



Engineering Field Tools (EFT) software

Overview and Basic Tasks

V4.0.2.2

USDA-Natural Resources Conservation Service



EFT: Overview and Basic Tasks

Webinar Goals

- Overview of EFT software
- Hydraulic Formulas utility
- Earthwork Calculations using SET
- Waterway Sizing Wizard
- Future Vision

Presenters

- Eric Fleming, Agricultural Engineer, USDA NRCS East National Technology Support Center, Greensboro, NC
- Kip Yasumiishi, Civil Engineer, USDA NRCS West National Technology Support Center, Portland, OR
- Carol Drungil, National Engineering Software Coordinator, USDA NRCS Conservation Engineering Division, Fort Collins, CO
- Norman Friedrich, Civil Engineer, USDA NRCS Iowa, West Union, IA

EFT Software Overview

What: Tools for conservation engineering practices

- Surveying & Basic earthwork
- Terraces
- Waterways
- Hydraulic and other formulas

Who: NRCS field and engineering staff & Partners

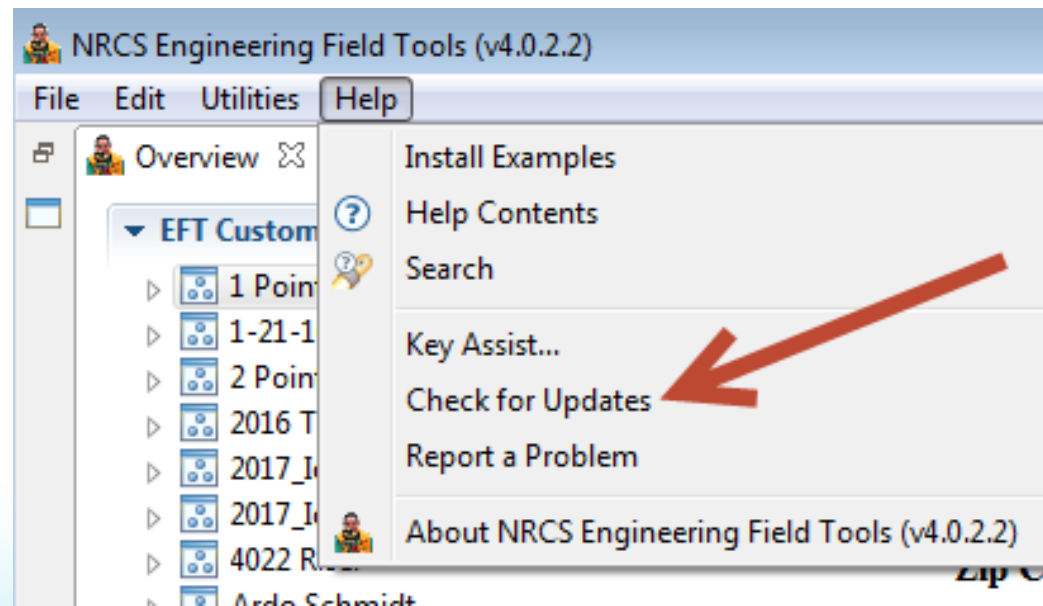


EFT Software Overview

How to obtain software

- NRCS installations via CTS staff
- Others - eft.nrcs.usda.gov

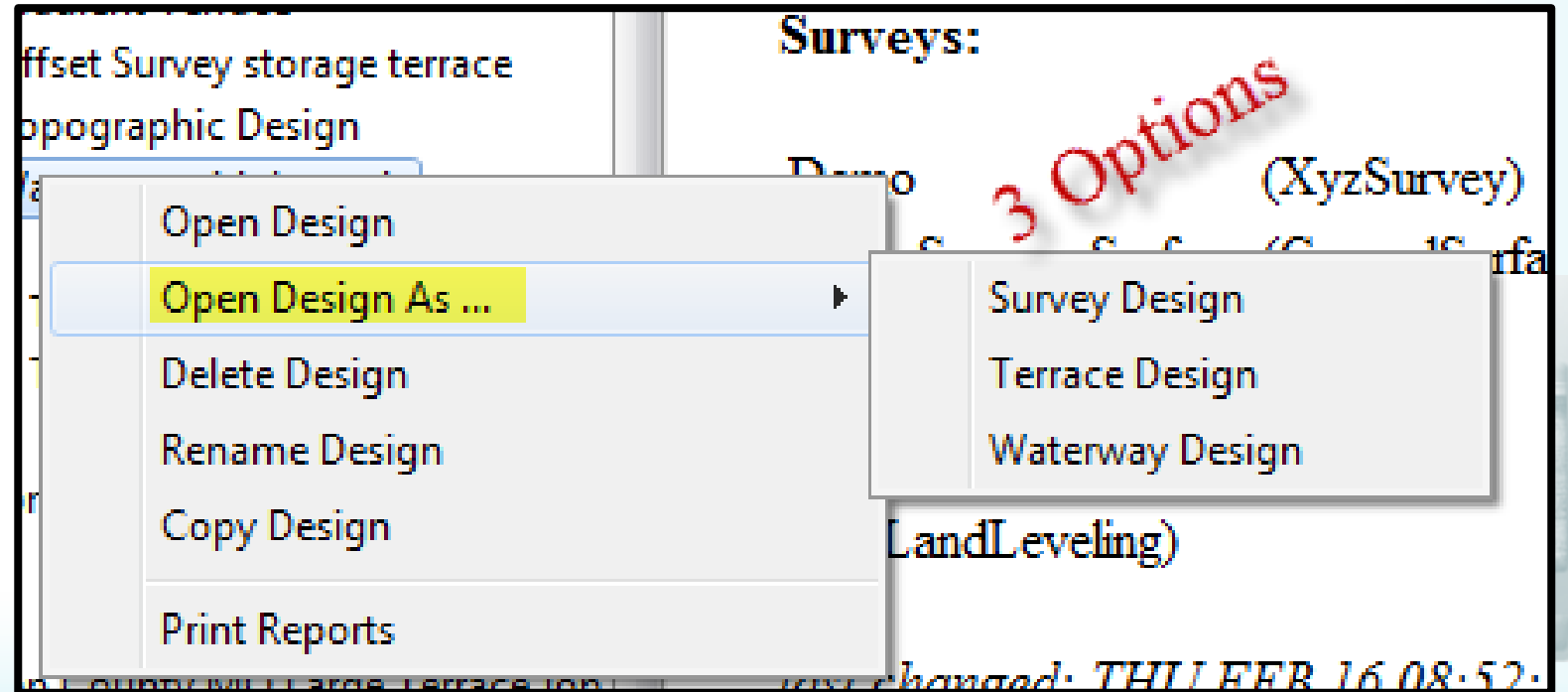
Software updates through *Help...Check for Updates*



EFT Software Overview

Job based tools

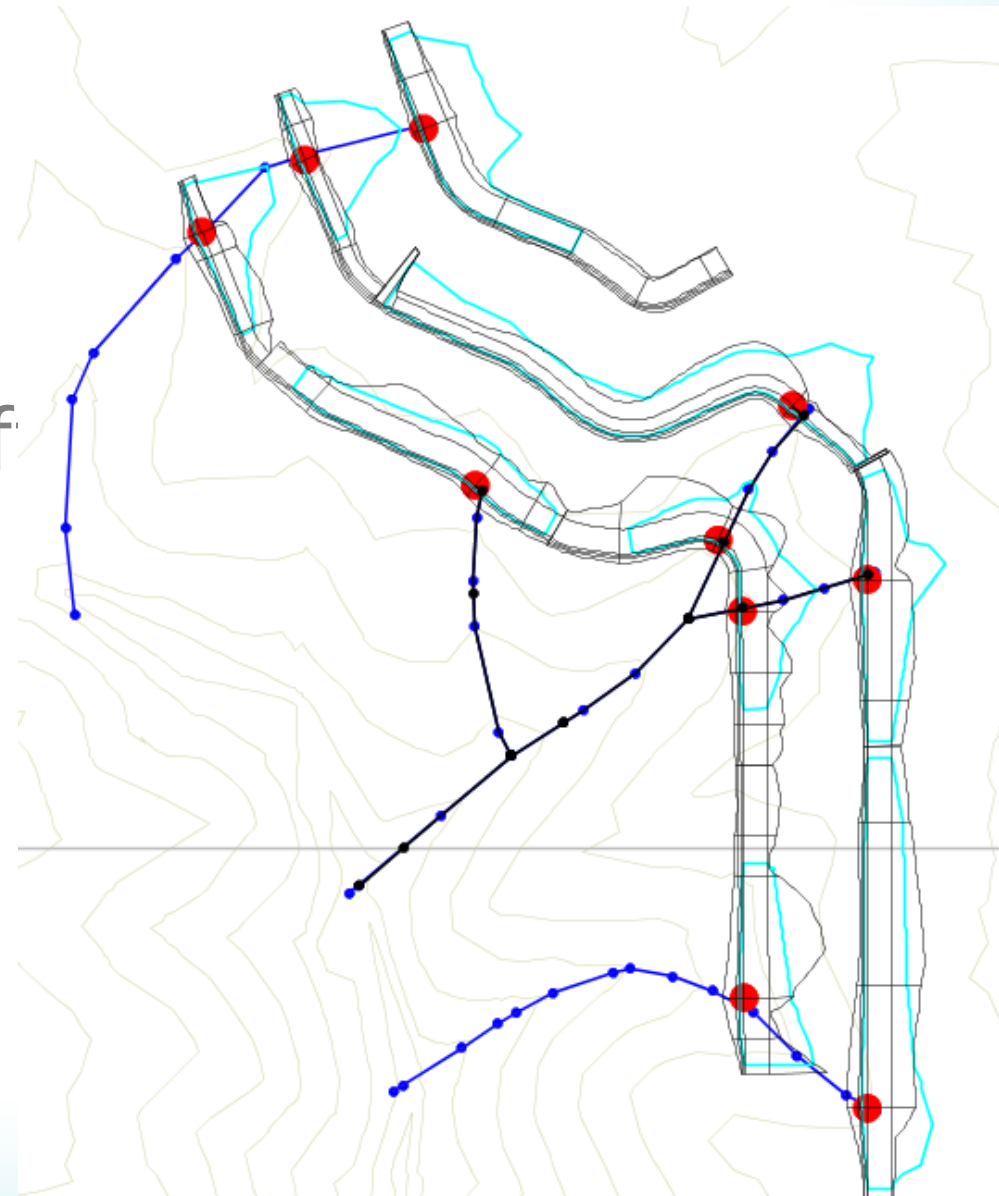
- Designs using 3D surfaces
 - Survey
 - Radial, XYZ, or Station/Offset + DEM
 - Structure



EFT Software Overview

Job based tools

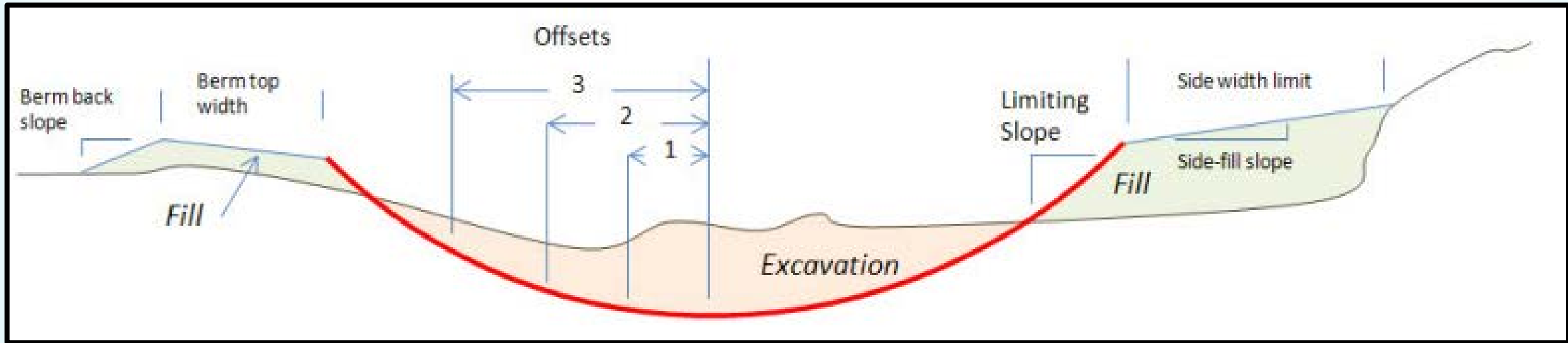
- Designs using 3D surfaces
 - Survey
 - Radial, XYZ, or Station/Of
 - Structure
 - Terrace
 - Gradient, Storage, Level
 - w/ Underground Outlet



