Chapter 4

• Modeling the Existing Terrain Using Surfaces
  – Topics
    • Understanding surfaces
    • Creating a surface from survey data
    • Using breaklines to improve surface accuracy
    • Editing surfaces
    • Displaying and analyzing surfaces
    • Annotating surfaces
Understanding Surfaces

• A surface is made using a TIN (Triangular Irregular Network) algorithm.

• You provide point data; in this chapter, this is survey data.

• The TIN algorithm fills in the spaces between the points.

• This enables an elevation to be approximated anywhere within the surface.

• Surfaces are key components of nearly every land development project.
Components of a Surface

- Boundaries: Control where the surface is
- Breaklines: Control the alignment of TIN lines
- Contours
- DEM files: Large-scale Digital Elevation Models
- Drawing objects: Lines, arcs, circles, and so on
- Point files (text files)
- Point groups
Surface from Survey Data

• There are many ways to create surfaces, and many different types of data can contribute to them.

• In this chapter, you will create a surface from survey data. Later you will use other methods/sources of data.

• You will begin by creating a new surface and then adding a point group to it.
Breaklines

- Points alone do not make an accurate surface.
- You must control how the lines are drawn between those points to make a truly accurate representation of the ground.
- Breaklines establish “hard edges” within the surface along curb lines, edges of pavement, embankment edges, and so on.
Adding Boundaries

- Adding Boundaries
  - Boundaries: Control where the surface *is*
  - Outer boundaries: *Contain* the surface
  - Hide boundaries: Make a hole in the surface
  - Show boundaries: Make an island within the hole
Editing Surfaces

– Deleting lines

  » The TIN algorithm can place lines where they don’t belong.
  » Contour will appear where there are TIN lines, even if they are wrong.
  » Deleting TIN lines is an important part of cleaning up a surface.
Editing Surfaces

- Editing points
  - Field errors can cause a point to have an incorrect elevation.
  - Individual points can be edited within the surface to correct them.
Display and Analyze a Surface

• One way to leverage the dynamic surface model is through display and analysis.
• The surface can “tell its story” in ways other than contours.
Elevation Analysis

• Divides the surface into ranges of elevation
• Displays each range as a different color
• Great for helping someone visualize terrain who doesn’t know how to read topo maps
Slope Analysis

- Divides the surface into ranges of slope
- Displays each range as a different color
- Great for identifying areas with excessively steep or flat slopes
Other Types of Analysis

• Contours
  – Contours are color-coded based on elevation.
  – A legend shows the area/volume of each contour.

• Directions
  – These are visual representations of surface slopes.
  – For example, which parts of your surface flow to the south, and which flow to the north?

• User-Defined Contours
  – These are used for “odd” contours between regular intervals.

• Watersheds
  – These are areas within the surface where rainfall runoff flows to a certain point or in a certain direction.
Annotating Surfaces

- Surface annotation is as important as the surface itself.

- In this section, you will study three types of surface labels:
  - Spot Elevation Labels
  - Slope Labels
  - Contour Labels
Spot Elevation Labels

• Used to label key elevations or flat areas where contours are sparse
• Update automatically when they are moved or copied
• Update automatically when the surface changes
Slope Labels

- Used to label areas where slope is important such as
  - Steep embankments
  - Travel-ways like roads and driveways
  - Many others

- Come in one-point and two-point versions
  - One-point labels: These always point in the steepest downhill direction.
  - Two-point labels: You control the direction.
Contour Labels

- Created by drawing a line across one or more contours
  - Labels appear wherever the line crosses a contour.
  - Labels move as line moves.
  - Lines can be made invisible so that only labels can be seen and plotted.
- Major and minor labels stylized separately
Now You Know…

• How surfaces fit into land development project design
• How to existing ground surfaces from survey data
• How to modify surfaces
• How to analyze surfaces
• How to annotate surfaces
The Essentials and Beyond

• Now that you’ve seen how to create a surface from survey data, complete the additional exercise to investigate a different way to create a surface, from contours.

• Once the surface is created, you’ll also do the following:
  – Add a boundary
  – Perform an elevation analysis
  – Assign a style to the surface
  – Label the surface