# #5: Site Modeling

Questions of scale, complexity, and purpose influence strategies for "doing dirt"

The problems with sites

- Site geometry is a data problem
  - Drawing data: *contours*
  - Survey data: *3D point 'cloud'*
  - Remote sensing: *satellite, aerial 'DEM'*
- Differing visual (3D) and traditional (2D) representations
  - Physical Models: contour steps
  - Perspectives: Surfaces, horizon lines, objects
  - Plans: contours, spot elevations
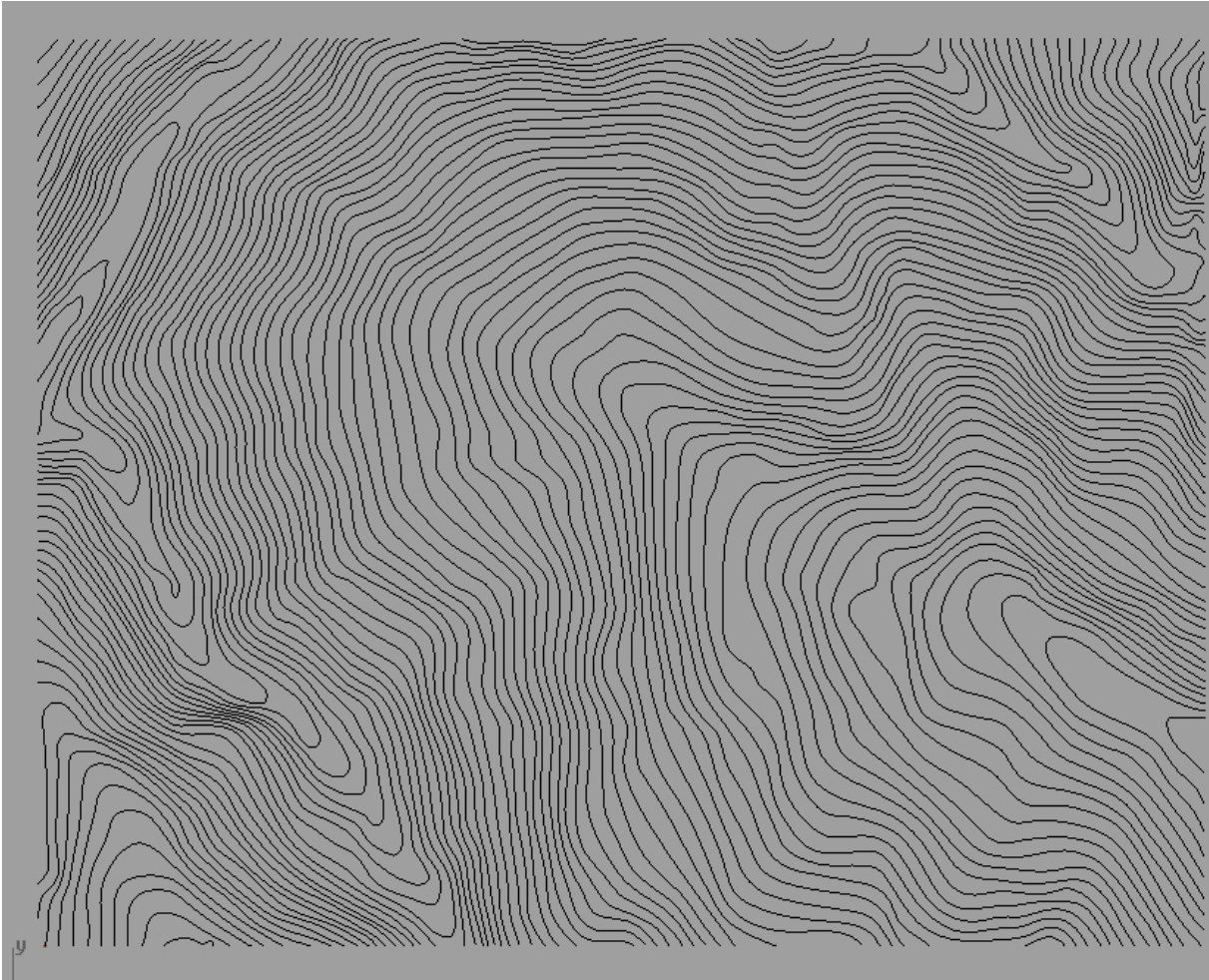 - Elevations: Horizons, ground-lines, grounded objects

Sites: Alternative models

- Contours (2D, flat, available)

- Step models (3D contours)

- Surface models (more real)

- Triangulated Irregular Networks (TINs) – mostly from GIS

- Urban form: hard-scape
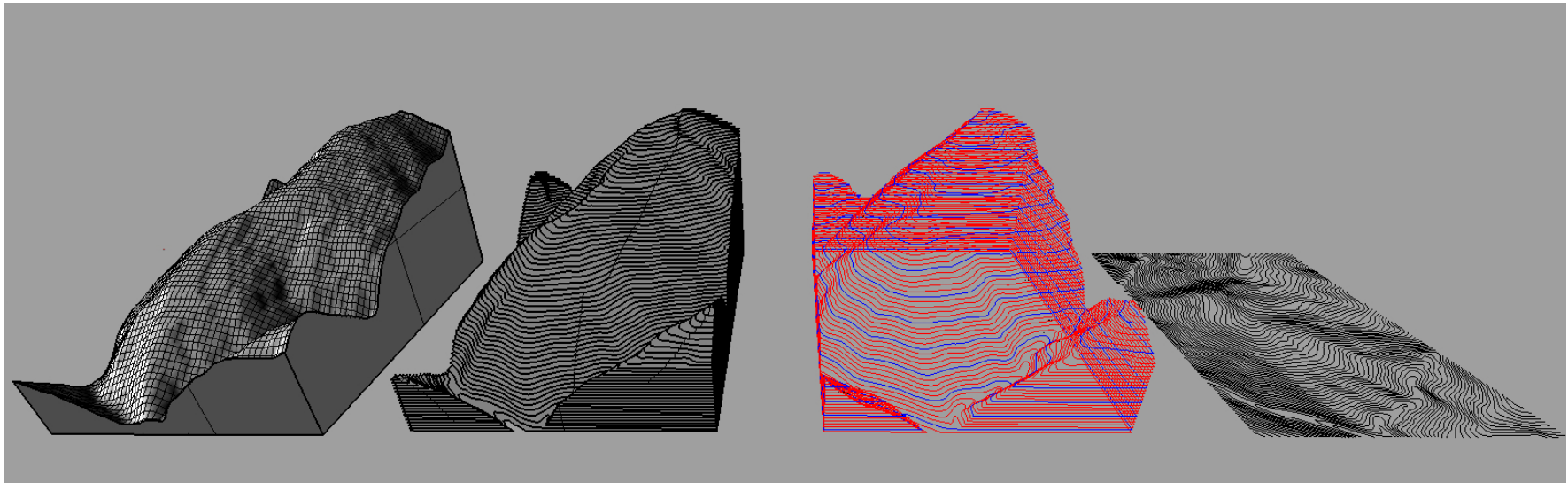
- Digital Elevation Models: (raster grid landforms)
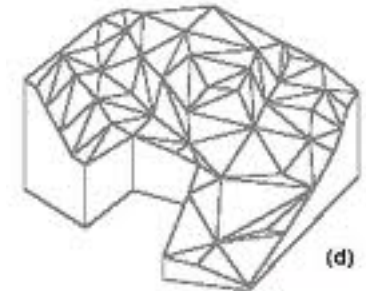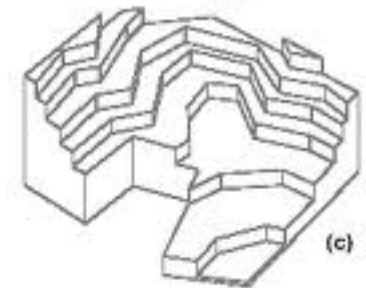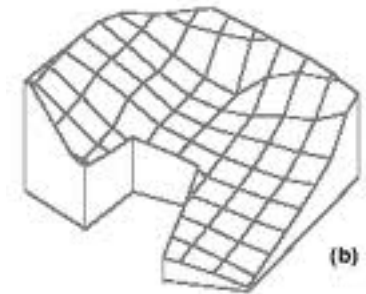
Contours & Survey Data

Landform as contours.

