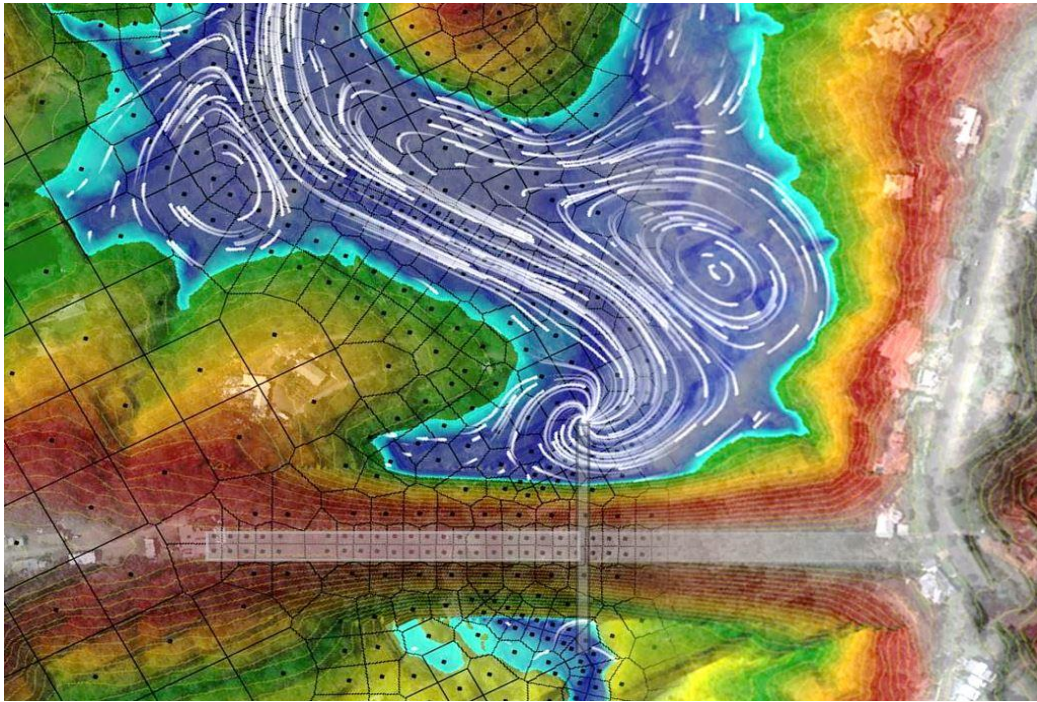# HEC-RAS 5.0 Training
## Australia
# Workshop Guide

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# Contents
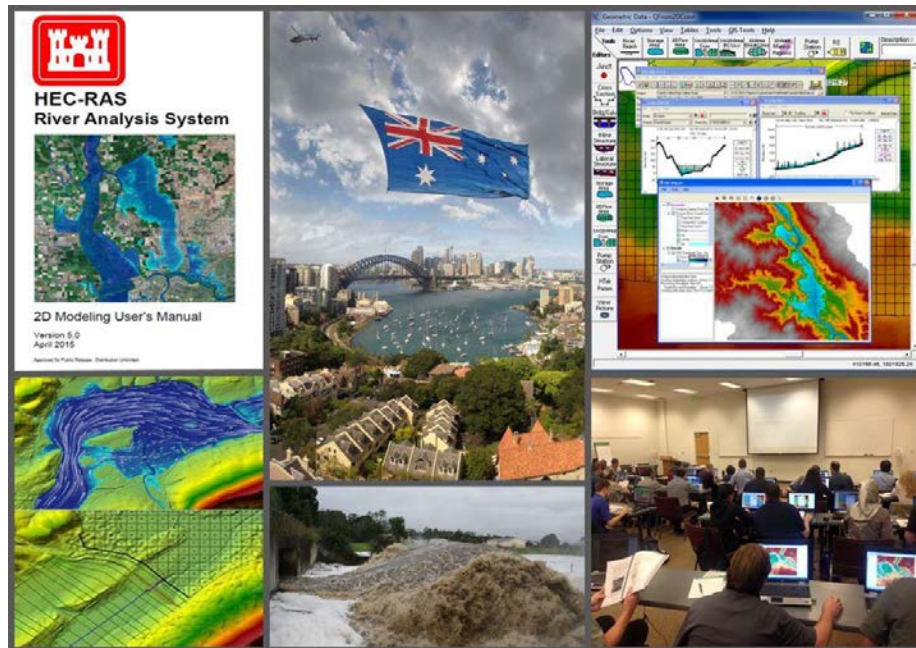


**Workshops:**

In conjunction with the lecture notes,
these workshops are designed to prepare you
to build, run, and animate 1D and 2D flood models
using the new features available in HEC-RAS 5.0.5

Additional resources: **www.surfacewater.biz/workshops/**

## Key:



**Left-click**     **Right-click**     **Double-click**     **Select Link**     **Draw**

## Introduction

This guidance document describes a basic model setup process for:

- HEC-RAS one-dimensional (1D) flood model
- HEC-RAS two-dimensional (2D) flood model

This guide includes new features available in HEC-RAS Version 5.0.5 and assumes that users have downloaded and installed the latest version.

The schematic image below shows an example of the file setup for the files that will be developed for these exercises along with the relevant icons for creating, running, and viewing basic HEC-RAS models.

Reading from left to right, the HEC-RAS icons that will be covered in these exercises correspond to the following files:

- HEC-RAS project file (*.prj)
- Geometry file (*.g01)
- Unsteady flow file (*.u01)
- Plan file (*.p01)
- RAS Mapper file (*.rasmapper)

The first four icons shown in the inset image below require user input with a defined title that is associated with each file name. The RAS Mapper file (*.rasmapper) is automatically created and does not require the selection of a title.

Before beginning, an appropriate folder structure should be set up under a HEC-RAS directory created within the overall project folder. Here is an example of the folders to be created:

- Aerial photos
- Hydrology
- Land use
- Projection
- Results
- Terrain
- Shape files

This folder structure may be adjusted to suit organisational IT requirements and geospatial data standards. Available shape files, terrain files, hydrographs, and other relevant files should be placed in the appropriate folders before proceeding. It would be beneficial to create new layers outside of HEC-RAS for some features first, such as:

- Catchment delineations
- Flow paths
- Cross section and long section profile alignments
- Roadway or levee centreline alignments
- Building footprints

These features should be defined as shape files using CAD or GIS software (Arc, QGIS, AutoCAD, etc.). The shape file should include a name field, and individual features should be assigned names that will allow clarity and consistency in the HEC-RAS model once the shape file is imported.

# HEC-RAS File Management:
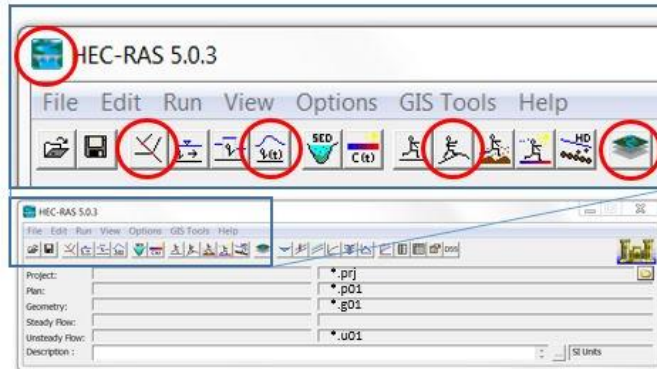


**HEC-RAS Project File (\*.prj)**

- Model settings
- File linkage
- Project description

**RAS Mapper File (\*.rasmapper)**

- Assign projection (\*.prj)
- Associate terrain/land use
- View:
  - Geometry input
  - Plan results
  - Geospatial data

**Plan File (\*.p01)**

- Geometry and flow linkage
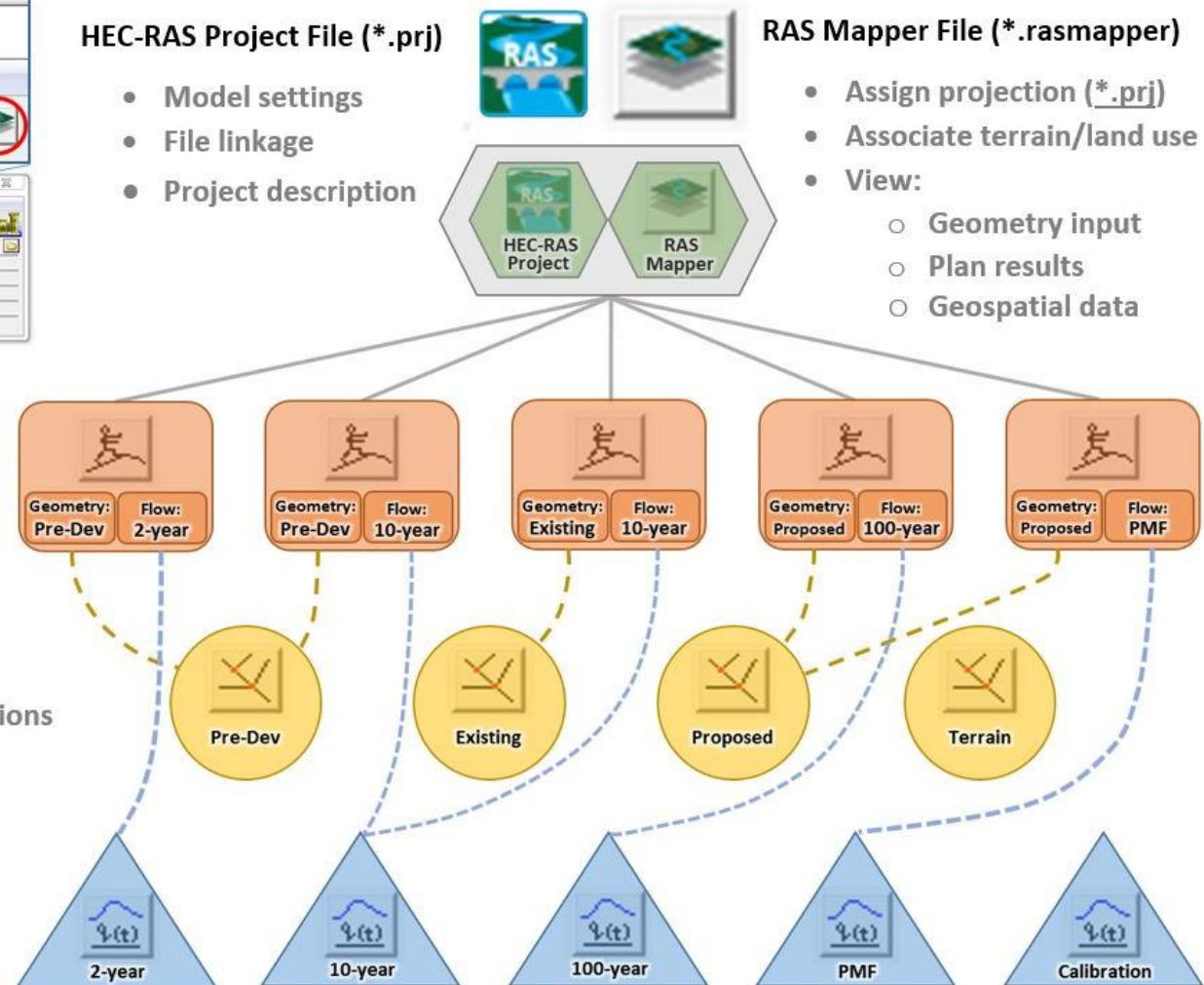- Simulation window
- Options & tolerances

**Geometry File (\*.g01)**

- Mesh definition
- Breaklines & boundary locations
- Roughness

**Unsteady Flow File (\*.u01)**

- Hydrographs
- Precipitation rates
- Boundary conditions

HEC-RAS Project    RAS Mapper

Geometry: Pre-Dev    Flow: 2-year
Geometry: Pre-Dev    Flow: 10-year
Geometry: Existing    Flow: 10-year
Geometry: Proposed    Flow: 100-year
Geometry: Proposed    Flow: PMF

