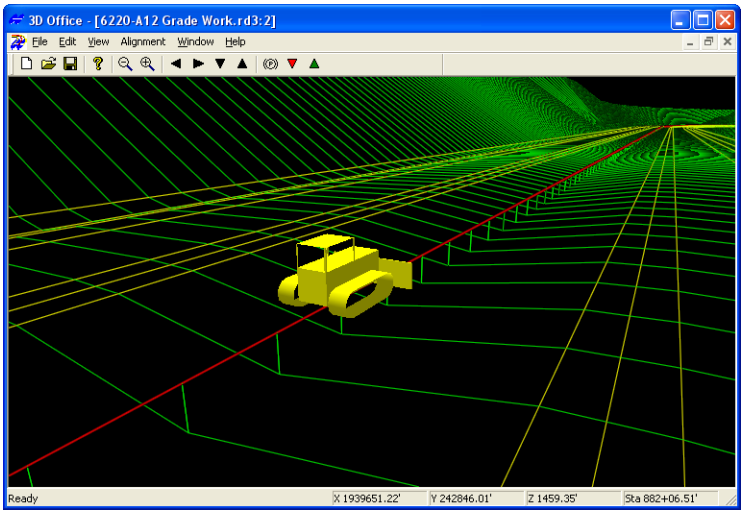


Figure 6-46. Alignment Simulation – Wire Frame

To view a solid model simulation of the alignment, click **Alignment ▸ View 3D simulation ▸ Solid model**. A new window opens displaying an interactive, 3-dimensional simulation of movement along the alignment (Figure 6-47).

- Press and hold the mouse on the screen to have the pointer rotate the view.
- The arrow keys on the keyboard control the motion of the machine: up arrow is forward, down arrow is backward, left and right arrows rotate the "ground" accordingly.
- On a mouse with a scroll wheel, the scroll wheel zooms in/out.
- Use the View menu to display contour or grid lines, the road alignment, or a cross section of the road.
- Use the **Alignment ▸ Options** menu to set grid and contour intervals.
- See "3D-view and Profile View Menu Bars" on page 1-14 for details on the menus and menu items.
- See "3D-view and Profile View Toolbars" on page 1-16 for details on the 3D-view toolbar.

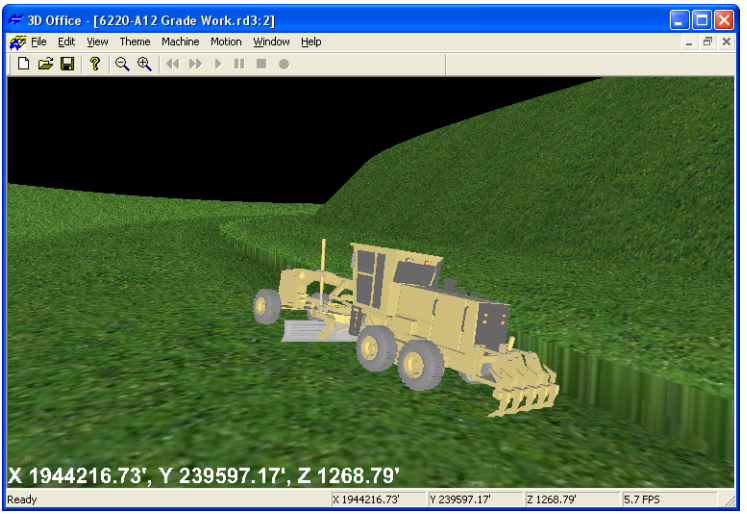


Figure 6-47. Alignment Simulation – Solid Model

Viewing a Profile of the Alignment

The profile view is a powerful tool for visualizing cut and fill heights along a line through the alignment (road surface) and can be used for the following:

- to check clearances between the design surface and existing gas lines, or other utility lines, of known depth
- to determine the grade of the design or existing surface along a line

The profile can be viewed statically or dynamically by dragging the profile line across the field.

1. To view a profile of the field, click **Alignment ▸ View profile**. A check mark displays next to the menu option.
2. In Plan View, click a location at which to begin the profile. Stretch the line across the field and click once to end it (Figure 6-48).

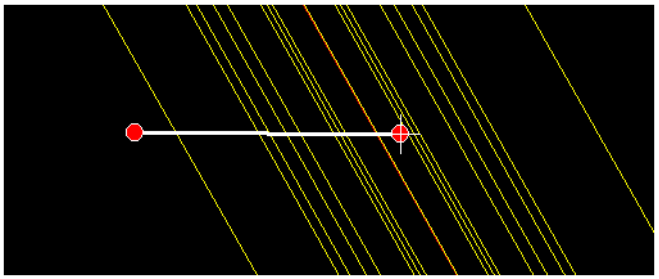


Figure 6-48. Select Area to View in Profile

The Profile View displays (Figure 6-49 on page 6-40) the following information:

- elevation tic marks on the left of the view window
- a cross section of the current TIN
- a pop-up box showing XY point coordinates, TIN : Z coordinates, and grade at the point of the crosshair
- a horizontal scale bar

- cross hair coordinates in the status bar

  The vertical exaggeration is shown as a ratio next to the elevation in the status bar on the far right.

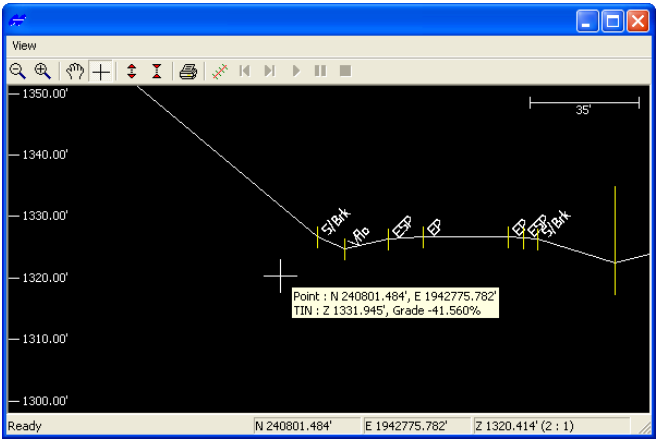


Figure 6-49. Profile View

3. On the ***View*** dialog box (Figure 6-49), use the toolbar to manipulate the view. See "3D-view and Profile View Toolbars" on page 1-16 for information on the toolbar buttons.
4. To change the position of the profile view, click on the Plan View, then click, "grab" and "drag" the start or end point of the profile line in the Design View to a new position. The "grabbed" point is green while being moved. The Profile View changes accordingly.

   Or, you can "grab" the line and shift it without changing its direction or length.

Closing the Profile View quits the profile function. Repeat steps 1 through 3 to display the profile view again.

5. To quit this function, press **Esc**.

Setting View Options

The ***Road options*** dialog box sets the parameters to use for the various alignment views (plan view, profile view, simulation view).

1. Click **Alignment ▸ Options**.
2. On the *Plan view* tab, select the desired parameters (Figure 6-50) and press **OK**.
   - Show road feature lines – check mark this box to show road feature lines in plan view.
   - Show regular station lines at intervals of – check mark this box to display station lines at a certain interval along the route (enter a value in the field tot he right).
   - Show horizontal transition points – check mark this box to display horizontal transition points in plan view.
   - Show vertical transition points – check mark this box to display vertical transition points in plan view.

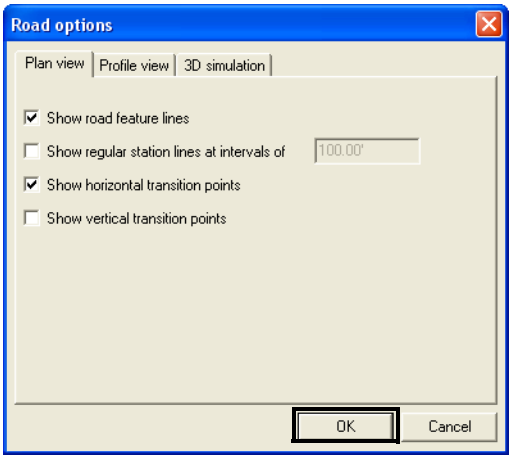


Figure 6-50. Set Plan View and Profile View Options

3. On the *Profile view* tab, select the desired parameters (Figure 6-51 on page 6-42) and press **OK**.
   - Show vertical transition points – check mark this box to display vertical transition points in profile view.

- Show vertical transition point labels – check mark this box to display vertical transition point labels.
- Show tangent lines – check mark this box to display tangent lines (if needed).
- Default vertical scale exaggeration factor – enter an exaggeration factor to set the amount the vertical scale is magnified as compared to the horizontal scale.

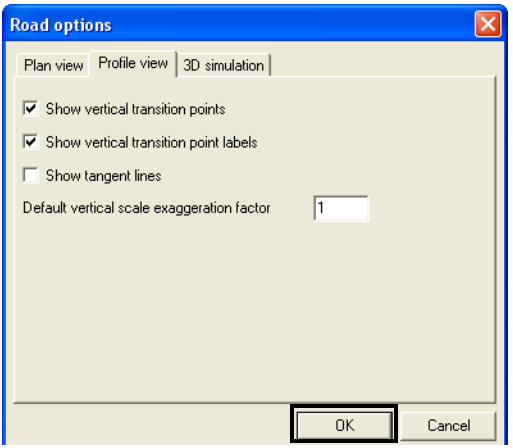


Figure 6-51. Set Plan View and Profile View Options

4. On the *3D simulation* tab, select the desired parameters for wire frame simulations (Figure 6-52 on page 6-43). ??
   - Machine type – select either *Bulldozer*, *Motor grader*, or *3-track curb* machine from the drop-down list.
   - Road feature to steer to – select either *Centerline*, ??
   - Machine steering point – select blade position of the machine from the drop-down list.
   - Start simulation at start of road – enable to begin simulation where the road starts.
   - *Start simulation at specific station along road* – enter a station number to begin the simulation at a specific station.
   - Travel in direction of increasing stations – ??
   - Travel in direction of decreasing stations – ??

- Loop indefinitely – check mark this box to have the simulation restart when the virtual machine reaches the end of the road.

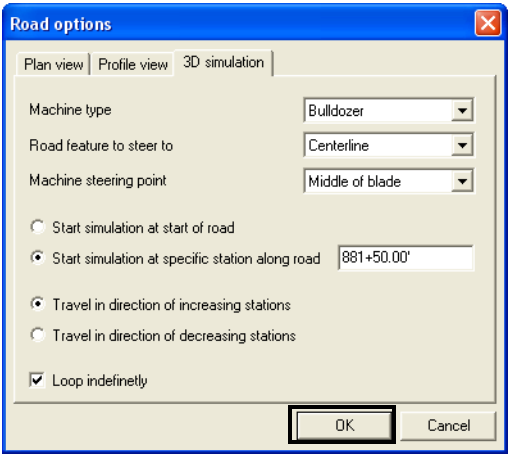


Figure 6-52. Set 3D Simulation View Options

5. Press **OK** to apply the view options to the alignment file.

Exporting an Alignment

If you made changes to an alignment, you can export the modified alignment to a new alignment file or overwrite a current file with the new information.

Export different versions of the file to track progress.

Exporting to an Alignment File

1. With a 3D Project file open, click **Alignment ▸ Export current alignment ▸ To 3D alignment file (*.RD3)**.
2. On the ***Save As*** dialog box (Figure 6-53 on page 6-44), do one of the following:

- To export to another alignment file, navigate to the location of the file and select it, then press **Save**. This will overwrite the content of the existing file.
- To save to a new file, navigate to the desired folder, type a name for the new file, and press **Save**.

