

The TilePro Jump Start

Introduction and Disclaimer

Achieving results in TilePro is straightforward. The challenges you may face relate only to becoming comfortable with operating a computer and running a piece of software. In this respect TilePro presents no more of a challenge (actually, far less) than becoming proficient with a spreadsheet, a word processor or a personal finance program.

If you have never run a piece of software more complex than an internet browser you can learn TilePro. However, running any software well takes time, patience and a willingness to learn from failure. If you don't think you have these you probably want to back away from TilePro.

There is one unavoidable issue. TilePro was designed to provide a simple visual and computational assist to people who put tile in the ground. If you are not a designer/builder of agricultural drainage systems you probably should not be using TilePro. If you are a designer or tiling contractor you have to understand TilePro simply as an assist to your art- a product that helps you apply your knowledge and intuition more efficiently and effectively.

There is no 'science' in TilePro. There is a bit of arithmetic, trigonometry and cartography. TilePro will not figure pipe sizes, recommend optimal slopes or calculate lateral spacing for you. It will only help you apply your knowledge in building a graphic/cartographic representation of a drainage system so you can present the job to your customer and physically lay out the job in the field.

There is no 'magic' in TilePro. It can not predict the best run through a complex physical/topographic surface. You use your knowledge and experience to propose and test the runs of mains and laterals. The design process in TilePro is simple and totally interactive.

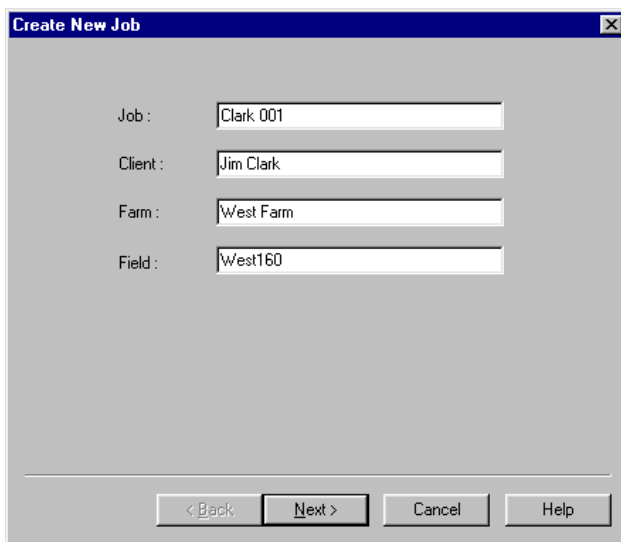
The basic function of TilePro is to show you how a proposed main and its associated laterals will lay under the ground. You propose the alignment and run of a line on an image of the physical/ topographic surface of a field and the computer shows you if the run will lay within an envelop of minimum and maximum depth at a functional slope. If it does, keep the design. If it does not, cancel and start over.

Using TilePro (Start the Program by double-clicking on the program icon. Just like any piece of software.)

Step 1. Create a Job.

A system design is undertaken in a job context. Creating a job simply involves supplying detail about the job. Job creation is wizard driven. Click **File | New Job...** and supply content to the boxes on each page of the wizard. Click **Next>** to proceed.

Page1 Who is the job for?



Job :

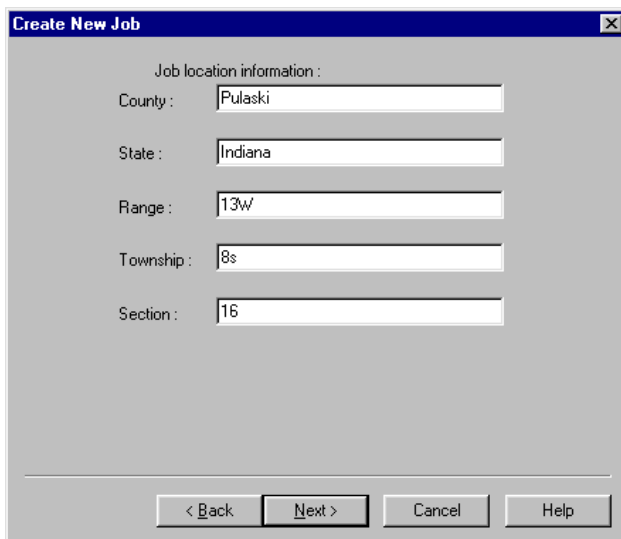
Client :

Farm :

Field :

< Back Next > Cancel Help

Page 2 Where is the job?



Job location information :

County :

State :

Range :

Township :

Section :

< Back Next > Cancel Help

Page 3 Who gets the bill?

The screenshot shows a dialog box titled "Create New Job" with a close button (X) in the top right corner. The dialog is divided into a "Billing Information" section and a navigation section at the bottom. The "Billing Information" section contains the following fields:

- Name :
- Address 1 :
- Address 2 :
- Town/City :
- State : Zip Code :

At the bottom of the dialog, there are four buttons: "< Back", "Next >", "Cancel", and "Help".

Page 4 What units do you work in? English or Metric? Are linear units in feet, inches, centimeters, meters, etc.? Is slope expressed in degrees, percent, arcseconds, etc.? Is area expressed as acres, hectares, square miles, etc.? When you see coordinates are they to be in latitude/longitude or in projected x,y?

The screenshot shows the same "Create New Job" dialog box, but now displaying the "Units System" and "Map Coordinates" sections. The "Units System" section has two radio buttons: "Metric" (unselected) and "English" (selected). Below this are four dropdown menus:

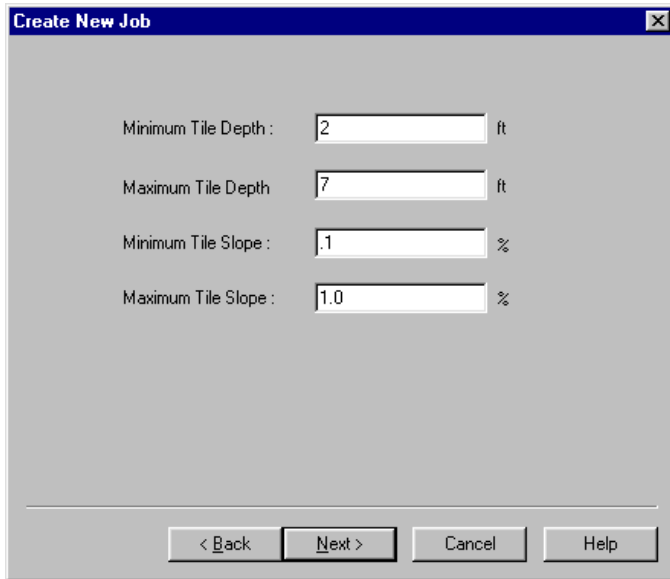
- Horizontal Units :
- Vertical Units :
- Slope Units :
- Area Units :

The "Map Coordinates" section is enclosed in a box and contains three radio buttons:

- Degrees, Minutes, Seconds
- Decimal Degrees
- Easting/Northing (m.)