Pre-Dev    Existing    Proposed    Terrain

2-year    10-year    100-year    PMF    Calibration

4

# Introduction: Getting started

**Download elevation data (Skip this step if terrain and projection are already available)**
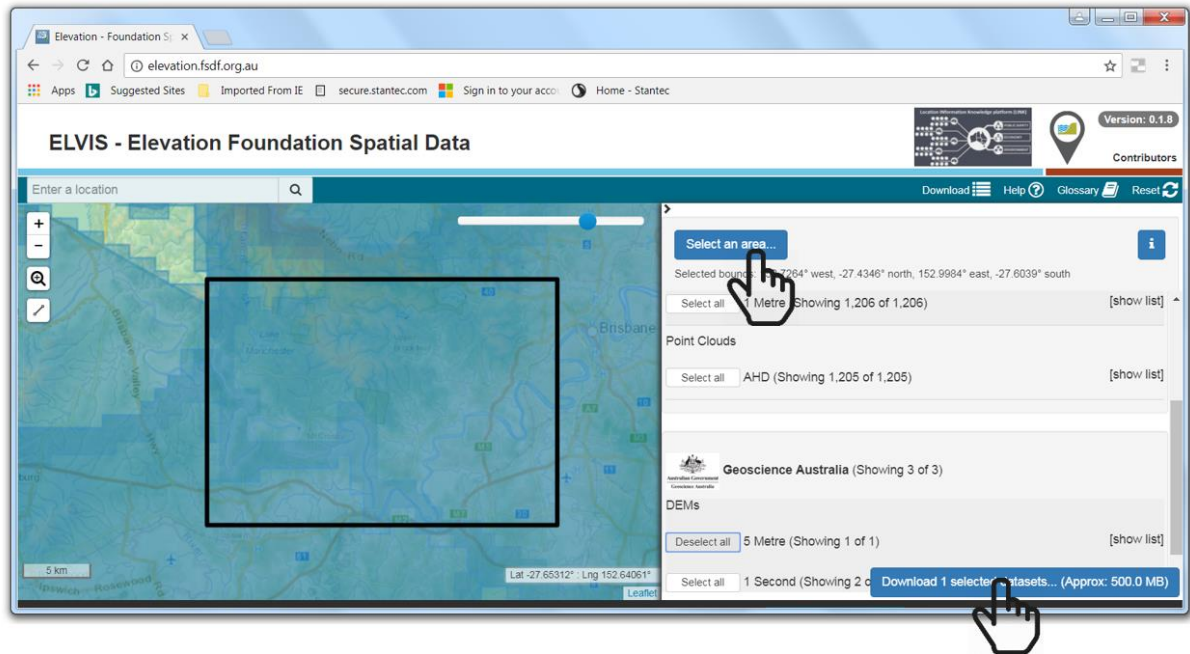
- Google "Australia elevation data" and select Geosciences Australia website
- Hint: Internet Explorer may not work; Chrome or Firefox are generally preferred.
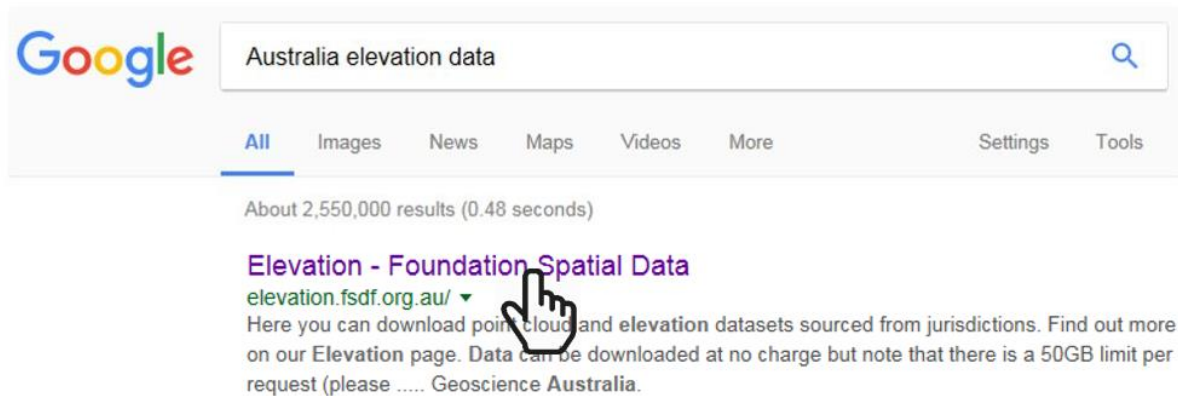


- Select Elevation Foundation Spatial Data, accept conditions, and click download link
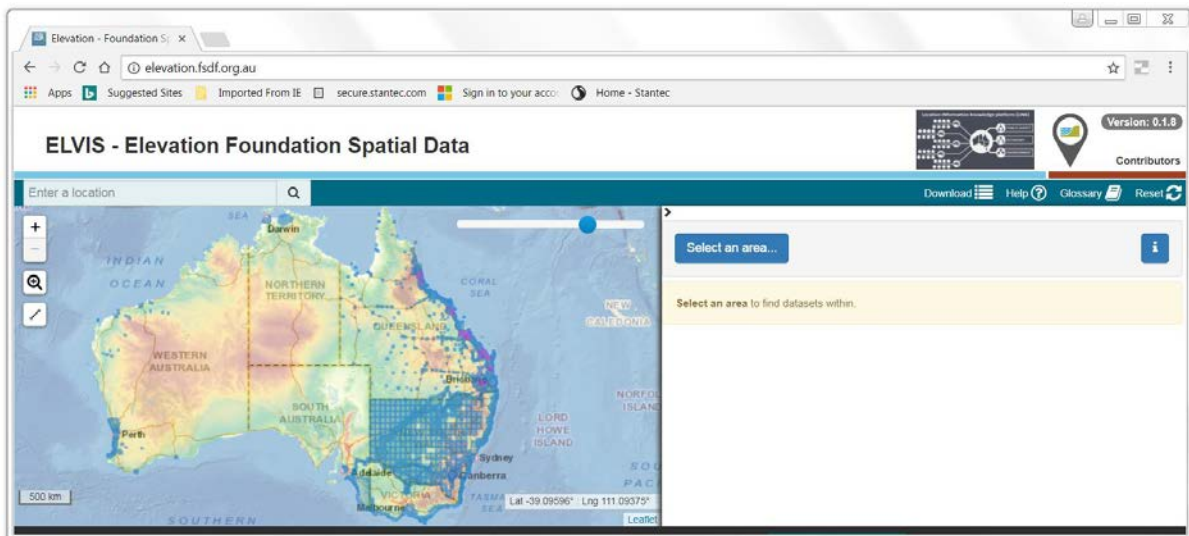


- Zoom/pan to area of interest and choose "Select an area"
- Select data set and click on "Download"

- Output format (suggest geotiff) and coordinate system (suggest GDA 94)
- Enter e-mail address and start extract

- Google "Australia Zone XX projection file", click on spatialreference.org website



Select prj file and download (suggest creating "GIS" folder and assigning descriptive name)
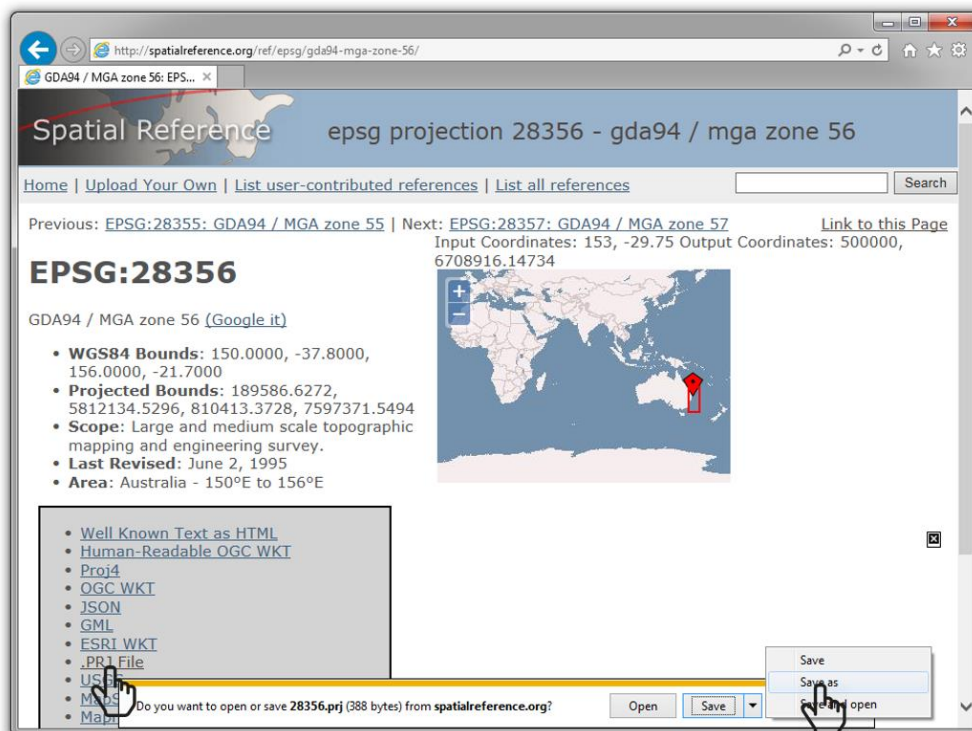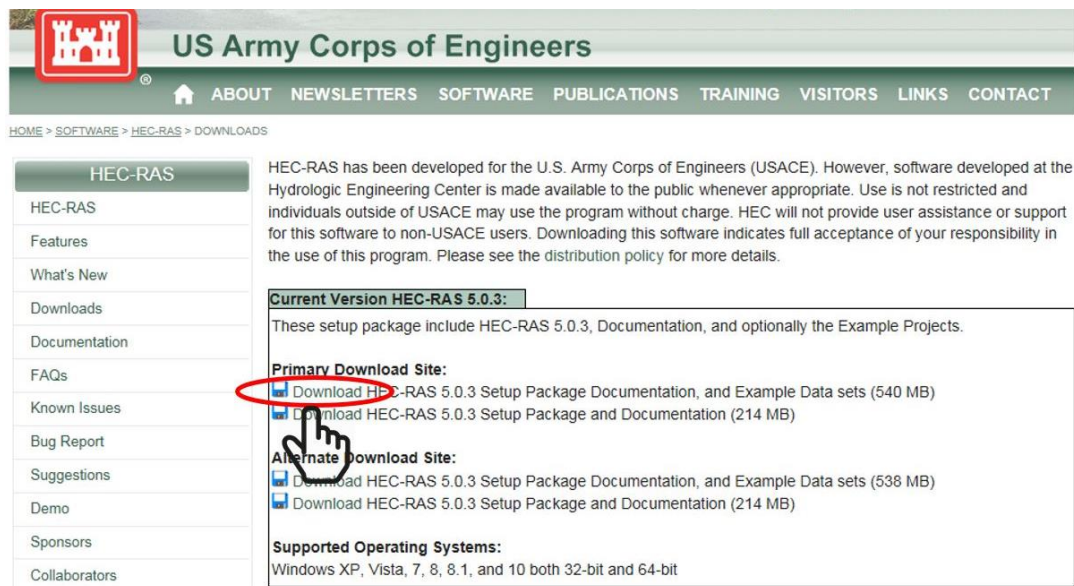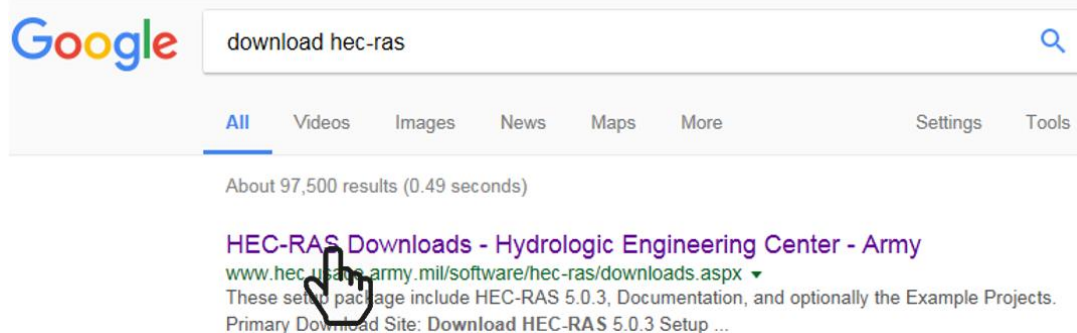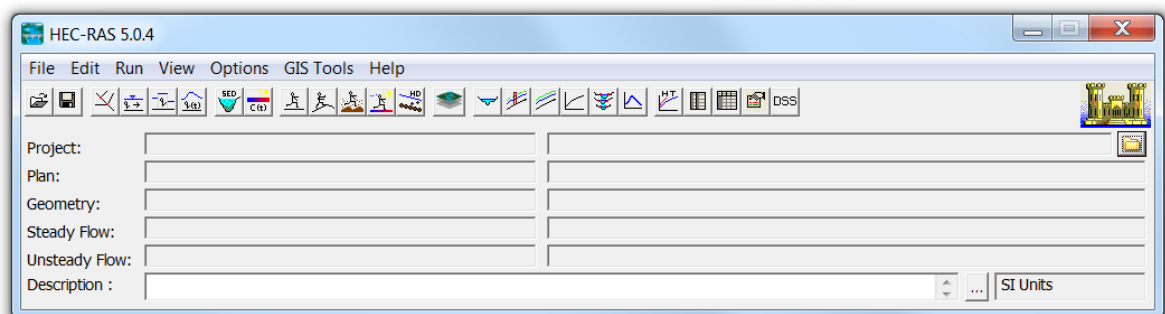
# Workshop 1: Set Up Project File and RAS Mapper