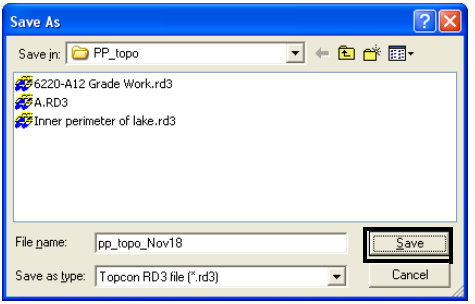


Figure 6-53. Save Alignment File

The selected alignment overwrites the existing file or creates a new alignment file.

Exporting to a Pocket-3D Controller

To use the alignment file in the field, export it to a Pocket-3D controller.

1. Connect the Pocket-3D controller to the computer and turn on the controller (see Appendix A for details). Run Pocket-3D on the controller.
2. With a 3D Alignment file or 3D Project file open, click **Alignment ▸ Export alignment ▸ To Pocket-3D controller** or **Alignment ▸ Export current alignment ▸ To Pocket-3D controller**.
3. On the ***Pocket-3D files*** dialog box, do one of the following and press **Save** (Figure 6-54 on page 6-45):
   - Select an existing file to replace.
   - Enter a new file name or keep the default file name.

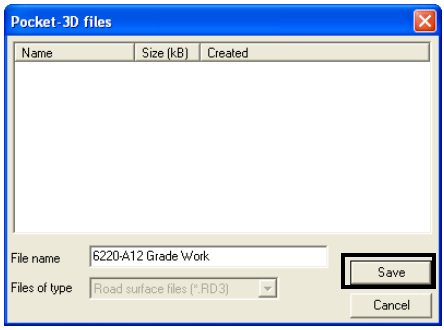


Figure 6-54. Save Alignment to Pocket-3D Controller

Setting Unit Options

The ***Project options*** dialog box sets the type of units to use for various quantities and is the same as for 3D Project files. See “Setting Project Units” on page 2-35 for details.

Notes:

Plane Files

A plane file defines a planar surface with a particular location and orientation in three-dimensional space. Planar surfaces are frequently used to define a design surface.

Importing and Opening a Plane Surface

3D-Office opens any three dimensional plane surface file (*.pl3) for setting plane parameters, exporting to another plane surface file, comparing with another plane surface, or setting plane options.

3D-Office recognizes plane surfaces from two file types:

- 3D plane files (*.pl3)
- Pocket-3D controller files
  See “Importing from Pocket-3D” on page 7-2 for import details.

Importing a Plane Surface

Follow these steps to import a plane surface from a 3D plane file into a 3D Project file.

1. With a 3D Project open, click **Plane ▸ Import plane ▸ From 3D plane file (*.pl3)**.
2. On the ***Open*** dialog box, navigate to the location of the desired file, select it, and click **Open** (Figure 7-1 on page 7-2). The plane surface from the selected file is added to the 3D Project file.

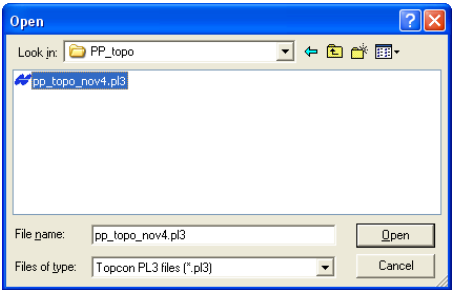


Figure 7-1. Open 3D Plane Surface File

Importing from Pocket-3D

Follow these steps to import a Pocket-3D controller plane file into a 3D Project file.

1. Connect the Pocket-3D controller to the computer and turn on the controller (See Appendix A for details). Run Pocket-3D on the controller.
2. With a 3D Project file open, click **Plane ▸ Import plane ▸ From Pocket-3D controller**. 3D-Office connects with the Pocket-3D controller and retrieves *.pl3 (plane) files.
3. On the ***Pocket-3D files*** dialog box, select the file to import and click **Open** (Figure 7-2). The file type is automatically selected. The information from the selected file is added to the 3D Project file.

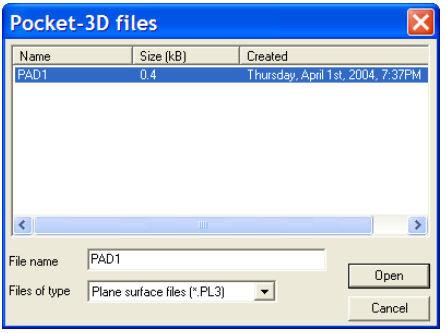


Figure 7-2. Select and Open Pocket-3D Plane File

Opening a Plane Surface in 3D-Office

1. To open a 3D plane file, click **File ▸ Open**.
2. On the ***Open*** dialog box, navigate to the location of the file, select the file type as 3D Plane (*.pl3), select the desired file, and click **Open** (Figure 7-3).

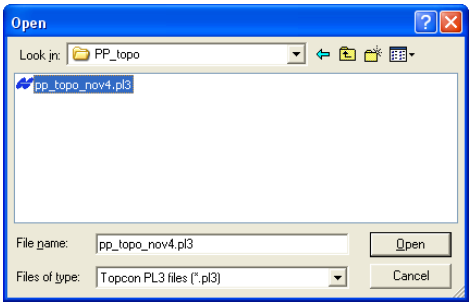


Figure 7-3. Open 3D Plane Surface File

Opening a Pocket-3D Plane File

If a Pocket-3D controller is connected to the computer, 3D-Office can open plane surface files directly from the controller. Once opened, the file can be exported to other files or saved to the computer. See Appendix A for details on connecting a computer and controller.

1. Click **File ▸ Open Pocket-3D file**.
2. On the ***Pocket-3D files*** dialog box, select the file type (*.pl3) and the desired file, then click **Open** (Figure 7-4). The Pocket-3D plane file opens in 3D-Office.

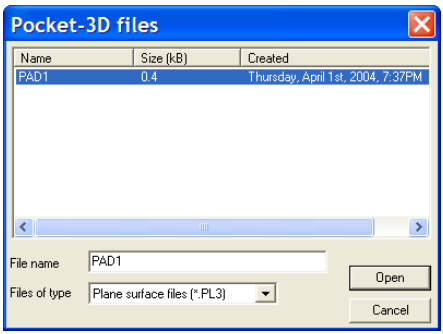


Figure 7-4. Select File and Click Open

Calculating a Plane Surface

When 3D-Office calculates a best-fit plane surface, it produces a single planar surface, based on the input point and line data, that most closely fits the data-point elevations. A best-fit design computation is often a good starting point for a user-customized design. The plane parameters—point on surface, mainfall/crossfall slopes, and boundary—can be easily modified after completing a best-fit computation.

1. If needed, import points into a 3D Project file. Select the desired points from which to create a plane surface (Figure 7-5).
2. Click **Plane ▸ Calculate new plane surface ▸ Best fit through selected points**. 3D office calculates a plane surface and applies a boundary (Figure 7-5).

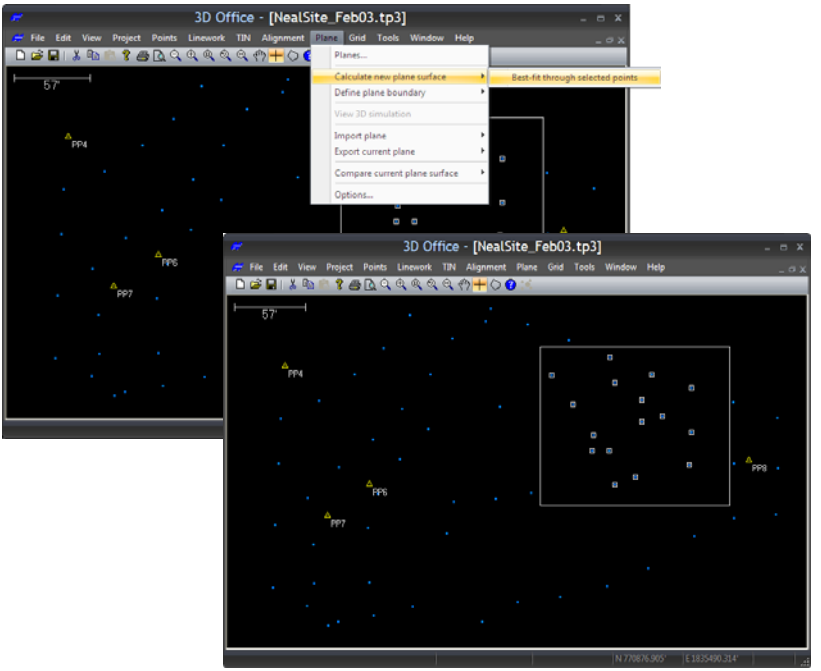


Figure 7-5. Import and Select Points, then Calculate Surface

To edit the main-fall and cross-fall slopes of the plane surface, see “Working with Plane Surfaces” on page 7-5.

Plane surfaces can also be created or copied from existing surfaces using the ***Planes*** dialog box. See "Working with Plane Surfaces" on page 7-5 for details.

Working with Plane Surfaces

Once you have a Plane surface, you can edit it for project requirements. A plane surface can also be compared to other surfaces within the job for volume computation purposes. Making copies of plane surfaces is also useful for project management and design.

In This Section:

- Viewing, copying, and deleting existing plane surfaces
- Creating a new plane surface
- Editing plane parameters and defining plane boundaries

Viewing Plane Surfaces

To view the plane surfaces in a 3D Project file, click **Plane ▸ Planes**. The ***Planes*** dialog box displays the following information about the selected plane surface (Figure 7-6 on page 7-6):

- Plane surfaces – a listing of all plane surfaces in the 3D Project file.
- Name – the name of the selected/current plane surface.
- Layer – the layer in which the plane surface exists. Click the drop-down box to change the layer for the currently selected plane surface.
- Visible – whether or not plane surface is visible, or if the surface is visible by layer.
- Point on surface – the unique definition of a planar surface. Changing any of these parameters affects the location and slopes of the plane surface.
  - Point on surface: enter the coordinates through which the plane passes.

– Direction of mainfall: enter a parameter for mainfall slope direction.

– Main-fall: enter the percentage of slope along the plane in the direction of the main-fall.

NOTE: Enter a positive value if the plane rises along the main-fall direction.

– Cross-fall: enter the percentage of slope in the direction that is 90° clockwise from the main-fall direction.

NOTE: Enter a positive value if the plane rises in the cross-fall direction.

To view a plane surface, select the surface from the list and press **OK**.

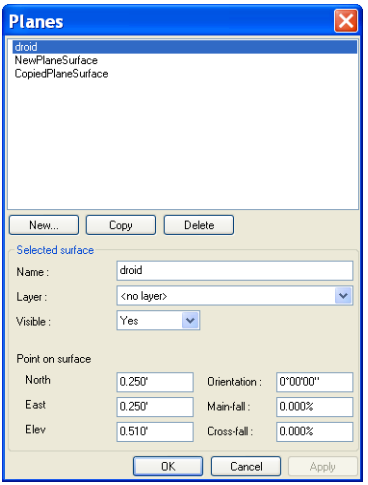


Figure 7-6. Plane Surfaces

Viewing a 3D Simulation of the Plane Surface

The 3D views in 3D-Office use lines and colors to give a three-dimensional perception of a field or pad on a two-dimensional screen. 3D view will help you to visualize what the project terrain looks like. Any changes made in this view using the Road options menu selection will also be saved in the Plan view.

