



Bison

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**Note:**

All Bison components are designed to work with single-surface landscape meshes oriented to the XY plane ("2.5D").

Since landscape data can vary greatly in scale, mesh density and physical dimensions should be considered when defining resolution and scale variables. It is usually best to start rough and refine as necessary.

## Component Reference: Analysis

### Aspect

Slope aspect analysis for surface meshes.

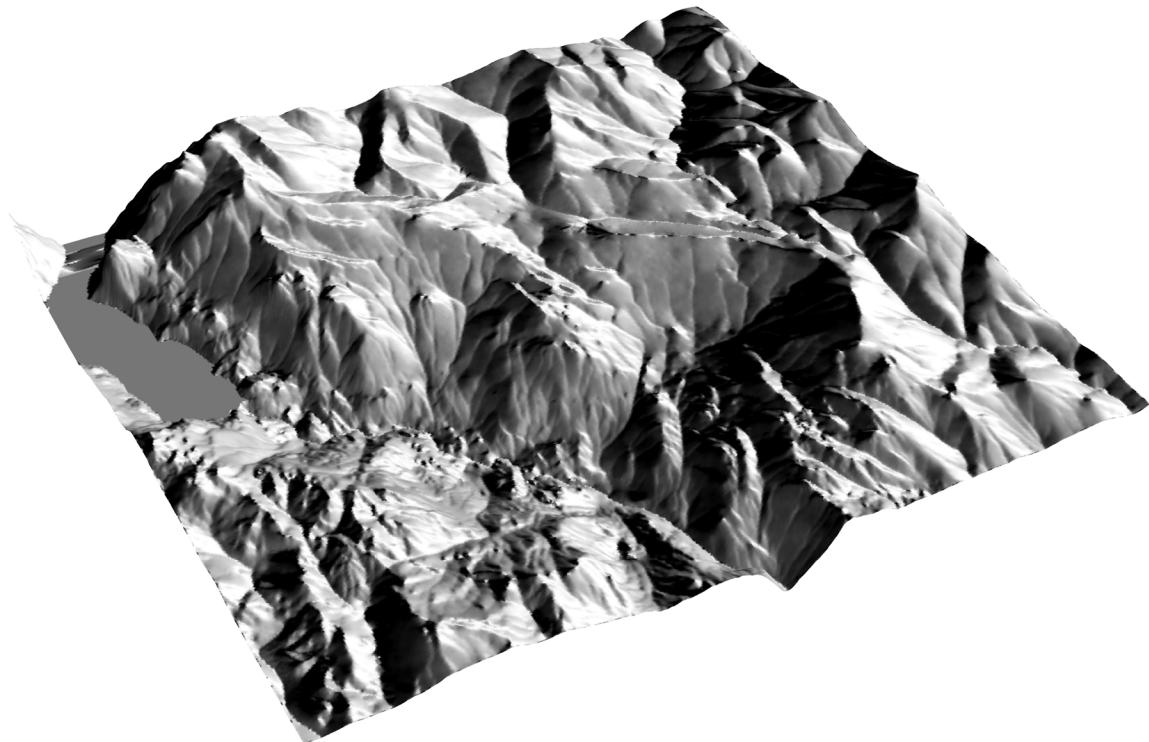
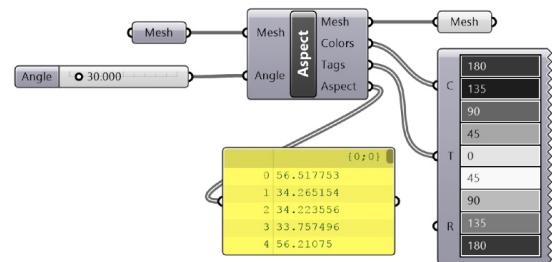
#### Inputs:

**Mesh:** Mesh for slope aspect analysis.  
**Angle:** Direction angle in degrees.

#### Output:

**Mesh:** Resulting analysis mesh.  
**Colors:** Color range for legend.  
**Tags:** Aspect angle tags for legend.  
**Aspect:** Per vertex list of deviation angle relative to input.

Note: Legend output uses the Grasshopper Display > Graphs > Legend component.



## Component Reference: Analysis

### Concavity

Relative approximate concavity analysis for surface meshes

Inputs:

**Mesh:** Mesh for concavity analysis

Output:

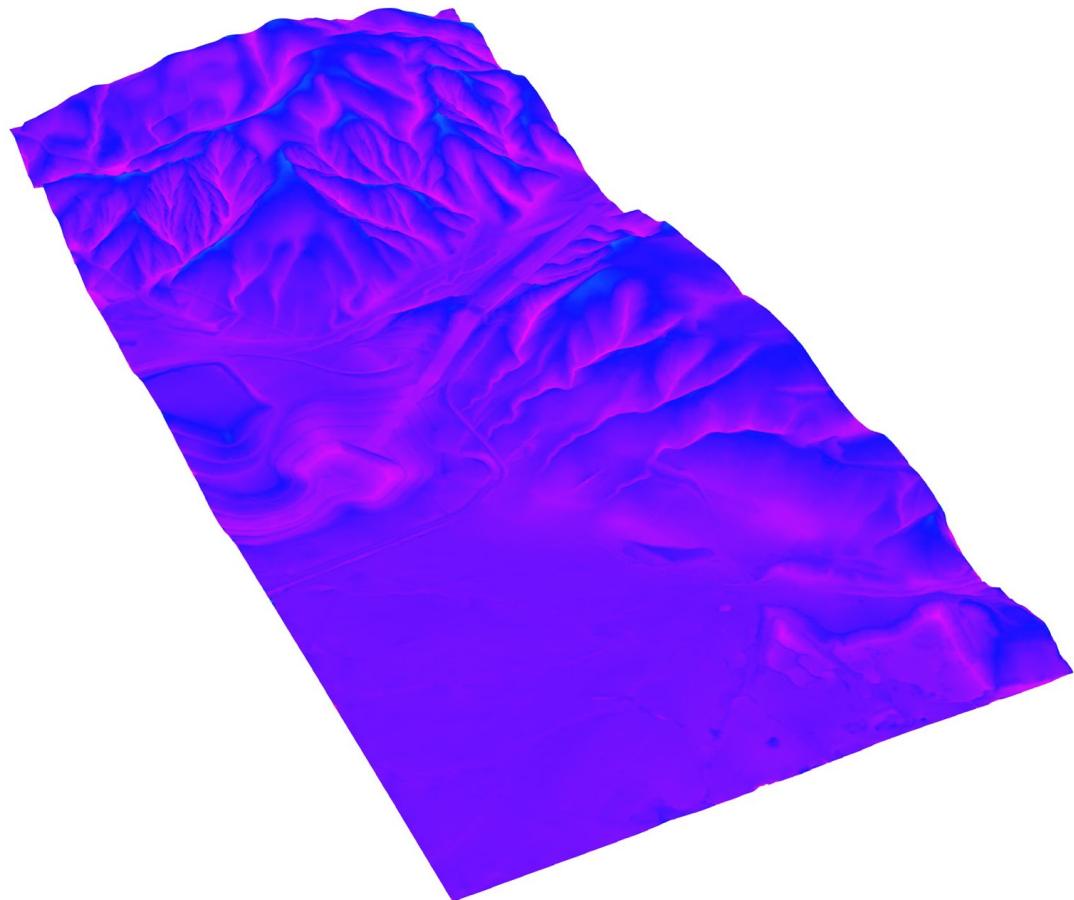
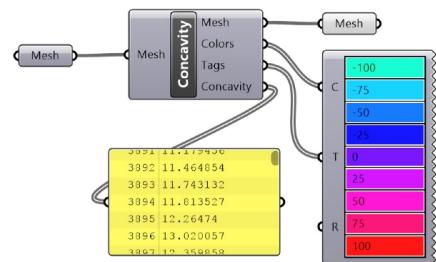
**Mesh:** Resulting analysis mesh

**Colors:** Color range for legend

**Tags:** Percentage tags for legend

**Concavity:** Per vertex list of relative values, negative are convex, positive are concave

Note: Legend output uses the Grasshopper Display > Graphs > Legend component.



## Component Reference: Analysis

### CutFill

Calculate cut and fill volumes from proposed and existing meshes. Produces a numerical output and a mesh visualization of areas showing local cut and fill values.

