Estimating Base Flood Elevations in Approximate A Zones

Kurt Buchanan, CFM

Huntington District Corps of Engineers

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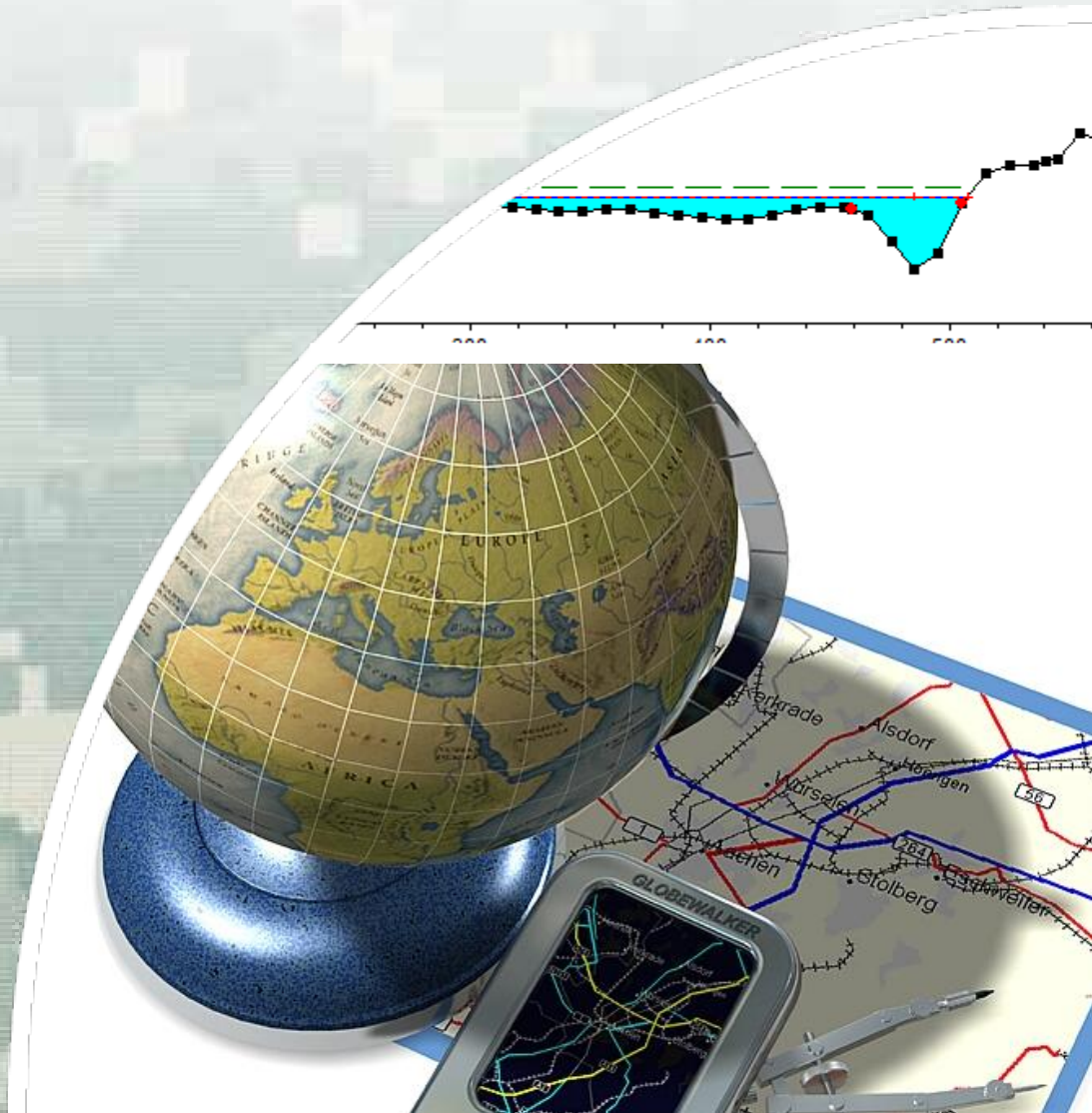