For more details on the 3D simulation menu and menu items, see "3D-view and Profile View Menu Bars" on page 1-14.

Copy a Plane Surface

The copy function provides a way to produce multiple versions of a plane surface, which may be useful for monitoring job progress.

Select a plane surface and press **OK** to display that version on the Plan View. From there, the plane surface can be edited and exported for use in other files.

1. Click **Plane ▸ Planes** to view all available plane surfaces in the 3D Project.
2. Highlight the plane surface to copy and press **Copy** (Figure 7-7 on page 7-8).
3. Type a name for the duplicate plane surface and press **Enter** (Figure 7-7 on page 7-8).

   If needed, click-pause-click a plane surface name to rename a plane surface.

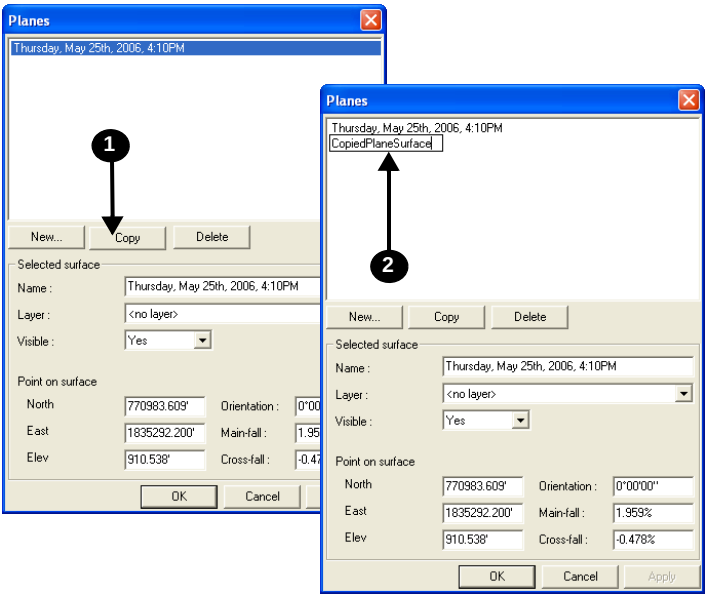


Figure 7-7. Create a Copy of a Plane Surface

Create a New Plane Surface

This process will create a plane surface without a boundary. After creating the surface, you can define a boundary using the polygon selection tool (see “Editing a Plane’s Boundary” on page 7-9).

1. Click **Plane ▸ Planes**.
2. Press **New** (Figure 7-8 on page 7-9).
3. Type a name for the copied plane surface and press **Enter** (Figure 7-8 on page 7-9). If needed, click-pause-click a plane surface name to rename a plane surface.

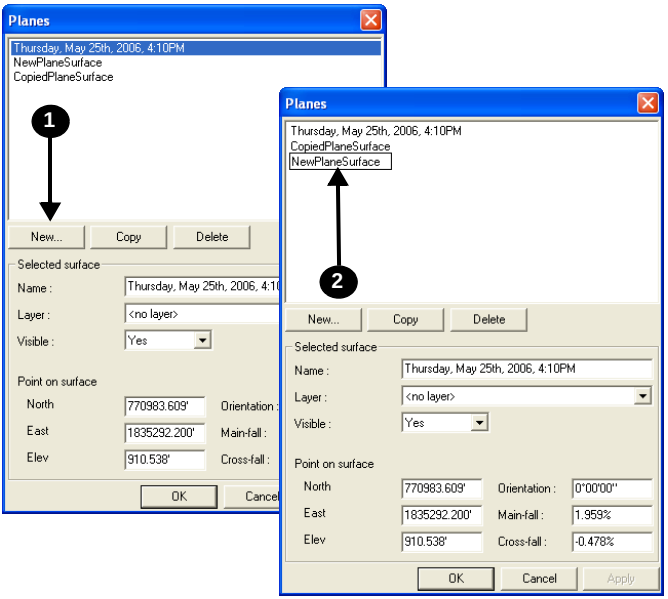


Figure 7-8. Create a New Plane Surface

Editing a Plane's Boundary

The boundary of a plane defines the extents of the region to use in volume comparison calculations. In order to compare the volume between two plane surfaces, at least one of the planes must have a boundary.

3D-Office provides two ways to define the boundary of a plane surface: either use the polygon selection tool or choose an existing closed polygon.

Remove a Current Boundary

A boundary "clips" a plane surface to a defined perimeter. Removing a plane's boundary detaches and deletes the boundary from the plane, infinitely extending the plane surface in 3-dimensional space.

To remove the boundary from the current plane surface, click **Plane ▸ Define plane boundary ▸ Remove current boundary**.

Figure 7-9 illustrates this process. The arrows along the grid lines indicate main-fall and cross-fall direction.

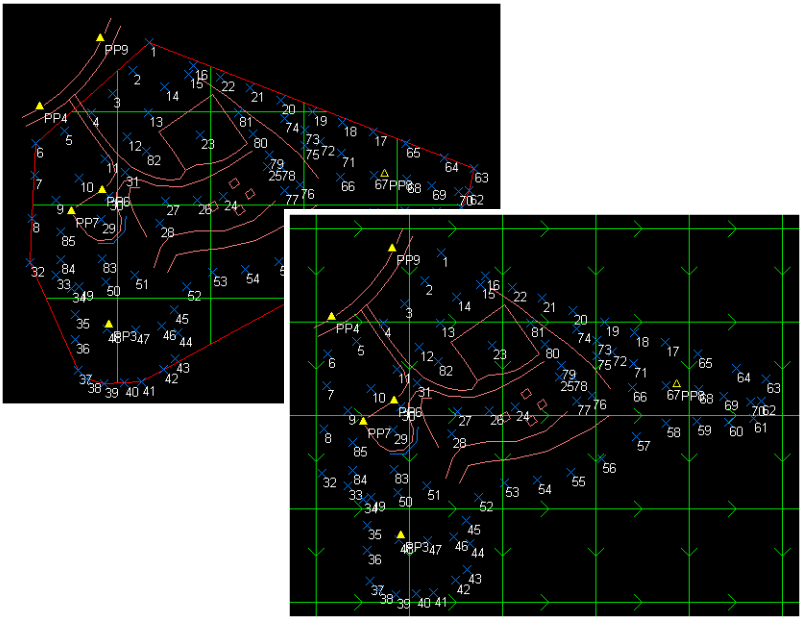


Figure 7-9. Removing the Boundary of a Plane Surface

Define a Boundary Using the Selection Polygon

The selection polygon may be used to define the boundary of an existing polygon. Use this tool to re-define the boundary of a plane or to apply a boundary to a plane. To create a plane surface, see “Calculating a Plane Surface” on page 7-4.

1. Using the polygon selection tool, trace a polygon around the area for which to define a boundary. When the polyline becomes a thick white border, click once to close the polygon (Figure 7-10 on page 7-11).

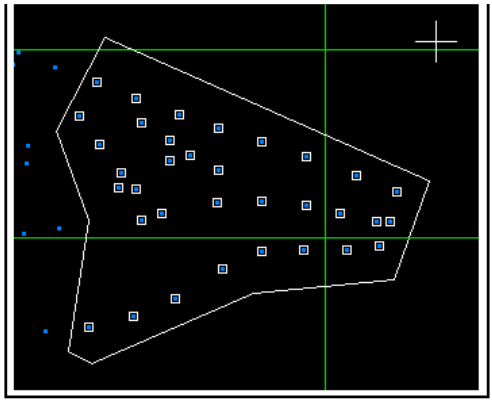


Figure 7-10. Trace Polygon and Calculate Best-fit Surface

2. Click **Plane ▸ Define plane boundary ▸ By selection polygon**. 3D office generates a new boundary for the existing plane surface based on the selection polygon (Figure 7-11).

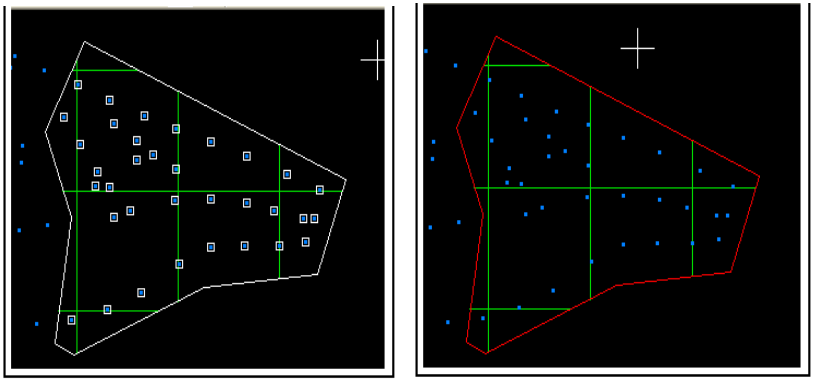


Figure 7-11. Define Boundary and Apply

Define a Boundary by Selecting an Existing Polygon

This function uses an existing polygon to create a boundary. This may be useful when a project already contains one or more closed polygons, such as building pads, that mark the edges of regions that must be graded to planar surfaces.

1. Using the selection tool, select a closed polygon using one of the following methods:
   - If creating a polygon (closed polyline), see “Creating a Polyline” on page 6-10.
   - Click an existing polygon.
2. Click **Plane ▸ Define plane boundary ▸ By selected closed polyline**. 3D-Office calculates a plane surface and applies a boundary based on the chosen polygon (Figure 7-12).

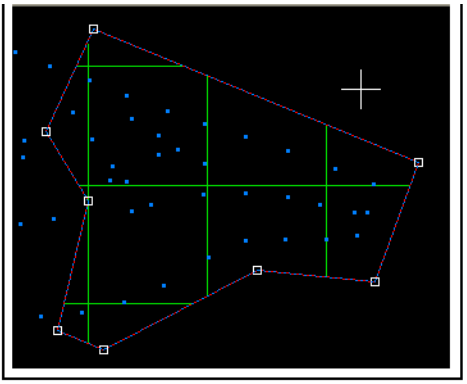


Figure 7-12. Select Polyline and Define Boundary

Notice that the chosen polygon changes color to indicate that it overlays a plane surface boundary.

Deleting a Plane Surface

Only delete a surface when the data it contains will not be needed again. If necessary, save a backup copy of the file before deleting surfaces.

1. Click **Plane ▸ Planes** to view all available plane surfaces in the 3D Project.
2. Select the plane surface to delete and click **Delete**.
3. Press **OK** at the confirmation, then press **OK** on the ***Planes*** dialog box to apply the change to the file.

Comparing Surfaces

When comparing surfaces, 3D-Office creates and opens a cut/fill file. Surface comparisons are useful for monitoring excavation or for determining the quantity of material that has been imported to, or exported from, the job site.

Comparing Surfaces in the Current File

The compare surfaces in current file option is only available in 3D Project files, not 3D Plane files.