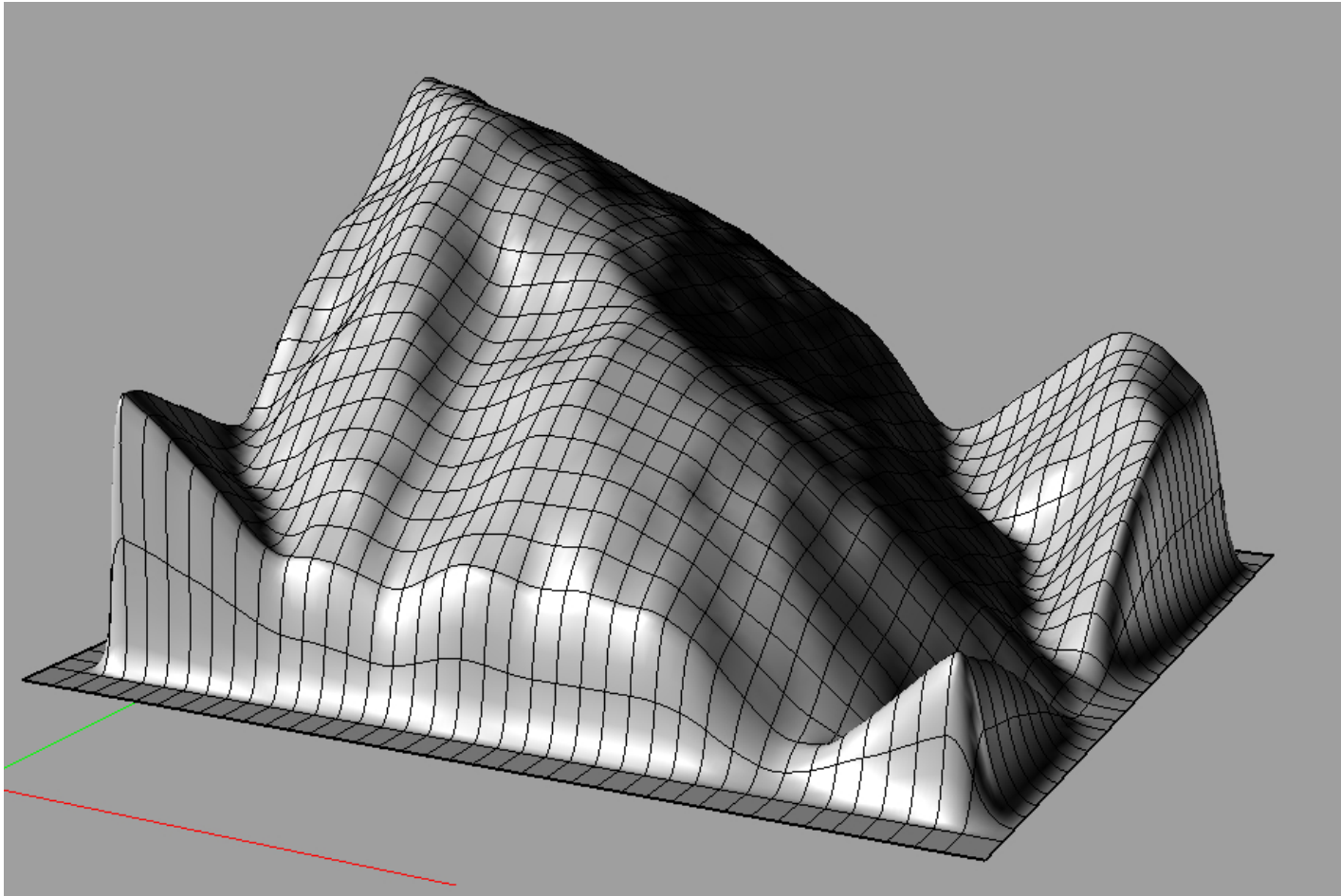

Contours: Serial horizontal sections

Starting with contours
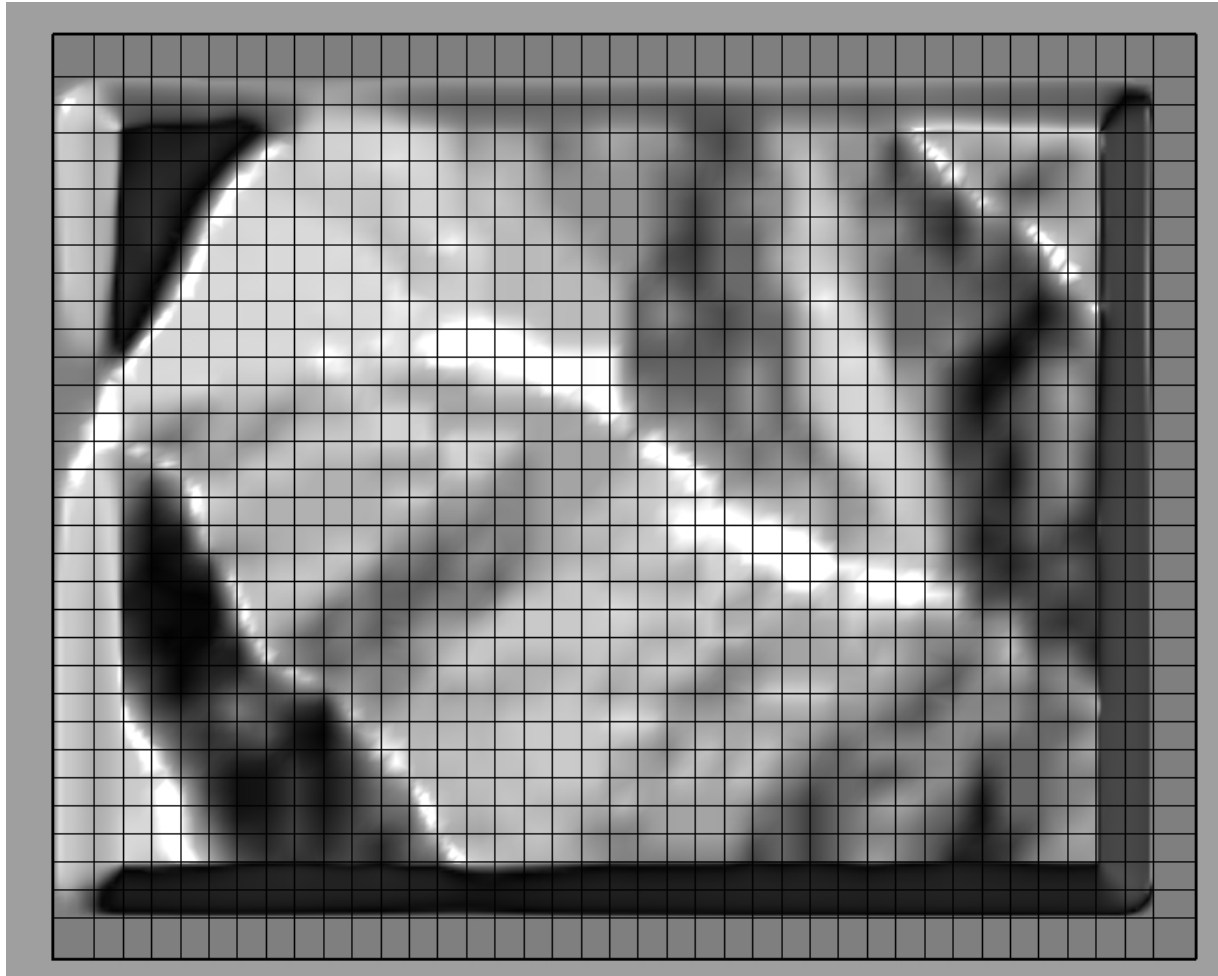

Conversion options
- Flat contours (e.g. from maps) possibly repaired
- Elevated contours
- Extruded contour steps
- Mesh (drape) or Surface (patch)
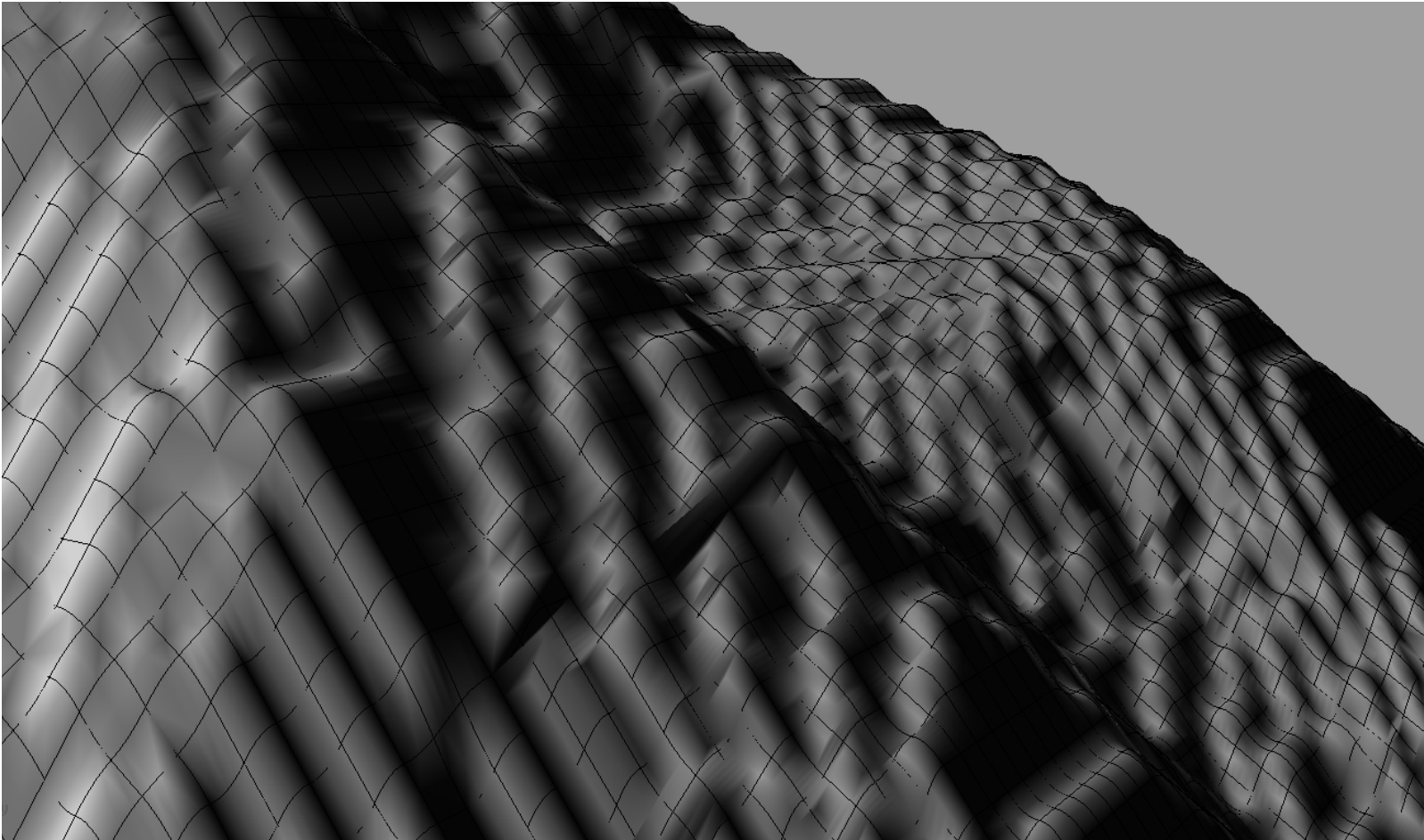
Draped Mesh

Drape operates on surfaces, so contours must be closed and converted to surfaces before doing the drape

Vacuum formed Dirt?