US Army Corps of Engineers

BUILDING STRONG®

BFE Requirements in Approximate A Zones

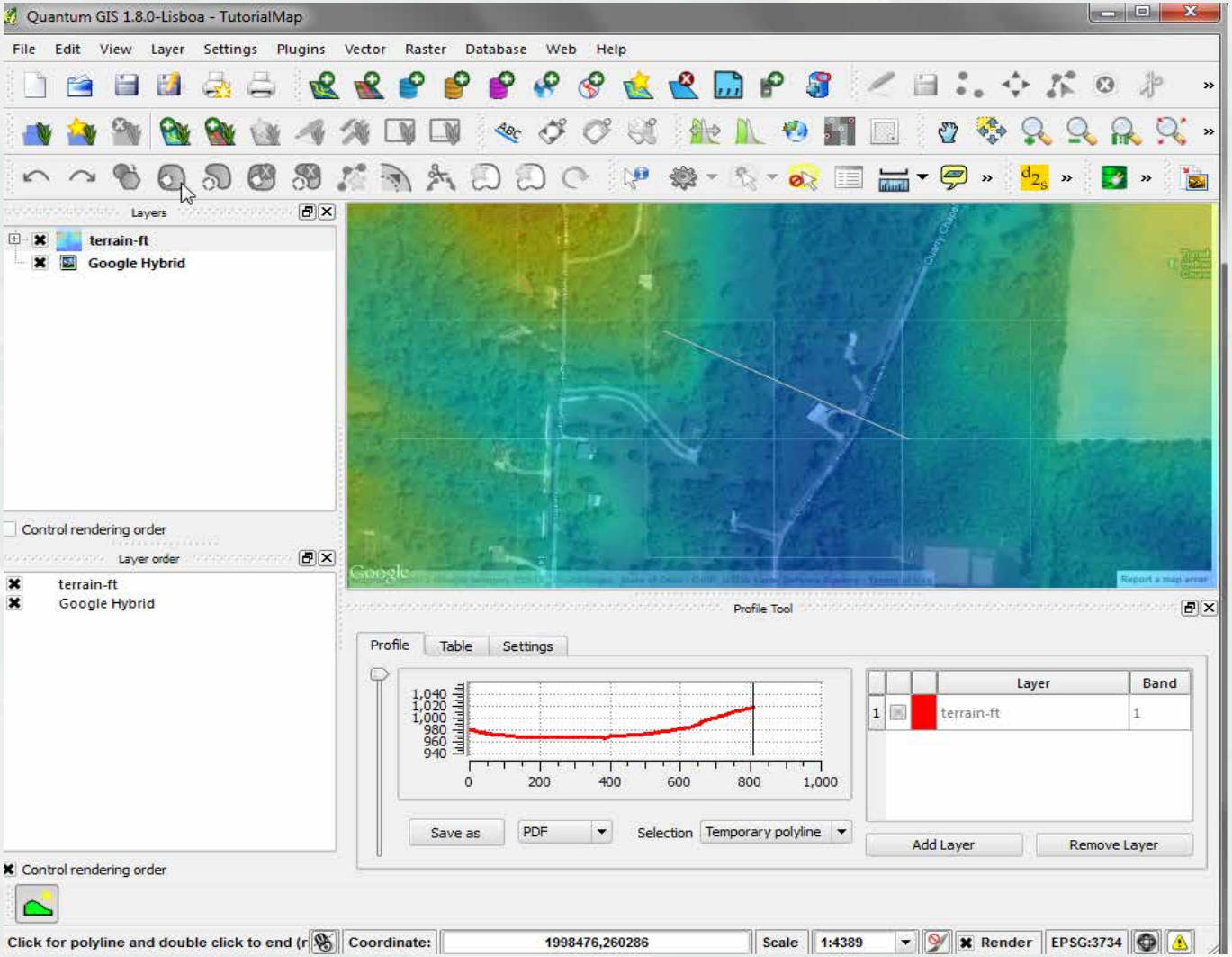
- FEMA 265: Managing Floodplain Development in Approximate Zone A Areas, July 1995
- Requires use of best available data to determine a BFE
- Describes simplified methods and detailed methods
  - Simplified: point on boundary, contour interpolation
  - Detailed: requires floodplain geometry (**topography**), discharge (**hydrology**), and flood height (**hydraulics**)
- A simplified method CANNOT be used for an Elevation Certificate

Topography

How can I get a Cross Section?