1. Click **Plane ▸ Compare current plane surface ▸ With other surface in this project**.
2. On the ***Surfaces*** dialog box, select the following and click **OK** (Figure 7-13 on page 7-14):
   - The *Surface of type* from the drop down list, either TIN surface, Road alignment surface, or Plane surface. Only the surface types that exist in the project will be available from this list.
   - The desired surface from the surface list

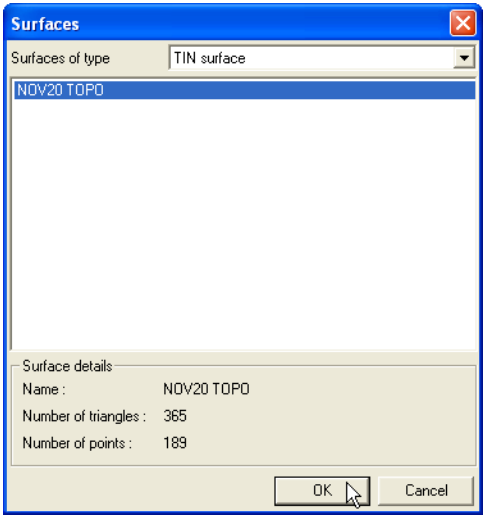


Figure 7-13. Select Surface to Compare

3D-Office compares the two surfaces and opens a Cut/Fill view to display surface comparison information (Figure 7-14).

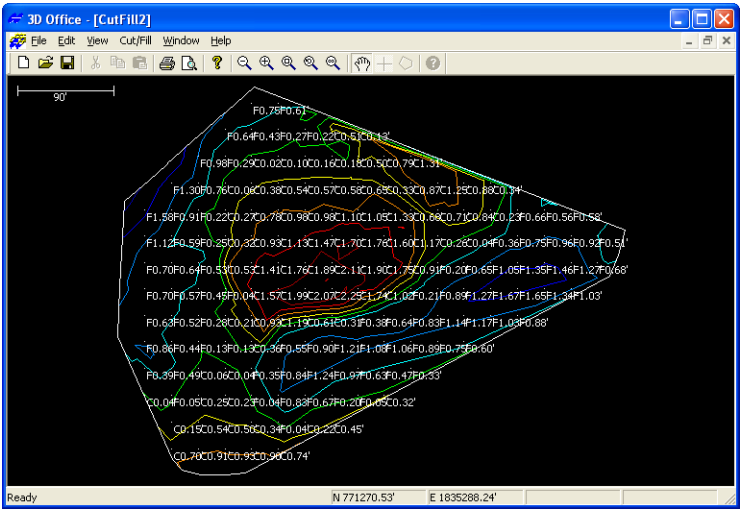


Figure 7-14. Cut/fill View to Compare Surfaces

3. View the cut/fill information. See “Cut/Fill Files” on page 9-1 for details on cut/fill surface files.

- If needed, re-compare the surface files after making desired adjustments in the original 3D surface files (for example, changing the Direction of mainfall for a plane file).
- Save the cut/fill file. Click **File ▸ Save as**, navigate to the desired located, type a name for the file, and click **Save**.

Comparing Surfaces in Different Files

1. Click **Plane ▸ Compare plane surface ▸ With 3D surface file** for 3D Plane files or **Plane ▸ Compare current plane surface ▸ With 3D surface file** for 3D Project files.
2. On the ***Open*** dialog box, navigate to the folder in which the file resides, select the *Files of type* from the drop down list (either TN3 files, PL3 files, or RD3 files), select the desired file and click **OK** (Figure 7-15).

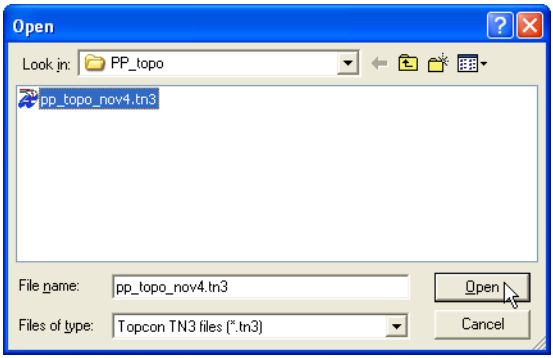


Figure 7-15. Select Surface to Compare

The selected surfaces must overlap, otherwise, no comparison is possible.

3D-Office compares the two surfaces and opens a Cut/Fill file displaying the compared information (Figure 7-16 on page 7-16).

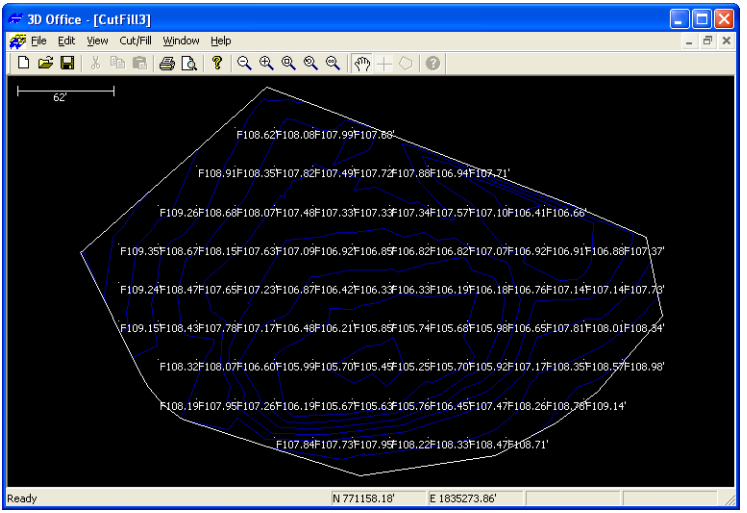


Figure 7-16. Cut/fill File for Compared Surfaces

3. View the cut/fill information. See “Cut/Fill Files” on page 9-1 for details on cut/fill surface files.
   - If needed, re-compare the surface files after making desired adjustments in the original 3D surface files (for example, changing the Direction of mainfall for a plane file).
   - Save the cut/fill file. Click **File ▸ Save as**, navigate to the desired location, type a name for the file, and press **Save**.

Setting Plane Options

The ***Plane options*** dialog box sets grid lines for showing the orientation of the mainfall and crossfall and determines if the plane's boundary will display on the Plan View.

1. Click **Plane ▸ Options**.
2. Select and enter the following information on the ***Plane options*** dialog box, then click **OK** (Figure 7-17):
   - Enable *Show main-fall and cross-fall grid lines* to show a grid oriented along the main-fall and cross-fall directions.
     – *Grid interval* sets the spacing between grid lines.
     – *Grid orientation* rotates the grid. Changing the grid orientation value will also change the main-fall and cross-fall directions shown in the ***Plane options*** dialog box (Figure 7-17).

     Changing the grid orientation value in this dialog box will not alter the location or orientation of the plane in 3D space.
   - Enable *Show boundary* to display the boundary.

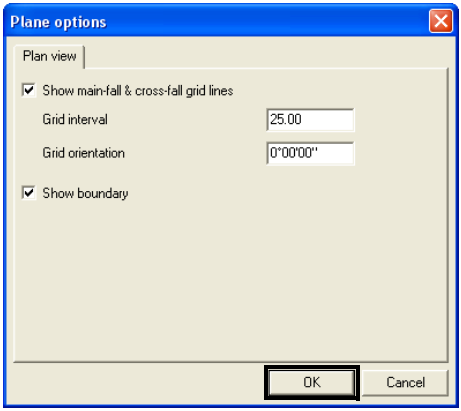


Figure 7-17. Set Plane Surface File Options

Exporting a Plane Surface

If you made changes to a plane file, you can export the changed plane surface to a new plane file or replace a current file with the revised information. This function is the same as the Save as function.

Export versions of the file to track progress.

Exporting to a Plane File

1. Click **Plane ▸ Export plane surface ▸ To 3D plane file** for 3D Plane files or **Plane ▸ Export current plane surface ▸ To 3D plane file** for 3D Project files.
2. On the ***Save As*** dialog box, type a name for the new plane surface file or select a plane file to replace. Click **OK** to export the file (Figure 7-18).

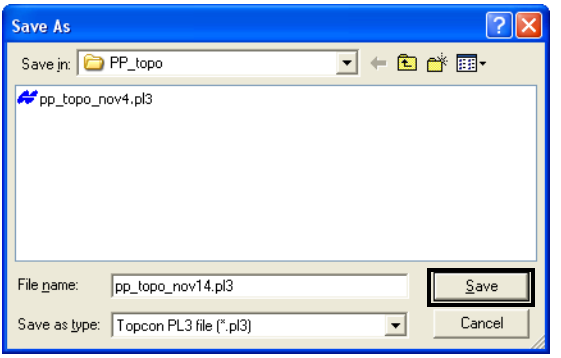


Figure 7-18. Save Plane File

Exporting to a Pocket-3D Controller

To use the plane surface file in the field, export it to a Pocket-3D controller.

1. Connect the Pocket-3D controller to the computer and turn on the controller (see Appendix A for details). Run Pocket-3D on the controller.
2. With a plane surface file open, click **Plane ▸ Export plane surface ▸ To Pocket-3D controller** for 3D Plane files or **Plane ▸ Export current plane surface ▸ To Pocket-3D controller** for 3D Project files.
3. On the ***Pocket-3D files*** dialog box, do one of the following and click **Save** (Figure 7-19):
   - Select an existing file to replace.
   - Enter a new file name or keep the default file name.

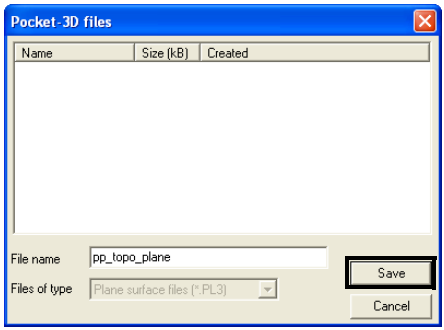


Figure 7-19. Save Plane Surface File to Pocket-3D Controller

Notes:

Grid Files

A grid surface represents elevation at a specific interval and can display changes in elevation and passes by a machine using a range of colors.

Opening a Grid Surface in 3D-Office

3D-Office provides an interface for working directly with grids through grid files (*.GD3). Using a grid, you can add, edit, or delete grids, as well as view grid information.

Opening a Grid File

1. Click **File ▸ Open** to open a grid surface file in 3D-Office.
2. On the ***Open*** dialog box, navigate to the location of the file, select the file type as Alignment (*.GD3), select the desired file, and press **Open.**

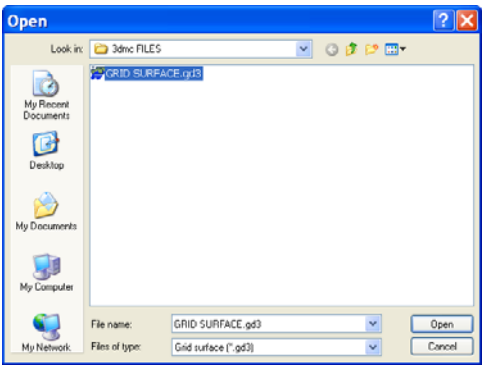


Figure 8-1. Open a Standalone Grid File

The file opens on the 3-Office main screen (Figure 8-2 on page 8-2).