At the bottom of the dialog, there are four buttons: "< Back", "Next >", "Cancel", and "Help".

Page 5 What are your working parameters? How much cover is minimum? (Here, 2 feet.) What is the maximum depth for your equipment? (Here, 7 feet.) What is the minimum slope for a line? (Here one tenth percent.) What is the maximum slope? (Here, one percent.)

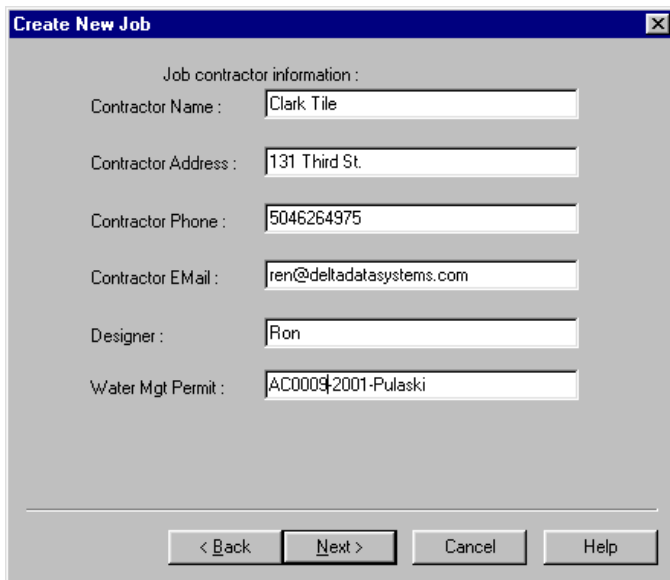


The screenshot shows a dialog box titled "Create New Job" with a close button (X) in the top right corner. The dialog contains four input fields for tile parameters:

- Minimum Tile Depth : ft
- Maximum Tile Depth : ft
- Minimum Tile Slope : %
- Maximum Tile Slope : %

At the bottom of the dialog, there are four buttons: "< Back", "Next >", "Cancel", and "Help".

Page 6 Who is doing the job? Who is the contractor? Who is the designer? Normally that's you.



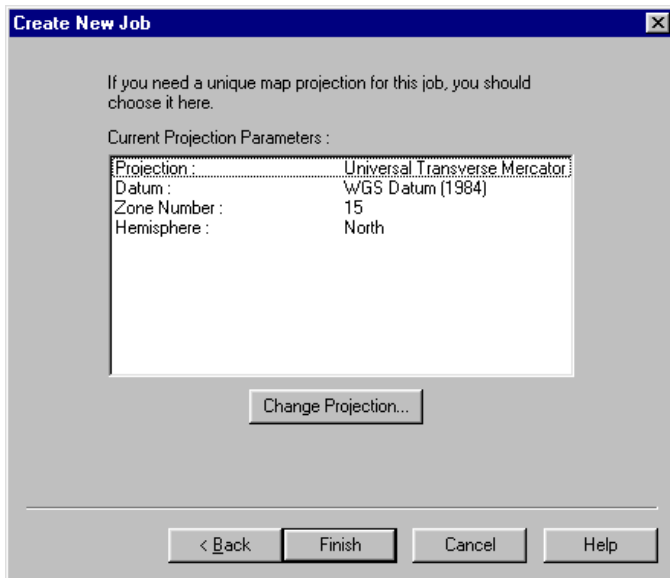
The screenshot shows a dialog box titled "Create New Job" with a close button (X) in the top right corner. The dialog contains six input fields for contractor and designer information:

Job contractor information :

- Contractor Name :
- Contractor Address :
- Contractor Phone :
- Contractor EMail :
- Designer :
- Water Mgt Permit :

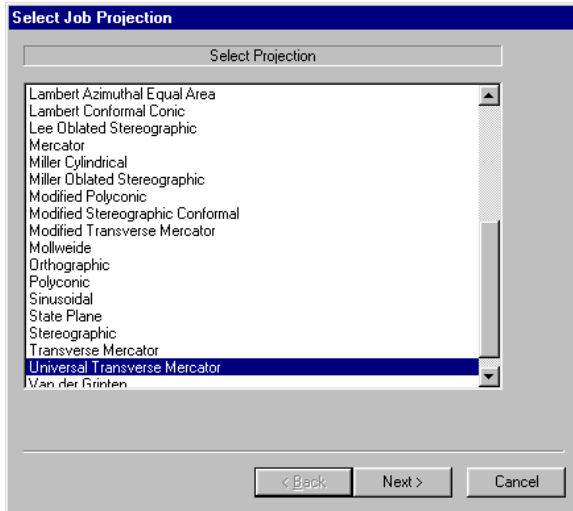
At the bottom of the dialog, there are four buttons: "< Back", "Next >", "Cancel", and "Help".

Page 7 What is the map projection to be applied to all work in this job? UTM? State Plane? What datum? NAD27? WGS84? You can't put something curved on something flat without a projection. Latitudes and Longitudes are ellipsoidal coordinates (curved). To plot them on a computer screen or a piece of paper, they have to be projected. You want to do this on a real, map space so you can move back and forth between ellipsoidal (latitude/longitude) and plane systems.

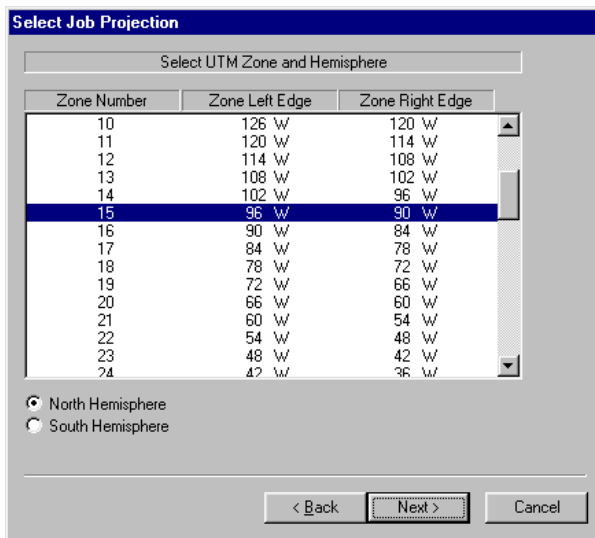


Unless you have a compelling reason to work with a specific map projection, do this:

