Ground Modelling, Road Design and Land Survey software for Civil Engineering, Environmental and Landscape applications working within CAD.

Flood modelling

KTF is not intended for sophisticated or dynamic flood modelling but can be very useful when it is acceptable to represent a water surface as a model either as a simple horizontal surface or more complex sloping surface.

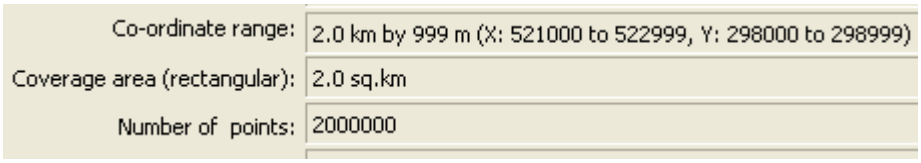
Step 1
Create the ground model representing the site or area to be studied

a. Working with "LIDAR" data or OS PANORAMA / ESRI (often with .asc file type.)

These "matrix" format files can have a very large amount of data and need to be converted to more simple .xyz files. Use menu item *Translators, OS, OS OpenData, OS Land-Form PANORAMA to .xyz*

To combine two or more .xyz files use menu item *File utilities, .xyz Co-ordinate files, Merge*
Click and hold Ctrl key to select the .xyz files and enter the name of combined output file.

To create the model use menu item *Ground Modelling, Create Model, from .xyz file Gridding*.



In the above LIDAR example the supplied data is a 1 metre grid but by setting the Grid Interval to 5 metres the model will have an easily manageable 160,000 triangles.

b. If starting with OS Land-Form PROFILE DTM or OS Terrain5 supplied as a simple x,y,z file then make the model using menu item *Ground Modelling, Create Model, from .xyz file Gridding* to write a model with 150,000 to 200,000 triangles for example.

Step 2
Create the model to represent the flood water surface

a. Horizontal
Menu item *Ground Modelling, Create Model, Uniform surface*
Pick one location that can be anywhere in the drawing.
Enter the flood level.
↵ (one location will define a horizontal surface).
Enter the model name (e.g. 25_5).

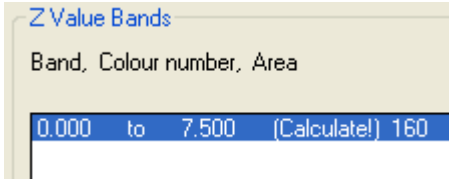
b. Sloping (but a single facet)
Identify the plan location of two nodes (locations with flood levels) that cover the site.
Menu item *Ground Modelling, Create Model, Uniform surface*
Pick location for the first node.
Enter the flood level.
Pick location for the second node.
Enter the flood level.
↵ (two locations will define a sloping surface).
Enter the model name.

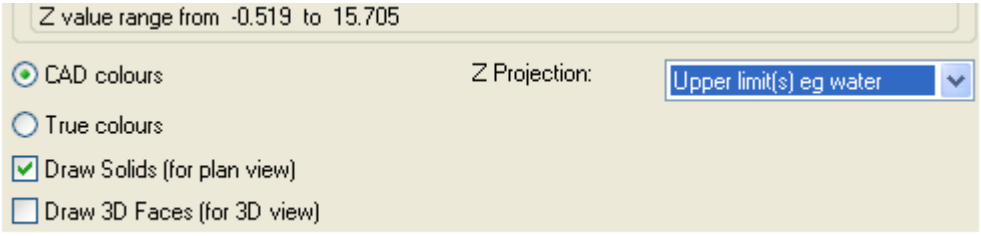
c. Sloping with multiple facets
The node/section lines need to be represented as 3D Polylines.

Use menu item *3D Polylines, from 3D locations* to construct a number of 3D Polylines (assuming the supplied data is of a plan or 2D nature). Alternatively it may be suitable to use *Levels, Levels*.
Ground Modelling, Create Model, from Drawing entities
Select all 3D Polylines and or level blocks.
Note that this may need to be repeated to have models for 1 in 20 years, 1 in 100 years if this information has been supplied.