Meshed representations tend to obscure geometry when rendered as line drawings, but work well when rendered.

Setting surfacing parameters?

Parameters depend on local geometry. Set "Tension" or "Stiffness" of the surface.

Patch

- Works with spatial contours or 3d-points
- Produces NURBS surface.
  - Surface can be 'excavated' using boolean ops
  - Surface can be 'shaped' using control points
  - New contours can be extracted using 'contour' op
- Patch orientation may vary
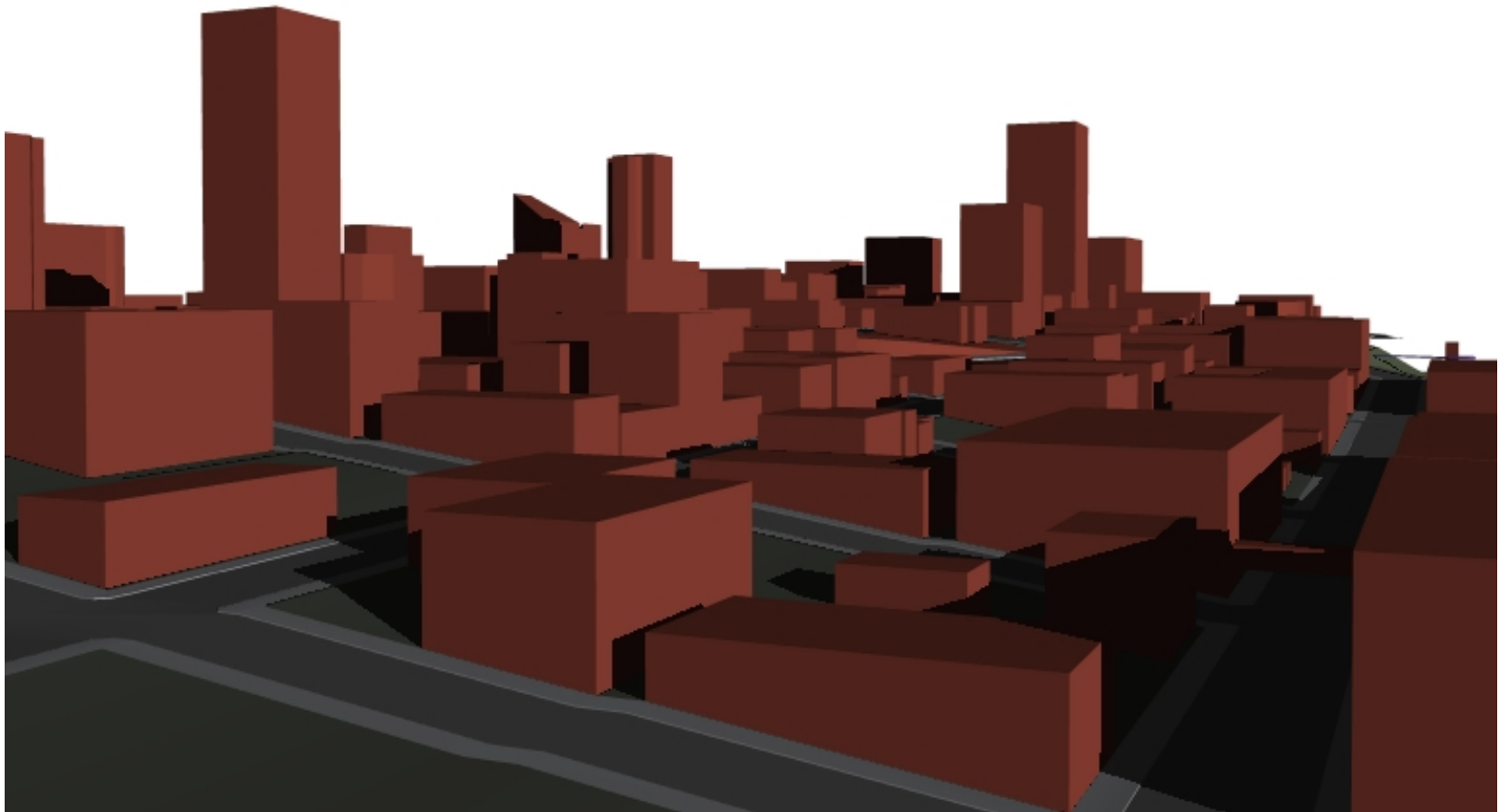- Patch will be larger than contours B-box
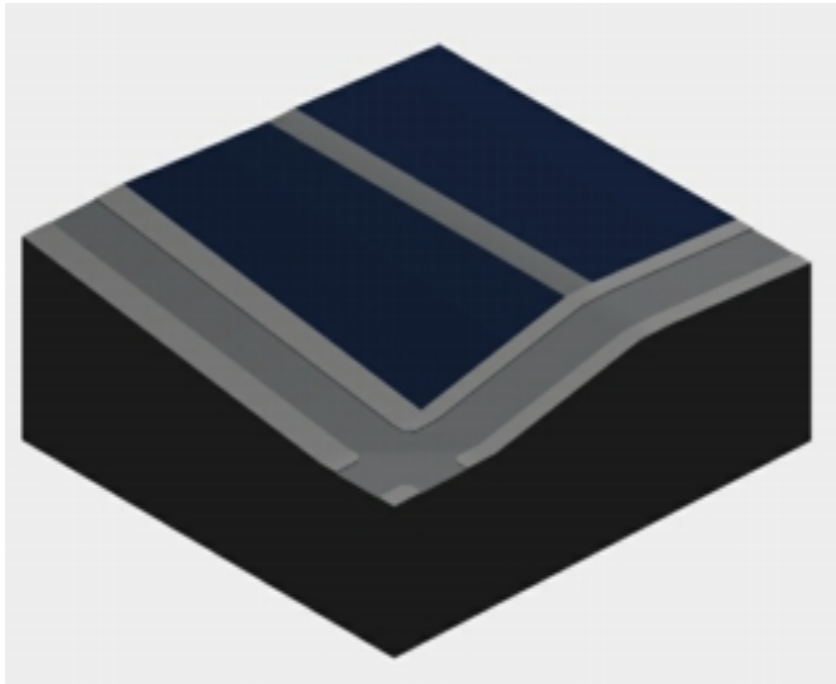
Urban Sites

