USER GUIDE

WM-Subsurface

SOFTWARE

Version 2017 or later
Revision A
February 2017

Trimble

Contact and Legal Information

Trimble Inc.
PO Box 250
Hamilton, IN 46742
USA

Contact numbers

USA / Canada: +1 800-282-4103

Other countries: +1 260-488-3492

Europe: +44 1786-465100

Australia / New Zealand: +61 (3) 8680-7222

Legal Notices

Copyright and Trademarks

© 2010–2017, Trimble Inc. All rights reserved. Trimble, *Ag*GPS, EZ-Guide, EZ-Pilot, FmX, GreenSeeker, Juno, Nomad, and Yuma are registered trademarks of Trimble Inc., registered in the United States and in other countries. CFX-750, FieldLevel, FM-750, FM-1000, TMX-2050, WM-Topo, and XCN-2050 are trademarks of Trimble Inc.

Microsoft, ActiveSync, Windows, Windows Vista, and Windows Mobile are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

All other trademarks are the property of their respective owners.

Release Notice

This is the February 2017 release, version 2017 or later, Revision A of the *WM-Subsurface Software User Guide*.

Product Limited Warranty Information

For applicable product Limited Warranty information, please refer to Legal Notices in the License Agreement for this product, or consult your authorized reseller.

Contents

Contact and Legal Information 2

1 Getting Started 5

Related information and technical support 6
Installing the software 6
Windows Vista and Windows 7 operating system 6
Registering the software 7
Running the software for the first time. 7
Creating and opening a farm project 7
Selecting a measurement system 9
Changing user information 10
Changing the working date / system date 11
Changing languages 12
Interface overview 13
Menus, submenus, and contextual menus 13
Toolbars 14
Backing up projects 16
Restoring project backups 18

2 WM-Subsurface Software 20

Data: Reading and writing 21
Viewing data 24
Topographic maps 25
Selecting views of topographic data. 26
Display options 29
View in 3D 33
Viewing benchmarks 35
Drainage maps 36
Working with drainage layers 36
Creating a drainage line 40
The Select Line tool 41
The Node Edit Tool 42
Creating offset lines. 43
Changing the appearance of drainage lines. 45
Adding labels to drainage lines 46
Deleting Mains, Submains, and Laterals 47
Creating a Drainage design 47
Setting up Pipe supplies 47
Entering drainage design parameters 49
Data entry / display options 52

Creating a Drainage design 54
Lateral Spacing Calculator 58
Extending and connecting lines 59
Auto Pipe Sizing 61
Displaying the profile 64
Viewing information on a drainage line 66
Saving changes to a drainage layer 67
Changing the types of attributes a drainage layer 67
Changing the color or legend of drainage features 69
Show Me 70
Levee Creation Tool 72
Printing maps 77
Printing Drainage reports 79

CHAPTER 1

Getting Started

In this chapter:

- Related information and technical support
- Installing the software
- Running the software for the first time
- Changing user information
- Changing the working date / system date
- Changing languages
- Interface overview
- Backing up projects
- Restoring project backups

This section describes how to get up and running with the Trimble® WM-Subsurface Software. It also describes common software operations.

The WM-Subsurface software includes functionality for analyzing topographic data on your farm and creating drainage plans. It also includes general mapping, field records and simple accounting.

This manual covers the topographic and drainage functionality of the software only. For details on using the other functions of the Trimble Ag Software, refer to the *Trimble Ag Software: Desktop with Advanced Desktop Accounting* manual.

Related information and technical support

Trimble provides a range of support options:

- You can email the technical support group at TABS_Support@trimble.com.
- If you are subscribed to an Annual Software Maintenance Plan, you can contact the technical support group at one of the following numbers:

  USA / Canada: +1 800-282-4103

  Other countries: +1 260-488-3492

  Europe: +44 1786-465100

  Australia / New Zealand: +61 (3) 8680-7222
- The Annual Software Maintenance Plan gives you access to current updates to all of your software modules as well as unlimited telephone support.

Installing the software

To install the software:

1. Insert the installation disk into the CD/DVD drive of your desktop computer.

   The installation starts automatically.
2. Select the software module(s) or manual that you want to install / download and then follow the on-screen instructions.

   Some software modules require a software product code—these codes are located within your account on the Store or will be included with your software purchase.

Windows Vista and Windows 7 operating system

If you are running the software on a computer running the Windows Vista® or Windows® 7 operating system, and you receive an error message (for example, `DBI Create Table Error`) when you run the software, you may need to set the program shortcut to *Run as an Administrator*. For more information, see http://www.farmworks.com/files/faqs/General/Vista_and_7_Setup.pdf.

Registering the software

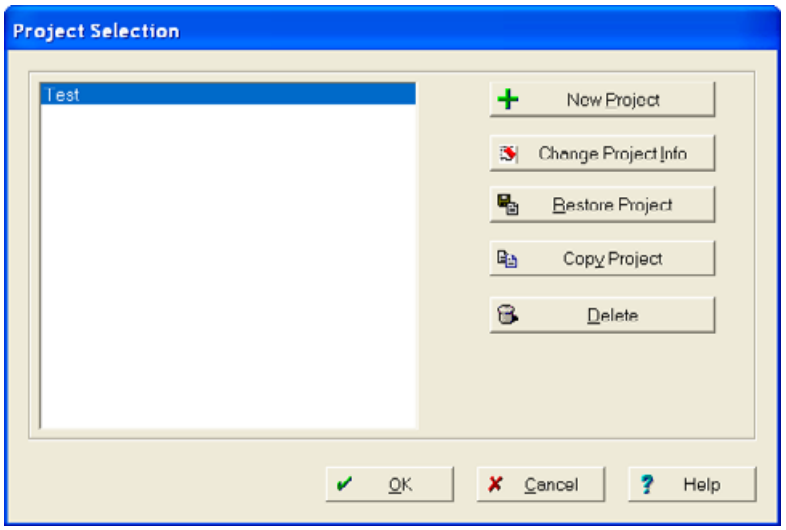
You must register your software to get full use of it. You can register the software automatically over the Internet by selecting the appropriate option when you run the software for the first time.

Alternatively, you can register your software by calling the number listed for support in the front of the manual or by contacting your Reseller. If you are calling to register, make sure that you are at your computer with the software installed and running.

Running the software for the first time

Creating and opening a farm project

Every time that you start the software, the *Project Selection* dialog appears.



In this dialog:

Click ...	To ...
A project name in the list	Select a project.
New Project	Create a new project. See Adding a new project, page 8.
Change Project Info	Change the project name and/or password.
Restore Project	Restore a backup of a project previously saved to another storage device.
Copy Project	Copy a project or part of a project.
Delete	Delete a project

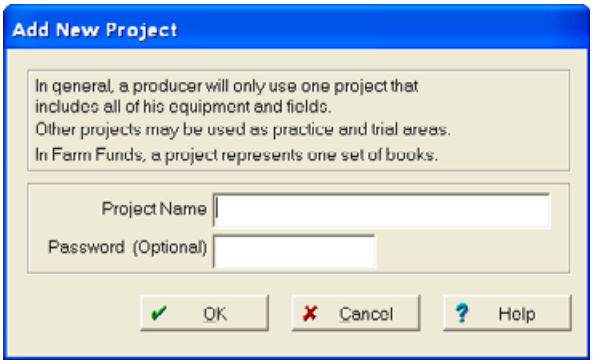
CAUTION – It is strongly recommended that you back up your projects frequently to protect vital project information in the event that a computer suffers hardware failure or become infected by a virus. The software saves the backup to your desktop computer's hard drive, but you can also save the backup to a removable medium, such as a flash drive or CD. See Backing up projects, page 16.

Adding a new project

If this is the first time you use the software, no projects will be listed in the *Project Selection* dialog.

To create a new project:

1. In the *Project Selection* dialog, click **New Project**.



2. In the *Add New Project* dialog, enter a name for the new project in *Project Name*. You can also enter a password in *Password*—this is optional.

   Passwords are case sensitive and may have up to eight letters and numbers, but no special characters, such as the at sign (@) or tilde (~). If no password is required, leave *Password* blank.

   To remove the password at a later date:

   a. In the *Project Selection* dialog, select the project and then click **Change Project Info**.

   b. Enter your password in the *Project Password* dialog and then click **OK**.

   c. In the *Project* dialog, select the password, press Delete on the keyboard and then click **OK.**

CAUTION – A password will protect your project, but if you forget it, you will not be able to view your project. Make sure that your password is easy for you to remember, but not easy for others to guess. If you do forget your password, contact the technical support team.

3. Click **OK** to return to the *Project Selection* dialog.

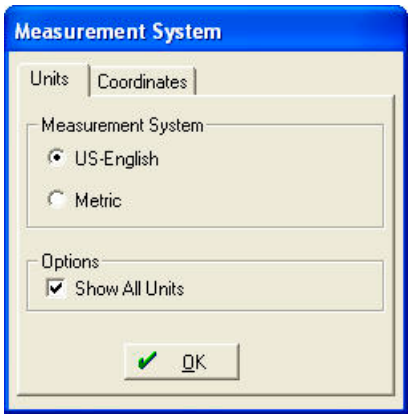
4. The *Project Selection* dialog displays the name of your project. To open your project, make sure that you have highlighted the correct project name and then click **OK**.

   The software creates a new blank project that you can start working in.

Note – *A project represents all of the maps, records, and accounting information for a farming operation. If Accounting is enabled, each project will have a separate set of books and should represent a separate taxable entity. Most users require only a single project. The data in each project is kept separate from all other projects and there is no way to combine or merge the data from multiple projects.*

Selecting a measurement system

The first time that you open the software, you are prompted to select a measurement system.



Select the required option and then click **OK**. The options are:

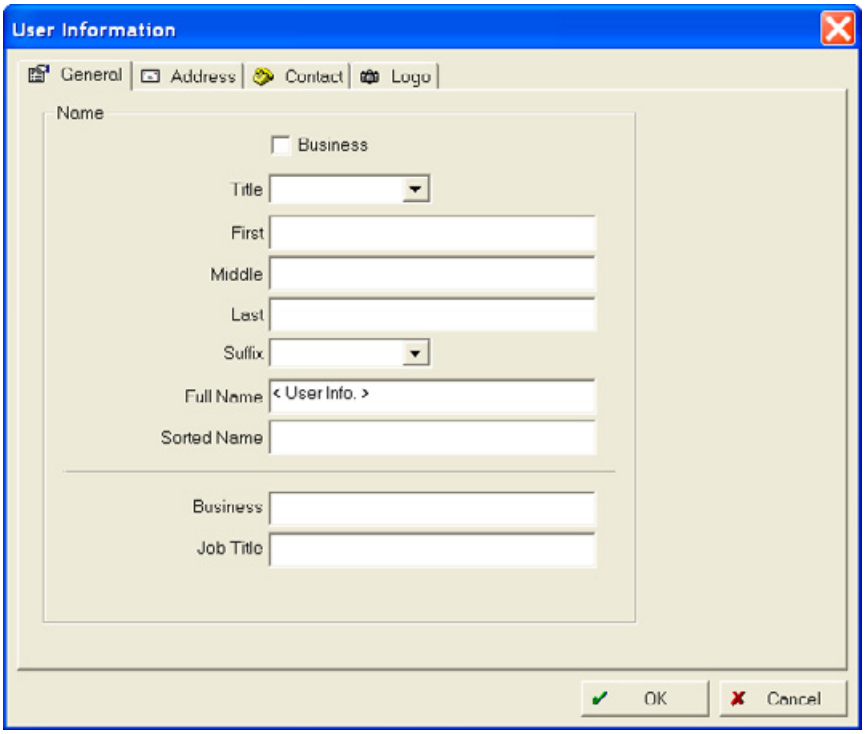
- US-English
- Metric
- Show All Units. This shows US and Metric units—the software uses the first selection (US-English or Metrics) for area and distance measurements, but gives both US-English and Metrics for any volume measurements.

The *Show All Units* option is suitable for users in Canada who want US distance and area measurements and metric volume and quantity measurements.

Changing user information

The contact information that is printed on many reports is sourced from the user information entered in the software. To change this:

1. Select *File / Preferences / User Info*.
2. In the *User Information* dialog, select the tabs in turn to enter the details that you want to appear on printed reports and then click **OK**.

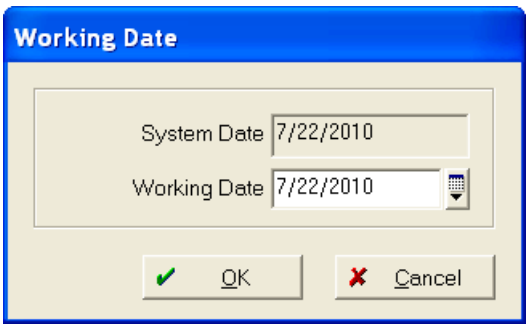


Changing the working date / system date

If you want to enter data or print reports for a particular date, you can change the working date.

1. Click the date in the top right-hand corner of the screen.

2. Enter or select the *Working Date* that you want to use for data entry or for generating a report and then click **OK**.

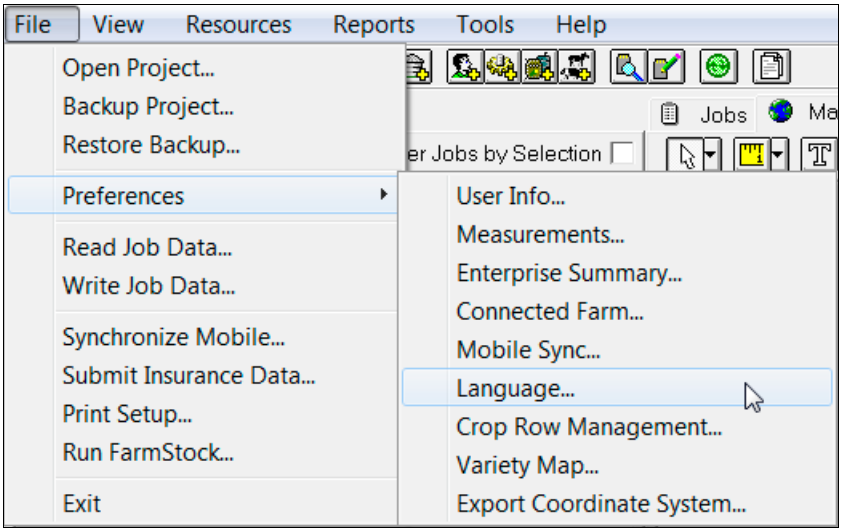


3. Once you finish entering data/printing reports, repeat Step 1 through Step 2 to change the *Working Date* back to the *System Date*.

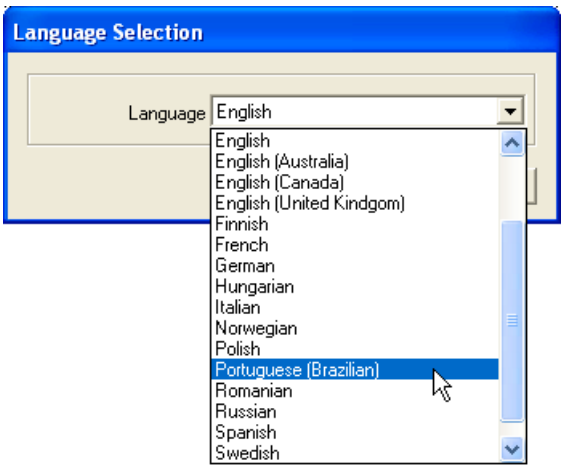
Changing languages

The language feature allows you to change the language that you selected during the original installation, without requiring you to reinstall the software.

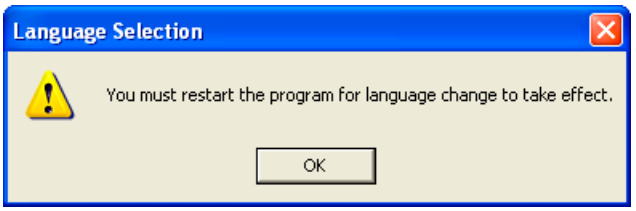
1. Select *File / Preferences / Language*.



2. Select the required language from the drop-down list and then click **OK**.



3. The software prompts you to restart the software. Once you have done this, the language change appears.

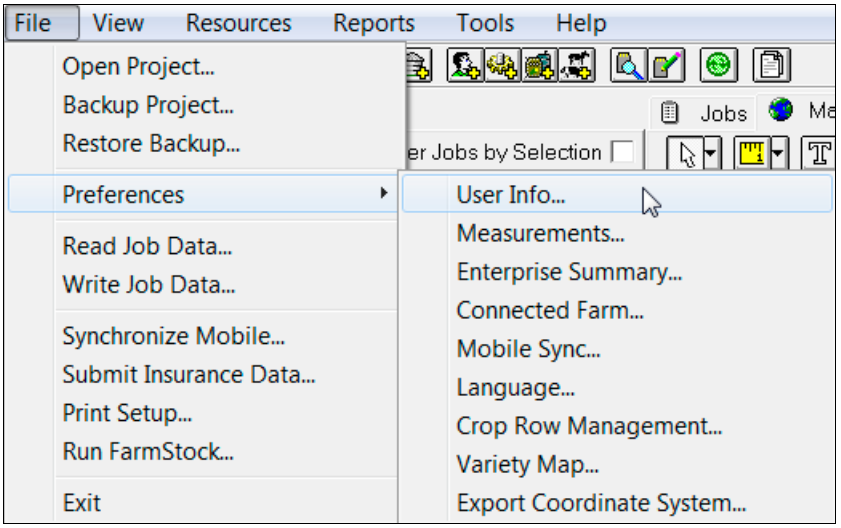


Interface overview

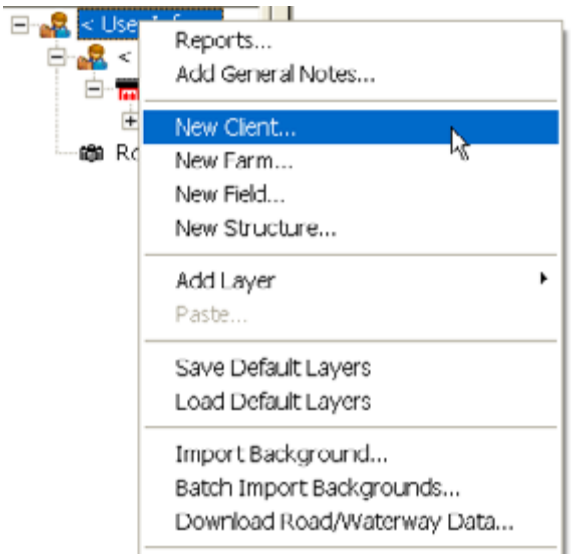
This section describes the elements of the software.

Menus, submenus, and contextual menus

- You can select items from a menu. Where these items show an arrow next to them, there is a submenu. In the manual, this is described as “Select *File / Preferences / User Info”*.



- Hover over an item and then click the right mouse button to show a contextual menu. In the manual, this is described as “right-click *<User Info>* and then select *New Client*.



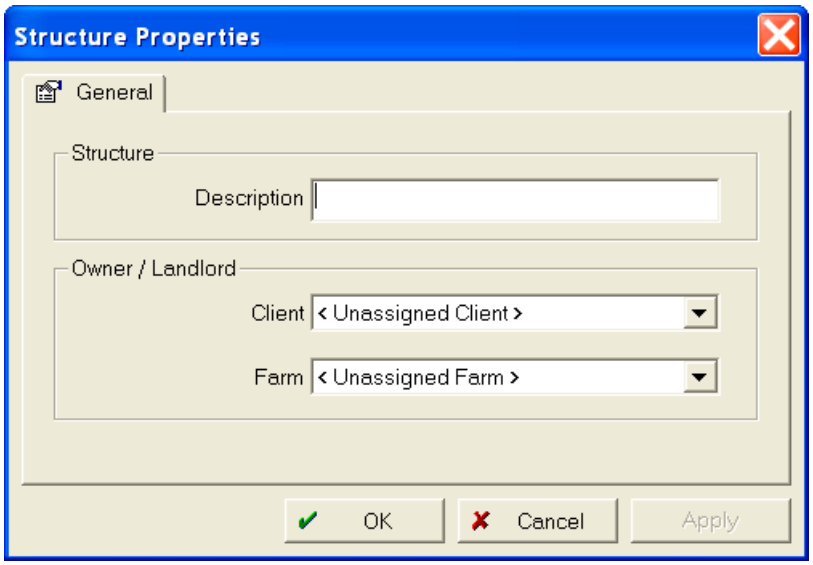
Note – *Most, but not all, of the items contained in the menus and submenus have corresponding toolbar icons (buttons). If you cannot find an icon to perform the command you want, look for the command on the appropriate menu.*

Toolbars

You can select a toolbar from the drop-down list. This list shows all toolbars that are available for the current software.

To view icon information, hover the mouse pointer over the icon.

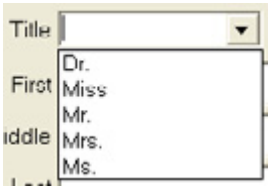
Click any icon on the toolbar to open the dialog—in this example, click the Structure icon to open the *Structure Properties* dialog where you can create a new structure.



Dialogs

Dialogs appear when you need to perform an action. Dialogs contain elements you may use to add, edit, delete, view, and print information—for example, buttons, options, check boxes, lists, and fields.

- ***Drop-down lists:*** You can select an item from drop-down lists. To show the available items in a list, click the arrow. Click an item to select it.



  If the list allows you to select more than one item, press Ctrl on the keyboard to select additional items.

  <Add/Edit>: If this appears in a list, you can select it to add a new item to the list, or change the name of an item that appears in the list.

  <New>: If this appears in a list, you can select it and then enter a new item in an adjacent box.

  <All>: If this appears in a list, it selects all items in an adjacent list.

- ***Dialog fields***: You can enter information directly into a dialog field by clicking in the field. This includes *Notes* or *Description* fields, where you can enter a description or reminder.

Note – *If a field appears greyed-out, it is not available. This means that you cannot enter or modify information in these shaded boxes.*

  Some fields allow you to enter information directly, or pick it from a list or calendar.

- ***Radio buttons and check boxes***: You can click to select only one option from a list of radio buttons. However, you can select more than one check box. Check boxes are generally used to enable one or more options. If you select a radio button, it is marked with a black dot; if you select a check box, a check mark appears in the box. To clear a radio button or check box, click it again.
- ***Buttons:*** When you click a button (either a toolbar icon or a command button) this performs an immediate action, such as enabling an option or opening a dialog. For example, if you click **OK**, it usually closes the dialog.