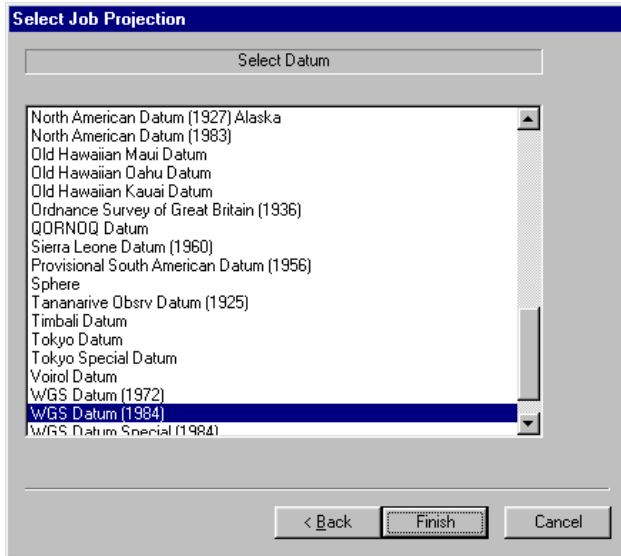
- 1) Find the longitude position of the job. Since most of your field work involves GPS, this is not going to be a problem. But, if you do not know the longitude, ask the county surveyor or consult a Geological Survey map. Let's say that the center of your field is 81 degrees 37 minutes and 5 seconds West Longitude.
- 2) Click 'Change Projection'



- 3) Universal Transverse Mercator is highlighted by default. This is a very reasonable choice for a map projection. We recommend that you use it in your work unless your client requires a different choice (and that would be a rare request). Click 'Next>'.



- 4) UTM projections are arranged “by zone” every six degrees and by hemisphere. The default zone is “15”. Any position between 90 degrees and 96 degrees West is in zone 15. You noted your position as 81 degrees West. This puts your job in zone 17. Put your cursor on the list line that has “17 84 W 78 W” and click the left mouse button to highlight that list entry. You are in the northern hemisphere. Make sure that radio button is active (and it is by default). Then click ‘Next>'.



- 5) A projection must be associated with a datum. The default selection is WGS Datum (1984). This is the one used in GPS survey work and characterizes most GIS work. Again, unless your client has required the use of another datum use WGS84 in all your work. Click on 'Finish' here and then click on 'Finish' on the main job creation dialog. At this point, the New Job is created. You see 'Clark001' in the Job drop down list.

Each time you create a new job it gets added to the job list. When you activate TilePro all Jobs with all the parameters that you have just set are selectable.

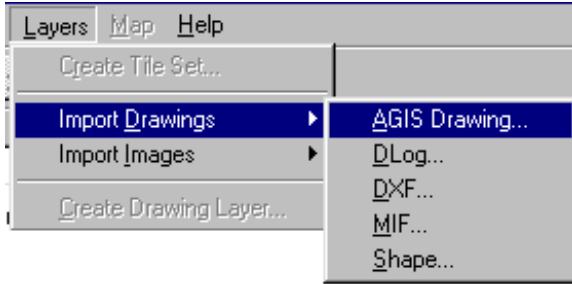


Step 2. Create a topo map.

You are using TilePro to see how proposed runs of main or lateral sections fit under the physical surface of the field. Where do you get a map of surface elevations? You build it from collections of field elevations. How did you collect field elevations? With a survey grade GPS system. The basic data point is 1) a longitude (X), 2) a latitude (Y) and 3) an elevation (Z).

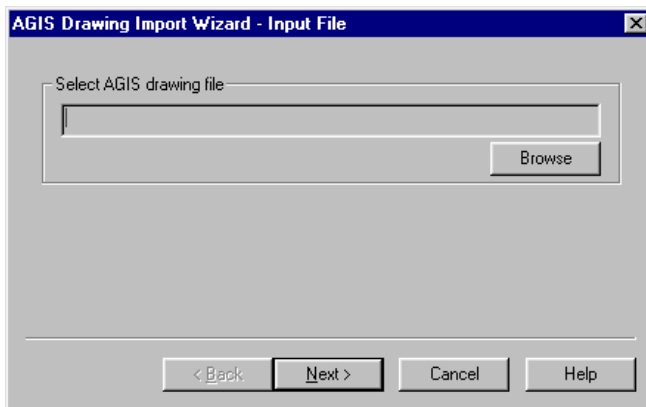
In fact, your field collection activity will have produced two data sets: 1) a field boundary and 2) a set of x,y,z data points. There will be two external files to work with: a boundary file and an elevation points data file. They are created by your GPS survey system.

Import the Boundary File

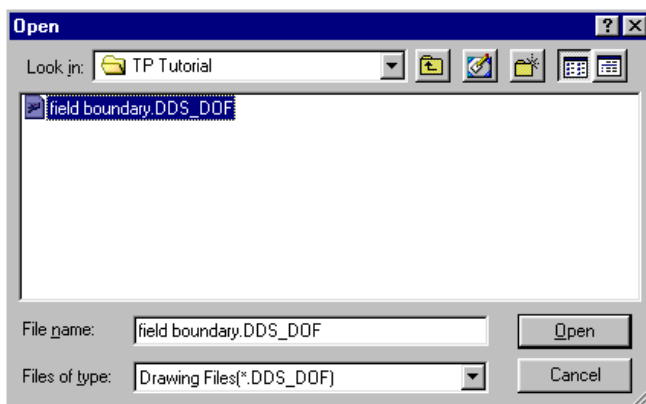


The boundary file was collected with Dlog and exported in an “AGIS Drawing” format. Therefore, to get this into TilePro you need to import it. Click on ‘Layers’ then ‘Import Drawings’ and finally ‘AGIS Drawing’.

This pops up an import wizard for this type of file.

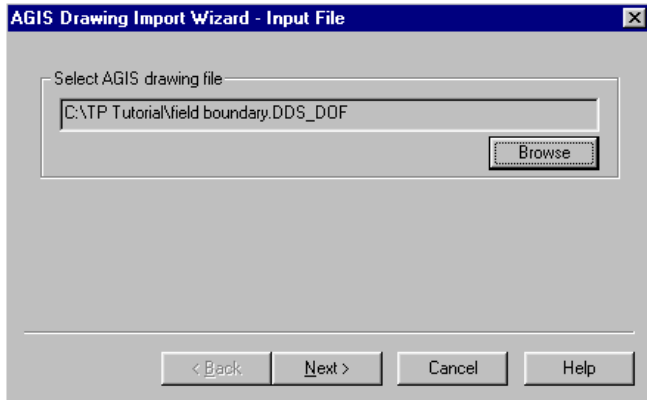


Click on ‘Browse’ to locate the file in a folder titled “TP Tutorial”