- **Download the latest version of HEC-RAS (Version 5.0.5)**
    - Google "Download HEC-RAS"
    - Download link: http://www.hec.usace.army.mil/software/hec-ras/downloads.aspx
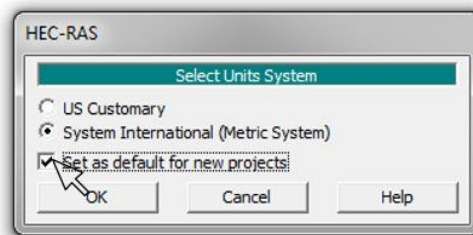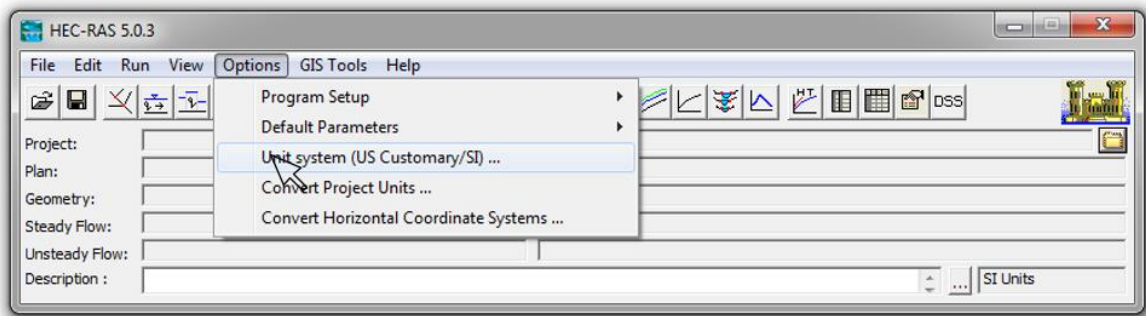    - Recommend installing with Example Projects



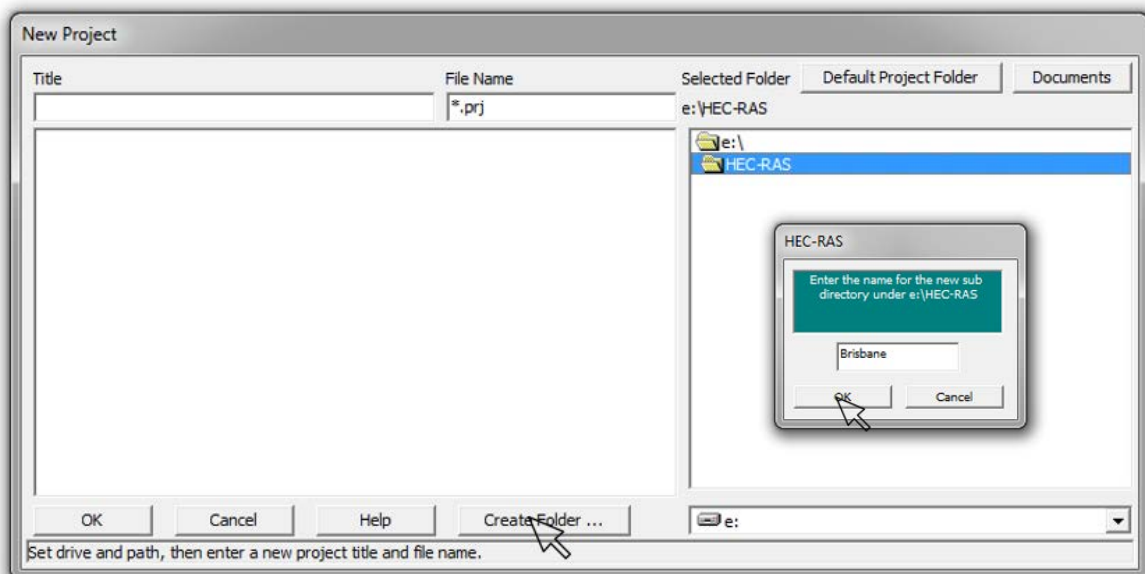- **Open HEC-RAS (Select HEC-RAS 5.0.5 from Start Menu)**

- Set unit systems to default to SI units (Options | Unit System)



- Start a new project in SI units (File | New Project)
- If folder structure has not yet been set up, return to introduction for instructions or create a new folder (recommend setting up folder in root directory, not in windows shortcuts)

- Assign descriptive project title and relevant file name

[Note: the file name will be replicated in many other files with varying file extensions – sometimes to hundreds or even thousands of files. The files are not easily renamed, so choose the file name carefully!]
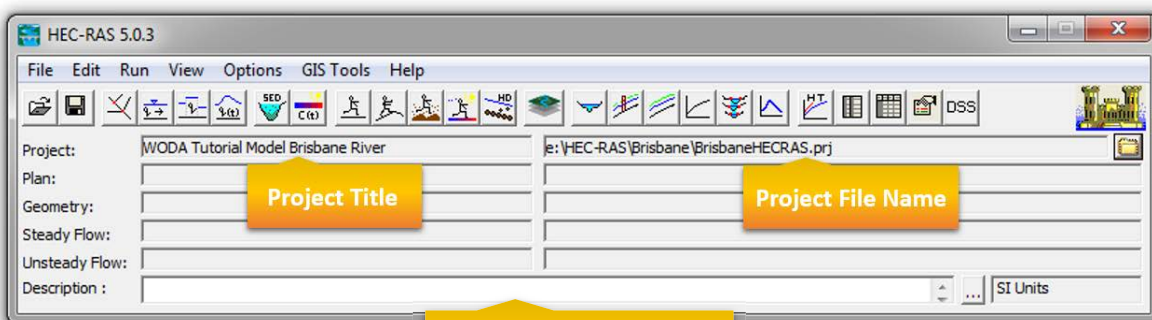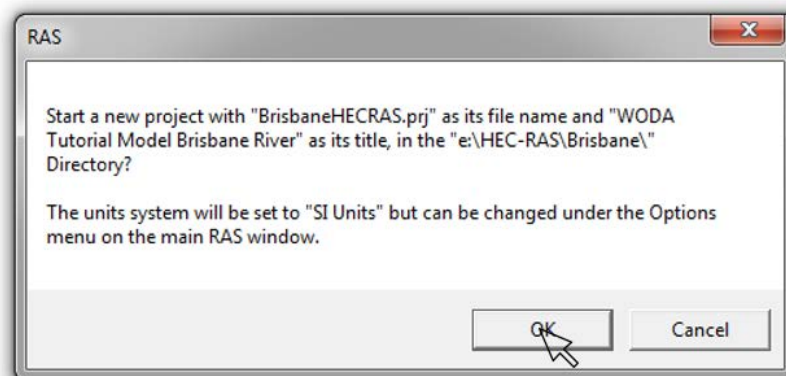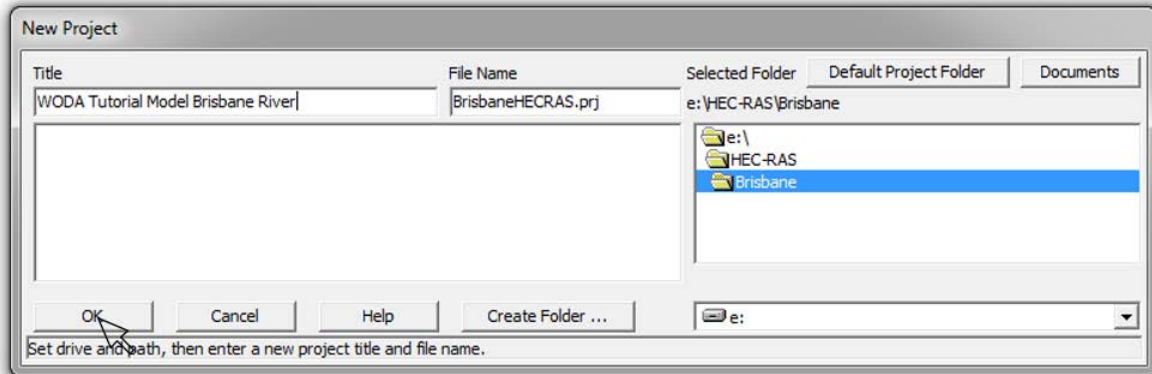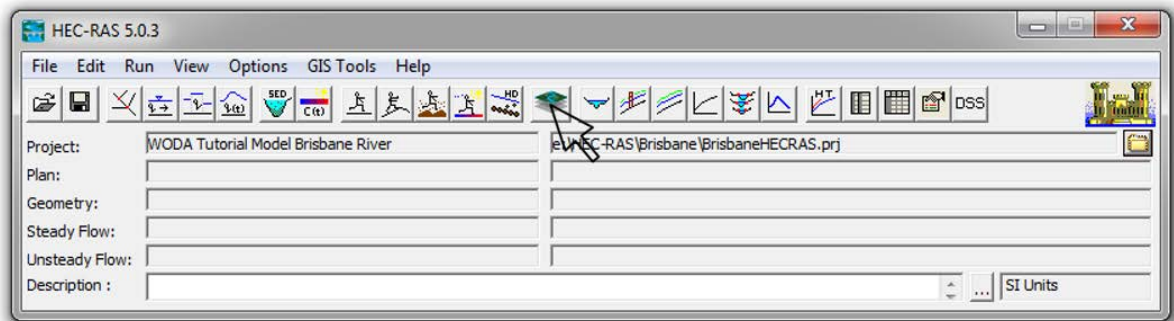






