

Technical Training and Certification Program



EFT

Terrace Design Tool



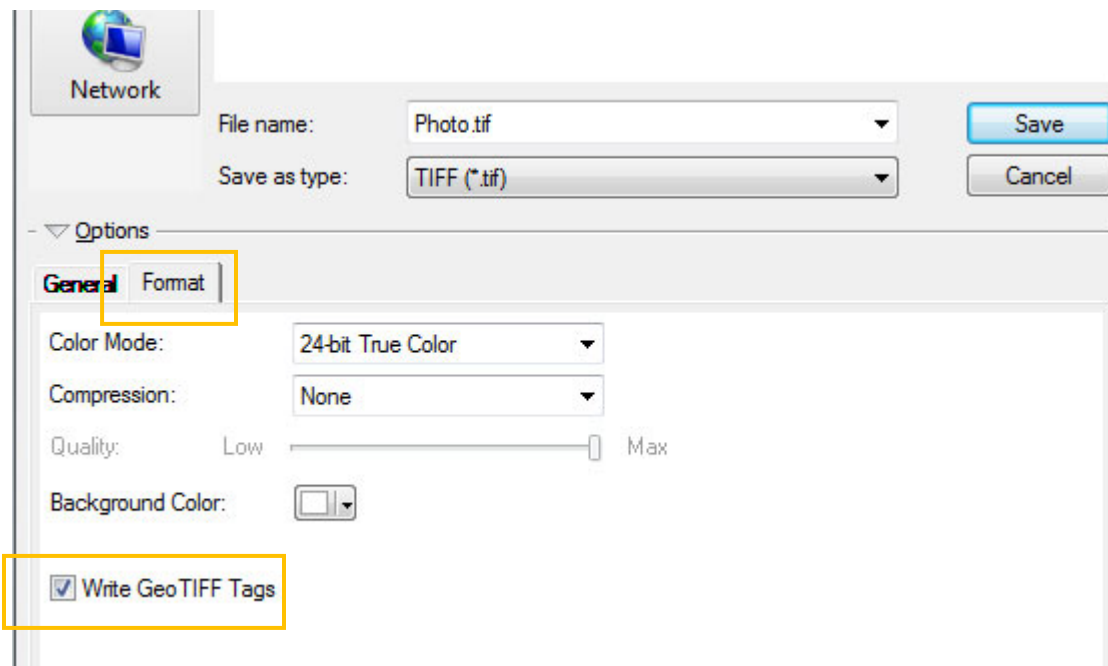
Workflow

Updated 11/15/21

Create Background Image

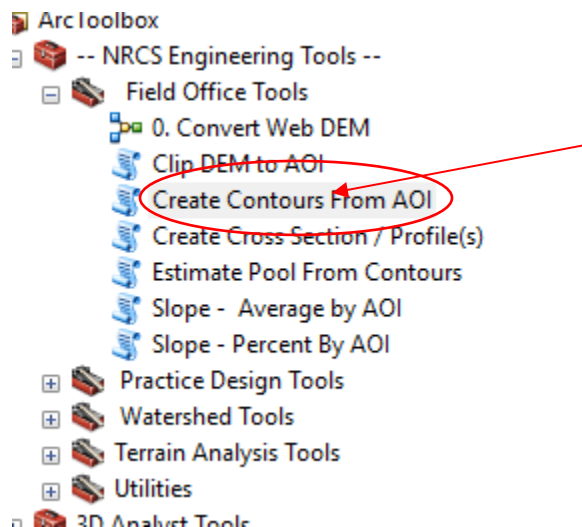
In ArcMap

- a. Zoom into the area that you would like to display as a background image (your entire screen's viewable extents will be exported, including any visible layers.)
- b. Click "File" menu – Export Map
- c. Specify Save Location
- d. Enter File Name
- e. Save as type: TIFF (*.tif)
- f. Under "Options":
 - i. Click the Format tab
 - ii. Select 'Write Geo TIFF Tags'
- g. Select Save



This reference guide covers the method for exporting a DEM from ArcMap for use in Engineering Field Tools. This ground surface can be used in preliminary planning of conservation practices including waterways, terraces as well as water and sediment control basins.

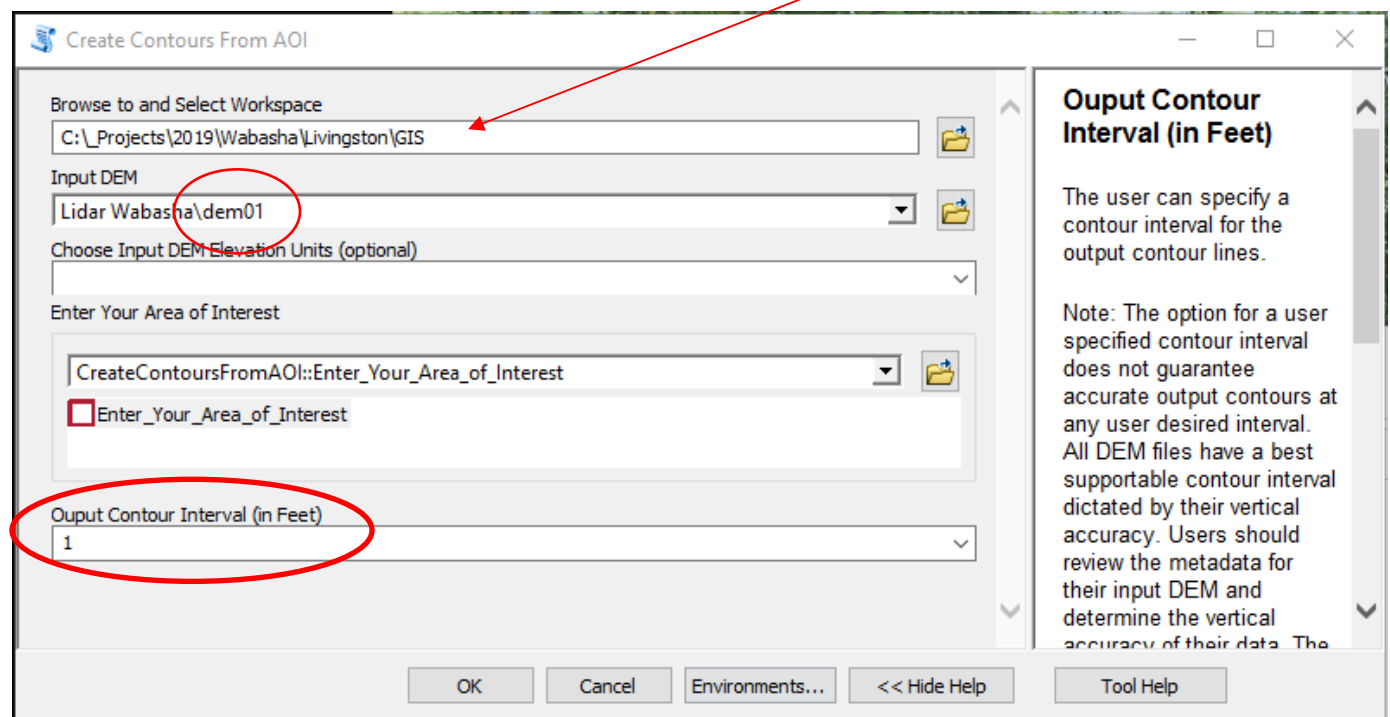
Creating a GIS DEM for EFT



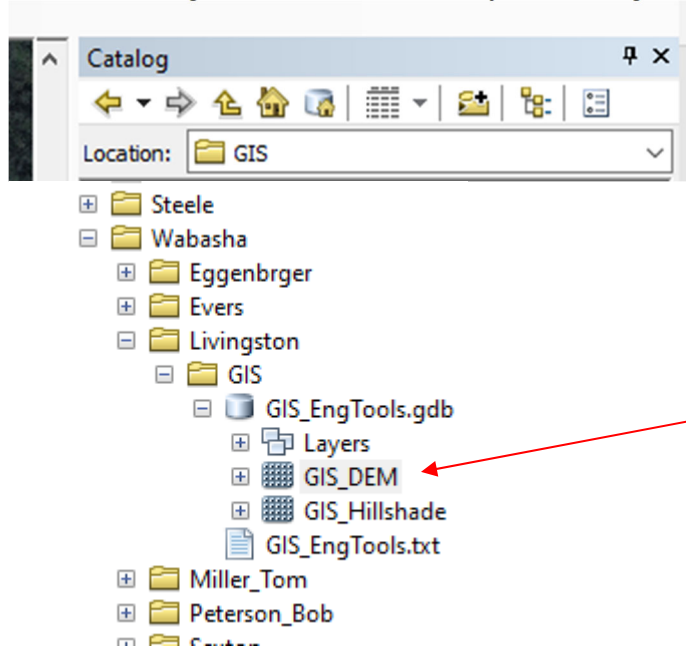
When in ArcMap access the NRCS Engineering Tools toolbox and double click on the Create Contours from AOI.

Below is a screenshot with the information completed to complete the tool. ****Pay special attention to the red circled areas. Note: **Use a 1m DEM** for the Input DEM.

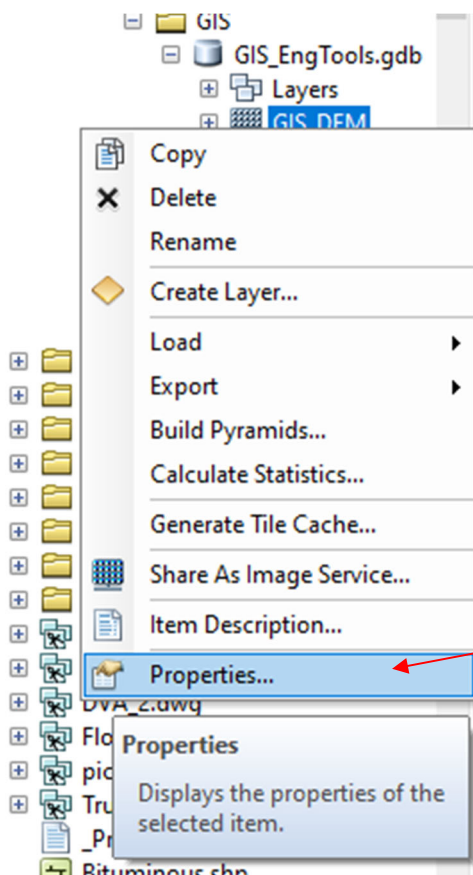
Folder to save files



In ArcCatalog, browse to the newly created geodatabase:



This tool creates a GIS_DEM that may need to have some adjustments done for units.



Right click on the GIS_DEM and select properties.

Scroll down in the resulting dialogue box on the **General** tab. Left click the Edit button in the **Spatial Reference** row.

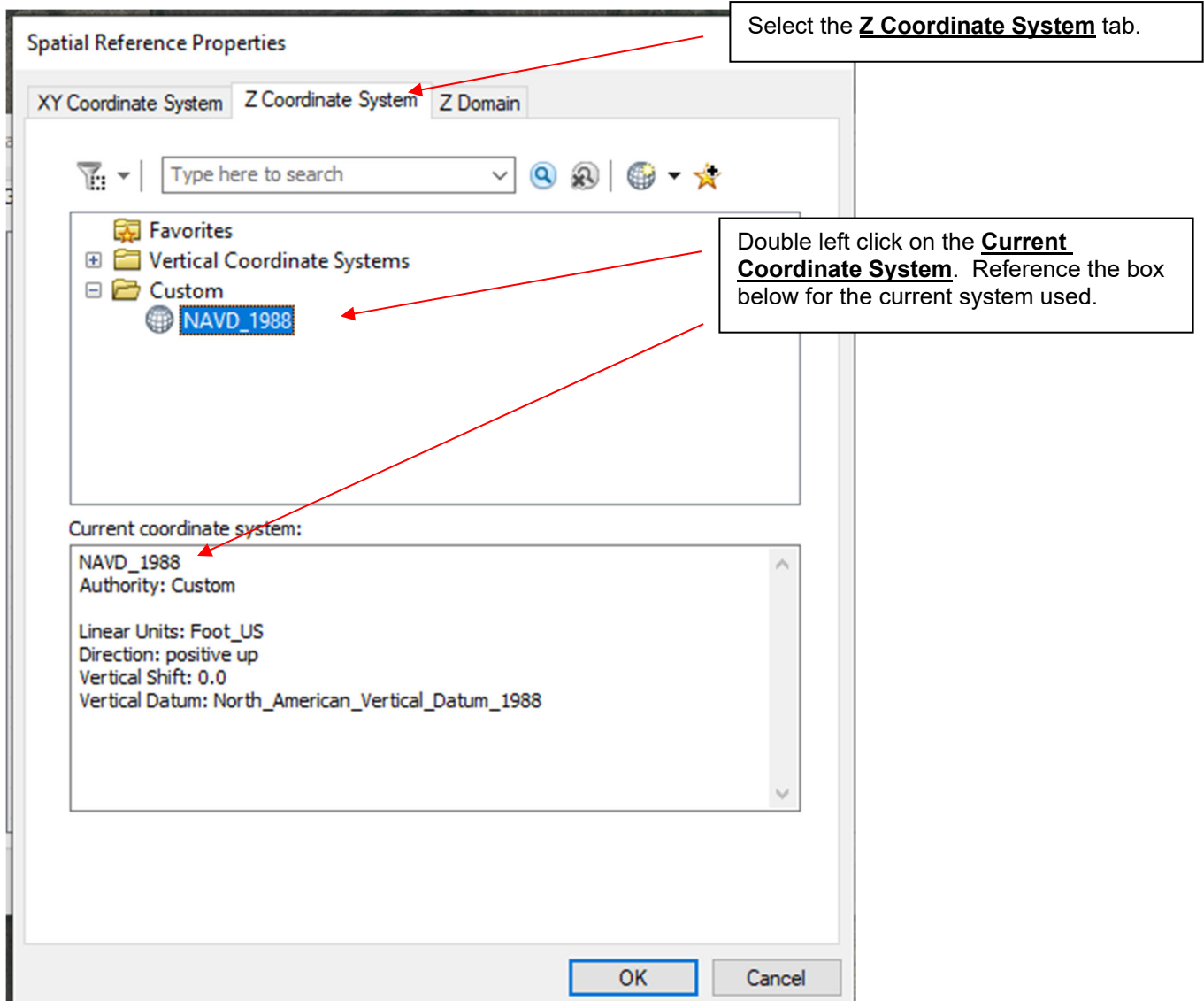
Raster Dataset Properties

General Key Metadata

Property	Value
Left	555753.732276
Right	556366.732276
Bottom	4895930.23583
Spatial Reference	Edit...
XY Coordinate System	NAD_1983_UTM_Zone_15N
Linear Unit	Meter (1.000000)
Angular Unit	Degree (0.0174532925199433)
False_Easting	500000
False_Northing	0
Central_Meridian	-93
Scale_Factor	0.9996
Latitude_Of_Origin	0
Datum	D_North_American_1983
Vertical Coordinate S...	NAVD_1988
Linear Unit	Foot_US (0.304801)
Vertical_Shift	0
Direction	positive up
Datum	North_American_Vertical_Datum_1988

OK Cancel Apply

Check Vertical Coordinate System. This needs to say **Meters**. If not, complete next two steps.