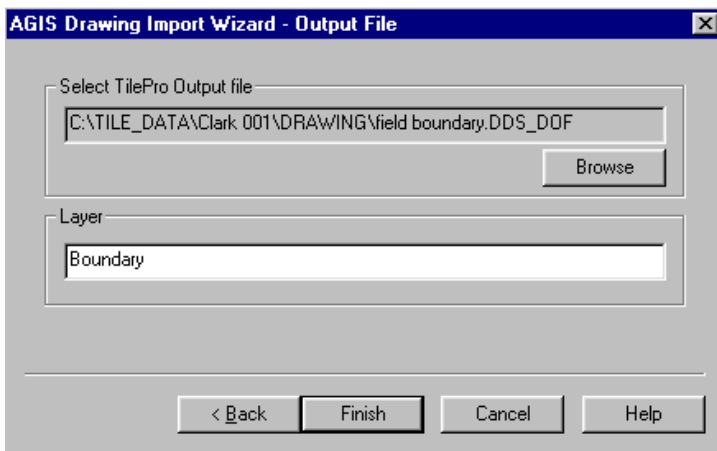
The file is named ‘field boundary.DDS_DOF’. Highlight it and click on ‘Open’.

The wizard page is updated with the selected file.

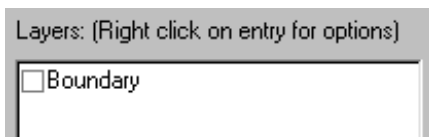


Click Next to proceed.

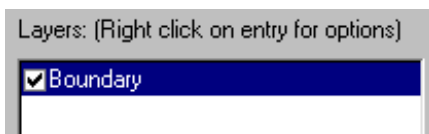
Supply a Layer Name in the edit box. Use 'Boundary'.



Click 'Finish'. The file is processed and you will see that the Layer List on the interface has been updated with a new entry.



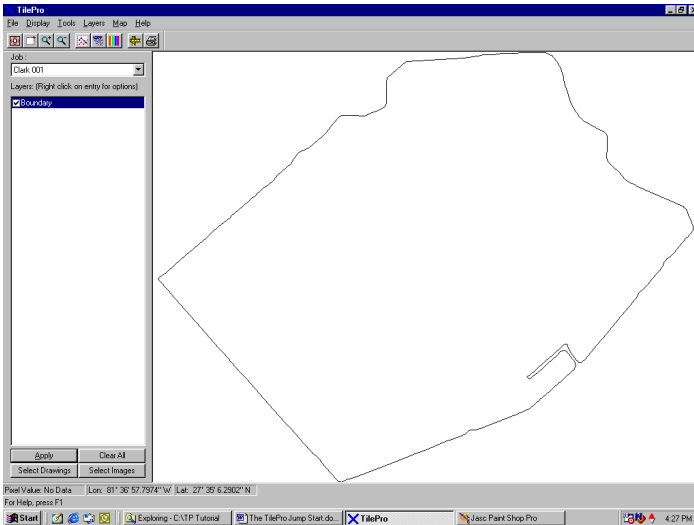
Put your cursor on the check box next to 'Boundary'.



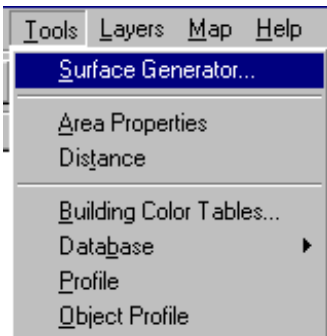
Now click on the 'Apply' button at the bottom of the layer list.



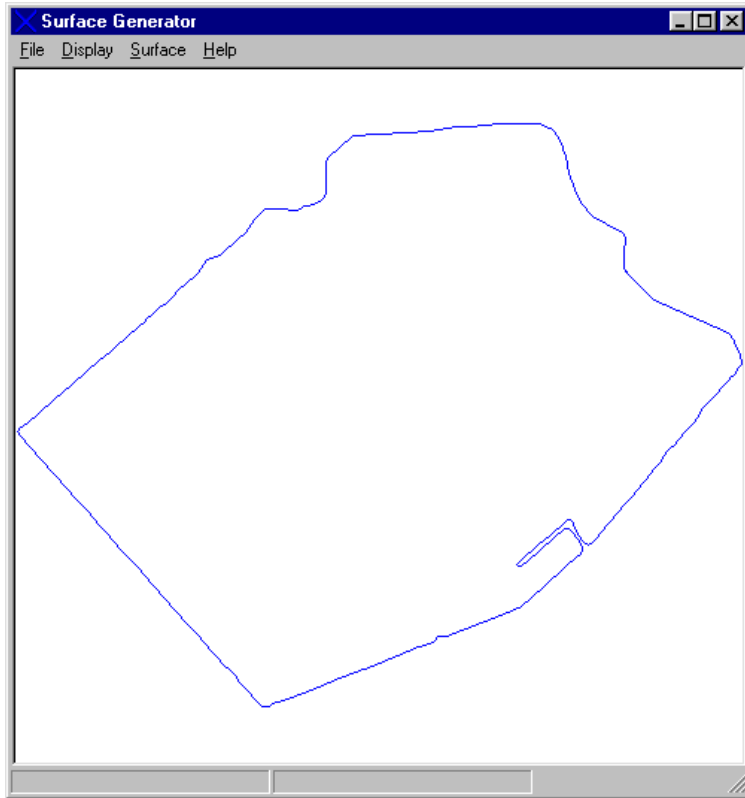
You should see the boundary on the display like this:



Now you have a boundary to limit the operation of Surface Generation. Let's build the top surface.



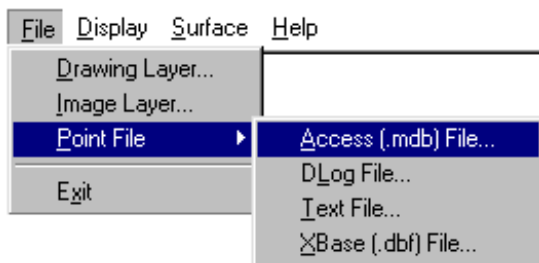
Surface Generator has its own interface.



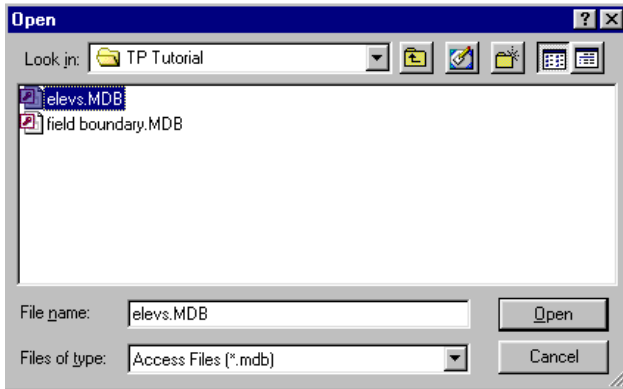
You see that the boundary is displayed here too. If it is not, click **File | Drawing Layer** on the Surface Generator dialog. Then highlight 'Boundary' and click **OK**.