- Enter description, including:
  - Purpose of model
  - End client
  - Data sources for hydrology
  - Data sources for terrain data
  - Name and contact details for modeller
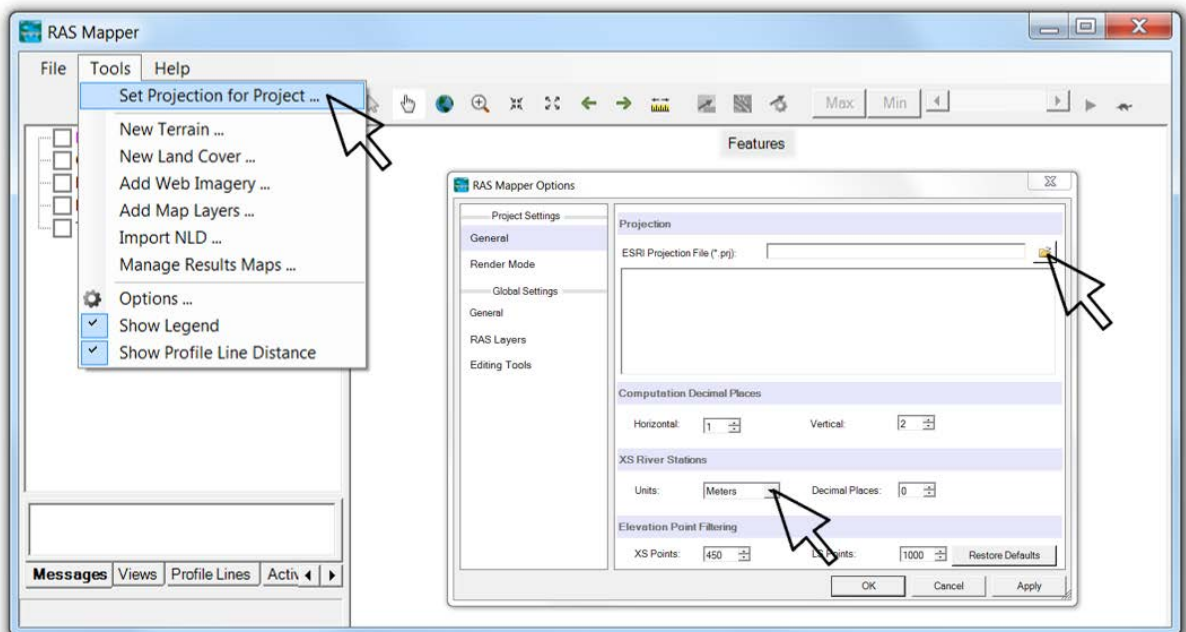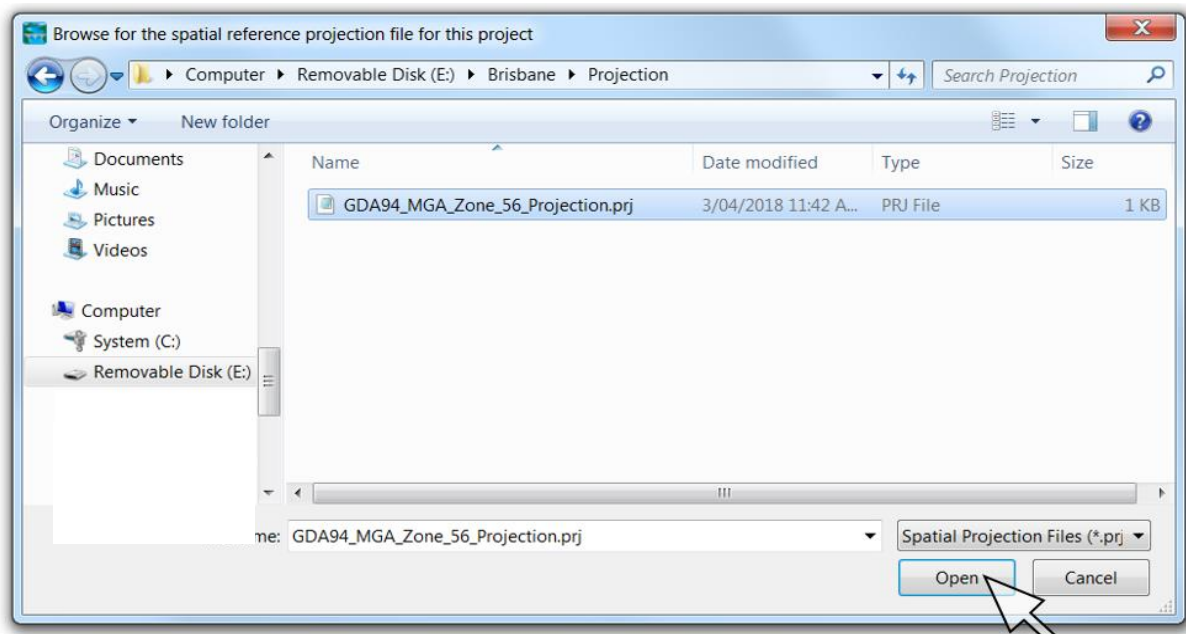- Save files using File | Save

- Open RAS Mapper (click on RAS Mapper icon or Menu: GIS Tools | RAS Mapper)



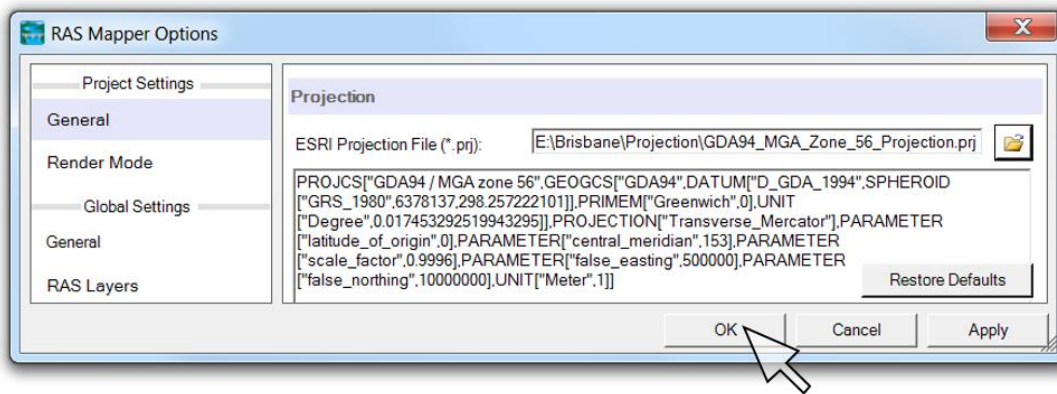- Set projection (Menu: Tools | Set Projection for Project)



- Change Default XS River Stations to Metres and browse to downloaded projection file
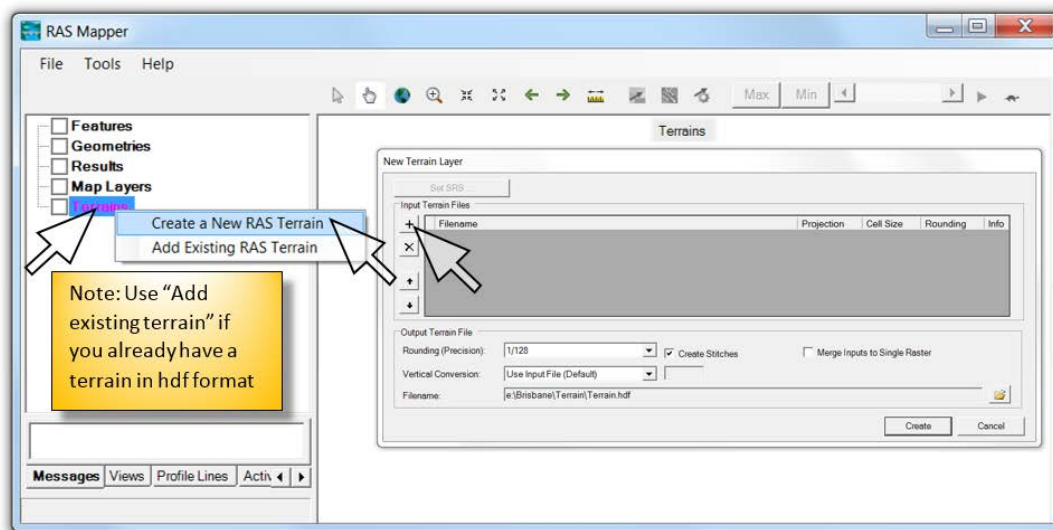
- **Confirm details**



- **Create a new terrain (right-click on Terrain | Create a new terrain) and select "plus" button**



Note: Use "Add existing terrain" if you already have a terrain in hdf format

- **Browse to downloaded or provided terrain file (Be sure to drag down to additional file types)**
- Users with high spec computers, use "Brookfield_1m.tif"; all others use "Brookfield_5m.tif"