EFT Software Overview

Job based tools

- Designs using 3D surfaces



- w/ Underground Outlet
- Waterway
 - Tractive stress design



EFT Software Overview

Job based tools

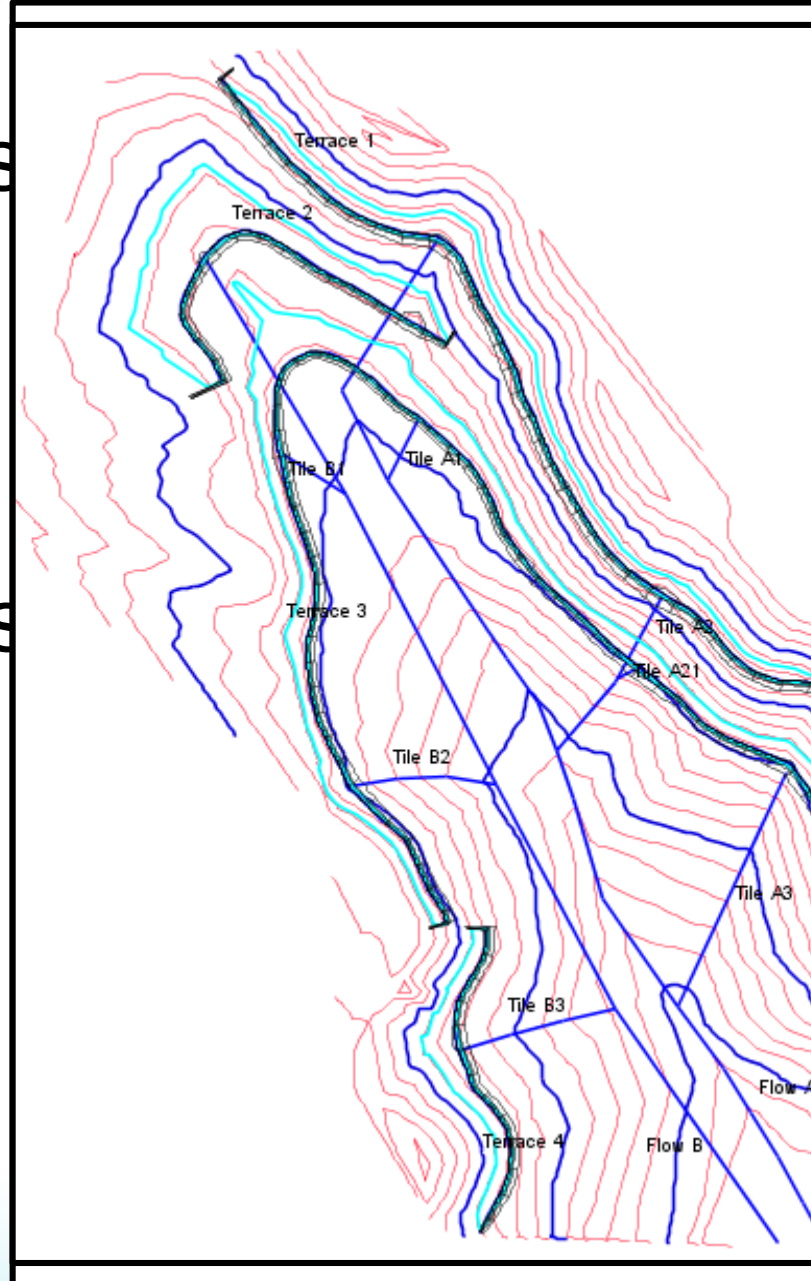
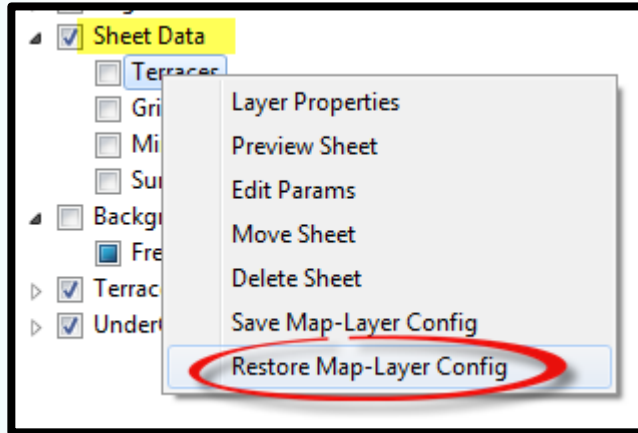
- Designs using 3D surfaces
 - Survey
 - Radial, XYZ, or Station/Offset + DEM
 - Structure
 - Terrace
 - Gradient, Storage, Level
 - w/ Underground Outlet
 - Waterway
 - Tractive stress design



EFT Software Overview

EFT Map features

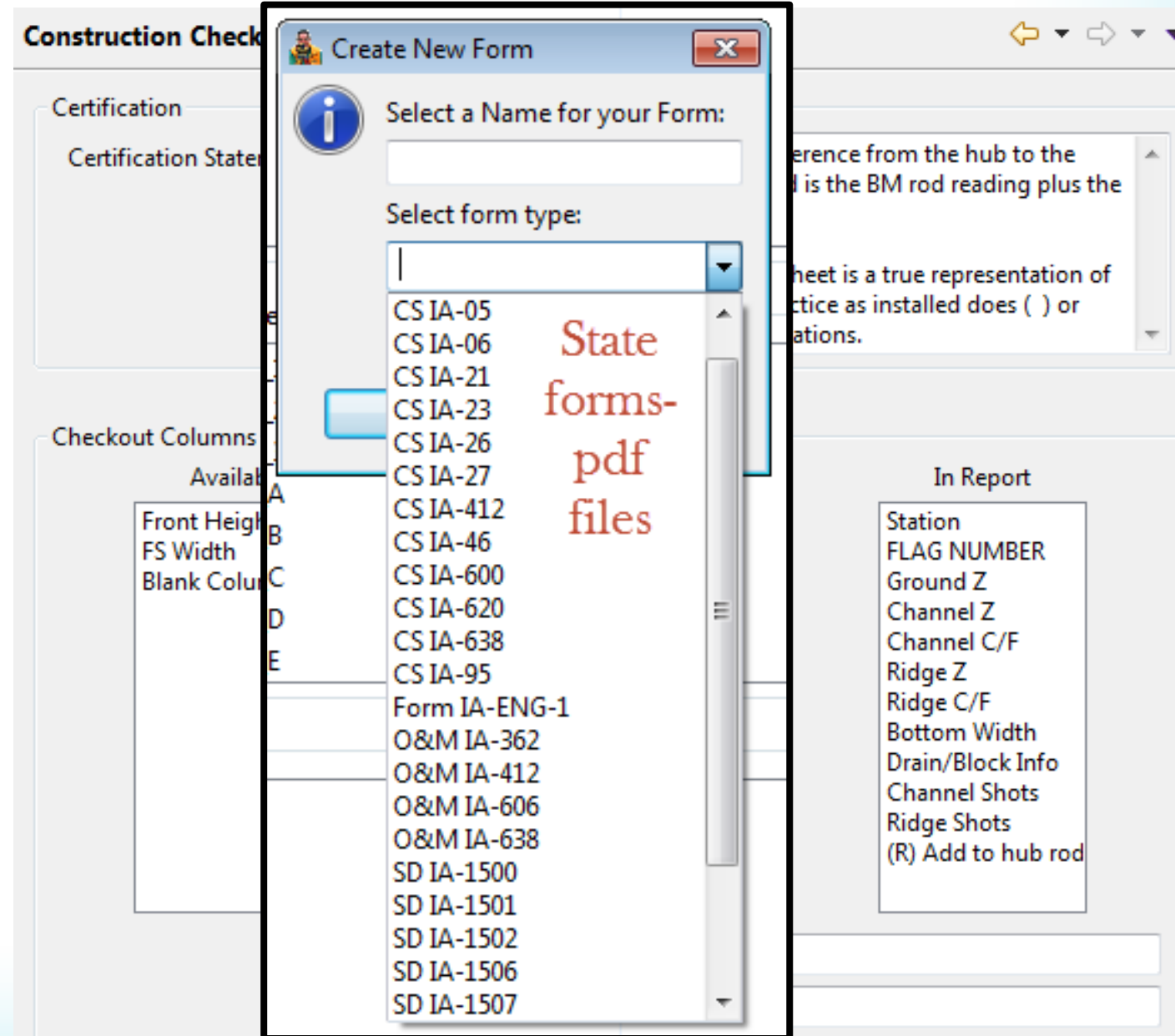
- Layer Control
- Map Sheets
 - Plotting
 - Layer settings



EFT Software Overview

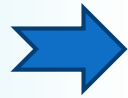
Local Customization

- Preferences
- State defaults
 - Forms

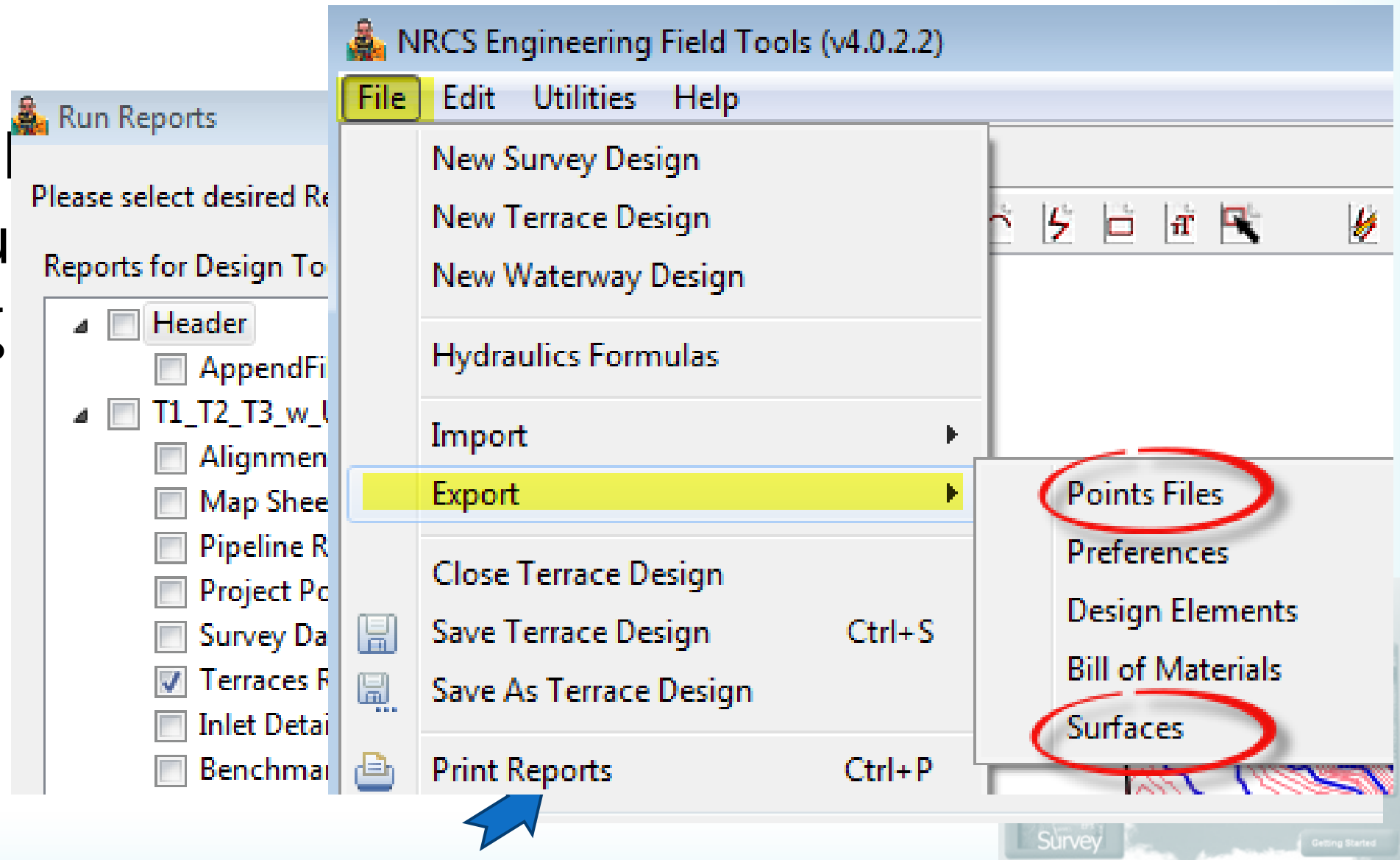


EFT Software Overview

Output



- Design
- Construction
- Staking



EFT Software Overview

Support

- Help file
- Install Example files
- NRCS Conservation Engineering Division web page
 - eft.nrcs.usda.gov
 - Videos
- USDA users
 - connections.usda.gov/communities/community/nrcsEFT
 - Videos