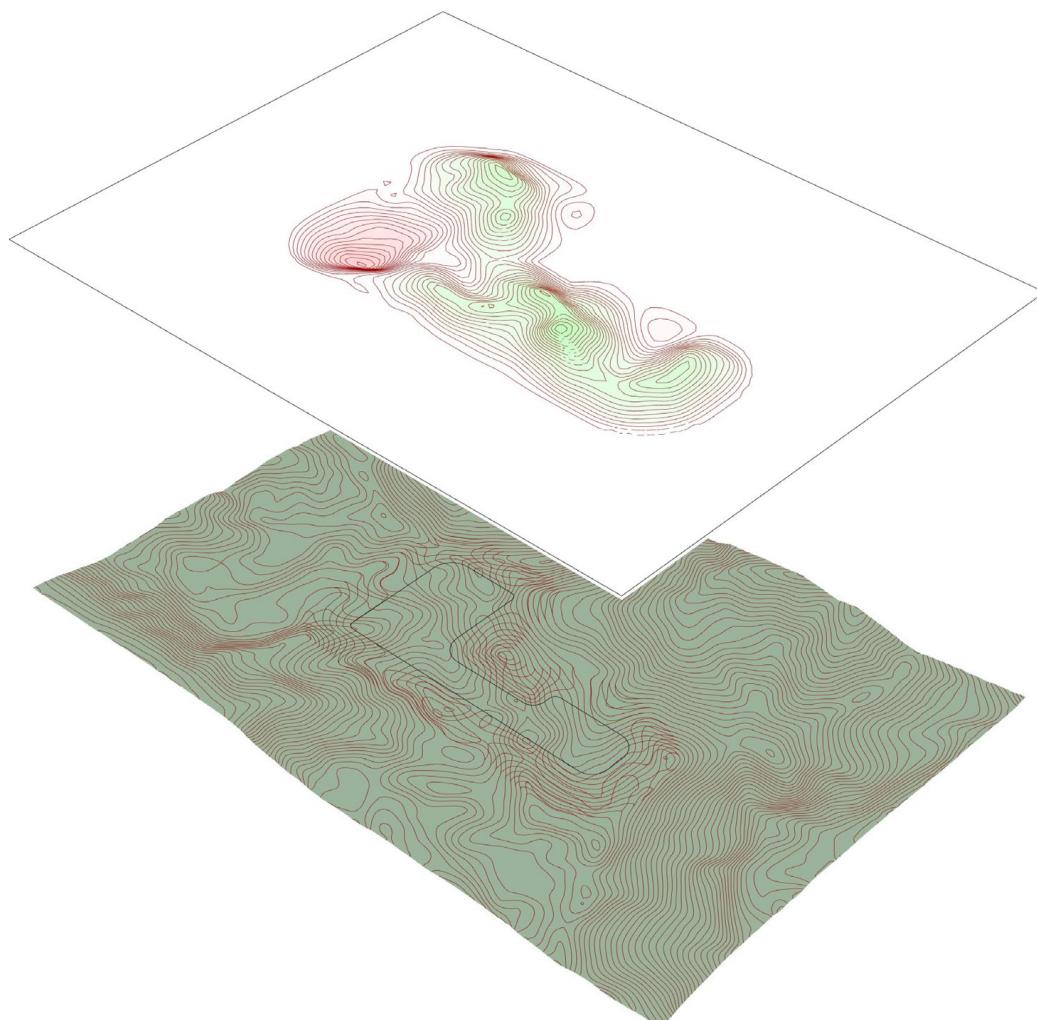
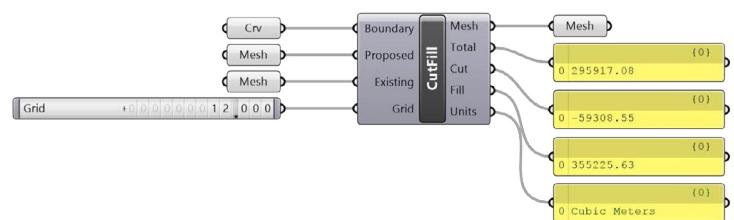
Inputs:

- Boundary:** Boundary curve for analysis
- Proposed:** Proposed mesh
- Existing:** Existing mesh
- Grid:** Analysis grid interval size

Output:

- Mesh:** Analysis mesh output, cut shown in red, fill in green.
- Total:** Total balance of cut and fill
- Cut:** Total volume of cut
- Fill:** Total volume of fill
- Units:** Units for returned values

Note: Grasshopper may display large numbers in rounded scientific notation. To restore to standard format, go to File > Preferences > Display and raise the E-Upper slider to the required limit.



## Component Reference: Analysis

### Elev

Elevation analysis for surface meshes

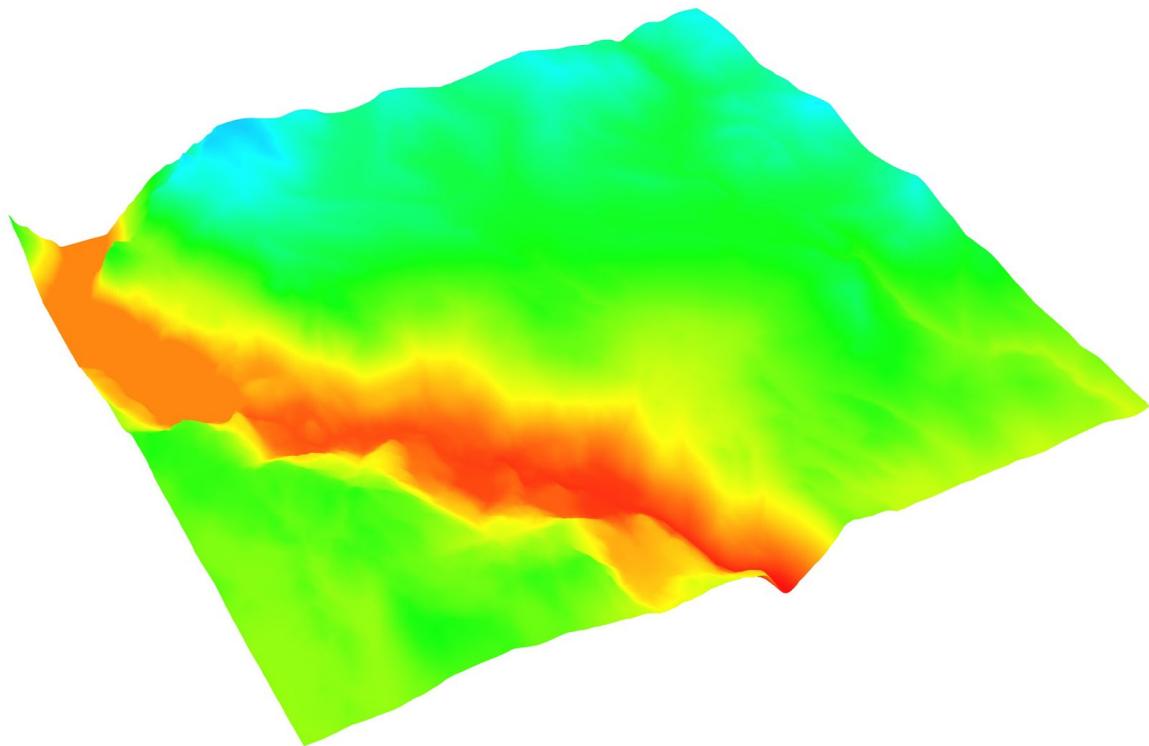
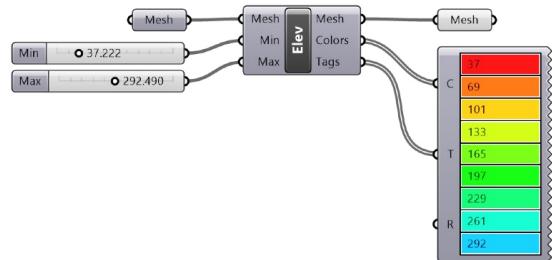
#### Inputs:

- Mesh:** Mesh for elevation analysis
- Min:** Minimum elevation, optional
- Max:** Maximum elevation, optional

#### Output:

- Mesh:** Resulting analysis mesh
- Colors:** Color range for legend
- Tags:** Elevation tags for legend

Note: Legend output uses the Grasshopper Display > Graphs > Legend component.



## Component Reference: Analysis

### Flow

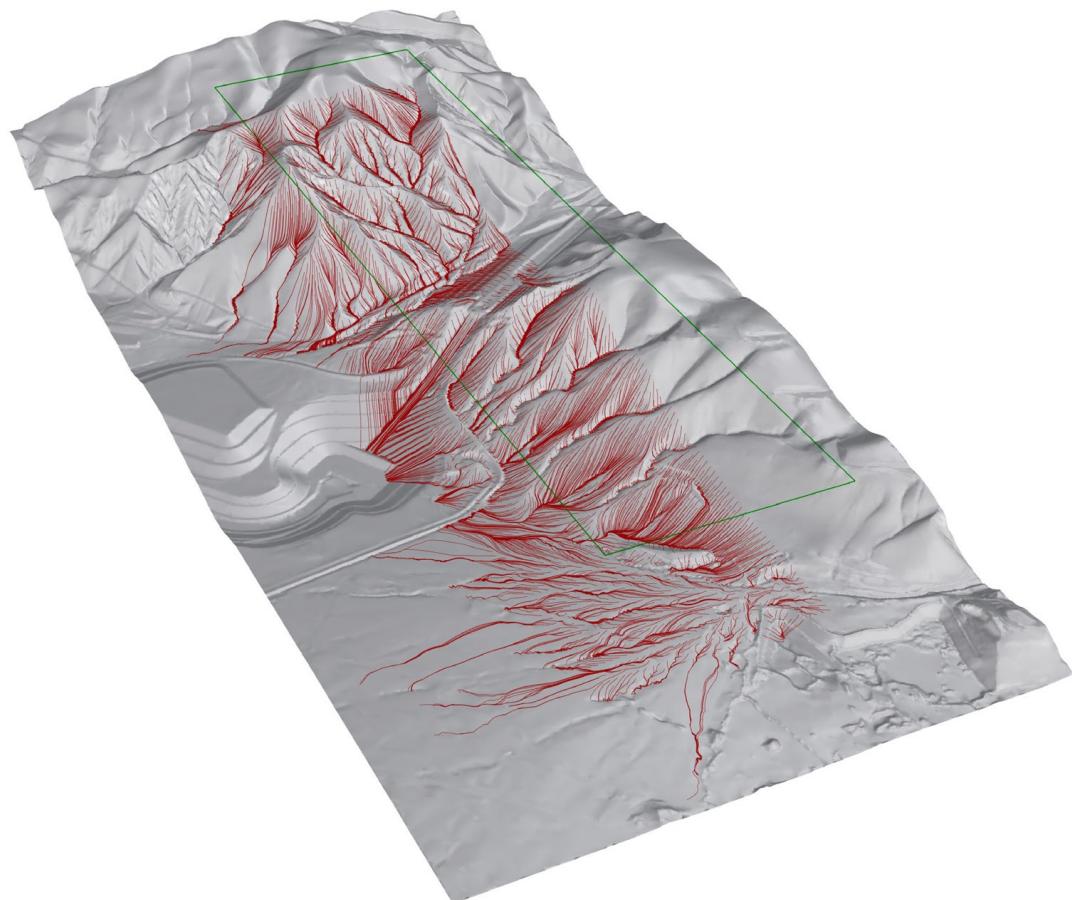
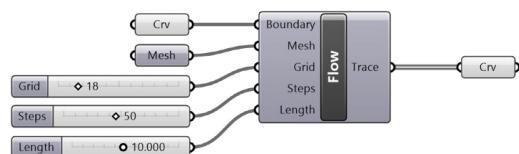
Flow tracing for surface meshes.