Urban Landform
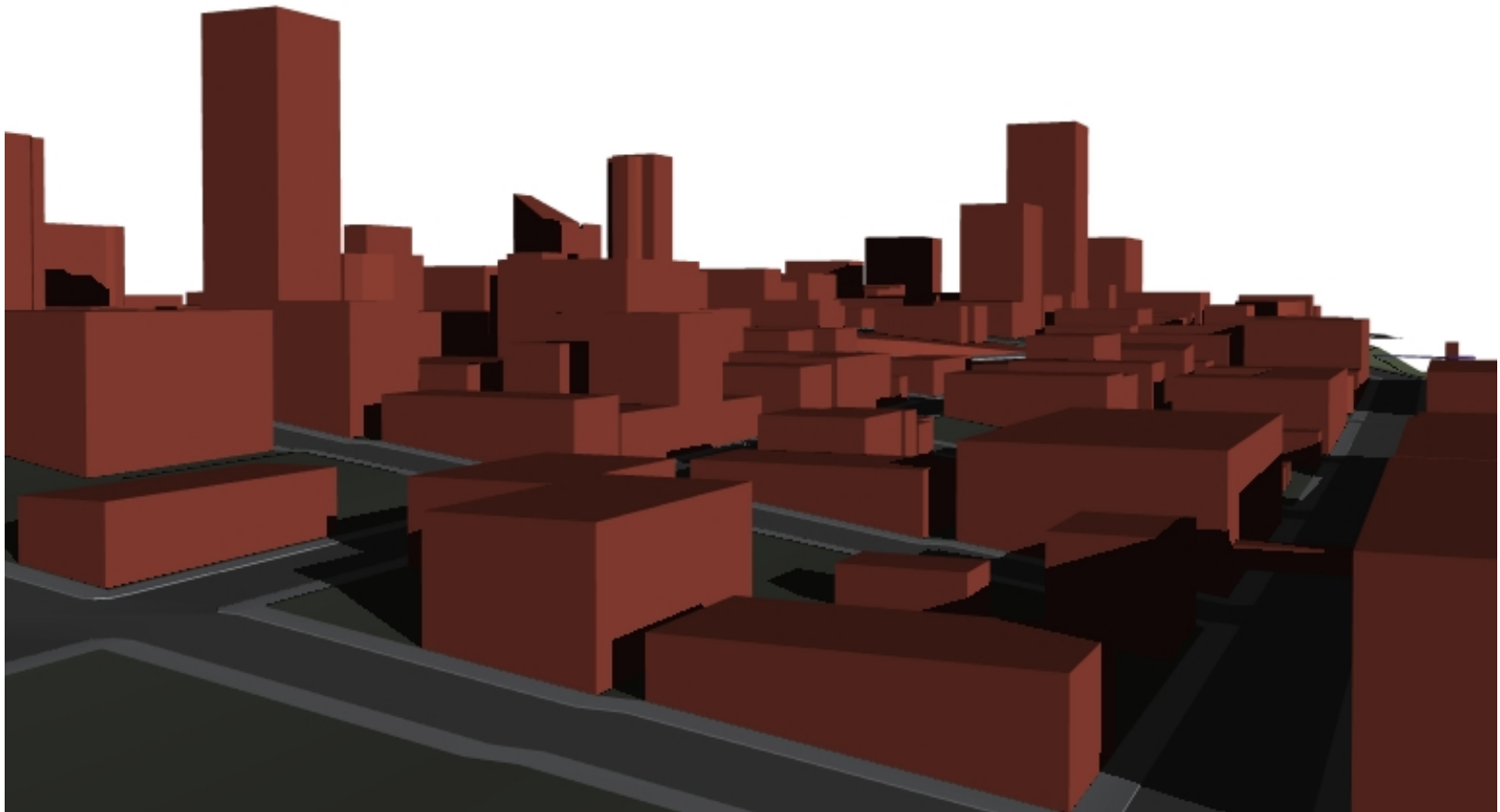
Belltown Charette Model

Cities are **not** contoured…

Belltown Charette Model
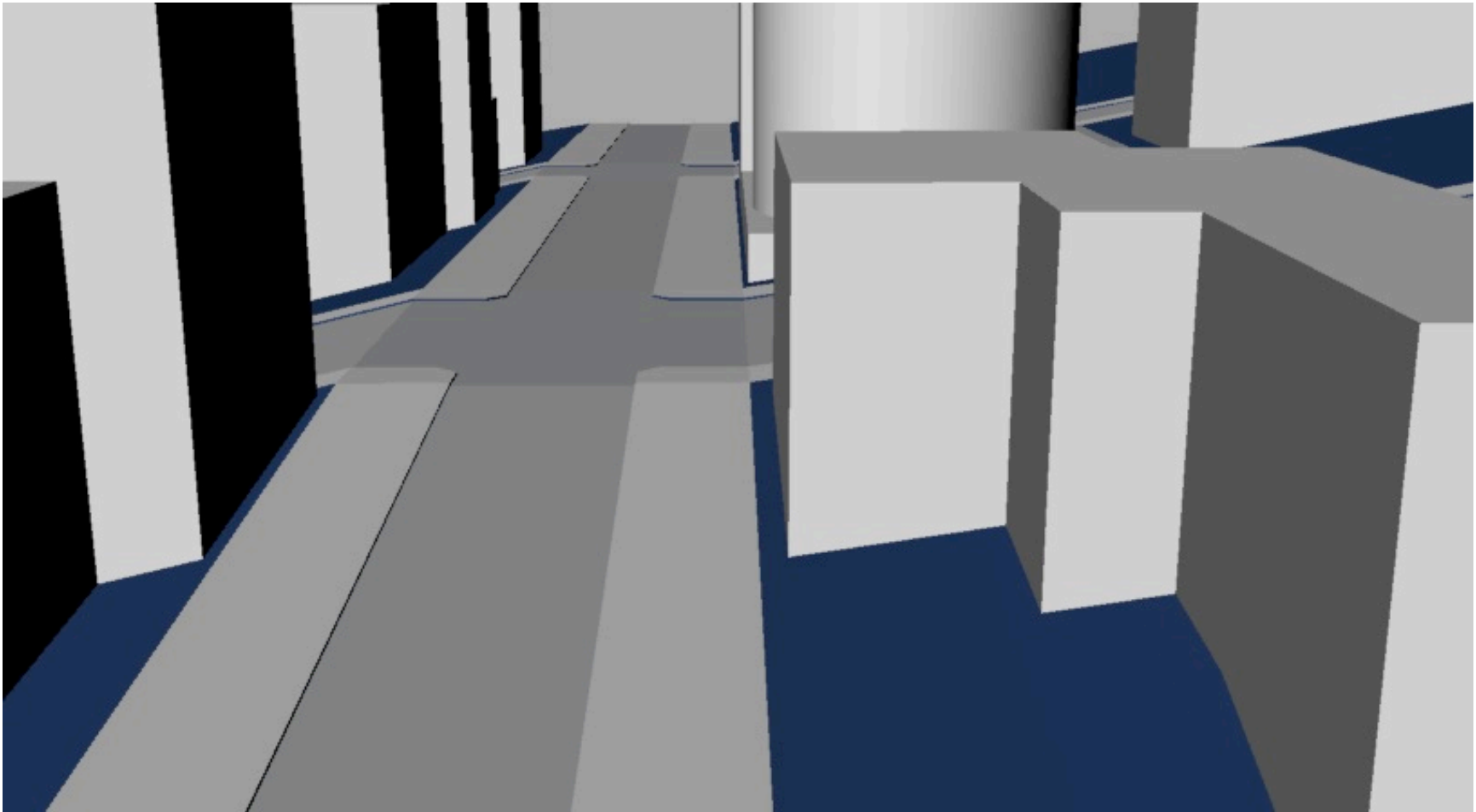
Cities are made of *blocks*

Entourage3d "base block"

- Regular plan geometry
- Planar surfaces
- Slope in one direction
- Level intersections
- Buildings in the middle of the blocks.
- Uniform topology
  - Group blocks
  - Select/move points
  - Add buildings
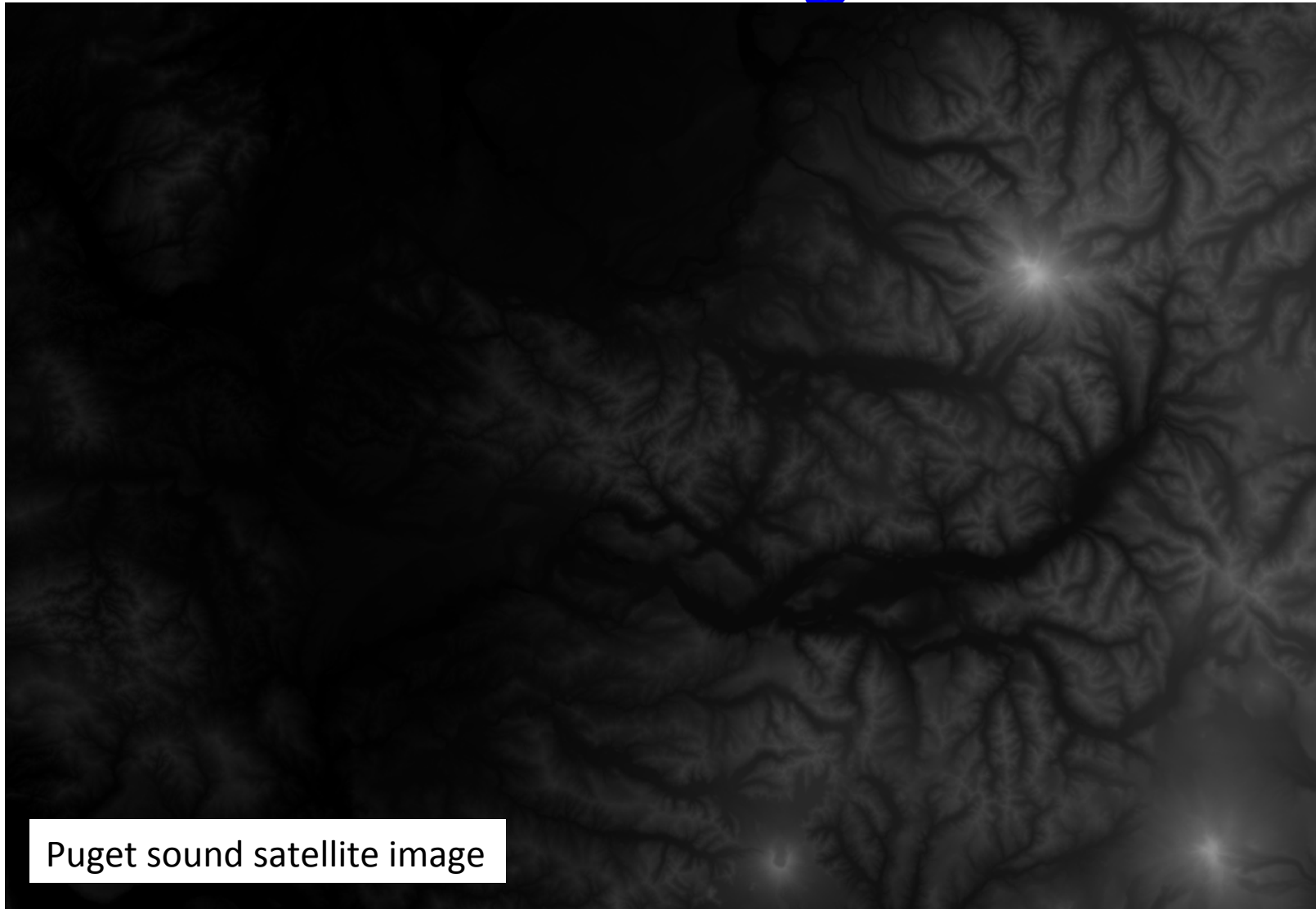 - Add street furniture

Where's the Twist?

An Urban View

Blocks snapped together, points can be moved to define surface.