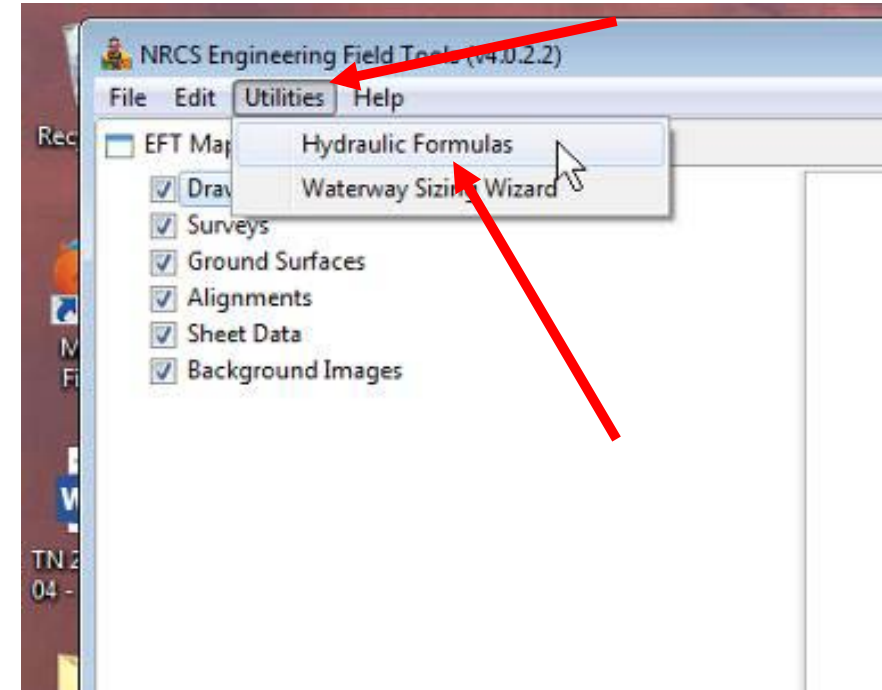
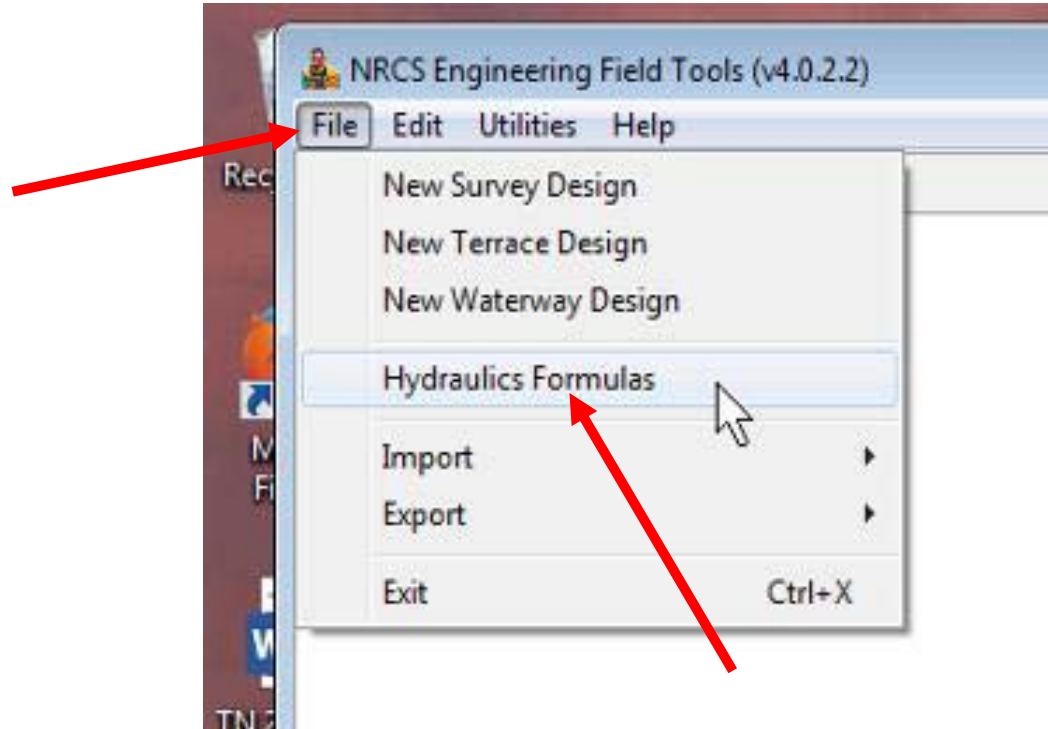
EFT Hydraulic Formulas

Bundled Utilities to:

- Calculate Pipe and Channel Flow
- Calculate Flow Over Weirs and Through Structures
- Calculate Areas and Volumes

Replaces older, Ohio Engineering version and the stand-alone Hydraulic Formulas application

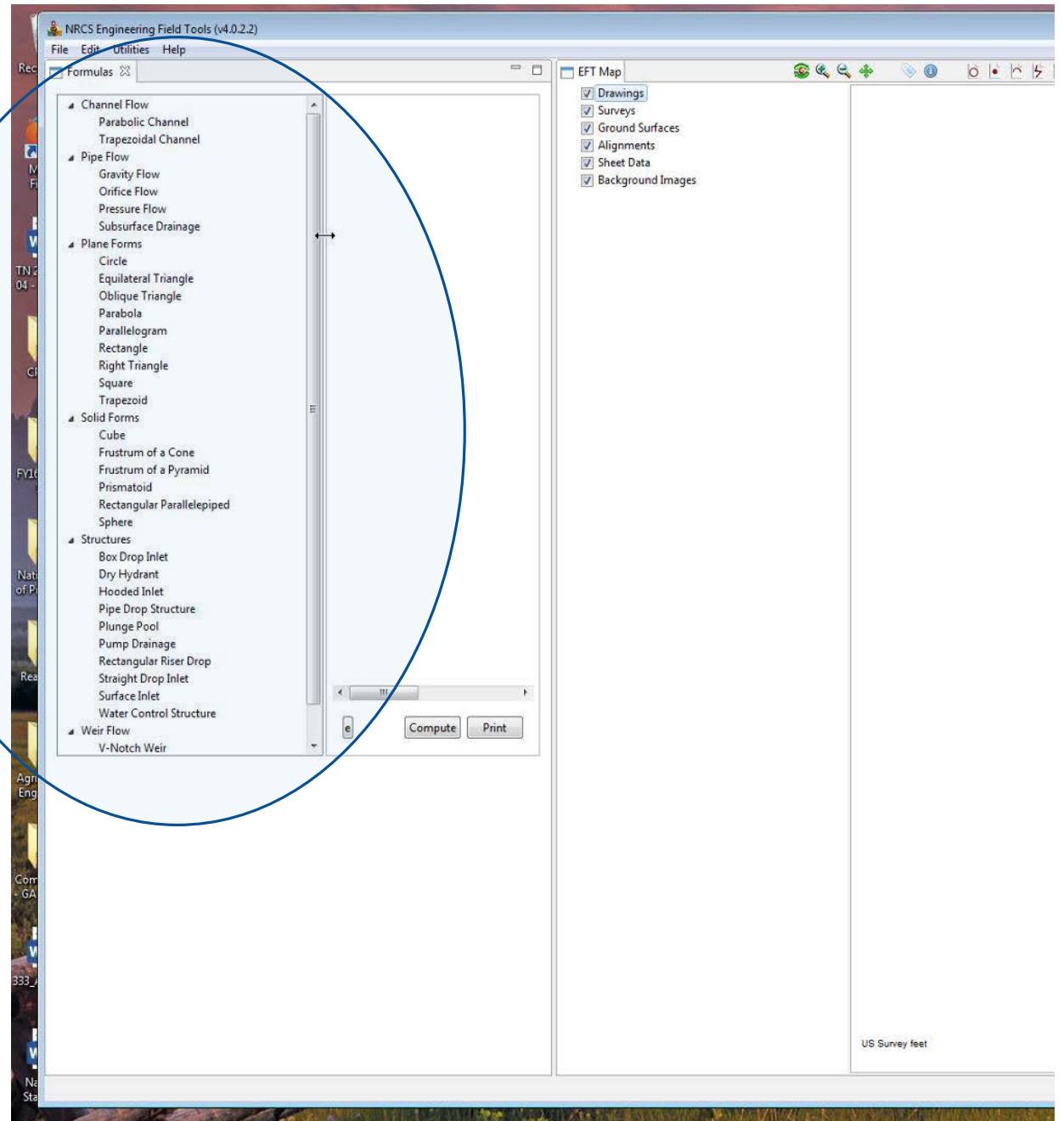
Access Method 1: File menu, Hydraulic Formulas



Access Method 2: Utilities menu, Hydraulic Formulas

33 Formula Options:

- Channel Flow
- Pipe Flow
- Plane Forms (Areas)
- Solid Forms (Volumes)
- Structures
- Weirs



Trapezoidal Channel Example – Manning's Equation

1. Select Formula in Left Pane

2. Edit values for design in Center:

- Bottom Width
- Depth
- Side Slopes
- Bed Slopes
- Manning's n

3. Select Compute Button

NRCS Engineering Field Tools (v4.0.2.2)

File Edit Utilities Help

Formulas

- Channel Flow
 - Parabolic Channel
 - Trapezoidal Channel**
- Pipe Flow
 - Gravity Flow
 - Orifice Flow
 - Pressure Flow
 - Subsurface Drainage
- Plane Forms
 - Circle
 - Equilateral Triangle
 - Oblique Triangle
 - Parabola
 - Parallelogram
 - Rectangle
 - Right Triangle
 - Square
 - Trapezoid
- Solid Forms
 - Cube
 - Frustrum of a Cone
 - Frustrum of a Pyramid
 - Prismatoid
 - Rectangular Parallelepiped
 - Sphere
- Structures
 - Box Drop Inlet
 - Dry Hydrant
 - Hooded Inlet
 - Pipe Drop Structure
 - Plunge Pool
 - Pump Drainage
 - Rectangular Riser Drop
 - Straight Drop Inlet
 - Surface Inlet
 - Water Control Structure
- Weir Flow
 - V-Notch Weir

- Trapezoidal Channel Section -

$$Q = \frac{1.486}{n} A r^{2/3} s^{1/2}$$

Bottom Width (ft)

Depth (ft)

Side slope 'Z1' (ft/ft)

Side slope 'Z2' (ft/ft)

Bed slope (ft/ft)

Manning's n

Help select n value

Hydraulic radius:
Top Width:
Area:
Capacity (Q):
Velocity:
Critical Depth:

Help

Compute Print

Trapezoidal Channel Example – Manning's Equation

Review Computed values

Adjust Inputs to get desired
Capacity and **Velocity** values

Help Button:

- how to use the formulas,
- reference material,
- examples

Help select n value Button:

- guidance on selecting formula input (other help options for other formulas)

NRCS Engineering Field Tools (v4.0.2.2)

File Edit Utilities Help

Formulas

- Channel Flow
 - Parabolic Channel
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- Trapezoidal Channel Section -

$$Q = \frac{1.486}{n} A r^{2/3} S^{1/2}$$

Bottom Width (ft)

Depth (ft)

Side slope 'Z1' (ft/ft)

Side slope 'Z2' (ft/ft)

Bed slope (ft/ft)

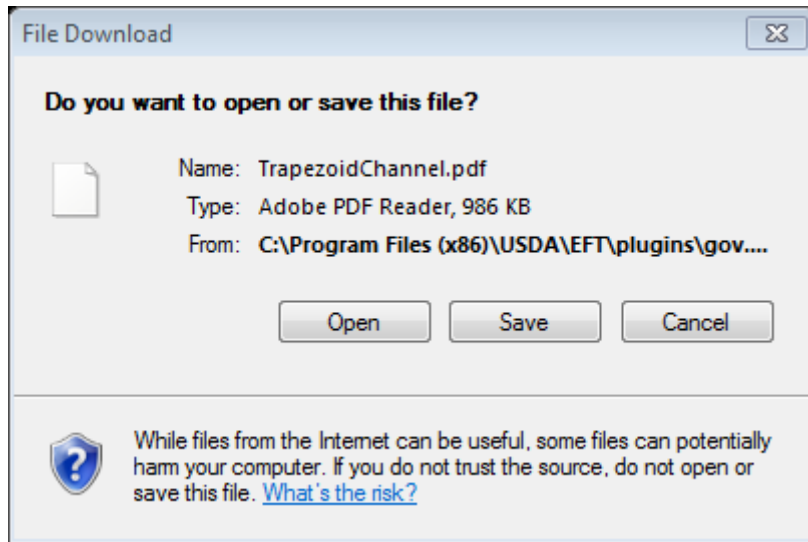
Manning's n

[Help select n value](#)

Hydraulic radius: 0.65 ft
Top Width: 12.00 ft
Area: 8.00 sq ft
Capacity (Q): 22.38 cfs
Velocity: 2.80 ft/sec
Critical Depth: 0.77 ft

[Help](#) [Compute](#) [Print](#)

Help Materials

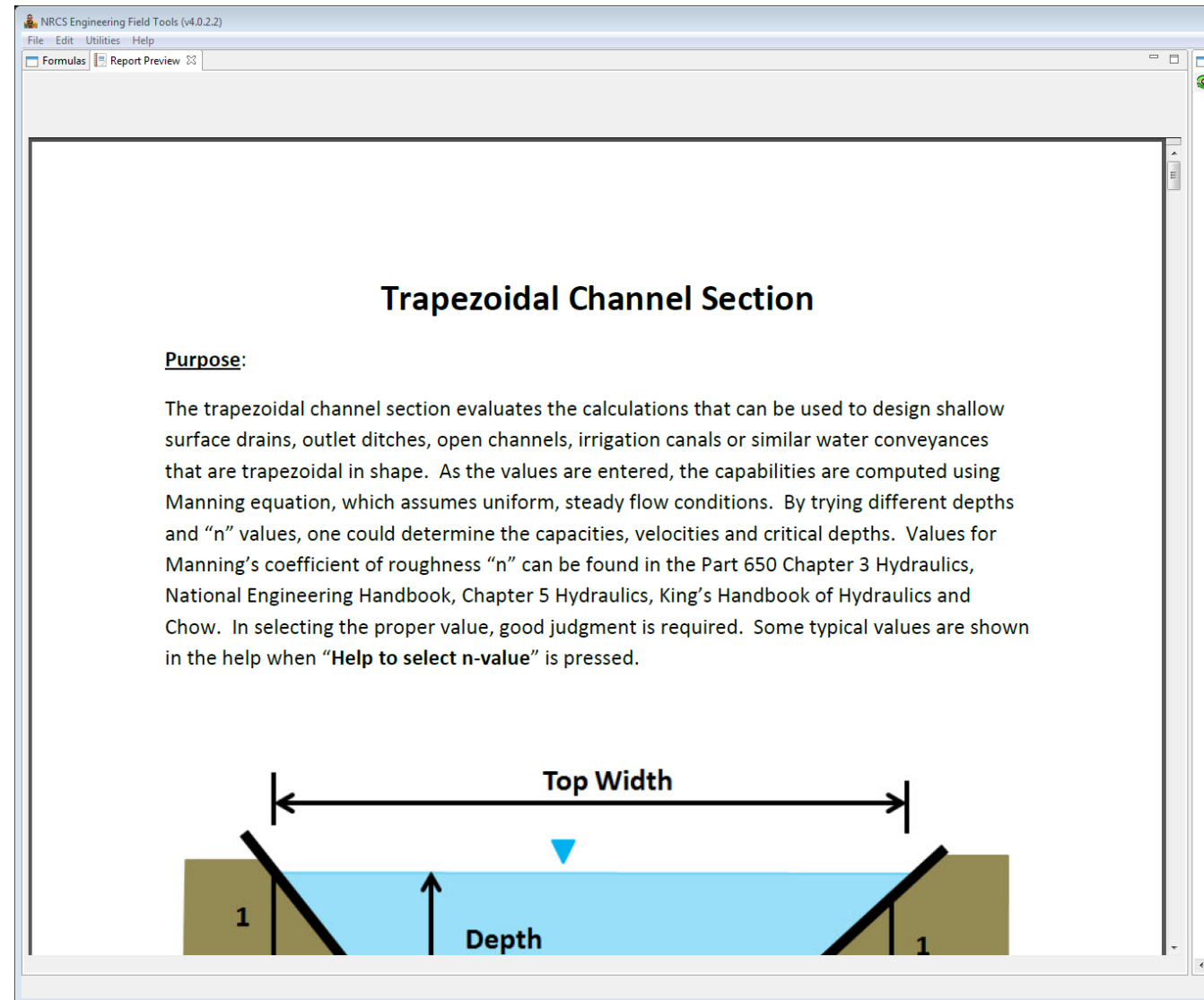


Options to Open or Save as PDF


Comprehensive and Descriptive Info

For Trapezoidal Channels:

- 14 pages of explanation, guidance, examples and references



Trapezoidal Channel Example – Report

X

Report Title Block Information

Name ←

Designed By Date

Drawn By Date

Checked By Date

Approved By Date

Practice

Location

Project Information

Description

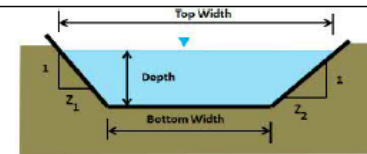


Report Generated 02/21/2017
EFT Version 4.0.2.2

Trapezoidal Channel

Project Name: Joe Smith Location: _____
Project Description: _____ Practice: _____

Designed by: _____ Date: _____
Checked by: _____ Date: _____
Approved by: _____ Date: _____



$$Q = \frac{1.486}{n} A r^{2/3} s^{1/2}$$

Inputs

Bottom Width : 4.00 ft
Depth of Flow : 1.00 ft
Side Slope 1 : 4.00:1
Side Slope 2 : 4.00:1
Bed Slope : 0.0100 ft/ft
Manning's n : 0.040

Outputs

Top Width : 12.00 ft
Hydraulic Radius : 0.65 ft
Flow Area : 8.00 sq ft
Capacity : 22.38 cfs
Velocity : 2.80 ft/sec
Critical Depth : 0.77 ft

Pipe Flow – Pressure Flow

EFT currently **does not** include full culvert analysis

Pipe Flow, Pressure Flow formula is **not usable** with a submerged outlet

For a submerged outlet another tool must be used such as The Federal Highway Administration HY-8 Culvert Hydraulic Analysis Program

(NRCS User Guide 210_17_1)

NRCS Engineering Field Tools (v4.0.2.2)

File Edit Utilities Help

Formulas

Channel Flow
Parabolic Channel
Trapezoidal Channel

Pipe Flow
Gravity Flow
Orifice Flow
Pressure Flow
Subsurface Drainage

Plane Forms
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Structures
Box Drop Inlet
Dry Hydrant
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Plunge Pipe
Pump Drop
Rectangular
Straight Inlet
Surface Inlet
Water Control
Weir Flow
V-Notch

Water Surface Elev. (ft)
Inlet Elev. (ft)
Diameter (D)
Length (L)
Head on Pipe (ft)
Invert Outlet Elev. (ft)

$$Q = A \sqrt{\frac{2gH}{1 + K_e + K_b + K_p L}}$$
$$K_p = \frac{5087 n^2}{d^{4/3}}$$

Specify:
 Head Elevations

Water surface elev. (ft): 100.00
Invert outlet elev. (ft): 90.00
Pipe Diameter (in): 24.00
Pipe length (ft): 60.00
Manning's n: 0.015
Help select n value
Entrance loss coeff. (K_e): 0.20
Help select K_e value
Bend loss coeff. (K_b): 0.00

Flow Q: 0.00 cfs
Velocity: NaN ft/sec
Friction coefficient (K_p): 0.000
Max allowable fall in pipe: 0.00 ft
(when outlet is not submerged)

- Pressure Flow in Pipe - when outlet is not submerged -
Not for Culvert Flow

Compute Print

eDirectives.pdf - Adobe Acrobat
File Edit View Window Help

Open Create Save Print Copy Paste Undo Redo 95.4% Tools Fill & Sign Comment

USDA United States Department of Agriculture
Natural Resources Conservation Service

User Guides
Title 210 - Engineering

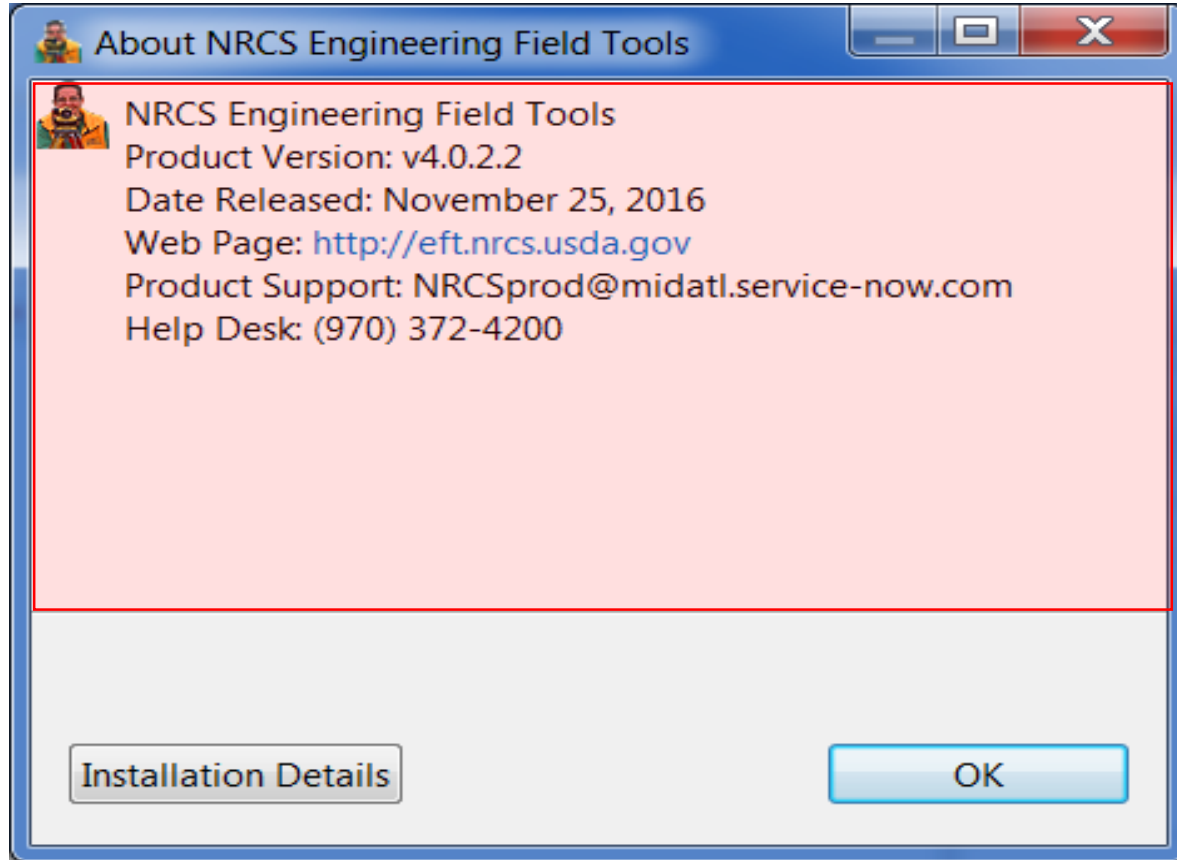
UG_210_17_1 ENG - FHWA HY-8, Version 7.50, Culvert Hydraulic Analysis Computer Program and Documentation

User Guide: 210-17-1 Date: November 14, 2016
Subject: ENG - FHWA HY-8, Version 7.50, Culvert Hydraulic Analysis Computer Program and Documentation

Purpose. This user guide announces the availability of the Federal Highway Administration (FHWA) HY-8, Version 7.50, "Culvert Hydraulic Analysis" computer program and provides information on obtaining the software and documentation.

Effective Date. Effective upon receipt.

NRCS Engineering Field Tools (EFT) - Resources



- State Conservation Engineer
- State Design/Hydraulic Engineer

- SME-Hydraulic Formulas
Quan Quan, Hydraulic Engineer
quan.quan@wdc.usda.gov
(301) 504-3952 (Office)

Presentation by: Eric Fleming, Agricultural Engineer, ENTSC
(336)370-3348; eric.fleming@gnb.usda.gov

EFT Waterway Sizing Wizard

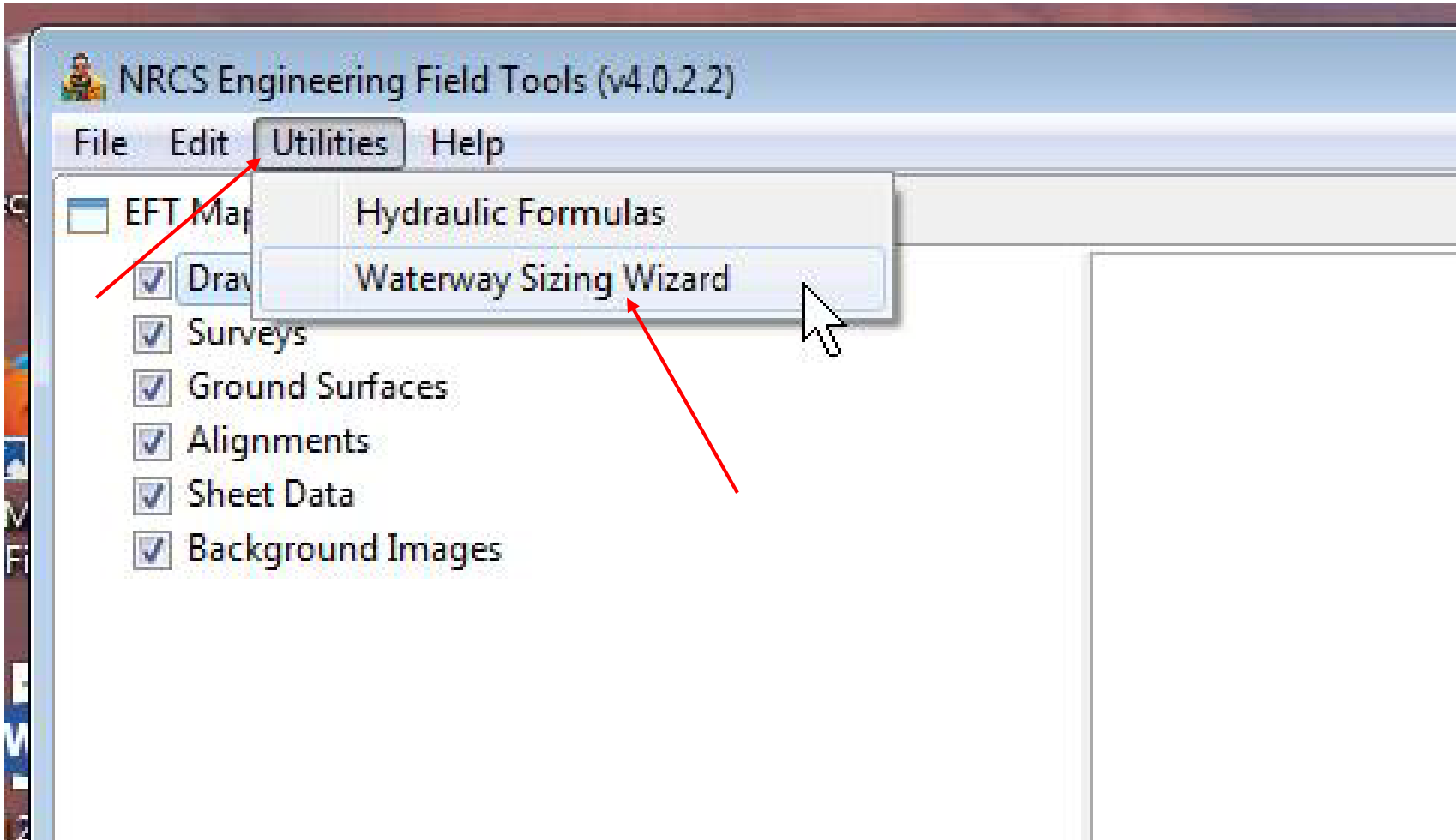
Bundled Utility to:

- Quickly size a waterway for a single reach
- Create a report
- Uses the same tractive stress method as WDT

Doesn't require survey data input to EFT

Won't provide as detailed output as WDT

Starting the Waterway Sizing Wizard



Soil Strength Input

Calculate Waterway Size

Soil Strength

Please define soil strength for the waterway site

Allowable Soil Stress

Direct entry

Allowable Stress (lb/sq.ft) Soil Grain Roughness

Erodibility Soil Grain Roughness

Erodibility class

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 Void Ratio (optional)