Inputs:

- Boundary:** Boundary curve for analysis.
- Mesh:** Mesh for analysis.
- Grid:** Analysis grid interval size.
- Steps:** Number of flow steps in analysis.
- Length:** Length of segment for each step.

Output:

- Trace:** Curves tracing flow paths.



## Component Reference: Analysis

### Roughness

Relative roughness analysis for surface meshes

Inputs:

**Mesh:** Mesh for roughness analysis

Output:

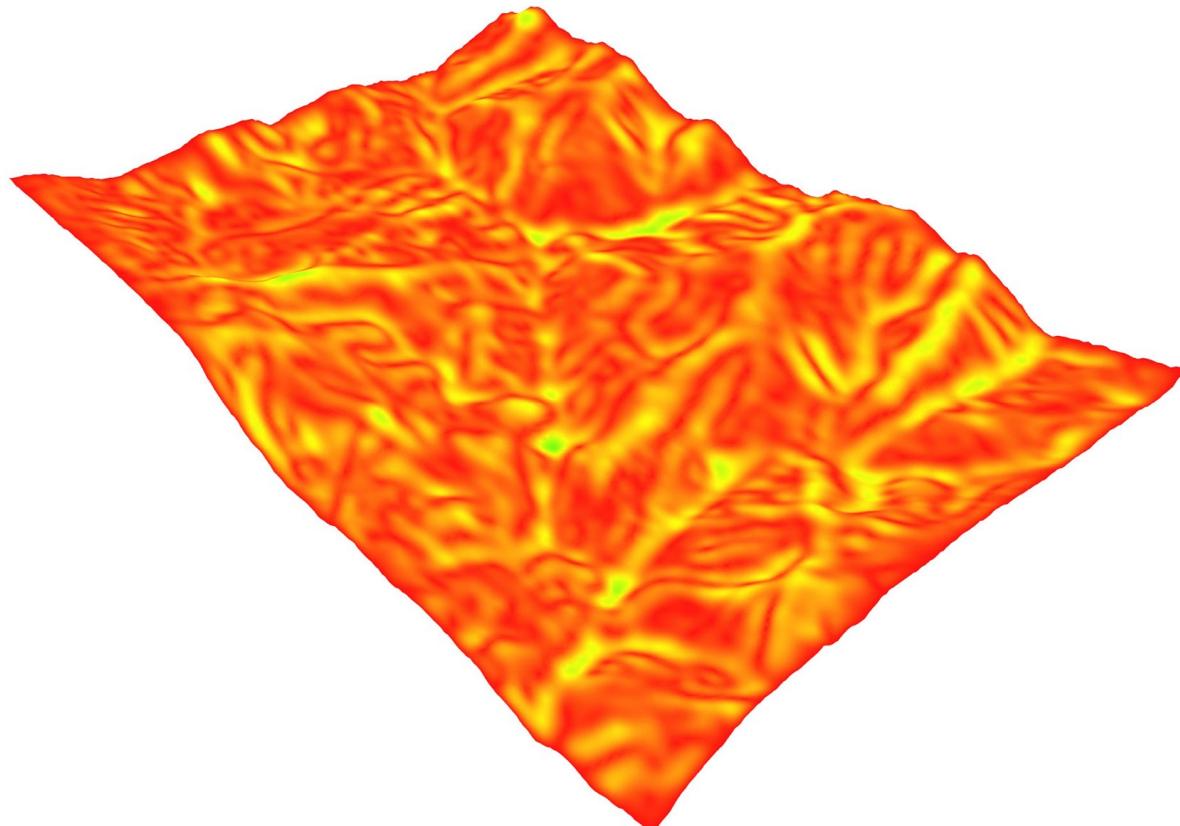
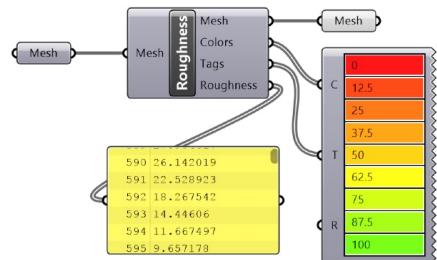
**Mesh:** Resulting analysis mesh

**Colors:** Color range for legend

**Tags:** Percentage tags for legend

**Roughness:** Per vertex list of percentage

Note: Legend output uses the Grasshopper Display > Graphs > Legend component.



## Component Reference: Analysis

### Shade

Shading analysis for surface mesh faces

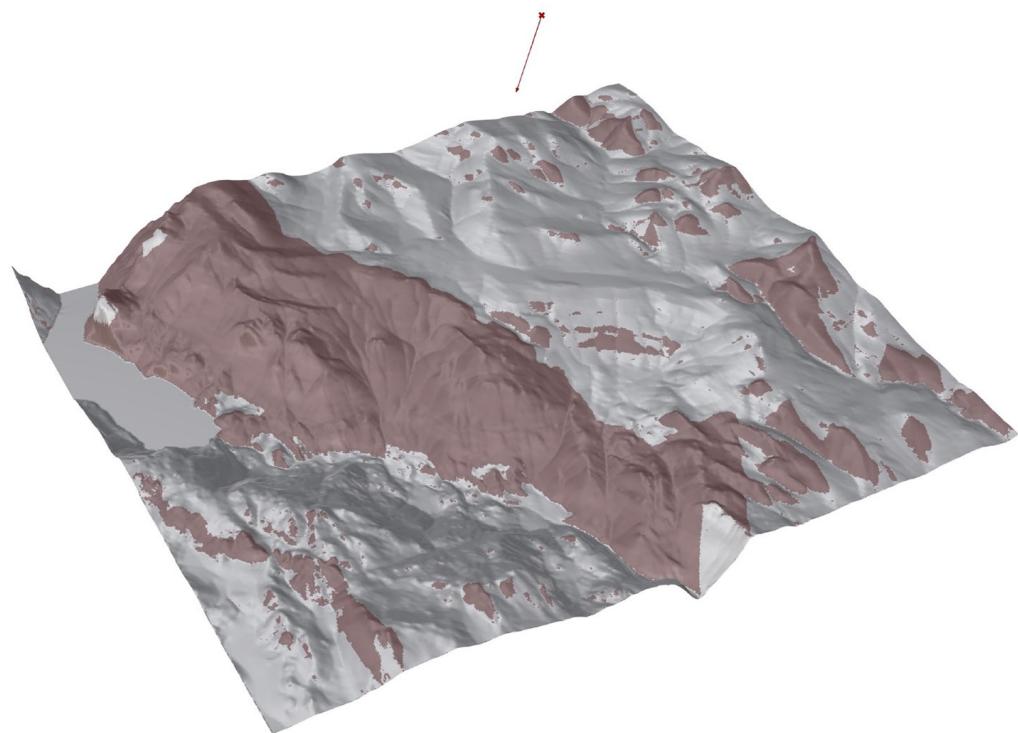
Inputs:

**Mesh:** Mesh for shading analysis

**Vector:** Vector for light direction

Output:

**Shade:** Mesh of faces in shade from given vector



## Component Reference: Analysis

### Slope

Slope analysis for surface meshes, with respect to the Z axis

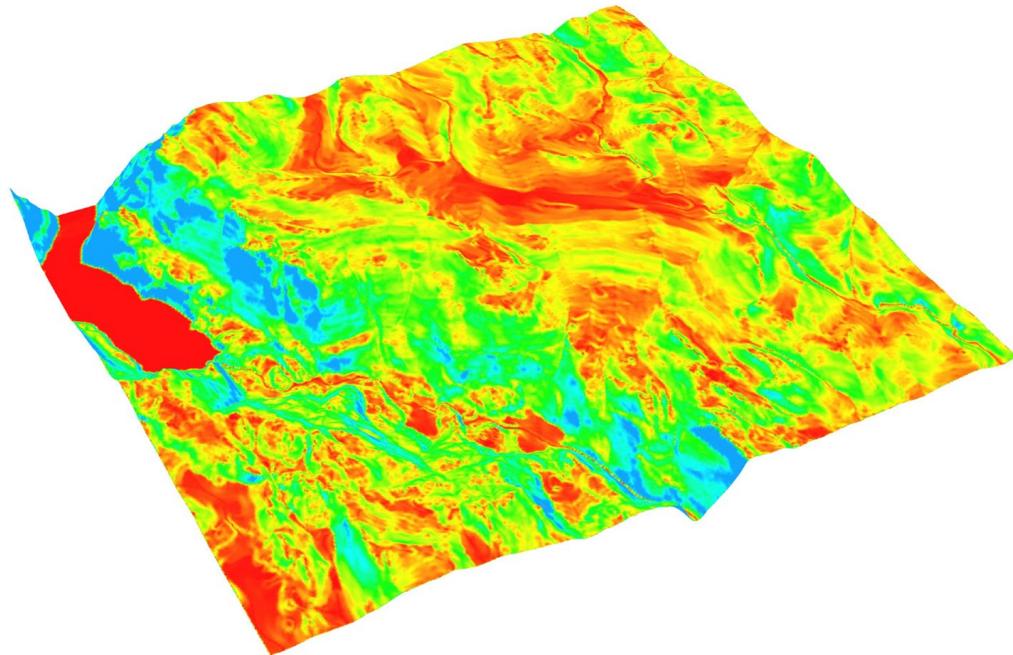
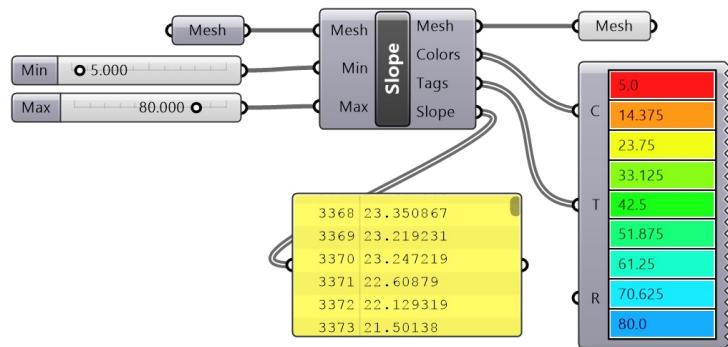
#### Inputs:

- Mesh:** Mesh for slope analysis
- Min:** Minimum slope percentage, optional
- Max:** Maximum slope percentage, optional

#### Output:

- Mesh:** Resulting analysis mesh
- Colors:** Color range for legend

Note: Legend output uses the Grasshopper Display > Graphs > Legend component.