Territorial Site Data
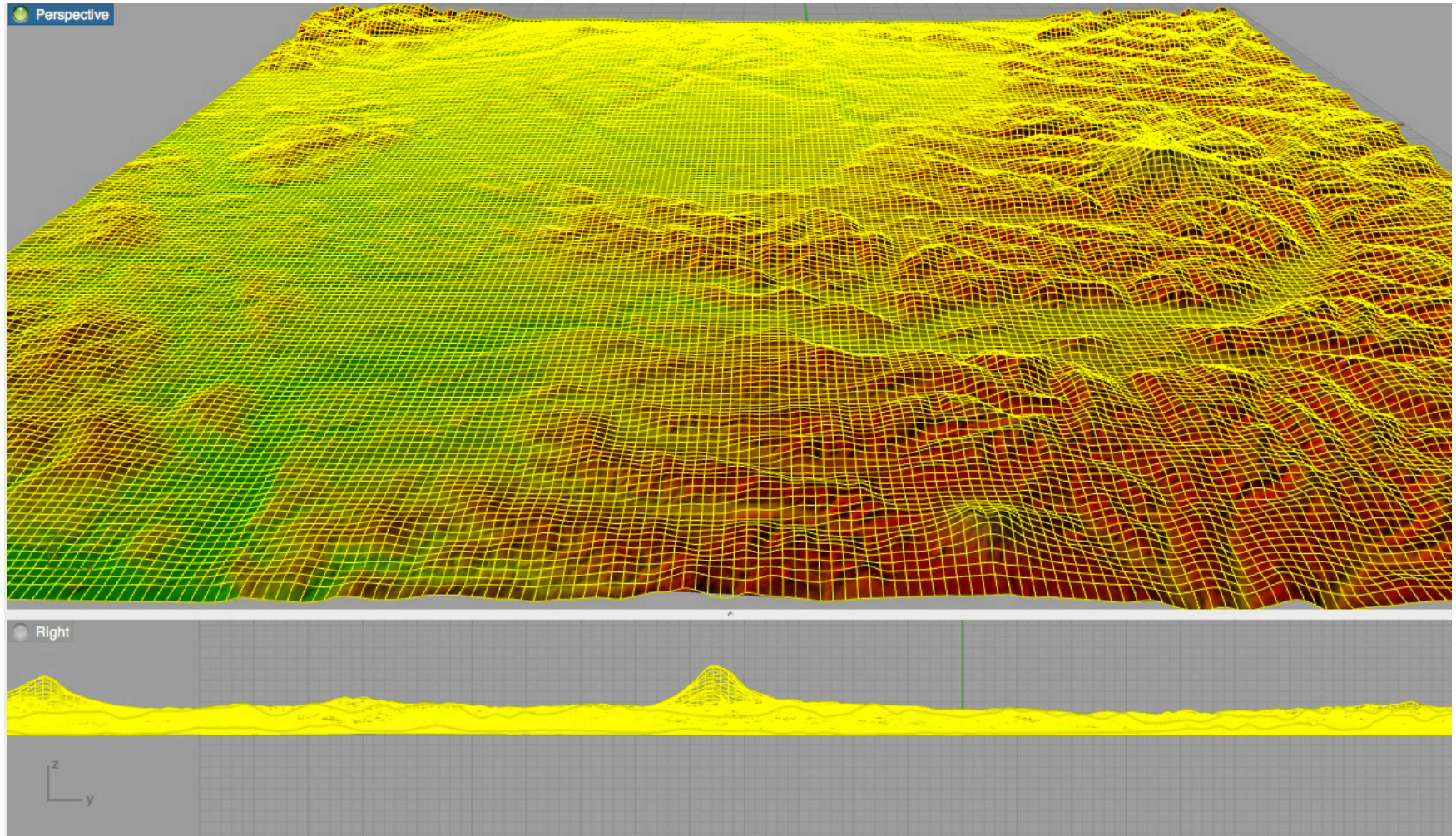
The view from high above...

Puget sound satellite image

Some height data is raster (GIS/DEM).

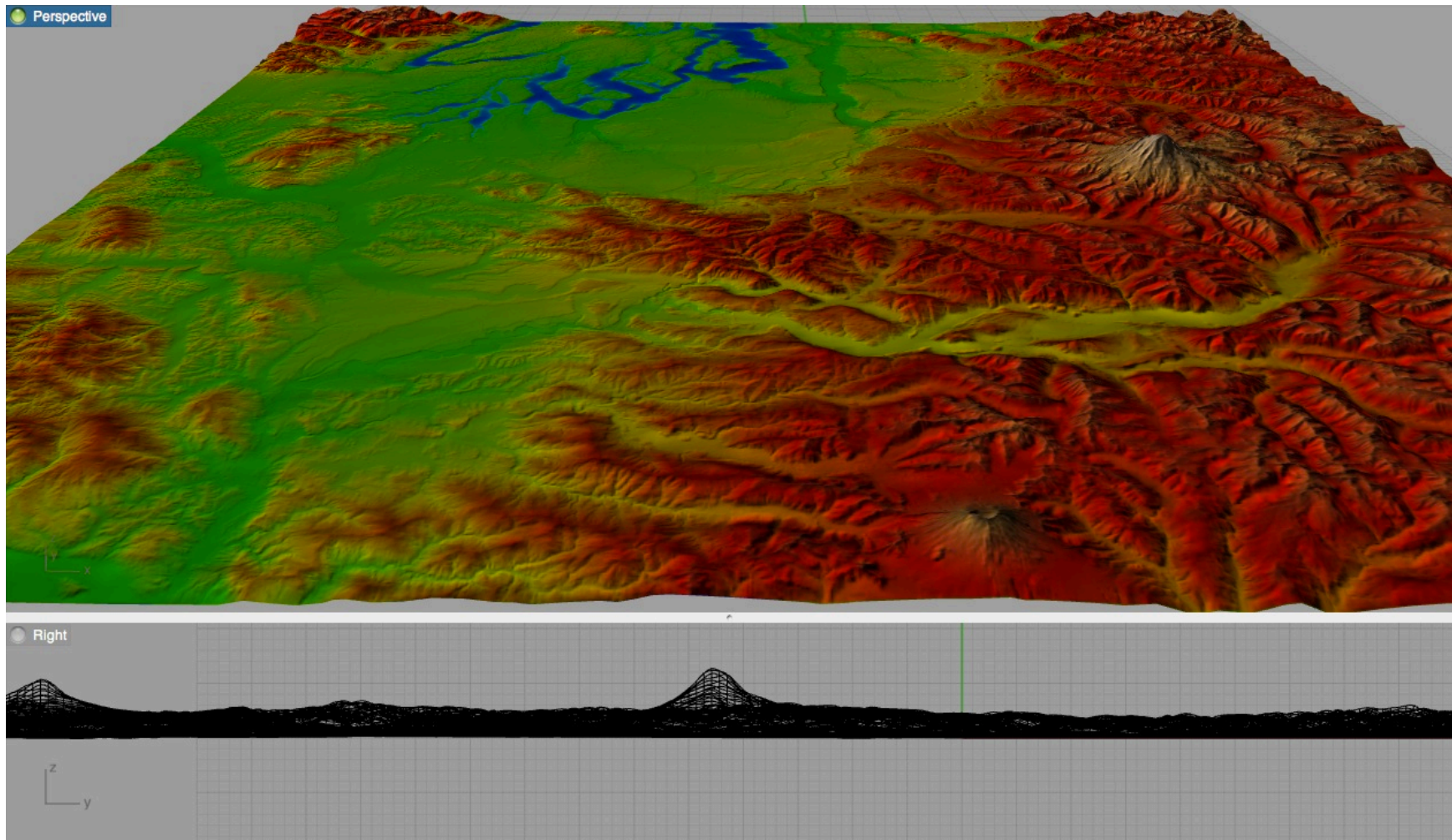# The 100,000 foot view (pixels)

- Regular grid of pixels (10m or larger)

- Radar data gives height at each pixel

- Image data gives ground cover, etc. at each pixel (usually using 'false color')
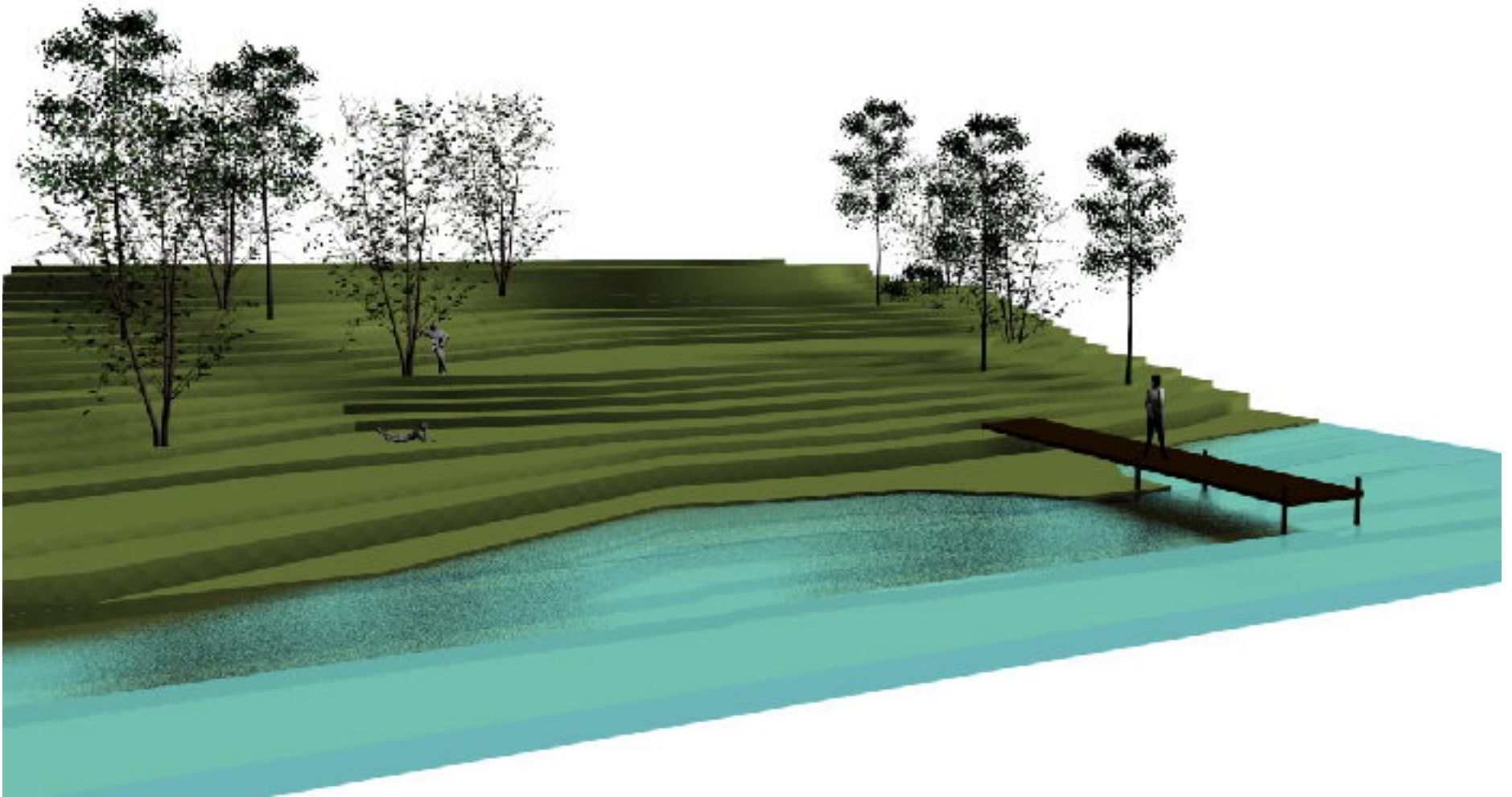
Heightfield: value as height

A Rhino "heightfield" (plus texture) from DEM.