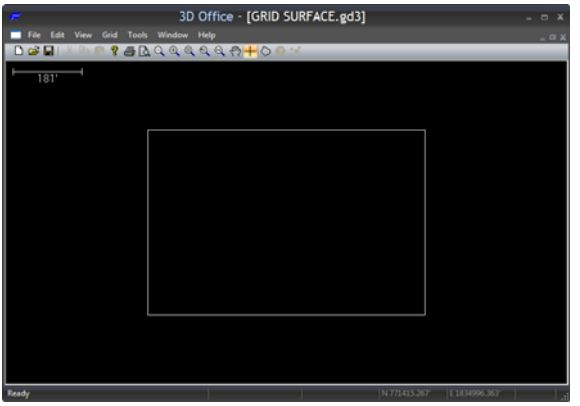


Figure 8-2. 3D Grid Main Screen

Grid Properties

To view grid properties, click **Grid ▸ Grid Properties**. The ***Grid surfaces*** dialog box displays parameter and display information about the selected grid surface. See "Viewing Grid Information" on page 8-10 and Figure 8-15 on page 8-11 for more details.

Tools Menu Options

The Tools menu provides tools to measure a distance or area in the plan view, show surface elevation, and compare surfaces.

Computing the Distance Between Points/Polygons

The measuring tool computes distances between points and areas of polygons. For example, this tool can be used to determine the length along a route or to measure the area of a building pad.

1. WIth a 3D Project file open, click **Tools ▸ Measure distance/ area** (Figure 8-3 on page 8-3). A check mark displays next to the menu option.

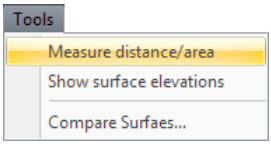


Figure 8-3. Compute the Distance/Area of the Grid Surface

The polygon cursor is automatically selected and a pop-up box displays running length and bearing (Figure 8-4).

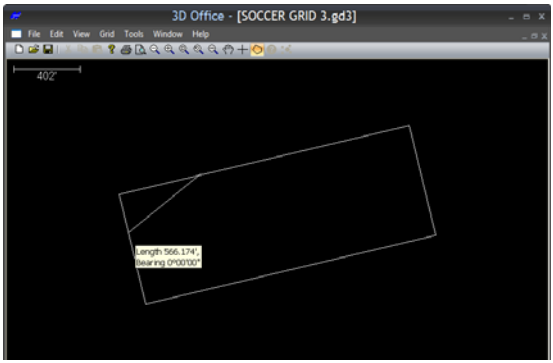


Figure 8-4. Tools Menu – 3D Grid Main Screen

2. Click at a point to begin the measurement. Move the polygon cursor to the next point and click until the desired distance or area has been delineated.
   - When measuring a distance, the length of the drawn line displays (Figure 8-5 on page 8-4).

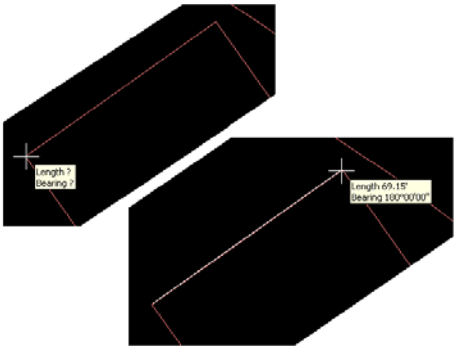


Figure 8-5. Measuring Distance

- When measuring an area, click three or more points, then return the polygon cursor to the starting point to complete the polygon. The polygon perimeter length and its area display in the pop-up box (Figure 8-6).

Figure 8-6. Measuring Area

3. To quit the routine, click **Tools ▸ Measure distance/area**, click one of the selection tools, or press the **Esc** key to end the operation.

Displaying Surface Elevation

1. To display surface elevation anywhere within the grid surface, click **Tools ▸ Show surface elevations** (Figure 8-7).

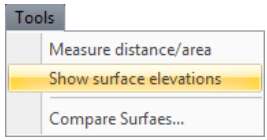


Figure 8-7. Show Surface Elevations

2. Select an area of the grid surface and right-click on the mouse to display the elevation of the grid surface (Figure 8-8).

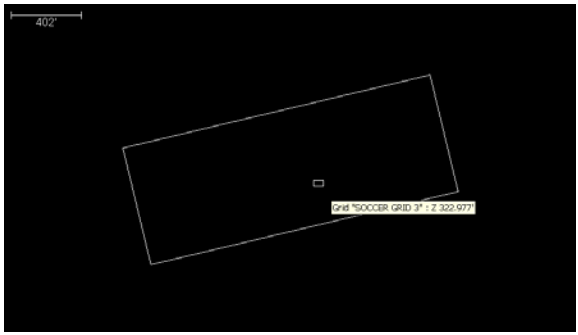


Figure 8-8. Display the 'Z" Elevation of the Grid Surface

3. Click **Tools ▸ Show surface elevations** again or press **Esc** to end the routine.

Comparing Grid Surfaces

To compare grid surfaces, click **Tools ▸ Compare surfaces.**

The ***Grid Surfaces*** dialog box displays (Figure 8-9 on page 8-6).

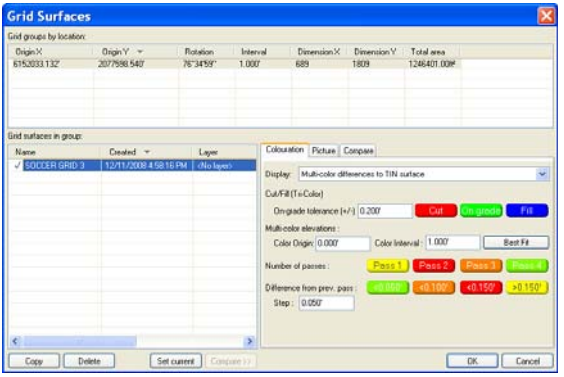


Figure 8-9. Compare Grid Surfaces

See “Viewing Grid Information” on page 8-10 and Figure 8-15 on page 8-11 for more information on this dialog box.

Importing a Grid

3D-Office imports grids into 3D Project files from 3D grid files (*.gd3). Follow these steps to import a grid from a 3D Grid file into a 3D Project file.

1. With a 3D Project file open, click **Grid ▸ Import grid ▸ From 3D grid file (*.GD3)**.
2. On the ***Open*** dialog box, navigate to the location of the desired file, select it, and click **Open** (Figure 8-10). The information from the selected file is added to the 3D Project file.

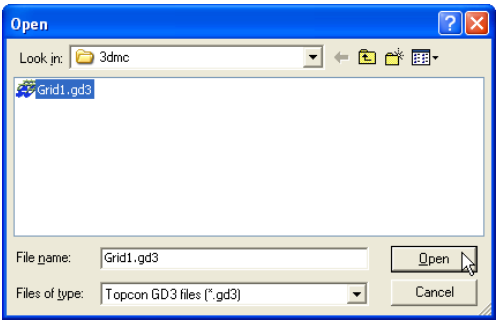


Figure 8-10. Open 3D Grid File

3. On the ***Open*** dialog box, navigate to the location of the file, select the file type as Grid surface (*.GD3), select the desired file, and click **Open** (Figure 8-11).

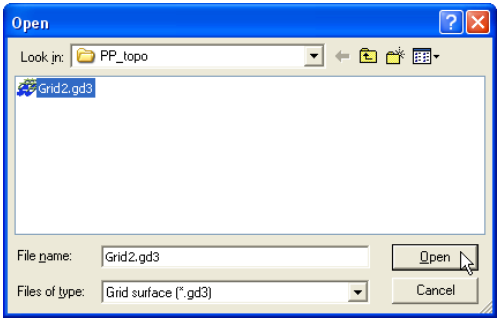


Figure 8-11. Open Grid File

Creating a Grid Surface

A grid surface represents elevation at specific intervals, and two types of grid surfaces can be created in 3D Project files. Using the selection rectangle option, a rectangle is drawn on the surface that is aligned north-south and east-west. Using the rotated rectangle selection, a line is first drawn to show the orientation from start to end, then a rectangle can be drawn with that same orientation.

1. Click **Grid ▸ Create new grid ▸ From selection rectangle** or **Grid ▸ Create new grid ▸ From rotated rectangle**.
2. On the Plan View, click and draw a rectangle around the area from which to create a grid surface. The width and height of the new grid displays in the pop-up box (Figure 8-12). When done, the ***New Grid*** dialog box displays (Figure 8-13 on page 8-9).

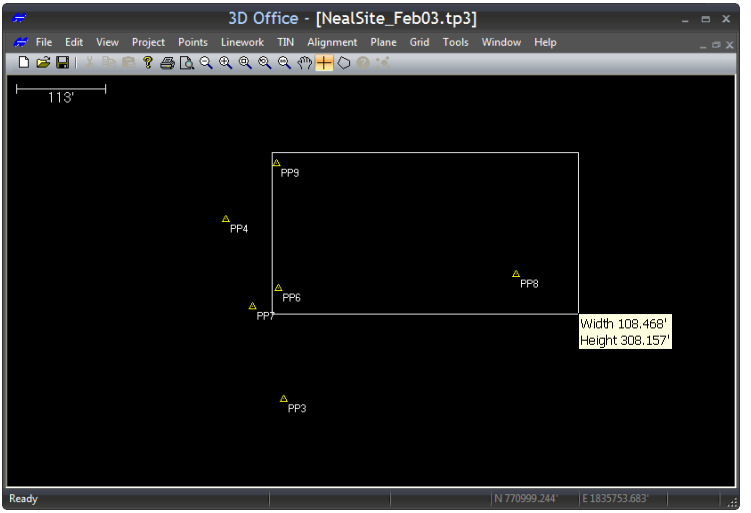


Figure 8-12. Draw Rectangle for New Grid Surface

3. On the *Parameters* tab, enter the following parameters for the grid (Figure 8-13 on page 8-9):
   - Name – enter a name for the new grid surface.
   - Layer – select a layer in which to store the grid surface.
   - Visible – select whether or not the grid surface is visible, or if it will be visible by layer.
   - Origin X/Y – enter the X/Y origin of the grid surface. This is the point that represents the bottom-left corner of the rectangle.
   - Dimension X/Y – enter the X/Y dimensions of the grid. These values determine the size of the grid surface and affect the Extents X/Y values.
   - Orientation – enter the orientation of the grid surface from the bottom left to bottom right corners. This should be the same line drawn for a rotated rectangle grid.
   - Interval – enter the interval for grid lines.

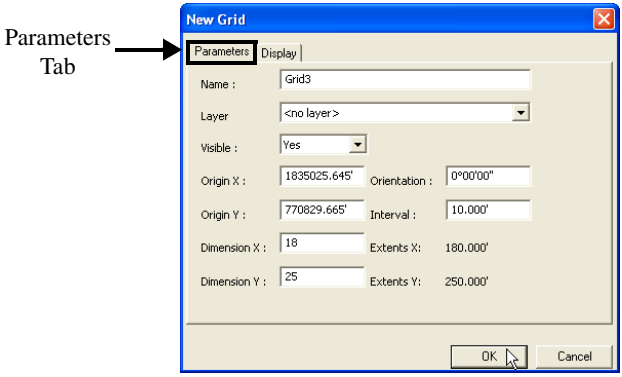


Figure 8-13. Enter New Grid Parameter Information

4. On the *Display* tab, enter the following display information for the grid (Figure 8-14 on page 8-10):
   - Display – select one of the following displays to use for grid surface information.
     – Tri-color differences to TIN surface: shows differences to the surface in three colors.
     – Multi-color differences to TIN surface: shows differences to the TIN surface in multiple colors.
     – Multi-color elevations: shows colored elevation contours at the entered interval.
     – Number of passes: shows a different color for each pass of a machine.
     – Previous pass height diff: shows the elevation difference between the previous pass and the current pass.
   - Cut/Fill (Tri-Color) – enter a (+/-) value for *On-grade tolerance*, then press the **Cut**, **On grade**, and **Fill** buttons to select a color from the ***Color Selection*** screen to represent each one.
   - Multi-color elevations:
     – Color Origin: enter the elevation that appears as the center contour.
     – Color Interval: enter the elevation difference between contours.