Step 3
Flood mapping

a. Horizontal flood surface
To show the flood extents :-
Ground Modelling, Analysis and Colour mapping, Z value
Select the existing site model created in step 1.
Click CAD colours “on”.
Set Z Projection to Upper limit.
Click the Add… button to define one colour band from 0.000 or below up to the flood level e.g. 7.500.



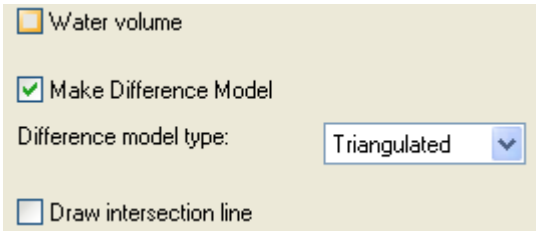


Settings for plan output

To calculate the volume of water above the active triangles of a ground model use menu item *Ground Modelling, Volumes.*
Click Water volume “on” and Make Difference Model “off”.
Select the existing site model created in step 1 and enter the flood water level.

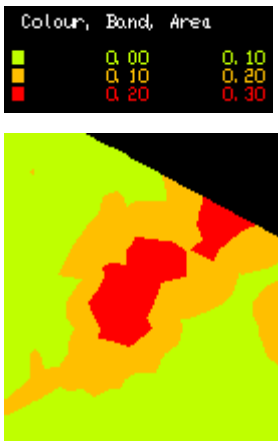
To produce surfaces suitable for rendering set the output to “Draw 3D Faces” and not “Solids”. In the example to the left the survey or site model was drawn as a 3D Grid (3D Faces) before the water surface was also drawn as 3D Faces.

b. Sloping flood surface :-
To show the flood extents :-
Ground Modelling, Volumes
Make Difference Model needs to be set “on”.
Select the existing site model.
Select the flood model from step 2b or step 2c.
Write the Difference model.
The flood water volume (respecting active and passive triangles) is displayed as the fill volume.



Ground Modelling, Analysis and Colour mapping, Z value
Select the Difference model.

Use CAD colours or True colours to define a range of elevation bands above 0.000 to illustrate depths of flood water.

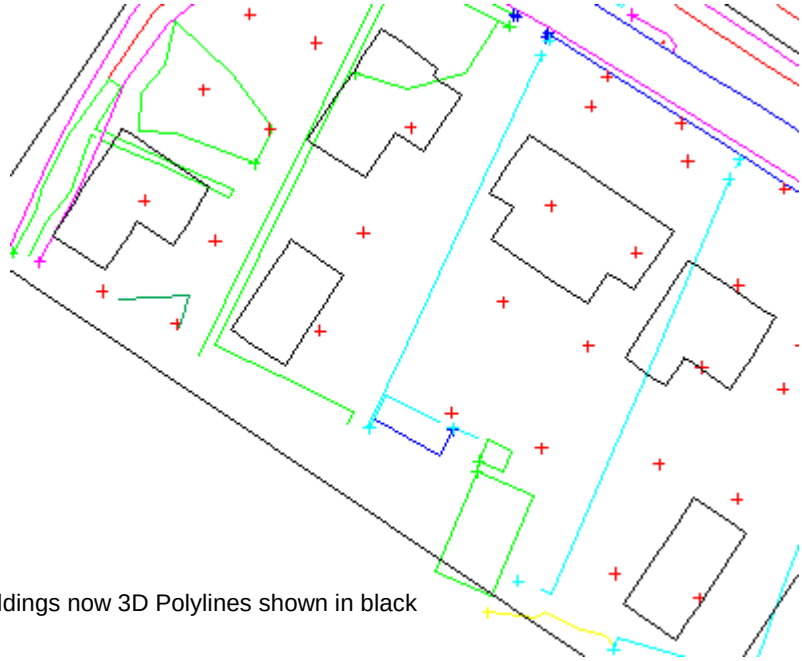


Flood depths from 0.0 to 0.3

Step 4
Calculating displacement volumes

Starting with the site/survey model from step 1 and with building outlines represented as 2D Polylines.

a. *Ground Modelling, Drape, Drape entities* to convert these 2D Polylines to 3D Polylines.

