6. Digital Line Graph (DLG)

Print

Identification

Digital Line Graphs (DLGs) are vector representations of most of the features and attributes shown on USGS topographic maps. Individual feature sets (outlined in the table below) are encoded in separate digital files. DLGs exist at three scales: small (1:2,000,000), intermediate (1:100,000) and large (1:24,000). Large-scale DLGs are produced in **tiles** that correspond to the 7.5-minute topographic quadrangles from which they were derived.

Table 7.1 Description of Digital Line Graph Layers

Heading 1	Heading 2
Public Land Survey System (PLSS)	Township, range, and section lines
Boundaries	State, county, city, and other national and State lands such as forests and parks
Transportation	Roads and trails, railroads, pipelines and transmission lines
Hydrography	Flowing water, standing water, and wetlands
Hypsography	Contours and supplementary spot elevations
Non-vegetative features	Glacial moraine, lava, sand, and gravel
Survey control and markers	Horizontal and vertical monuments (third order or better)
Man-made features	Cultural features, such as building, not collected in other data categories
Woods, scrub, orchards, and vineyards	Vegetative surface cover

Layers and contents of large-scale Digital Line Graph files. Not all layers available for all quadrangles (USGS, 2006).

The Nature of Geographic Information

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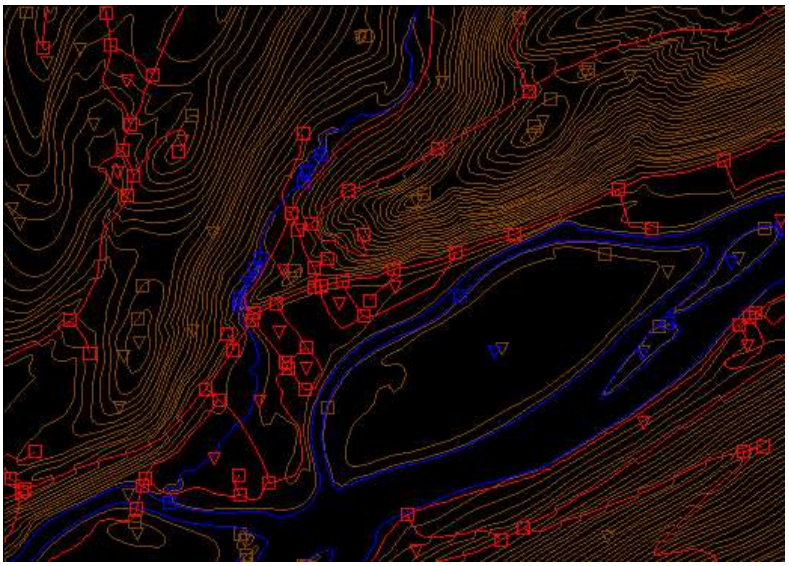

Figure 7.7.1 Portion of three Digital Line Graph (DLG) layers for USGS Bushkill, PA quadrangle; imaged with Global Mapper (dlgv32 Pro) software. Transportation features are arbitrarily colored red, hydrography blue, and hypsography brown. The square symbols are nodes and the triangles represent polygon centroids.

Data quality

Like other USGS data products, DLGs conform to National Map Accuracy Standards. In addition, however, DLGs are tested for the logical consistency of the topological relationships among data elements. Similar to the Census Bureau's TIGER/Line, line segments in DLGs must begin and end at point features (nodes), and line segments must be bounded on both sides by area features (polygons).

Spatial Reference Information

DLGs are heterogenous. Some use UTM coordinates, others State Plane Coordinates. Some are based on NAD 27, others on NAD 83. Elevations are referenced either to NGVD 29 or NAVD 88 (USGS, 2006a).

Entities and attributes

The basic elements of DLG files are nodes (positions), line segments that connect two nodes, and areas formed by three or more line segments. Each node, line segment, and area is associated with two-part integer attribute codes. For example, a line segment associated with the attribute code "050 0412" represents a hydrographic feature (050), specifically, a stream (0412).

Distribution

Not all DLG layers are available for all areas at all three scales. Coverage is complete at 1:2,000,000. At the intermediate scale, 1:100,000 (30 minutes by 60 minutes), all hydrography and transportation files are available for the entire U.S., and complete national coverage is planned. At 1:24,000 (7.5 minutes by 7.5 minutes), coverage remains spotty. The files are in the public domain, and can be used for any purpose without restriction.

Large- and Intermediate -scale DLGs are available for download through EarthExplorer system. You used to be able to access 1:2,000,000 DLGs on-line at the USGS' National Atlas of the United States, but the National Atlas has recently been removed from service.