– **Best Fit –** press to use the highest and lowest elevation within the grid to calculate the optimal color origin/ interval to cover the grid surface evenly.

- Number of passes – press either **Pass 1**, **Pass 2**, **Pass 3**, or **Pass 4** and select a color to represent each machine pass.
- Difference from prev. pass – press the less than/greater than button to change the color for up to four passes.

  – Step: enter the step difference (size of elevation change between each stage) between passes.

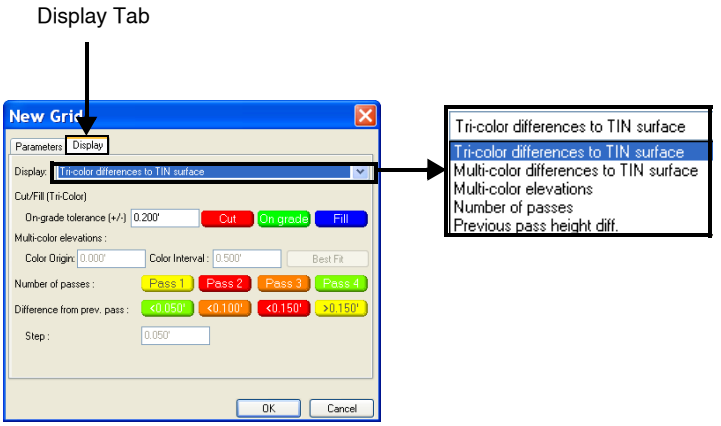


Figure 8-14. Enter New Grid Display Information

5. Click **OK** to save the grid surface.

Viewing Grid Information

To view 3D Project and 3D Grid grid surfaces, click **Grid ▸ Grid surfaces**. The ***Grid surfaces*** dialog box displays parameter and display information about the selected grid surface (Figure 8-15 on page 8-11).

On the *Grid groups by location* panel:

- Origin X/Y – enter the X and Y origin of the grid surface (the point that represents the bottom-left corner of the rectangle).

- Rotation – enter the orientation of the grid surface from the bottom left to bottom right corners. This should be the same line drawn for a rotated rectangle grid.
- Interval – enter the interval for grid lines.
- Dimension X/Y – enter the X and Y dimensions of the grid, which determines the size of the grid surface.
- Total area – enter the total sum for the area.

On the *Grid surfaces in groups* panel:

The columns to the left shows the name of the grid, the date of creation, layers (if any), the date the grid surface was updated, any active cells and the active area pertaining to the grid surface.

- **Copy** – press to produce multiple versions of a grid surface (useful for reducing an existing grid into one or more subregions)
- **Delete** – press to delete a grid surface.
- **Set current** – press to set current grid to the active surface.
- **Compare** – press to compare grid surfaces.

The Colouration Tab: See Figure 8-14 on page 8-10, Step 4 to set parameters for the *Colouration* tab.

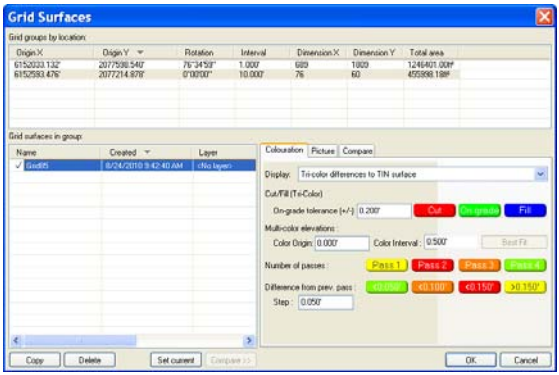


Figure 8-15. Grid Surface Dialog Box

The Picture Tab: shows a graphical display of the grid surface.

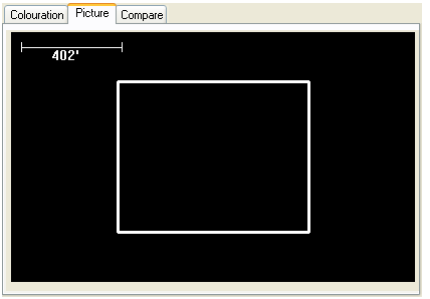


Figure 8-16. Graphical Display of the Grid Surface

On the *Compare* Tab, enter the following parameters to compare surfaces:

- From/To – press to select the surfaces to compare.
- Cut Area/CUT VOLUME – cut value given after comparing two grid surfaces.
- Fill Area/FILL VOLUME – fill value given after comparing two grid surfaces.
- **Swap To/From** – press to swap selected grid surfaces that are being compared.
- **Clear All** – press to clear all selected grid surfaces.
- **Calculate** – press to calculate the value for comparing grid surfaces.
- **Export** – press to export the grid cut/fill plot.

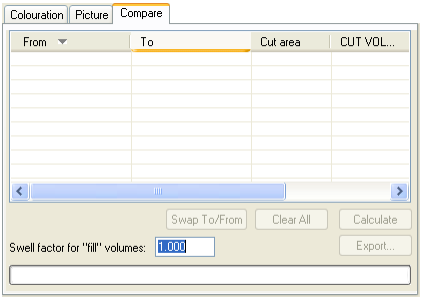


Figure 8-17. Compare Surfaces

Editing a Grid Surface

1. On the ***Grid surfaces*** dialog box, select the grid surface to edit (Figure 8-18 on page 8-14).
2. Change or edit the following parameters as needed:
   - The name of the grid surface.
   - The layer in which the grid surface exists.
   - If the grid surface is visible, not visible, or visible by layer.
   - The color of the triangles, perimeter, or contours of the TIN surface (click the element's button and select a new color).
   - The origin of the grid surface.
   - The size of the grid surface (the also affects the extents).
   - The orientation of the grid surface.
   - The interval of the grid lines.
3. Change or edit the following display information as needed:
   - If using multi-color elevation display type, the color origin and/or interval.
   - If using the number of passes display type, the color for up to four passes.
   - If using the difference from a previous pass display type, you can display the color for up to four passes. Enter the step difference between passes.
4. Click **OK** to save the changes and apply then to the selected surface.

Copying a Grid Surface

The copy function provides a way to produce multiple versions of a grid surface, which may be useful for reducing an existing grid into one or more sub-regions. Selecting a grid surface and clicking **OK** will display the grid in design view.

1. On the ***Grid surfaces*** dialog box, select the grid surface to copy and click **Copy** (Figure 8-18 on page 8-14).
2. Type a unique name for the new grid surface and press **Enter** (Figure 8-18 on page 8-14).

3. Make any desired changes as described in “Editing a Grid Surface” on page 8-13.
4. To view or edit the copied grid surface, select it and press **OK**.

You can now make changes to the grid surface, then export for use in another file.

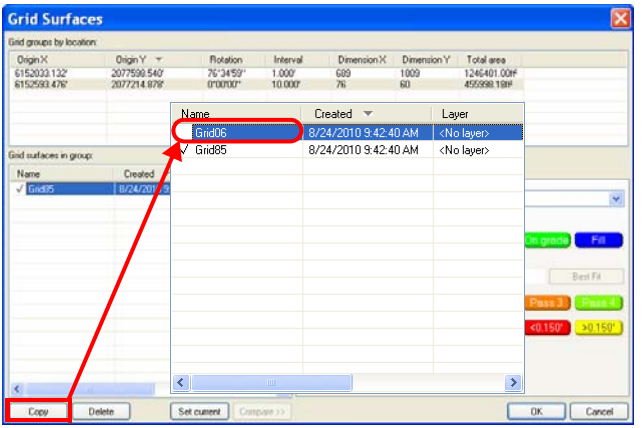


Figure 8-18. Copy and Name Grid Surface

Deleting a Grid Surface

Only delete a surface when the data it contains will never be needed again. If necessary, save a backup copy of the file before deleting surfaces.

NOTICE Deleting a surface will also delete all of its contents.

1. On the ***Grid surfaces*** dialog box, select the grid surface to delete and click **Delete**.
2. Click **OK** to confirm the deletion (Figure 8-19 on page 8-15).

To undo the deletion, click **Edit ▸ Undo edit grid surfaces** or press **Ctrl+Z**.

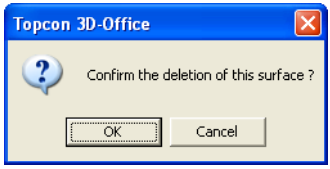


Figure 8-19. Delete Grid Surface

Loading a Grid Surface from a TIN Surface

3D-Office can load the 3D Grid surface with interpolated data from a TIN surface. A TIN surface must exist in the 3D Project file. You can select to either match the color origin/interval from the TIN file, or to enter a new color origin/interval for the Grid surface.

To load a grid surface from a TIN surface, click **Grid ▸ Load current grid ▸ Load from TIN surface**.

The ***Load grid from TIN surface*** dialog box displays (Figure 8-20 on page 8-16).

- TIN surface – select a TIN surface from the drop-down list from which to load data.
- On the *Colouration* panel:
  - Match TIN color origin: check mark this box to match TIN color origin.
  - Match TIN color interval: check mark this box to match TIN color interval.
  - Color origin: enter the color origin.
  - Color interval: enter the color interval.

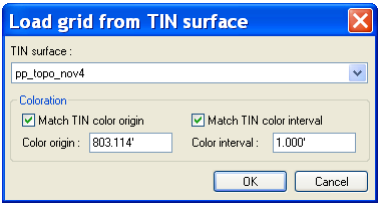


Figure 8-20. Load Grid Information from TIN Surface

The Grid surface will load with information from the TIN surface (Figure 8-21).

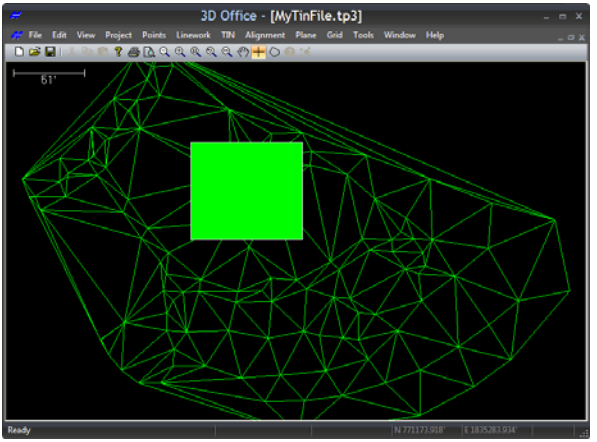


Figure 8-21. Grid Surface Loaded with TIN Information

Removing Grid Data To clear loaded TIN surface grid information, click **Grid ▸ Remove grid data ▸ Remove all grid data**, then press **OK** at the confirmation.

Exporting a Grid Surface

If you made changes to a grid surface, you can export the changed surface to a new grid surface file, or replace an existing file with the new information.

Export versions of the file to track progress.

1. Click **Grid ▸ Export current grid ▸ To 3D grid file (*.GD3)**.
2. On the ***Save As*** dialog box, do one of the following (Figure 8-22):
   - To export to an existing TIN file, navigate to the location of the file and select it, then click **Save** (the contents of the existing file are replaced).
   - To save to a new file, navigate to the desired folder, type a name for the new file, and click **Save**.