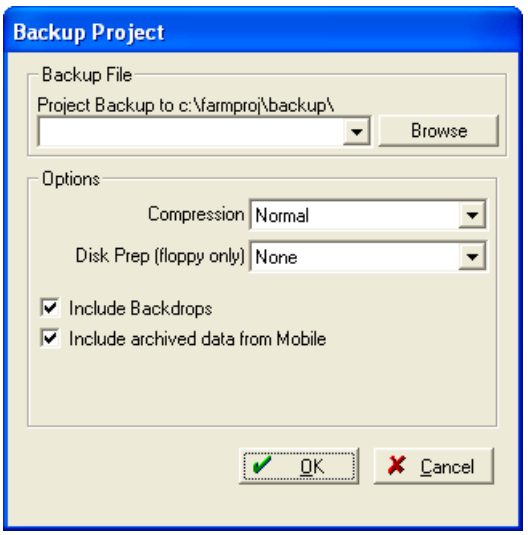
Common buttons are used as follows:

Button	Action
OK	Save information and close a dialog.
Cancel	Close a dialog without saving the information.
Record	Save information and clear the dialog so that you can enter new data.
Done	• If you did not enter information, the dialog closes. • If you did enter information, you are prompted to save it before the dialog closes.

Backing up projects

To safeguard your data, it is recommended that you make regular and frequent backups of your project to a medium other than your hard drive (USB, CD, hard disk, and so on) in case of failure, loss, or damage. This enables you to restore the backup of your project and recover lost data. Without a project backup, there is no way to recover the records and maps for your farm.

1. Select *File / Backup Project*.



2. Enter a name for the backup in the *Backup To* field, or replace an earlier backup by selecting it from the drop-down list.

   By default, the software saves project backups in the backup folder on the computer hard drive (c:\farmproj\backup). To save the backup to a different folder or to a removable drive:

   a. In the *Backup Project* dialog, click **Browse**.

   b. In the *Save As* dialog, do one of the following:

   - Select the required folder or removable drive from the *Save In* list.
   - Select an icon in the left column of the dialog and then browse to the folder or drive where you want to save the backup (for example, to save the backup to a USB drive, select the My Computer icon , select the letter for the removable drive to enter it in the *Save In* field).

   c. Enter a name for the backup file in the *File Name* field, or replace an earlier backup by selecting it from the drop-down list.

3. Do one of the following:

   - Click **Save** to return to the *Backup Project* dialog.
   - Click **Cancel** to close the dialog without saving the backup.

4. In the *Options* section of the *Backup Project* dialog, select a value from the *Compression* drop-down list to change the size of the backup file and the amount of time it will take to create the backup. The options are *Maximum* (slowest), *Normal* (default), *Fast*, *Super Fast*, or *None*:
   - If you select *Maximum*, the software takes longer to create the backup but the file will be smaller.
   - If you select *None*, the software will takes a shorter time to create the backup, but the file will be much larger.
5. If you are saving the backup to a USB drive or a disk, you can select *Wipe Disk* from the *Disk Prep* drop-down list to erase all files on the USB drive or floppy disk before making the backup.

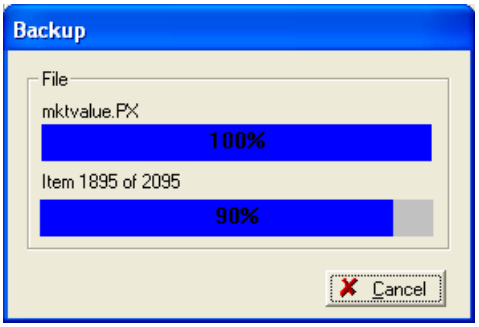
CAUTION – Before you select Wipe Disk, verify there are no files you want to keep.

---

6. You can also select the checkboxes to include backdrops and /or Mobile archived data.

Note – *Backdrops include aerial images and digital photos. Mobile data is a copy of the original data from the Mobile software.*

7. Click **OK**. A progress screen appears.



   Click **Cancel** to close the dialog box without making a backup.
8. Repeat Step 1 through Step 7 to save another backup to a different folder, removable drive, or floppy disk.

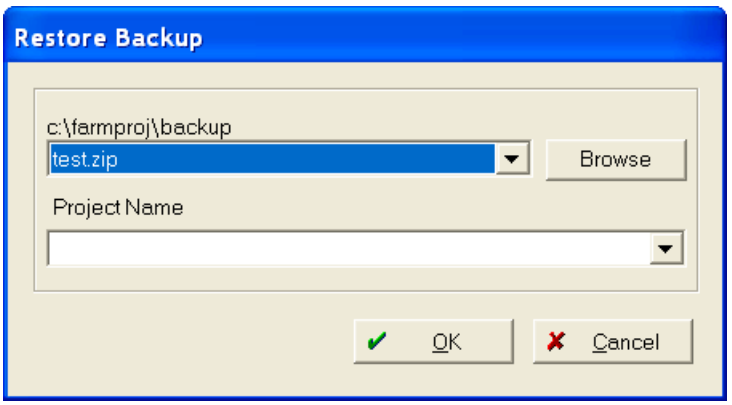
Restoring project backups

If your data is corrupted or if you lose your data through a hardware failure, you can attempt to recover it by restoring a backup you created earlier with the backup option (as described above).

Note – *The software will not restore backups made with other software, such as the Windows XP backup utility.*

Restoring a project backup replaces the information in the current project with the information that you had at the time you made the backup. For example, if you created a backup on Monday, and then needed to restore it on Friday of the same week, you will lose any information entered Tuesday through Thursday of that week.

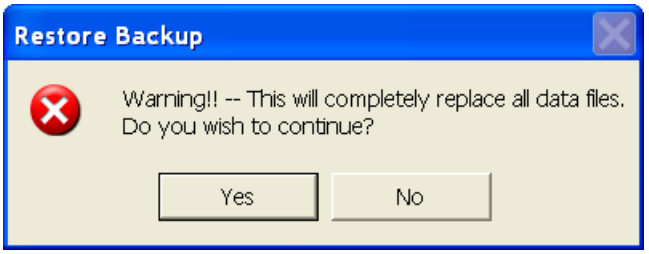
1. Do one of the following:
   - Select *File / Restore Backup*.
   - In the *Project Selection* tab, click **Restore Project**.
2. From the *Backup Project* drop-down list, select the backup file you created previously. If the backup does not appear on the list, browse to locate it:
   a. Click the **Browse** button to open a second *Restore Backup* dialog.
   b. Do one of the following:
   - Browse to the folder or drive where you previously saved the backup.
   - Select an icon in the left column and then browse to the folder or removable drive where you previously saved the backup (for example, if you saved the backup to your My Documents folder, select the *My Documents* icon to transfer it to the *Look In* field).
3. Select the backup file—it moves to the *File Name* field—and then click **Open**.
4. In the *Restore Backup* dialog, the backup file now appears in the *Restore From* field.



5. From the drop-down list, select the Project Name that you want to restore the backup to.

Note – *If you selected Restore Backup from the File menu, you cannot restore to the project that you were previously in. To restore to this project, exit the software, restart it and then click* ***Restore Project*** *in the Project Selection tab.*

6. Do one of the following:
   - Click **OK** to restore the file.
   - Click **Cancel** to close the dialog box without restoring the backup.
7. If you click **OK**, you are prompted to confirm the restore operation.



8. Click **OK**. A progress screen appears—you can click **Cancel** to close the dialog box without restoring a backup.

During the restoration of the backup, the software replaces the current data in your project with the data in the backup file. When the restoration is complete, you can begin working with the restored data.

CHAPTER 2

WM-Subsurface Software

In this chapter:

- Data: Reading and writing
- Viewing data
- Topographic maps
- View in 3D
- Drainage maps
- Creating a Drainage design
- Printing maps
- Printing Drainage reports

The WM-Subsurface software can read (import) data that was collected using the Trimble FmX® integrated display. You can transfer this data to the software through a USB drive or wirelessly, using the Trimble AG Software. Additionally, you can use the software to create pipe layouts that include both the horizontal and vertical layout.

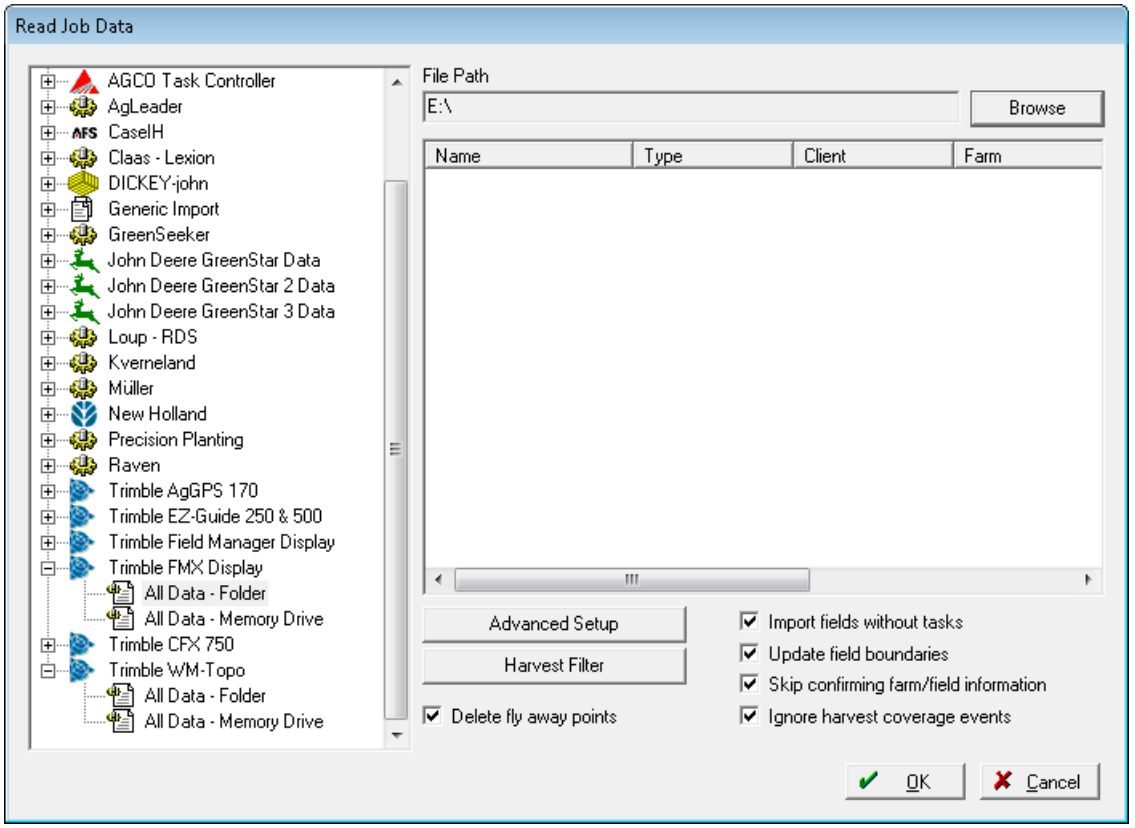
Once the software is synchronized with an FmX integrated display, you can use the Autoslope feature to optimize the slopes and depths; this creates efficient farm drainage networks or surface ditches for optimal field drainage, which can lead to increased yields.

When combined with the Trimble AG Software, the WM-Subsurface Software enables you to wirelessly deliver completed drainage designs to the FmX integrated display through the Connected Farm server.

You must have an accurate GPS mapped boundary for the field (it is recommended that it is mapped with a Trimble FmX integrated display and RTK). Additionally, when elevation data is collected with the FmX display you must map right up to the edge of the boundary.

Data: Reading and writing

1. Select *File/ Read Job Data*, or click the Read Job Data icon on the *Job/Resource Tools* toolbar.
2. In the left column of the *Read Job Data* dialog, click + next to *Trimble FMX Display* (or select the *Trimble WM Topo o*ption*),* and then select either *All Data - Folder* or *All Data - Memory Drive*.



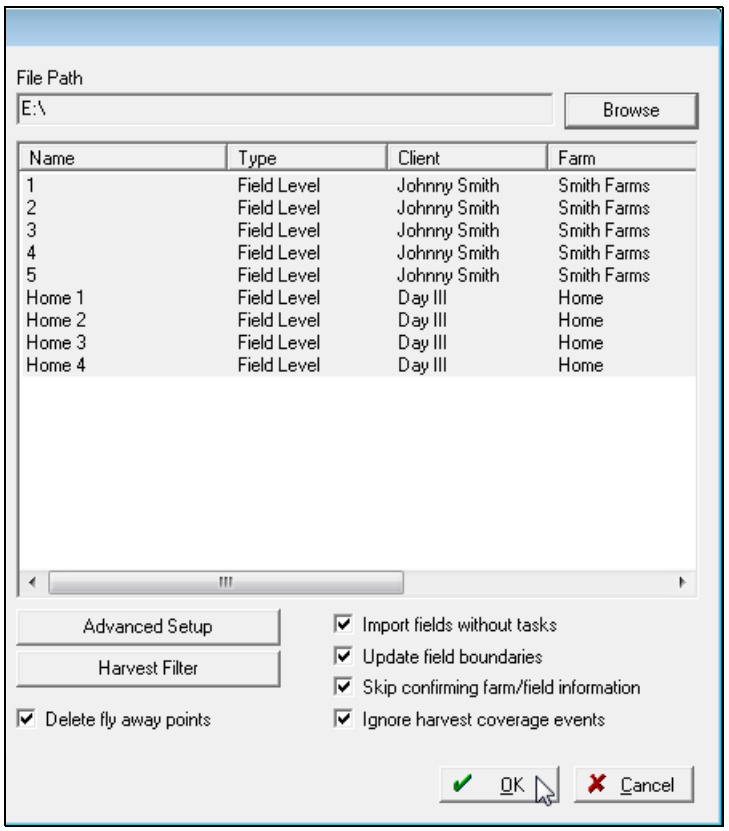
This filters the files so that only the selected file types will appear.

Note – *If you select the Trimble WM-Topo™ options, this allows you to import data logged using WM-Topo. It can be used by itself or in conjuction with an FmX integrated display, where the FmX display is used to log part of the field, while WM-Topo logs the other part of the field. WM-Topo data will be added to the existing topographic layer.*

3. On the right-hand side, click **Browse** (next to *File Path*) to find the storage card or folder where you saved the FieldLevel™ II surface data.

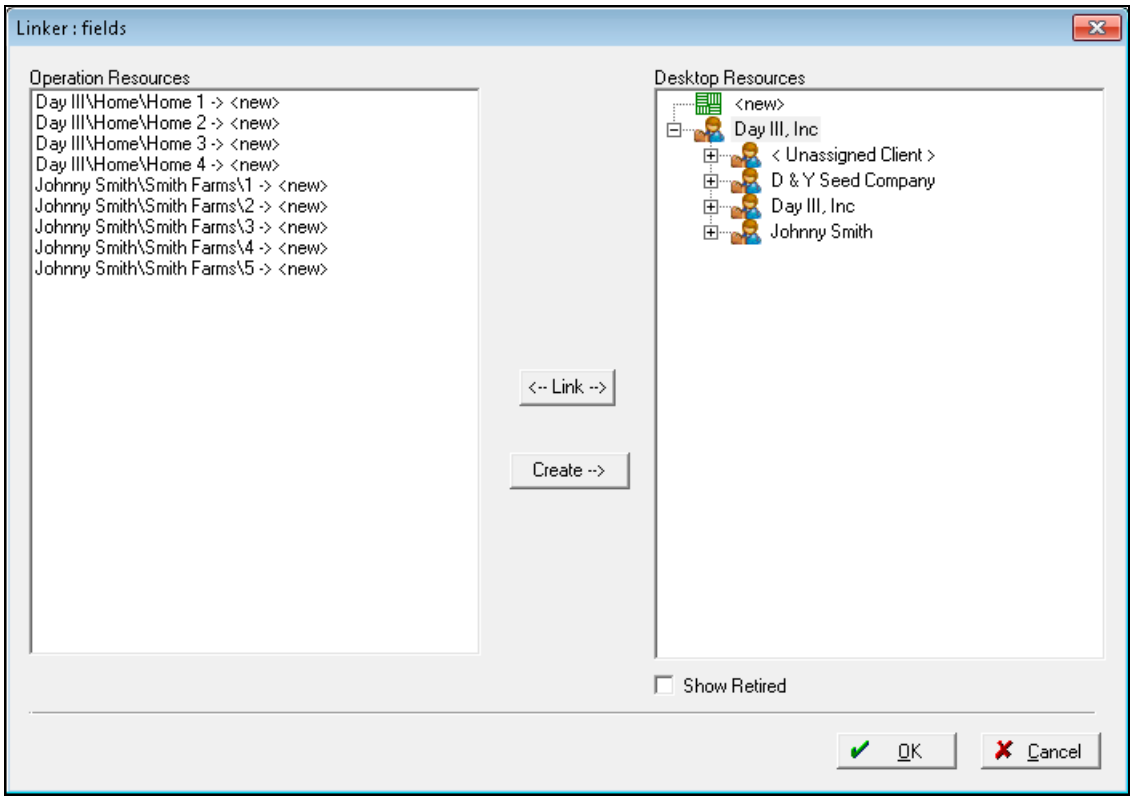
4. Select the *Ag*GPS® folder and then click **OK**.

5. All files of the selected type appear in the *Read Job Data* dialog. Select the files that you want to import—to select multiple files, hold down the Ctrl key while selecting.



6. You can now do any of the following:
   - Select the *Delete fly away points* checkbox to filter out points that are away from the field because of bad GPS data. This is recommended, but with the quality of GPS receivers today, it is rarely needed. If portions of the map are missing after you have imported the data, reimport the data and then clear this checkbox.
   - Select the *Import fields without tasks* checkbox to allow field names that were set up on the monitor to be imported and set up in the *Client, Farm,* and *Field* lists without having to first log a job for that field.
   - Select the *Update field boundaries* checkbox to allow a boundary that was logged and saved to the card to be updated when the jobs are read in. This only applies to certain monitors.
   - Select the *Skip confirming farm/field Information* checkbox to check, when completing the *Linker* screen, if there is a *New* farm or field. If this is the case, the program automatically sets those up for you and places them in the *Client/Farm/Field* list.
7. Click **OK**. The import progress shows each of the files being read.

   The *Linker* dialog appear. This links resources used during the operation with resources on the desktop computer, and any new fields are added here.



When importing jobs from a data file, some resources and job entry items may not exist in the desktop software. For example, when entering a resource in the field, you may enter a different name from that used in the office. When you import jobs, the *Linker* dialog either creates new resources or links them with current ones. If they are linked, the software assumes that the two different items are the same.

8. The *Linker* dialog shows two lists of resources: *Operation* and *Desktop*. You must now create or link any items in the *Operation Resources* list with items in the *Desktop Resources* list. To do this:

   a. Select an item in the *Operation Resources* and then do one of the following:

   - If it is a new item, click **Create** and then enter the applicable information in the screen that appears. This creates a new resource in the desktop software.
   - You can leave the item linked to *New*—when the *Linker* screen is completed, you are prompted to create the new item. If you selected the *Skip confirming Farm and Field information* checkbox, the program automatically creates those clients, farms, and fields at the appropriate location.
   - If the item is the same as an item already listed under *Desktop Resources*, highlight both resources and then click **Link**.

   b. If a resource does not appear under *Desktop Resources* it may be a retired item. Select the *Show Retired* checkbox.

   c. Once all items are linked or created, click **OK**.

   The surface maps are now added under the appropriate *Farm* and *Field*.

Viewing data

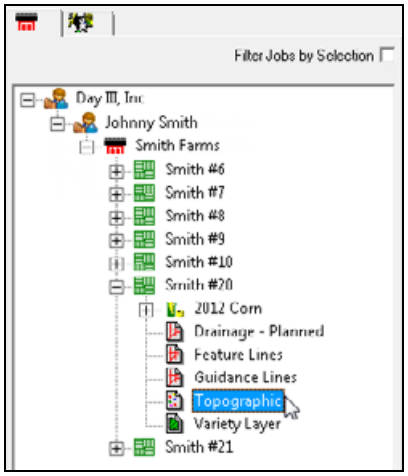
The software makes it easy for you to view topographic maps—in a normal base data (or “birds eye”) view or in a 3D view, which makes it easier to identify high and low areas with their associated slopes. As data is read into the software, background layers are created. Each layer has a map associated with it that includes the topographic data to be used as a reference for creating drainage maps. The software enables you to view this data differently so that you can easily determine different watersheds, along with the direction of the water flow and other important information. In addition, when this data is imported, it automatically creates a blank Drainage layer.

The Drainage layer is a pre-defined layer that contains the drainage designs that you create. The contents of this layer can be written to an FmX display and used for actual drainage work. The Site software includes features that enable you to change the way your maps are displayed and printed. These include an Edit Legend feature with which you can customize the colors and ranges used on a legend, and change the way legends are printed on maps. Map layers including Google Earth imagery, yield, soil type, and others can also be displayed.

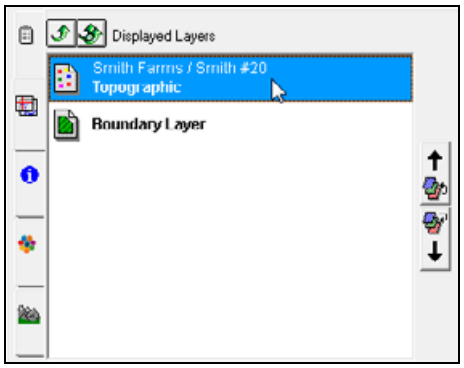
For more information, refer to the *Trimble Ag Software: Desktop with Advanced Desktop Accounting* manual.

Topographic maps

Once the data is read into the software, it appears as a background layer (or map) in the *Client/Farm/Field/Event* (or *Enterprise*) list.



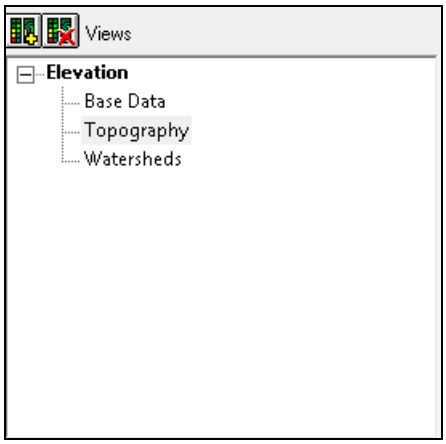
To view a background layer, double-click it. The layer appears in the *Displayed Layers* window at the bottom of the screen.



For more information, refer to the *Trimble Ag Software: Desktop with Advanced Desktop Accounting* manual.