Now that's a BIG model….

Site Modeling:

beyond the basic geometry

Some stuff can be added "on top"
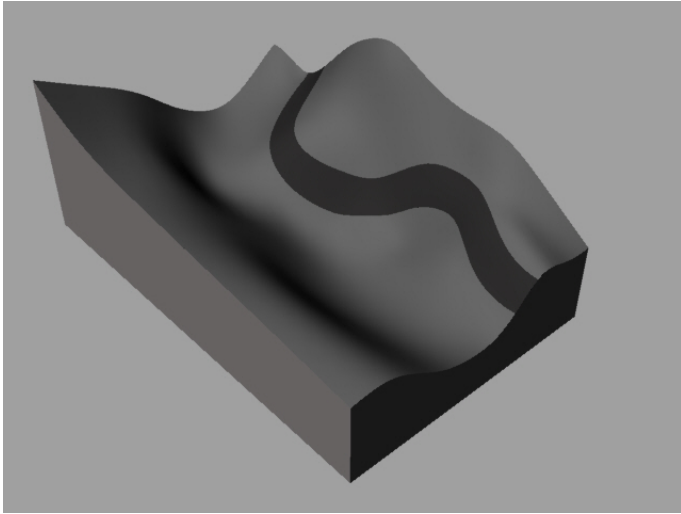
Editing Your Site Geometry

Pushing Dirt Around?

- Contours – redraw or move points
- Mesh – push points up and/or down
- TIN – ditto
- Blocks – Adjust heights
- *Generating NEW contours?*

Dirt and Built form? Bringing them together

- What's in the basement?
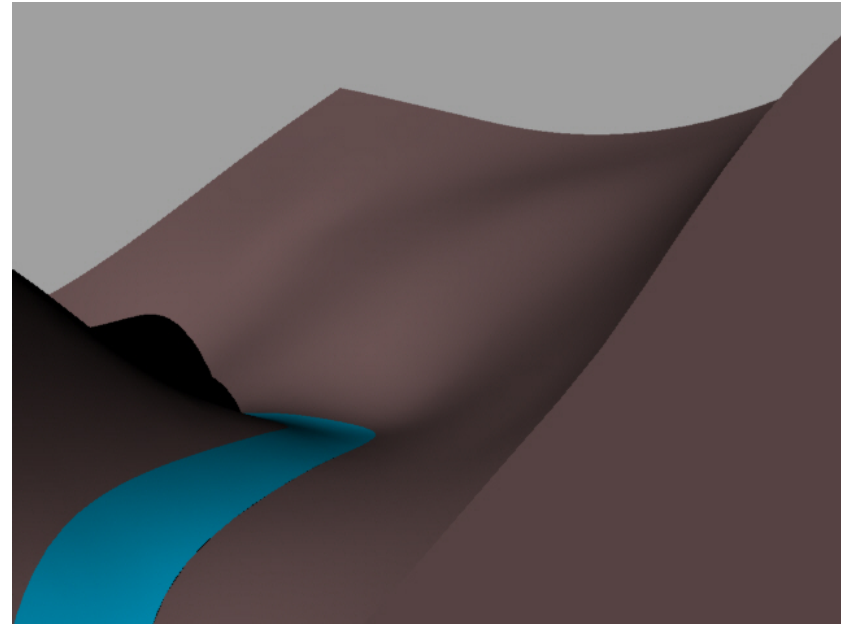- Driveways, sidewalks, paths – edges and offsets
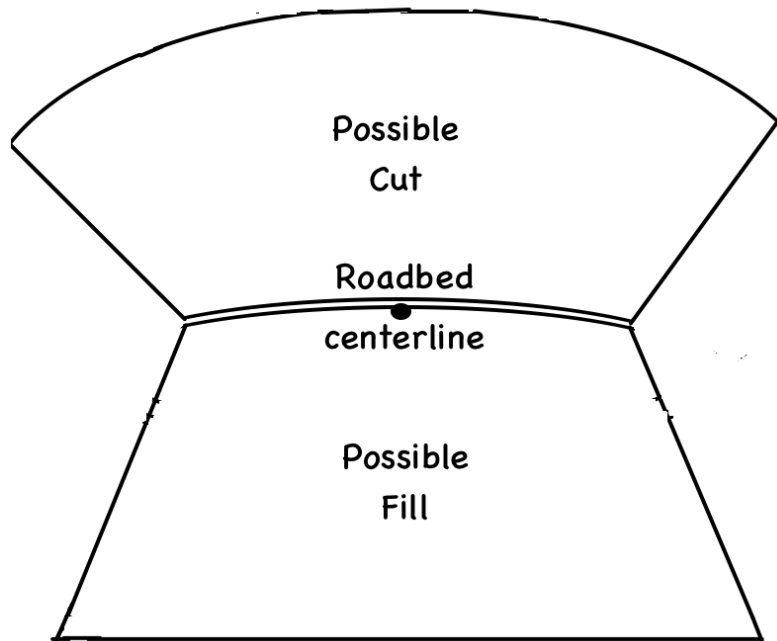
Adding Elements

Quick and Dirty
- Draw features in plan
- Use 'split' to make geometry
- Assign colors to differentiate

Quick and Dirty Features
- Look 'painted on' (2D)
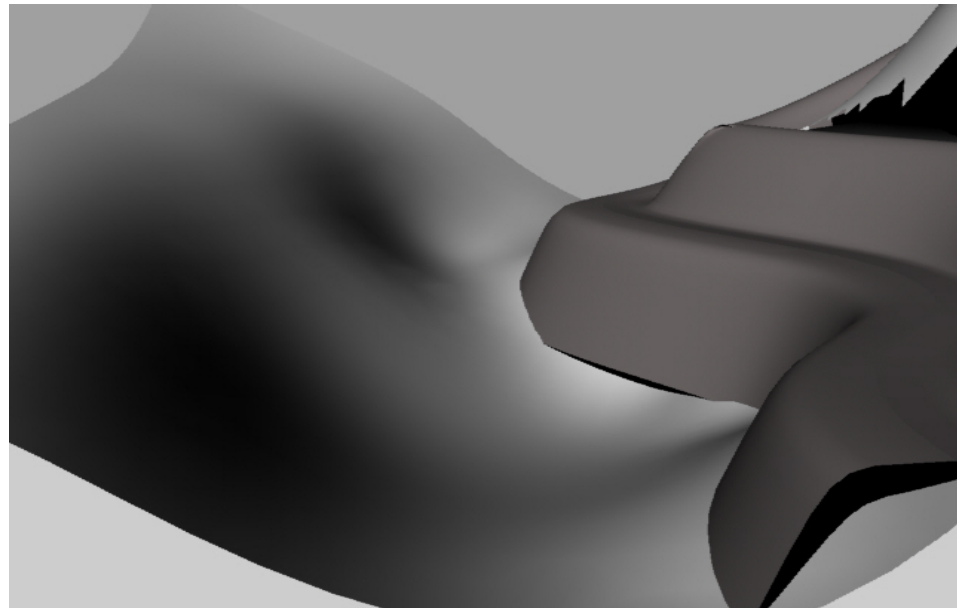- May not be shaped correctly
- Water may flow uphill