- Can be obtained from existing mapping or surveyed
- Cross sections can be derived from digital elevation models (DEMs) from USGS using GIS software
- ESRI's ArcGIS software or Quantum GIS open source software

Cross section in Quantum GIS

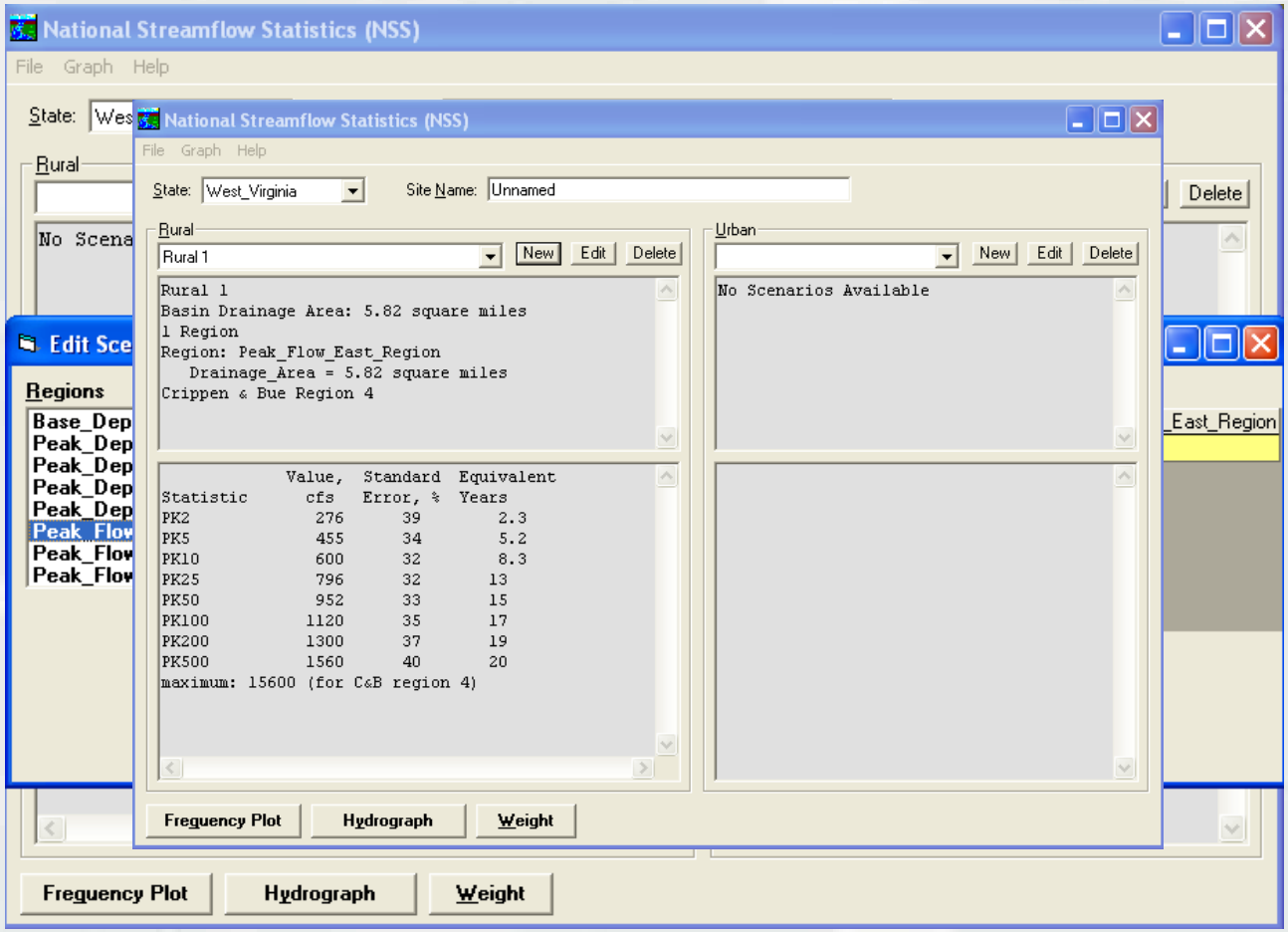


Hydrology

What is the 100-year flow?