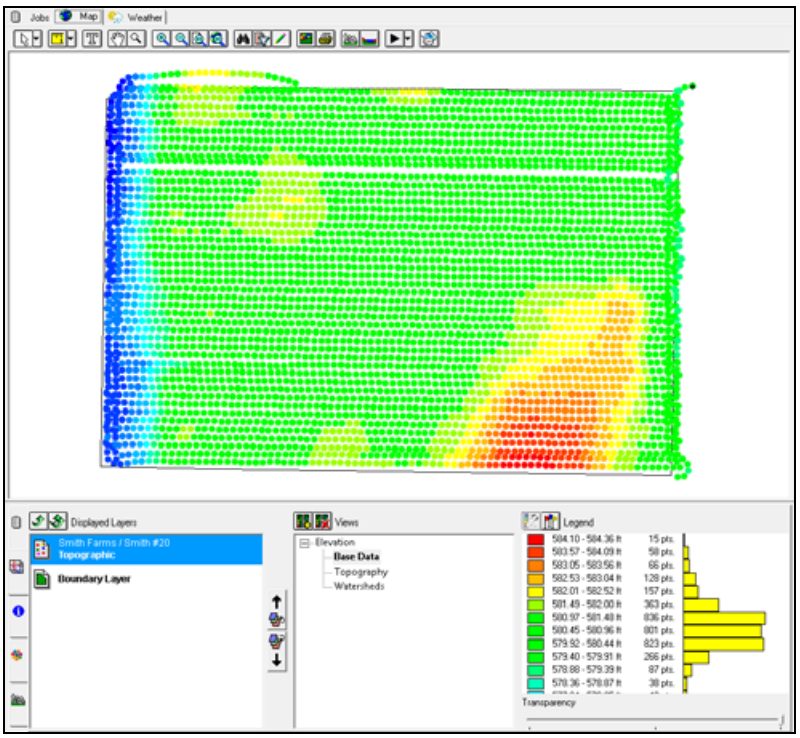
Selecting views of topographic data

In the *Views* area at the bottom of the screen, you can select an attribute that changes how a map appears.

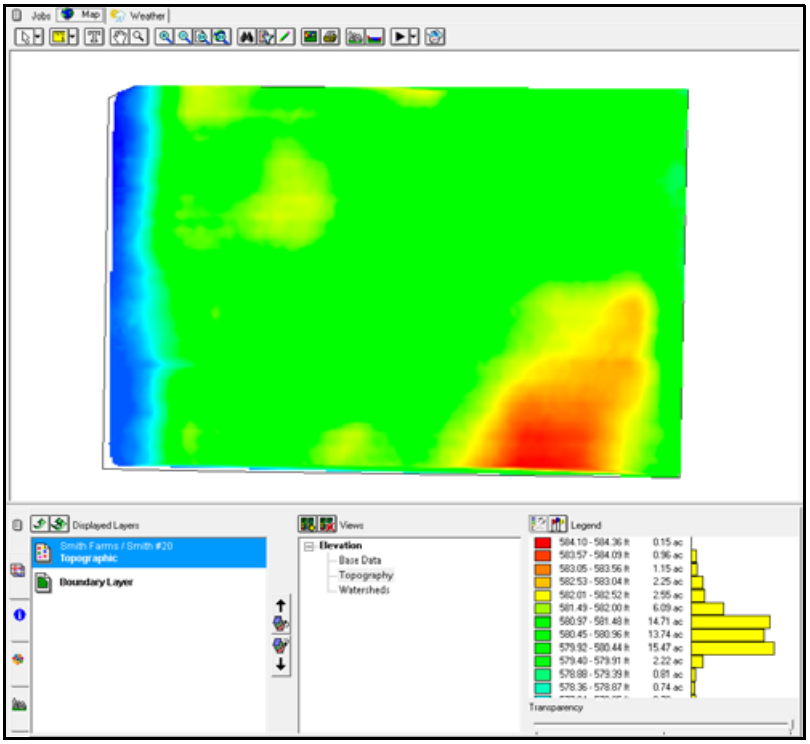


When you view a topographic map, you can select from the following options:

- Base Data: Shows the raw point data that was collected. This data appears with a legend that uses the elevation attribute associated with it. The only points you see are those that represent the areas that were physically mapped.



- Topography: Shows the full map, colored according to its elevation data.



This view features a map that completely fills the field to reflect the entire area within the field boundary. To use this view, the field must have a correctly mapped GPS boundary. Boundary maps created with an FmX display are automatically created when the data is read into the software using Read Job data or Synchronization.

You can also manually create boundaries: Right-click the field (in the tree view on the left) and then select *Import Boundary* or *Create Boundary*.

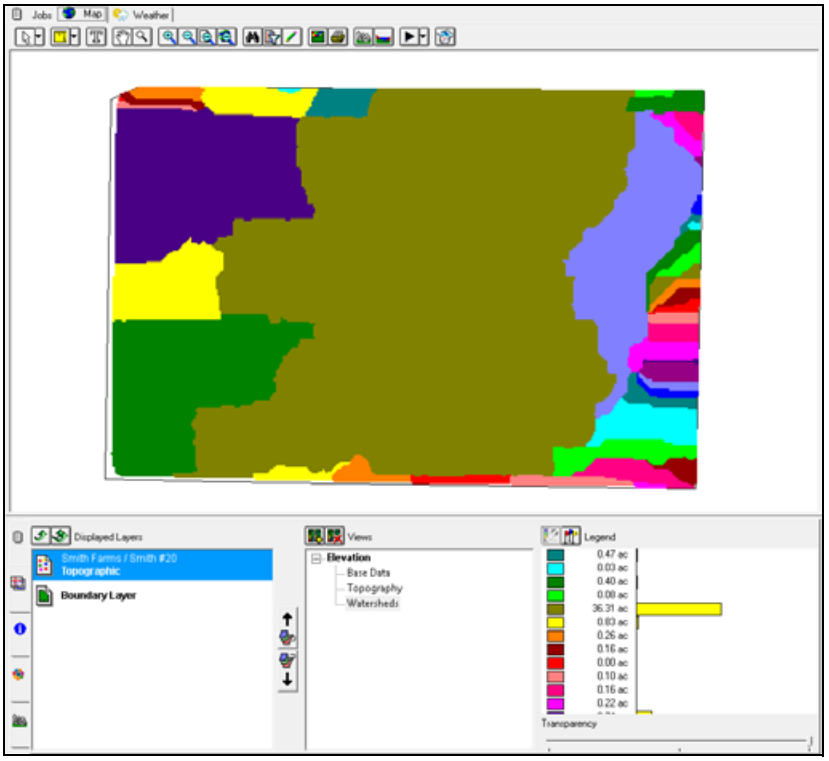
If you select the *Update field boundaries* option in *Read Job Data*, the program updates all field boundaries with the latest boundaries in the files that are being imported. This includes any boundaries created with the WM-Drain® survey that are included in FmX data that is read into the software.

If you change a boundary and you want to update the topography view, right-click the topographic layer and then select *Refresh Surface*.

For more information, refer to the *Trimble Ag Software: Desktop with Advanced Desktop Accounting* manual.

- Calculating the topography view: The program takes latitude/longitude (a bird-eye's view, ignoring altitude) of points and generate a Delaunay triangulation. After the points have been connected into triangles, a grid of cells (2 meters by 2 meters) is defined that covers the area. The program samples the elevation of the triangles at the center of each grid cell to determine the elevation of the cell.

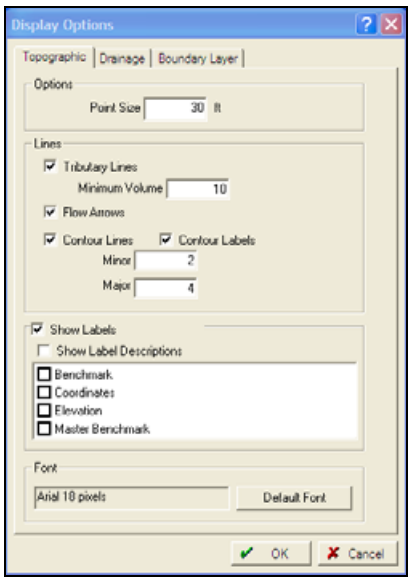
- Watershed: Computes and shows the different watersheds for the field that you are viewing.



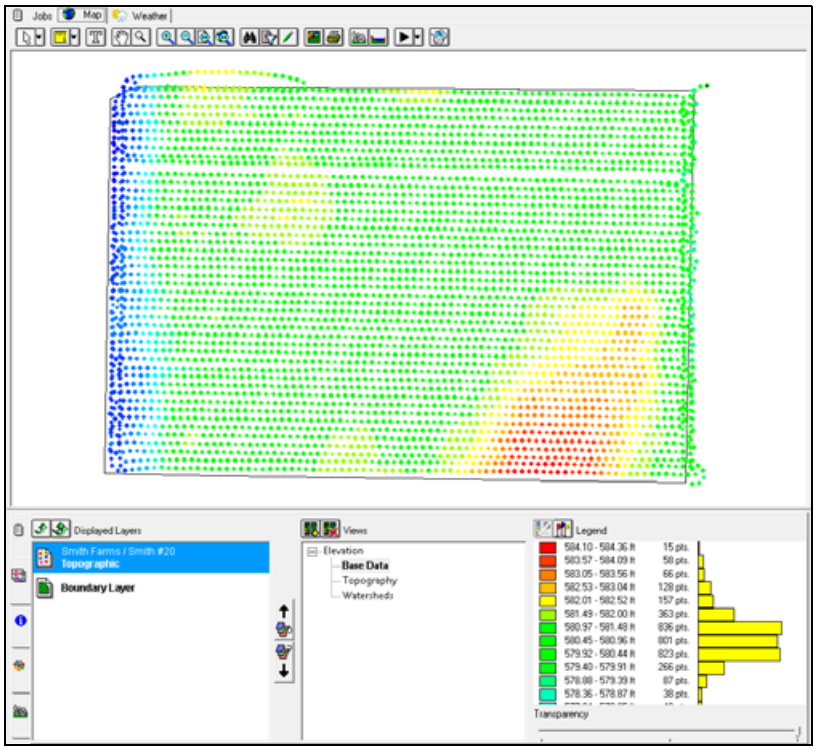
Watersheds are computed according to the elevation values for the field, and represent distinct areas of the field that are expected to drain differently and may require separate drainage plans. Watersheds are defined by their ultimate destination or ending cell, which is either a hole/basin in the middle of the field or an exit on the side of a field. All cells that eventual flow to the exit/end will be colored the same. As with topography, this option requires the field to have a valid boundary.

Display options

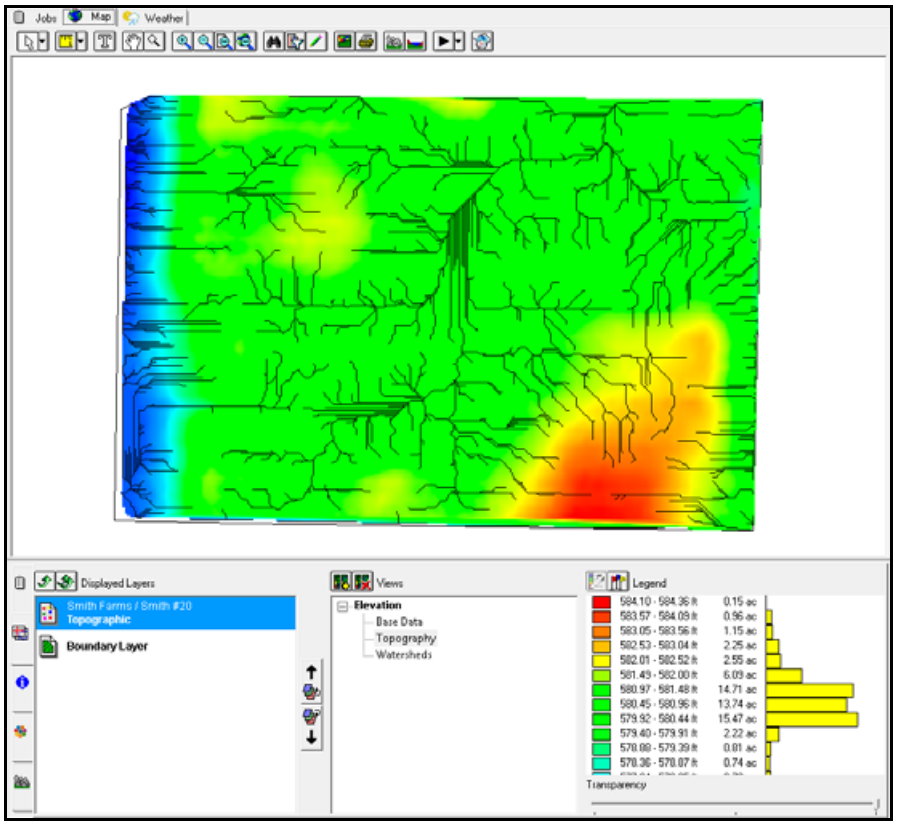
Click the Display Options icon to open the *Display Options* dialog where you can change how a layer appears. When a topographic layer (map) is displayed, the dialog includes options to change how topographic maps appear.



- Point Size: Changes the size of the circular points in the Base Data view.



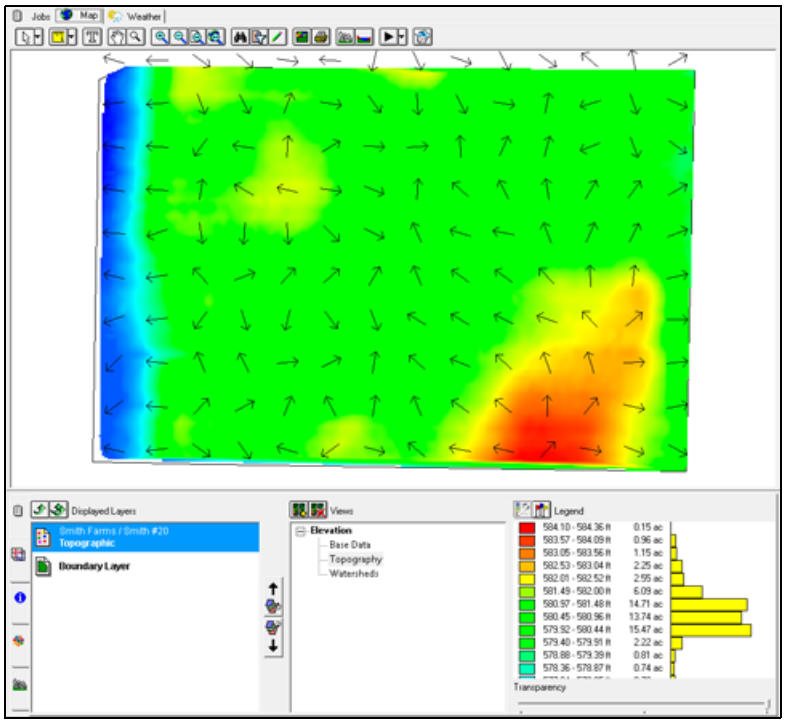
- Tributary Lines: Shows tributary lines on top of the map.



These lines reflect the predicted water flow of the field based on the topographic data.

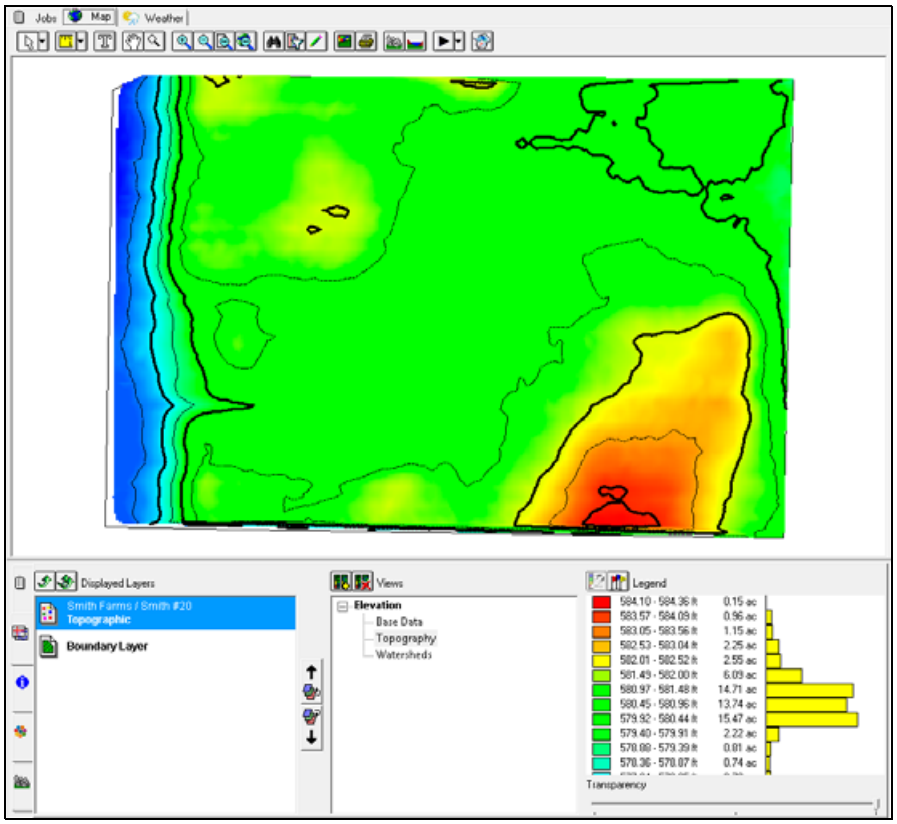
- Minimum Volume: The minimum volume option controls which lines are drawn, based on the number of cells that flow/feed into a given cell. Once the threshold is reached, a line is drawn connecting the cells to show the path the water takes as it travels from cell to cell. Lowering the minimum volume will reveal more of the river/path calculated for the water flow in the field.

- Flow Arrows: Shows tributary lines with arrows that represent the direction of flow.



As you zoom in on the map, more arrows are visible, with the arrows closer together

- Contours: Shows elevation contour lines on top of the map.



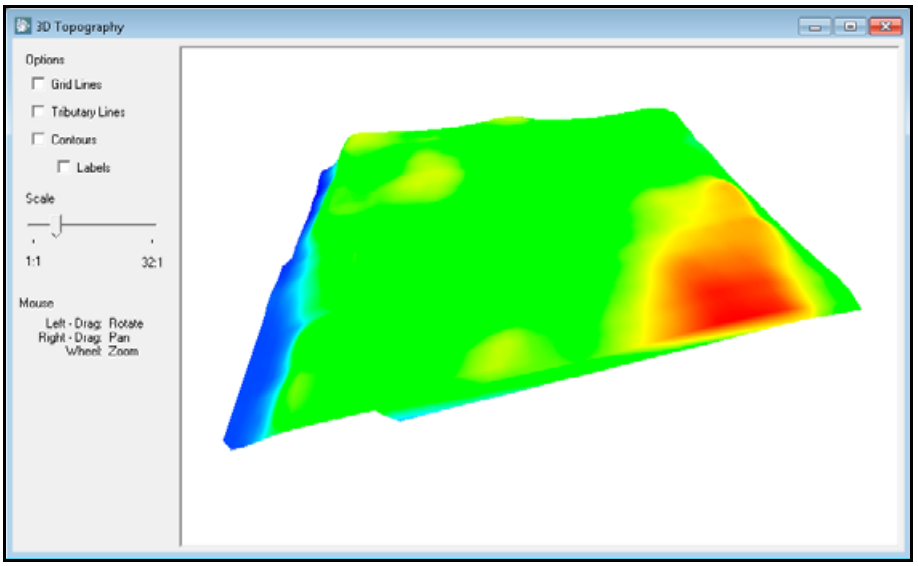
Contour lines represent different levels of elevation on the map. If you select the Label option, labels show the specific elevation for each contour line. Use the Minor setting to control the number of contours by entering the required elevation difference between contour lines. For example, if you want to see contours every two tenths of a foot, enter 0.2 for the minor contour. The Major setting determines the frequency of contour lines that will be bolder and that will include a text label on the map (when the *Labels* option is enabled).

The Major setting must be divisible by the Minor setting. For example, a Minor setting of 2 and a Major setting of 6 means that contour lines appear every 2 feet, and labeled contoured lines appear every 6 feet (every third contour line includes a label).

To change the color and font for labels, click **Default Font**.

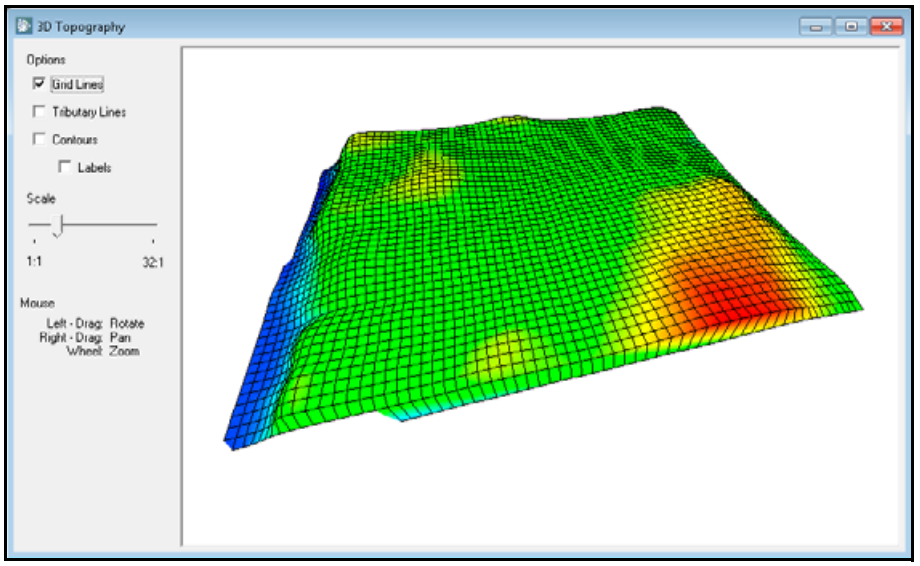
View in 3D

Click the View in 3D icon to open the currently displayed map in 3D in a new window.



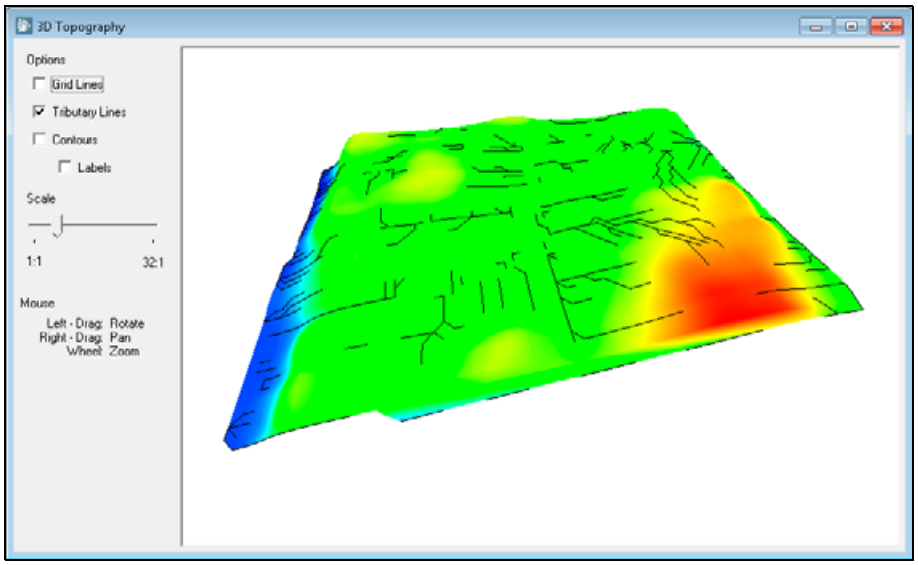
This enables you to more easily see high and low areas of the field and to determine the slopes and other information. The 3D view includes the following options:

- Grid Lines: Shows grid lines on top of the 3D map.