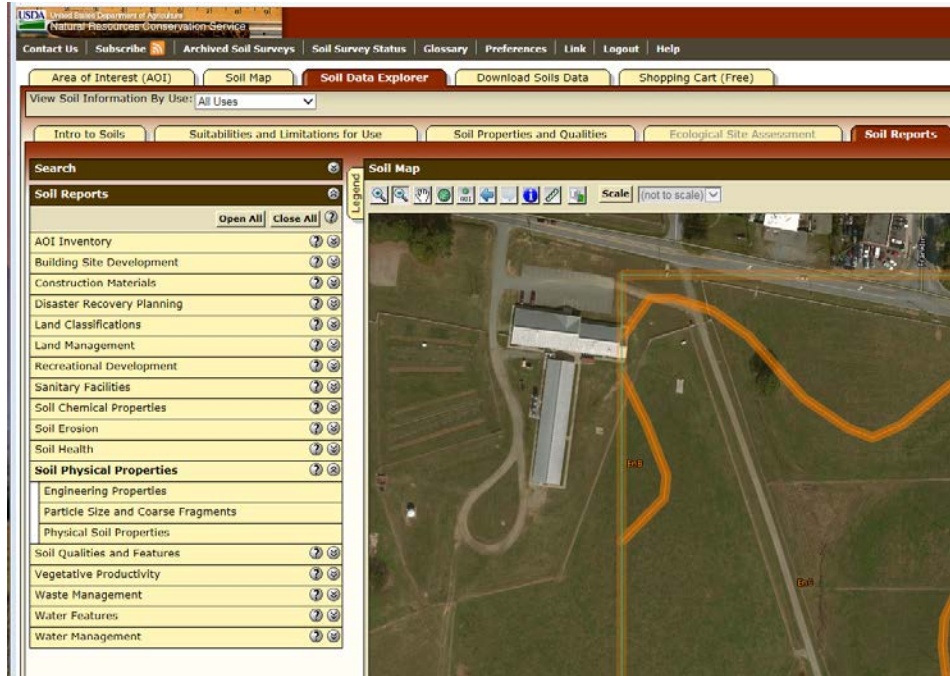
Plasticity Index d75 (in)

< Back Next > Finish

Three Methods to Input Soil Strength:

1. Direct Entry
 - Need Allowable Stress
 - Soil Grain Roughness
2. Erodibility Class
3. Soil Parameters
 - Need Unified Soil Classification
 - Plasticity Index
 - d75 Particle size

Soil Strength Input – Where do I get this?



Web Soil Survey – Soil Reports, Soil Physical Properties (<http://websoilsurvey.nrcs.usda.gov>)

Engineering Field Handbook, Ch.7 Grassed Waterways – Tables, Charts, explanations

United States
Department of
Agriculture

Natural
Resources
Conservation
Service

Part 650 Engineering Field Handbook

Chapter 7 Grassed Waterways

Table 7-1 Allowable effective stress for categories of soil erodibility

Category	Allowable stress, τ_{a1} , lb/ft ²
Easily eroded	0.02
Erodible	0.03
Erosion resistant	0.05
Very erosion resistant	0.07

(1) Determination of allowable effective stress
The erodibility of the soil may be estimated to fall into one of these categories:

- easily eroded (sand textural soil classification)
- erodible (silt textural soil classification)
- erosion resistant (clay textural soil classification)

Vegetal Cover

Engineering Field Handbook, Ch. 7

Calculate Waterway Size

Vegetal Cover
Please define vegetal cover for the waterway site

Stability Retardance

Manning's n: 0.000
 Retardance Curve Index: 4.44
 Stem Length/Density: Length (ft) 0.10 Density (#/sq.ft) 11.0
 Retardance Class: D

Vegetal Cover: Smooth Brome (0.87)
(select or enter numeric value)

Capacity Retardance

Manning's n: 0.000
 Retardance Curve Index: 7.64
 Stem Length/Density: Length (ft) 0.10 Density (#/sq.ft) 11.0
 Retardance Class: B

< Back Next > Finish

Table 7-3 Properties of grass channel linings; values apply to good uniform stands of each cover!

Cover factor, C_F	Covers tested	Reference stem density (stem/ft ²)
0.90	Bermudagrass	500
	Centipedegrass	500
0.87	Buffalograss	400
	Kentucky bluegrass	350
	Blue grama	350
0.75	Grass mixture	200
0.5	Weeping lovegrass	350
	Yellow bluestem	250
	Alfalfa ^{2/}	500
	Lespedeza sericea ^{2/}	300
	Common lespedeza	150
	Sudangrass	50

Table 7-4 Classification of vegetation cover as to degree of retardance

Retardance	Cover	Condition
A	Weeping lovegrass	Excellent stand, tall (average 30 in)
	Reed canarygrass or Yellow bluestem ischaemum	Excellent stand, tall (average 36 in)
	B	Smooth bromegrass
	Bermudagrass	Good stand, tall (average 12 in)
	Native grass mixture (little bluestem, blue grama, and other long and short midwest grasses)	Good stand, unmowed
	Tall fescue	Good stand, unmowed (average 18 in)

Channel and Flow Input

The screenshot shows a software window titled "Calculate Waterway Size" with a "Channel and Flow" section. The interface includes the following fields and controls:

- Channel Bed Slope (%)**: 3.600
- Design Discharge (cfs)**: 40.0
- Channel Controls**:
 - Channel Shape**: TRAPEZOIDAL
 - Freeboard (ft)**: 0.00
 - Left Slope (ft/ft)**: 6.00
 - Right Slope (ft/ft)**: 6.00
 - Min Bed Width (ft)**: 8.0
 - Bottom Dip**: NO_DIP
 - Dip Depth (ft)**: 0.00
 - Offsets 1,2,3 (%)**: 0.0, 0.0, 50.0
- Channel Options**:
 - Fix Flow Depth (ft) 1.00
 - Fix Flow Width (ft) 20.0

Navigation buttons at the bottom include "< Back", "Next >", and "Finish".

Data Input:

- Channel Grade
- Design Discharge – from outside EFT
- Choose Channel Geometry
 - Triangular
 - Trapezoidal
 - Parabolic
- Can fix Depth or Width or both can vary

Simulation

Calculate Waterway Size

Simulation
Click to Simulate channel flow

Simulate **Print** **Inputs**

Channel
Bank Slopes z1-z3: 99.9, 99.9, 99.9 Bed Slope: 999.999% Freeboard: 99.9 ft Min Bed Width: 999.9 ft
Fixed Depth: 999.9 ft Fixed Width: 999.9 ft Discharge: 99999.99 cfs
Dip Depth: 9.99 Offsets 1,2,3: 999.9, 999.9, 999.9
Cross Slope: 999.9 Crest Width: 99999.9 Cut/Fill Ratio: 9.99 Uphill Side: RIGHT

Soil
Grain Roughness: 0.0000 Allowable Stress: Very Erosion Resistant - 0.070 lb/sq.ft
Soil Type: ML Plasticity Index: 0.00 Void Ratio: 0.00 d75: 0.05

Vegetal

	Stem Length	Density	Ret Curve Index	Veg Cover
Stability			9.9999 (mannings r)	Creeping grasses (Bermudagrass, 0.9)
Capacity			9.9999 (mannings r)	

Outputs

Flow Conditions with minimum cover (Stability)

Manning's n	Average Velocity	Flow Depth	Effect. Soil Stress	Flow Width
0.0000	0.00 ft/sec	0.00 ft	0.000 lb/sq.ft	999.9 ft

X-sect. Area	Hydraulic Radius	Bank Slopes, z:1,z:2	P-Channel Coeff	Flow Width w/Fb
0.0 sq.ft	0.00 ft	9.99, 9.99, 9.99	9.99999	999.9 ft

Capacity Flow Conditions

Manning's n	Average Velocity	Flow Depth	Flow Width
0.0000	0.00 ft/sec	0.00 ft	0.0 ft

X-sect. Area	Hydraulic Radius	P-Channel Coeff	Flow Width w/Fb
0.0 sq.ft	0.00 ft	0.00000	0.0 ft

Not simulated yet

< Back Next > Finish

For the wizard to perform calculations the user must select **Simulate**. Note the status at the bottom.

Simulation Complete

Calculate Waterway Size

Simulation

Click to Simulate channel flow

Simulate Print

Trapezoidal Inputs

Channel

Bank Slopes, z1,z2 6.0, 6.0 Bed Slope: 3.600% Freeboard: NA Min Bed Width: 8.00 ft

Fixed Depth: NA **Fixed Width: 20.00** Discharge: 40.0 cfs

Soil

Grain Roughness: 0.0156 Allowable Stress: 0.030 - 0.030 lb/sq.ft

Vegetal

	Stem Length	Density	Ret Curve Index	Veg Cover
Stability			4.44 (D)	Smooth Brome (0.87)
Capacity		7.64 (B)		

Outputs

Flow Conditions with minimum cover (Stability)

Manning's n	Average Velocity	Flow Depth	Effect. Soil Stress	Flow Width
0.0398	4.80 ft/sec	0.87 ft	0.039 lb/sq.ft	14.8 ft

X-sect. Area	Hydraulic Radius	Bed Width	Flow Width w/Fb
8.3 sq.ft	0.56 ft	4.4 ft	14.8 ft

Capacity Flow Conditions

Manning's n	Average Velocity	Flow Depth	Flow Width
0.0952	2.53 ft/sec	1.30 ft	20.0 ft

X-sect. Area	Hydraulic Radius	Bed Width	Flow Width w/Fb
15.8 sq.ft	0.78 ft	4.4 ft	20.0 ft

Warning: Effective Soil Stress is greater than Allowable Stress
(Might re-check your fixed depth and fixed width values)
Design channel is 20.0 ft wide x 1.30 ft deep

< Back Next > Finish

Note the Warning with suggestions to fix

Note the Fixed Width

Results

Report Title Block Information

Name

Designed By Date

Drawn By Date

Checked By Date


Approved By Date

Practice

Location

Project Information

Description

TRAPEZOIDAL Inputs				
Bank Slopes, z1,z2	6.0, 6.0	Bed Slope:	3.600%	Freeboard: NA
Channel Data	Fixed Flow Depth: NA	Fixed Flow Width:	20.00	Discharge: 40.0 cfs
Soil Data	Grain Roughness: 0.0156		Allowable Stress: 0.030 lb/sq.ft	
Vegetal Data	Stem Length	Density	Ret Curve Index	Vegetal Cover Factor
Stability			4.44 (D)	Smooth Brome (0.87)
Capacity			7.64 (B)	
Outputs				
Flow Conditions with Minimum cover (Stability)				
Manning's n	Average Velocity	Flow Depth	Effect. Soil Stress	Flow Width
0.0398	4.80 ft/sec	0.87 ft	0.039 lb/sq.ft	14.8 ft
X-sect. Area	Hydraulic Radius	Bed Width	Flow Width w/Fb	
8.3 sq.ft	0.56 ft	4.4 ft	14.8 ft	
Capacity Flow Conditions				
Manning's n	Average Velocity	Flow Depth	Flow Width	
0.0952	2.53 ft/sec	1.30 ft	20.0 ft	
X-sect. Area	Hydraulic Radius	Bed Width	Flow Width w/Fb	
15.8 sq.ft	0.78 ft	4.4 ft	20.0 ft	
Warning: Effective Soil Stress is greater than Allowable Stress (Might re-check your fixed depth and fixed width values) Design channel is 20.0 ft wide x 1.30 ft deep				
 <small>Natural Resources Conservation Service United States Department of Agriculture</small>		Reach Simulation Report Waterway Wizard Example _____ _____	Date _____ Designed _____ Drawn _____ Checked _____ Approved _____ <small>EFT Version 4.0.2.2</small>	File Name Wizard Drawing Name _____ 03/03/2017 Sheet _____ of _____

WW Sizing Wizard VS. WDT Comparison

WW Wizard

Quick Sizing Calculation

Limited to a single reach

Set channel geometry for reach

Doesn't require detailed survey data

Doesn't include Hydrology calculations

No earthwork (cut/fill) volumes

Waterway Design Tool

More expansive capabilities

Multiple reaches

Channel geometry varies x-sec. to x-sec.