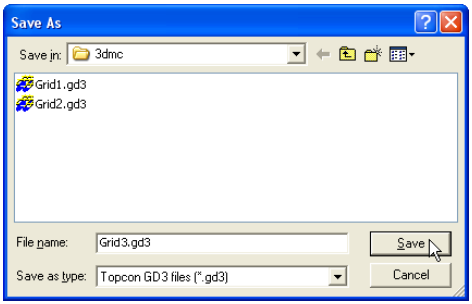


Figure 8-22. Save Grid Surface File

The selected grid surface overwrites the existing file or creates a new 3D Grid surface file.

Notes:

Cut/Fill Files

Cut/fill files provide relative height information between two surfaces. These files can be used to determine cut and fill volumes between surfaces and to ascertain the high and low excavation areas within a project. 3D-Office creates cut/fill files through the surface comparison function.

Opening a Cut/fill File

3D-Office opens a current cut/fill file or creates cut/fill files through the compare surface function.

1. To open a cut/fill file (*.cf3), click **File ▸ Open**.
2. On the ***Open*** dialog box, navigate to the location of the file, select the file type as Cut/fill plot (*.cf3), select the desired file, and press **Open** (Figure 9-1).

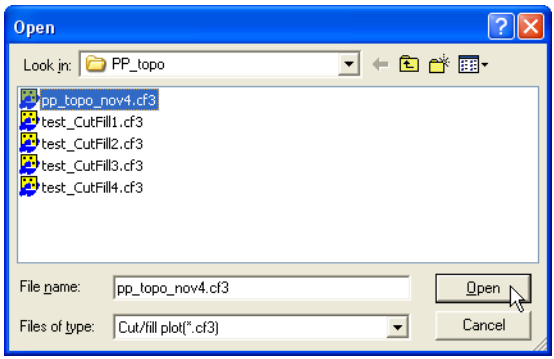


Figure 9-1. Open Cut/fill File

Cut/Fill Main Screen

After opening a Cut/Fill file, the main screen displays (Figure 9-1).

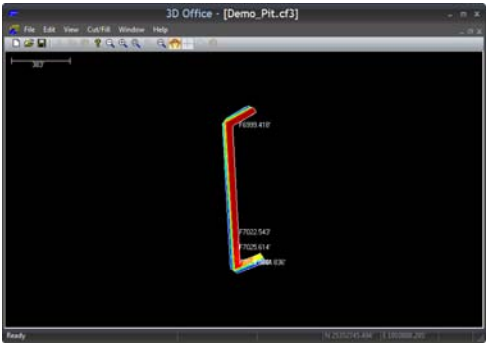


Figure 9-2. The Cut/Fill Main Screen

Viewing Plot Properties

To view the cut/fill plot properties, click **Cut/Fill ▸ Plot properties**. The ***Properties*** dialog box (Figure 9-3) displays the following parameters:

- Total area of surface model
- Total cut and fill volumes
- Total balanced volume
- Cut/fill minimum and maximum values
- Effective cut/fill ratio (cut to fill volume)

The above information also displays in the title bar when printing the graph.

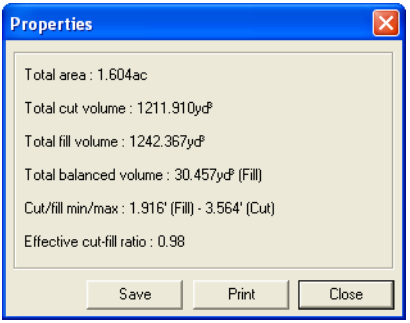


Figure 9-3. Plot Properties

Saving Plot Properties

1. Click **Cut/Fill ▸ Plot properties** and press **Save** (Figure 9-4 on page 9-3).
2. Navigate to the location in which to save the text file, enter a name for the file, and press **Save**.

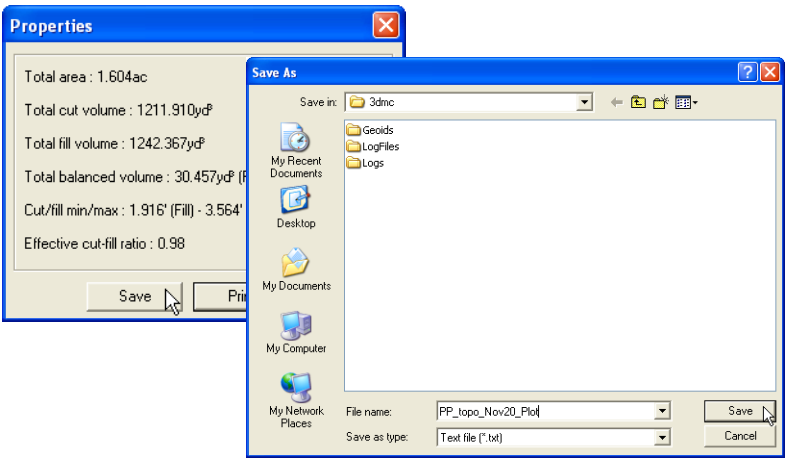


Figure 9-4. Save Plot Properties As Text File

Printing Plot Properties

1. Click **Cut/Fill ▸ Plot properties** (Figure 9-5).
2. On your system's print dialog box, select desired settings and press **Print**.

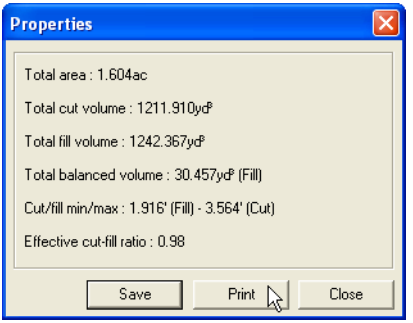


Figure 9-5. Print Plot Properties As Text File

Creating a Cut/fill File

Cut/fill files are created through the compare surfaces function using TIN surfaces, plane surfaces, or road alignments in a 3D Project file. The "compare surfaces in current file" option is only available in 3D Project files.

1. Click one of the following menu options to compare two surfaces in the same file.
   - **Plane ▸ Compare current plane surface ▸ With other surface in this project**
   - **TIN ▸ Compare current TIN surface ▸ With other surface in this project**

2. On the ***Surfaces*** dialog box, select the Surface type from the drop-down list and press **OK** (Figure 9-6).

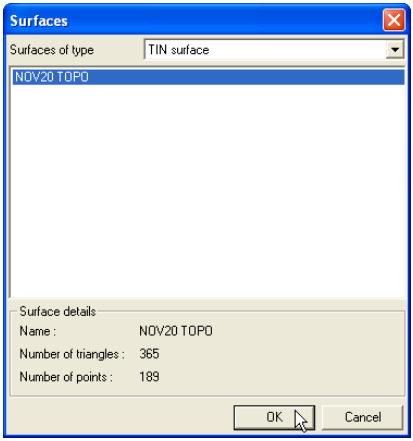


Figure 9-6. Select Surface to Compare

3D-Office compares two surfaces and opens a Cut/Fill file to display contours and/or a grid of cut/fill values, depending on the display settings (Figure 9-7).

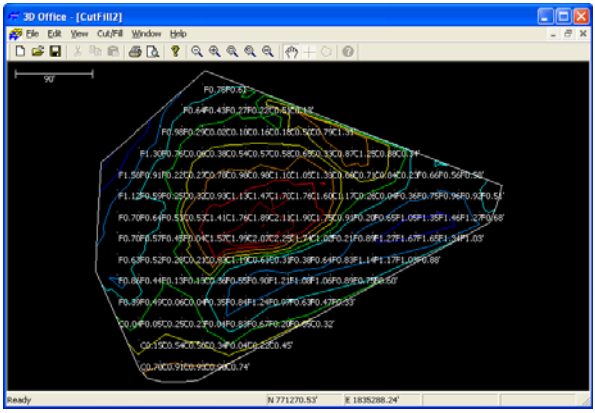


Figure 9-7. Cut/fill File for Compared Surfaces

3. Save the cut/fill file. Click **File ▸ Save as**, navigate to the desired located, type a name for the file, and press **Save**.

Comparing Surfaces in Different Files

Saving surfaces in different files allows you to track grading progress. 3D-Office supports this approach to project management through the compare surface function. Comparing surfaces in different files creates a cut/fill file of the highs and lows of the overlapping surfaces.

1. Depending on the type of file open, click one of the following:
   - For 3D Plane files, click **Plane ▸ Compare plane surface ▸ With 3D surface file**
   - For 3D TIN files, click **TIN ▸ Compare TIN surface ▸ With 3D surface file**
   - For 3D Project files, click **Plane ▸ Compare current plane surface ▸ With 3D surface file** or **TIN ▸ Compare current TIN surface ▸ With 3D surface file**
2. On the ***Open*** dialog box, navigate to the folder in which the file resides, select the *Files of type* from the drop down list (either TN3 files, PL3 files, or RD3 files), select the desired file and click **OK** (Figure 9-8).

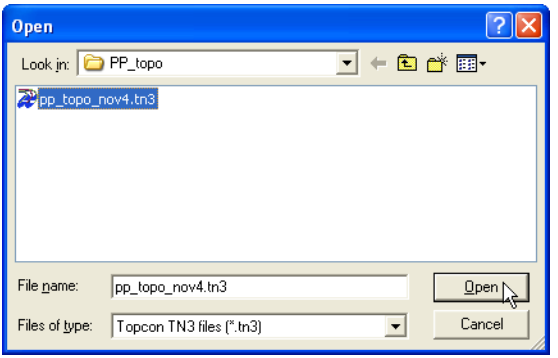


Figure 9-8. Select Surface to Compare

NOTICE

No comparison is possible unless the selected surface file overlaps with the current surface.

3D-Office compares the two surfaces and opens a Cut/Fill view displaying the results of the comparison (Figure 9-9).

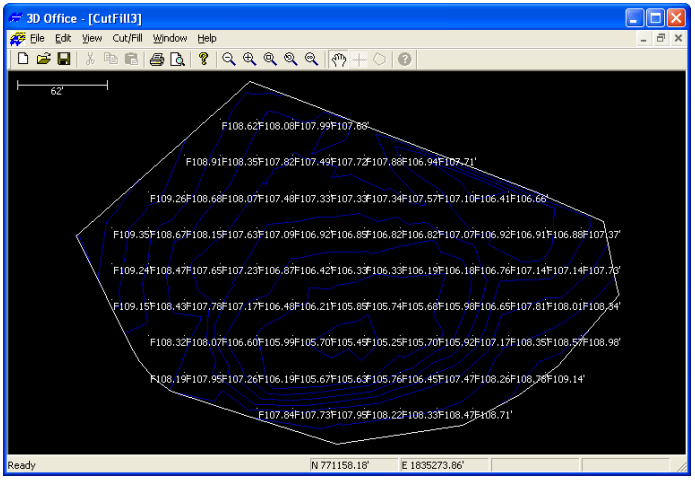


Figure 9-9. Cut/fill File for Compared Surfaces

3. View the cut/fill information. See “Cut/Fill Files” on page 9-1 for details on cut/fill surface files.
   - If needed, re-compare the surface files after making desired adjustments in the original 3D surface files (for example, changing the Direction of mainfall for a plane file).
   - To save the Cut-Fill file, click **File ▸ Save as**, navigate to the desired located, type a name for the file, and press **Save**.

Setting Plot Options

The ***View Options*** dialog box sets various cut/fill display options, and the type of units to use for various project quantities.