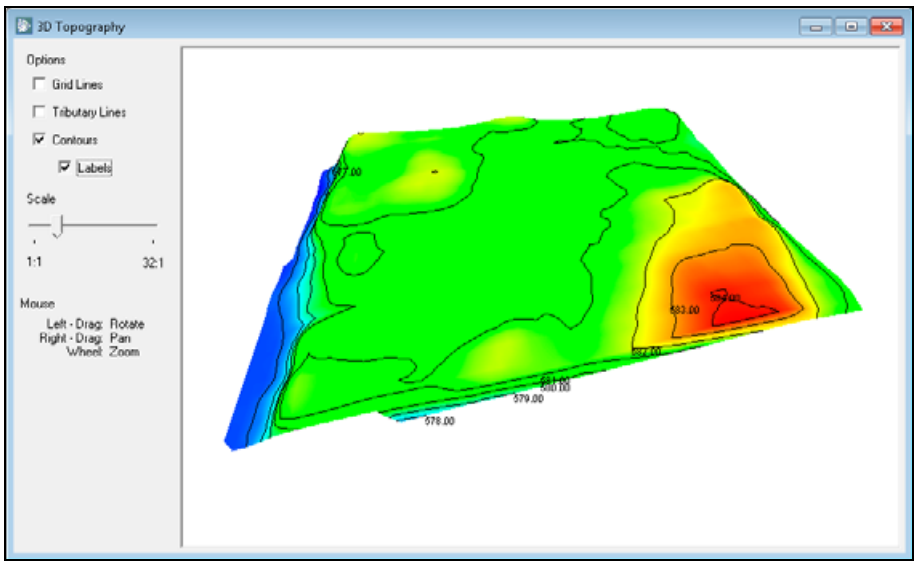
As you increase the scale of the map, the distortion of the different elevations is increased, and the grid lines are adjusted to make it easier to identify sharper grades due to changes in elevation.

- Tributary Lines: Shows tributary lines on top of the 3D map.



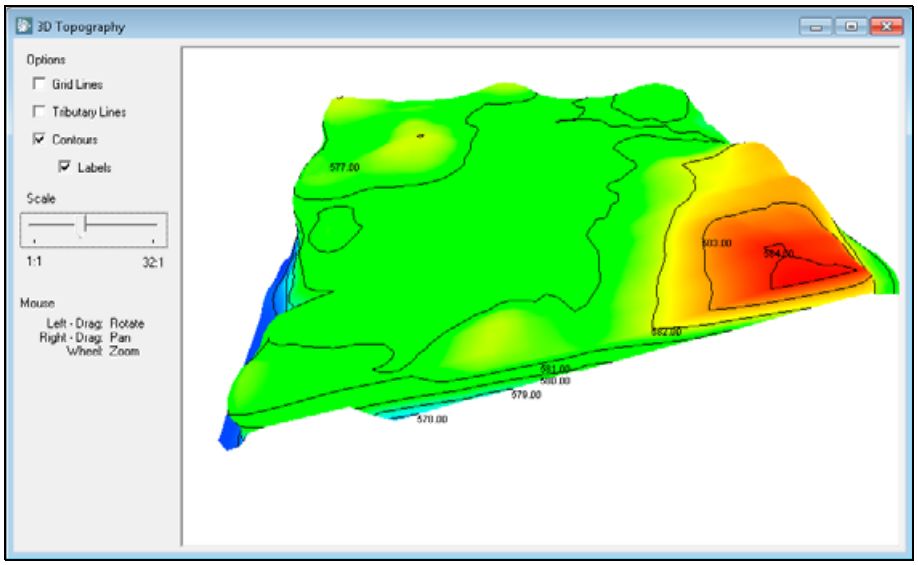
These lines reflect the predicted water flow of the field based on the topographic data.

- Contours: Shows contour lines on top of the 3D map.



These contour lines appear according to the settings entered in the *Display Options* dialog, see Display options, page 29. Contour lines may have labels that show the elevation of the lines.

- Scale: Increases the distortion of the scale between the different elevations of the map.

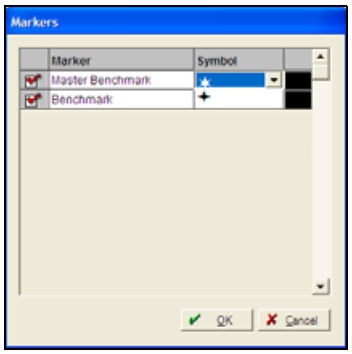


As you drag the *Scale* slider bar to the right, slopes on the field appear greater than they actually are, which makes it easier to identify them.

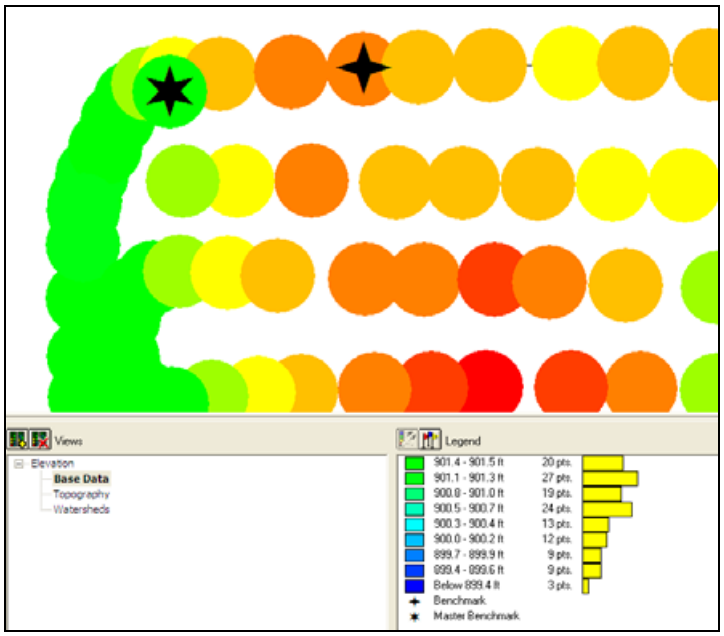
- Rotating: Place the cursor on the map, hold down the left mouse button and then drag the map. This enables you to see the map from different angles or directions so that it is easier to view the different slopes of the field.
- Panning: Place the cursor on the map, hold down the right mouse button and then drag the map. This enables you to move the map in the window so that it is easier to see different sections of the map.
- Zooming: Use the mouse scroll wheel to zoom in (scroll forward) or zoom out (scroll backward) on the 3D map.

Viewing benchmarks

With the Base Data view of the map selected, click the Markers icon to assign symbols for the Benchmark and Master Benchmark on the map.



Markers appear on top of the points on the map and are included in the legend.



Drainage maps

The software includes a number of easy to use yet powerful drawing tools that can be used to create drainage maps. This includes the ability to create designs that control both the horizontal and vertical placement of drainage pipe installation when used wit the FmX integrated display and the WM-Drain system.

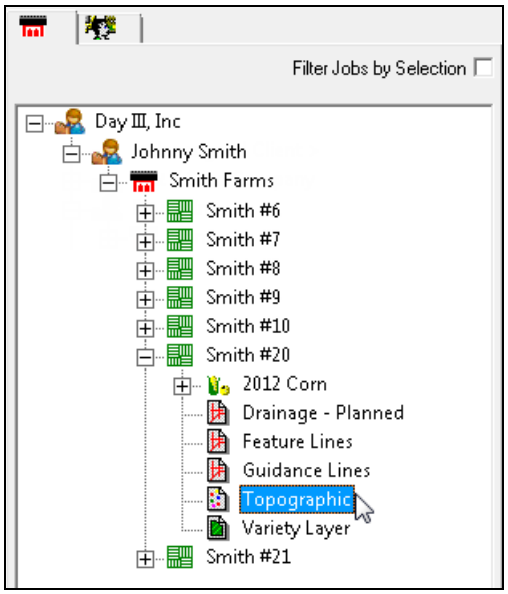
You can use drainage maps created by this software with the WM-Drain system and an FmX integrated display. This data can be transferred to the FmX display through a USB drive, or wirelessly using the Trimble AG Software.

This section describes how to work with drainage map, layers, and lines.

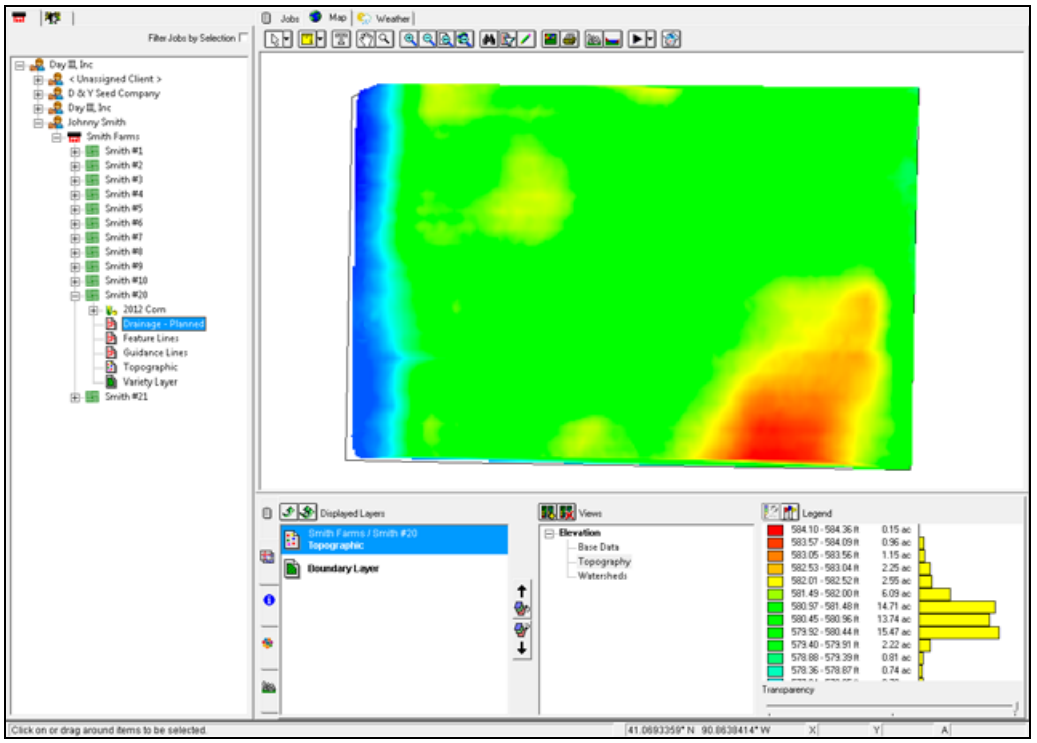
Working with drainage layers

Once you read in the topographic maps and use the display and view options to review the data, your next step is to create drainage maps. This section describes how to create and edit a Main, Submain, or Lateral drainage line.

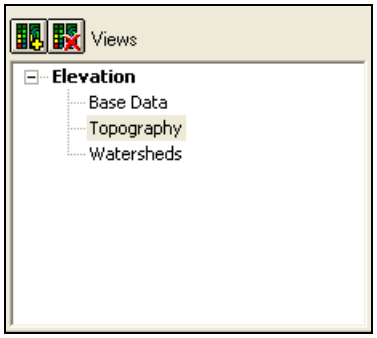
1. From the *Client/Farm/Field* list, select the required topographic background layer.



2. Double-click the name; the layer is added to the Displayed Layers list.

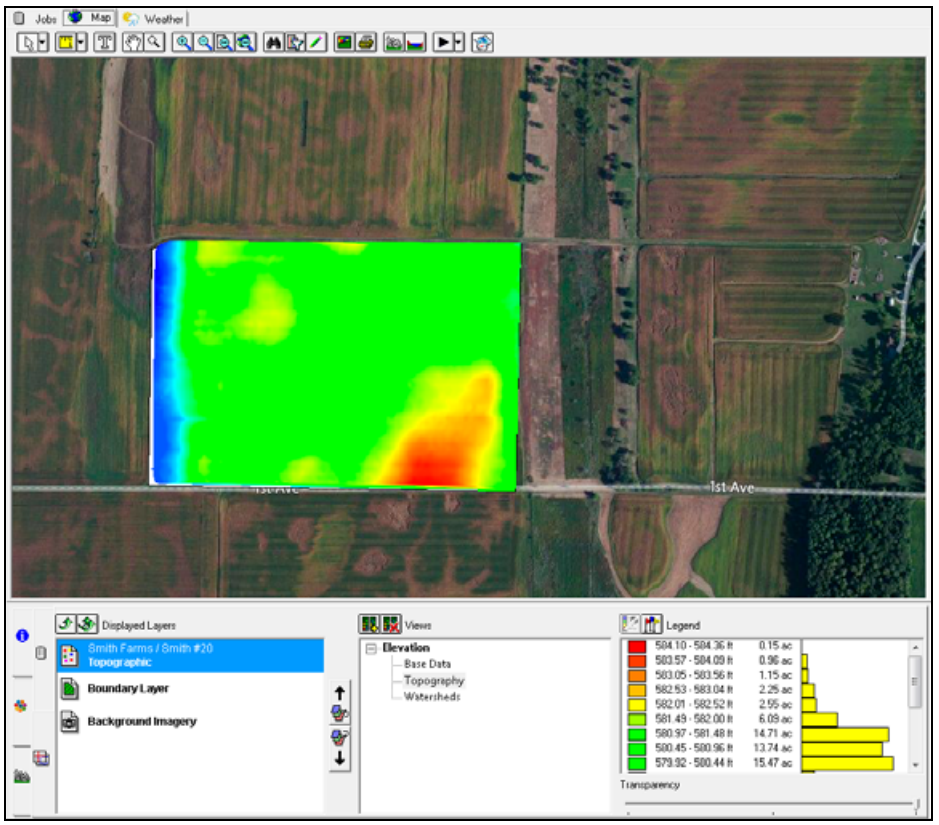


3. Select the View (Base Data, Topography, or Watersheds) so that you can easily locate the areas that need drainage.



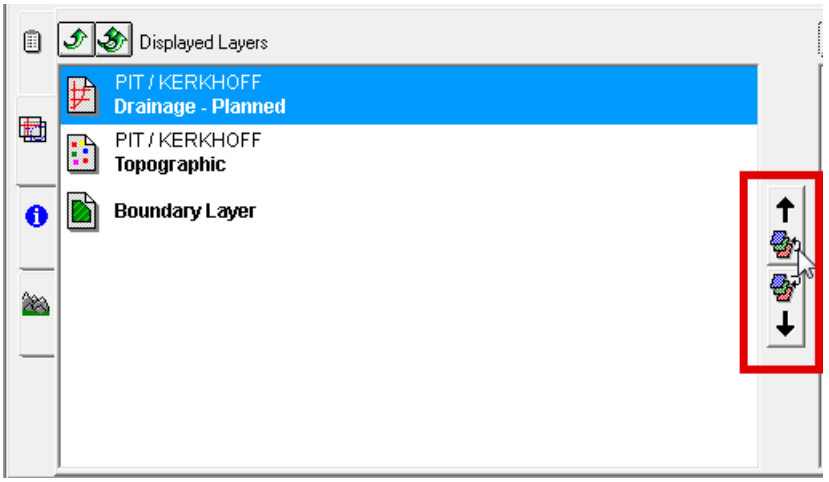
4. Click the Display Options icon to change the appearance of the map so that you can easily identify the exact locations to install drainage pipe.

   You can also view other maps such as the Bing® Background imagery, yield data, or soil type maps. Typically, these appear in the *Displayed Layers* list below the Topographic layer.

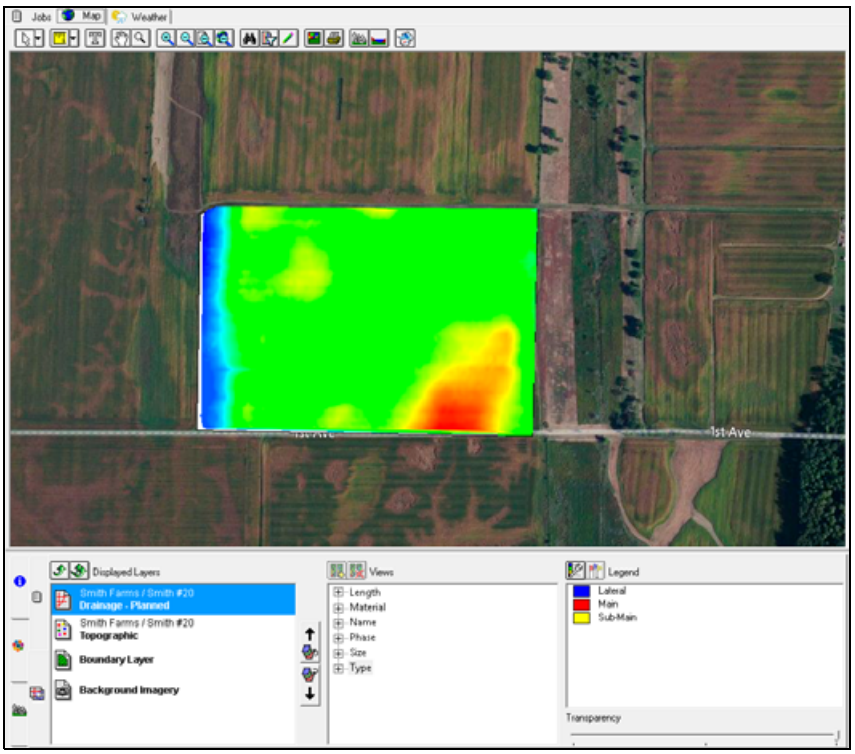


For more information, refer to the Mapping documentation.

5. Use the arrow buttons in the *Displayed Layers* list to move a selected layer up or down. The top layer always appears before layers that are below it. You can edit ***only*** the top layer.



6. Once the layers appear correctly, double-click the Drainage layer for the field in the *Client/Farm/Field* list so that it appears in the *Displayed Layers* list on top of the Topographic map.



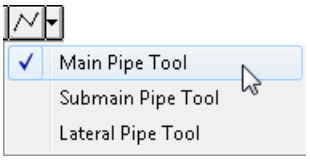
7. Click the Edit Layer icon .

You are now in Edit mode where you can create new drainage maps or edit/change existing drainage maps. There are a number of drawing tools and features available when you are in Edit mode.

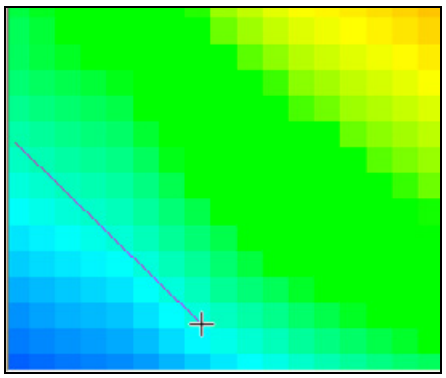
For more information, refer to the Site documentation.

Creating a drainage line

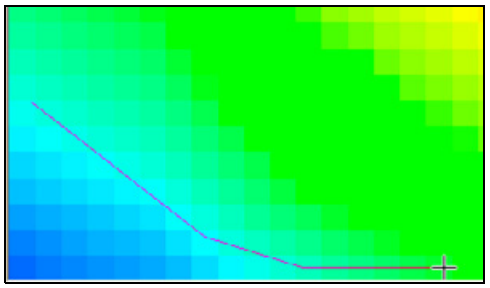
1. Click the drop-down arrow for the Main Pipe Tool and then select the type of line to create.



2. On the map, click where you want to start a line.



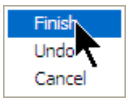
3. On the map, click where you want a corner or bend, or to end the line.



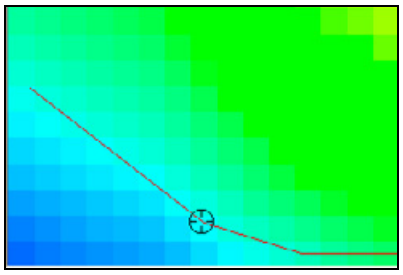
Each click ends the previous line segment and starts the next.

Note – *At any time, right-click and then select Undo to undo the previously created line segment. To completely cancel the line, right-click and then select Cancel.*

4. Once the line is complete. right-click and then select *Finish*.



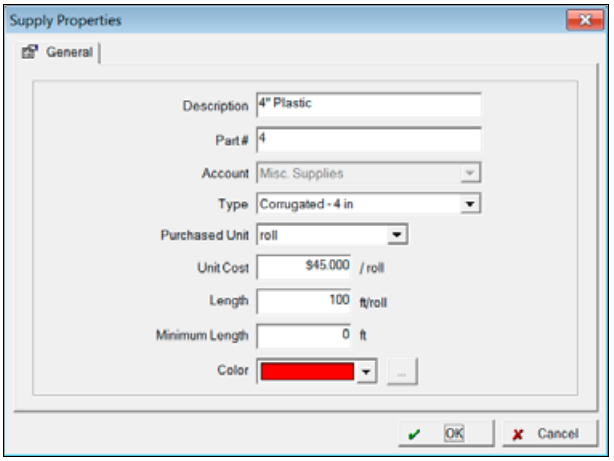
Note – *If you select the Submain or Lateral Line Tool, the cursor appears as a cross hair.*



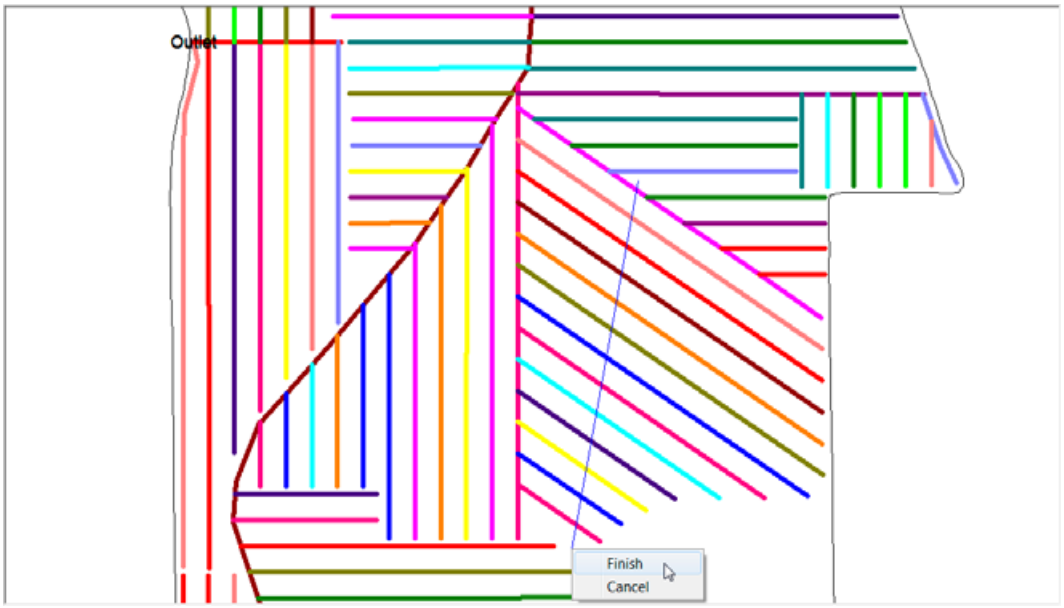
On the map, click near the required Main or Submain. The software automatically connects the Submain or Lateral to the nearest Main or Submain.