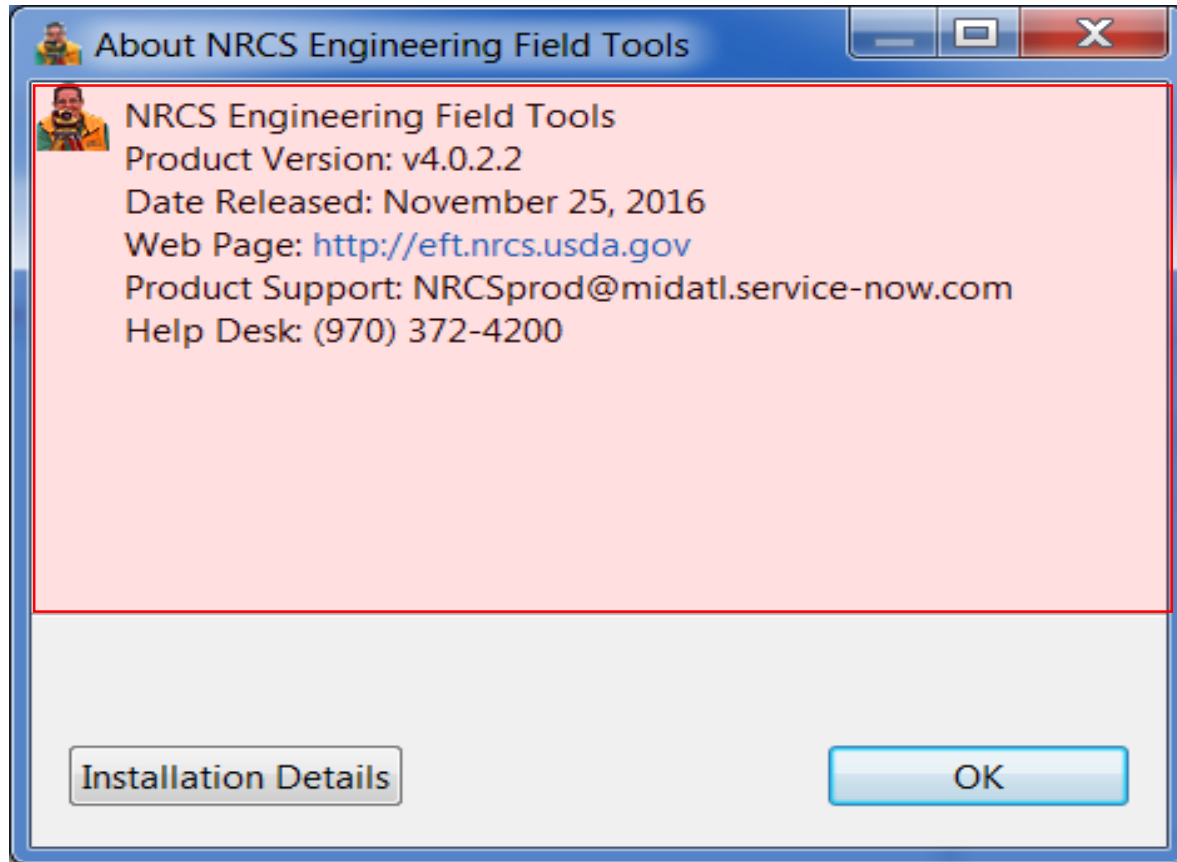
Survey data required to create a surface

Hydrology routine included (EFH2 model with older Type I, II, III distributions - doesn't use newer NOAA Atlas 14)

Calculates earthwork quantities

Graphically shows areas of cut and fill

NRCS Engineering Field Tools (EFT) - Resources



- State Conservation Engineer
- State Design Engineer

- SME- Waterway Wizard
Eric Fleming, Agricultural
Engineer
eric.fleming@gnb.usda.gov
(336)370-3348 (Office)



EFT Survey Engineering Tool Structure Templates and Survey Design Reports

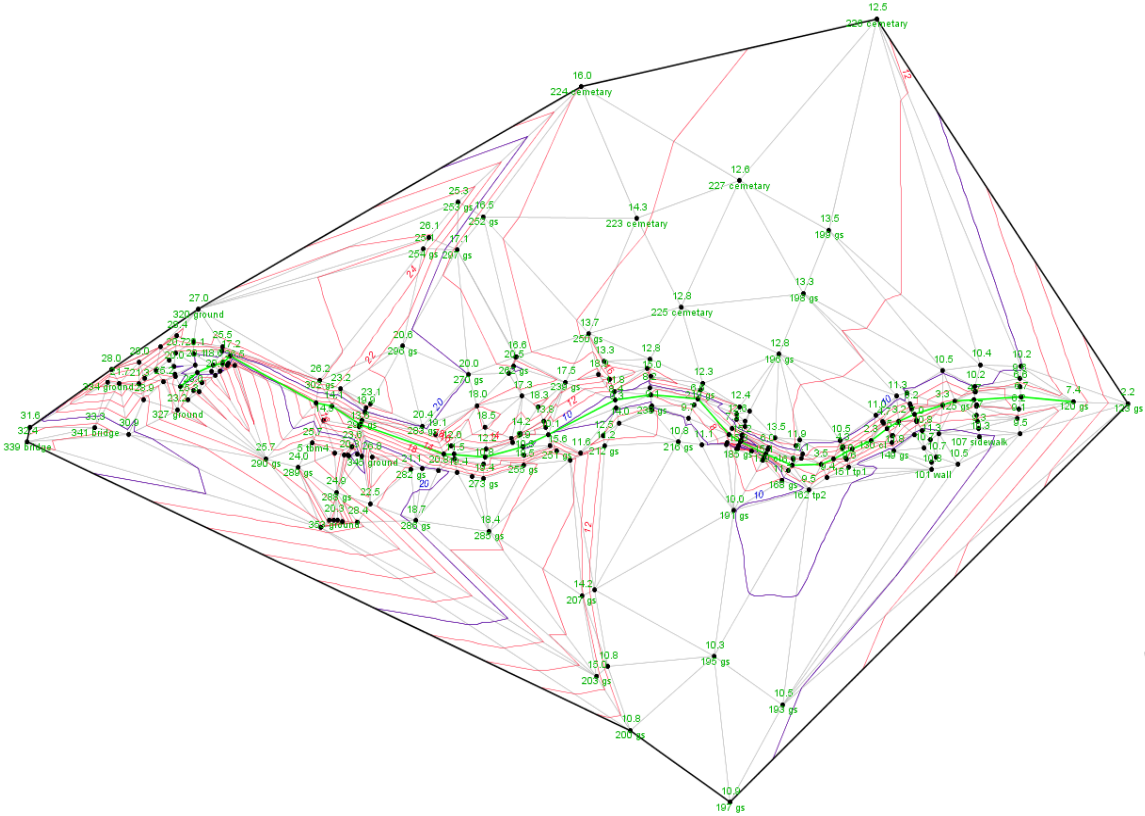
Kip Yasumiishi, P.E.
Civil Engineer - WNTSC



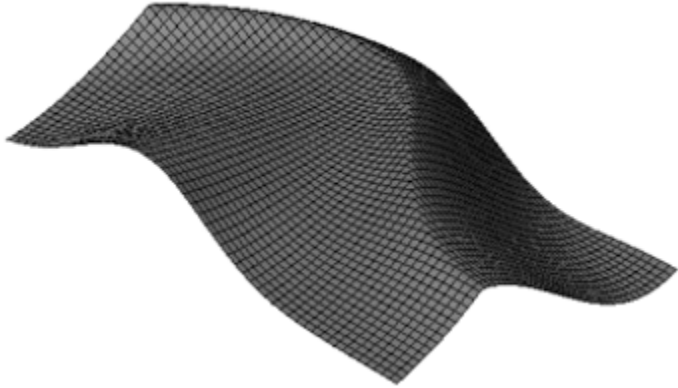
Survey Engineering Tool

- SET - software tool for survey note reduction, DTM and contour development, design applications, reports and map sheets
- Import Raster DEM and Image
- Limited CADD features and C3D compatibility

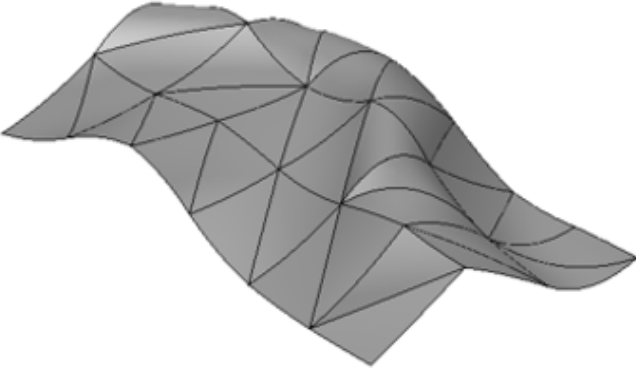
SET Ground Surface Model



SET DTM



Raster DEM (Import SET)



TIN DTM (SET Generated)

SET Features

Structure Templates

Pad

Pit Structures (3)

Land Leveling

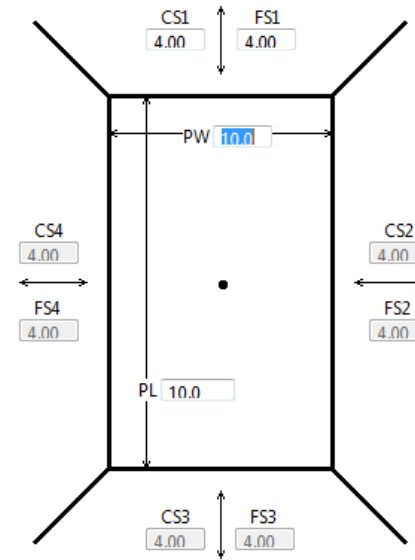
Survey Design Reports

Project Points

Survey Data

Structure (2)

Isopach (land leveling)

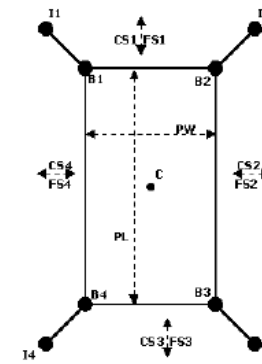


Structure Name: Pad

Structure Type: Pad

Structure Properties

PW	10.0
PL	10.0
CS 1	4.00:1
FS 1	4.00:1
CS 2	4.00:1
FS 2	4.00:1
CS 3	4.00:1
FS 3	4.00:1
CS 4	4.00:1
FS 4	4.00:1
Pad Elev.	17.0
Rotation	0.0



Stakeout Table

Pt. Name	Description	X	Y	Z	Cut / Fill
C	Center	4837.00	5226.00	17.0	F 3.8

Structure Templates

The screenshot displays the NRCS Engineering Field Tools (v4.0.2.2) interface. The main window shows a map with a network of points and lines, representing a survey or structure layout. The right-hand side contains a 'Summary' panel with sections for 'Report Title Block Information', 'Project Information', and 'Design Elements'. The 'Design Elements' section includes buttons for 'New', 'Open', 'Delete', 'Rename', and 'Redraw' for Surveys, Structures, and Forms. The 'New' button for Structures is highlighted with a red circle.

Report Title Block Information

Name	Wahikuli Gulch, May 2013		
Designed By	Kip	Date	2017
Drawn By	Kip	Date	
Checked By	Carol Drungil	Date	
Approved By	Eric Fleming	Date	
Practice	EFT Structures		
Location	Kaanapali, HI		

Project Information

Description

Construction Benchmark

Set Design Benchmark Elevation

Description

Design Elements

Surveys

Total Station

New
Open
Delete
Rename
Redraw

Structures

New
Open
Delete
Rename

Alignments

New
Open
Delete
Rename
Parallel

Forms

New
Open
Delete
Rename

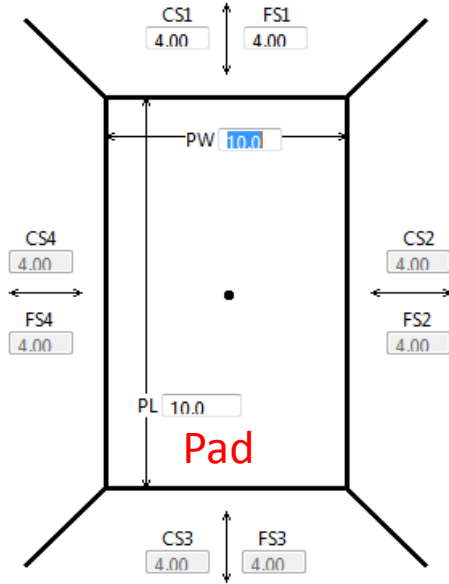
US Survey feet
NONE Elev. from survey TIN

HI NRCS => Wahikuli Gulch => May 2013

Structure Templates

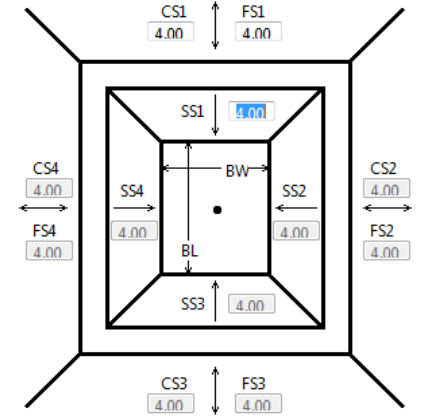
The screenshot displays the NRCS Engineering Field Tools (v4.0.2.2) interface. The main window is titled "EFT Map" and shows a topographic map with a network of points and lines. A dialog box titled "Create New Structure" is open in the center, prompting the user to "Select a Name for your Structure:" and "Please select which type of Structure to create:". The dialog lists several structure types: Rectangular Pit (highlighted), Pad, Land Leveling, Diked Pit, and Round Pit. The background interface includes a menu bar (File, Edit, Utilities, Help), a toolbar, and a right-hand panel with tabs for "Summary", "Project Info", "Project Points", and "Cut/Fill". The "Summary" tab is active, showing "Report Title Block Information" with fields for Name, Designed By, Drawn By, Checked By, Approved By, Practice, and Location. Below this, there are sections for "Structures" and "Forms", each with a "New" button circled in red. The status bar at the bottom indicates "HI NRCS => Wahikuli Gulch => May 2013".