## Component Reference: Analysis

### Viewshed

Viewshed analysis for surface mesh faces

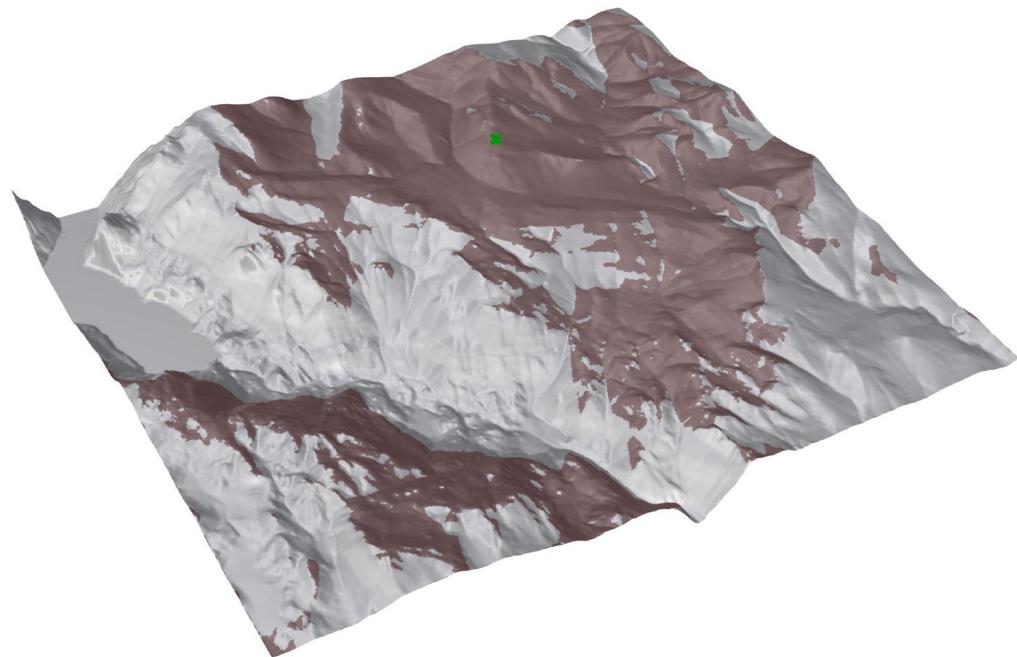
Inputs:

**Mesh:** Mesh for viewshed analysis

**Viewpoint:** Point for view location

Output:

**Viewshed:** Mesh of faces in view from given point



## Component Reference: Analysis

### Watershed

Calculate the watershed for given points on a surface mesh.

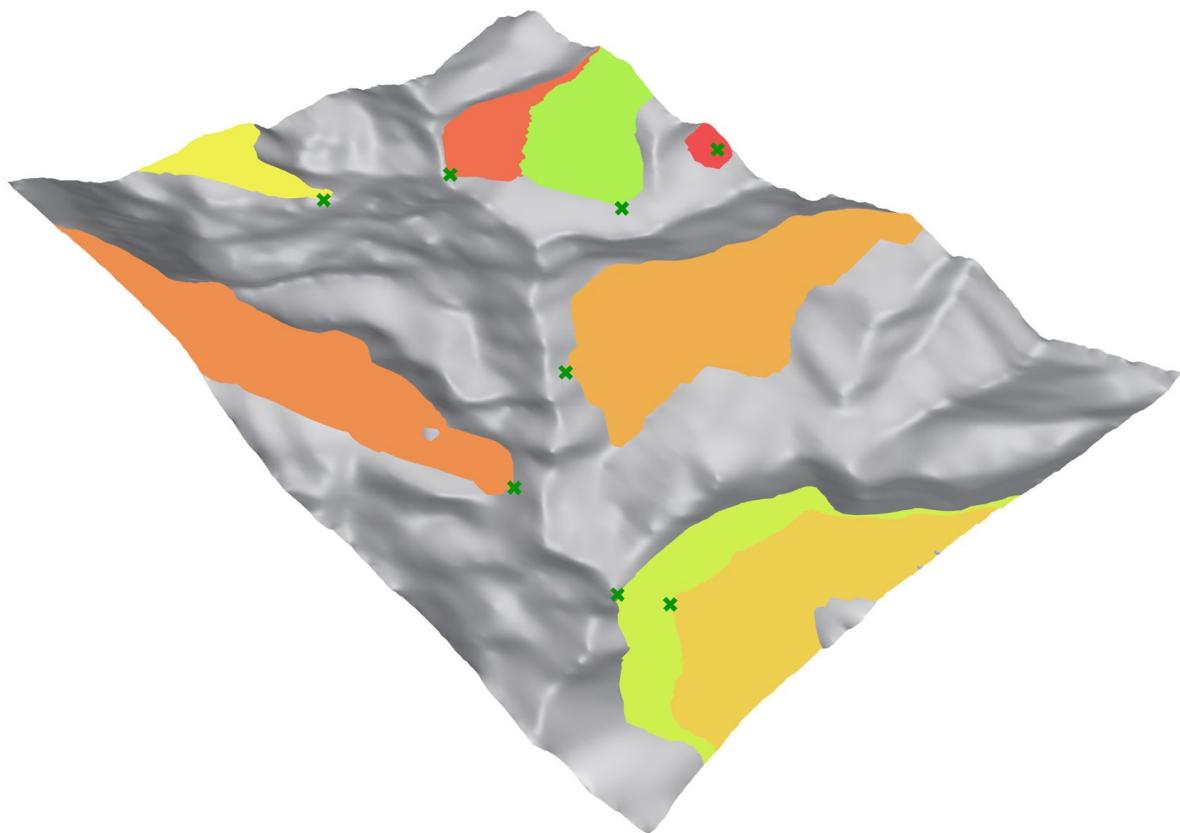
Inputs:

**Mesh:** Surface mesh for analysis.

**Points:** Points for watershed calculation.

Output:

**Watershed:** Resulting watershed meshes.



## Component Reference: Anno

### Contour

Draws major and minor contours with elevation tags

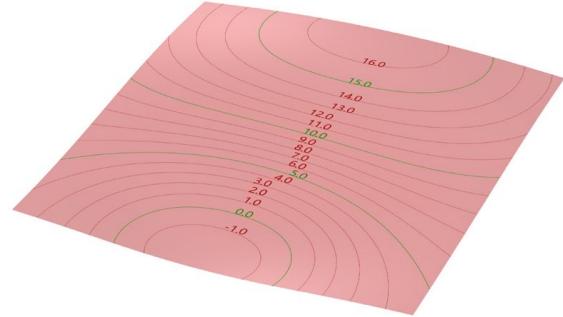
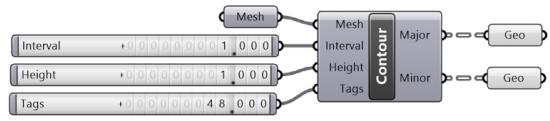
Inputs:

- Mesh:** Mesh to generate contours
- Interval:** Elevation interval for contour lines
- Height:** Text height for elevation tags
- Tags:** Distance interval for elevation tags

Output:

- Major:** Major contour lines and elevation tags
- Minor:** Minor contour lines and elevation tags

Note: Connect to generic 'Geometry' parameter



### HP LP

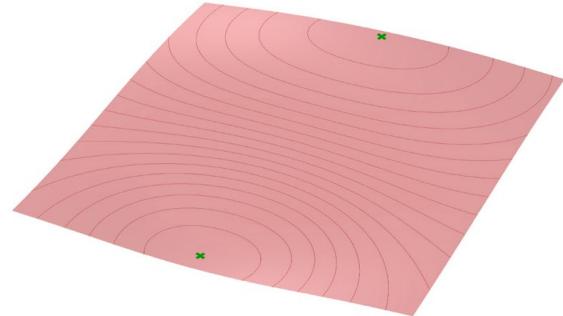
Calculate local high and low points on a surface mesh

Inputs:

- Mesh:** Mesh to find high and low points
- Tolerance:** Optional minimum elevation difference between neighboring and high or low points

Output:

- HP:** Local high points
- LP:** Local low points



## Component Reference: Anno

### Spot Elevation Point

Draw elevation tags for points

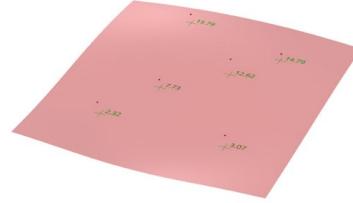
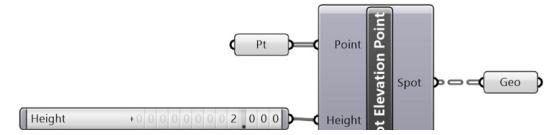
#### Inputs:

**Point:** Point for elevation tag location  
**Height:** Text height for elevation tags

#### Output:

**Spot:** Spot elevation tags

Note: Connect to generic 'Geometry' parameter



### Spot Elevation

Draw elevation tags for points projected to a mesh

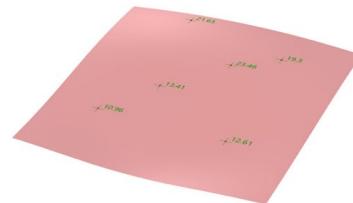
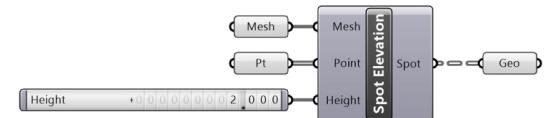
#### Inputs:

**Mesh:** Mesh to calculate elevation points  
**Point:** Points to project to mesh  
**Height:** Text height for elevation tags

#### Output:

**Spot:** Spot elevation tags

Note: Connect to generic 'Geometry' parameter



### Spot Elevation Path

Draw elevation tags for points along a curve on a mesh

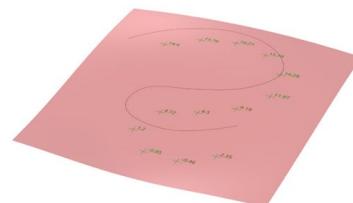
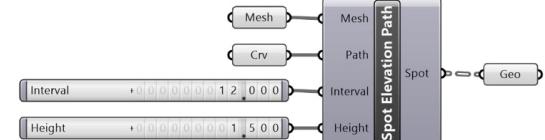
#### Inputs:

**Mesh:** Mesh to calculate elevation points  
**Path:** Curve for points to draw elevation tags  
**Interval:** Interval distance for points along curve  
**Height:** Text height for elevation tags

#### Output:

**Spot:** Spot elevation tags

Note: Connect to generic 'Geometry' parameter



### Spot Elevation Grid

Draw elevation tags for a point grid on a mesh

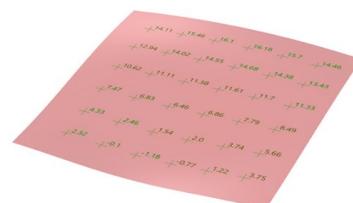
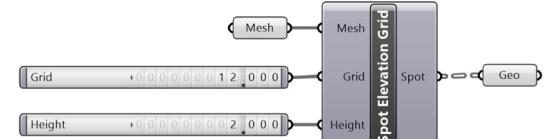
#### Inputs:

**Mesh:** Mesh to calculate elevation points  
**Grid:** Grid interval for elevation tags  
**Height:** Text height for elevation tags

#### Output:

**Spot:** Spot elevation tags

Note: Connect to generic 'Geometry' parameter



## Component Reference: Anno

### Slope Point

Calculate local slope percentage for a point on a mesh

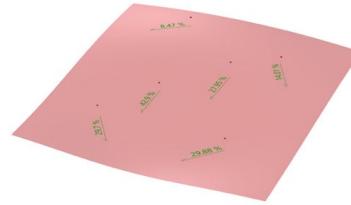
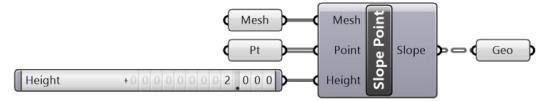
Inputs:

- Mesh:** Mesh for slope analysis
- Point:** Point to calculate local slope percentage
- Height:** Text height for slope percentage tags

Output:

- Slope:** Slope percentage tags

Note: Connect to generic 'Geometry' parameter



### Slope Line

Calculate slope percentage for the end points of curves

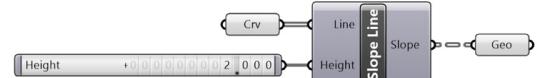
Inputs:

- Line:** Curve to calculate slope percentage
- Height:** Text height for slope percentage tags

Output:

- Slope:** Slope percentage tags

Note: Connect to generic 'Geometry' parameter



### Slope Path

Calculate local slope percentage for points along a curve on a mesh

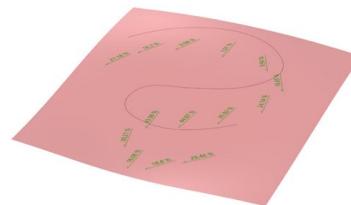
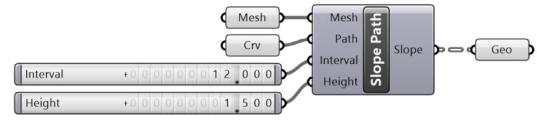
Inputs:

- Mesh:** Mesh for slope analysis
- Path:** Curve for points to calculate local slope percentage
- Interval:** Distance interval for points along the path curve
- Height:** Text height for slope percentage tags

Output:

- Slope:** Slope percentage tags

Note: Connect to generic 'Geometry' parameter



### Slope Grid

Calculate local slope percentage for a point grid on a mesh

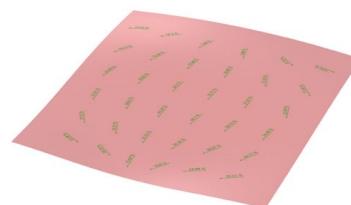
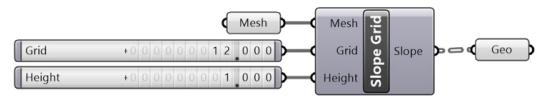
Inputs:

- Mesh:** Mesh for slope analysis
- Grid:** Grid interval for slope percentage tags
- Height:** Text height for slope percentage tags

Output:

- Slope:** Slope percentage tags

Note: Connect to generic 'Geometry' parameter



## Component Reference: Mesh

### Remesh Square

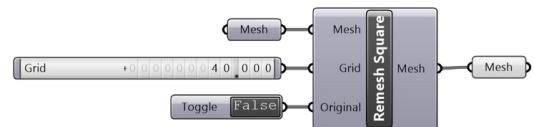
Resample a landscape mesh with a square grid

Inputs:

- Mesh:** Mesh to resample
- Grid:** Dimension of sampling grid
- Original:** Set boolean to True to include original points in the mesh

Output:

- Mesh:** Resulting mesh



### Remesh Triangular

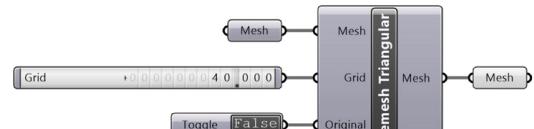
Resample a landscape emesh with a triangular grid

Inputs:

- Mesh:** Mesh to resample
- Grid:** Dimension of sampling grid
- Original:** Set boolean to True to include original points in the mesh

Output:

- Mesh:** Resulting mesh



### Remesh Random

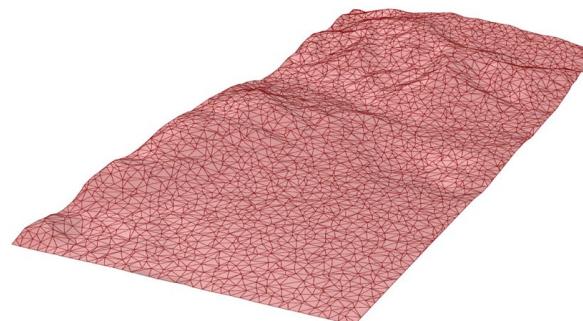
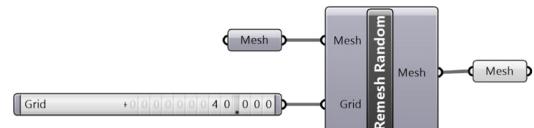
Resample a landscape mesh with a random grid

Inputs:

- Mesh:** Mesh to resample
- Grid:** Dimension of sampling grid

Output:

- Mesh:** Resulting mesh



## Component Reference: Mesh

### Triangulate Mesh

Create a surface mesh from points and/or curves

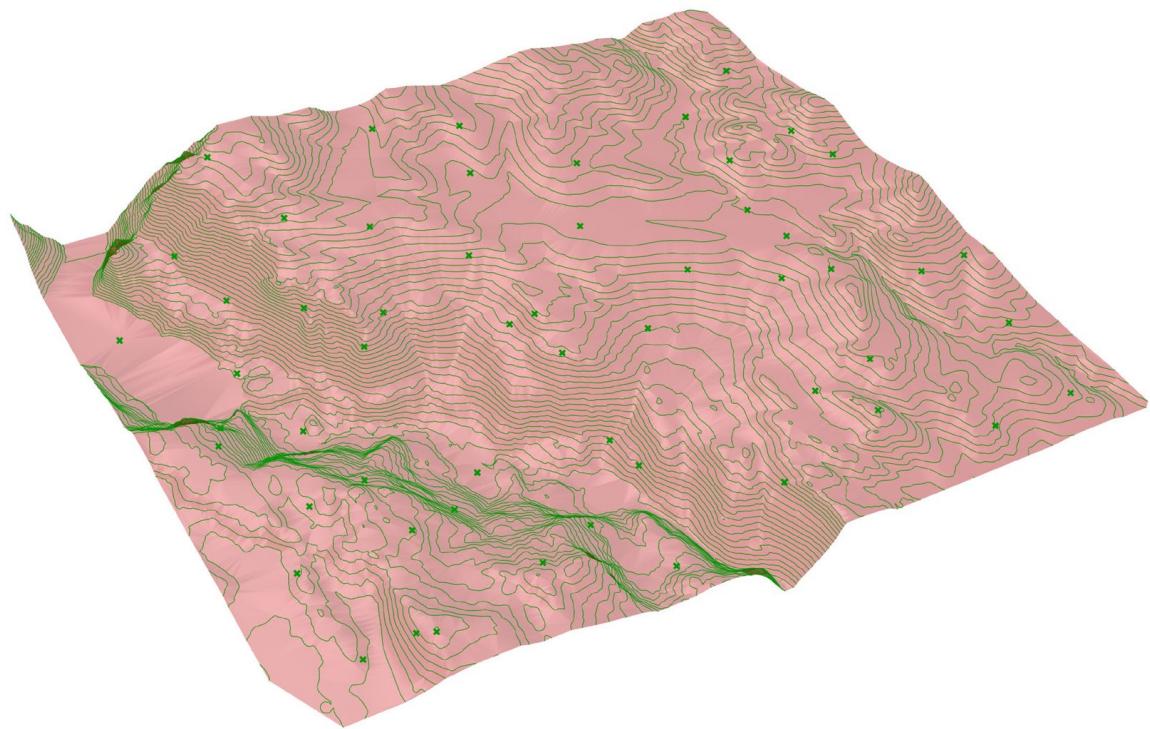
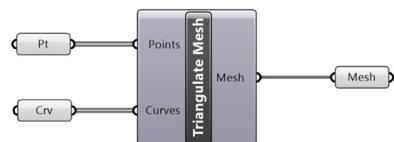
Inputs:

- Points:** Points to triangulate
- Curves:** Curves to triangulate

Output:

- Mesh:** Resulting mesh

Note: Component is designed for use with simplified, clean contour curves and elevation points. Input data should not contain any doubled or overlapping elements. Mesh is triangulated with respect to the XY plane, and will produce anomalies at vertically coincident points.