Vertical Coordinate System Properties

General

Name: NAVD_1988

Datum

☒ Geoid-based

Name: North_American_Vertical_Datum_1988

☐ Spheroid/Ellipsoid-based

Name: 1_Ceres_2015

Spheroid

Name: 1_Ceres_2015

Semimajor Axis: 470000

☒ Semiminor Axis: 470000

☐ Inverse Flattening: 0

Linear Unit

Name: Foot_US

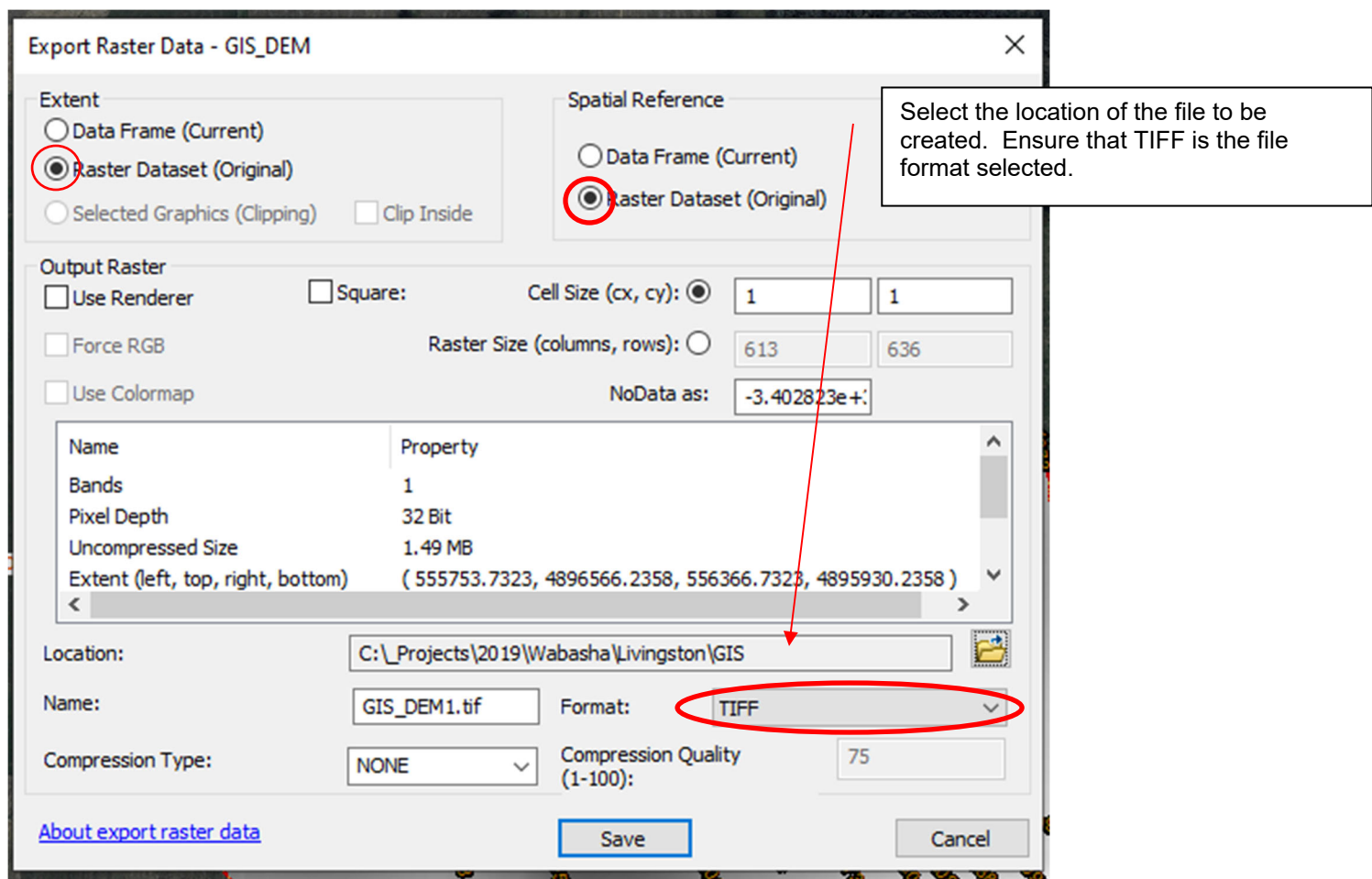
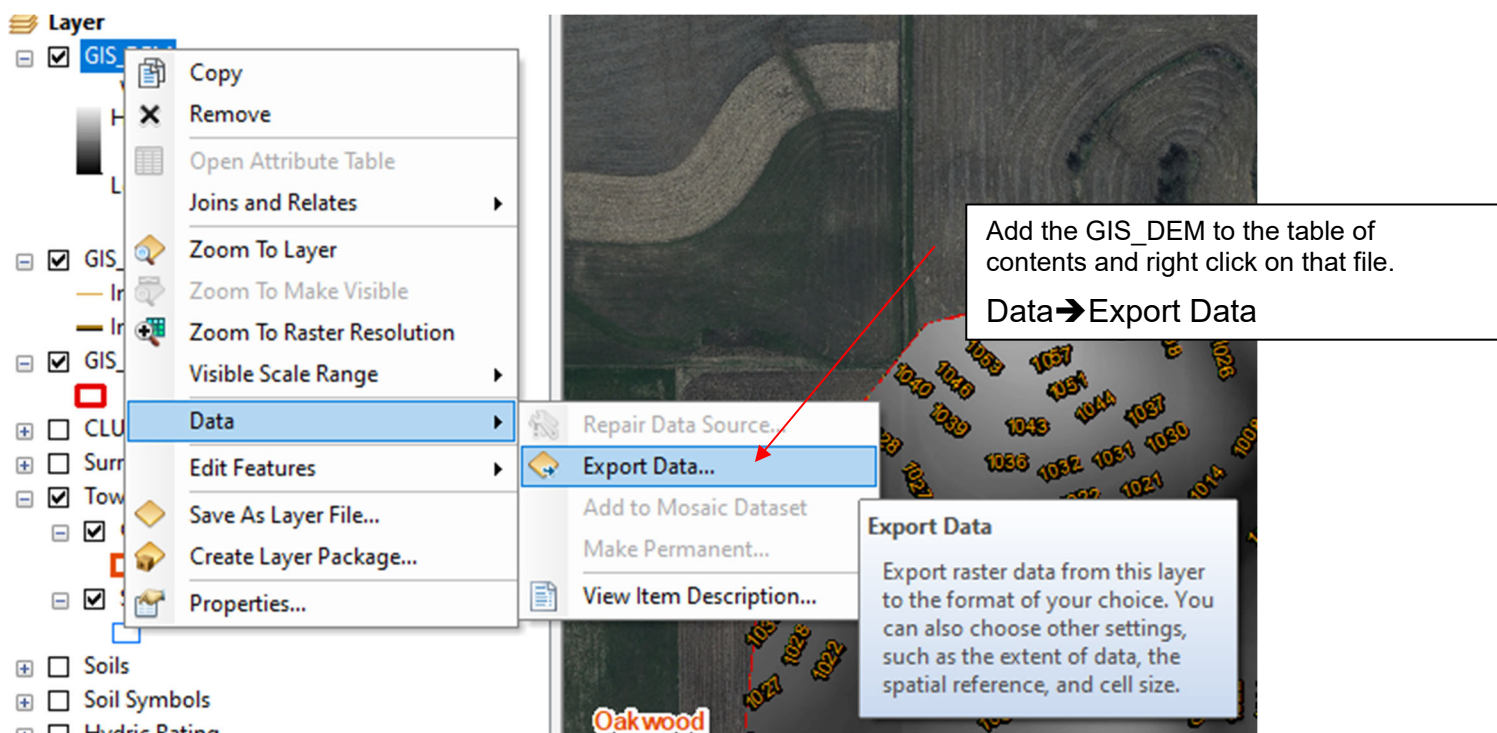
Meters per unit:

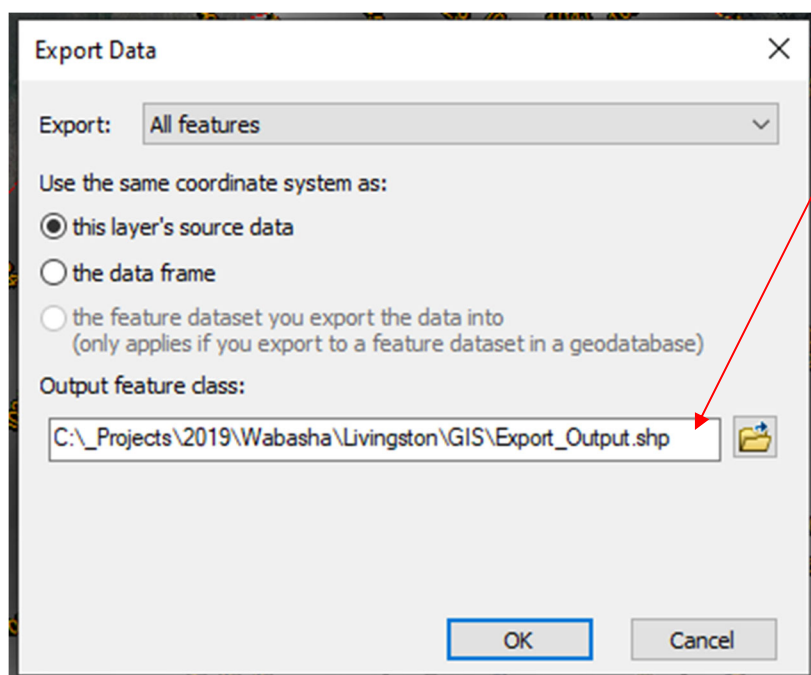
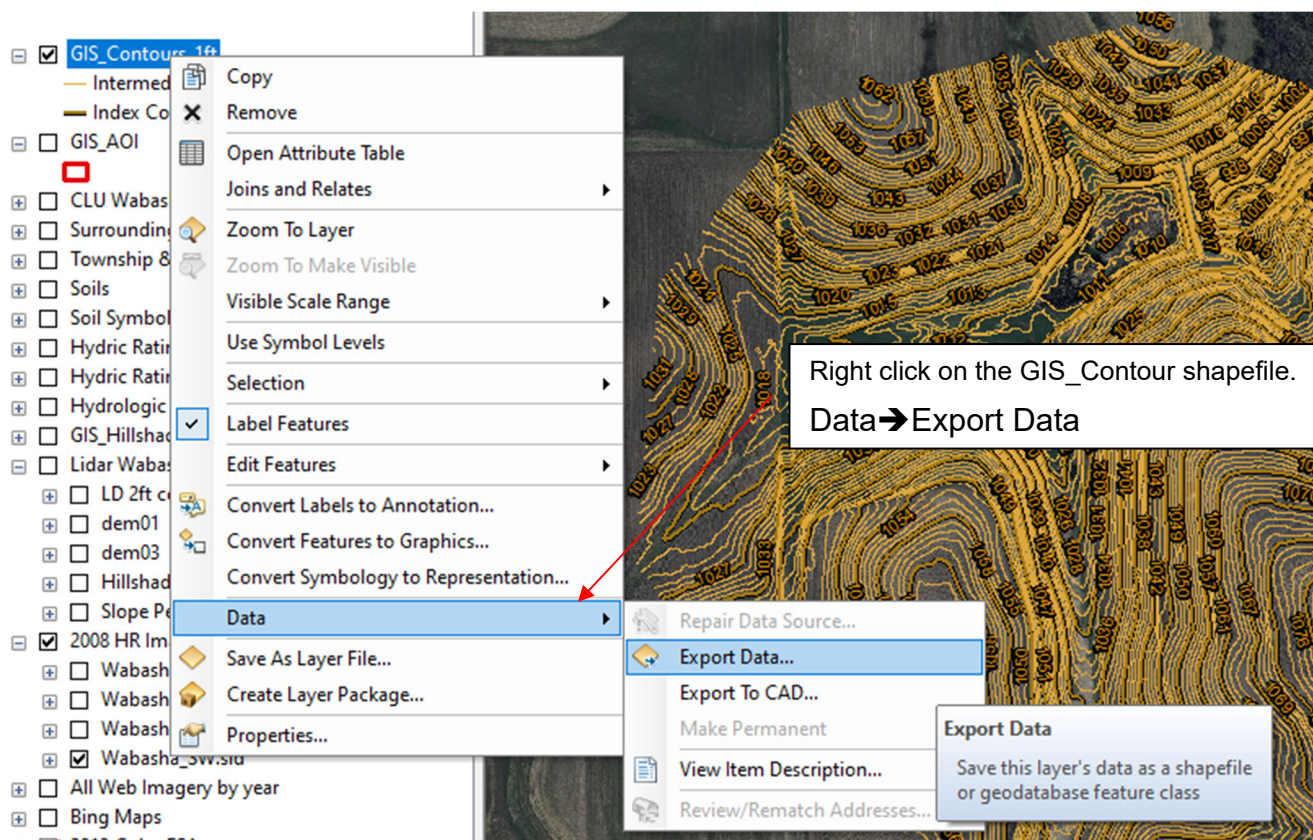
Parameters

Parameter	Value
Vertical_Shift	Link_Benoit_1895_A
Direction	Link_Benoit_1895_B
	Link_Clarke
	Link_Sears
	Link_Sears_1922_Truncated
	Link_US
	Meter
	Meter_German
	Micrometer
	Mile_US
	Millimeter
	Nanometer
	Nautical_Mile
	Nautical_Mile_US

Apply

This Linear Unit may need to be changed to Meters. ****If this unit is already meters nothing needs to be completed at this level.