- Can be obtained from a USGS program called NSS (National Stream Statistics)
- Requires the drainage area in square miles
- Drainage area can be determined using a flow accumulation grid or watersheds in a GIS program

NSS Program



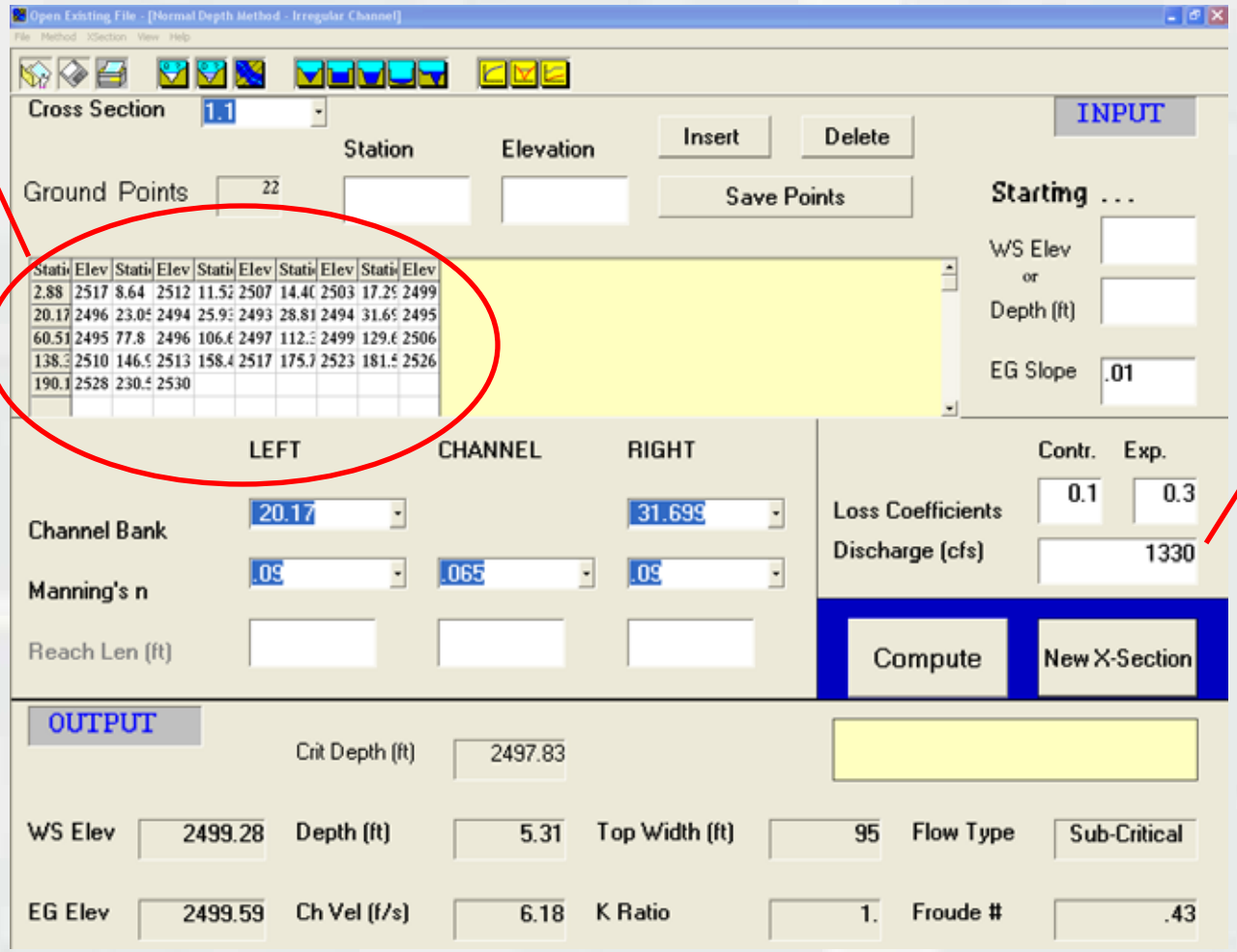
Hydraulics

If I put discharge A through area B, what will the water elevation be?