The Select Line tool

1. Select the *Select Tool: Line* option from the *Select Tool* drop-down list.



2. Click outside the lines where the selection is to begin, click outside the line where the selection is to end and then right-click and select *Finish*.



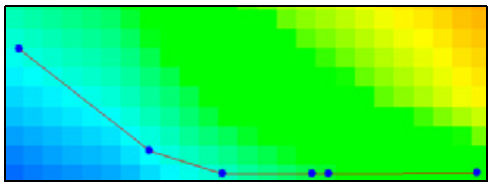
The lines that the select line tool crossed should now be flashing and allow for editing just those specific lines.

The Node Edit Tool

Use this tool to change an existing Main, Submain, or Lateral.

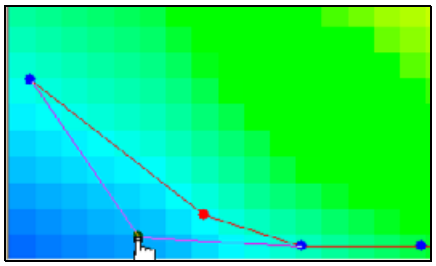
With the Node Edit Tool selected:

- Click the line to edit. Blue points appear at all corners of the line.

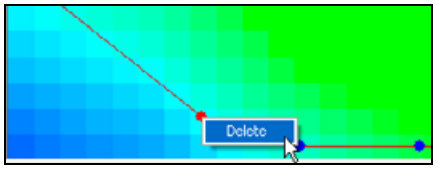


- To select a point, click it; the point turns red.

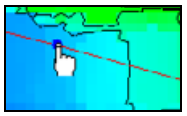
- To move a point, click and drag it.



- To remove a point, right-click it and then select Delete.



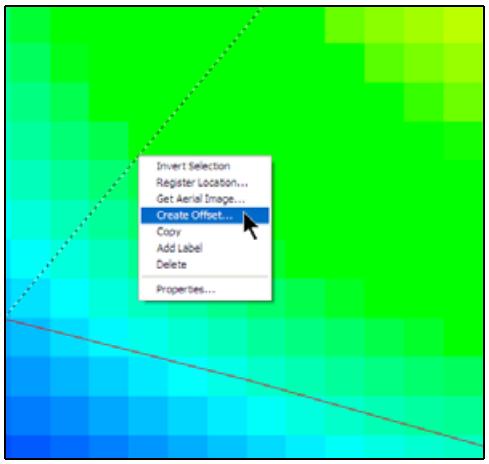
- To add a new point that can be moved, double-click anywhere on a line.



Creating offset lines

The software enables you to repeat a Main, Submain, or Lateral. This is useful if you want to install pipe in a pattern where they run parallel to each other at a set distance:

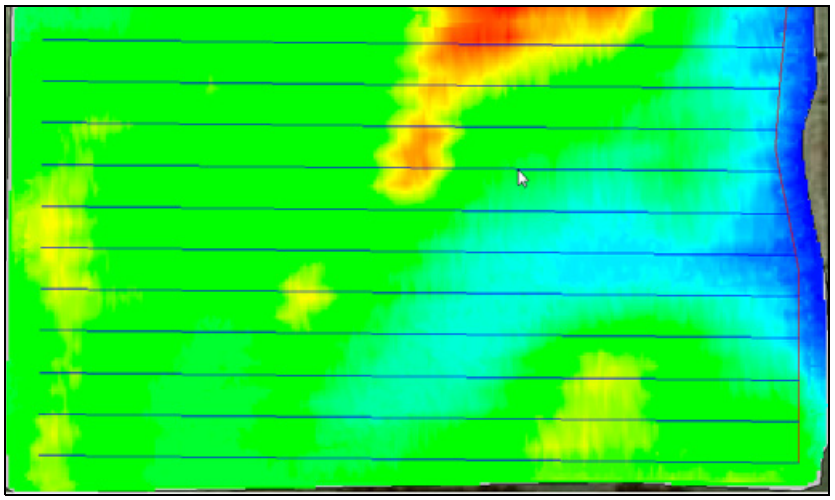
1. Click the Select Tool icon .
2. Right-click an existing Main, Submain, or Lateral and then select *Create Offset*.



3. In the *Distance* field, enter the required distance to use between each line.

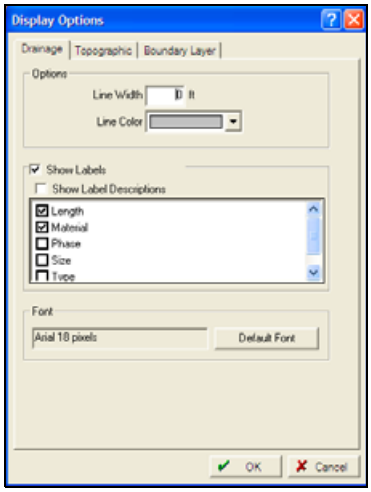
4. In the *Count* field, enter the number of lines to create.

5. Select the line direction. This is the direction compared to the selected line, and is in relation to the order in which the selected line was created (drawn).
6. Click **OK**. The software creates the offset line(s). If the selected line was a lateral or submain connected to a Main or Submain, the offset line(s) will automatically be connected to the same Main or Submain.



Changing the appearance of drainage lines

1. Select the Display Options icon .
2. Enter a new value in the *Line Width* field.



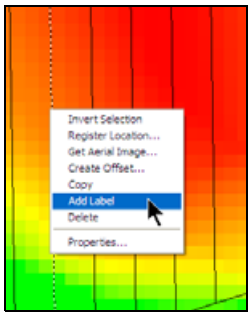
3. If you selected an attribute (shown at the bottom of the screen) that does not have a legend, you can select the line color to use for all lines on the layer.

   If the attribute does has a legend, lines are colored according to that legend.
4. To view labels on lines in this layer, select the *Show Labels* check box.
5. If you select the *Show Label Descriptions* check box, the attribute description (such as Length or Material) appears with the value for the selected lines.
6. Select any attributes to include in a label.
7. In the *Font* field, set the font for the labels.
8. Click **OK** to save the changes.

Adding labels to drainage lines

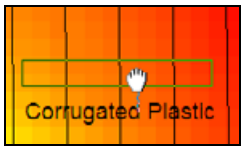
You can add labels to a map to enhance the appearance of drainage lines. This can be particularly useful if you need to print a high quality map.

1. Click the Select Tool icon .
2. Right-click a line and then select *Add Label*.

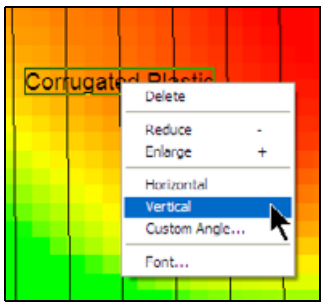


To select more than one line at a time, hold down the keyboard Shift or Ctrl key as you select lines. The labels appear.

3. To remove a label, right-click the line and then select *Remove Label*.
4. To change a label, select the Text icon and then select the label to change.
5. To move a label on the map, drag-and-drop it in the new position.



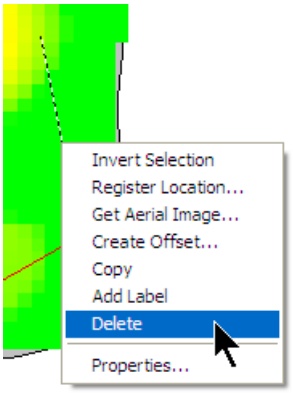
6. To change the orientation or font of the selected label, right-click and then use the available options.



For more information, refer to the Site documentation.

Deleting Mains, Submains, and Laterals

1. Click the Select Tool icon .
2. Right-click the line to delete and then select *Delete*.



Alternatively, click a line to select it and then press Delete on your computer keyboard.

Creating a Drainage design

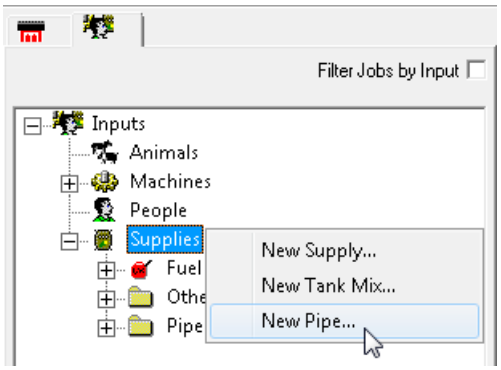
The WM-Subsurface software enables you to create a vertical profile for the pipe that you will be installing. Once you've created a map of where you want to install the pipe, you can take each design segment and enter installation parameters, including the minimum depth, optimum depth, maximum depth, and minimum slope. These values are then used to automatically calculate the optimal depth for the pipe to be installed. Once you have confirmed these values for each line, you will be able to view the profile and save the design. The drainage design can then be exported for use with an FmX integrated display running the WM-Drain system. You can also enter other useful information into the drainage design, including the type and size of pipe that will be used and the phase. Defining attributes for the design phase can be useful for projects that will be completed over a long period of time.

Setting up Pipe supplies

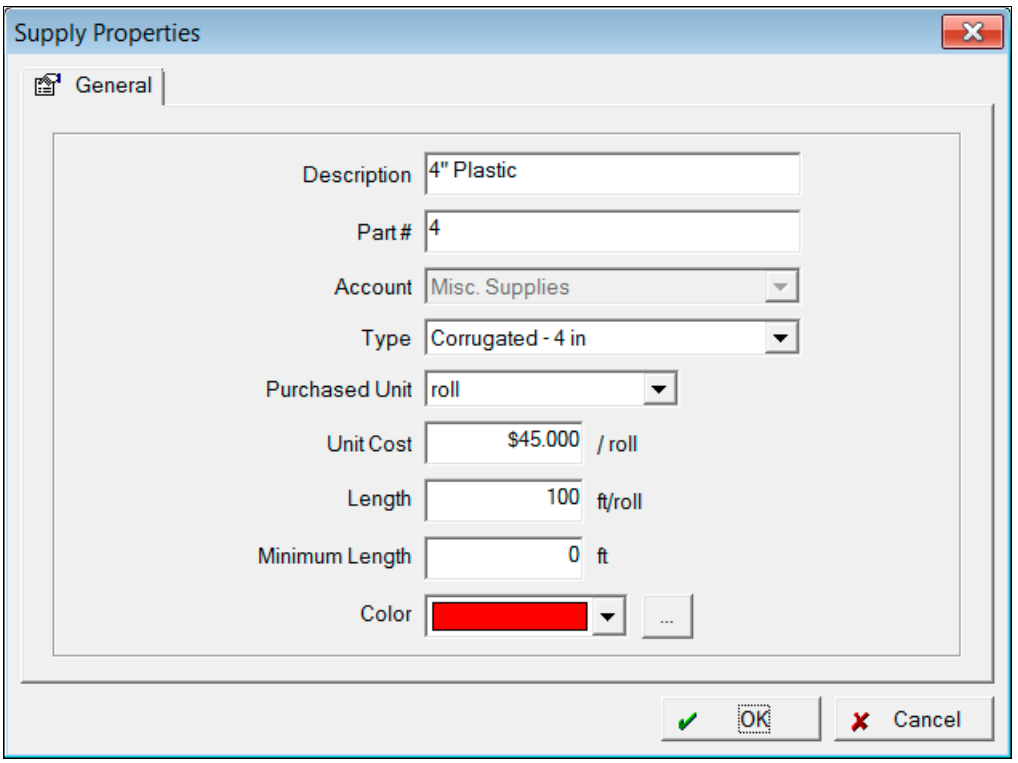
The WM-Subsurface software enables you to assign the type of pipe used in each section of your drainage design. Pipe types are created as Supplies so that you can easily keep track of the amount and cost of each supply needed for a job. It is recommended that you set up all the different pipe types that you are using before you assign them to the section lines on your map.

To set up different pipe types:

1. From the *Inputs* tab, either select the Supplies icon , or right-click the *Supplies* or *Pipe* category and then select *New Pipe*.



2. Complete the *Supply Properties* dialog and then click **OK**:

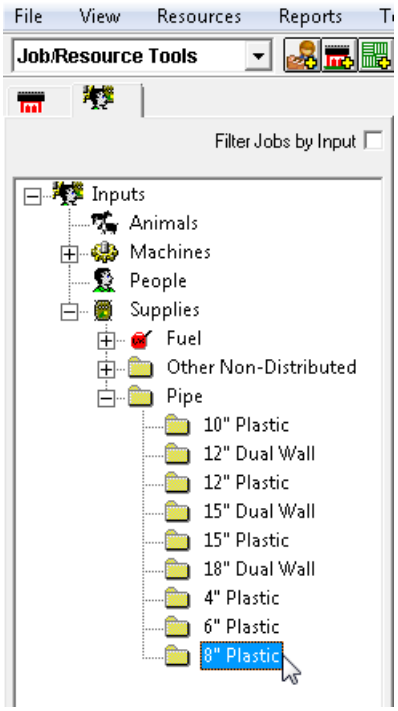


Field	Description
Description	Used for reporting purposes. This will typically be made up of the size/diameter of the pipe and the material that it is made of.
Part #	Used as a reference for a part number that a supplier may require when ordering material.
Size	The diameter/size of the pipe.

Field	Description
Purchased Unit	The unit of measure that the pipe is purchased in (typically the length that is purchased). This will likely be feet or meters.
Unit Cost	The unit cost that you will be paying for the pipe.
Length	The length of the pipe.
Minimum Length	The minimum length of the pipe.
Color	The color used to display the pipe on a map. When displaying the *Pipe View*, the corresponding color is represented in the legend.

Note – *By default the supply properties purchased unit will be Rolls—this is the unit that is used to represent quantity on drainage reports.*

The new pipe is added to the *Supplies* tab:

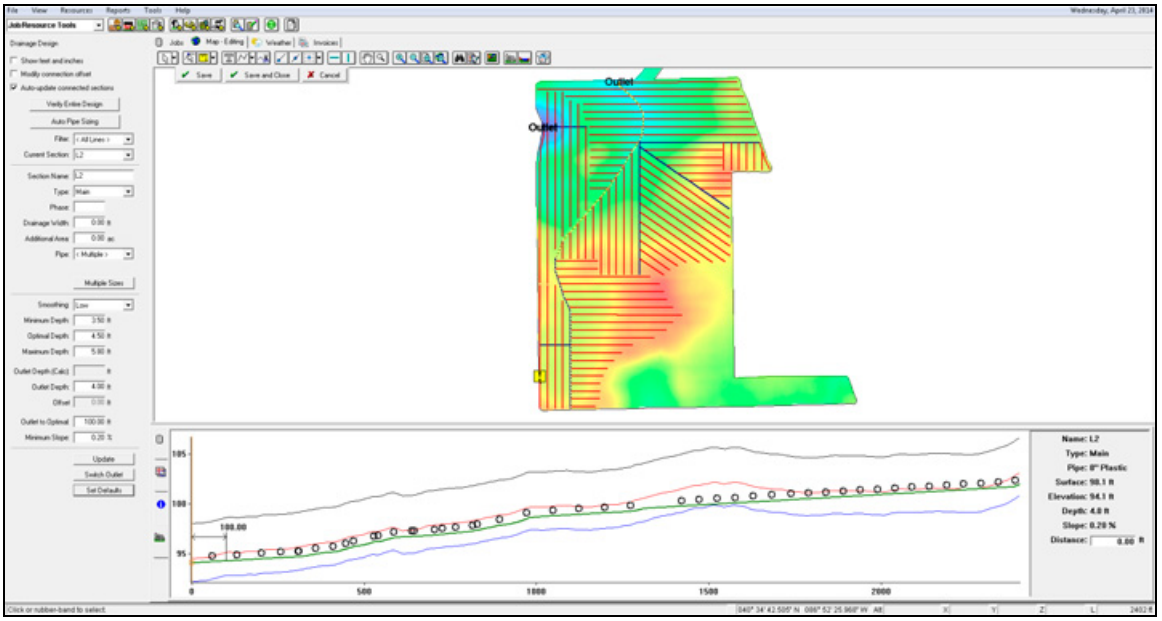


Entering drainage design parameters

The WM-Subsurface software enables you to enter the drainage design parameters required by the WM-Drain plugin on the FmX integrated display. Once you have drawn a Main, Submain, or Lateral, select it. You can then use the *Drainage Design* area on the left of the screen to enter the settings for the selected line.

Setting Default Values for a design

Click **Set Defaults** to enter default values for use in the *Drainage Design* area.

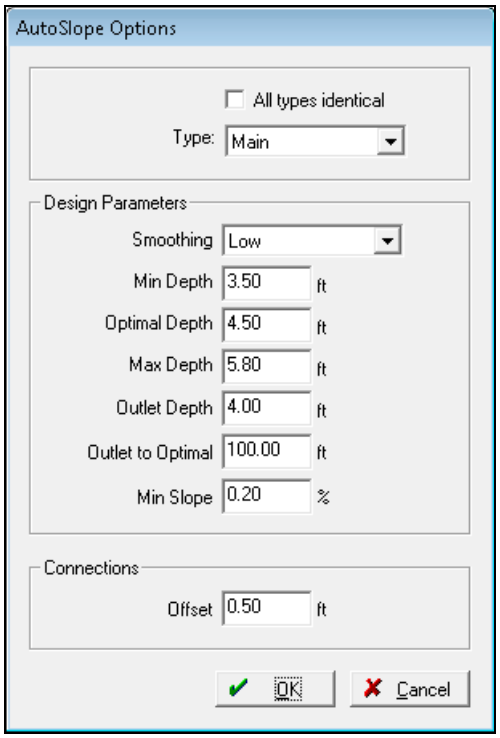


Once you have entered defaults, they can be used for all future Mains, Submains, and Laterals that are created. The default settings do not affect lines for which you have previously entered drainage design parameters.

Note – *It is recommended that you set default values* ***before*** *you create drainage lines.*

To set default settings:

1. Click **Set Defaults**.
2. Complete the *AutoSlope Options* dialog and then click **OK**:

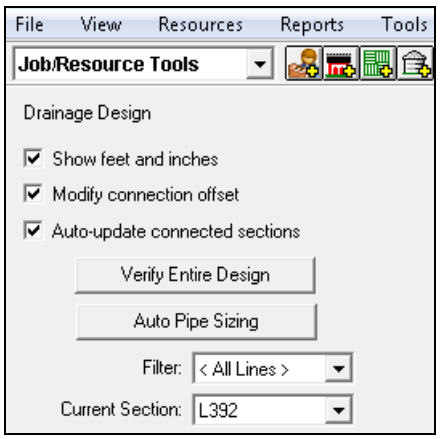


Field	Description
All types identical	Clear the check box to assign individual defaults to the Main, Submain, and Laterals.
Type	Select the specific line type for the default. This field is available only if the *All types identical* check box is not selected.
Smoothing	Set the smoothing levels of the selected line type.
Min. Depth	This setting controls how shallow a design or installation can be and is usually defined by the field operations and drainage machine. It is used when installing pipe with the WM-Drain system to create the actual pipe design. If the intended design goes above the minimum depth, a warning appears.
Optimal Depth	This setting is used when installing pipe with the WM-Drain system. It is the targeted optimal depth used to create the pipe design.
Max. Depth	This setting is the value of the maximum depth that a drainage design can be installed and is often based on the limits of the drainage machine. It is used when installing pipe with the WM-Drain system to create the actual pipe design. If the intended design goes below the maximum depth, a warning appears.
Outlet Depth	The required Outlet Depth used for the Main. This setting is only used when you enter Drainage Design details for a Main (it does not affect Sub-main or Lateral designs).

Field	Description
Outlet to Optimal	The distance to use for smoothing the slope of the line when the calculated *Outlet Depth* is deeper than the *Optimal Depth*. This is the distance that the smoothing is spread over and is used to smooth out large drops in the design that occur near the outlet.
Min. Slope	The minimum slope used for the drainage design.
Connection Offset	If you will be connecting laterals above the mains, enter the typical distance that you want to use between the outlet of the lateral and the main it is connecting to. When the program computes the design for a lateral (or sub-main), it will make sure that the outlet is this distance above the Main it is connecting to. For example, if a lateral connects to a main that is 3 feet deep, and you enter a *Connection Offset* of 6 inches, the program uses an *Outlet Depth* of 2 foot 4 inches for the lateral.

Data entry / display options

The *Drainage Design* area enables you to customize how you enter required settings. This area also includes a filter to easily find errors in lines on your map. This area includes the following options:



Option	Description
Show feet and inches	Select to view and enter all depth settings using a combination of feet and inches. If this option is not selected, depths are entered in feet with decimal places (for example, 3 feet 6 inches is entered as 3.5 feet).
Modify connection offset	For Laterals and Submains, the program computes the calculated *Outlet Depth*. • Clear this option to over-ride the calculated value and enter the actual *Outlet Depth* to use. • Select this option to enter an *Offset* to compute the actual *Outlet Depth*.
Auto-update connected sections	Select this option to update sub-sections that are connected to a section when the section changes. For example, if you adjust the design of a main and the depth changes, the program updates any Submains and Laterals connected so that the outlets connect properly. This is carried throughout the entire design until all sections are updated and all outlets connect properly.

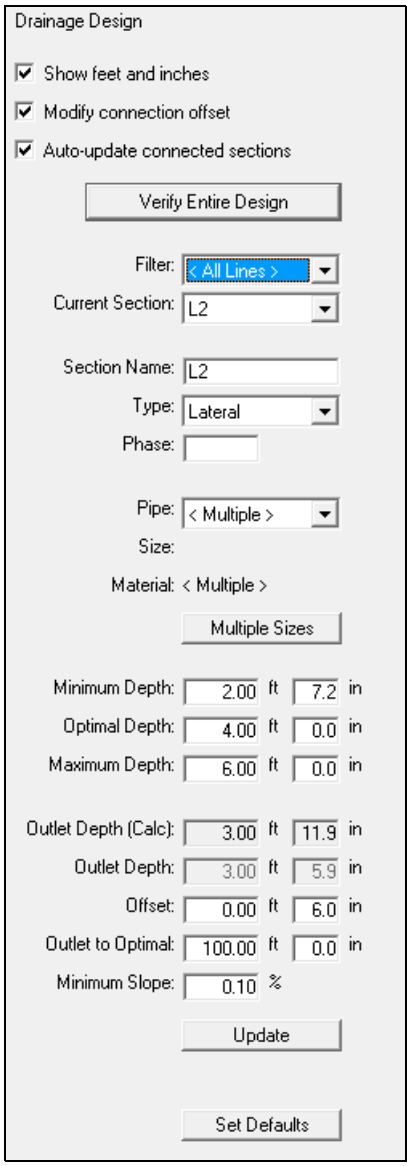
Option	Description
Verify Entire Design	Click this button to check the entire design for errors—a message appears indicating which sections have errors (or that there are No Errors). To correct errors, click the section and make the required changes in the design.
Auto Pipe Sizing	Before selecting this option, you must first create a drainage design, making sure that you have created all the required section lines. The program then computes the correct size of pipe for each section and will also break sections into sub-sections with different pipe sizes where required.
Filter	Select an option to filter the lines that appear on the map to find lines that may be missing key details. The options include: • *All Lines*: All lines appear on the map regardless of their settings. • *Connection Error:* All lines that have a connection error in the design appear. A connection error is typically due to the calculated outlet depth being above the actual outlet depth. To correct an error, click the line, change the necessary setting(s) and then click **Update**. • *Design Error*: Lines that have an error in their design appear (for example, a lateral that will not meet the minimum slope). To correct an error, click the line, change the necessary setting(s) and then click **Update**. • *Design Not Set:* Lines that have no associated settings appear. If you did not use **Set Defaults** to enter defaults and you created drainage lines without entering design information, these lines will have no associated settings. • *Design OK*: All parts of the design that do not result in an error appear. • *Pipe not Set*: Any part of the design that has not had a pipe (supply) assigned appear. To assign a pipe to one of these lines, click the line, select the pipe from the drop-down list and then click **Update**. • *Topographic Error*: All lines where the topographic elevation data is missing or insufficient.
Current Section	Locate a drainage line (or section) on the map by selecting its name from the drop-down list.