Note: Drag down file type if your raster data is in asc, dem, or other format
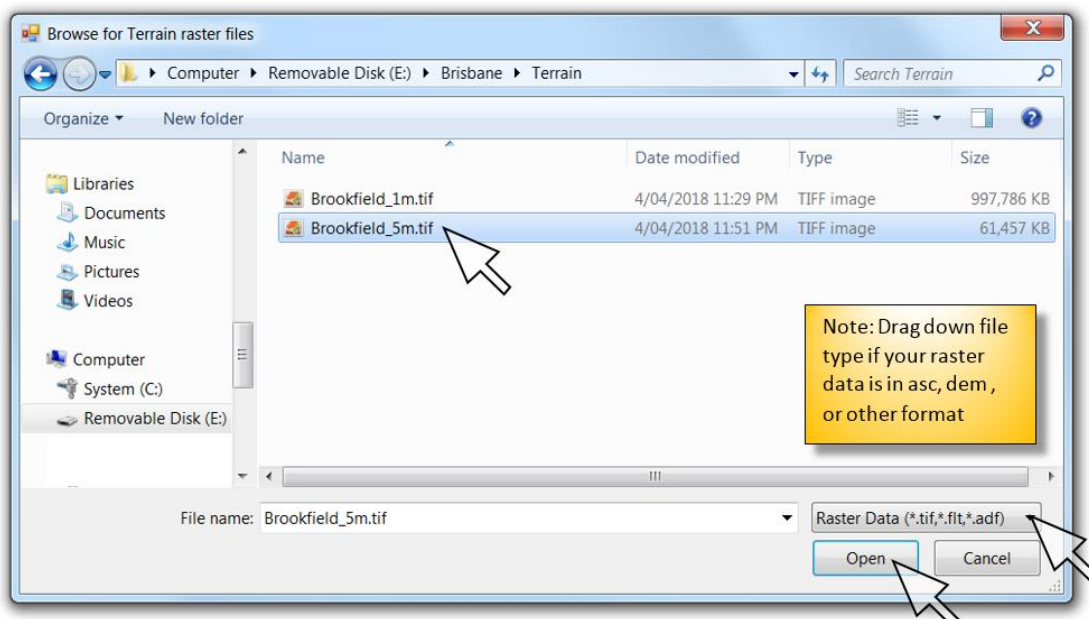
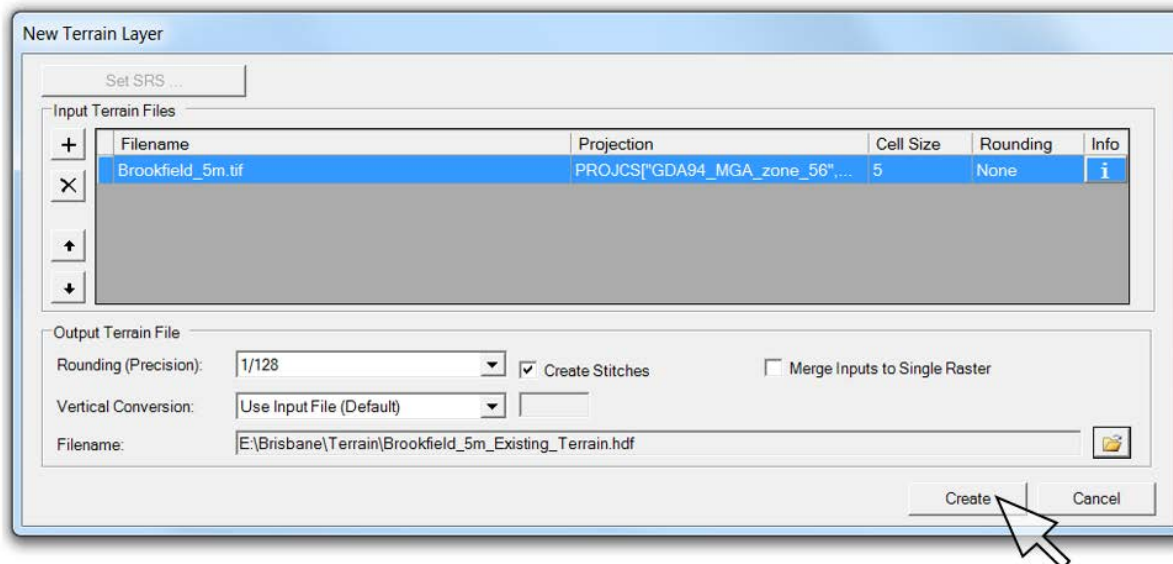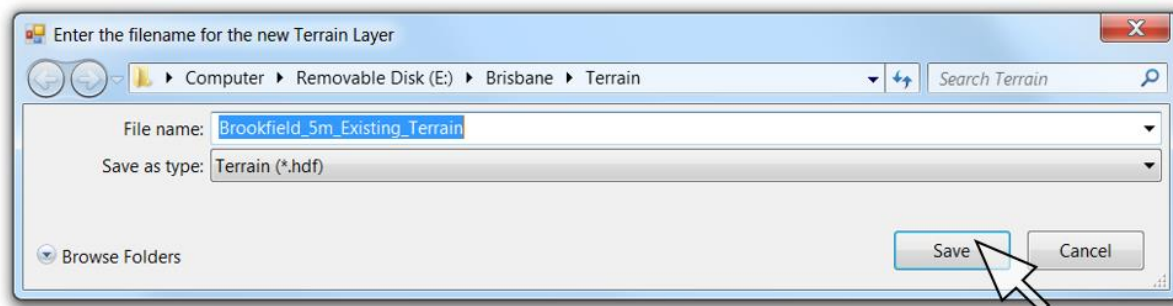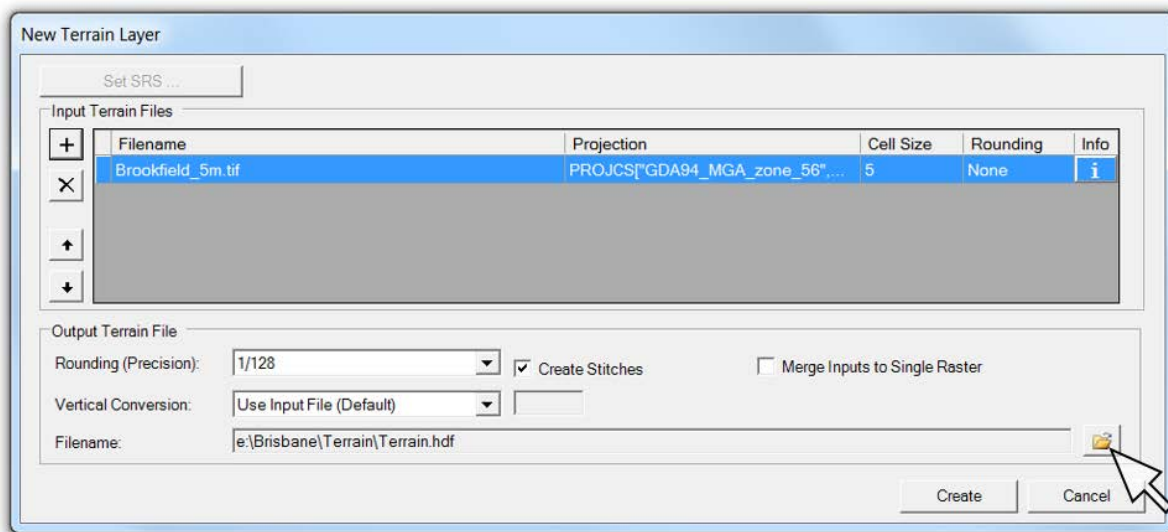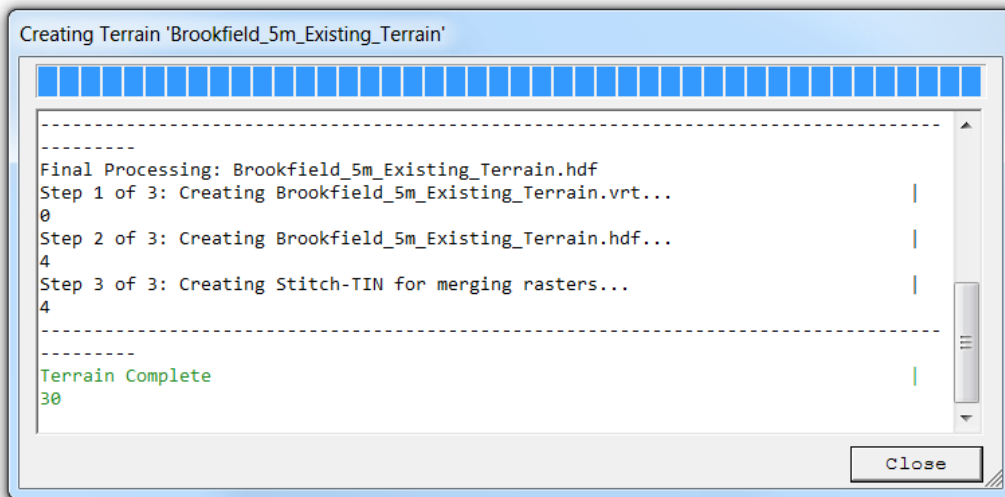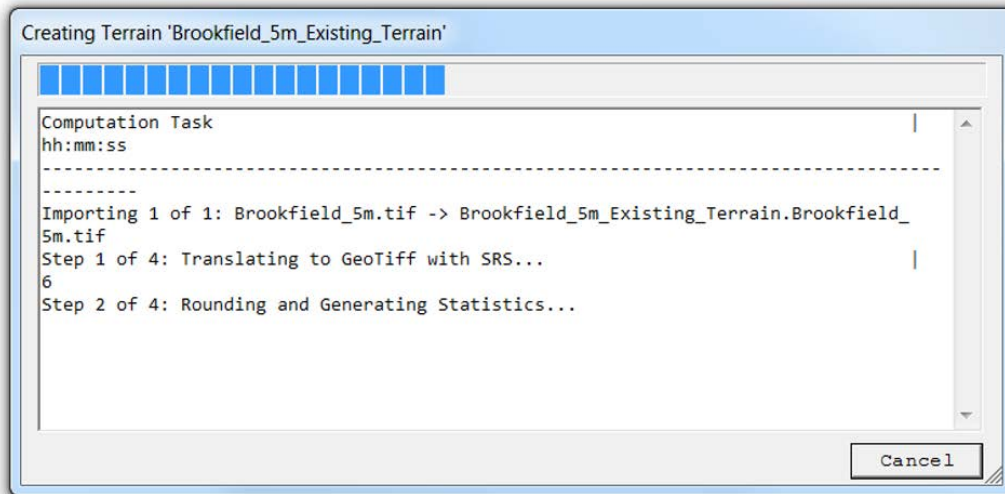- Change file name to relevant description of terrain and click "Create"







- Click "Close" when complete

Creating Terrain 'Brookfield_5m_Existing_Terrain'

```
Computation Task                                                      |
hh:mm:ss
----------------------------------------------------------------------
---------
Importing 1 of 1: Brookfield_5m.tif -> Brookfield_5m_Existing_Terrain.Brookfield_
5m.tif
Step 1 of 4: Translating to GeoTiff with SRS...                       |
6
Step 2 of 4: Rounding and Generating Statistics...
```

Cancel

Creating Terrain 'Brookfield_5m_Existing_Terrain'

```
----------------------------------------------------------------------
---------
Final Processing: Brookfield_5m_Existing_Terrain.hdf
Step 1 of 3: Creating Brookfield_5m_Existing_Terrain.vrt...           |
0
Step 2 of 3: Creating Brookfield_5m_Existing_Terrain.hdf...           |
4
Step 3 of 3: Creating Stitch-TIN for merging rasters...               |
4
----------------------------------------------------------------------
---------
Terrain Complete                                                     |
30
```
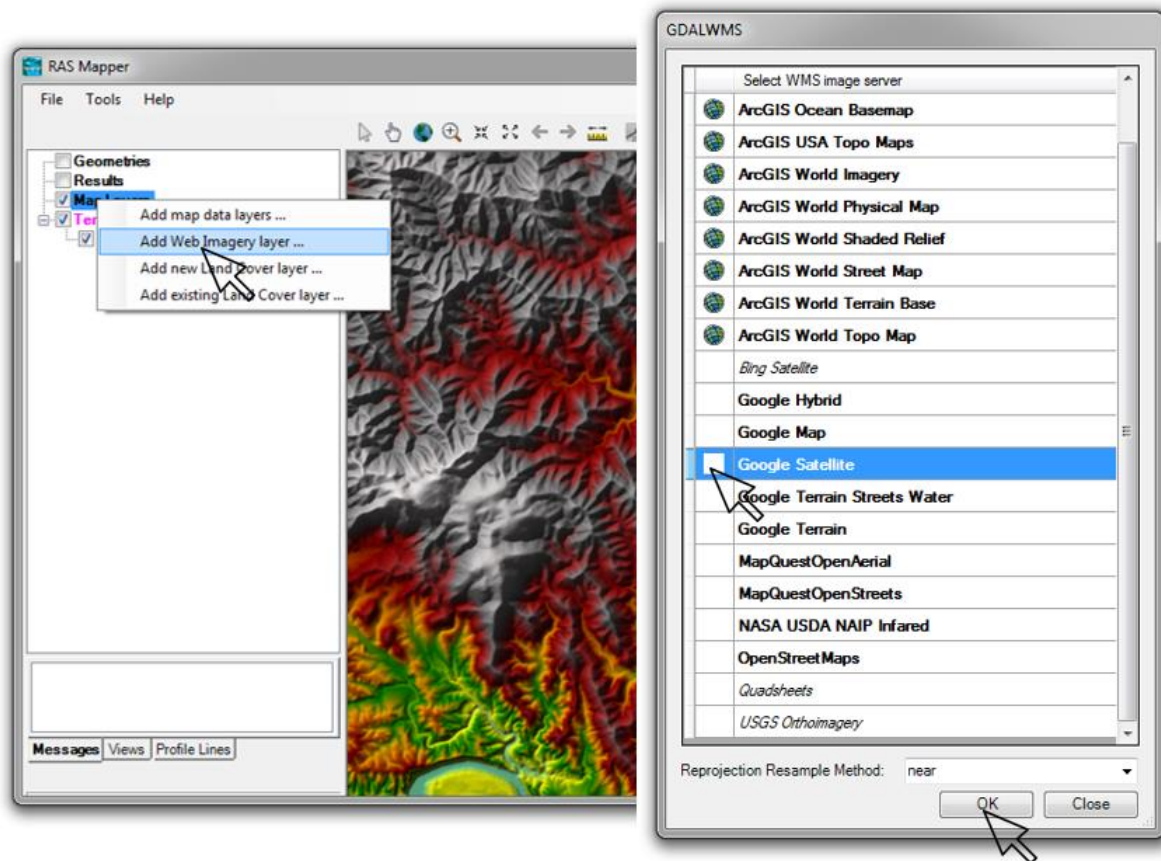
Close