Now you want to locate the data set of 'x,y,z' points that was collected in the field with GPS. It is in '.mdb' format. This means that the data are structured in a very specific way that is instantly recognizable to TilePro. The data could be in other formats. That would depend on your GPS collection system. TilePro supports enough so that you can get almost anything in.

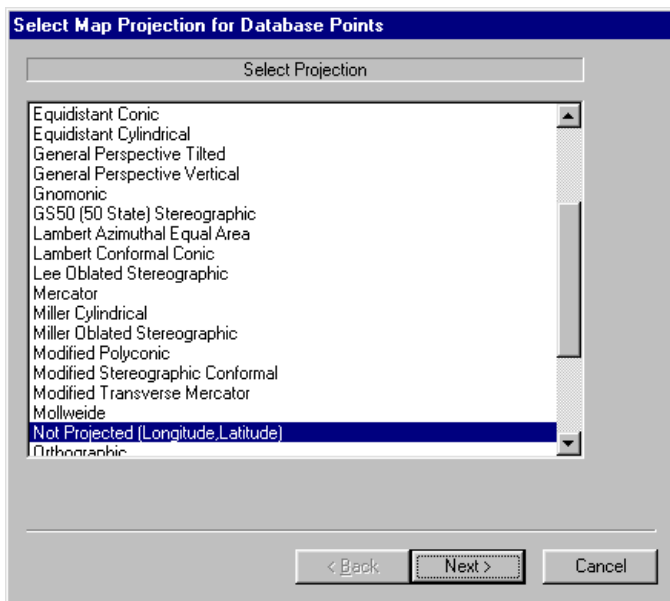
Click **File | Point File > Access (.mdb) File**



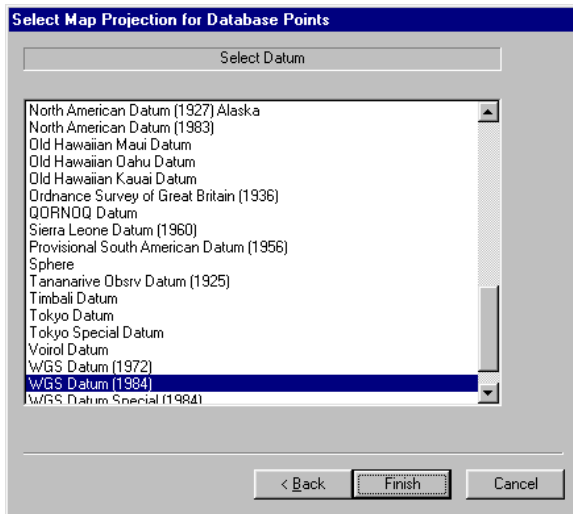
Click on 'elevs.mdb' and click **Open**.



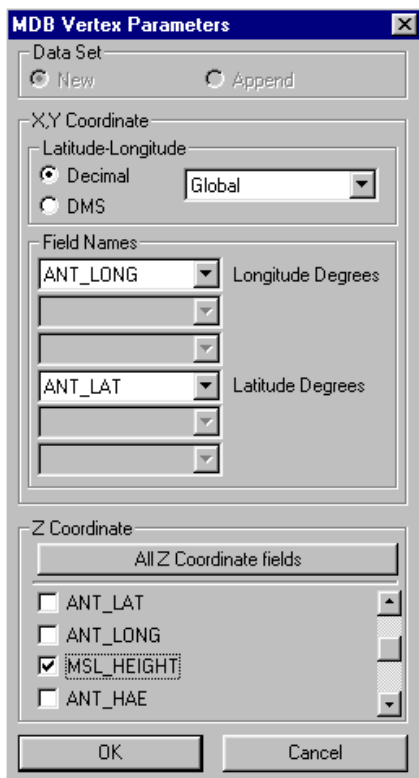
You need to tell Surface Generator about the geography of these data. What is the coordinate system? In most cases with GPS the answer is “Not Projected (Longitude, Latitude)”. This is the default. Click **Next**.



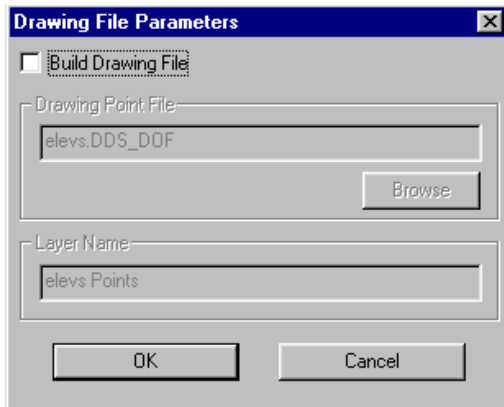
Now supply the datum. Again, in most GPS work this will be WGS Datum (1984), the default. Click **Finish**.



When you click 'Finish' this dialog pops up.

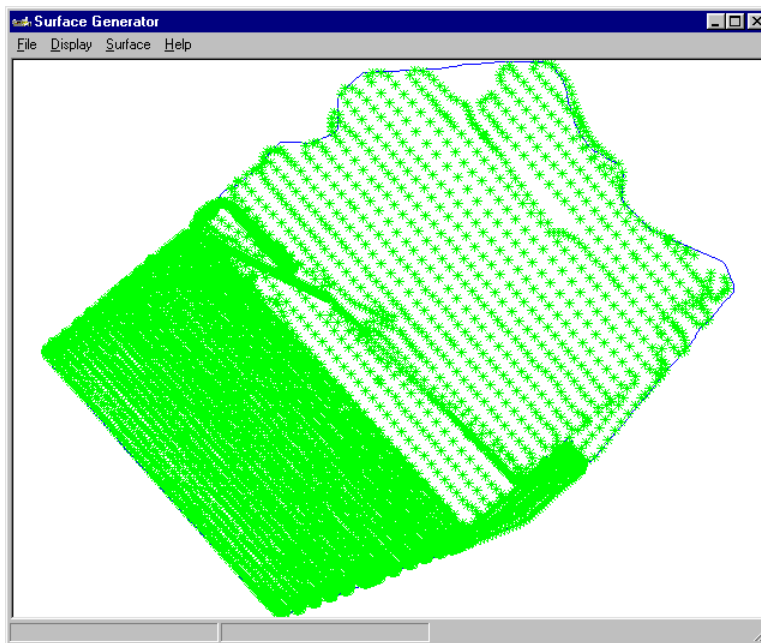


The purpose of this dialog is to tell Surface Generator where to find table fields for X, Y and Z. In this case the X is 'ANT_LONG' (antenna longitude), the Y is 'ANT_LAT' (antenna latitude) and the Z is 'MSL_HEIGHT' (mean sea-level height). Click on the appropriate drop downs to define X and Y and click the check box next to 'MSL_HEIGHT'. Then, click 'OK' to continue.