Creating a Drainage design

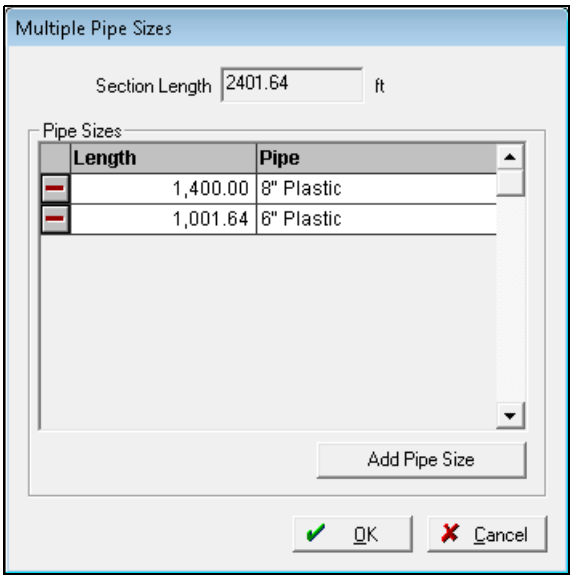
Once you have drawn a Main, Submain, or Lateral on your map, select it and then enter design parameters in the *Drainage Design* area.

To enter the Design parameters:

1. Click the required Main, Submain, or Lateral on the map.
2. Complete the *Drainage Design* dialog and then click **Update**:



Option	Description
Section Name	The name you enter here is used in the WM-Drain system running on the FmX integrated display when you install the drainage. The section name defaults to L1, with subsequent names numbered sequentially (L2, L3, and so on).
Type	Defaults based on the drawing tool used. For example, if you use the Lateral Pipe Tool, this field defaults to *Lateral*. If the Type is incorrect (because you used the wrong drawing tool), you can change it here.
Phase	***Optional***. Enter the period that the design is expected to be completed in. This is useful if you expect to spread a project over a period of time. In this scenario, Phase 1 could represent the pipe you expect to install now; Phase 2 could represent pipe to be installed in the future.
Drainage Width	The spacing between the tile. This is used to calculate how much ground drains into the tile. For example, if the laterals are spaced evenly at 40 foot intervals, enter 40 feet in this field.
Additional Area	This represents any additional areas that are flowing into the pipe. For example, if there is tiling from another field that connects into a pipe, enter the size of that field. This will then increase the size of the pipe required.
Pipe	***Optional***. The pipe supply that will be used. Select *Add* to create a new pipe supply. Select *Multiple* if the drainage line is made up of more than one type of pipe.

Option	Description
Multiple Sizes	Select *Multiple* from the *Pipe* drop-down list or click **Multiple Sizes** to use more than one size or type of pipe on the selected drainage line.  In the *Multiple Pipe Sizes* dialog, enter the lengths and types/sizes of pipe to use. To add lines to this area, click **Add Pipe Size** —you can enter the length and type/size of pipe in each line. The program assigns the pipe types/sizes to the drainage line with the first type/size in the list assigned to the part of the line that starts at the outlet. If the pipe was logged with the FmX integrated display, the size entered on the display appears in the *FMX* column. You can then select a pipe supply associated with this size.
Smoothing	Select the level of smoothing required for the auto pipe sizing.
Minimum Depth	The Minimum Depth for the drainage line. If you used the **Set Defaults** option, the design default value is used. The program uses this setting to create the actual pipe design. If the intended design goes above the minimum depth, a warning appears.
Optimal Depth	The Optimal Depth for the drainage line. If you used the **Set Defaults** option, the design default value is used. This is the targeted optimal depth that the program uses when creating the pipe design.
Maximum Depth	The Maximum Depth for the drainage line. If you used the **Set Defaults** option, the design default value is used. The program uses this setting when it creates the actual pipe design. If the intended design goes below the maximum depth, a warning appears.
Outlet Depth (Calc)	The calculated *Outlet Depth* appears. For Laterals and Submains this is the depth of the Main they are connected to. Mains do not have a calculated *Outlet Depth.*
Outlet Depth	If you did not select the *Modify Connection Offset* option, you can enter the required depth for the outlet (if it is different from the calculated depth). The outlet depth defaults to the calculated *Outlet Depth* (typically, the depth of the Main). If the Lateral or Submain will be connected above the actual main, you can change the depth to reflect that location.

Option	Description
Offset	If the *Modify Connection Offset* option is selected, you can enter the required offset distance. If you plan to connect laterals above the mains, enter the distance that you want to use between the outlet of the lateral and the main it is connecting to. The program changes the *Outlet Depth* to reflect this offset. For example, a lateral connects to a Main that is 3 feet deep and you enter a Connection Offset of 6 inches, the program uses an *Outlet Depth* of 2 foot 4 inches.
Outlet to Optimal	The distance that you want to use to smooth the slope of the line when the calculated *Outlet Depth* is less than the *Optimal Depth*. This is the distance the smoothing will be spread over. This setting is used to smooth out large drops in the design that occur at the outlet.
Minimum Slope	Enter the *Minimum Slope* percentage setting to be used for the drainage design.

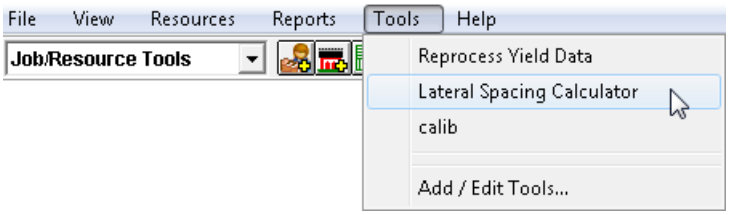
3. Click **Update** to update the drainage design based on the settings entered.
4. Click **Switch Outlet Insert** to move the outlet from one end of a Main to the other.

Note – *The program defaults to the Outlet at the start of the Main (based on how it was drawn). This option is only available with a Main as Laterals—Sublaterals will always have their outlet at the main that they connect to.*

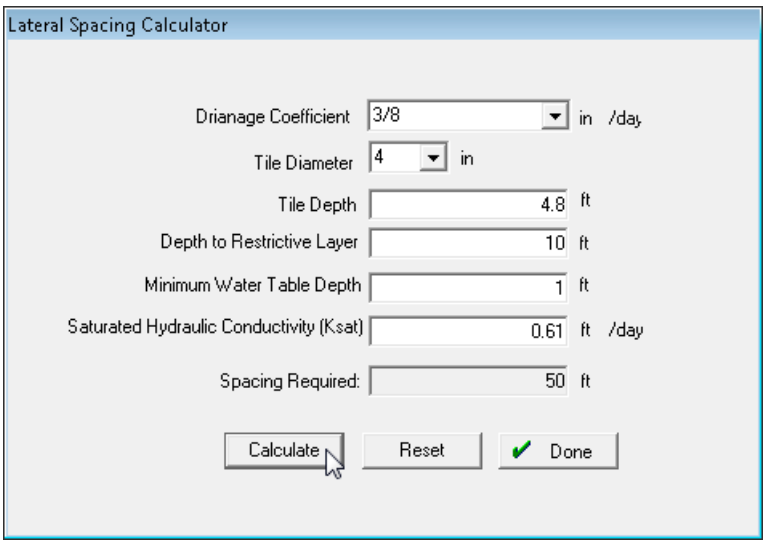
Lateral Spacing Calculator

The Lateral Spacing Calculator is used to compute a recommended spacing between laterals. Once you have calculated the recommended spacing, you can create the section laterals using this spacing.

1. Select *Tools / Lateral Spacing Calculator*



2. In the *Lateral Spacing Calculator,* select or enter the following values:



   a. *Drainage Coefficient* (required amount of water to be removed each day).

   b. Tile Diameter.

   c. *Depth to Restrictive Layer.*

   d. *Minimum Water Table Depth*.

   e. Saturated Hydraulic Conductivity (Ksat)

3. Click **Calculate**.

For more information and definitions of the terms in this area, refer to http://climate.sdstate.edu/water/DrainSpacingCalculatorDocumentation.html.

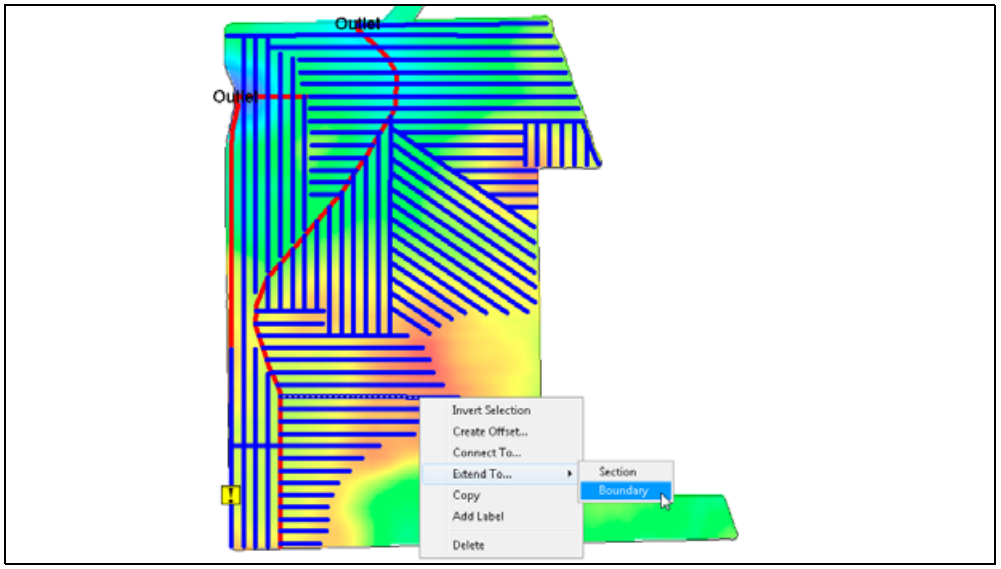
Extending and connecting lines

Use the *Extend* option to extend any line. Lines can be extended either to the boundary of the field or to another line.

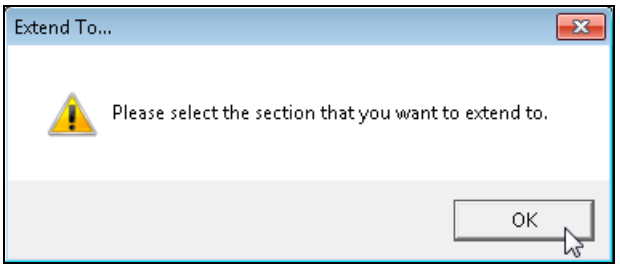
Use the *Connect* option to extend a line and then connect it to another line.

Using the Extend tool

1. Click the Select Tool icon .
2. Right-click an existing Main, Submain, or Lateral and then select *Extend to*.



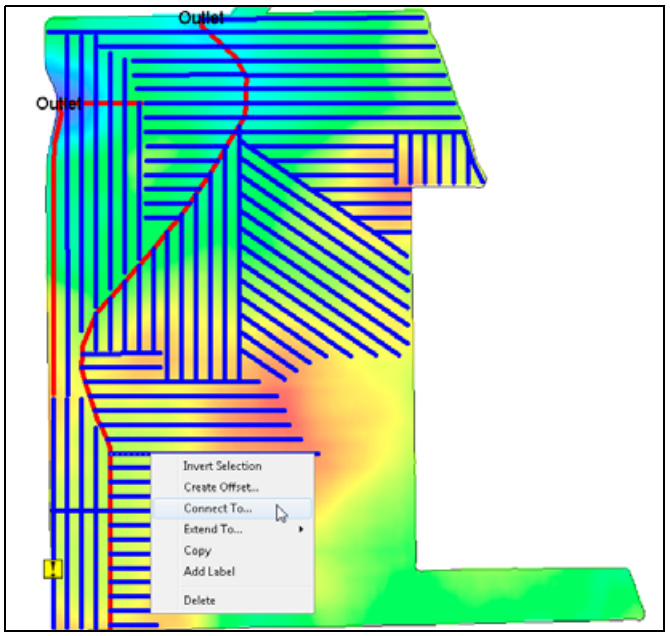
3. Select either *Boundary* or *Section*:
   - If you select *Boundary,* the line is extended automatically to the boundary.
   - If you select *Section*, you are prompted to select the section you want to extend to. Click **OK** and then left-click the line you want to extend to.



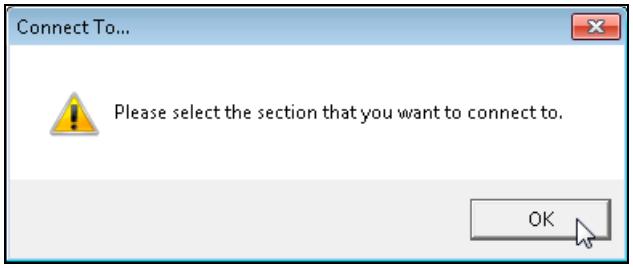
Note – *Using the Extend To Section option does not connect the two section lines. If you need to connect the two section lines, use the Connect To option, see below.*

Using the Connect tool

1. Click the Select Tool icon .
2. Right-click an existing Main, Submain, or Lateral and then select *Connect to*.



3. Click **OK** when prompted.



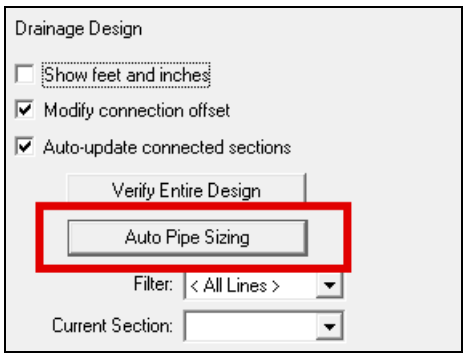
4. Click the section that you need to connect.

The Connect To option can only be used when connecting lateral to main and connecting to the outlet.

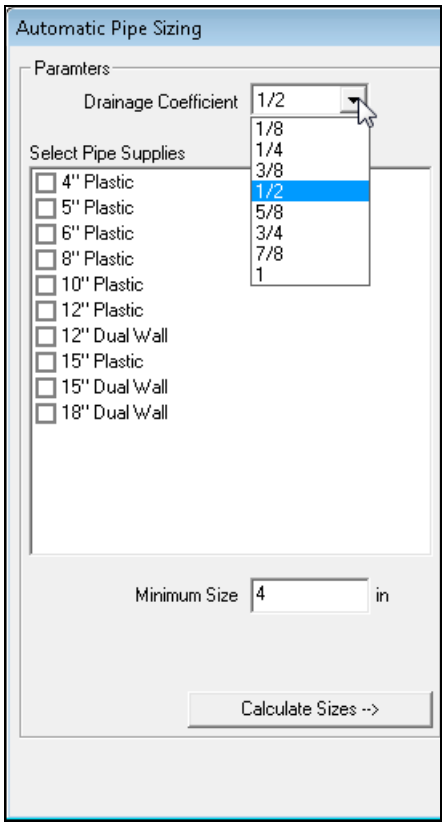
Auto Pipe Sizing

Before starting this procedure you must create a drainage design. See Creating a Drainage design, page 47.

1. Click **Auto Pipe Sizing**:



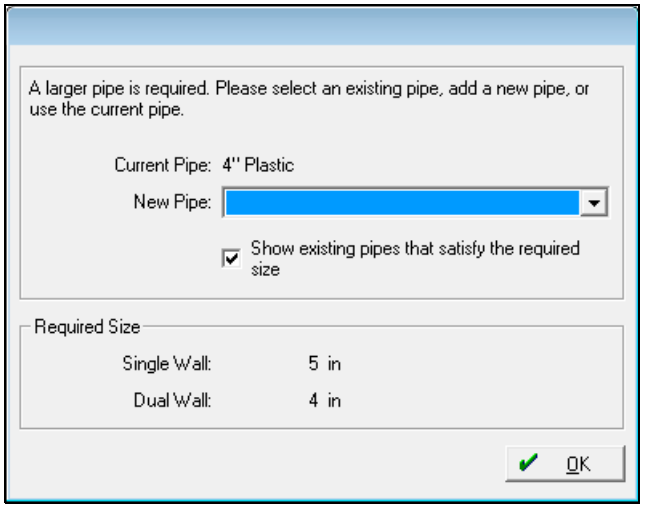
2. Select the correct *Drainage Coefficient* (required amount of water to be removed each day):



3. Select the correct pipe supplies needed for the particular design.

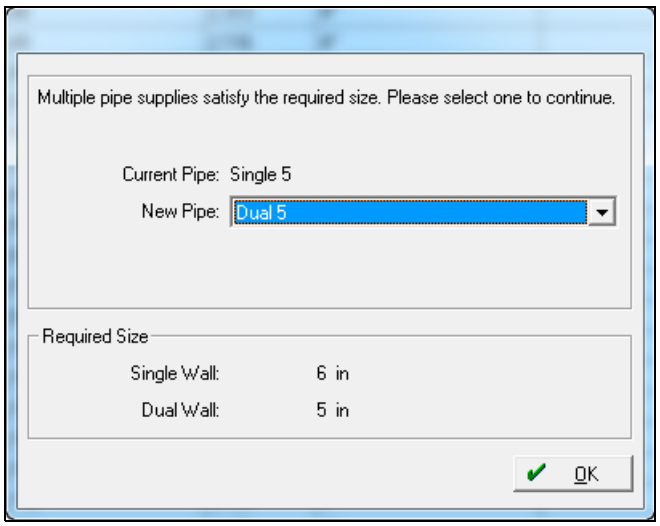
Note – *Pipe supplies must have a Type in order for them to work in Auto Pipe Sizing.*

4. Click **Calculate Sizes**.
5. If a larger pipe size is required than the option you selected, the program will notify you that a larger pipe is required. You will need to either confirm that you want to use the previously selected size or select a different size. If you select the *Show existing pipes that satisfy the required size* check box, the drop-down list will list all available pipes that will work:.



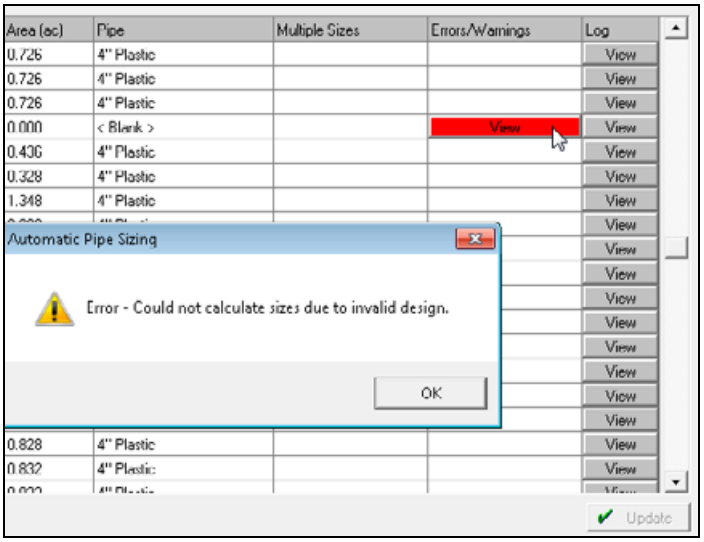
6. Select the correct size then click **OK** or select *<Add Pipe Supply>* to create a new pipe for the required size.

   If there are different pipes (sizes) that could be used, a message appears prompting you to select the size you want to use:

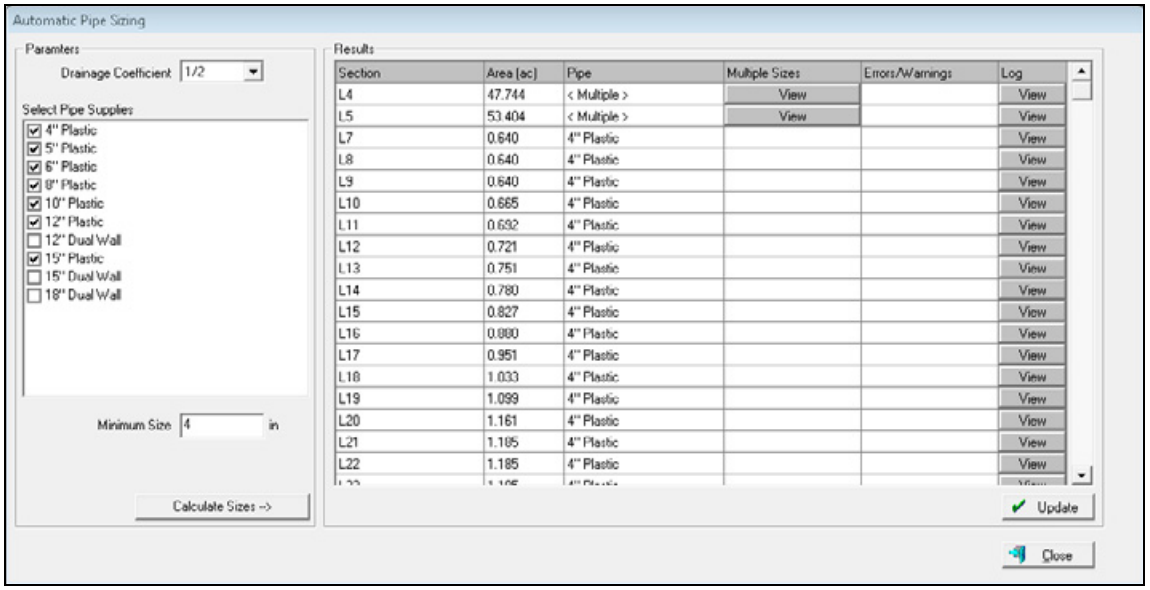


7. Once you have calculated the sizes, the program lists the section lines in the *Results* screen:

Field	Description
Section	Section Name given to the line when designed.
Area (ac)	Area in acres or hectares that drains into that section.
Pipe	List the name of the pipe selected for each section.
Multiple Sizes	A **View** button appears for all sections that require multiple sizes of pipe. Click **View** to view details of the multiple pipe sizes.
Errors/Warnings	A **View** button appears for lines that have errors or warnings. Warnings are shown in yellow, errors in red. Click **View** to view details of the error or warnings.
Log	Click **View** to display the results of the calculation for each section. These results include any selections made for pipe sizes that were different from the calculated size.