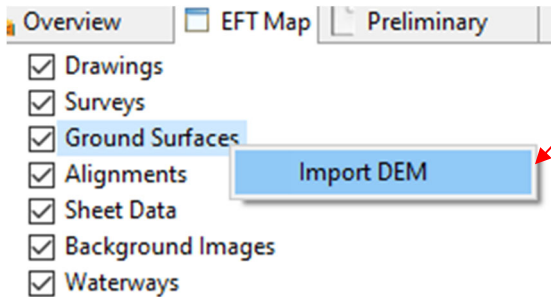




Choose the location to place the resulting .shp file.

Importing DEM into Engineering Field Tools

Create a new survey, terrace or waterway design in a selected customer/project folder.



Right click on Ground Surfaces.

Select **Import DEM**

Below is a screenshot of the window and fields completed for importing the DEM, Contour shapefile and imagery (if needed).

****Pay special attention to the red circled options.

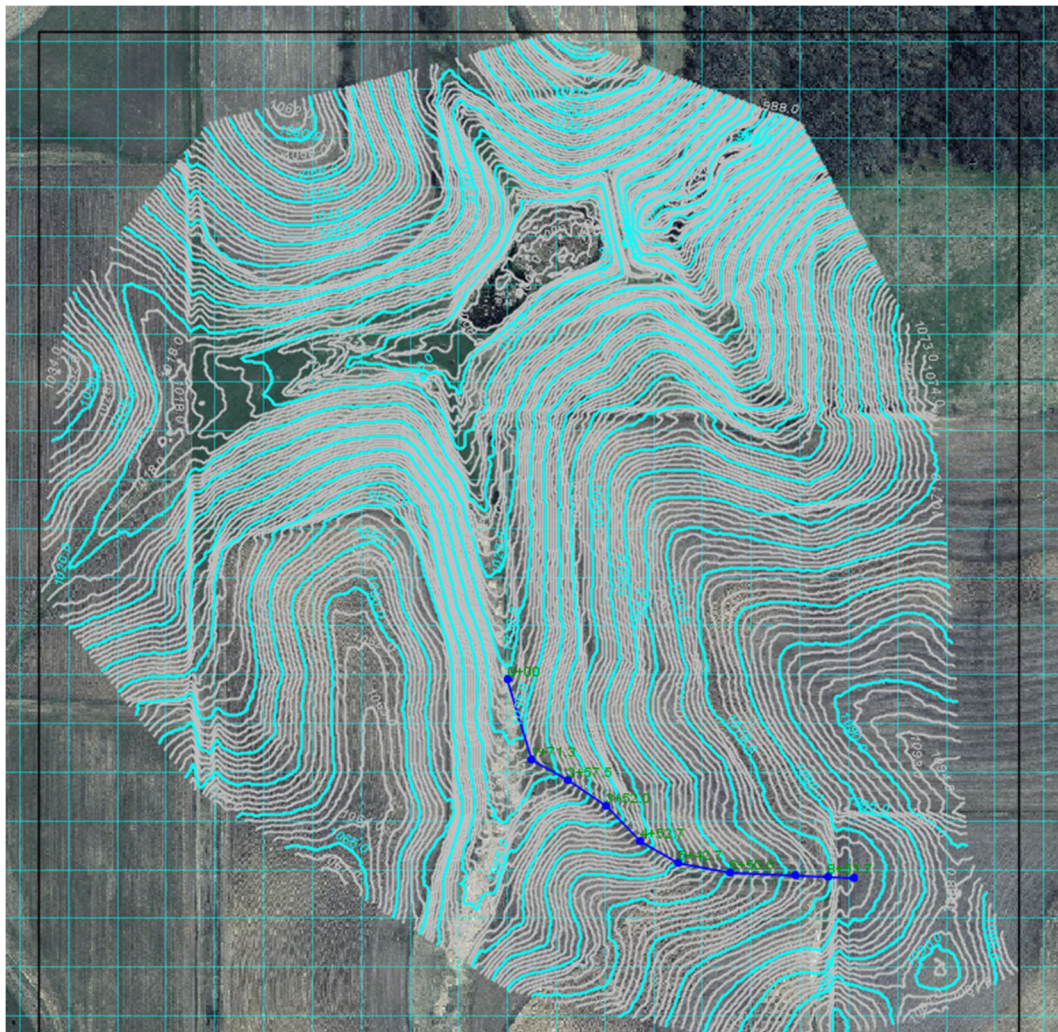
The 'Import DEM Data' dialog box is shown with the following fields and options:

- Title:** LiDAR
- DEM Data File:** C:_Projects\2019\Wabasha\Livingston\GIS\GIS_DEM1.tif
- Contours File:** C:_Projects\2019\Wabasha\Livingston\GIS\Export_Output.shp
- Unit Conversion (meters to):** feet
- Convert Z coords:** (checked)
- Image Files:**
 - Layer Title:** Wabasha
 - Image File:** C:_Projects\2019\Wabasha\Livingston\GIS\Wabasha_Te
 - Transparent:** (slider bar)
 - Opaque:** (checkbox)

Red circles highlight the 'Copy' dropdown menus for the DEM Data File, Contours File, and Image File. A red oval highlights the note at the bottom of the dialog box.

Note: In order to include these files in the zipfile produced with 'Export Customer to Zipfile', you need to choose one of the 'Copy' or 'Move' methods of import. The files will then be copied/moved to the Customer directory, and can be shared among design files.

OK Cancel

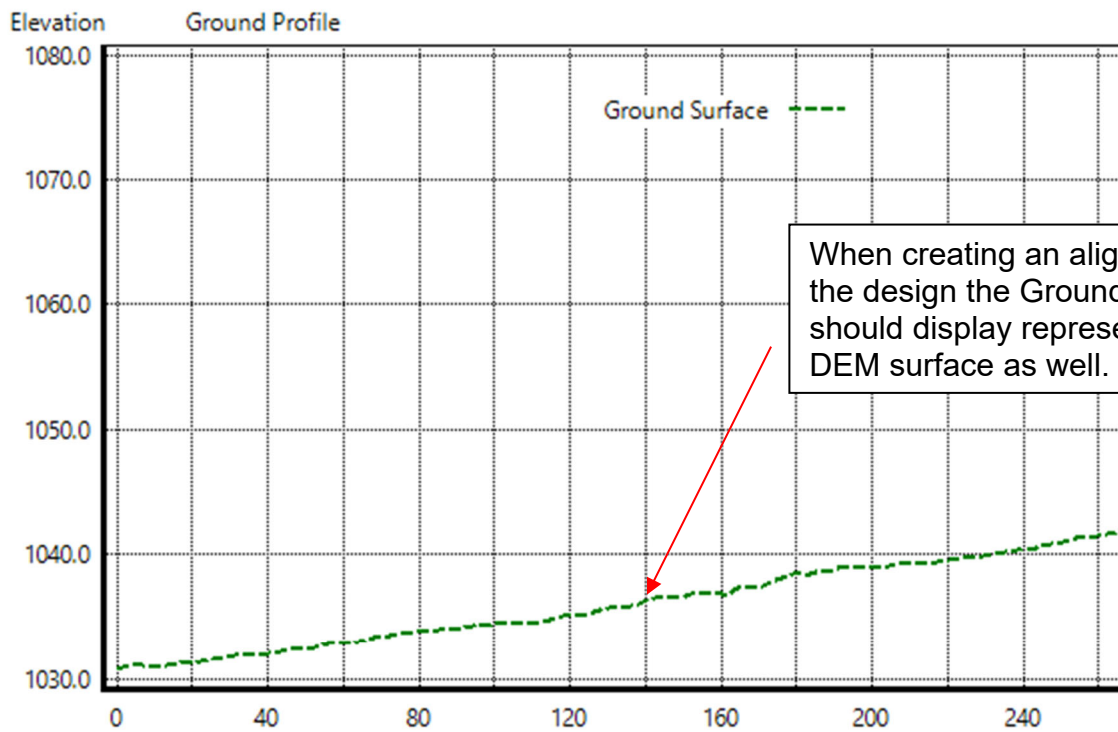


If done correctly, when the cursor hovers over the DEM/Contour Area, the elevation should be displayed in US Survey Feet.

US Survey feet
UTM_15N

X (Easting): 1,823,938.07 Y (Northing): 16,063,298.48
Elev. from DEM LiDAR

Z (Elevation): 1,059.61



Map Edit Operations



Sketch Alignment



Insert Station



Move Points

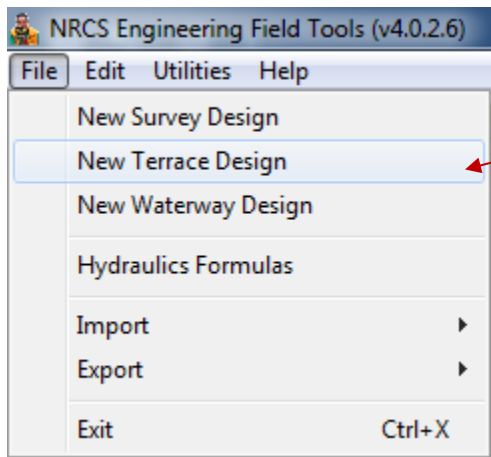


Apply Curves

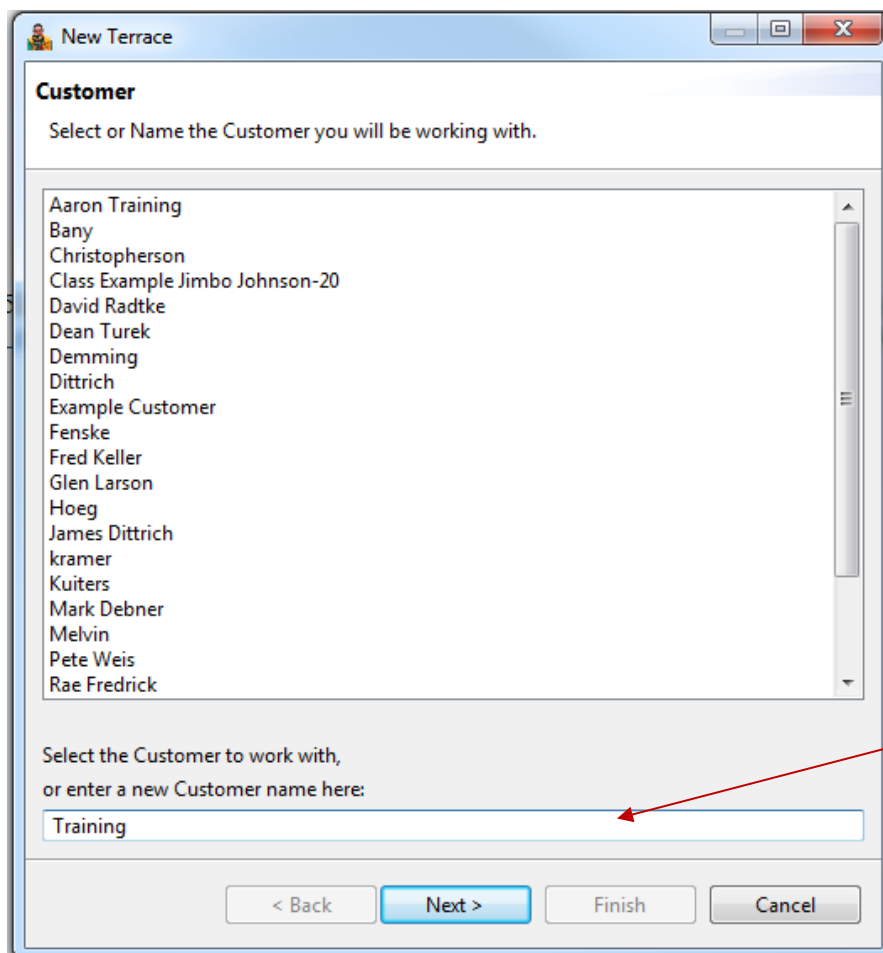
▼ Alignment Data

This reference guide covers the design of a simple water and sediment control basin using the Engineering Field Tools program as provided by the Natural Resources Conservation Service.

Creating a New Design



Under the File menu Select "New Terrace Design"



Create a new customer or select an existing customer (Landowner)

New Terrace

Project

Select or Name the Project you will be working with.