There is an option to build a drawing file of the surface points in addition to the physical surface map. Normally the number and density of points is too great to bother with creating an additional overlay. Just click 'OK' here.

Now the Surface Generator display is updated with the field collection of points.



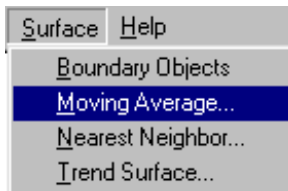
Note that the collection was much more dense in the west half of the field than in the east. The reason is that the contractor started with a collection frequency of 5Hz (five points per second) and then decided to change to 1Hz (one point per second).

To continue, click **Surface | Boundary Objects**

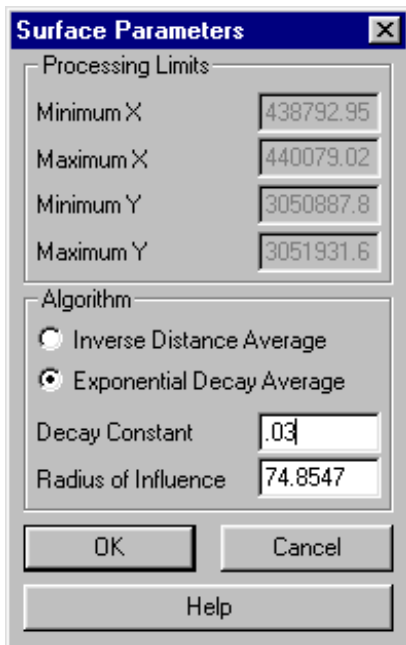


When you do this, the display cursor will change to a cross-hair. This means that a display operation is possible. You are going to select the field boundary as a 'boundary object'. Put the cursor on the line and click the left mouse button. The boundary will be highlighted in RED. Now, click the right mouse button to stop selecting boundary objects. The display cursor will return to its 'arrow shape'. You have specified the field boundary as the limit of surface estimation.

Click **Surface | Moving Average**

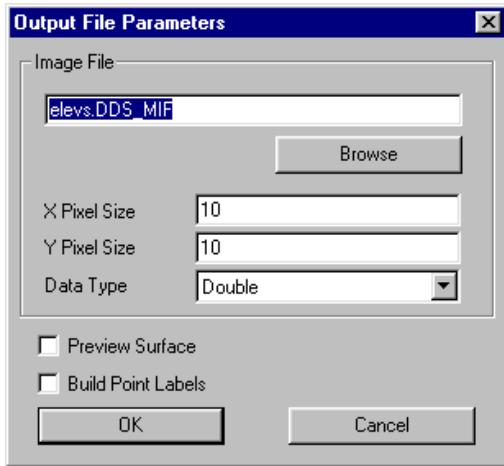


This will pop up a dialog for surface model parameter entry.



We think 'exponential decay' is an effective modeling technique for a dense and regular data set as created by RTK GPS. Change the 'Decay Constant' from the default (1.0) to a new value, .03. Click **OK**.

Now you are asked to supply parameters for the file that is being created by Surface Generator.

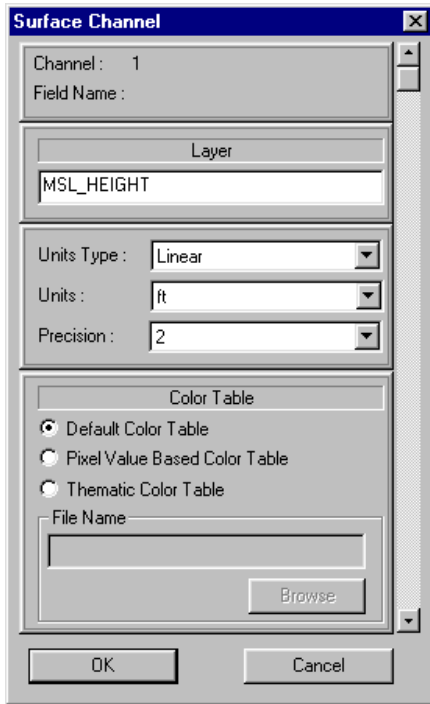


The parameters are: 1) File Name. Use the default. You could change it by clicking **Browse** and supplying a different name. 2) X Pixel Size. The output of Surface Generator is an image composed of picture elements (pixels). These elements have a width (x-dimension) and a height (y-dimension). The default is 10 meters (~32.80 feet) for both dimensions. You can change either dimension by typing in a new number in the edit box. Note that the smaller the number, the larger the output file. 3) Data Type. This refers to the numeric precision of the output calculation. A 'double' is a 64-bit, double precision number. Your other option is 'Float' a 32-bit, single precision number.

Other options are 1) 'Preview Surface' which means to build a temporary view of the output for review before committing to a final process. You might do this if you wanted to see what various parameter settings would yield before you actually built the output file. 2) 'Build Point Labels' which means that a label will be put at the location of each input data point. Note that with as many input points as you have here, building labels would result in a very busy display.

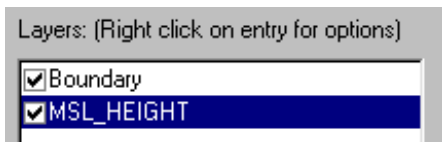
Don't change anything. Just click **OK**.

This dialog offers a chance to supply parameters other than defaults for units, unit precision and color. In normal operation, keep the defaults. Click **OK**.

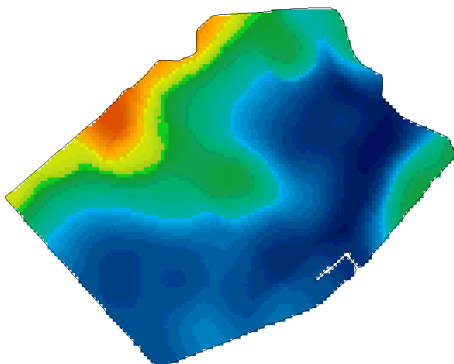


Surface Generator runs with a progress bar showing completion. When the surface run is complete, click **File | Exit** on the Surface Generator dialog to return to general TilePro operation.

You should see that your layer list has been updated with a new topo layer.