- Toggle on Terrains Layer Group, right-click on Terrain and click "Zoom to Layer"
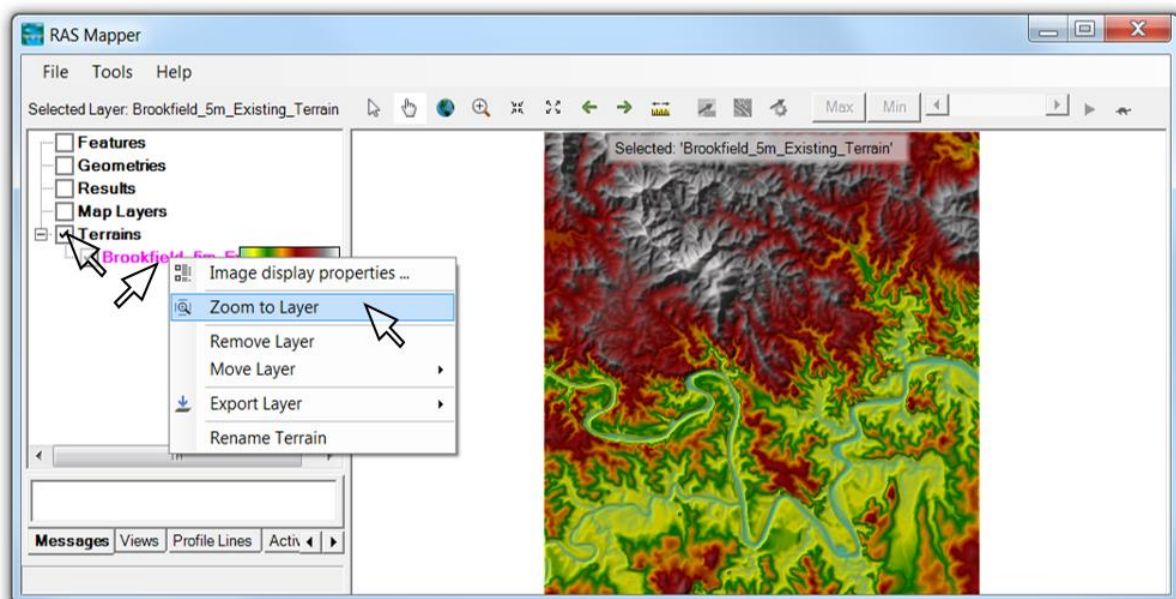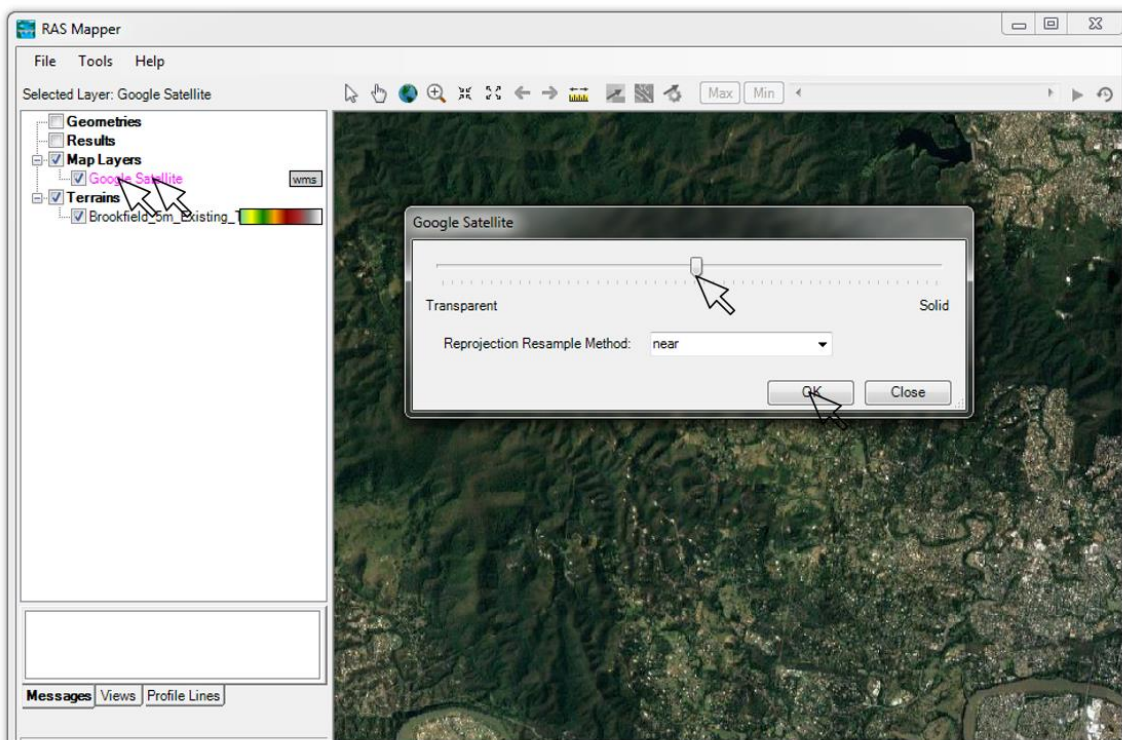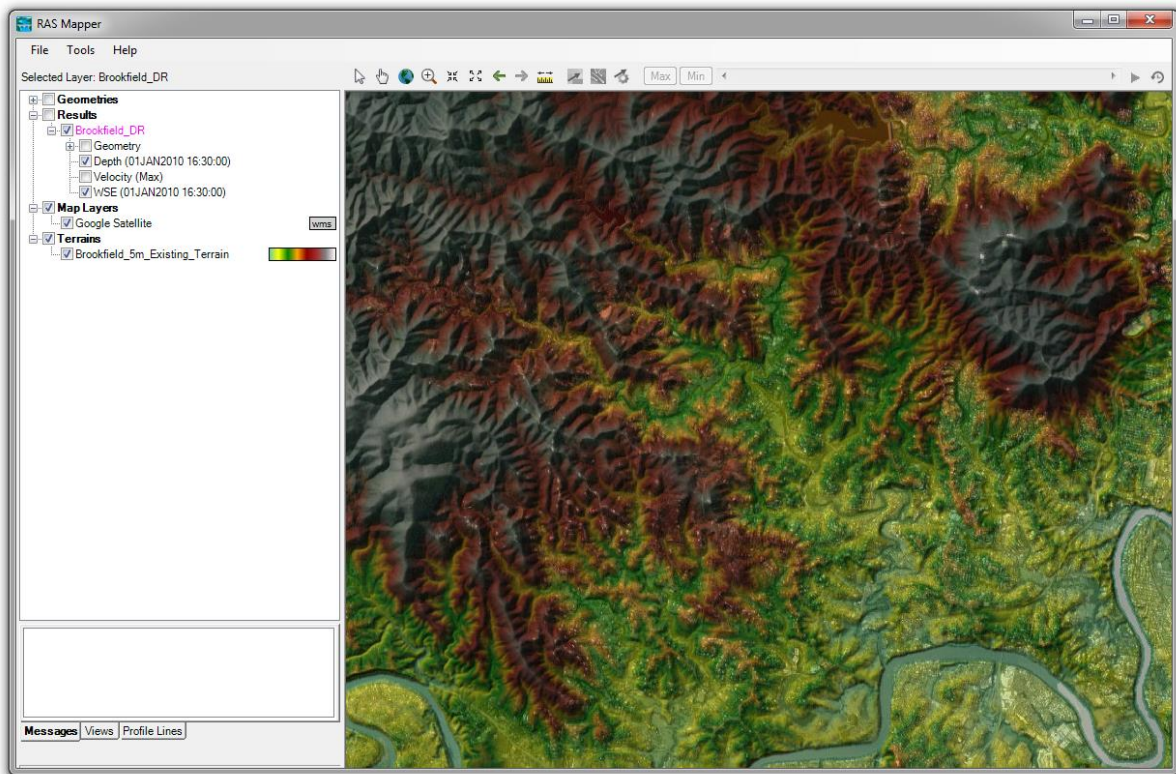
- Right-click on "Map Layers", select "Add Web Imagery Layer", and click on "Google Satellite"
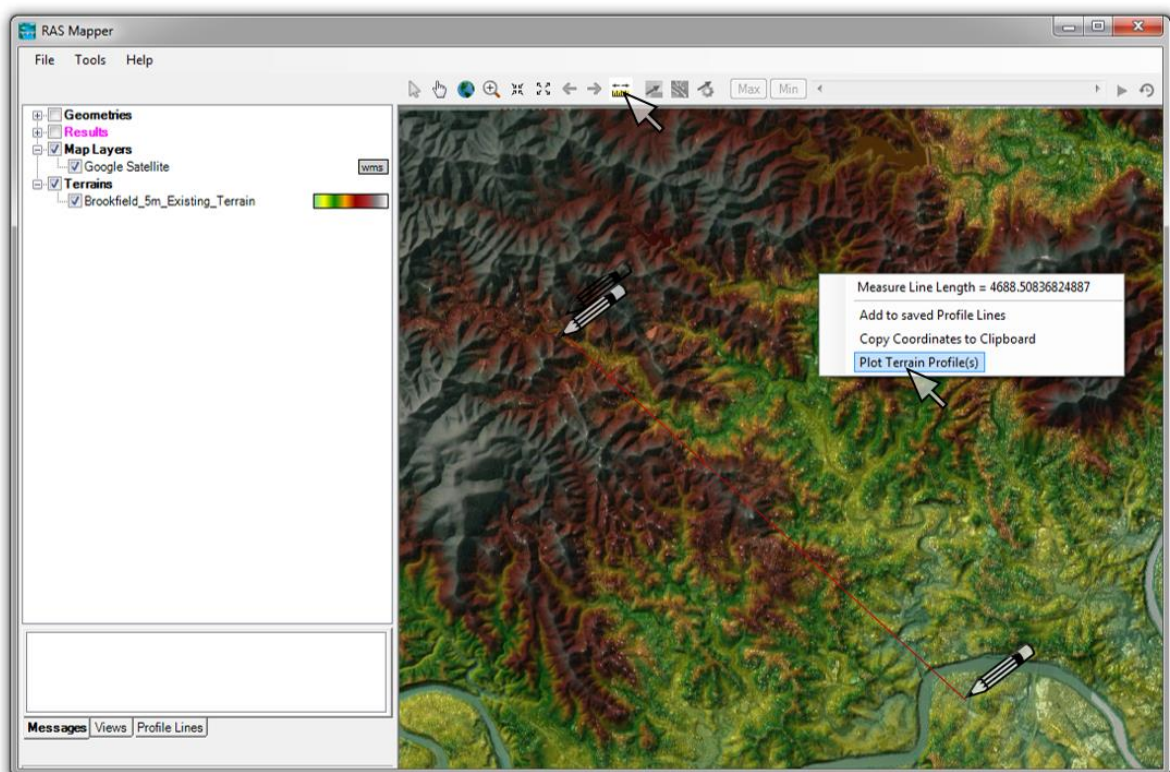


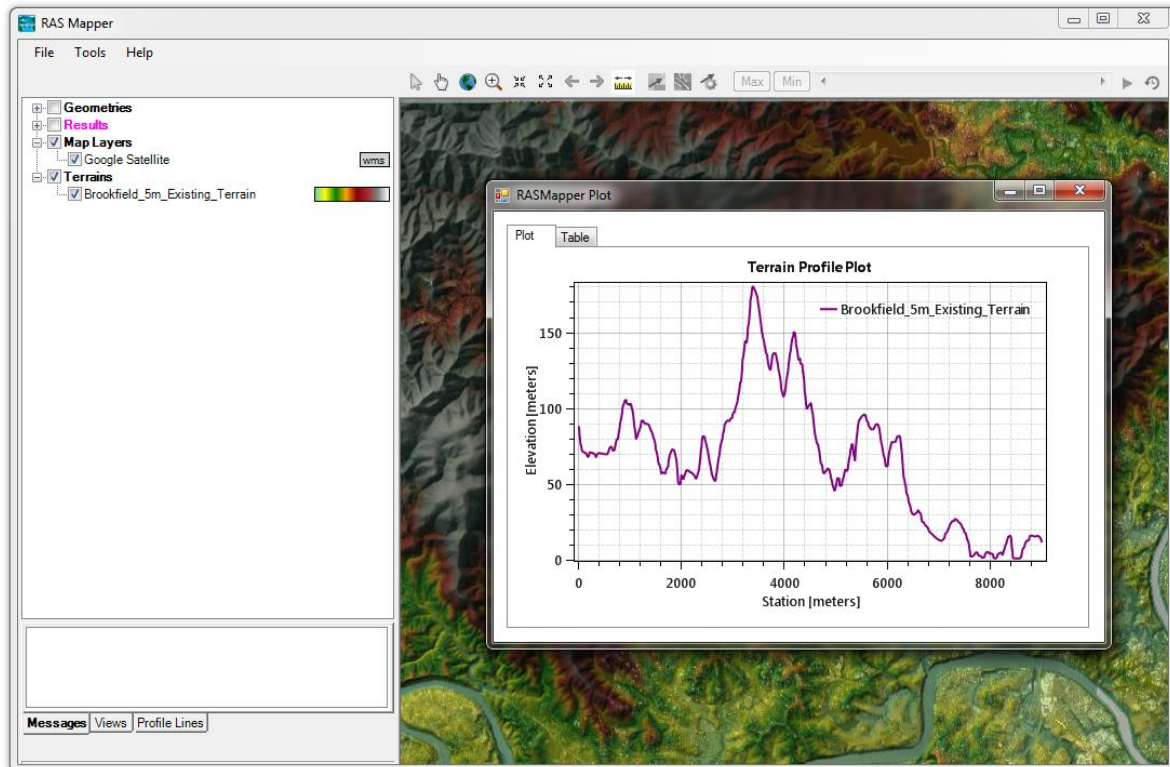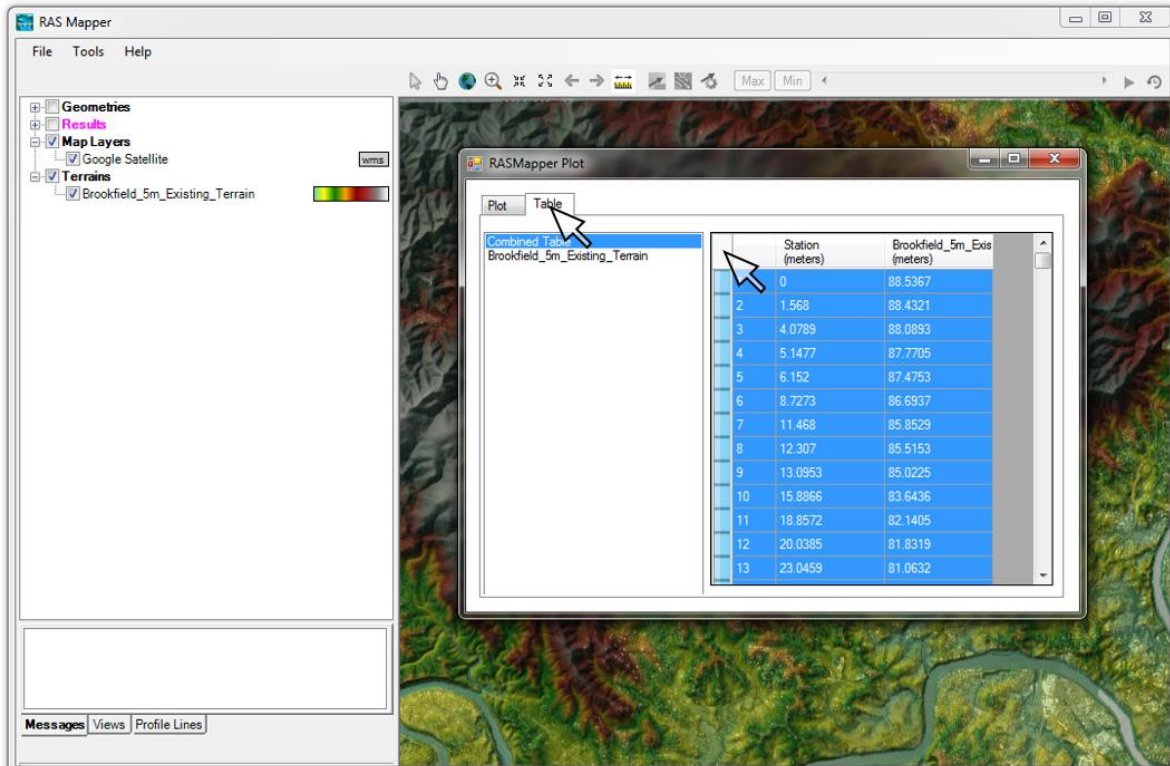- Double-click on "Google Satellite" and adjust transparency