Select the Project to work with,
or enter a new Project name here:

SE Minnesota

< Back

Next >

Finish

Cancel

Select a project from the list to work with if you have an existing customer or create a new project. Ex: Location (Township/Section)

New Terrace

TerraceDesign

Enter a new name for the Design you will be working with.

Enter a new TerraceDesign name below.
The above list entries already exist, and cannot be used.

Example

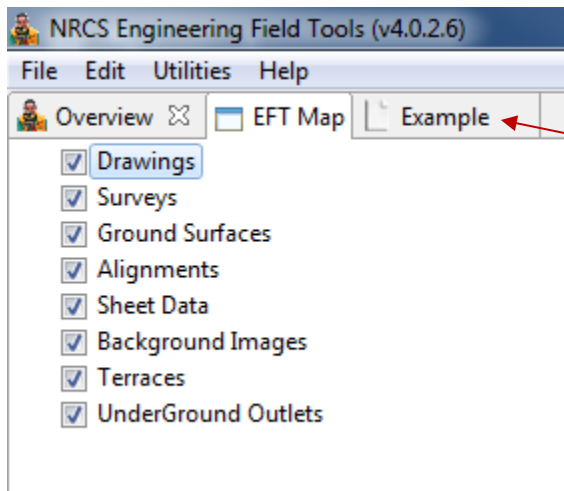
< Back

Next >

Finish

Cancel

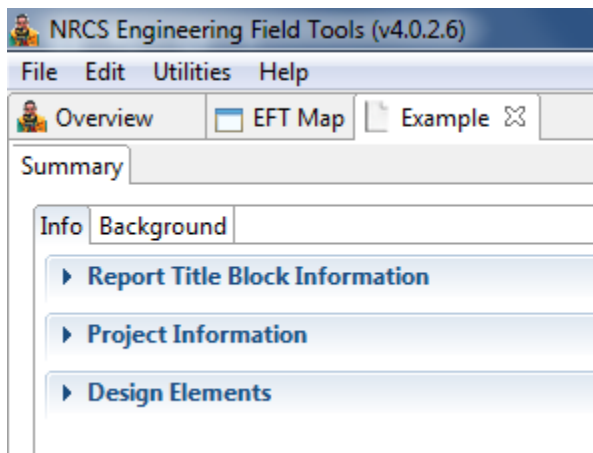
Enter the name of the design.
(Type: Basin/Waterway)



You will now have three tabs located near the top of the page.

Overview
EFT Map
Example (Project Name)

Highlight the project name to begin the design.



The project tab will have a Summary tab that includes an Info tab and Background Tab. (Expand both of these tabs to see the input information)

Info

Report Title Block Information – Project name, designed, drawn, checked, approved, applicable dates, location of project

Project Information – Description of the project, benchmark description and elevation

Design Elements – *The majority of the work will be done here.*
Surveys, Alignments, Terrace, UGO, Forms

Background

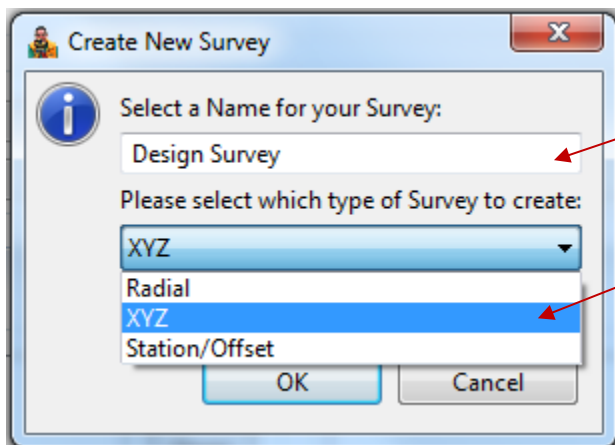
Landowner Preferences – Equipment width, Crops, Tillage, type of structure, type of outlet

Site Characteristics – Soils, Soil loss, Landscape Characteristics, Assumptions

Importing a Survey



Under the Survey Window select New.

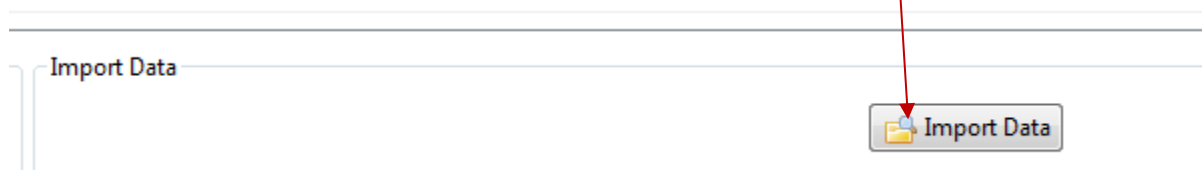


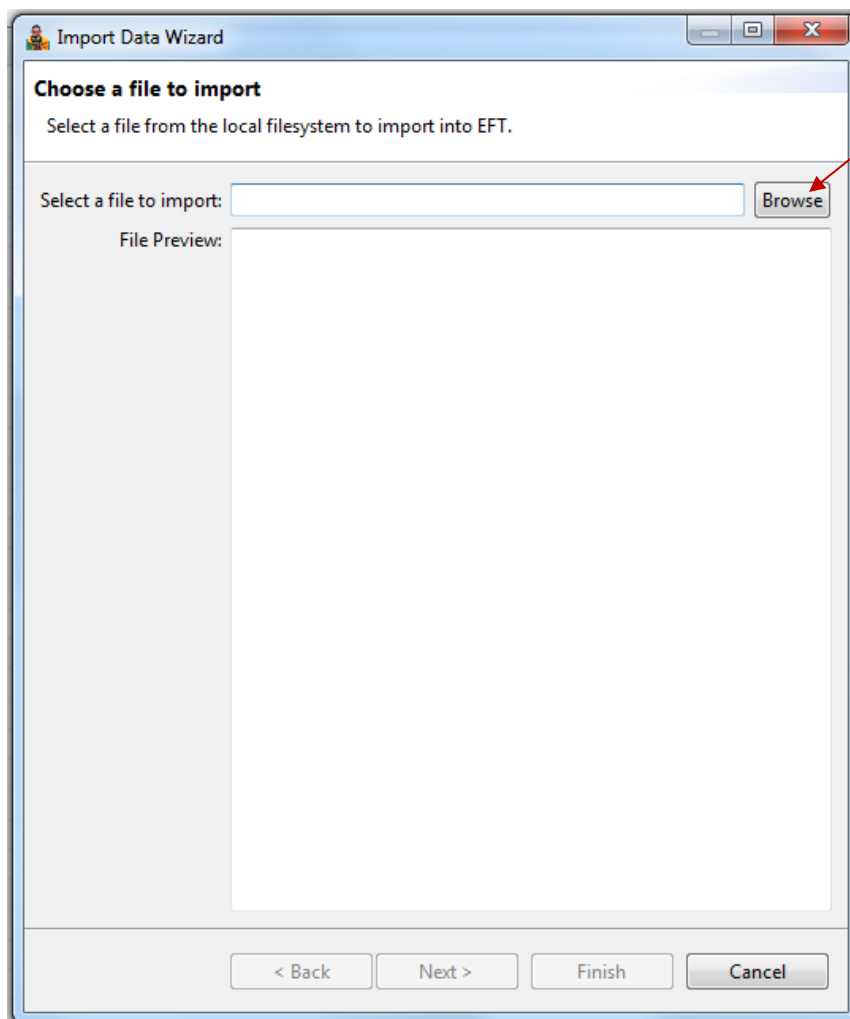
-Name the survey that you would like to import.

-Make sure that the XYZ option is selected to import **electronic survey points**

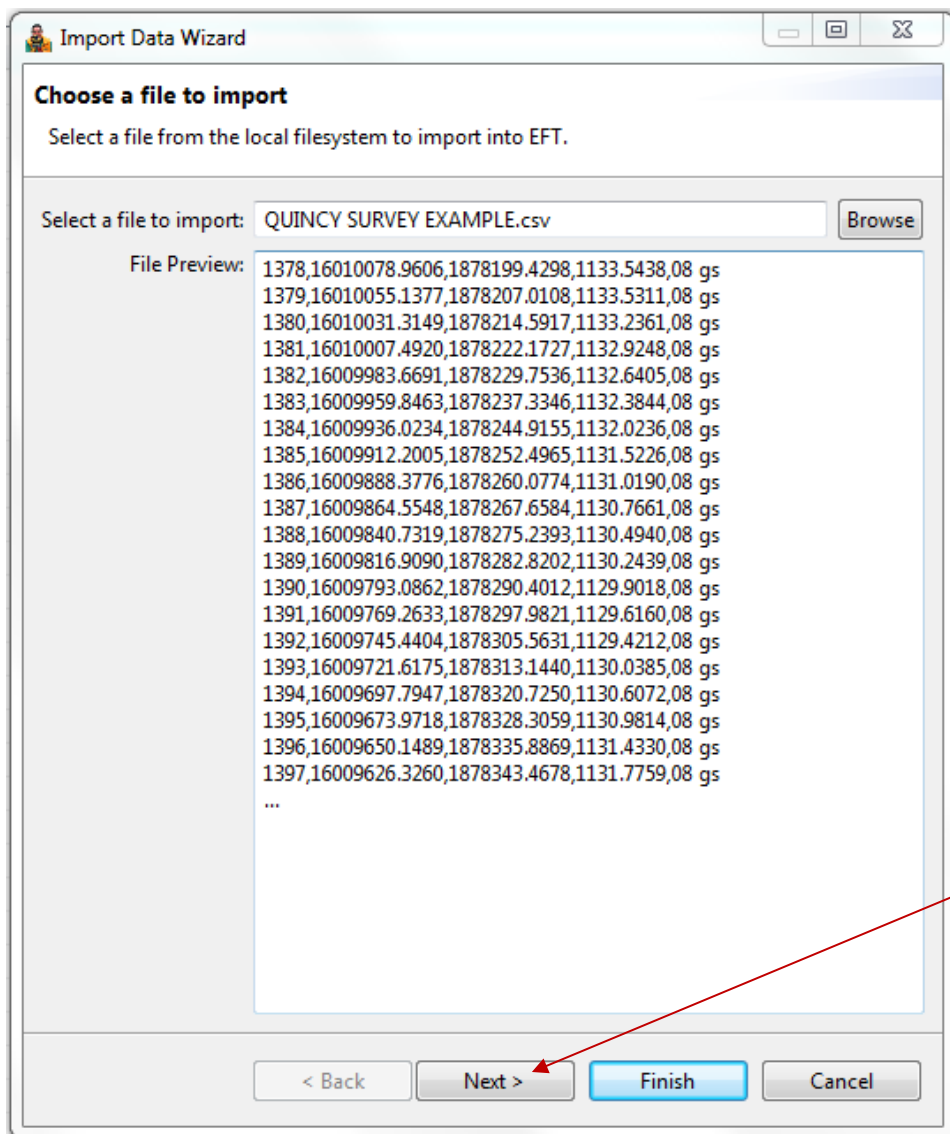
-Click OK

Select "Import Data"





Click Browse to locate .csv file from desired folder.
(make sure that the file type is set to .csv)



The file preview will show an example of the points that you are importing. This is *just an example* and not the full list of points

-Click Next

Import Data Wizard

Select a conversion format

Select a conversion format for your imported file.

Choose the format of the imported file:

PNEZD: Point Name, NORTHING, EASTING, Elevation, Description
 EN: EASTING, NORTHING
 END: EASTING, NORTHING, Description
 ENZ: EASTING, NORTHING, Elevation
 ENZD: EASTING, NORTHING, Elevation, Description
 Garmin DNR: Type, Point, Lat., Long., Northing, Easting, Desc.
 Garmin DNR: Type, Point, Lat., Long., Northing, Easting, Desc., Elev.
 NE: NORTHING, EASTING
 NED: NORTHING, EASTING, Description
 NEZ: NORTHING, EASTING, Elevation
 NEZD: NORTHING, EASTING, Elevation, Description
 PEN: Point Name, EASTING, NORTHING
 PEND: Point Name, EASTING, NORTHING, Description
 PENZ: Point Name, EASTING, NORTHING, Elevation
 PENZD: Point Name, EASTING, NORTHING, Elevation, Description
 PENZVD: Point Name, EASTING, NORTHING, Elevation, Visibility, TINability, Description
 PNE: Point Name, NORTHING, EASTING
 PNED: Point Name, NORTHING, EASTING, Description
 PNEZ: Point Name, NORTHING, EASTING, Elevation
PNEZD: Point Name, NORTHING, EASTING, Elevation, Description
 PNEZVD: Point Name, NORTHING, EASTING, Elevation, Visibility, TINability, Description
 PZEN: Point Name, Elevation, EASTING, NORTHING
 PZNE: Point Name, Elevation, NORTHING, EASTING
 Trimble PENZ: Point Name, EASTING, NORTHING, Elevation
 Trimble PNEZ: Point Name, NORTHING, EASTING, Elevation

Unit Conversion (meters to feet) No conversion

< Back Next > **Finish** Cancel

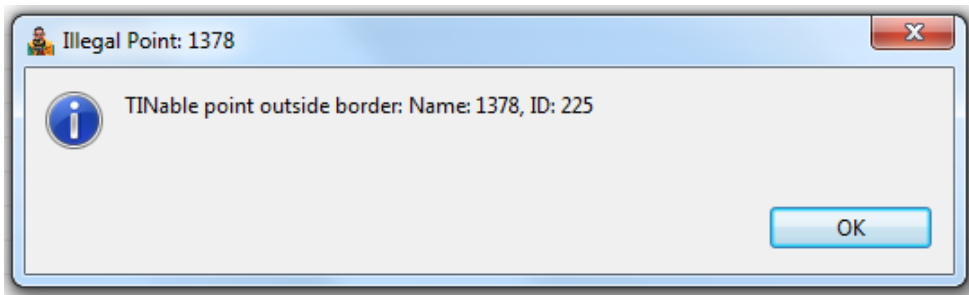
Select a conversion format. You should be selecting **"PNEZD"** as this is the standard format used with most of the electronic survey equipment. (this can be preset in the preferences)
 -***No conversion
 -Click "Finish"

Name	X (Easting)	Y (Northing)	Z (Elevation)	Visible	Tinable	Description
1378	1878199.430	16010078.961	1133.544	✓	✓	08 gs
1379	1878207.011	16010055.138	1133.531	✓	✓	08 gs
1380	1878214.592	16010031.315	1133.236	✓	✓	08 gs
1381	1878222.173	16010007.492	1132.925	✓	✓	08 gs
1382	1878229.754	16009983.669	1132.641	✓	✓	08 gs
1383	1878237.235	16009959.846	1132.384	✓	✓	08 gs

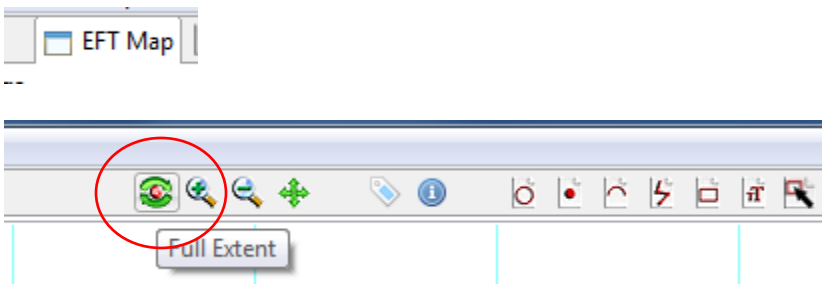
Points will be added to the list in the survey. There are options to make each point visible and tinable. All points that would be included in a surface should be tinable. Benchmarks and survey points on pipes, walls or other structures that do not represent the landscape should **not be** tinable.