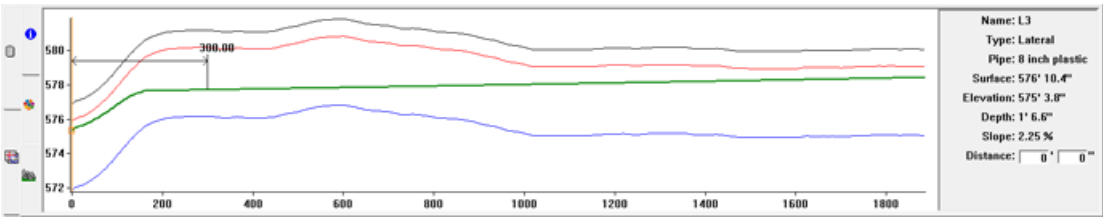
8. Click **Update** to assign the pipes to the sections.



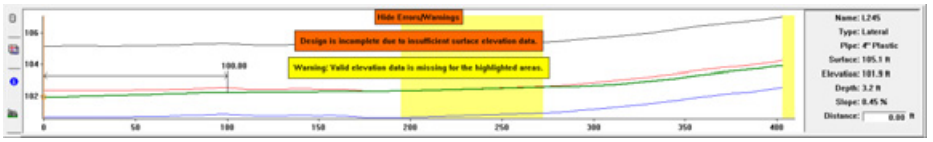
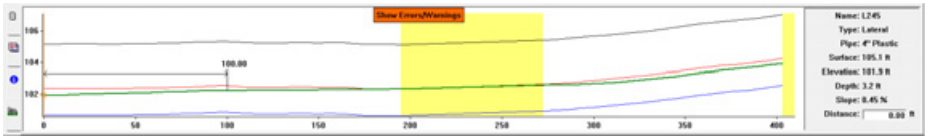
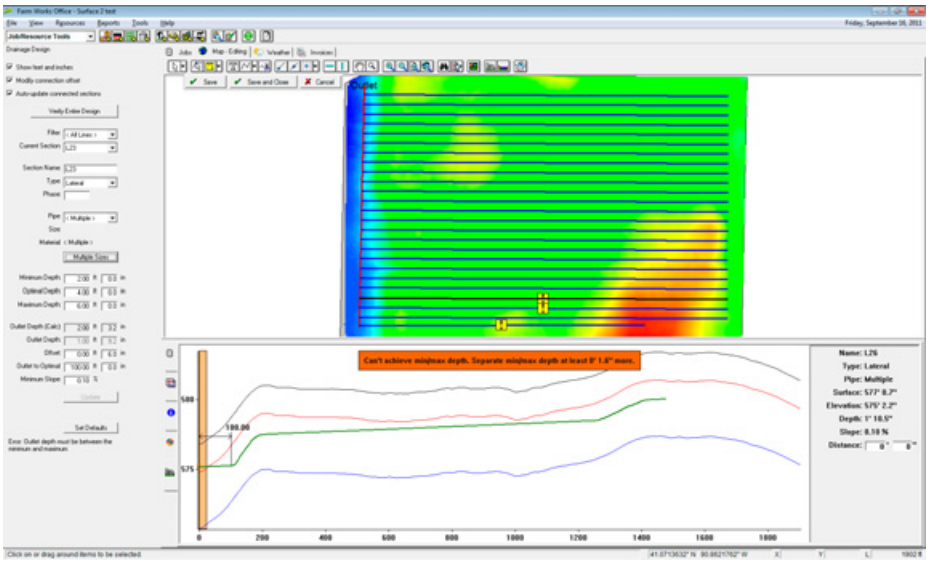
9. Click **OK** to close the *Auto Pipe Sizing* screen and return to the design screen. If you click a section line, the correct pipe appears on the left.

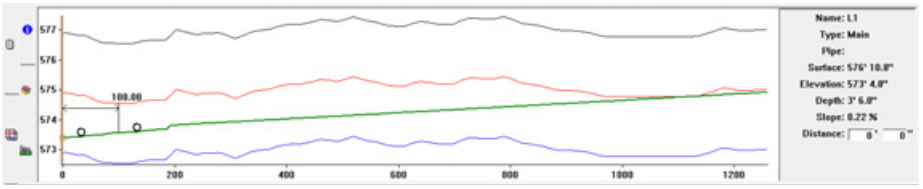
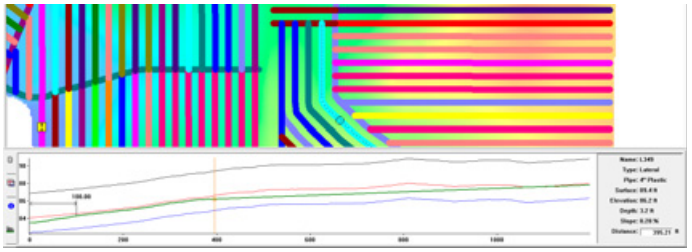
Displaying the profile

The *Profile* tab at the bottom of the screen displays key information about a selected drainage line. The information displayed in this area includes the following:



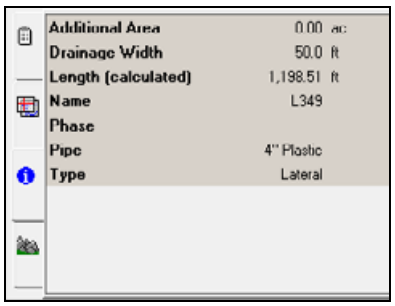
The following describes each of the lines in the Profile View:

Option	Description
Errors	If there are any errors in the design, the profile appears with an orange background that highlights the area of the design where the error exists. The area on the left may display more details on the error.  Errors can be due to the calculated drainage plan not falling within the Minimum and Maximum Depths or an Outlet that falls outside the Minimum and Maximum depths. Error: Outlet depth must be between the minimum and maximum To hide errors and warnings, select *Hide Errors and Warnings* on the *Profile* tab.  To correct an error, change the design parameters and then click **Update**.  The map also shows an icon that highlights any section that has an error.
Surface Elevation	A black line represents the actual surface elevation of the ground.
Minimum Depth	A red line represents the minimum depth based on the setting entered in the design.
Drainage Depth	A green line represents the calculated planned drainage design.
Maximum Depth	A blue line represents the maximum depth based on the setting entered in the design.

Option	Description
Outlet to Optimal	A horizontal black line with arrows indicates the area over which the Outlet to Optimal adjustment is spread.
Lateral Connections	When a main is selected, the location where each lateral connects to the main is identified by a black circle. If no offset is used, these are located directly on top of the *Drainage Depth* line. If an offset is used, the symbols appear separated from the *Drainage Depth* line. 
Details for a point	The area in the lower right- hand corner displays the details for a selected point on the *Drainage Depth* path. Click any point on the *Drainage Depth* line to display the details for that location and show that position on the map (with a cross hair). You can also enter the required distance in the area in the lower right-hand corner—the program displays the information for that location on the line. 

Viewing information on a drainage line

To view attributes for a selected Drainage line.

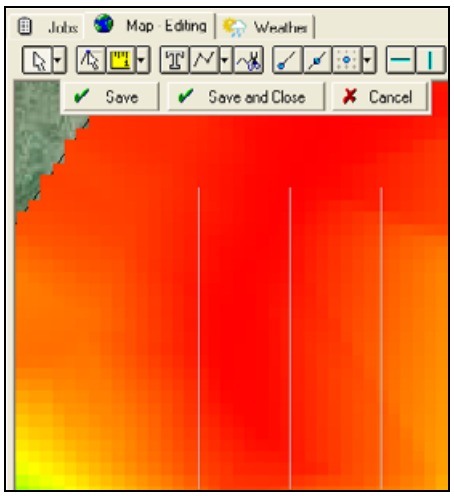


1. Make sure that the Drainage layer is the top layer in the *Displayed Layers* list.
2. Click the Select Tool icon and then click a drainage line (Main, Submain, or Lateral).
3. Select the *Information* tab .

Saving changes to a drainage layer

Any changes you make in Edit mode are not automatically saved: You must click **Save** (this saves your current edits and allows you to continue making changes to the layer) or **Save and Close** (to save all the changes and close map editing).

To exit Edit mode without saving changes, click **Cancel**.

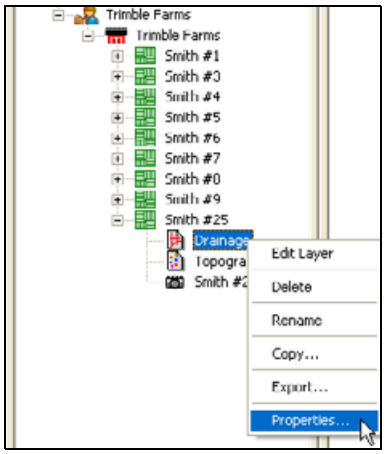


Changing the types of attributes a drainage layer

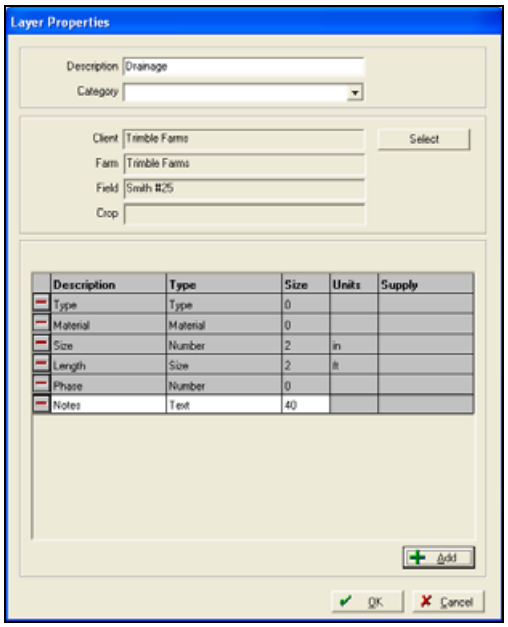
When the software creates a new Drainage layer, it automatically sets up attributes for the type of line (Main, Submain or Lateral), the material used, the size (width) of the pipe, the length of the pipe (computed by the software based on the length of the line), and the phase when the pipe will be installed.

To track any additional attributes:

1. From the *Client/Farm/Field* list, select the required Drainage layer.



2. Right-click the layer and then select *Properties*.



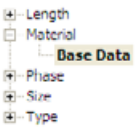
3. To add attributes to the list, click **Add**.
4. Enter a description for the type of attribute.
5. Select the type of data that will fit this attribute type.
6. Where appropriate, enter the size of the attribute (number of decimal places to use for numbers, or number of characters for text).
7. For numeric data, you can enter a unit of measure.

Changing the color or legend of drainage features

The software can automatically create legends for the different attribute types on the layer. These legends determine what colors are used with each attribute on the layer.

To change the colors:

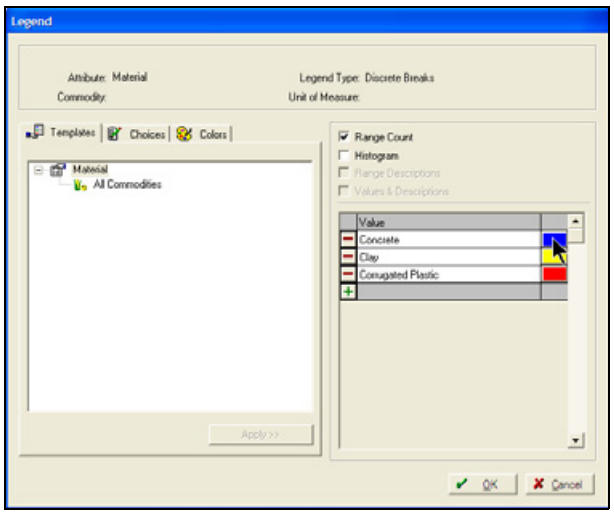
1. Select the relevant attribute type.



   The drainage lines are colored according to the attributes assigned to each line and the legend.

2. Click the Edit Legend icon .

3. In the *Legend* dialog, click a color and then select another color.



4. You can edit the description to change how it appears in the legend.

5. Select the *Range Count* check box for the software to show the total length of all lines for each type on the legend.

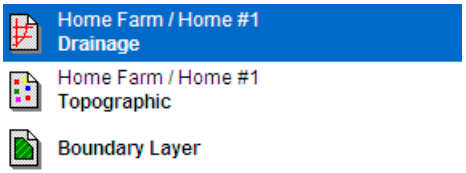
   This feature is particularly useful when used in conjunction with the type or material, as the legend shows the total length of each type of pipe or each type of material to be used.

6. Click **OK** to save changes.

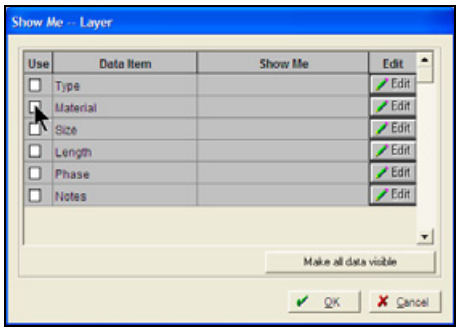
Show Me

Use the Show Me icon to query the map to show only lines that have a certain attribute (such as a type of pipe). You can use it in conjunction with the *Information* tab to find key details such as the amount of a certain pipe that you mapped.

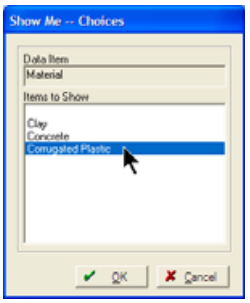
1. Select the layers to use. Make sure that these layers are in the correct order with the required layer at the top.



2. Click the Show Me icon .
3. In the *Use* column, select the required attributes.

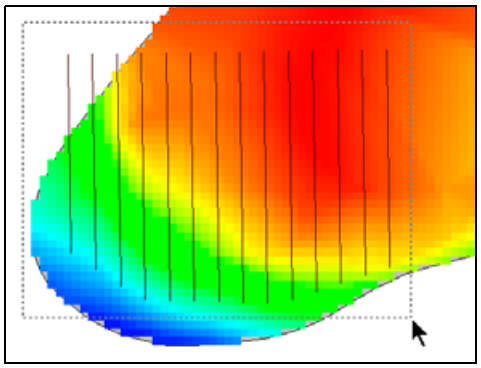


4. Select the attribute(s) to use for the filter.

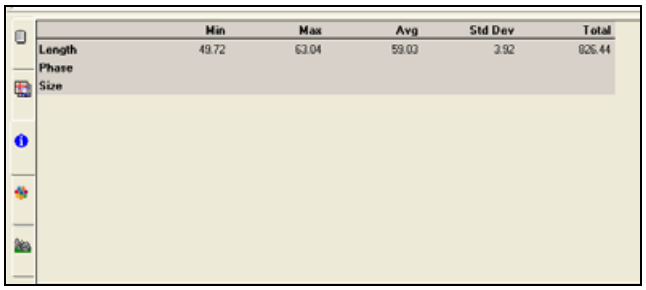


5. Click **OK**. The map shows only the lines that meet your selection.

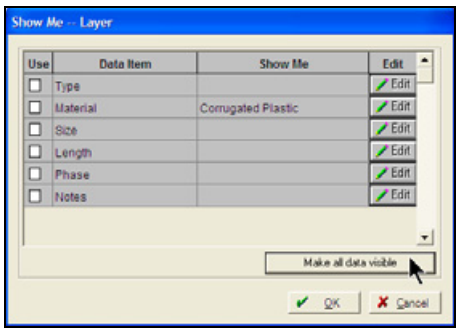
6. Click the Select Tool icon and then click and drag to select all of the visible lines.



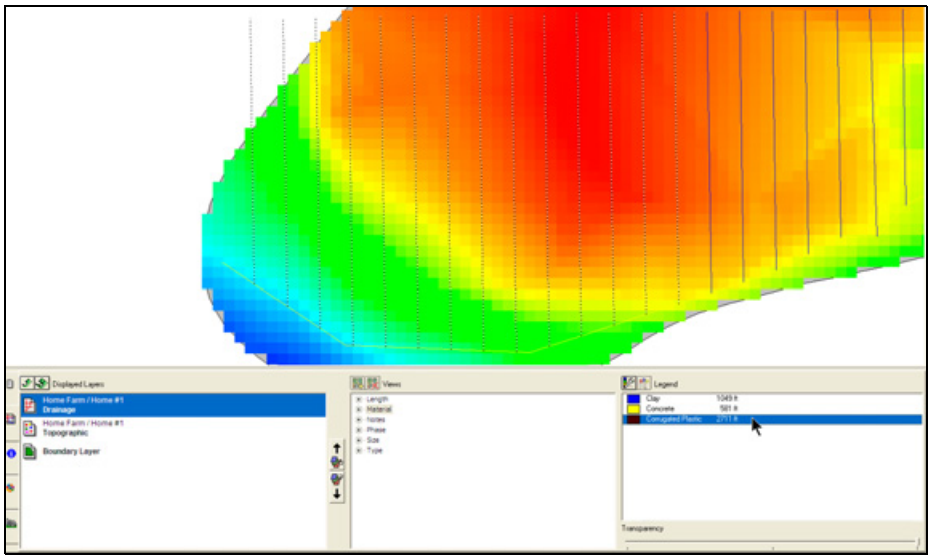
7. Select the *Information* tab to see the total length of the lines that meet the selected attribute.



8. To restore the map to its original display, select **Make All Data Visible** in the *Show Me* dialog.



9. To select lines with a certain attribute, double-click an attribute in the legend area.



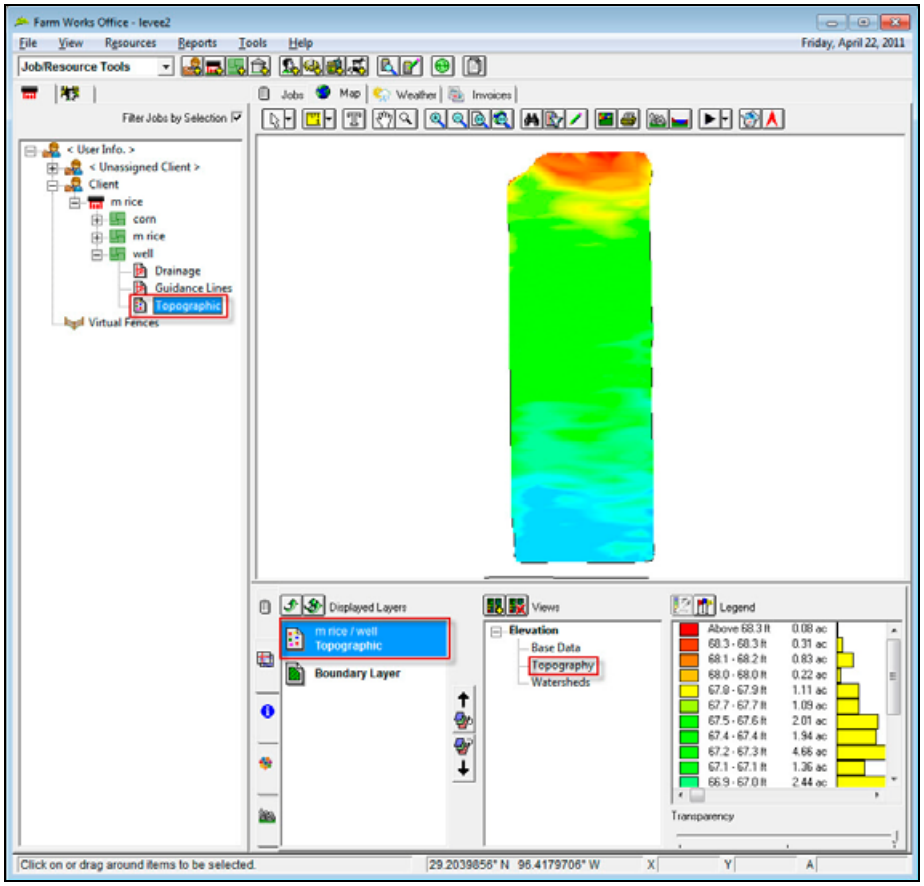
Levee Creation Tool

The Levee Creation Tool uses the Topographic map collected with an FmX integrated display and the WM-Survey plugin to create levee or contour lines. These elevation contours can be saved to a *Feature Lines* layer that can be exported to an FmX integrated display with Autopilot guidance for building levees or berms and can optionally be smoothed to suit the machine and implement used to install the levees. The levee creation tool, paired with an FmX integrated display and the Autopilot system can replace the need to manually survey and mark paths for an operator to follow by eye. This adds accuracy and is more efficient.

To use the Levee Creation Tool:

1. Display the *Topographic Layer* as the top (active) layer.

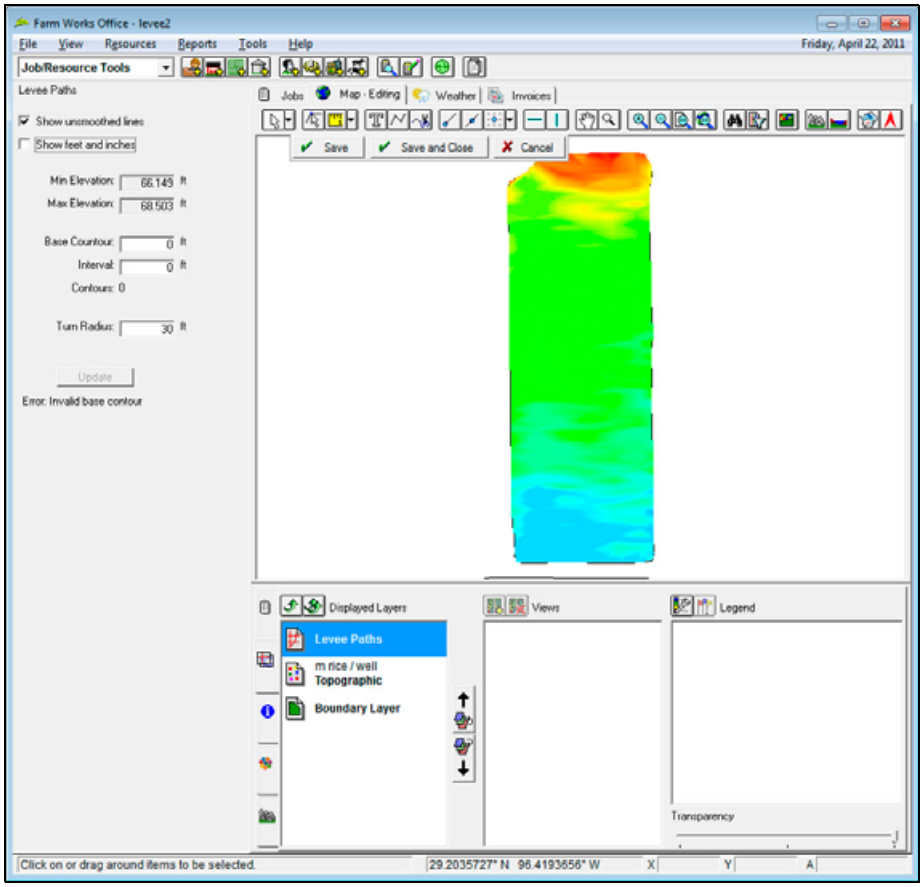
2. Select the view that you want to display; in this example, the Topographic View is selected:



3. Click the Create Levee Paths icon .

   This will place you in Edit mode with the *Levee Paths* toolbar showing on the left of the screen. You can use this toolbar to specify the settings for the Levee Paths (or contours) that will be drawn on your topographic map.