**Component Reference: Mesh Edit**

**Reduce Slope**

Reduce mesh slopes to given limit

Inputs:

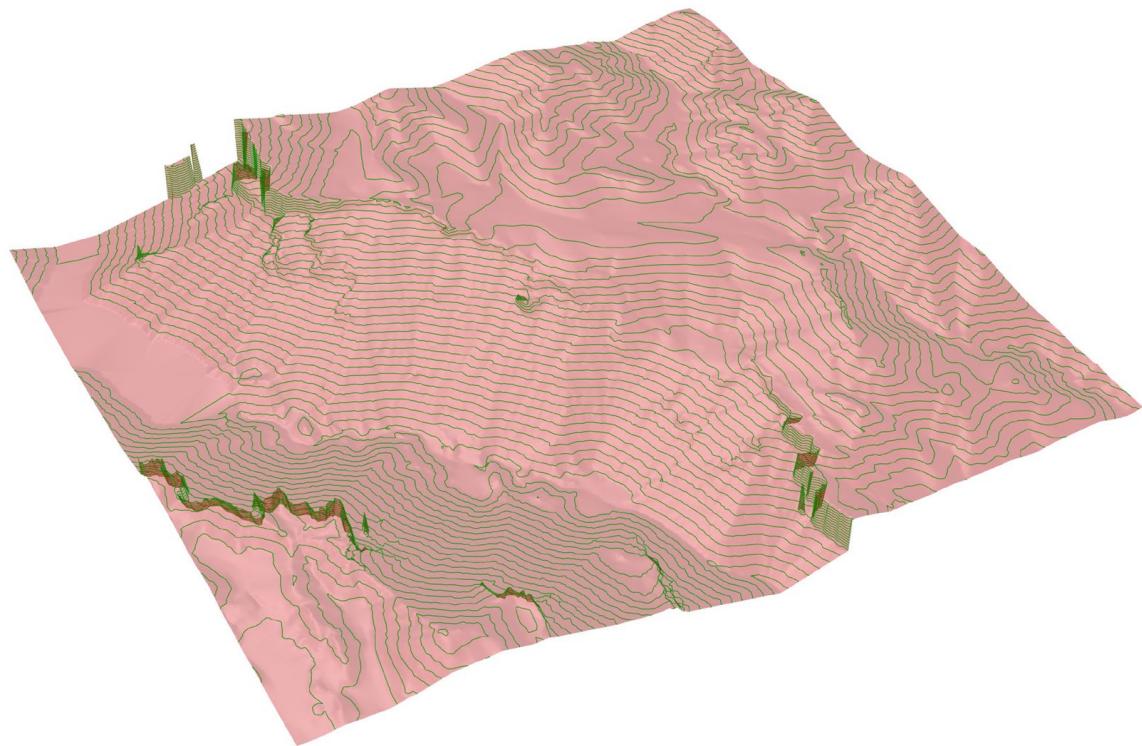
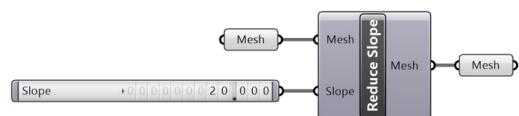
**Mesh:** Mesh to edit

**Slope:** Maximum slope in resulting mesh, in percent

Output:

**Mesh:** Edited mesh

Note: Severe changes in maximum slope may produce discontinuities.



## Component Reference: Mesh Edit

### Mesh Point

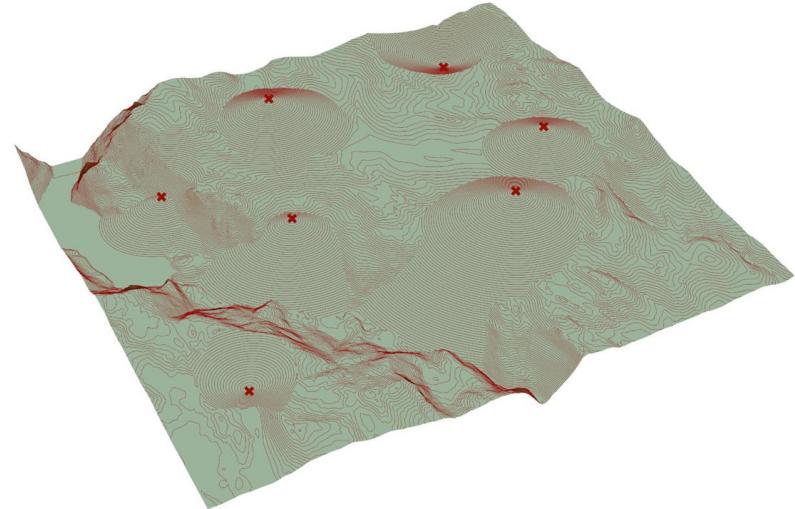
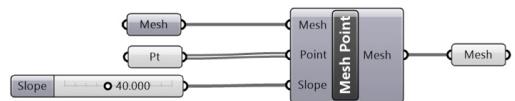
Edit mesh with points and a given slope

Inputs:

- Mesh:** Mesh to edit
- Point:** Points to edit mesh
- Slope:** Slope for edits

Output:

- Mesh:** Edited mesh



### Mesh Point Pull

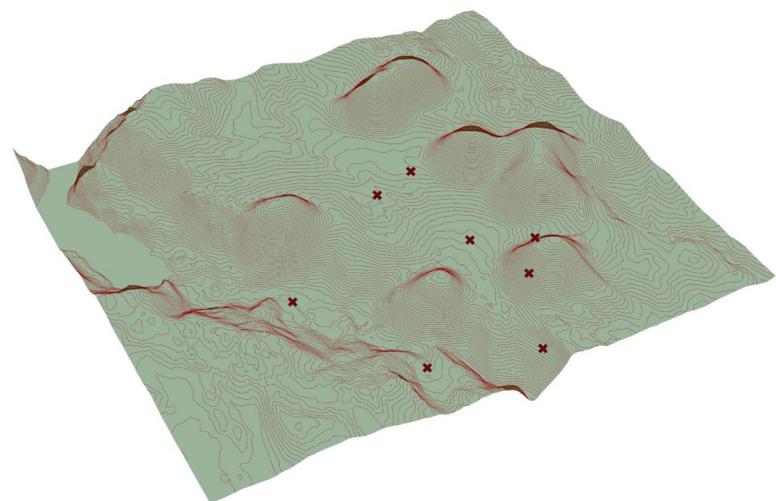
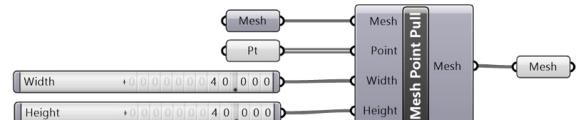
Edit mesh with deformations at points, strength defined by point elevation

Inputs:

- Mesh:** Mesh to edit
- Point:** Points for edit to follow
- Width:** Width factor for mesh edit
- Height:** Height factor for mesh edit

Output:

- Mesh:** Edited mesh



## Component Reference: Mesh Edit

### Mesh Curve

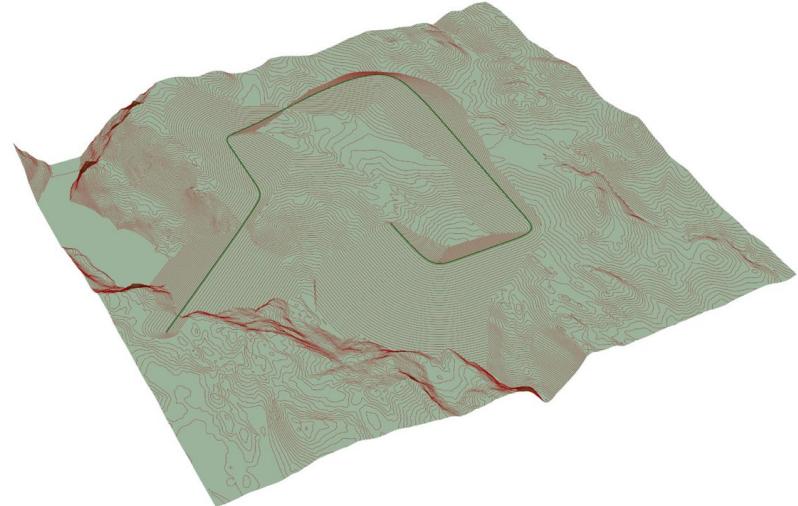
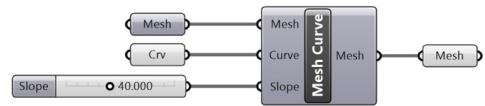
Edit mesh with an edge curve with a given slope

Inputs:

- Mesh:** Mesh to edit
- Curve:** Curve to edit mesh
- Slope:** Slope for edge curve

Output:

- Mesh:** Edited mesh



### Mesh Curve Pull

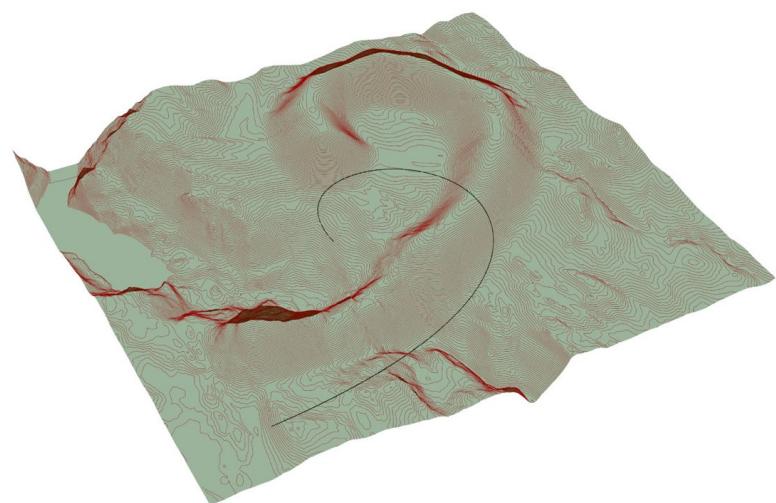
Edit mesh with deformations following curves, strength defined by curve elevation

Inputs:

- Mesh:** Mesh to edit
- Curve:** Curves for edit to follow
- Width:** Width factor for mesh edit
- Height:** Height factor for mesh edit

Output:

- Mesh:** Edited mesh



**Component Reference: Mesh Edit**

**Mesh Flat**

Edit mesh with a flat region defined by a closed planar curve

Inputs:

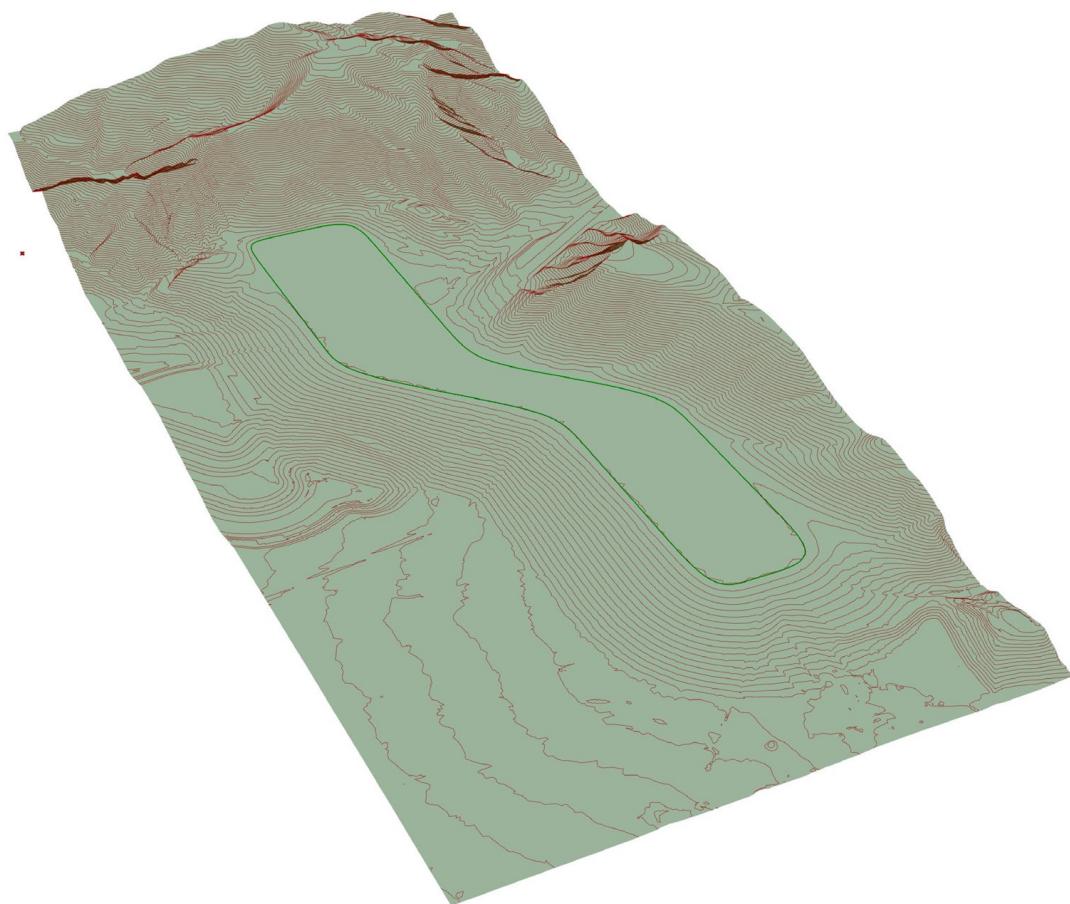
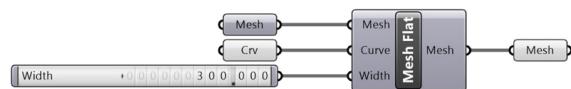
**Mesh:** Mesh to edit

**Curve:** Closed planar curves for mesh edit

**Width:** Width factor for edit

Output:

**Mesh:** Edited mesh



**Component Reference: Mesh Edit**

**Mesh Path**

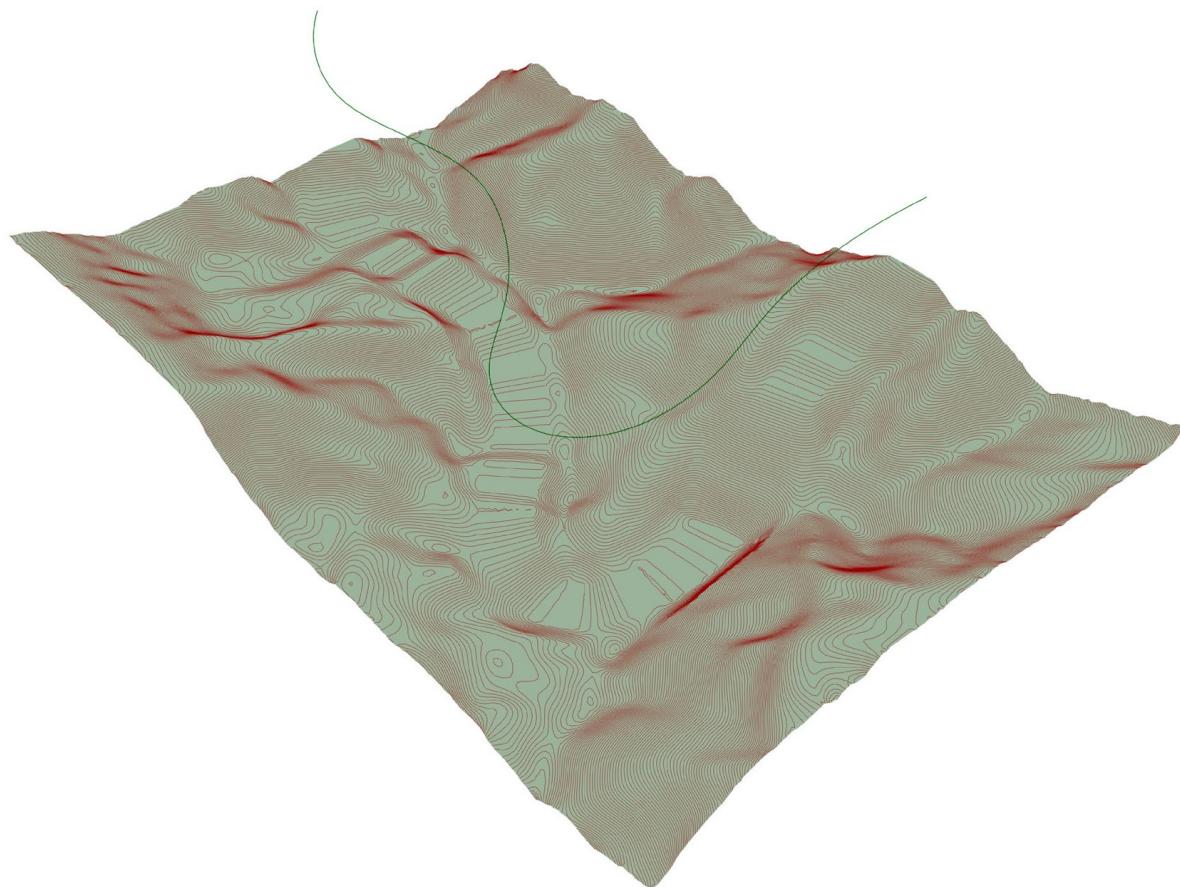
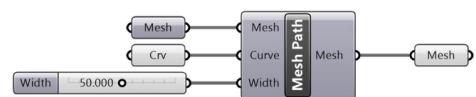
Edit mesh with a flattened path along a given curve

Inputs:

**Mesh:** Mesh to edit  
**Curve:** Curve for path  
**Width:** Width of flattened segment

Output:

Mesh: Edited mesh



## Component Reference: Mesh Import

### Import Mesh DEM

Import mesh from a Tiff DEM file encoded in single-channel 32 bit floats

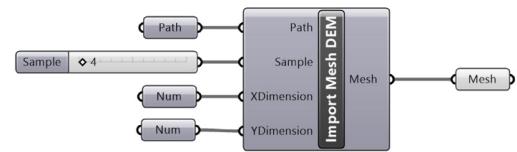
Inputs:

**Path:** Path to .tiff file  
**Sample:** Sampling factor as nth pixel to read  
**XDimension:** X dimension pixel size  
**YDimension:** Y dimension pixel size

Output:

**Mesh:** Imported mesh

Note: Does not import metadata for spatial reference. Mesh is placed at document origin as projected in the raster image.