Adding Elements

Possible
Cut

Roadbed
centerline

Possible
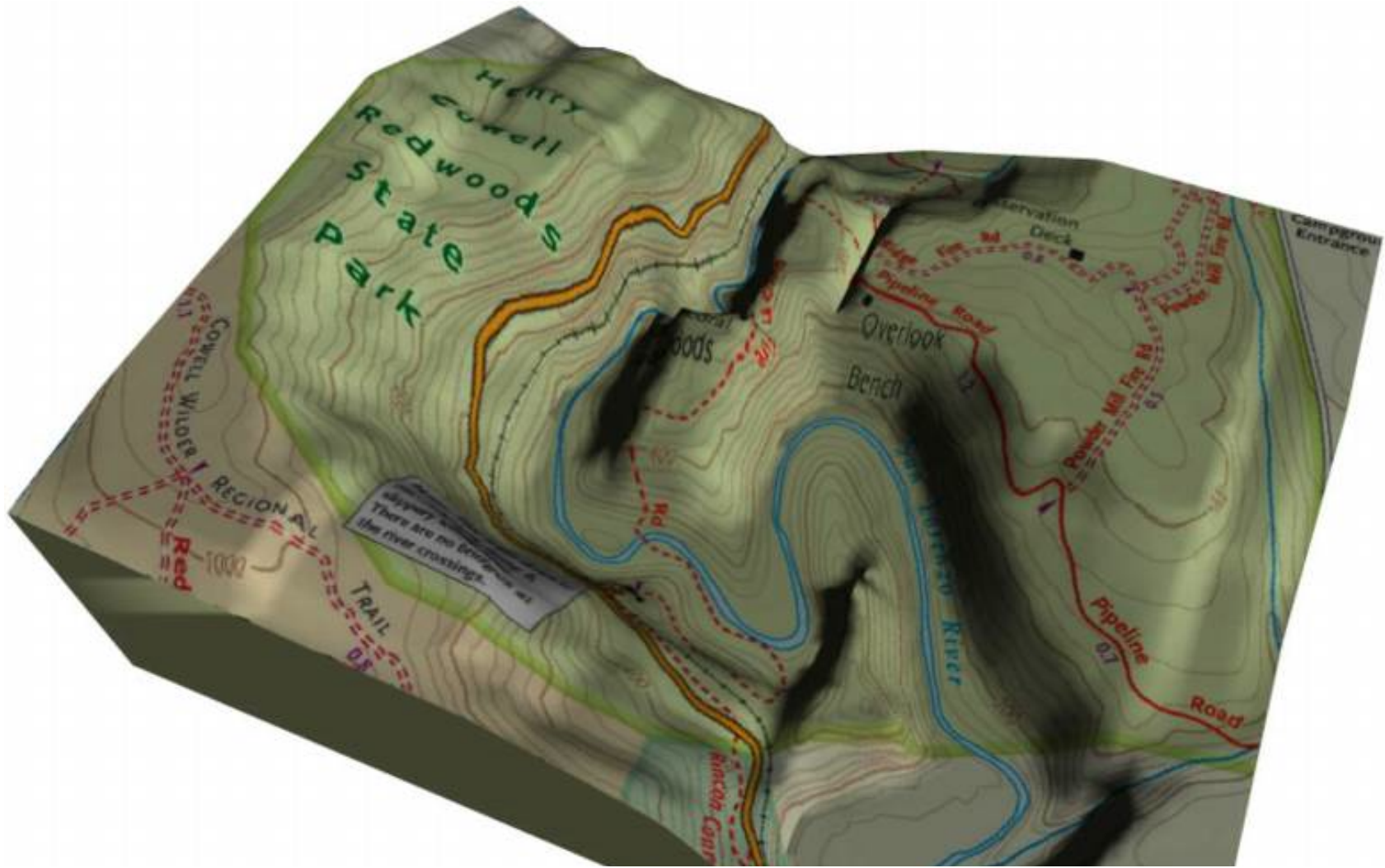Fill

Longer and Better
- Build 'cut' and 'fill'
  elements using sweep
- Use Boolean difference to
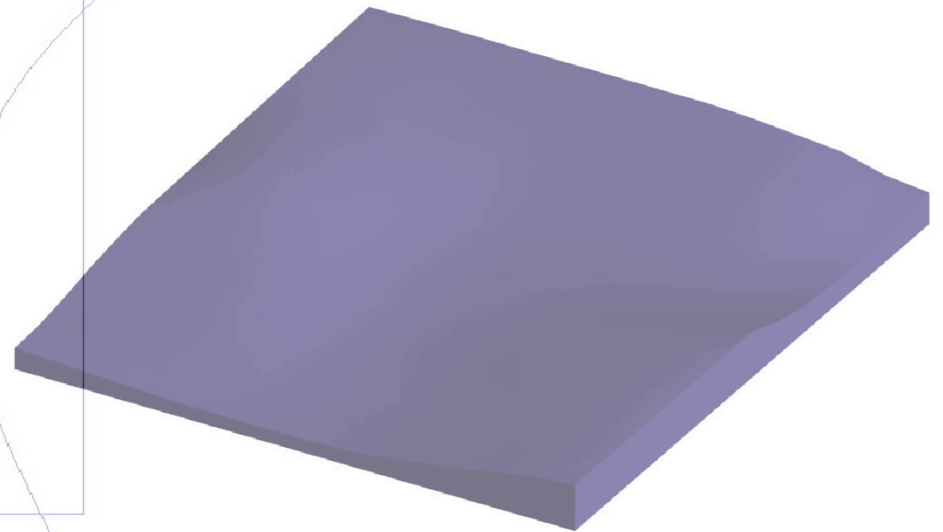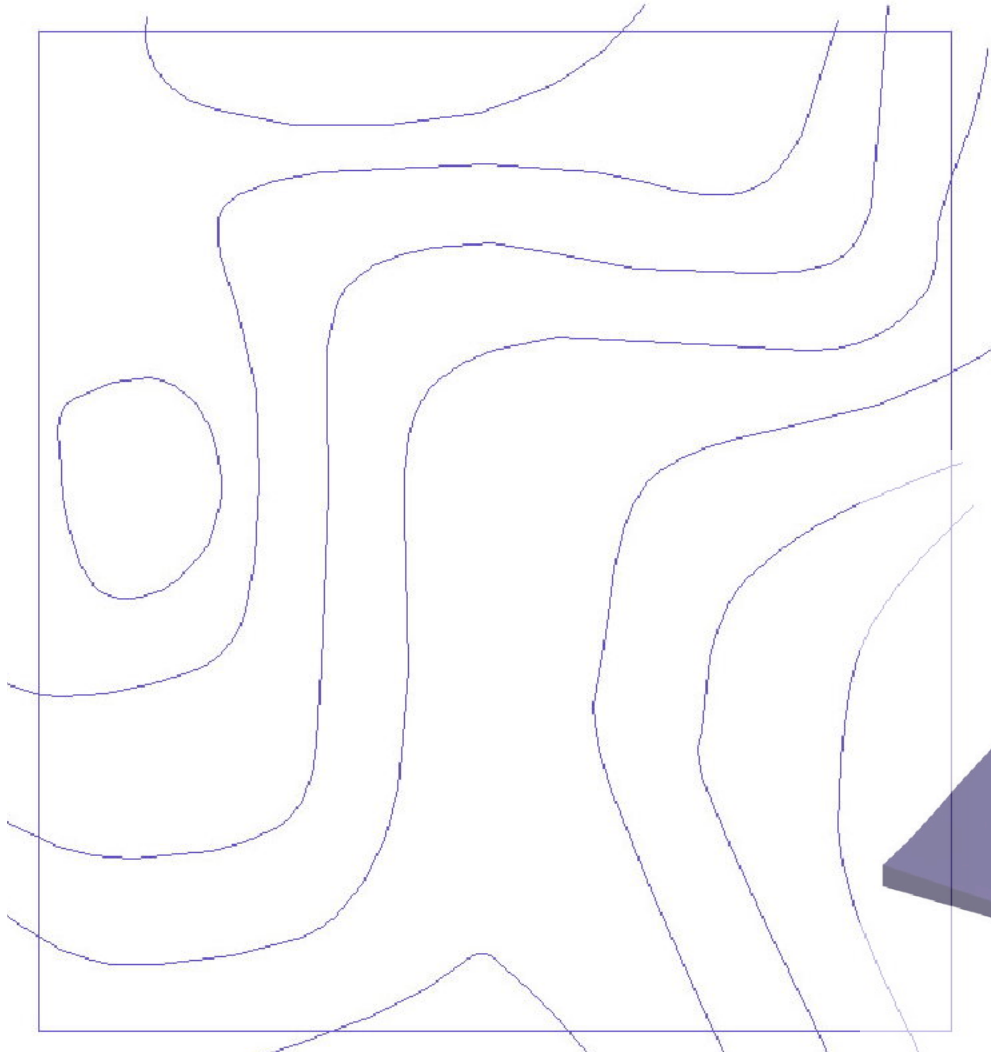 incorporate in site.

Boolean Splits
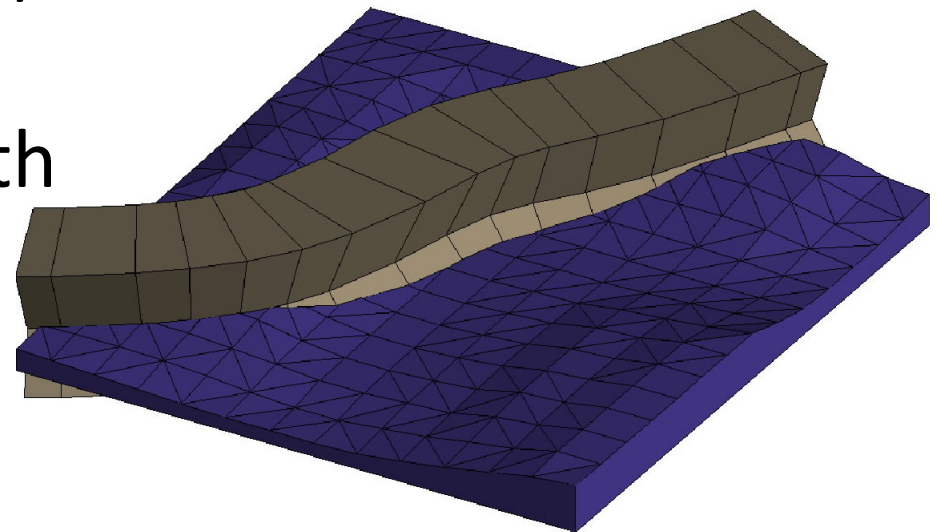
Textures Can Add Detail Here Too
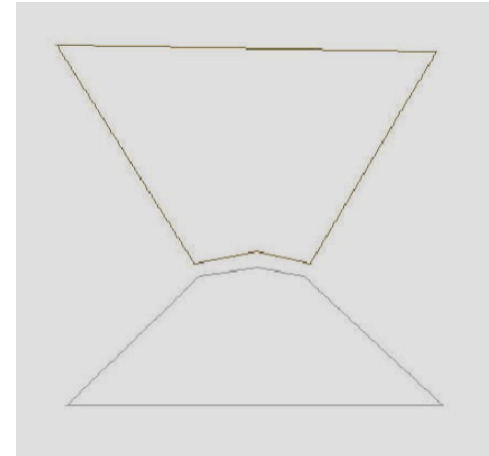
A More Complex Example