1. With a cut/fill file open, click **Cut/Fill ▸ Plot options**.
2. On the *Cut/fill* tab, select and enter the following information (Figure 9-10 on page 9-9):
   - *Show boundaries* – enable to display the boundary of the surface.
   - *Show breaklines* – enable to display any breaklines in the surface definition.
   - *Show grid of cut/fill values* – enable to display a grid of cut/fill values.
   - *Grid interval* – enter a value to set the spacing of the cut/fill grid lines.
   - *Show contours* – enable to display contours of the cut/fill surface.
   - *Show solid colored regions* – enable to display the cuts and fills as solid colors. The color grid describes the colors associated with a cut/fill value.
   - *Color interval* – enter a value to change the cut/fill range value associated with the corresponding color.
3. See "Setting Project Units" on page 2-35 for a description of the fields on the *Units* tab ("Set Cut/fill View Options" on page 9-9).

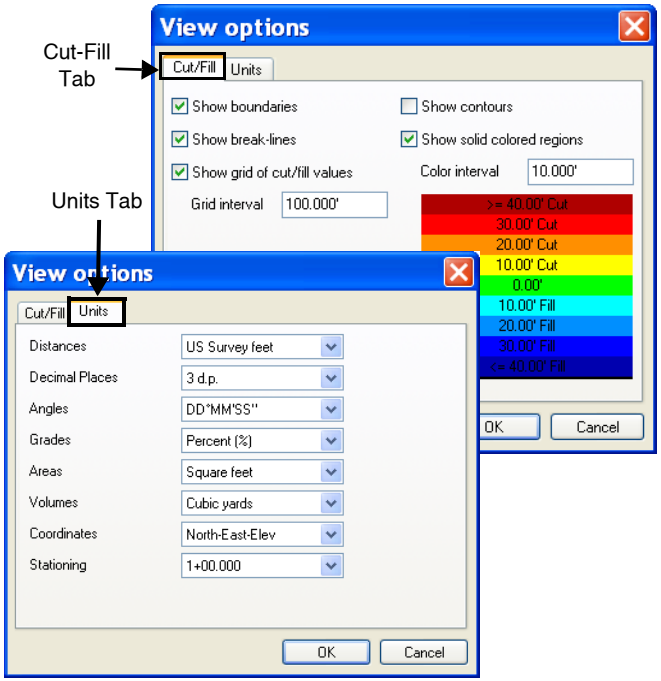


Figure 9-10. Set Cut/fill View Options

Notes:

Connecting a Computer to a Controller

Connecting the Pocket-3D controller and a computer will allow files to be transferred between devices for jobsite and file management.

Connect your device and computer using the desired connection method: serial cable, USB cable (Figure A-1), ethernet cable to connect to a network, or Bluetooth® wireless technology.

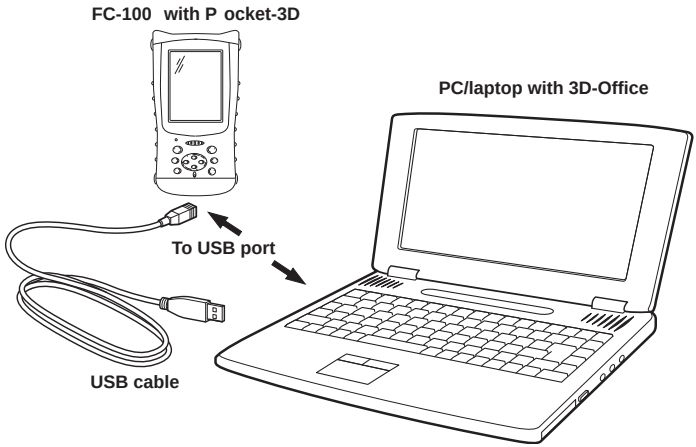


Figure A-1. Connect Controller and Computer

Regardless of the connection method, Microsoft® ActiveSync® must be installed on the computer to transfer data between a Pocket-3D controller and a computer with 3D-Office. ActiveSync establishes a connection between the computer and a mobile device, such as a TPS Controller. The mobile device must have the Windows CE operating system. ActiveSync is available free of charge from the Microsoft website (http://www.microsoft.com).

Follow the procedure below to establish a connection between the computer and a Pocket-3D controller using Microsoft ActiveSync.

1. If needed, download and install Microsoft ActiveSync, following the on-screen instructions from microsoft.com and the ActiveSync Install Wizard.
2. Connect your device and computer using the desired connection method (serial cable, USB cable, ethernet cable to connect to a network, or Bluetooth® wireless technology).
3. Switch on the Pocket-3D controller and computer.
4. Start Microsoft ActiveSync.
5. Click **Next** on the ***Get Connected*** dialog box (Figure A-2).

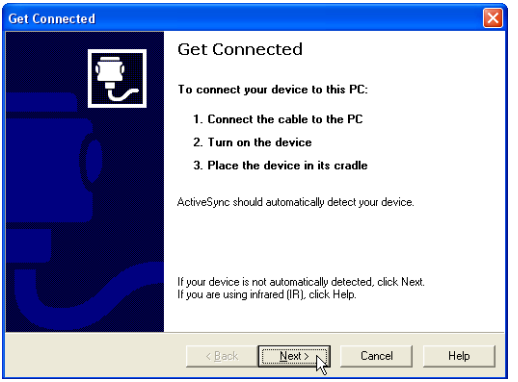


Figure A-2. Connect Using ActiveSync

The computer establishes a connection with the device. If the device is switched on, the ***Connected*** dialog box displays. The system tray also displays a green ActiveSync circle, indicating a successful computer-to-device connection (Figure A-3).

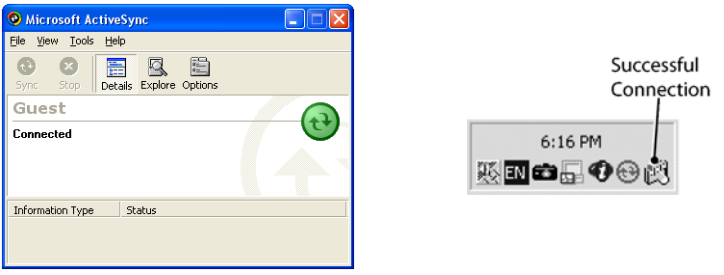


Figure A-3. Connection Established

If the computer has only one COM port:

1. Start Microsoft ActiveSync.
2. Click **File ▸ Connection Settings** (Figure A-4).

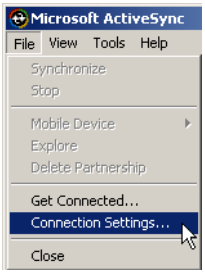


Figure A-4. Open Connection Settings

3. On the ***Connection Settings*** dialog box, click and enable the following parameters (Figure A-5):
   - "Allow network (Ethernet) and Remote Access Service (RAS) server connection with this desktop computer"
   - "Show status icon in Task bar"

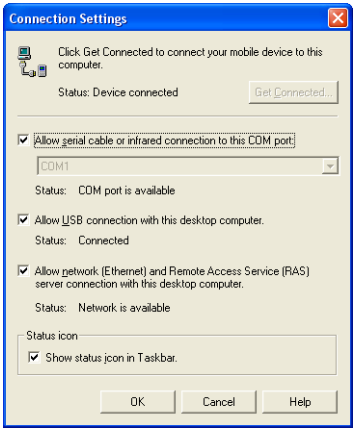


Figure A-5. Connection Settings

In this case, ActiveSync does not request the COM Port after disconnecting the TPS controller from the computer. The COM Port connects the computer with a TPS GPS+ receiver or Total Station.

If there are two or more COM ports on the computer:

1. Start Microsoft ActiveSync.
2. Click **File ▸ Connection Settings**.
3. On the ***Connection Settings*** dialog box, set the following parameters (Figure A-6):
   - click and enable "Allow serial cable or infrared connection to this COM port"
   - select a COM port from the drop-down list (usually COM 1)

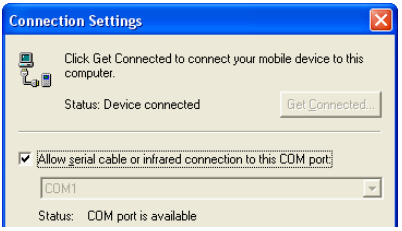


Figure A-6. Connection Settings for Multiple COM Ports

In this case, Microsoft ActiveSync requests the COM Port after disconnecting the controller and computer. The COM Port is available only for devices that use the Windows CE operating system.

Use separate COM Ports for computer-to-controller connections and computer-to-receiver/Total Station connections.

When reconnecting the Pocket-3D controller and TPS Controller, use the same serial interface port set in the ***Connection Settings*** dialog box.

Hot Keys

Table B-1 lists common keyboard shortcuts, or hot keys, for some 3D-Office functions.

Table B-1. AGForm-3D Hot Keys

Press This...	To Perform this Function...
Ctrl+A	Selects all (in active view).
Ctrl+C	Copies the selected information to the clipboard.
Ctrl+N	Opens a new 3D Project.
Ctrl+O	Displays the ***Open*** dialog box for selecting a file to open.
Ctrl+P	Displays the ***Print*** dialog box for printing the Plan View.
Ctrl+S	Saves the project.
Ctrl+V	Pastes copied information to the selected location.
Ctrl+X	Cuts the selected information for pasting to the clipboard.
Ctrl+Y	Redoes the last operation.
Ctrl+Z	Undoes the last operation.
Esc	Quits the Measure distance/area, create new polyline, and TIN profile view functions.
Arrow keys	When in 3D simulation mode, pans the screen left, right, up, and down (also depends on the type of simulation).
=	When in 3D simulation mode for TIN files, zooms in.
-	When in 3D simulation mode for TIN files, zooms out.
F2	When in 3D simulation mode for TIN files, changes the view from inside the machine's cab. When in the Points List view, allows in-place editing.
F3	When in 3D simulation mode for TIN files, changes the view from outside the machine's cab.
F4	When in 3D simulation mode for TIN files, changes the view from above the machine.
Tab	When in 3D simulation mode for TIN files, changes the machine to the next machine in the Machine menu.

Hot keys that correspond to a menu option are listed next to that menu option (Figure B-1).

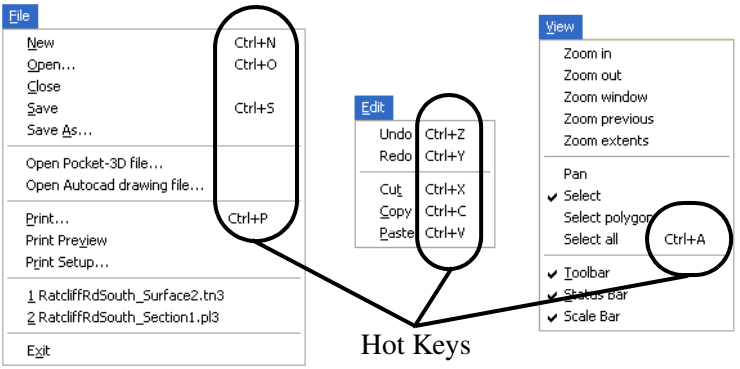


Figure B-1. Menu Examples with Hot Keys

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Topcon Positioning Systems, Inc.
7400 National Drive, Livermore, CA 94550
800·443·4567 www.topcon.com

ISO 9001:2000
FM 68448

3D-Office Reference Guide
P/N: 7010-0684 Rev. C 10/10