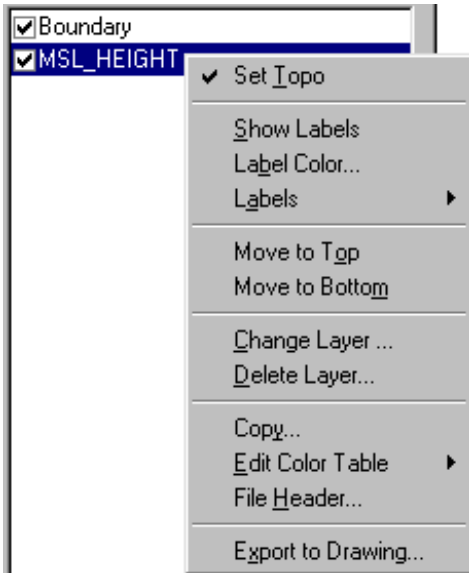


Click on the check box next to 'MSL_HEIGHT' and click on **Apply** to view the result of Surface Generator. This is the physical surface of your job.

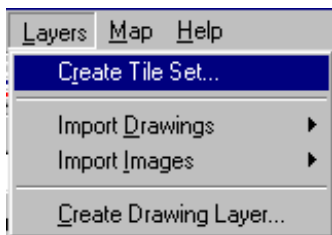


Step 3 Create a 'Tile Set' and build runs of Main and Laterals

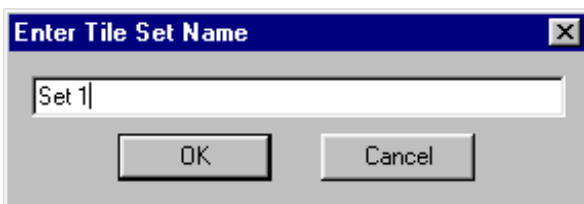
- 1) Right click on the layer list entry 'MSL_HEIGHT'. Then check **Set Topo** to identify this layer as the one containing topo values.



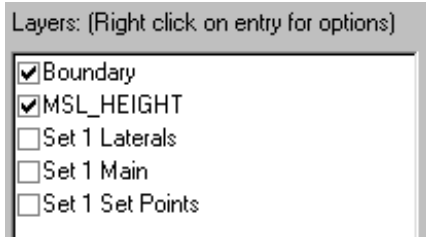
- 2) Click **Layers | Create Tile Set...**



- 3) Supply the name of the first 'Tile Set' for this Job as 'Set 1' (you could use any name that was descriptive). Click **OK**.

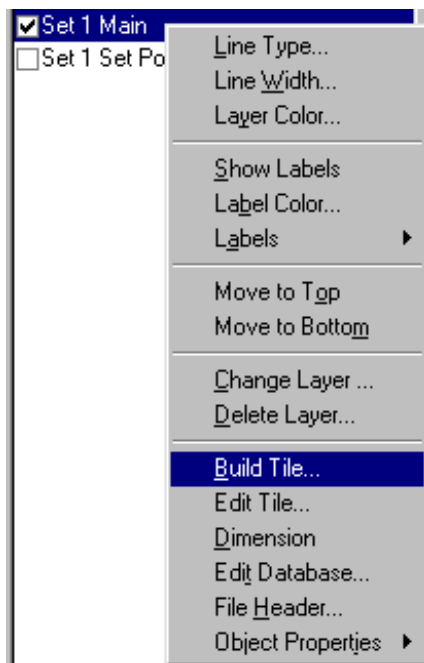


When you click **OK** the set is created and added to the Job's layer list.



As you see, a 'Tile Set' is a collection of three layers, Main, Laterals and Points. 'Mains' and 'Laterals' are easily understood. 'Points' are used to monument the position of any feature related to the functioning of the system, such as: risers, drains, etc. Everything you create for a Tile Set is related only to that set. You design a system as a series of Tile Sets.

- 4) Check **Set 1 Main** and click **Apply**. Then, right click on **Set 1 Main** to access Layer tools.



- 5) Click on **Build Tile**.

The 'Build Main' dialog offers choices of how to work. From an outlet into the field? From a position in the field to an outlet? Starting with an outlet elevation relative to some elevation bench mark? Starting at a specific depth below surface? What slope?

Build Main

Current Segment

Display tile info as : Elevations
 Depths

Outlet : 2 ft

Endpoint 2 : 2 ft

Slope : .1 %

Calculate tile using

Outlet & Slope
 Endpoint & Slope
 Endpoint 1 & Endpoint 2

New Main Tie Main

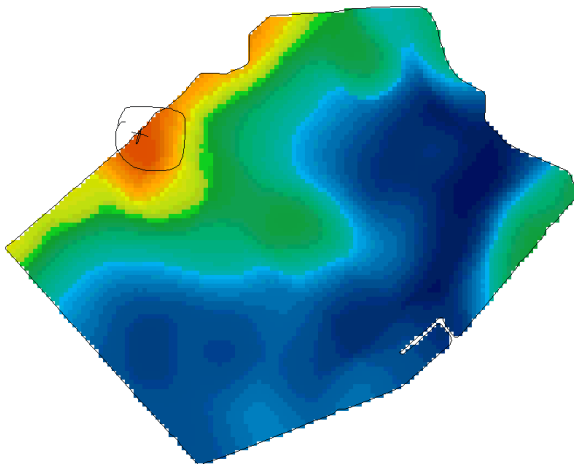
Conclude Main

Exit

We'll work from the outlet out to the field with a starting depth of two feet and a proposed slope of .1 percent (a 'tenth'). Set the parameters as you see them here.

Click **New Main**. The display cursor will change to a cross-hair. This indicates that display operation, in this case drawing, is enabled.

Now position the display cursor at this location:

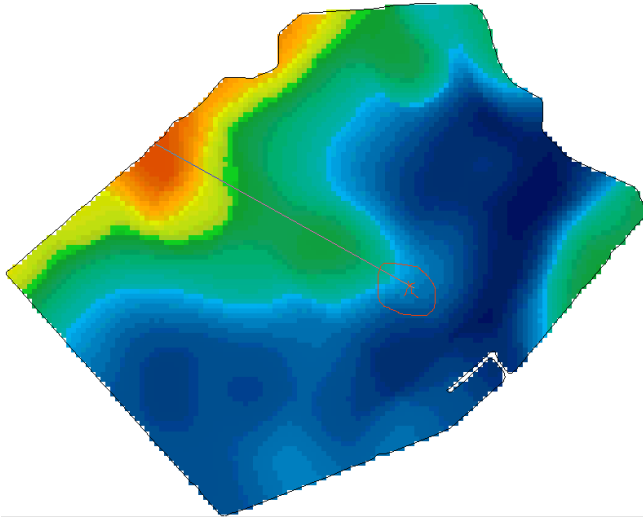


Use the cursor position display to see if you are close to this position:

Pixel Value: 189.35 ft Lon: 81° 37' 1.6017" W Lat: 27° 35' 14.5368" N

The 'Pixel Value:' report is elevation. This is the lowest point in the field.