Accept Edit **Cancel Edit**

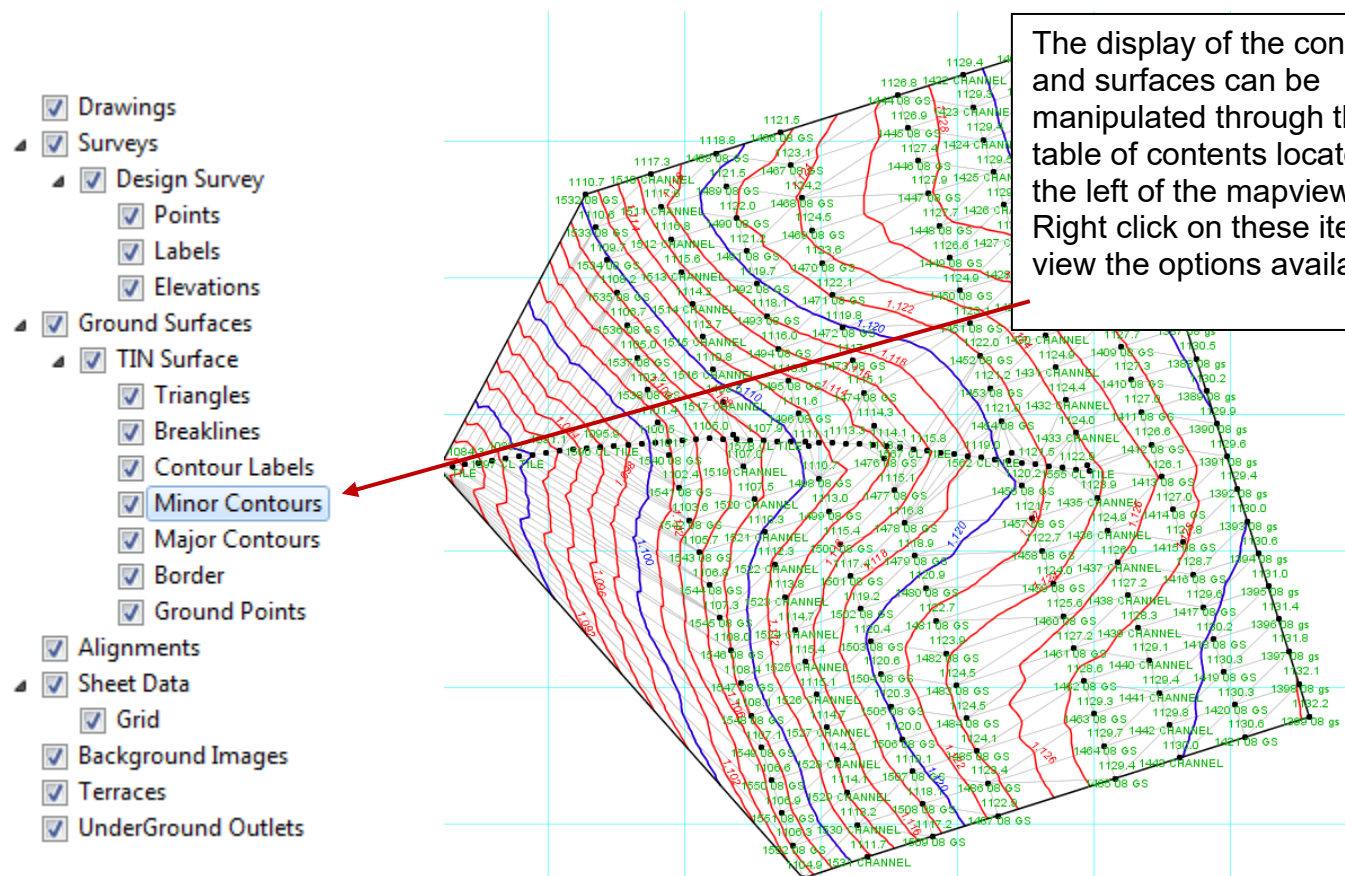
Select Accept Edit to confirm and close this window.



You may see this warning box indicating that certain points are outside the border. Click **OK** and go back into the survey and find the name of the point (1378) and uncheck the Tinable box for that point. At times there has been more than one point to be modified.

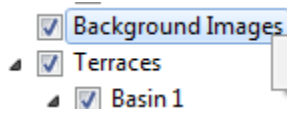


Go to the EFT Map tab. This is where your survey should show up. You will have to click the full extent button to zoom to the surveyed area.



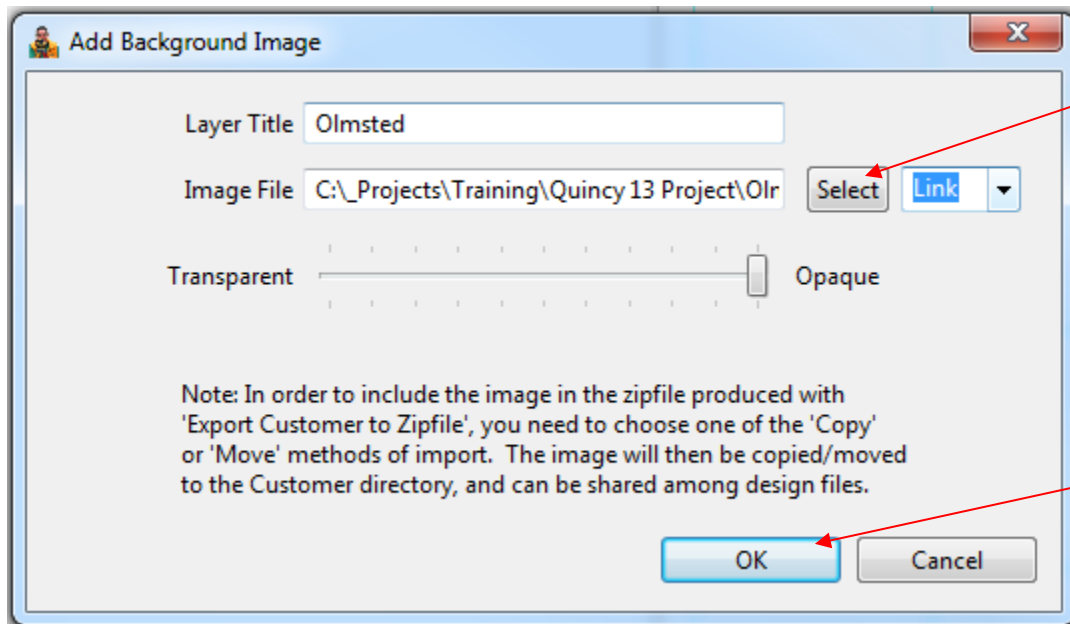
The display of the contours and surfaces can be manipulated through the table of contents located to the left of the mapview. Right click on these items to view the options available.

Adding an image to the map



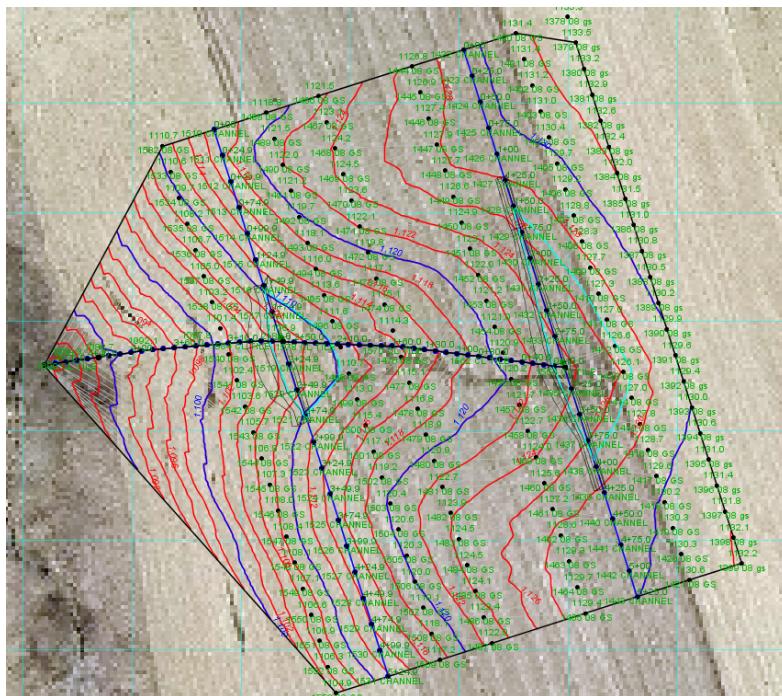
Add Background Image

Right Click on Background Images.



Browse to image file. May need to change file type to view needed file.

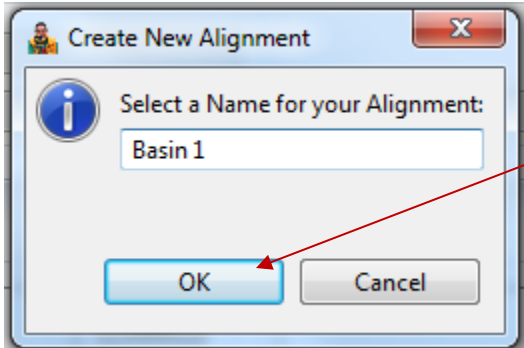
Select OK



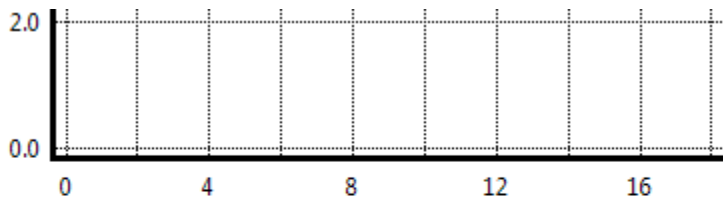


After the survey has been imported Alignments will need to be created. These are the channel alignments for the basins and tile.

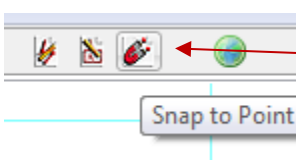
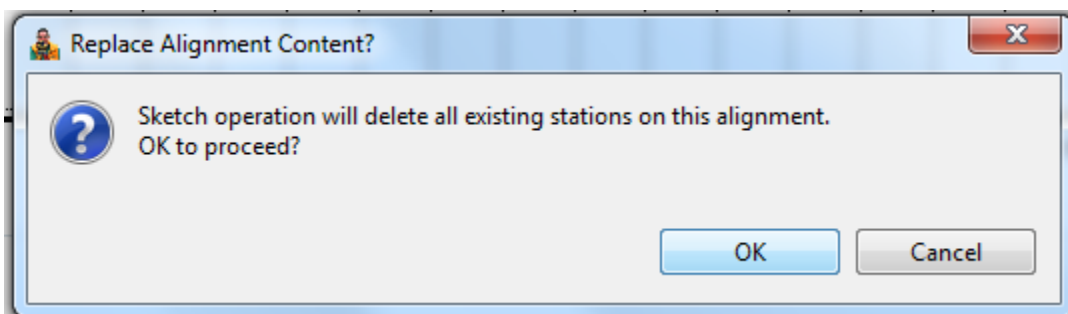
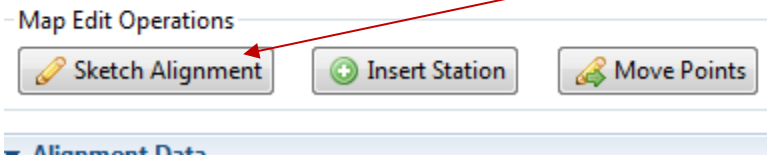
-Select New



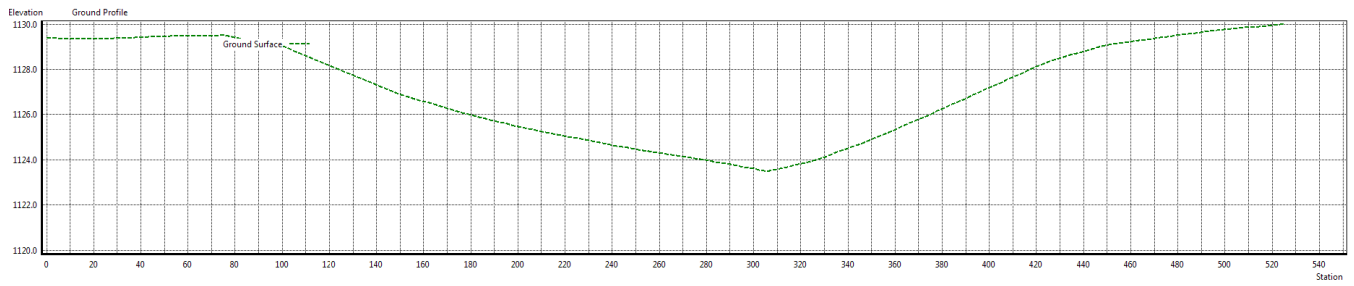
Name the alignment and click **OK**.