- A hydraulic program can use the cross section profile and the discharge to estimate the water surface elevation
- FEMA's Quick-2 v2: simplified model built for analyzing a single cross section
  - Easy to use, but not always stable
- HEC-RAS: built for more detail, but can be used in a simplified manner

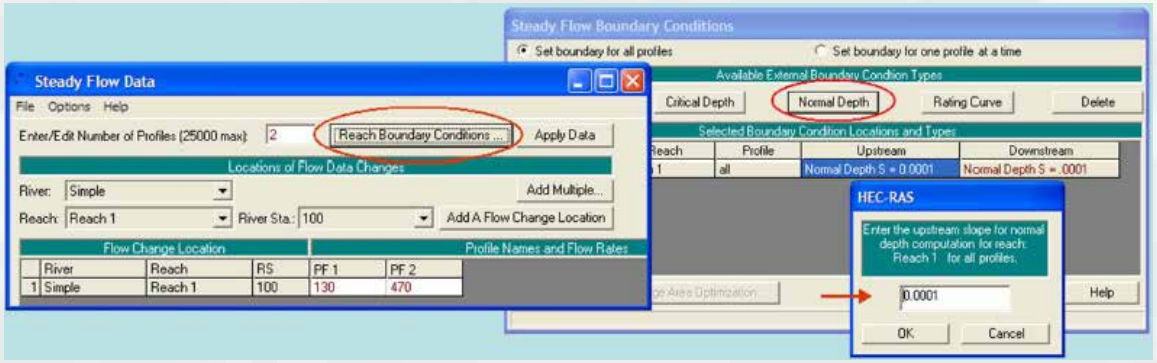
Quick-2

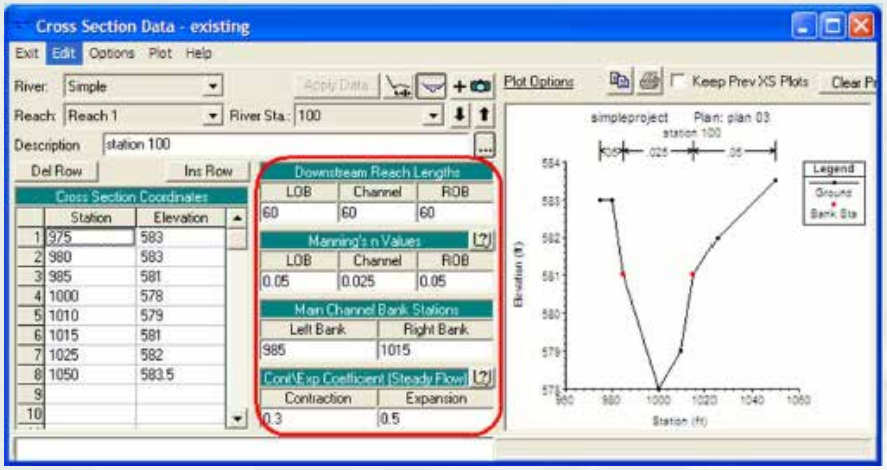
Cross Section Profile

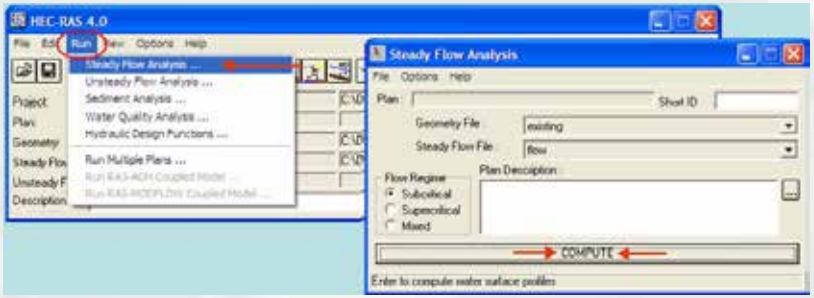


100-year discharge

HEC-RAS


Steady Flow Boundary Conditions
Set boundary for all profiles
Set boundary for one profile at a time
Available External Boundary Condition Types
Critical Depth
Normal Depth
Rating Curve
Delete
Selected Boundary Condition Locations and Types
Reach
Profile
Upstream
Downstream
all
Normal Depth S = 0.0001
Normal Depth S = .0001
Steady Flow Data
File Options Help
Enter/Edit Number of Profiles (25000 max):
2
Reach Boundary Conditions ...
Apply Data
Locations of Flow Data Changes
River:
Simple
Add Multiple...
Reach:
Reach 1
River Sta.:
100
Add A Flow Change Location
Flow Change Location
Profile Names and Flow Rates
River
Reach
RS
PF 1
PF 2
1 Simple
Reach 1
100
130
470
HEC-RAS
Enter the upstream slope for normal depth computation for reach: Reach 1 for all profiles.
0.0001
OK
Cancel
Help


Cross Section Data - existing
Exit
Edit
Options
Plot
Help
River:
Simple
Reach:
Reach 1