4. Select or clear the *Show unsmoothed lines* checkbox to display or hide the raw elevation contours. When selected, both the raw, unsmoothed contour/levee lines (in blue) and the smoothed contour/levee lines (in red) appear:

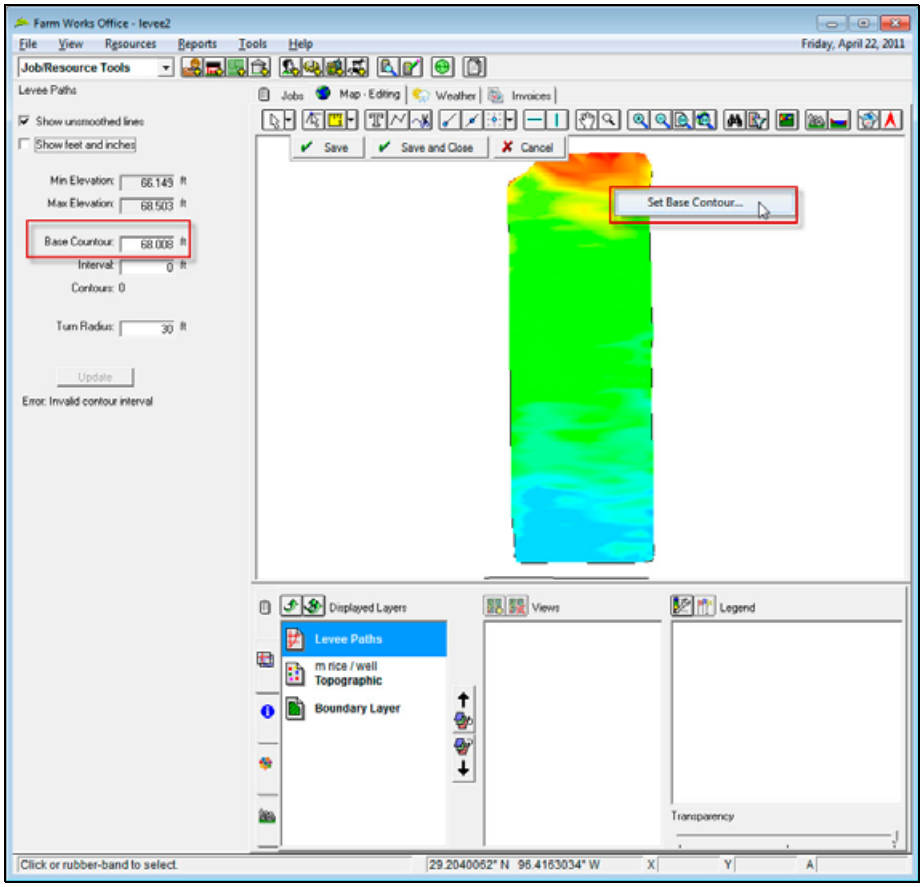


5. Select the *Show Feet and Inches* checkbox to enter the base contour and interval in feet and inches (as opposed to entering this in feet with decimal places).

   The program shows the *Minimum* and *Maximum Elevation* for the topographic data that is being displayed. This information can be useful when you are determining the elevation differences between contours.

   The *Base Contour* is an elevation used to determine a specific elevation that will receive a contour (or levee) line. The program creates a contour through this elevation and uses the *Interval* to establish contours in relation to this base. If, for example, you enter a base contour of 600 feet and an interval of 2 tenths of an inch, the program creates contour lines in increments of 2 tenths of an inch above and below the base. You will then have contours at 599.8, 600, and 600.2 feet.

6. To select the *Base Contour* from the map, right-click any location on the map and then select *Set Base Contour.* The program determines the elevation where you clicked and enters this as the base contour value:

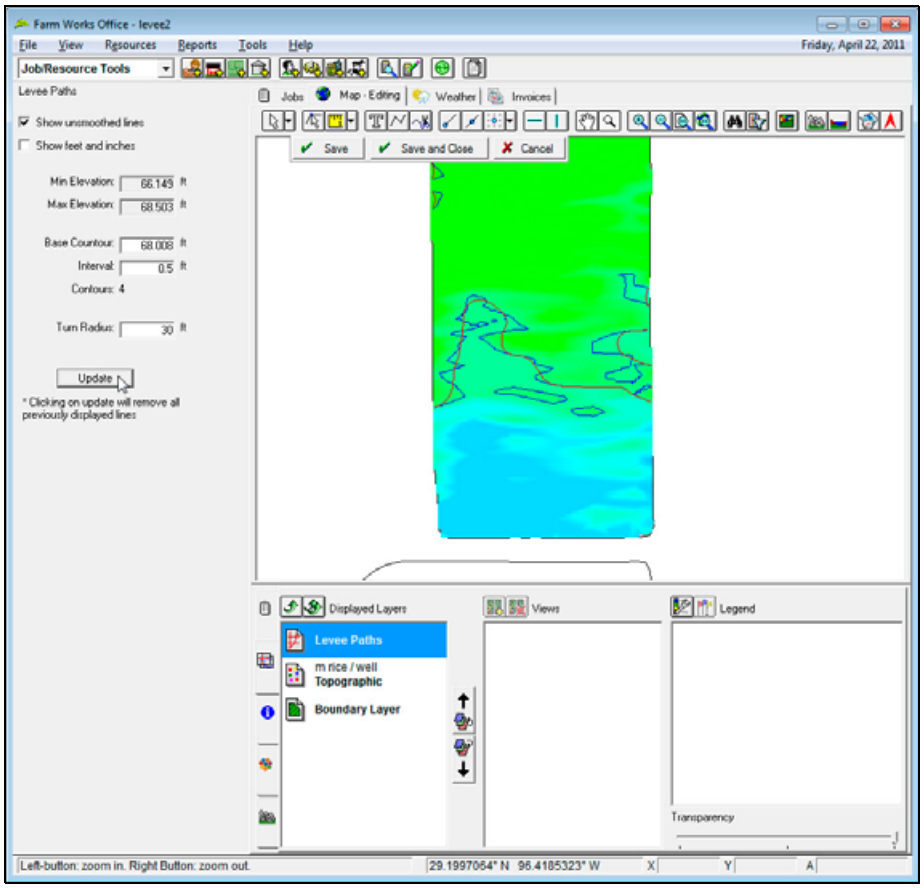


7. After you have set the *Base Contour* and entered the *Interval*, the program displays the number of contours that will be drawn based upon these settings. If this number is too high or low, you may change the *Base Contour* and/or *Interval:* The number is updated automatically.

8. You can now enter a *Turn Radius*. This is used to determine how smooth the smoothed contour lines (colored in red) will be created to allow a Trimble Autopilot system or EZ-Pilot™ system to accurately follow the paths. If you enter a small *Turn Radius*, contours with sharp corners (which can be difficult to follow or steer to) are created; if you enter a larger *Turn Radius*, the program creates paths that can more easily be driven.

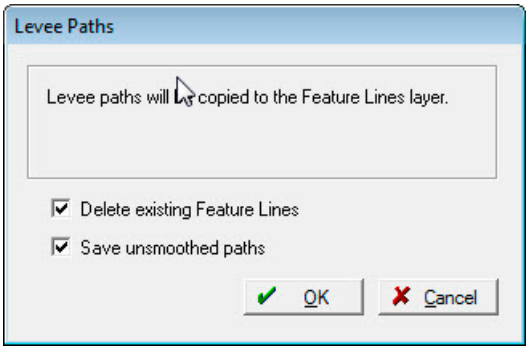
Note – The program does not take elevation into account when smoothing out the contour lines. *The adjustments that are made will likely result in contour lines being adjusted both to the higher and lower elevations on both sides of the lines.*

9. Click **Update**. The contour lines (levees) are created and drawn on the map. If you change any of the values, click **Update** again to recreate the contour lines.



10. Click **Save** to save your current work and continue editing, or click **Save and Close** when you have the lines completed to your satisfaction.

    When you click **Save and Close** a message appears.



11. You can now do any of the following:
    - If you select the *Delete existing Feature Lines* checkbox, any lines that already exist on the Trimble Feature Lines layer for the field are deleted ***before*** the Contour Lines are added. If you clear the checkbox, the contour lines are added to the existing lines on the layer.
    - If you select the *Save Unsmoothed Paths* checkbox, the program saves both the Smoothed (displayed in red) and Unsmoothed (displayed in blue) contour/levee lines to the Feature Lines layer.
12. Click **OK**. The program saves the contour/levee Lines to a Feature Lines layer.

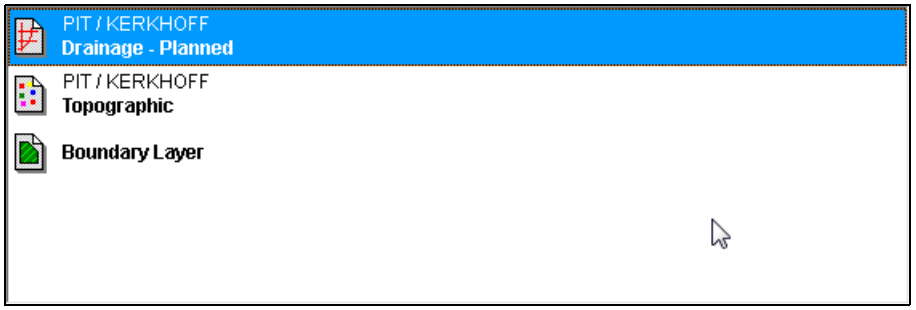
    This layer is exported to the FmX integrated display when you click the Write Job Data icon or, if you are using the Trimble AG Software, when you click the Resource List icon

    .

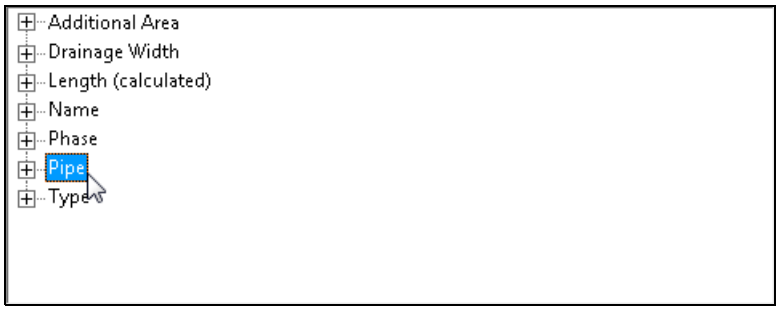
Printing maps

To print a high quality map:

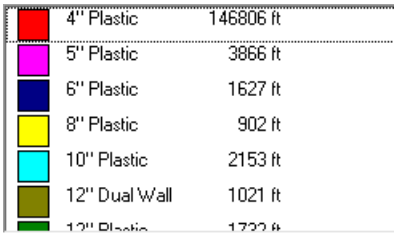
1. Select the layers to print on the map. Make sure that the layers are listed in the correct order with the required layer at the top. Use the arrow buttons in the *Displayed Layers* list to move a selected layer up or down. The top layer always appears before layers that are below it.



2. Select the attribute in the Views layer that you want for the top layer.



3. Make sure that the required legend is visible.

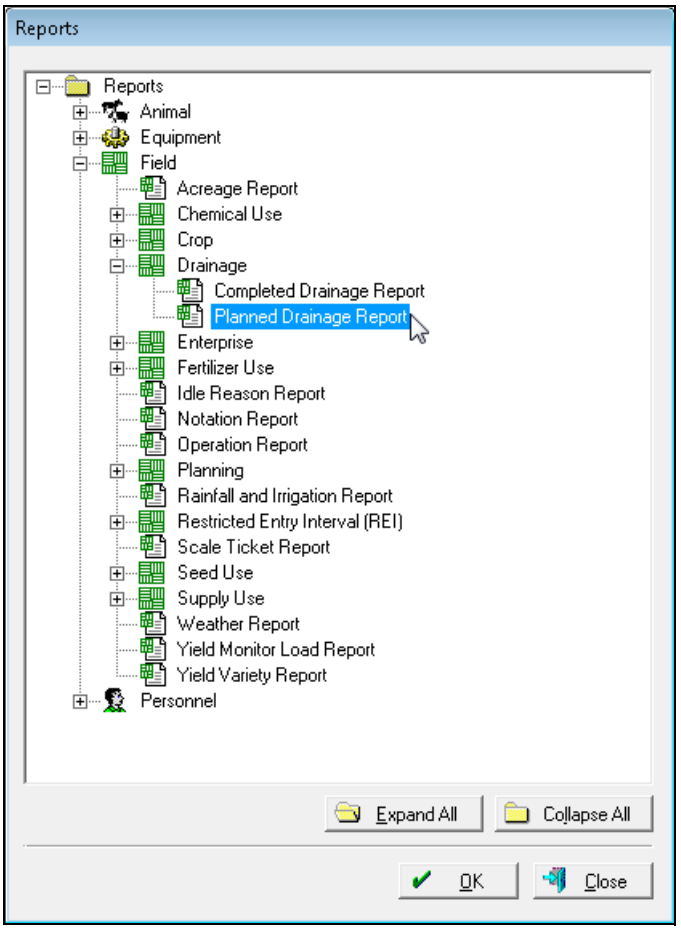


4. Click the Map Report icon .

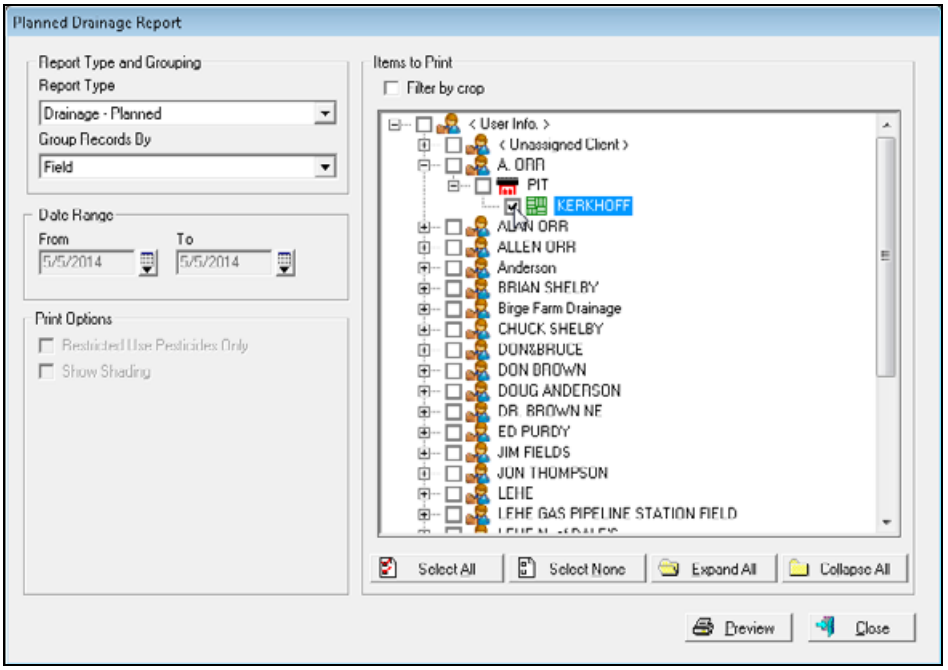
5. Enter the settings for printing the map.

Printing Drainage reports

1. Do one of the following:
   - Select *Reports / All Reports*.
   - Click the report icon.
   - In the *Farm* tab, right-click and then select *Reports*.
2. Click the + beside *Field* and then again beside *Drainage*.
3. Select either *Completed Drainage Report* or *Planned Drainage Report* and then click **OK**.

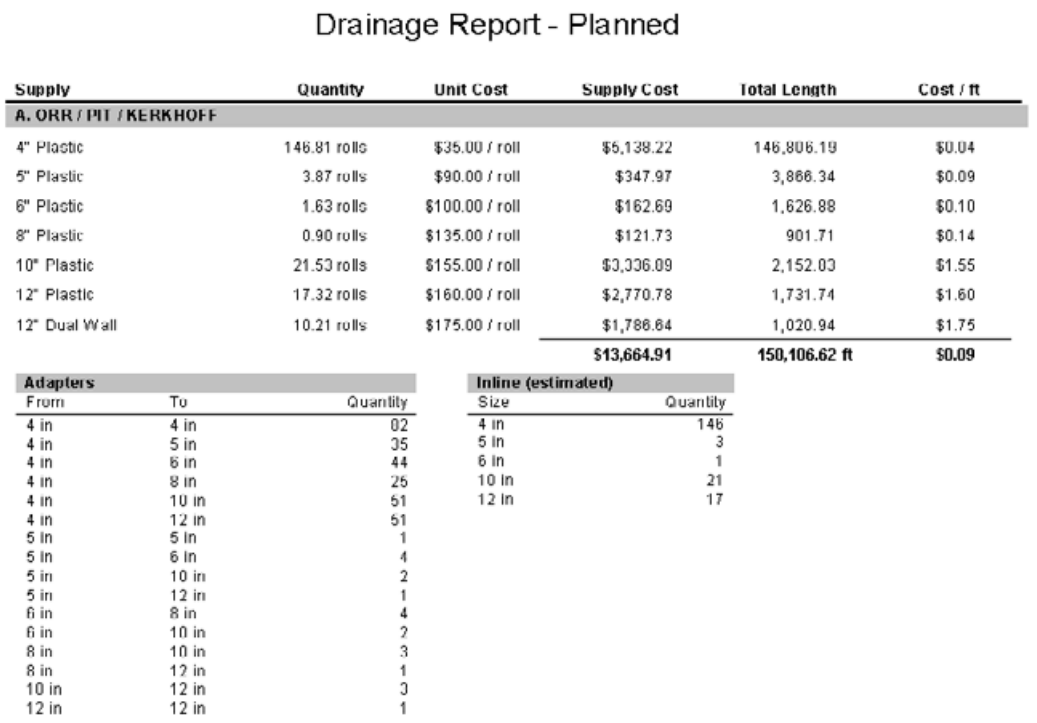


4. Select the fields that you want to include in the report or click **Select All** to select all items.



5. Click **Preview**.

   The print preview window shows the first page of the report. To view other pages, click the Next Page icon **>** or Previous Page icon **<**.



Drainage Report - Planned

Supply	Quantity	Unit Cost	Supply Cost	Total Length	Cost / ft
A. ORR / PIT / KERKHOFF					
4" Plastic	146.81 rolls	$35.00 / roll	$5,138.22	146,806.19	$0.04
5" Plastic	3.87 rolls	$90.00 / roll	$347.97	3,866.34	$0.09
6" Plastic	1.63 rolls	$100.00 / roll	$162.69	1,626.88	$0.10
8" Plastic	0.90 rolls	$135.00 / roll	$121.73	901.71	$0.14
10" Plastic	21.53 rolls	$155.00 / roll	$3,336.09	2,152.03	$1.55
12" Plastic	17.32 rolls	$160.00 / roll	$2,770.78	1,731.74	$1.60
12" Dual Wall	10.21 rolls	$175.00 / roll	$1,786.64	1,020.94	$1.75
			$13,664.91	**150,106.62 ft**	**$0.09**

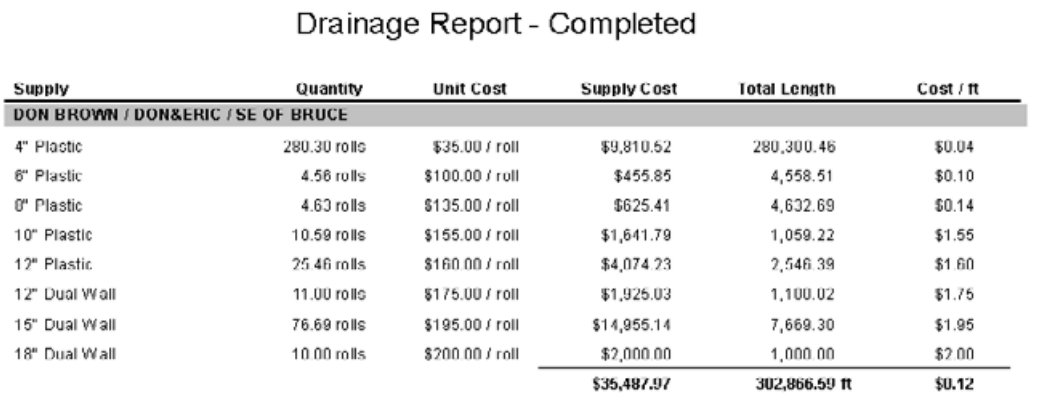
Adapters

From	To	Quantity
4 in	4 in	82
4 in	5 in	35
4 in	6 in	44
4 in	8 in	25
4 in	10 in	51
4 in	12 in	51
5 in	5 in	1
5 in	6 in	4
5 in	10 in	2
5 in	12 in	1
6 in	8 in	4
6 in	10 in	2
8 in	10 in	3
8 in	12 in	1
10 in	12 in	3
12 in	12 in	1

Inline (estimated)

Size	Quantity
4 in	146
5 in	3
6 in	1
10 in	21
12 in	17

The *Adapters* section of the report will show any connectors required either where a section goes into another section or when a section is being downsized. The *Inline* section shows an estimate of the connectors that are required. This estimate is determined based on the number of rolls required.



Drainage Report - Completed

Supply	Quantity	Unit Cost	Supply Cost	Total Length	Cost / ft
DON BROWN / DON&ERIC / SE OF BRUCE					
4" Plastic	280.30 rolls	$35.00 / roll	$9,810.52	280,300.46	$0.04
6" Plastic	4.56 rolls	$100.00 / roll	$455.85	4,558.51	$0.10
8" Plastic	4.63 rolls	$135.00 / roll	$625.41	4,632.69	$0.14
10" Plastic	10.59 rolls	$155.00 / roll	$1,641.79	1,059.22	$1.55
12" Plastic	25.46 rolls	$160.00 / roll	$4,074.23	2,546.39	$1.60
12" Dual Wall	11.00 rolls	$175.00 / roll	$1,925.03	1,100.02	$1.75
15" Dual Wall	76.69 rolls	$195.00 / roll	$14,955.14	7,669.30	$1.95
18" Dual Wall	10.00 rolls	$200.00 / roll	$2,000.00	1,000.00	$2.00
			$35,487.97	**302,866.59 ft**	**$0.12**

6. From the report preview, you can:
   - Click the Print Setup icon to set the printer properties.
   - Click the Print icon to print the report. In the *Print* dialog, you can select the pages and number of copies.
   - Click the Export icon to export the report and save a copy.

For more information on reports, refer to the *Trimble AG Software Desktop with Advanced Financial Reporting User Guide*.