Structure Templates



Use Equal Cut Slopes
 Use Equal Fill Slopes
 Center X:
 Center Y:
 Bottom Z:
 Rotation Azimuth:

Cut volume, cy:
 Fill volume, cy:
 Cut/fill balance:
 Cut/Fill ratio:



Pit (3)

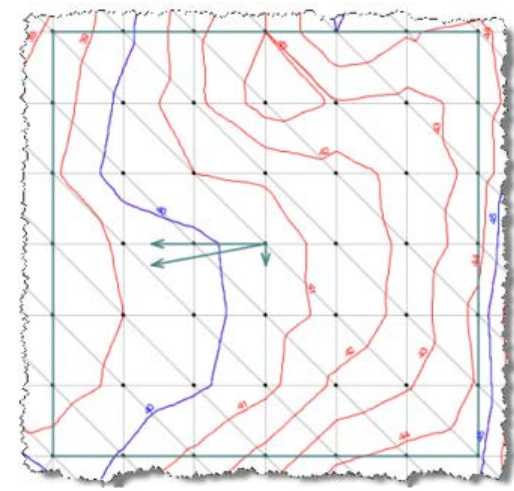
Use Equal Side Slopes
 Use Equal Cut Slopes
 Use Equal Fill Slopes
 Top Width: Top Elev:
 Bottom Width: Bottom Elev:
 Bottom Length: Pit Depth:
 Pit Center X:
 Pit Center Y:
 Rotation Azimuth:

Cut volume, cy:
 Fill volume, cy:
 Cut/fill balance:
 Cut/Fill ratio:
 Storage volume, ac-ft:
 Storage depth, ft:

Define Field Boundary:
 Base Point: X =
 Y =
 Z =
 % Slopes: Sx =
 Sy =
 Borrow =
 Waste =
 Cut/Fill Ratio =

 Cut volume, cy:
 Fill volume, cy:
 Cut rate, cy/ac:
 Field area, ac:

Land Leveling



Survey Design Reports

The screenshot displays the NRCs Engineering Field Tools (v4.0.2.2) interface. The 'File' menu is open, with 'Print Reports' highlighted. The main window shows a survey design with various points and lines. The right panel contains the following information:

Summary

Project Info | Project Points | Cut/Fill

Report Title Block Information

Name	Wahikuli Gulch, May 2013		
Designed By	Kip	Date	3/26/17
Drawn By	Kip	Date	3/26/17
Checked By	Carol Drungil	Date	3/28/17
Approved By	Eric Fleming	Date	3/28/17
Practice	Elevated Pad		
Location	HI		

Project Information

Description: Minihuni Sanctuary

Construction Benchmark

Set Design Benchmark Elevation:

Description:

Design Elements

Surveys

- Total Station

Structures

- Pad

Alignments

-

Forms

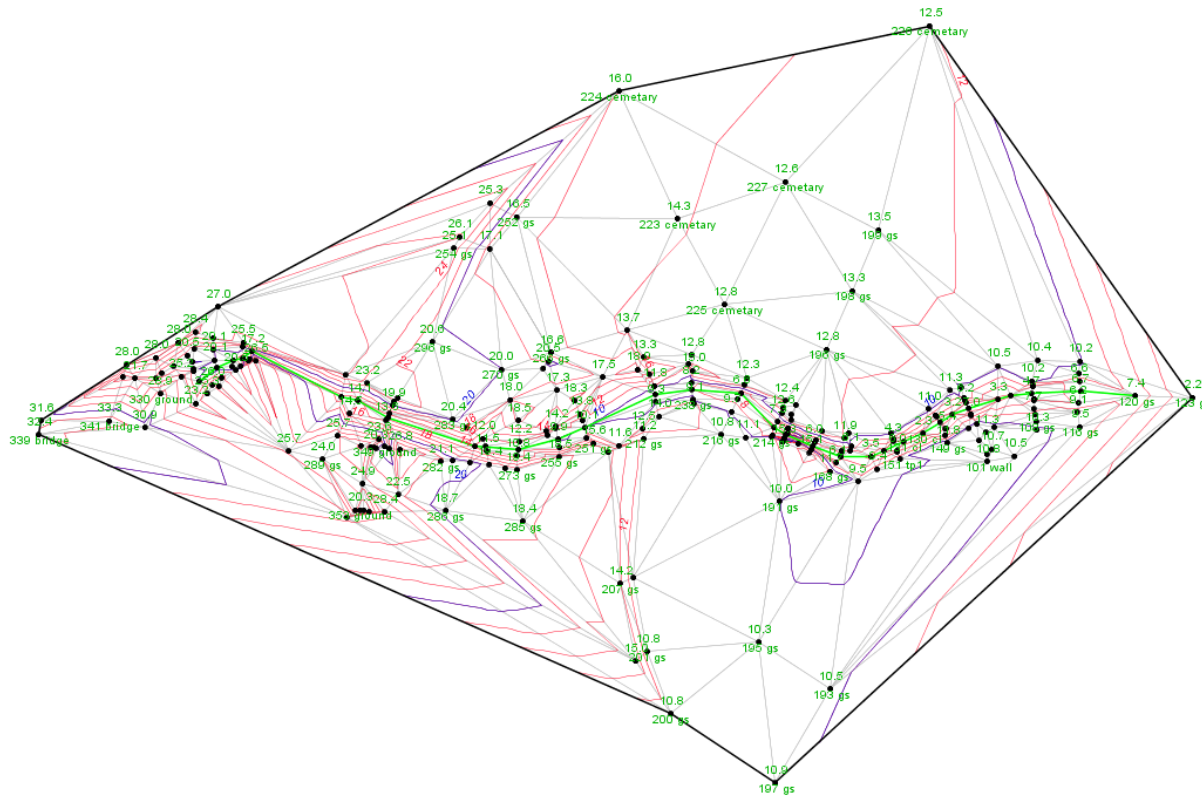
- Cover Page - Natl

US Survey feet
NONE Elev. from survey TIN

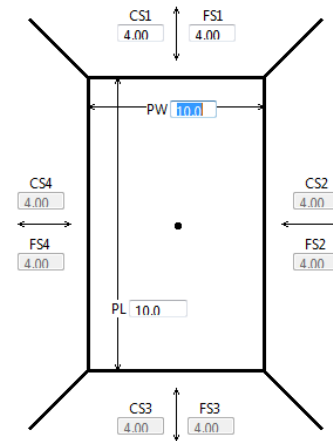
Example Pad Structure

The screenshot displays the NRCS Engineering Field Tools (v4.0.2.2) interface. The main window shows a map with a complex network of lines and points, representing a site plan or survey data. A dialog box titled "Create New Structure" is open in the foreground, prompting the user to "Select a Name for your Structure:" and "Please select which type of Structure to create:". The "Pad" option is selected in the dropdown menu. The dialog box also lists other structure types: Rectangular Pit, Land Leveling, Diked Pit, and Round Pit. In the background, the "Structures" panel on the right side of the interface has a "New" button circled in red, indicating the next step in the process. The "Summary" panel on the right shows a table with dates: 3/26/17, 3/26/17, 3/28/17, and 3/28/17. The "Forms" panel on the right shows a "Cover - Natl Template" form with "New", "Open", "Delete", and "Rename" buttons. The "EFT Map" panel on the left shows a tree view with "Drawings", "Surveys", "Ground Surfaces", "Alignments", "Sheet Data", "Grid", "Background Images", and "Structures". The status bar at the bottom indicates "US Survey feet" and "Elev. from survey TIN".

Example Pad Structure



Summary Pad



- Use Equal Cut Slopes
 - Use Equal Fill Slopes
- Center X:
- Center Y:
- Bottom Z:
- Rotation Azimuth:

Design

Cut volume, cy:

Fill volume, cy:

Cut/fill balance:

Cut/Fill ratio:

Example Pad Structure

The screenshot displays a software interface for site planning. The main window shows a site plan with a central pad structure. The pad is a rectangular structure with a width of 30.0 and a length of 50.0. The pad is surrounded by a network of lines representing the site's layout. The software interface includes a menu bar (File, Edit, Utilities, Help), a toolbar, and a left-hand navigation pane with the following items: Drawings (sp, pin), Surveys, Ground Surfaces, Alignments, Sheet Data, Grid, Background Images, Structures, Pad, and Outline. The right-hand panel shows a 'Summary: Pad' section with a diagram of the pad structure and the following parameters: Use Equal Cut Slopes (checked), Use Equal Fill Slopes (checked), Center X: 4840, Center Y: 5230, Bottom Z: 17, Rotation Azimuth: 0.0. Below the parameters are fields for Design, Cut volume, cy: 0.0, Fill volume, cy: 0.0, Cut/Fill balance: 0.0, and Cut/Fill ratio. At the bottom of the right-hand panel are buttons for 'Accept Edit' and 'Cancel Edit'. A red arrow points from the bottom right towards the pad structure in the main window.

File Edit Utilities Help

Overview | May 2013

Summary: Pad

CS1 4.00 FS1 4.00

PW 30.0

CS2 4.00 FS2 4.00

PL 50.0

Use Equal Cut Slopes

Use Equal Fill Slopes

Center X: 4840

Center Y: 5230

Bottom Z: 17

Rotation Azimuth: 0.0

Design

Cut volume, cy: 0.0

Fill volume, cy: 0.0

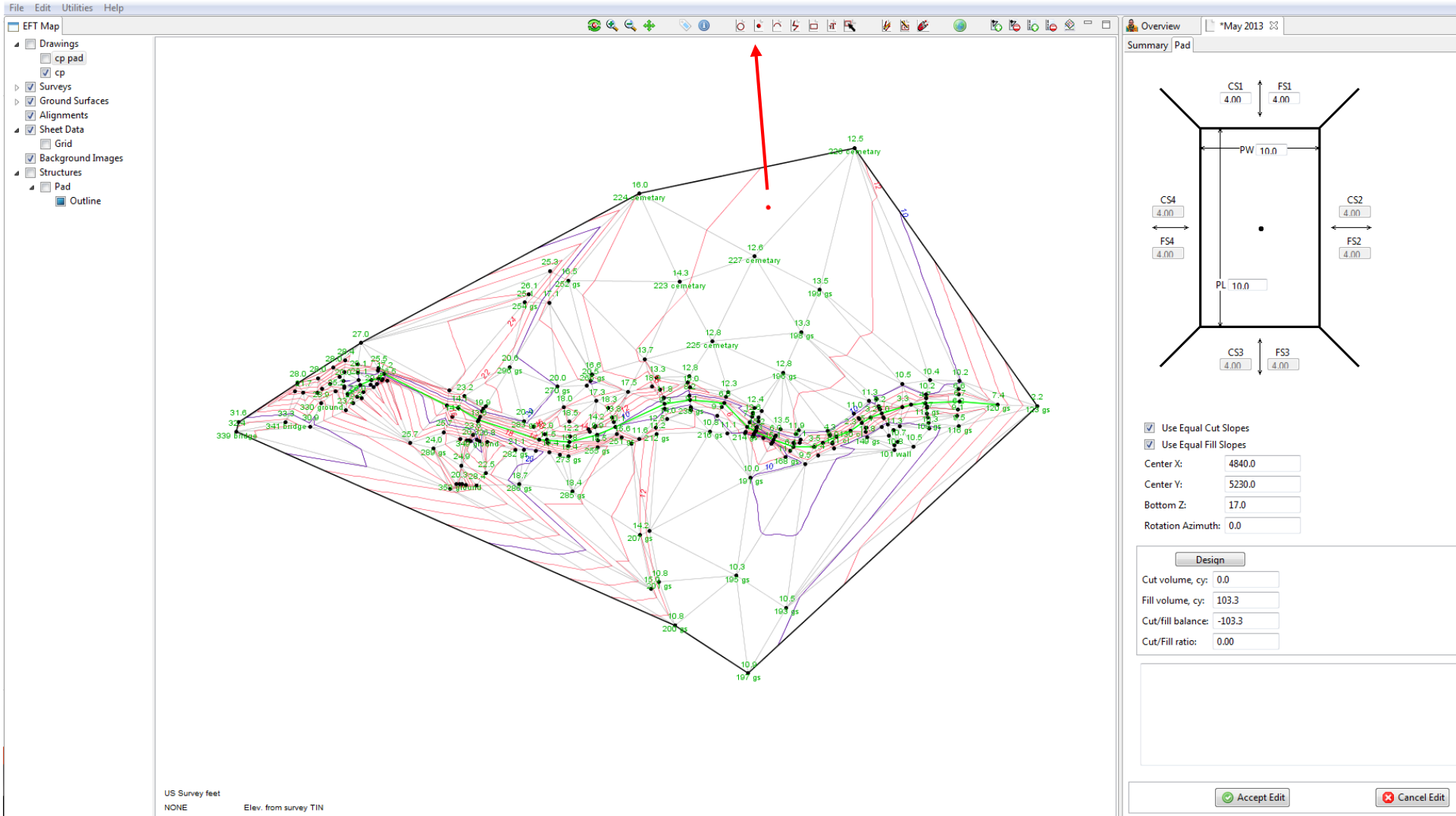
Cut/Fill balance: 0.0

Cut/Fill ratio:

Accept Edit Cancel Edit

US Survey feet X (Easting): 4,840.05 Y (Northing): 5,217.38 Z (Elevation): 013.00
NONE Click to start a zoom box.

Example Pad Structure



Example Pad Structure

The screenshot displays the EFT Map software interface. The main window shows a 3D terrain model with a proposed pad structure overlaid. The pad is a rectangular structure with a perimeter of 10.0 units (PW 10.0) and a length of 10.0 units (PL 10.0). The pad is surrounded by four cut slopes (CS1, CS2, CS3, CS4) and four fill slopes (FS1, FS2, FS3, FS4), all with a slope of 4.00. The terrain model shows various elevations and contours, with a center point marked by a red dot. The software interface includes a menu bar (File, Edit, Utilities, Help), a toolbar, and a left-hand navigation pane with options like Drawings, Surveys, Ground Surfaces, Alignments, Sheet Data, Grid, Background Images, Structures, and Pad. The right-hand pane shows the Summary Pad dialog, which includes a Design section with fields for Cut volume, Fill volume, Cut/fill balance, and Cut/Fill ratio. Red arrows labeled 1 and 2 point to the Design button and the Accept Edit button, respectively.