Click **Sketch Alignment**
-a window appears reminding the user that this operation will overwrite any existing alignment that has been created. Click **OK**



Selecting "Snap to Point" will allow you to create an alignment exactly where you surveyed the channel.



Map Edit Operations

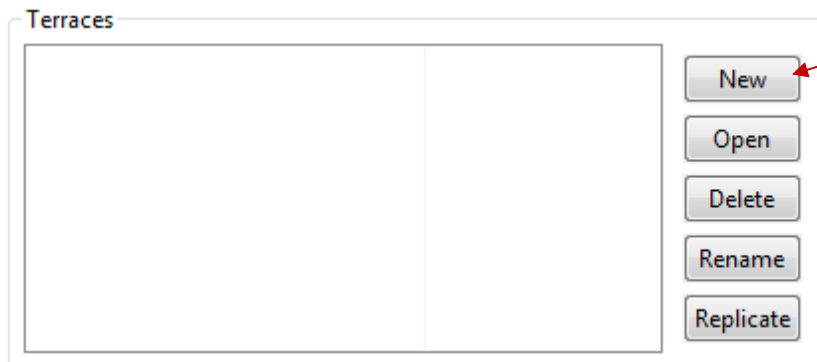
A profile of the existing ground surface will be generated from the alignment that is drawn by “snapping” to the channel’s surveyed points.

***If there are corners in the alignment, it is suggested to click Apply Curves for the alignment. This aids in the drawing of the embankment surface.**

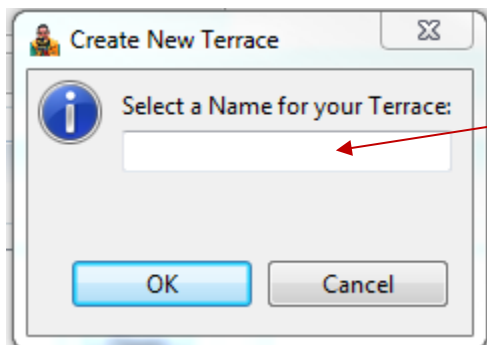


Select “Accept Edit” when completed.

Design a WASCOB

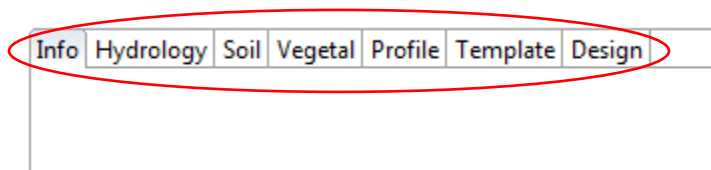


Select “New” to create a new terrace design.



Name the new terrace/basin and select “OK”. (Eg. Basin 1)

Info tab



The design will open with multiple tabs.

The Info tab requires us to choose an alignment from the menu.

Select "Set Terrace Benchmark" to be able to fill out an Elevation and Description of the location.

Hydrology tab

This is self explanatory but make sure the Drainage Area is filled out in acres, the Precipitation in inches and a Curve Number is defined. The watershed length and slope can be documented but are not needed for determining the runoff volume (these affect channel velocities in PS 600 Terrace design). Ensure that the correct sedimentation rate is chosen. Lastly make sure that the Caldwell Method is the Flood Routing Model selected and start the first design with a Flood Duration of 24 hours (recommended). **The flood duration can be adjusted by the hour if the MN Preferences were set prior to beginning the project.

Drained Area (ac)	1.90	
Runoff Model: EFH2 Hydrology		Model Outputs
Precipitation (in)	4.50	
Storm Type	MSE3	
Curve Number	74	
Watershed Length (ft)	1000.0	
Watershed Slope (%)	3.0000	
Design Life (yr)		Model Outputs
Erosion Model:	Simple Erosion	
Erosion Rate (T/ac-yr)	5.00	
Trap Efficiency	0.900	
Sediment Density (T/cy)	1.00	
Flood Routing Model		Model Outputs
Flood Routing Model	Caldwell Method	
Flood Duration (hr)	24.0	
Run Simulation Models	Select Run Simulation Models to calculate the runoff storage volumes.	Runoff Storage (cu ft): 8551.79 Equiv. runoff depth (in): 1.24 Required Discharge (cfs): 0.16

Soils Tab

The erodibility class has to be chosen based on the soil type classification from the soil survey. This is intended to determine the tractive stress properties of the soils in the channel. Below is a decision tree for deciding which erodibility class one should use for their respective soils which is derived from the MN Engineering Field Handbook Part 650 Chapter 7 (MN 7-13.8)

https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_021665.pdf

Info
Hydrology
Soil
Vegetal
Profile
Template
Design

☐ Direct entry

Allowable Stress (lb/sq.ft)
0.030

☒ Erodibility class

Erodibility
ERODIBLE

Erodibility	Allowable Stress	Soil Type
Easily Eroded	0.020	Weak/sandy materials
Erodible	0.030	CL with plasticity on order of 10
Erosion Resistant	0.050	CL with plasticity on order of 15
Very Erosion Resistant	0.070	Slightly < maximum base value CL and SC material

☐ Soil parameters

Soil Type
CL

Plasticity Index
0.00

Soil Grain Roughness
0.0156

Void Ratio (optional)
0.00

d75 (in)
0.000

Decision Tree

If the soil textural class is	And the reference PI is	the erodibility class is
CL	Any value	Erosion resistant (ER)
CH	Any value	Very erosion resistant (VER)
CL-ML	PI <= 16	Erodible (E)
CL-ML	PI > 16	Erosion resistant (ER)
ML	PI < 5	Easily erodible (EE)
ML	5 <= PI < 19	Erodible (E)
ML	PI >= 19	Erosion resistant (ER)
MH (elastic silts)	PI <= 15	Erodible (E)
MH (elastic silts)	PI > 15	Erosion resistant (ER)
SC, SC-SM, SM	PI < 5	Easily Erodible (EE)
SC, SC-SM, SM	PI > =5	Erodible (E)
SP, SP-SM, PT, organics	Any value (typically PI < 5)	Easily erodible (EE)

Vegetal Tab

This tab defines the vegetation that is to be used in the channel of the basin/terrace. In most cases there is not any vegetation in the channel. For this reason the Mannings n values for both Stability and Capacity should be set to 0.035, the value for bare earth. The vegetal cover should be set to None (bare, 0.0) indicating there is no vegetation.

Info	Hydrology	Soil	Vegetal	Profile	Template	Design
------	-----------	------	---------	---------	----------	--------

Stability Retardance

- ☒ Manning's n
- ☐ Retardance Curve Index
- ☐ Stem Length/Density Length (ft) Density (#/sq.ft)
- ☐ Retardance Class

Vegetal Cover

 (select or enter numeric value)

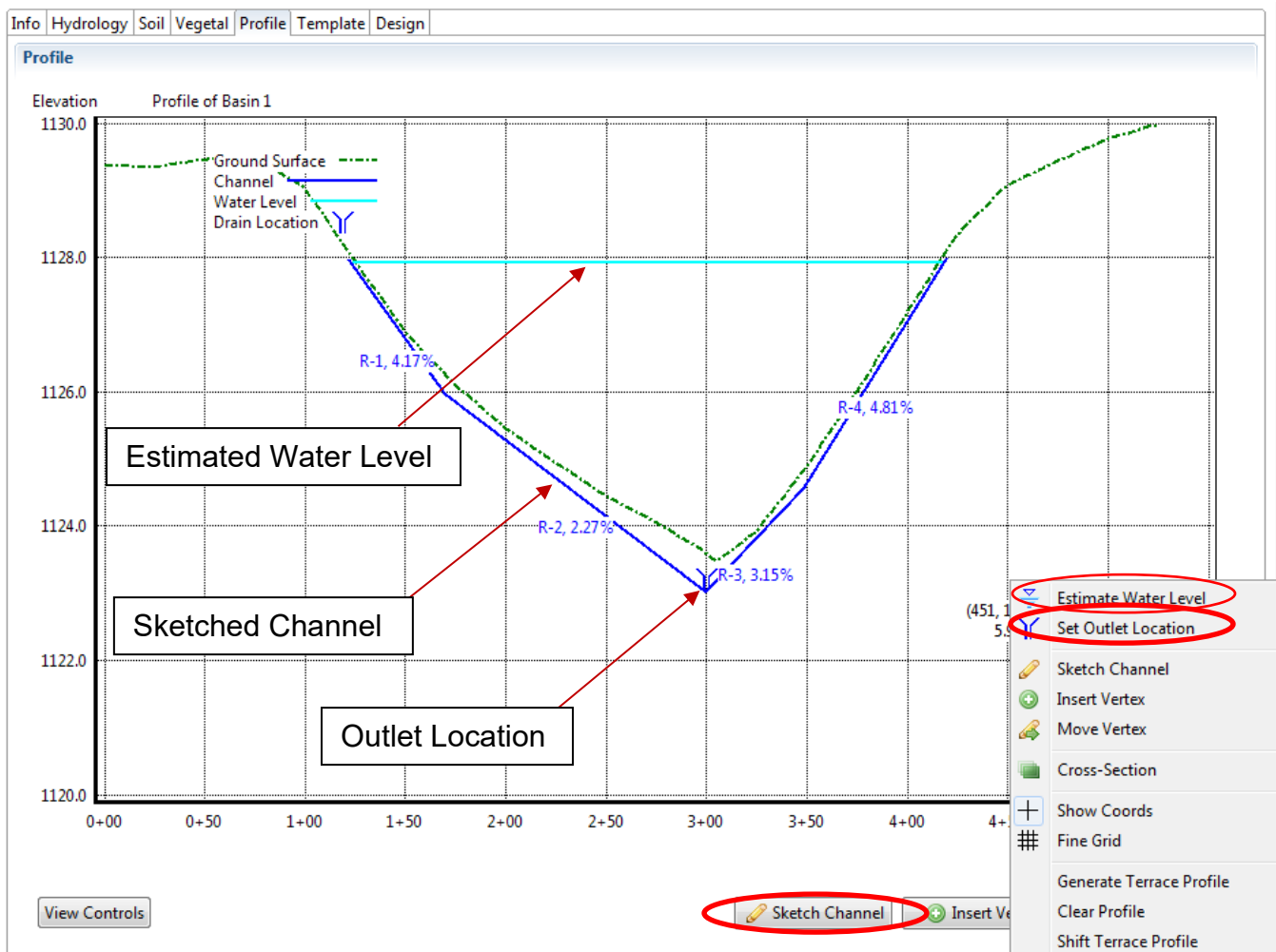
Capacity Retardance

- ☒ Manning's n
- ☐ Retardance Curve Index
- ☐ Stem Length/Density Length (ft) Density (#/sq.ft)
- ☐ Retardance Class

Profile Tab

This tab is where the planned channel grades will be determined. Follow the steps below to draft a final gradeline for the basin channel. Tip: When hovering on the profile view the station and elevation can be displayed by turning this option on from the **View Controls** button.

1. Select **Sketch Channel** to begin drawing final channel.
 - a. Pick an elevation along the ground line above what you estimate the height needed. ***Make sure the planned channel is slightly below the original ground.
2. Right click on the profile view and select **Set Outlet Location**. Then click on the profile at the location where you would like to place the intake (station and elevation). A window will appear where you can define the Drain, Drain Fraction, Offset and connect it to an underground outlet. ***You will not have an underground outlet to connect to as it has not been defined yet.
3. Right click on the profile view and select **Estimate Water Level**. Then click on the profile at the elevation which you would estimate the maximum water level for this structure. This aids in the initial design run of the structure.



Template Tab

This tab will define the cross section of the planned basin dimensions. Follow these steps to accurately define the desired dimensions for your project.

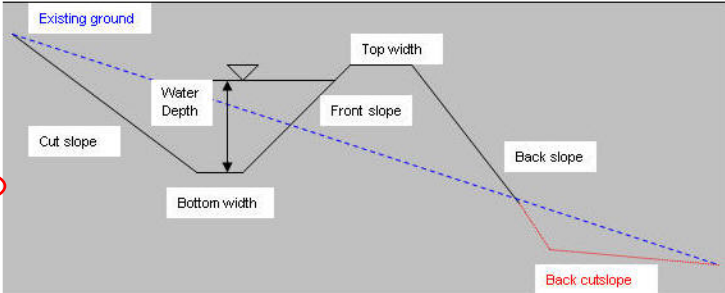
1. **Orientation:** Choose the direction of the cross-section. When looking along the channel alignment in a direction of increasing stations what direction is uphill from the flagline location. The **UPSTREAM_TOE** should be selected.
2. **Cross-Section Controls:** These options control the shape. **Select from DB** to choose narrow base, grassed-backed, or broadbase. The dimensions of each can be modified by double clicking on an item in the **Default Template**. Make sure you **Apply Defaults** if changes are made. **The **Front Height** refers to the minimum height to be built. This will have an effect on the ends of the basin.
3. **Optional Shape Controls:** These control the overfill amounts and reactions of the berm at the ends of the structures.