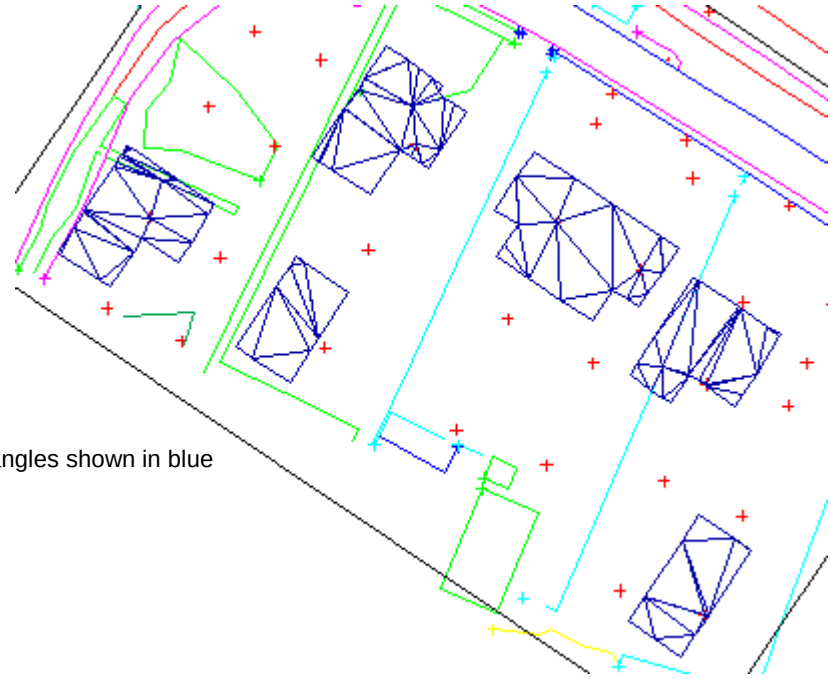


Buildings now 3D Polylines shown in black

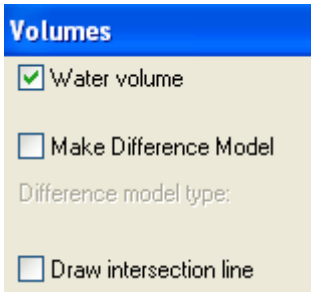
b. *Ground Modelling, Create model, from Drawing entities*
Including the above 3D Polylines with the original 3D survey entities – if the model was created from an .xyz file and not from entities in the drawing see the *Tip below. Give this model a suitable name.

c. *Ground Modelling, Active and Passive triangles, Define from Polyline(s)* for the model created above. In the illustration below all six buildings have been selected so that the subsequent displacement calculation will work on all of them and calculate a total. If individual buildings need to be calculated use one building at a time to define active and passive triangles.

d. *Ground Modelling, Draw Triangles* to confirm "that things look OK".



Active triangles shown in blue



e. Displacement volume calculation with horizontal flood surface

Ground Modelling, Volumes with these settings :-
Select the model as defined at step 4c.
Enter the flood water level.

The reported volume has been calculated from one or more of the buildings.

f. Displacement volume calculation with sloping flood surface

Ground Modelling, Volumes with none of the three options in the dialogue turned "on".
Select the model as defined in step 4c.
Select the Flood model (e.g. 100 year surface.kgm) from 2b or 2c.
The volume "within" the building or buildings is reported as the Fill volume.

*Tip
If working with a large model created from LIDAR data and displacement volumes need to be calculated and there is no 3D Survey drawing to use when draping the building to re-create the model with the original survey data as in step 4b above use this method :-

Ground Modelling, Draw Triangles Draw as Points
Drape the building 2D Polylines (on the LIDAR model).
Make a local model with *Ground Modelling, Create Model, from Drawing entities* click 3D Polylines and Points "on" and select the 3D Polyline and the Points within it.
Ground Modelling, Active and Passive triangles, Define from Polyline(s)