- Select the measure tool, choose a profile location, and select "Plot Terrain Profiles(s)"
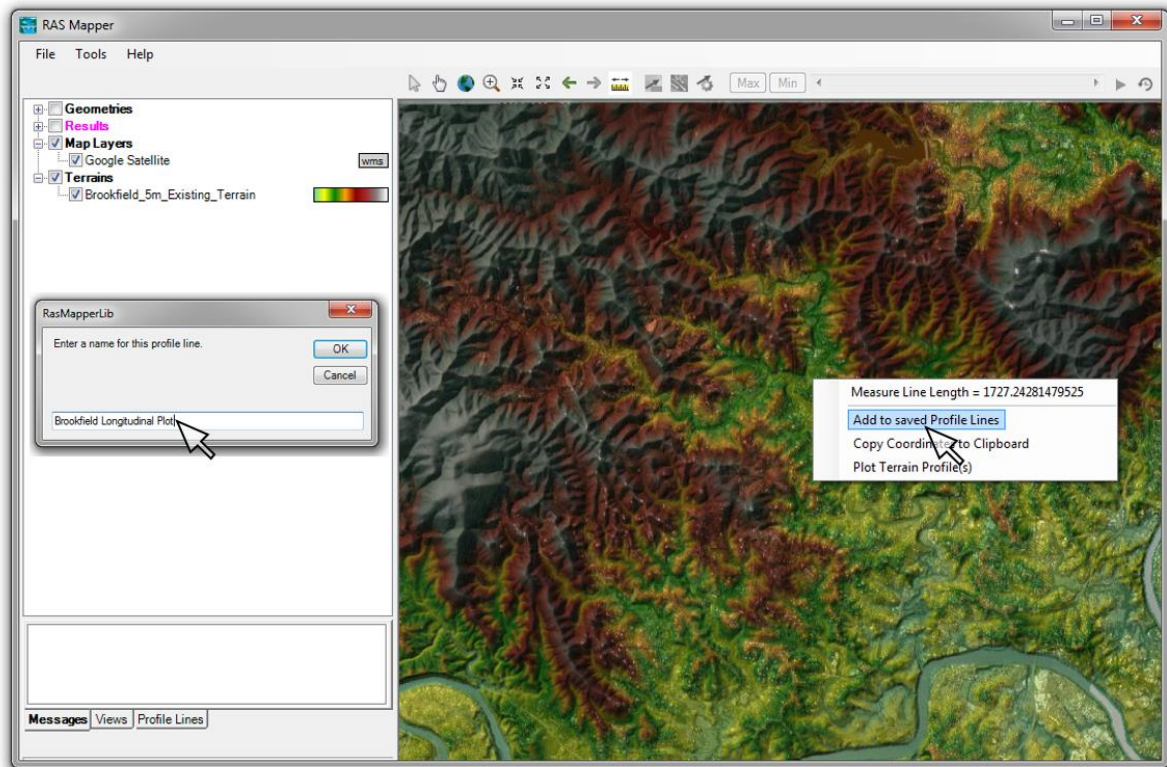
- Click on the "Table" tab to view the profile plot ordinates. Select the blank cell in the upper left to highlight all text. These values can be copied and pasted into Excel or similar program.
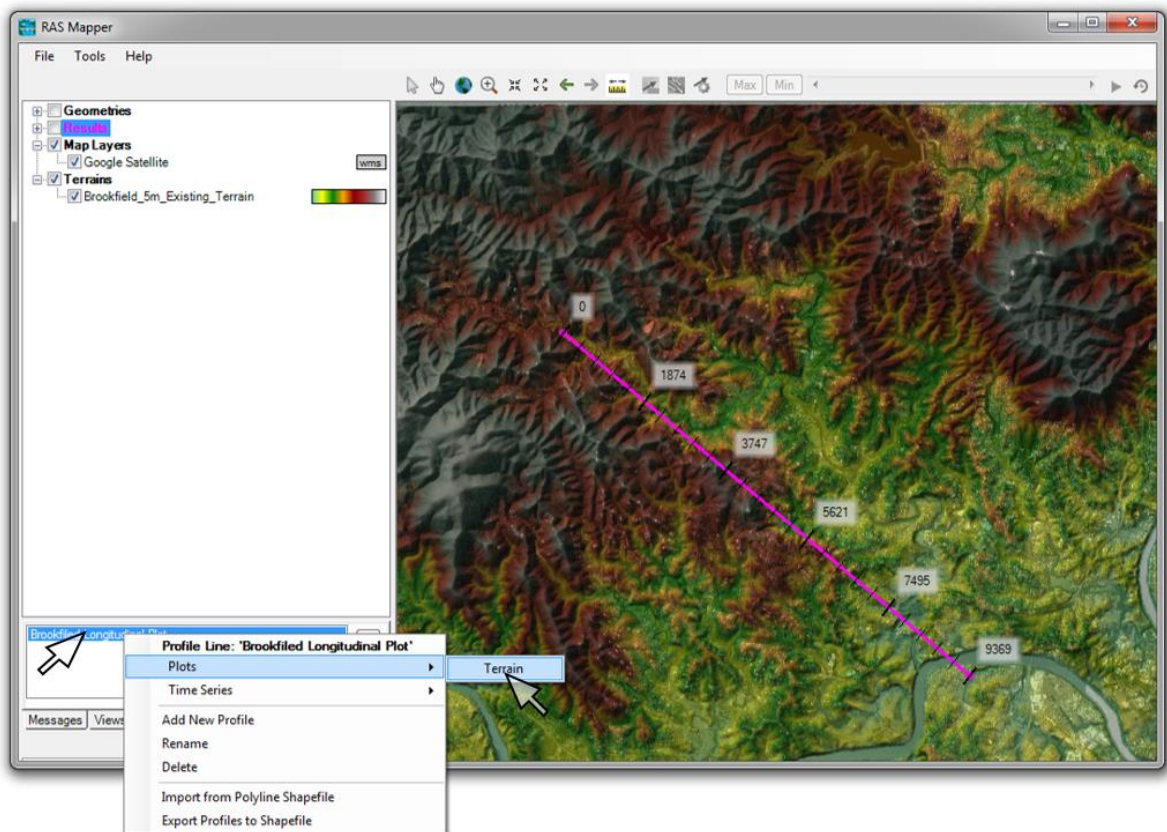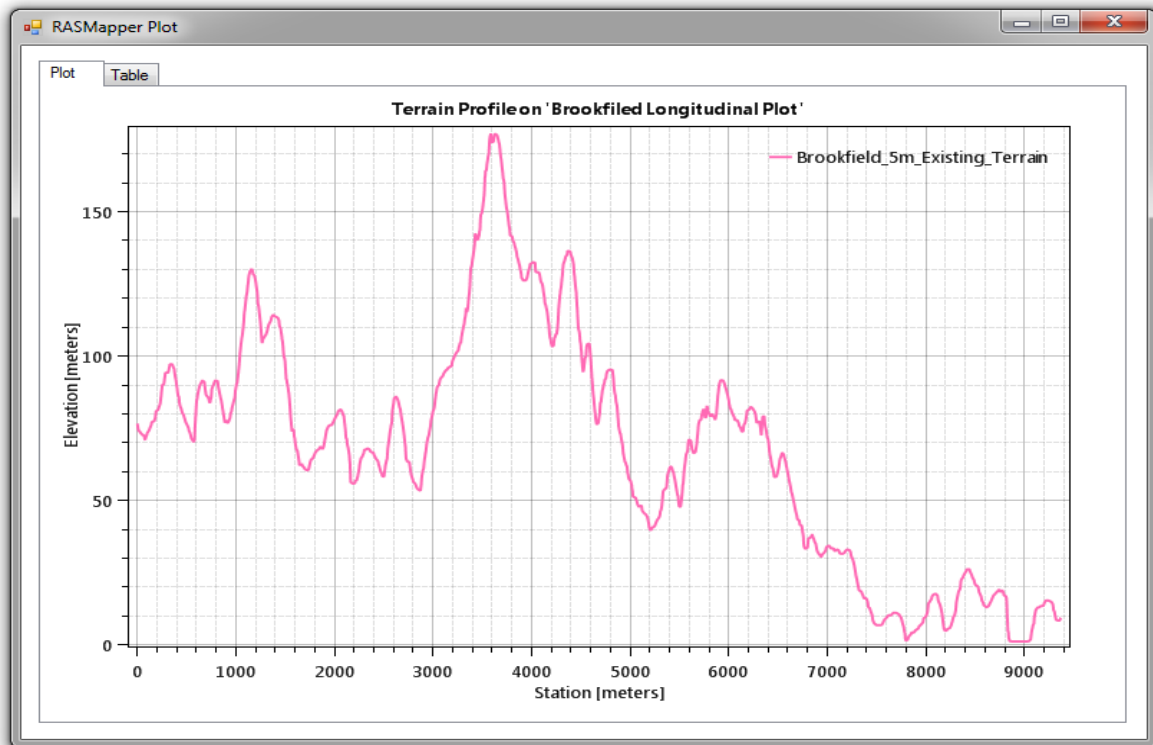