Info Hydrology Soil Vegetal Profile Template **Design**

Orientation

Uphill Direction
 Uphill is to ☒ Left ☐ Right
 when looking along the Alignment

Flag Line Location: **UPSTREAM_TOE**
 Offset from Alignment (ft): 0.0



Cross-Section Controls

Default Template

Name	Cut Slope	Front Slope	Back Slope	Btm. Width	Front Height	Top Width	
NarrowBase	5.00 : 1	3.00 : 1	2.00 : 1	2.00	1.00	3.00	<input type="button" value="Select from DB"/> <input type="button" value="Apply Defaults"/>

Vertex Templates

Station	Name	Cut Slope	Front Slope	Back Slope	Btm. Width	Front Height	Top Width	
1+22.2	NarrowBase	5.00 : 1	3.00 : 1	2.00 : 1	2.00	1.00	3.00	<input type="button" value="Select from DB"/> <input type="button" value="Copy"/> <input type="button" value="Paste"/> <input type="button" value="Slope Limits"/>
1+70.4	NarrowBase	5.00 : 1	3.00 : 1	2.00 : 1	2.00	1.00	3.00	
3+00.1	NarrowBase	5.00 : 1	3.00 : 1	2.00 : 1	2.00	1.00	3.00	
3+49.0	NarrowBase	5.00 : 1	3.00 : 1	2.00 : 1	2.00	1.00	3.00	
4+20.3	NarrowBase	5.00 : 1	3.00 : 1	2.00 : 1	2.00	1.00	3.00	

Optional Shape Controls

Overfill Mode: **PERCENT**
 Overfill Amount (%) 10.0
 Freeboard Mode: **NONE**
 Freeboard (ft) 0.0

Back Cut
☐ Enable back cut
 Minimum slope width (ft) 5.0
 Back Cut-Slope Grade (%) 1.0

Bank Start Slope
 Mode: **RATIO_BASED**
 Value (ft/ft) 1.0
 Limit (feet) 5.0
☒ Grade Channel/Bank at Start

Bank End Slope
 Mode: **RATIO_BASED**
 Value (ft/ft) 1.0
 Limit (feet) 5.0
☒ Grade Channel/Bank at End

Design Tab

This tab will run the design parameters against the hydrology requirements to develop a required height. Follow the steps below to complete the design.

1. **Simulate Runoff** to ensure you have an up to date storage volume requirement.
2. **Compute Storage** at the estimated water level. This may give you a warning on fill height as it is running the design at whatever you picked.
3. **Design Terrace** to run the design and calculate the actual height and elevation of the top of the berm.

The model outputs section displays the required elevation as well as quantities of earthfill/excavation. Also included are the Flooded Area acres and Computed Storage volume in cubic feet.

The channel section displays the channel profile and cross-section templates. You may need to make some modifications, in both the profile and cross-section tabs like channel elevations and topwidths.

Info

Hydrology

Soil

Vegetal

Profile

Template

Design

Terrace Design

Simulate Runoff

Compute Storage

Design Terrace

Balance Cut/Fill

Edit Balance Params

Water Elevation (ft) 1126.70

Req. Storage (cu ft): 10860.29

Target Cut/Fill Ratio 1.00

Model Outputs

For water elevation 1126.70 ft:

Total Cut (cy): 111.7

Total Fill (cy): 335.9

Cut/Fill Balance (cy): -224.2

Cut/Fill Ratio: 0.33

Stripping Volume (cy): 100.2

Flood Area (ac): 0.21

Computed Storage (cu ft) 10934.23

Channel

Profile Points

Cross-Section Templates

Station	Ground	Channel	Length	Grade	Flow Q	Flow Velocity	Flow Depth	Front Height	Design Height	Drain	Block
1+22.2	1128.06	1127.97	48.20	4.17%	0.00	0.00	0.00	1.00	1.10		
1+70.4	1126.24	1125.96	129.70	2.27%	0.64	1.95	0.13	1.00	1.10		
3+00.1	1123.59	1123.02	48.90	3.15%	2.36	2.63	0.29	1.00	4.07	Basin 1 Intake	
3+49.0	1124.83	1124.56	71.30	4.81%	0.95	2.32	0.16	1.00	2.36		
4+20.3	1128.11	1127.99	0.00	0.00%	0.00	0.00	0.00	1.00	1.10		

Design Status

No errors or warnings

***This completes the design for Basin 1. Select **Accept Edit** to close the window and return to the Summary page. Use the previous pages to design additional basins. Once completed an Underground Outlet Design will be built.

Design of Tile Outlet

UnderGround Outlets

New

Open

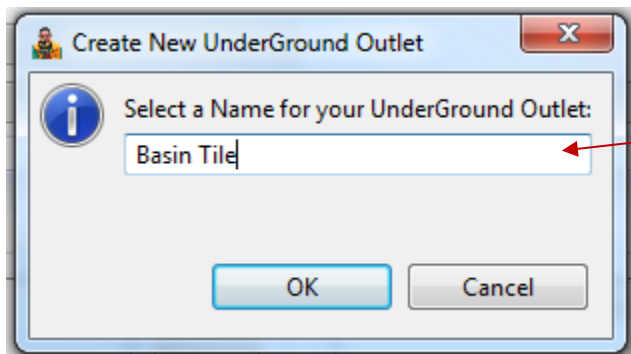
Delete

Rename

Simulate

Select New in the Underground Outlets box.

*The alignment for this needs to be already drawn.



Name the tile line and select **OK**.

Ensure that the alignment for the tile is selected. Also make sure the soil type along the tile route is correct to check allowable velocities

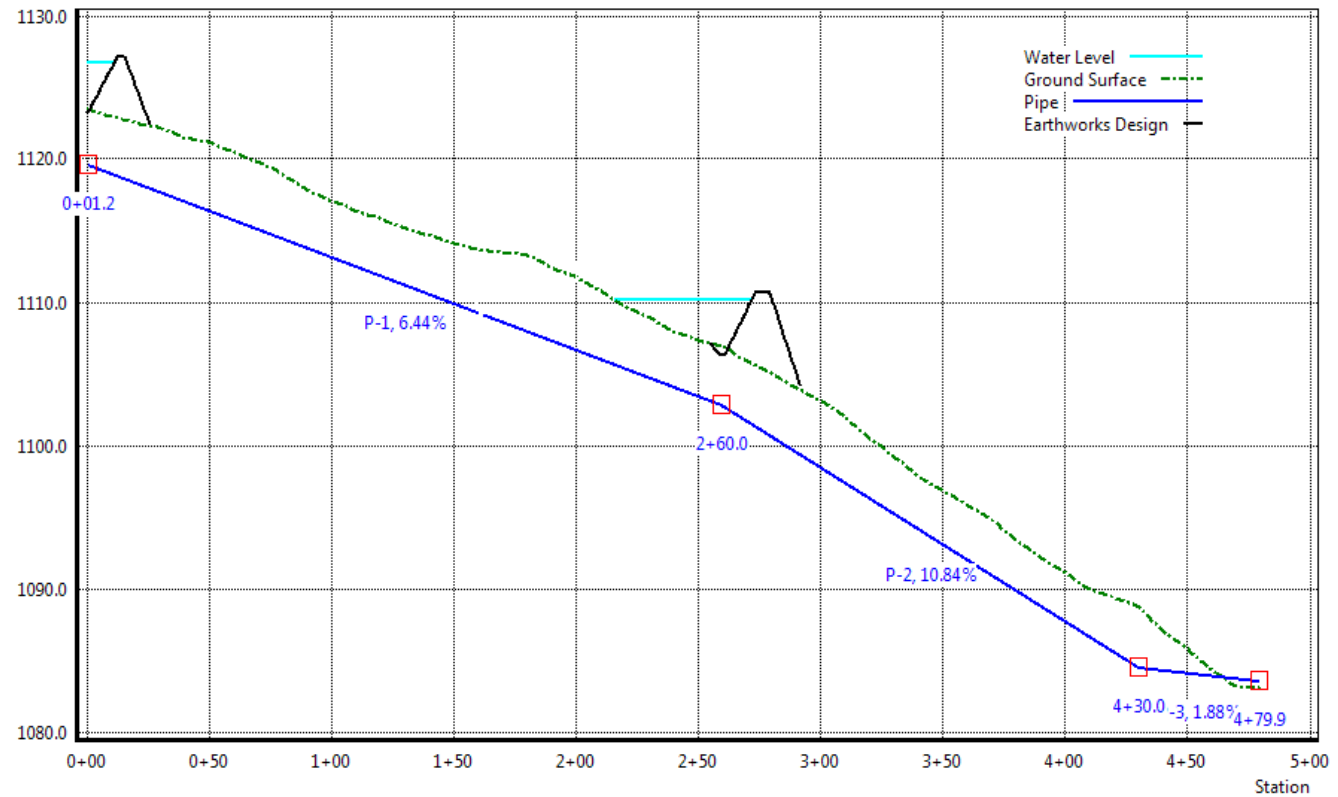
Info Tab

Profile Tab

This is where you will draw the profile, insert grade breaks and inlets. Use the steps below to design the underground outlet for the basins. (Graphics on next pages)

1. Select Sketch Pipe to begin drawing the profile. I start with the left side. Some assumptions can be made to the starting station and elevation but if the Cursor Coordinates are on (View Controls) you will see this information. You will see the table populate below showing the grade breaks and associated slopes. A predetermine pipe size has been assumed from previous settings.

Elevation Profile of Basin Tile



View Controls

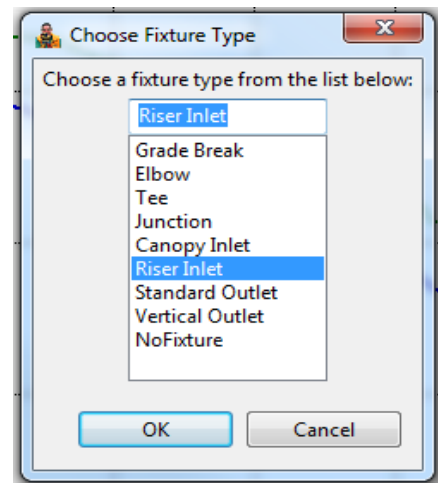
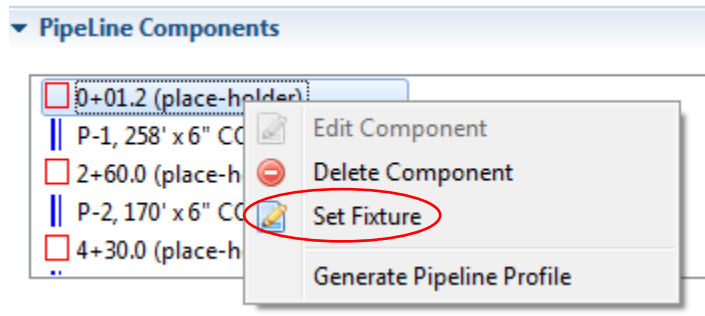
Sketch Pipe

Insert Fixture

Move Fixture

PipeLine Components

- 0+01.2 (place-holder)
- P-1, 258' x 6" CORRUG_PE pipe
- 2+60.0 (place-holder)
- P-2, 170' x 6" CORRUG_PE pipe
- 4+30.0 (place-holder)



Riser Inlet Inputs (left side of the screen)

Id: Basin 1 Intake

Flow Q (cfs): 0.52

Station (ft): 0.0

Pipe Elevation (ft): 1119.48

Material: CORRUG_PE_PERF

Pipe Size (in): 6.0

Manning's N: 0.015

☒ Perforated

☐ Pressurizable

☐ Pressure Flow

☒ Use Manufactured Riser: HICKENBOTTOM_6

Select...

Inlet Top

Guard: CAPPED

Top Opening (in): 1.00

Plugged Fraction: 0.50

Qtop = 0.00 cfs

Perforated Riser

Holes per ft: 40

Height (ft): 3.0

☒ Round Perf: 1.00 Perf. diam., in

☐ Rectangular Perf: 0.00 Perf. width x 0.00 height, in

Plugged Perf Fraction: 0.5

Qperf = 0.52 cfs

Intake Stations

Tile elev

Select Intake

(right side of the screen)

Water Source

Terrace and Outlet: No Connection
Basin 1: Basin 1 Intake (4.9')
Basin 2: Basin 2 (262.3')

Terrace Conditions:

Required Q:	0.158 cfs
Flood Elevation:	1126.7 ft
Channel Elevation:	1123.0 ft
Pipe Depth below Channel:	3.5 ft

Average Flood Depth Factor: 0.8 ☐ Enable Edit
UGO-Sizing Flood Depth Factor: 1.0 ☐ Enable Edit

Orifice Plate

☒ Use Orifice
☒ User-Defined Size

Orifice Depth (in): 6.00
Diameter (in): 3.00
Qorifice = 0.52 cfs

Offset Pipe

☐ Use Offset

Offset Length (ft): 0.0
Elbow Elevation (ft): 0.0

Material: CORRUG_PE_PERF ☒ Perforated
Pipe Size (in): 6.0 ☐ Pressurizable
Manning's N: 0.015

Design Controls

Average Flow: 0.47 cfs
Release Time: 8.1 hrs
UGO-Sizing Flow: 0.52 cfs

Qperf + Qtop = 0.47, Qorifice = 0.47
Qperf + Qtop = 0.53, Qorifice = 0.52

Annotations:

- Connect to basin (points to Basin 1/2 dropdown)
- Based on drawdown time selected in hydrology (i.e. Flood Duration = 24 hr) (points to Required Q)
- Choose Orifice Size (points to Diameter field)
- Compute Capacities Note actual release time!! (points to Compute Inlet Q button)

The release time and the basin's flood duration (in Hydrology tab) should be very close. However, a longer flood duration compared to the release time simply means the embankment is over-designed.