River Sta.:
100
Description
station 100
Del Row
Ins Row
Cross Section Coordinates
Station
Elevation
1 975 583
2 980 583
3 985 581
4 1000 578
5 1010 579
6 1015 581
7 1025 582
8 1050 583.5
Plot Options
Keep Prev XS Plots
Downstream Reach Lengths
LOB
Channel
ROB
60
60
60
Manning's n Values
0.05
0.025
0.05
Main Channel Bank Stations
Left Bank
Right Bank
985
1015
Cont\Exp Coefficient (Steady Flow)
Contraction
Expansion
0.3
0.5
simpleproject
Plan: plan 03
station 100
Legend
Ground
Bank Sta
Elevation (ft)
Station (ft)


HEC-RAS 4.0
Run
Steady Flow Analysis ...
Unsteady Flow Analysis ...
Sediment Analysis ...
Water Quality Analysis ...
Hydraulic Design Functions ...
Run Multiple Plans ...
Steady Flow Analysis
File Options Help
Plan:
Short ID
Geometry File
existing
Steady Flow File
flow
Plan Description
Flow Regime
Subcritical
Supercritical
Mixed
COMPUTE
Enter to compute water surface profiles

Considerations

- How detailed is the elevation data?
- Is the channel adequately depicted? On large rivers, is the water surface included in the DEM?
- Is flooding influenced by backwater from another source?
- Could a bridge, culvert, or other structure have significant hydraulic influence?
- What is the purpose for the BFE? Single home or large development?

Documentation

Document as much as possible in a letter or report to be submitted with an Elevation Certificate