- Repeat the process by selecting the measuring tool, but this time click on "Save as Profile Line" and enter a name for the profile line.
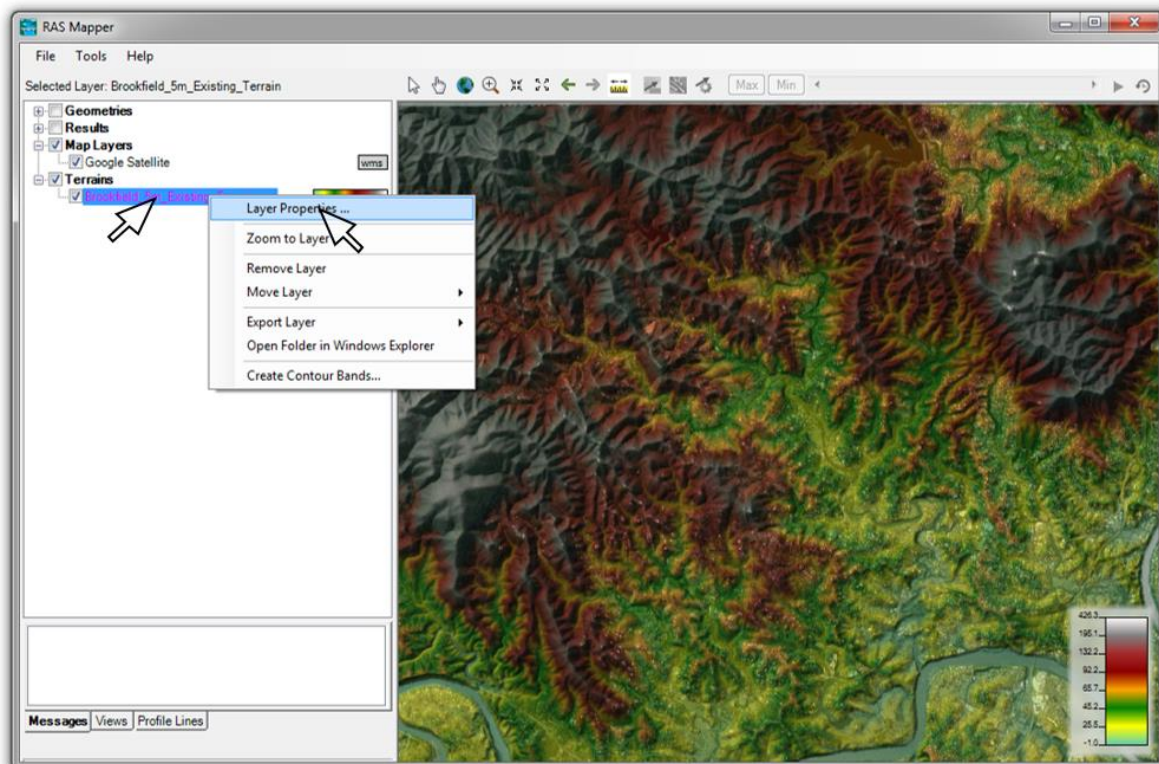
- Left-click on Profile Lines tab at the lower left of the window, then right-click on the newly named profile.
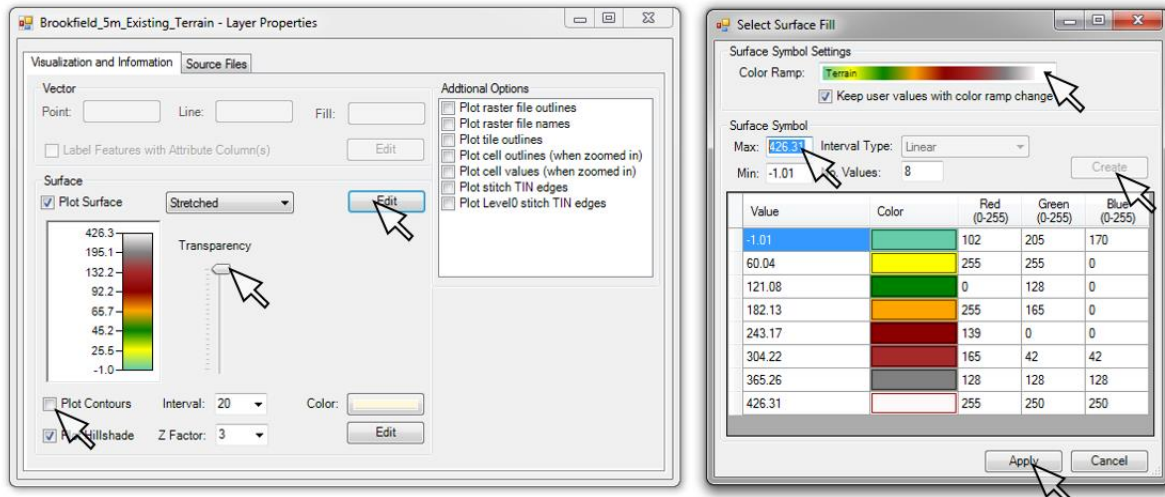- Select Plot | Terrain to view the long section

- Right-click on the name of the terrain file, then select "Layer Properties"
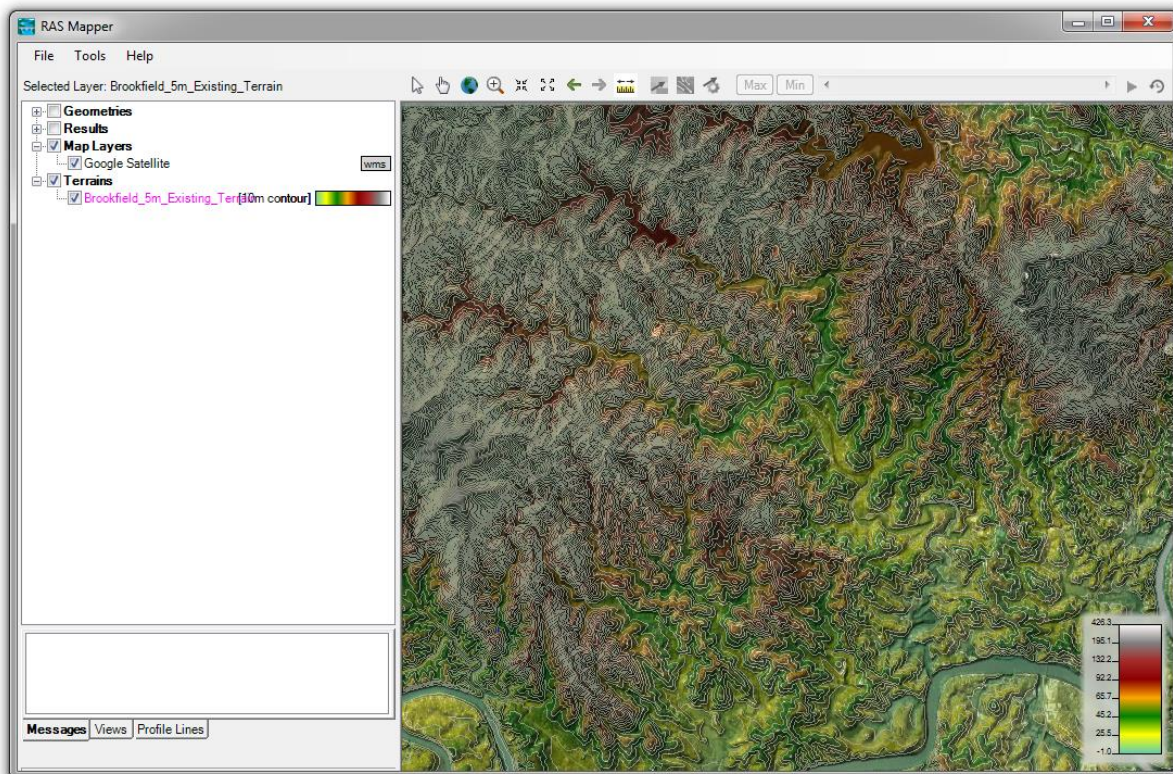


- Press the Edit button and adjust all desired parameters, including colour ramp, min/max values, number of displayed values, transparency, and number of values.
- Click on "Create" and "Apply" when finished

- Select "Plot Contours" and adjust contour line colours and interval
- Select "Plot Hillshade" and adjust Z factor to observe effect on map appearance

**Bonus GIS and RAS Mapper tasks:**

- Create your own shape file by creating a profile line, then right-click on the assigned name and select "Export Profile to Shapefile"
- Add the newly created shape file to the Map Layers in RAS Mapper and adjust display properties as desired
- Create polygon, polyline, and point shapefiles by right-clicking on Features and selecting "create new layer"
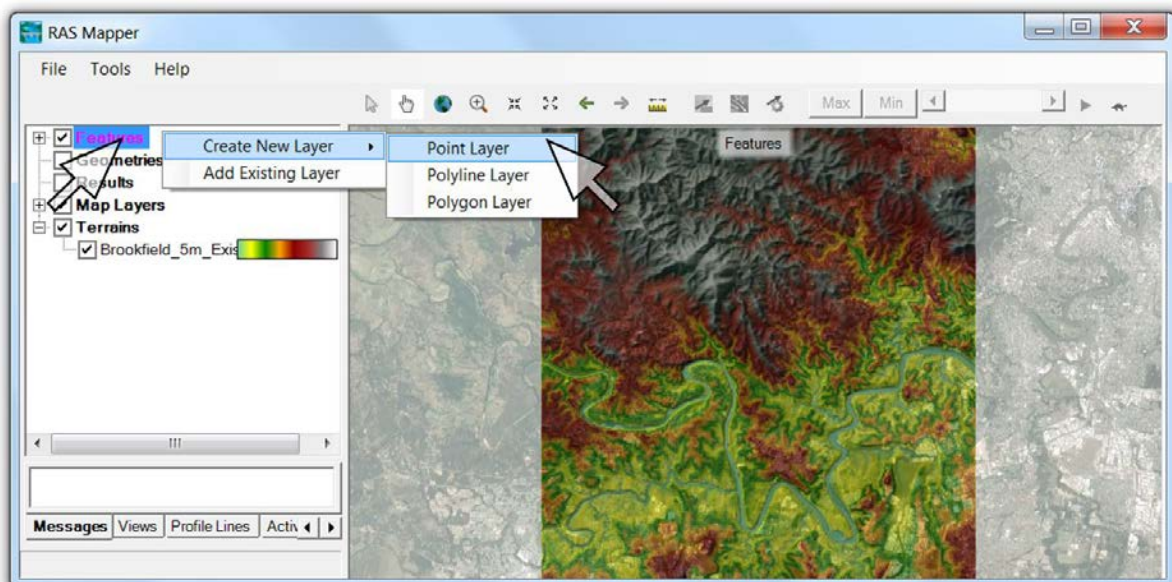


- Add features, then right-click and export to shape file, then add as existing map layers
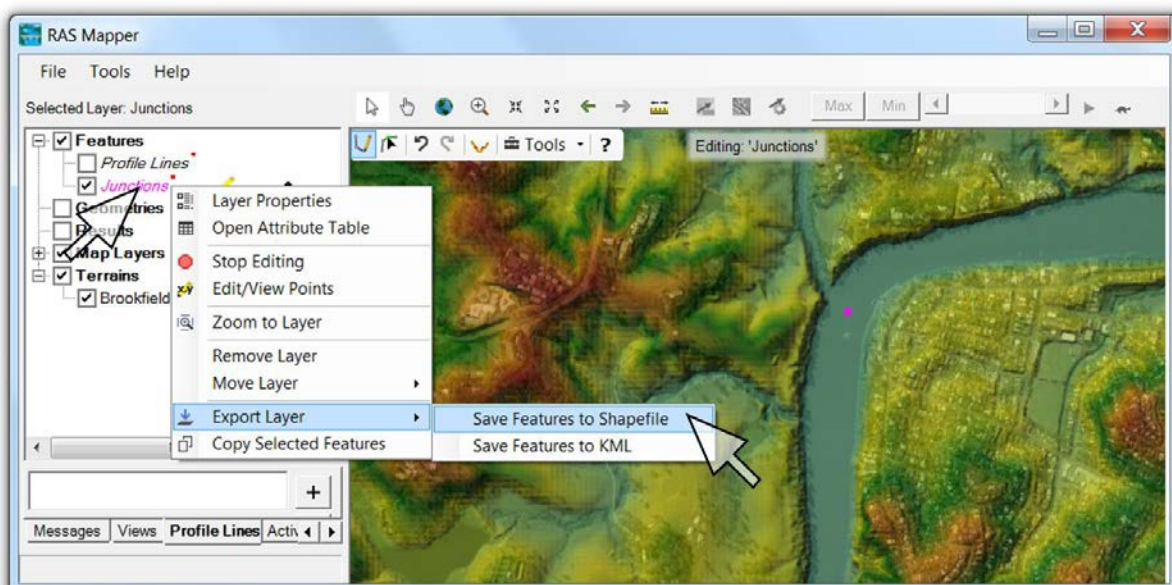


- Zoom to selected zoom levels and save views using view tab (www.surfacewater.biz/views/)
- Right-click on web imagery and save the view extents as a static image (with a world file)
- Add any additional GIS files or available static aerial images (with world files)
- Adjust symbols, colour palettes, ranges, intervals, and transparency for all layers to optimise the view for later use in the Geometry Editor