3. The designed underground outlet needs to be Simulated. Click on **Simulate** when the desired tile line design is selected. This simulation will adjust the tile sizes based on volume of water delivered.

UnderGround Outlets

Basin Tile

New
Open
Delete
Rename
Simulate

Select Simulate (points to Simulate button)

Select Design Network

Network Pipelines

Basin Tile	
------------	--

Design Network

Set Gravity Flow

Set All Gravity

[Edit Pipeline](#)

Set Pressure Flow

Set All Pressure

Pipe Details

[illegible]

Design Status

Basin Tile
Pipe:P-1, No Problem
Pipe:P-2, No Problem
Pipe:P-3, No Problem

Pipe:P-1, No Problem

Pipe:P-2, No Problem

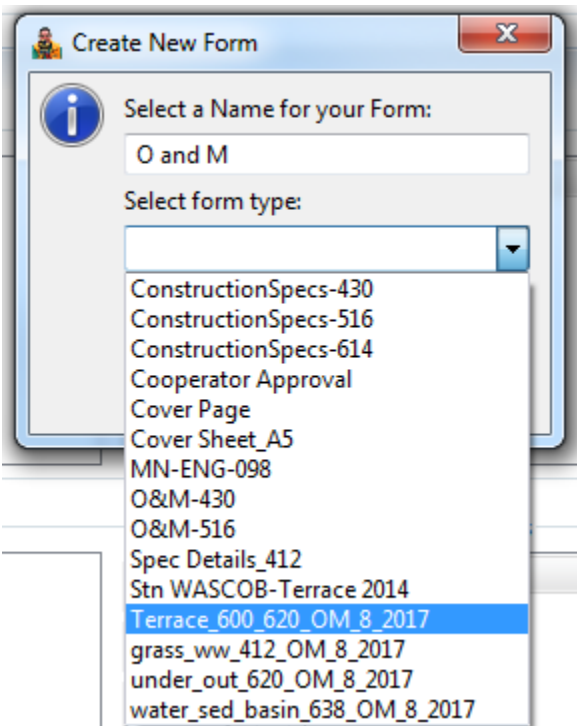
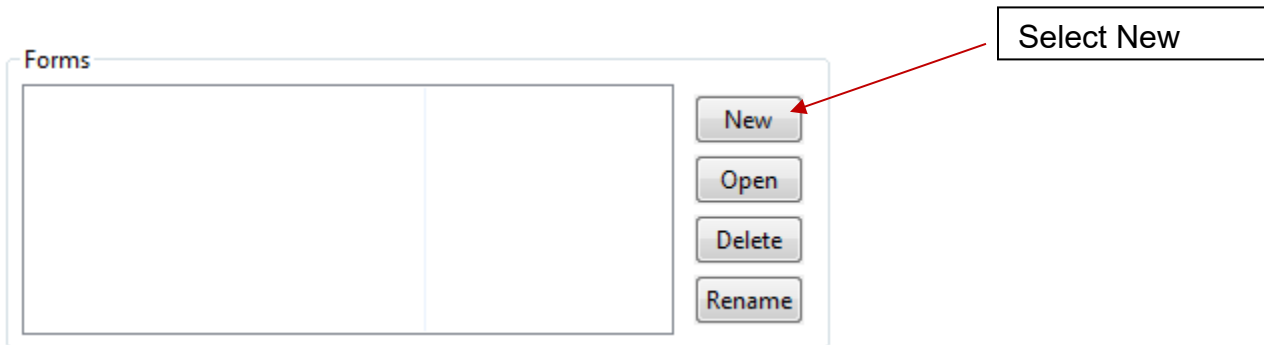
Pipe:P-3, No Problem

Total Flow Q for this pipeline: 1.04 cfs

 Accept Edit

Select Accept Edit

Standard Forms



Standard forms can be incorporated into the design so they will automatically print with the design.

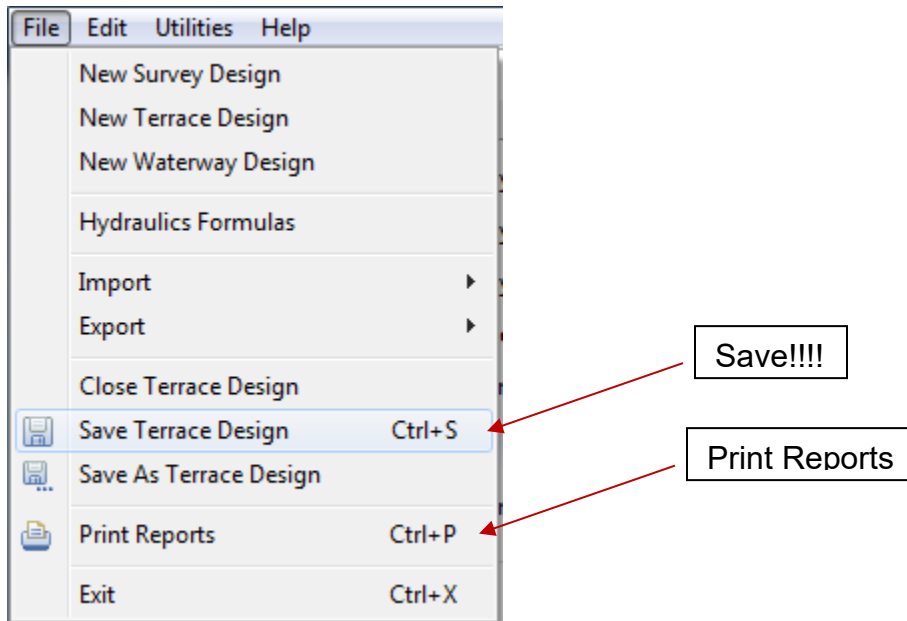
These forms need to be placed in the following location.

C:\Users\your user
name\AppData\Local\EFT\eft\workspace\formTem
plates

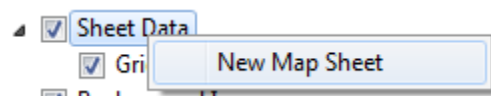
- Seeding Sheets
- GSOC
- O&M
- Specifications

Print Reports

***Make sure you save your design before Printing Reports to ensure it has the most up to date information.



***Before we print the reports we should develop a Map Sheet (Cover Sheet). This is located on the Map tab in the table of contents.



Edit Map Sheet

Edit Map Sheet parameters below:

Drawing Name

Sheet Title

Sheet Size

Sheet Layout

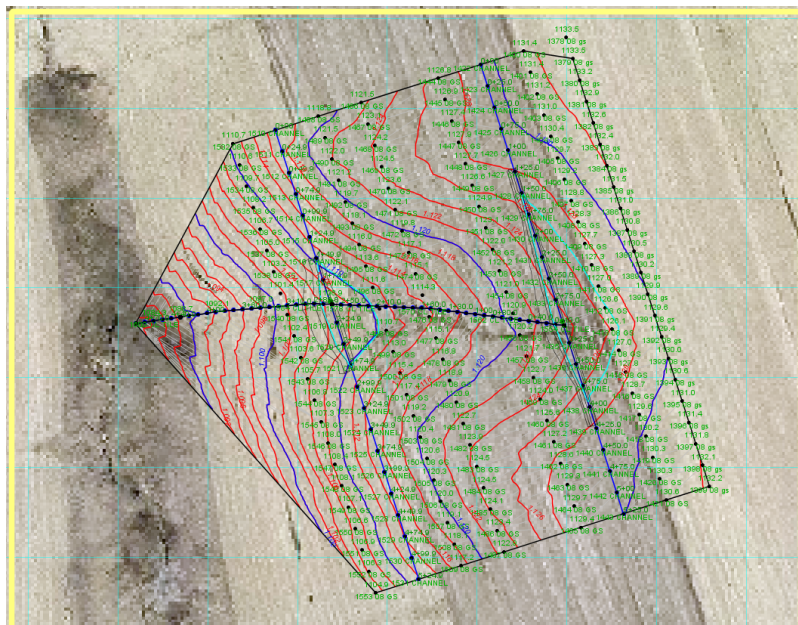
Print Scale, ft/in

Optional Symbols

☒ North Arrow ☒ Scale Bar ☒ Legend Key

Sheet Size

A – 8.5x11
B – 11x17
D – 22x34



Boundary of created sheet (Color can be changed)

Layer Properties

Preview Sheet

Edit Params

Move Sheet

Delete Sheet

Save Map-Layer Config

Restore Map-Layer Config

Select **Preview Sheet** or move sheet to encompass the area to be displayed.

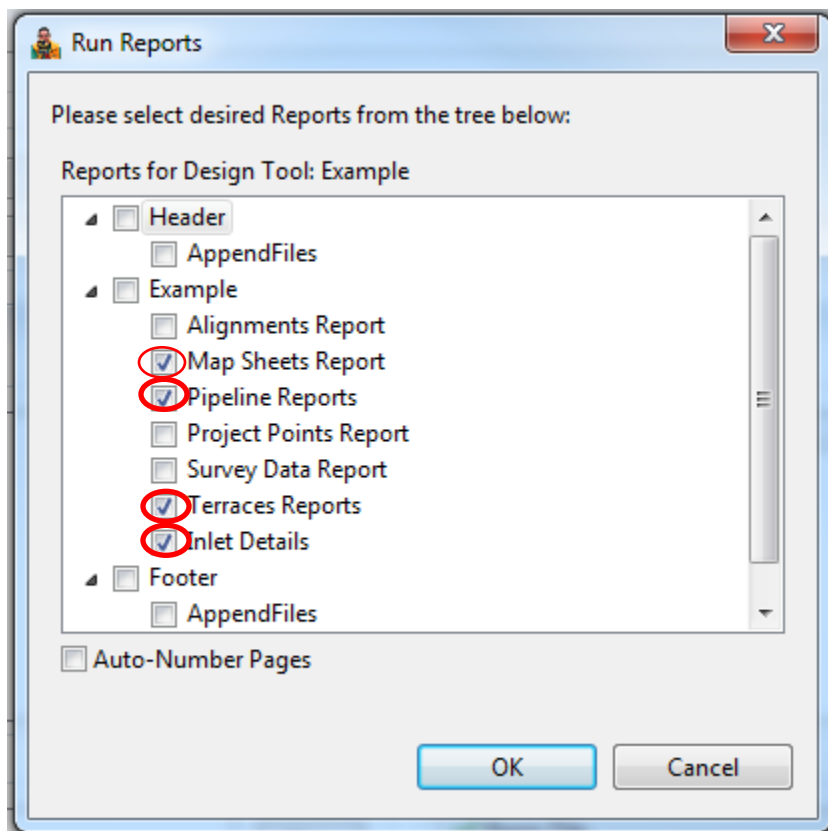


Too much showing?

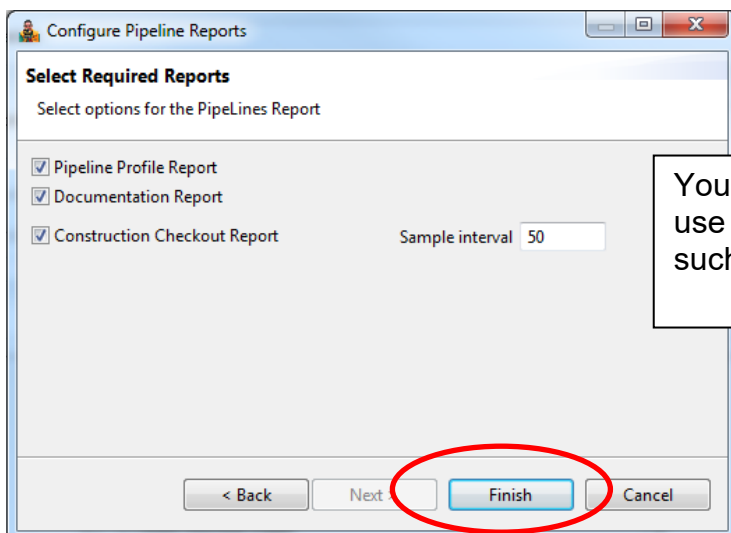
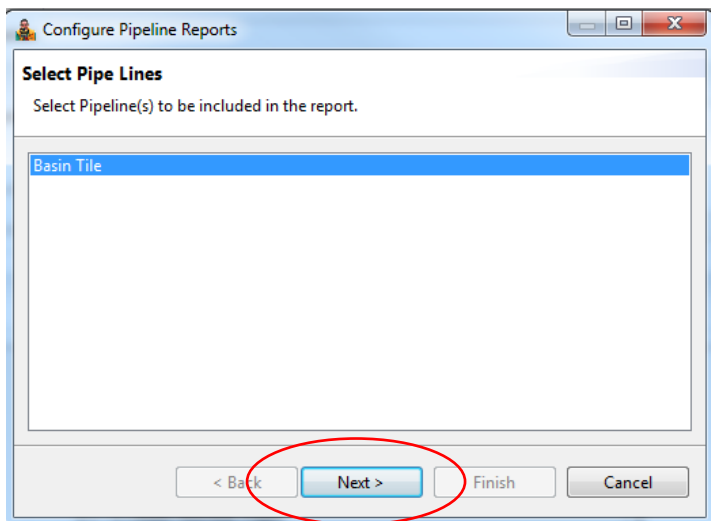
Suggestions:

- turn off layers in table of contents to reduce legend items.
- shut off points
- change colors of contours....
- change colors of alignments

--Go back to File>>Print Reports



Upon checking each box, you will be asked to configure each report.



You may wish to use a bigger interval such as 100'