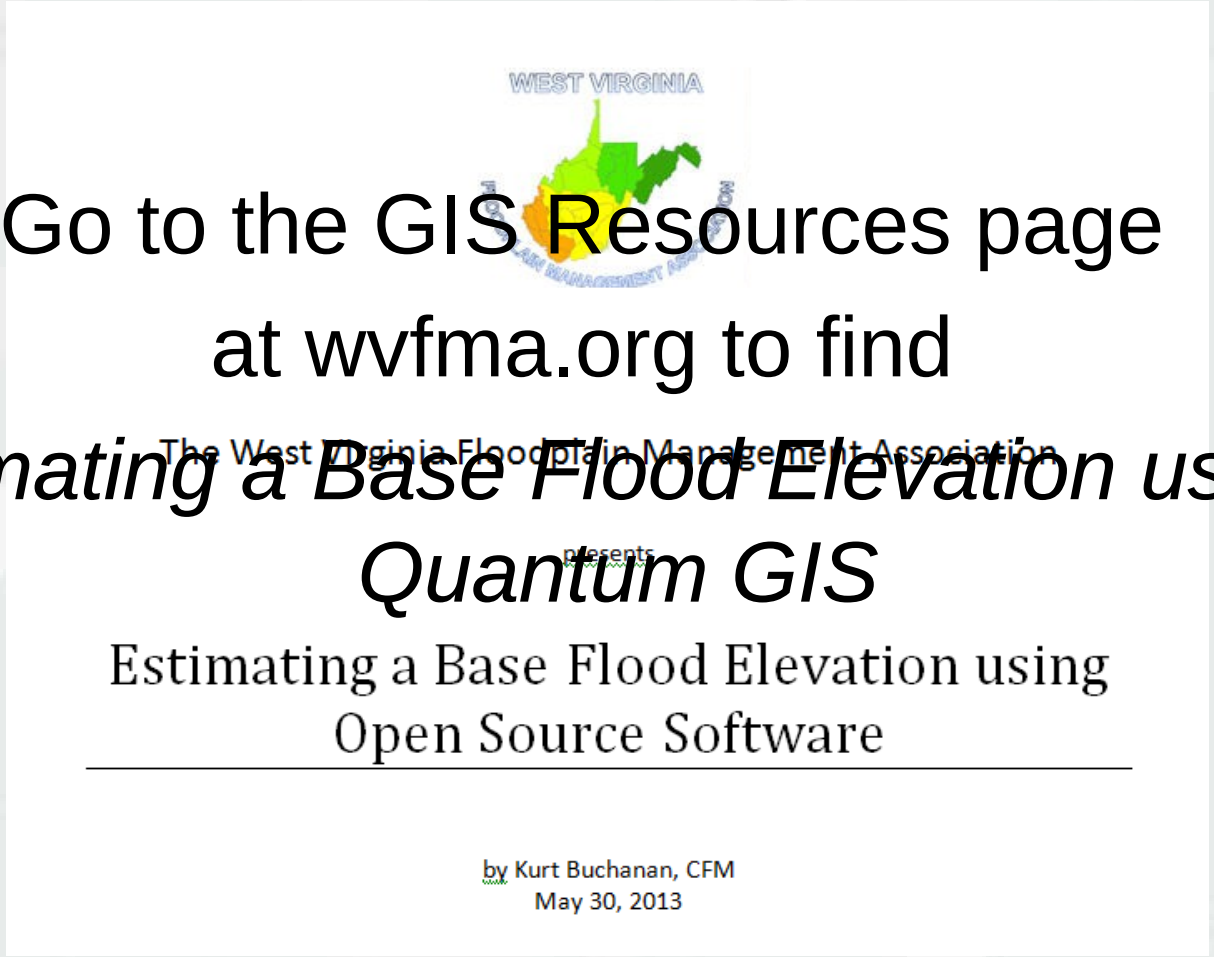
- Software used
- Elevation data source
- Drainage area
- NSS parameters
- 100-year discharge
- Manning's N values
- Screenshots
- Profile Graph

Include enough information for FEMA to be able to see that you used a detailed method to determine the BFE

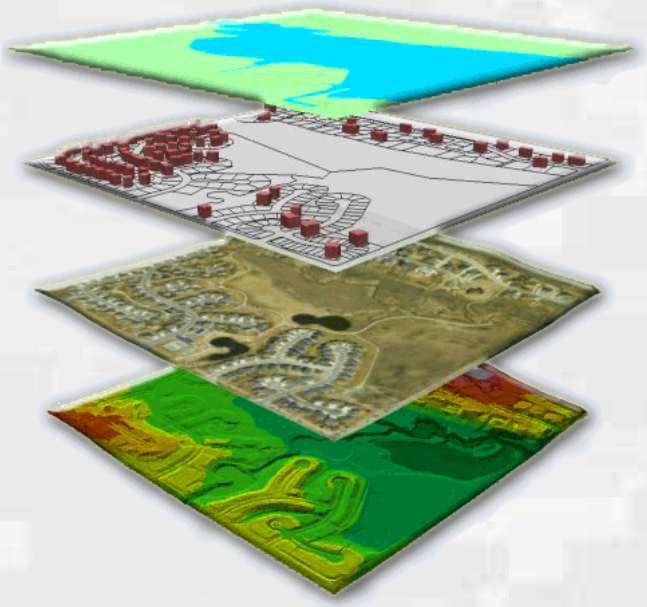
How in the world can I do all that?

Go to the GIS Resources page at wvfma.org to find

Estimating a Base Flood Elevation using Quantum GIS



QUESTIONS?



kurt.l.buchanan@usace.army.mil