US Survey feet
NONE Elev. from survey TIN

Summary Pad

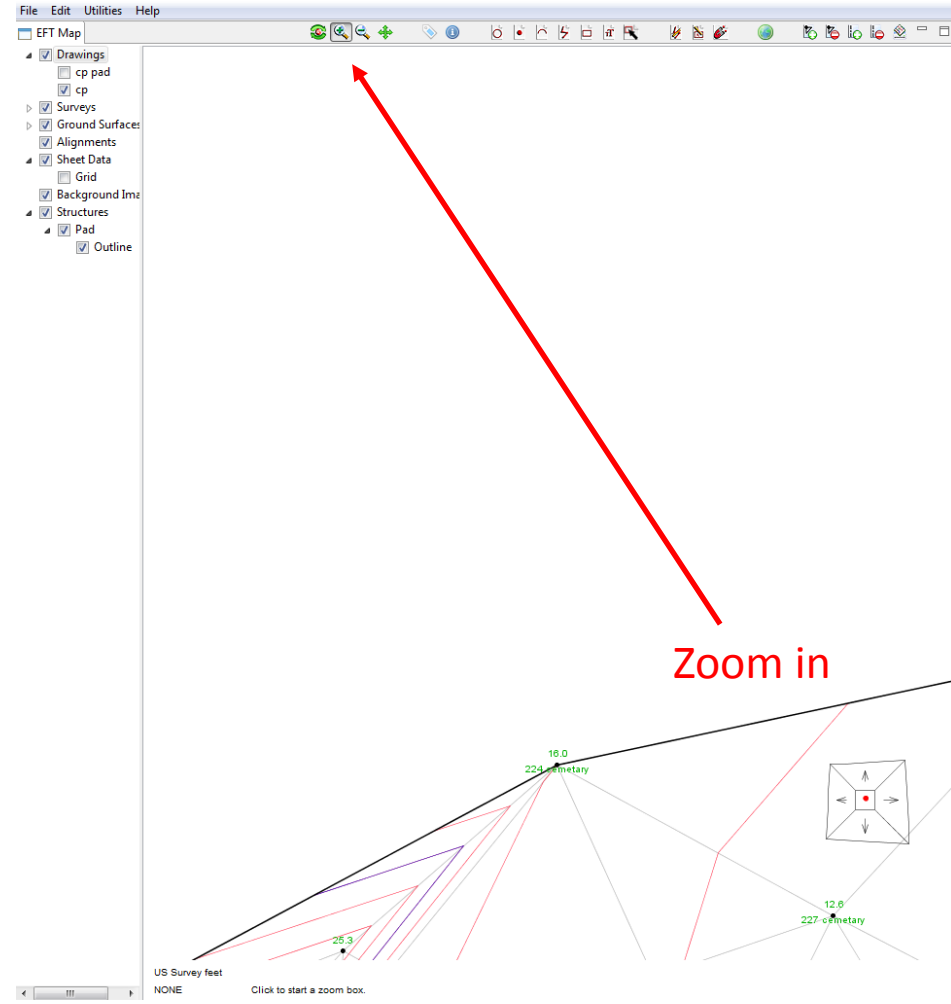
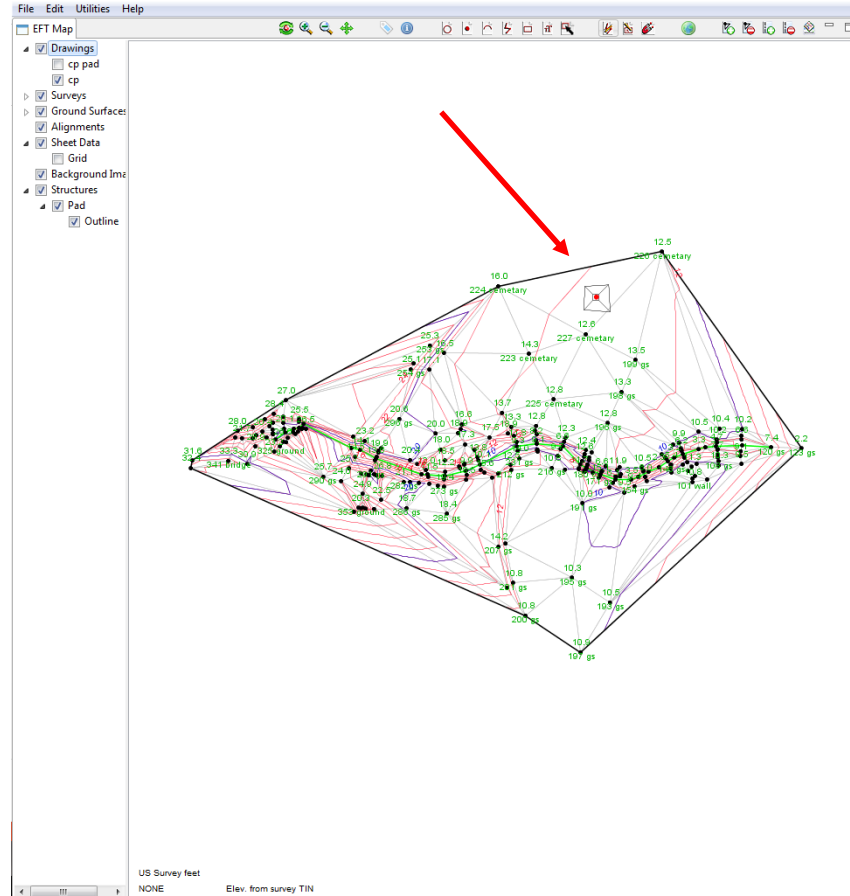
CS1 4.00 FS1 4.00
PW 10.0
CS2 4.00 FS2 4.00
PL 10.0
CS3 4.00 FS3 4.00
CS4 4.00 FS4 4.00

Use Equal Cut Slopes
 Use Equal Fill Slopes
Center X: 4840.0
Center Y: 5230.0
Bottom Z: 17.0
Rotation Azimuth: 0.0

Design
Cut volume, cy: 0.0
Fill volume, cy: 103.3
Cut/fill balance: -103.3
Cut/Fill ratio: 0.00

Accept Edit Cancel Edit

Example Pad Structure



Survey Design Reports

The screenshot displays the NRCES Engineering Field Tools (v4.0.2.2) interface. The 'File' menu is open, with 'Print Reports' highlighted. A 'Run Reports' dialog box is active, showing a tree view of reports for 'May 2013'. The 'Structure Report' is selected, indicated by a red arrow. A 'Configure Structure Reports' dialog box is also open, showing 'Design/Volume Report' and 'Stake-out Report' selected. The background shows a project overview window with details for 'Wahikuli Gulch, May 2013'.

File Menu:

- New Survey Design
- New Terrace Design
- New Waterway Design
- Hydraulics Formulas
- Close Survey Design
- Save Survey Design (Ctrl+S)
- Save As Survey Design
- Import
- Export
- Print Reports (Ctrl+P)**
- Exit (Ctrl+X)

Run Reports Dialog:

Please select desired Reports from the tree below:

Reports for Design Tool: May 2013

- Header
 - AppendFiles
- May 2013
 - AppendForms
 - Project Points Report
 - Survey Data Report
 - Structure Report
- Footer
 - AppendFiles

Auto-Number Pages

Buttons: OK, Cancel

Configure Structure Reports Dialog:

Select Structure Reports

Select Reports to document the selected Structures.

- Design/Volume Report
- Stake-out Report

Buttons: < Back, Next >, Finish, Cancel

Project Overview Window:

Project Info | Project Points | Cut/Fill

Report Title Block Information

Name	Wahikuli Gulch, May 2013		
Designed By	Kip	Date	3/26/17
Drawn By	Kip	Date	3/26/17
Checked By	Carol Drungil	Date	3/28/17
Approved By	Eric Fleming	Date	3/28/17
Practice	Elevated Pad		
Location	HI		

Object Information

Description: Minihuni Sanctuary

Construction Benchmark: Elevation


Set Design Benchmark: Elevation

Description

Project Points Report

Report Preview

1 / 9



Natural Resources Conservation Service
United States Department of Agriculture

May 2013.xml

Report Generated 03/07/2017

Project Points Report

Project Name: Wahikuli Gulch, May 2013
Project Description: Minihuni Sanctuary
Designed by: Kip **Date:** 3/26/17

Location: HI
Practice: Elevated Pad
Checked by: Carol Drungil **Date:** 3/28/17

Pt Name	X (Easting)	Y (Northing)	Z (Elevation)	Description
339	4184.58	4953.90	32.37	bridge
337	4187.00	4966.14	31.61	bridge
341	4245.02	4965.68	33.25	bridge
334	4256.47	5003.57	20.88	ground
400	4260.00	5014.00	28.00	Kip
342	4267.04	5002.48	21.74	bridge
343	4275.51	4960.29	30.87	bridge
332	4284.71	5002.17	21.29	ground
401	4285.00	5020.00	28.00	Kip
330	4288.88	4989.01	28.93	ground
340	4290.05	5006.91	20.52	bridge
338	4300.20	5013.05	20.39	bridge
402	4304.00	5033.00	28.00	Kip
328	4306.74	5003.67	25.15	ground
6	4311.91	5021.71	20.46	tbm8
333	4316.38	5016.36	19.96	ground

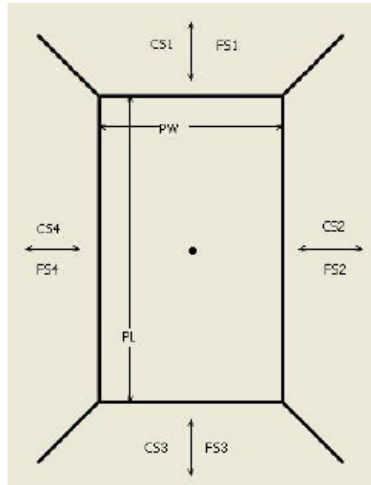
Structure Volume Report

Project Name: Wahikuli Gulch, May 2013
 Project Description: Minihuni Sanctuary
 Designed by: Kip Date: 3/26/17

Location: HI
 Practice: Elevated Pad
 Checked by: Carol Drungil Date: 3/28/17

Structure Name: Pad

Structure Type: Pad



Structure Design and Volume Report

Structure Size and Location:

Center X = 4837.00
 Center Y = 5226.00
 Bottom Elevation = 17.0
 Bottom Width = 10.0
 Bottom Length = 10.0
 Rotation Azimuth = 0.0

Design Results:

Cut Volume 0.00 cu yd
 Fill Volume 103.82 cu yd
 Cut / Fill Balance -103.82 cu yd
 Cut/Fill Ratio 0.00

Slope Table:

	Cut Slope	Fill Slope
Slope 1	4.00:1	4.00:1
Slope 2	4.00:1	4.00:1
Slope 3	4.00:1	4.00:1
Slope 4	4.00:1	4.00:1

Structure Stakeout Report

Project Name: Wahikuli Gulch, May 2013
 Project Description: Mimihihi Sanctuary
 Designed by: Kip Date: 3/26/17

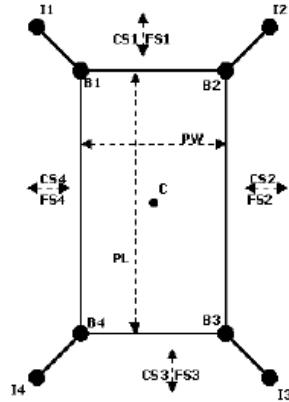
Location: HI
 Practice: Elevated Pad
 Checked by: Carol Drungil Date: 3/28/17

Structure Name: Pad

Structure Type: Pad

Structure Properties

PW	10.0
PL	10.0
CS 1	4.00:1
FS 1	4.00:1
CS 2	4.00:1
FS 2	4.00:1
CS 3	4.00:1
FS 3	4.00:1
CS 4	4.00:1
FS 4	4.00:1
Pad Elev.	17.0
Rotation	0.0



Structure Stakeout Report

Stakeout Table

Pt. Name	Description	X	Y	Z	Cut / Fill
C	Center	4837.00	5226.00	17.0	F 3.8
B1	Bottom 1	4832.00	5231.00	17.0	F 3.7
B2	Bottom 2	4842.00	5231.00	17.0	F 3.8
B3	Bottom 3	4842.00	5221.00	17.0	F 4.0
B4	Bottom 4	4832.00	5221.00	17.0	F 3.8
I1	Corner Intercept 1	4818.84	5244.16	13.7	0
I2	Corner Intercept 2	4857.50	5246.50	13.1	0
I3	Corner Intercept 3	4859.52	5203.48	12.6	0
I4	Corner Intercept 4	4816.82	5205.82	13.2	0



Summary

- SET functionality based upon a DTM (TIN) or an imported raster DEM (and contour file)
- *Structure Templates* assist with the design and earthwork computations (excavation and fill)
- *Survey Design Reports* document project point and survey data, structure parameters and earthwork computations, and stake-out information



EFT Future Vision



EFT Future Vision

New Tools

- **Pipeline Design Tool** – in development
- **Hydrology Tool** – in development, will replace EFH-2, WinTR-55, and Win TR-20, will include GIS functionality.



EFT Future Vision

New Tools

- **Animal Waste Management Tool** – replace current AWM application
- **Irrigation Water Management Tool** – replace and standardize current applications and spreadsheets
- **Farm Pond Design Tool** – replace WinPond for basic farm pond design



EFT Future Vision

CDSI Integration

- EFT will be the engineering planning and design tool of choice on the Conservation Desktop
- The current CDSI Roadmap has EFT integration planned for Conservation Desktop Release 10, scheduled in mid-FY19.