Roads combine "man-made" and "natural" in a challenging mix.
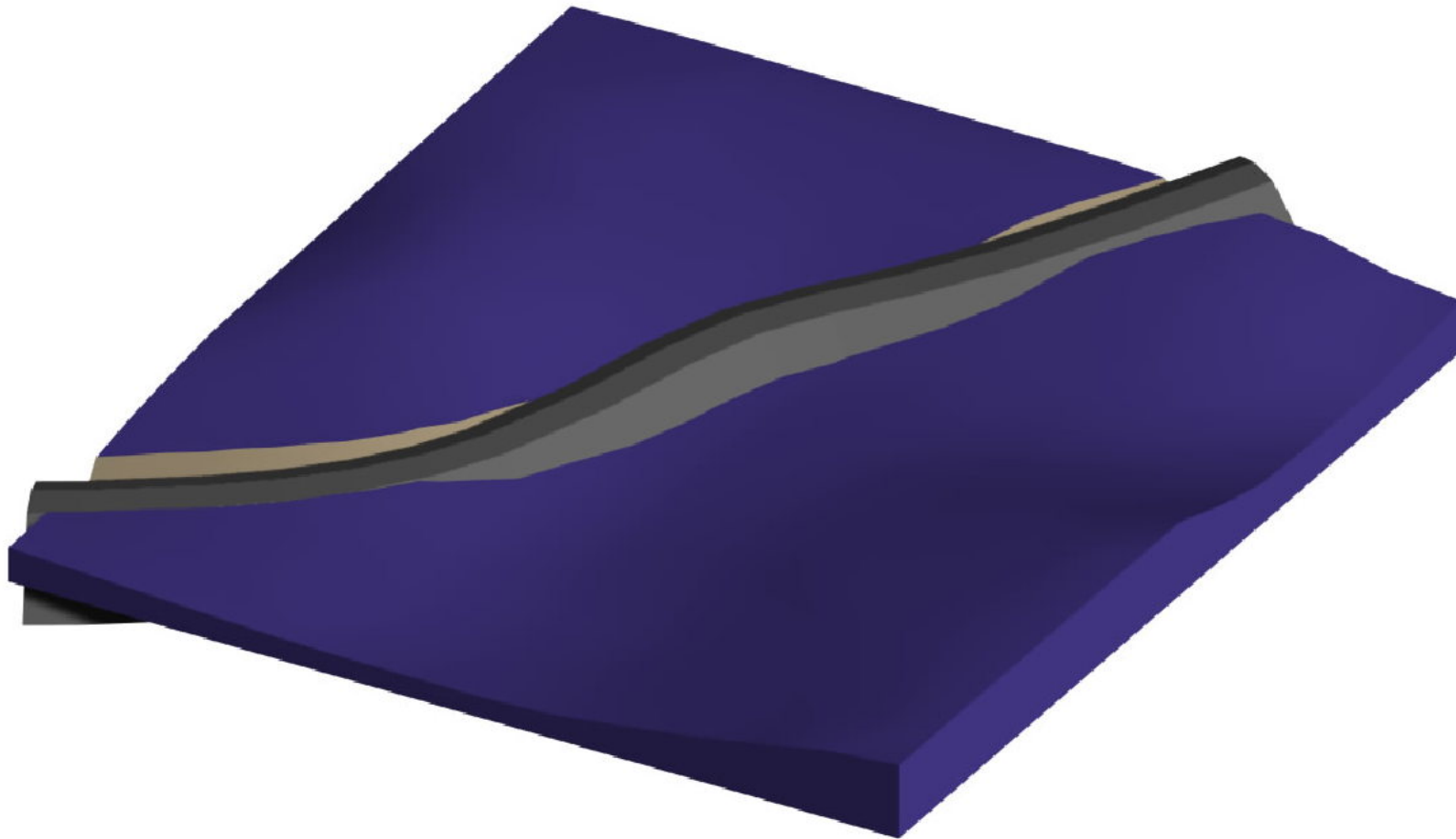
A More Complex Example

Man-made Road vs. Landform

- Define road cross-section profiles (slopes vary)

- Define roadway path (not always on the surface)
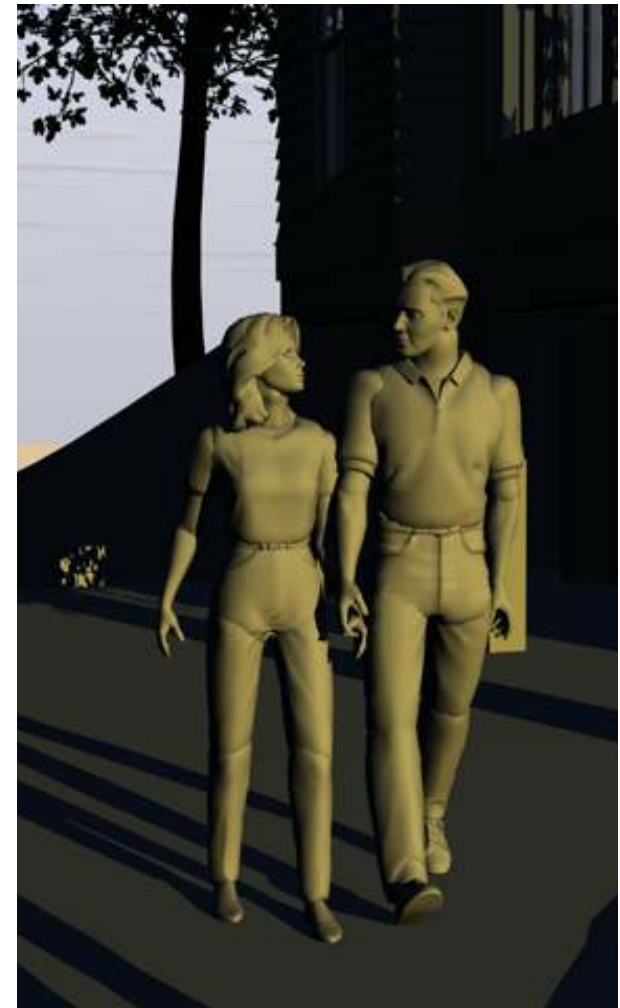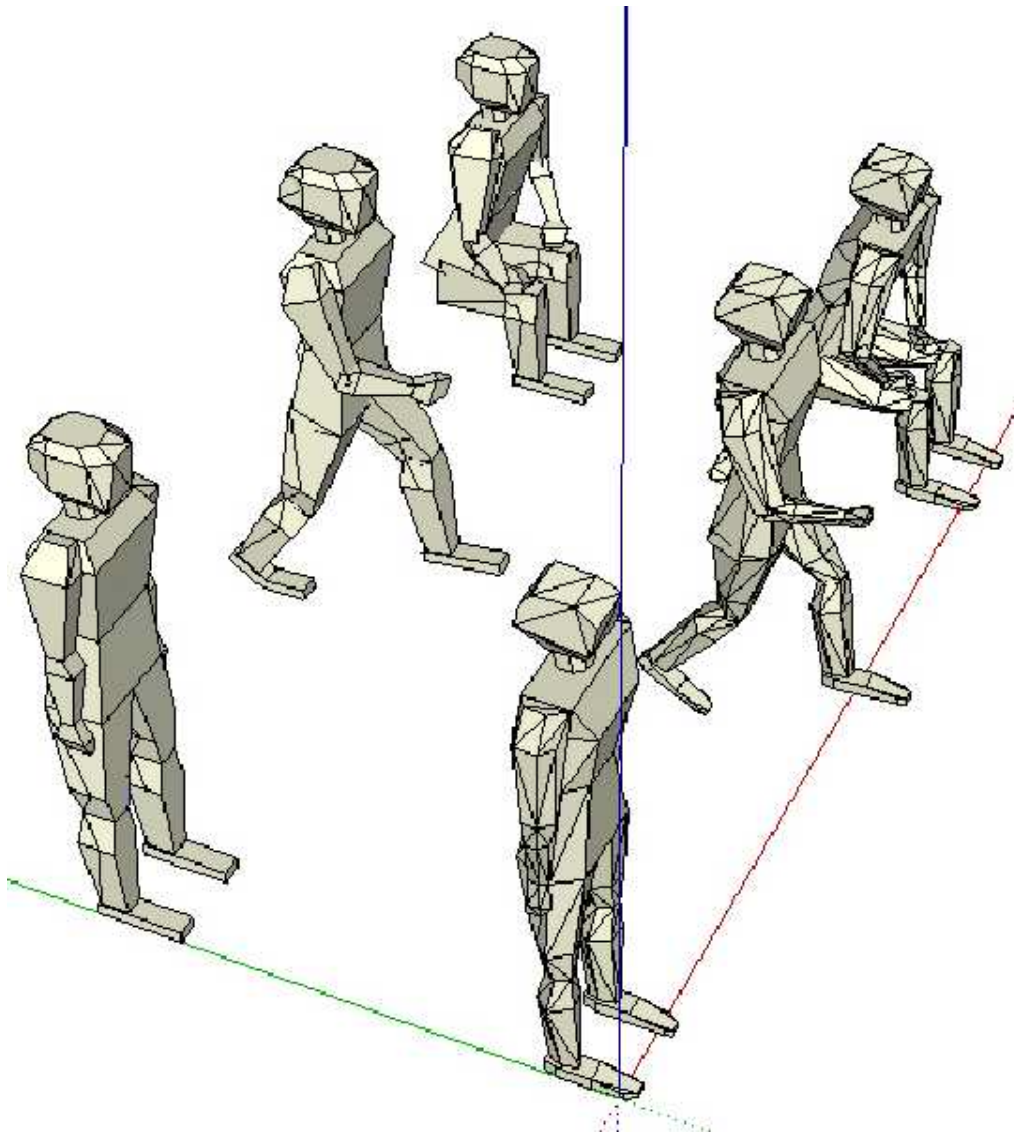
- Sweep profiles on path

Difference Cuts & Union Fills

What About People & Trees?

How to capture and represent the "non architectural" aspects of the project?

Levels of Detail & Abstraction

Where do you want attention?

#5: Site Modeling

Fini