### Import Mesh LandXML

Import mesh from a LandXML TIN surface

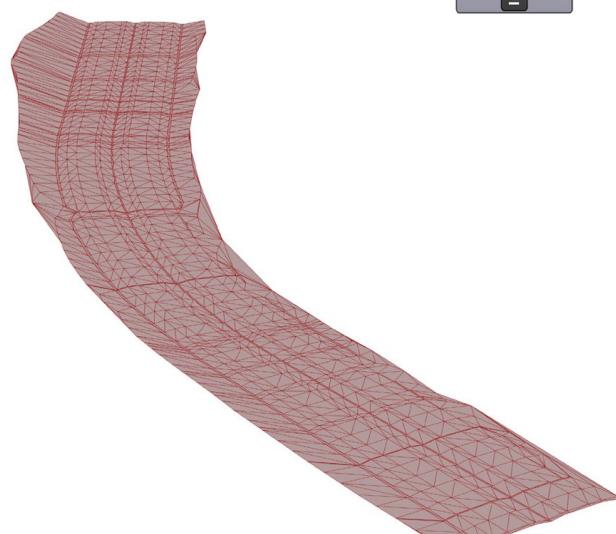
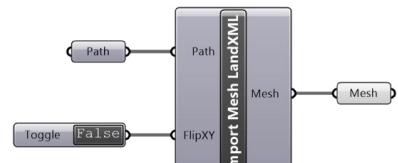
Inputs:

**Path:** Path to .xml file  
**FlipXY:** Boolean to flip coordinates, surface may be encoded as XY or YX

Output:

**Mesh:** Imported mesh

Note: Verify XY or YX coordinate encoding, may vary depending on data source. Component does not import LandXML geometry metadata.



## Component Reference: Section

### Section Serial

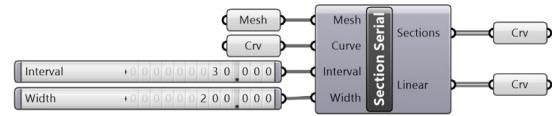
Cuts serial sections perpendicular to a centerline curve at a given interval

Inputs:

- Mesh:** Mesh for serial sections
- Curve:** Curve for centerline of serial sections
- Interval:** Interval distance between sections
- Width:** Width of section cuts

Output:

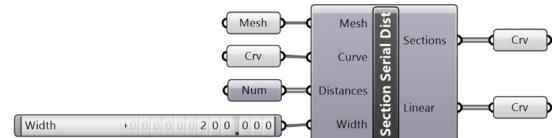
- Sections:** Section cuts on mesh
- Linear:** Section cuts unrolled to YZ plane



### Section Serial Dist

Identical to above, but takes cuts at specific stations

- Distances:** Distances for cut locations along centerline curve



### Section Profile

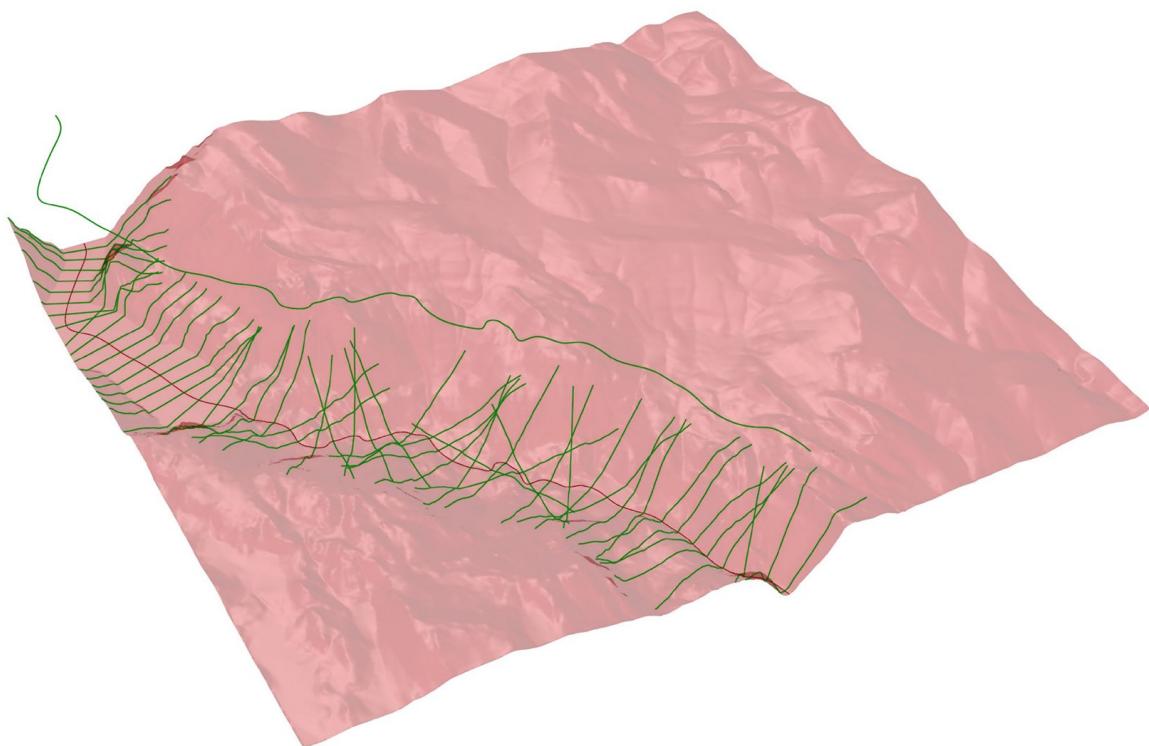
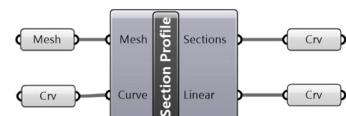
Cuts a section along an irregular profile curve.

Inputs:

- Mesh:** Mesh to cut by profile curve
- Curve:** Profile curve for section

Output:

- Sections:** Section cuts on mesh
- Linear:** Section cuts unrolled to XZ plane



**Component Reference: Section**

**Section To XY**

Cuts serial sections perpendicular to a centerline curve at a given interval

Inputs:

**Linear:** Input sections unrolled to YZ plane from Section Serial or Section Serial Dist components

Output:

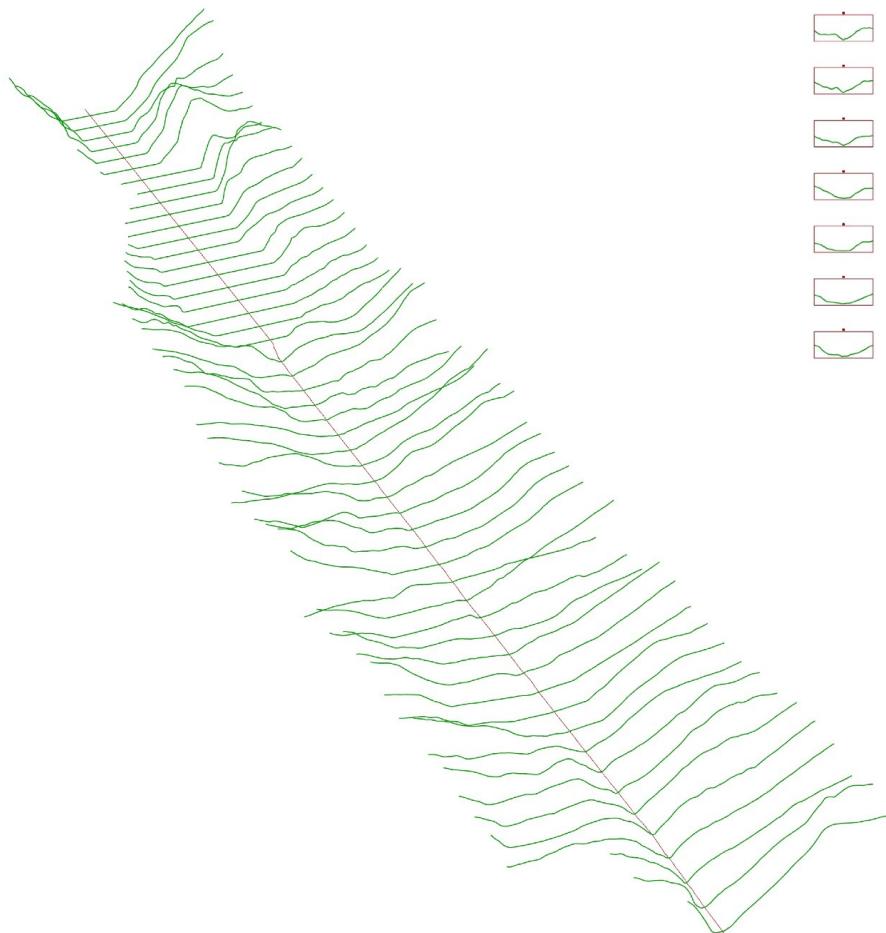
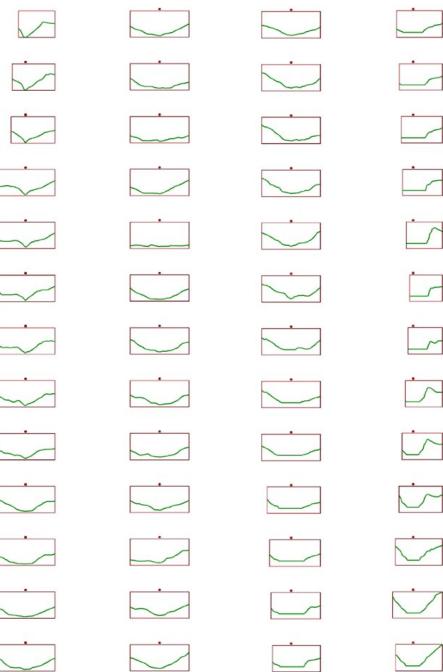
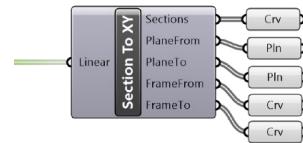
**Sections:** Section cuts mapped to XY plane

**PlaneFrom:** Origin planes for section cuts

**PlaneTo:** Destination planes for section cuts

**FrameFrom:** Origin frames around section cuts

**FrameTo:** Desination frames around section cuts



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