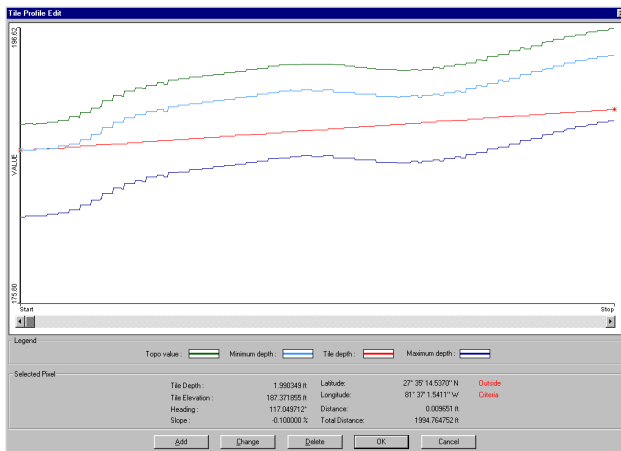
Click the left mouse button to lock on this position and then move the cursor out to this position:



The 'Pixel Value:' report shows this elevation and position:

Pixel Value: 195.78 ft Lon: 81° 36' 44.1556" W Lat: 27° 35' 5.7024" N

Click on the left mouse button to lock on this position. When you do, the Profile Edit tool is displayed.



Tile Profile Edit Tool

This is where some design work gets done. In the previous steps you worked in ‘plan view’ to lay out a main from an outlet to a point in the field. Now you are being shown the lay of the proposed run under the physical surface in ‘section view’ (elevation). If this display shows an acceptable run you can accept it and move on. Very often, some adjustment to the proposed run will be required and this is the principal function of the Tile Profile Edit Tool.

What you see is 1) the physical surface profile (in green) which is the surface elevation; 2) the minimum cover profile (in cyan) which is the depth above which the tile should not be placed; 3) the maximum depth (in dark blue) which is the depth below which your machinery can not dig; 4) the lay of the tile at the proposed start depth and slope (of .1% in this case). Profile #1 is derived from the topo surface that you built in Step 2. Profiles #2 and #3 were specified when you created this job in Step 1 (on page 5 of the Job Creation wizard).

To Look at the details of the proposed run.

Use the horizontal slide to move left and right on the graph. You can move it with the mouse or by tapping the keyboard arrow keys.



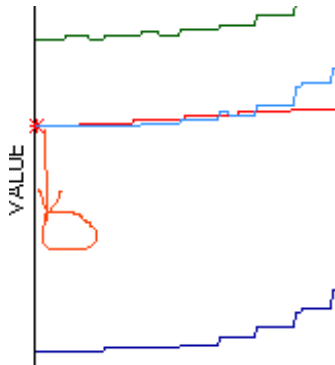
As you move the slider, a vertical marker travels along the graph. Information relating to tile depth, surface elevation, coordinate location, tile bearing, slope and length to/from tile start point is given.

Tile Depth :	1.990545 ft	Latitude:	27° 35' 14.2108" N
Tile Elevation :	187.331406 ft	Longitude:	81° 37' 2.0242" W
Heading :	118.209804°	Distance:	0.009455 ft
Slope :	-0.100000 %	Total Distance:	1954.241452 ft

Making some adjustments

In looking at the proposed run there are two slight problems to address.

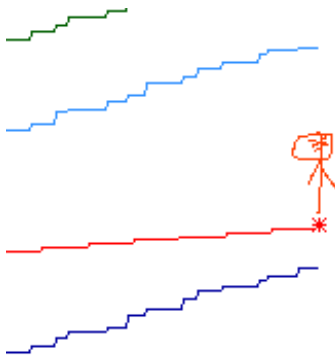
Problem 1. At the origin (extreme left), the tile is too close to the minimum cover requirement. We want to lower the start depth by a few inches to be sure we are within the MIN/MAX envelop (the cyan and dark blue profiles).



Make this change by:

- 1) Move the slide/vertical marker to the extreme left of the graph (on the start point).
- 2) Click on **Change**. NOTE that the **Add** and **Change** buttons change to **Accept** and **Reject**.
- 3) Tap the “down arrow key” ten times. Each tap moves the point lower in the profile.
- 4) After the tenth tap on the down arrow, click **Accept**. You should have changed the depth of the start of the main from ~1.95 feet to ~2.44 feet. And, you have changed the slope from .1 to ~.11.

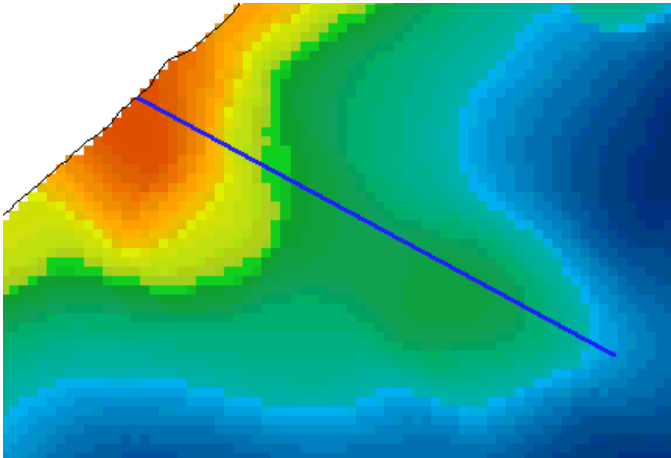
Problem 2. At the termination (extreme) right, the tile is deeper than it needs to be. We can raise it without exceeding slope requirements and the machinery will not have to work so hard.



Make this change by:

- 1) Move the slide/vertical marker to the extreme right of the graph (on the termination point).
- 2) Click on the **Change** button.
- 3) Tap the “up arrow key” about 30 times. (You can hold the key down to move continuously. You can hold the **Shift** key and the arrow key down to move much faster.)
- 4) After the thirtieth tap. Click the **Accept** button. You should have changed the termination depth to ~3.5 feet from an initial depth of ~ 6 feet. The slope has changed again to ~.15 %.

When you have completed these adjustments click **OK**. You are returned to the main TilePro display where the proposed run is shown in dark blue.



Note that the cursor is still locked at the termination point. (If you wanted to continue the run you could extend the line, left click and re-enter Tile Profile Edit.) Click the right mouse button to conclude the run.

Click on **Conclude Main**.

Attributes	
Pipe Length	1924.13 ft
Pipe Description :	10.0 in PVC
<input type="button" value="OK"/>	

At this point, you must supply an attribute for this feature in the tile set (the main). The attribute is “what pipe material?”, “what diameter?”. Click on the drop down to select the appropriate material and size. Click **OK** to accept. At this point the main has been drawn and is part of the Job.