Digital Line Graph Hypsography

In one sense, DLGs are as much "legacy" data as the out-of-date topographic maps from which they were produced. Still, DLG data serve as primary or

secondary sources for several themes in the USGS National Map, including hydrography, boundaries, and transportation. DLG hypsography data have not been included in the National Map, however. It was assumed that GIS users can generate elevation contours as needed from DEMs.

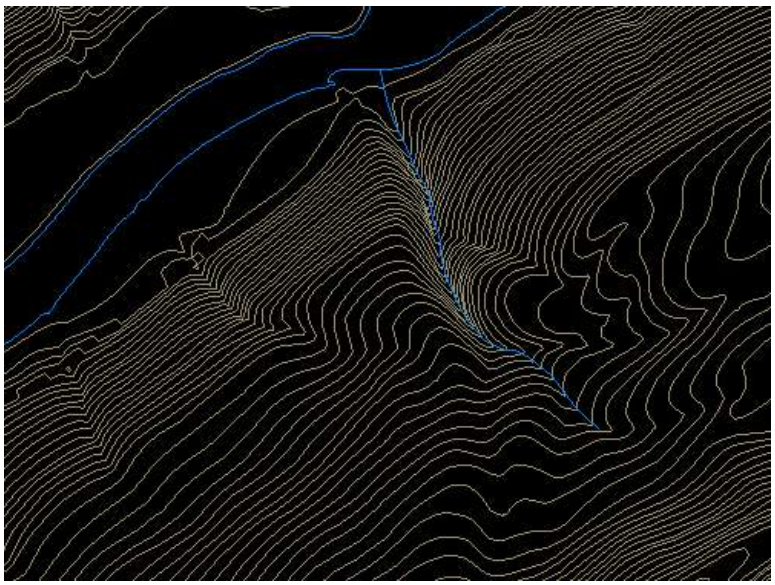

Figure 7.7.2 Portion of the hypsography and hydrography layers of a large-scale Digital Line Graph (DLG). USGS Bushkill, PA quadrangle; imaged with Global Mapper (dlgv32 Pro) software.

Hypsography refers to the measurement and depiction of the terrain surface, specifically with contour lines. Several different methods have been used to produce DLG hypsography layers, including:

- Scanning contour lines on photographic film or paper maps, converting the scanned raster data to vectors, then editing and attributing the vector features;
- Manually digitizing and attributing contour lines on photographic film or paper maps; and
- Producing contours by photogrammetric processes.

The preferred method is to manually digitize contour lines in vector mode, then to key-enter the corresponding elevation attribute data.

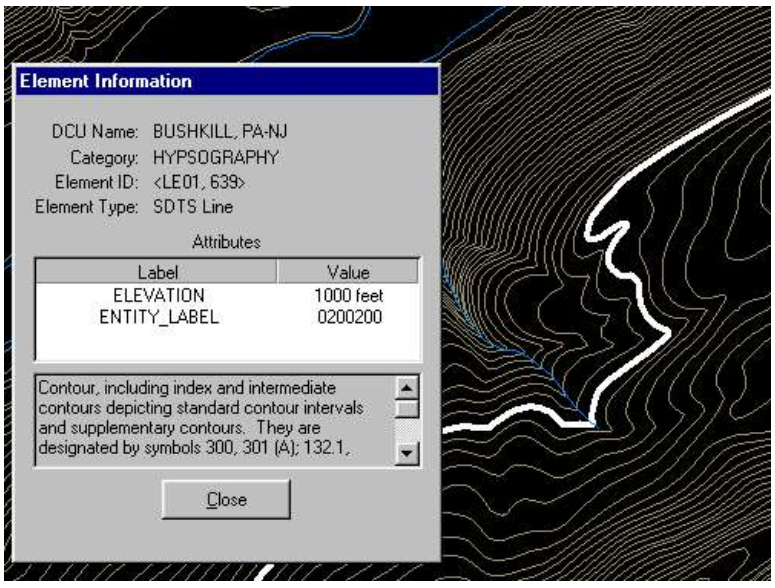

Figure 7.7.3 The highlighted contour line has been selected, and its attributes reported in a Global Mapper window. Notice that the line feature is attributed with a unique Element ID code (LE01, 639) and an elevation (1000 feet).

Try This!

Exploring DLGs with Global Mapper

Now, I'd like you to use the Global Mapper software to investigate the characteristics of the hypsography layer of a USGS Digital Line Graph (DLG). The instructions below assume that you have already installed the software on your computer. (If you have not done so, return to the download and installation instructions presented earlier in the Chapter 6, section 6 *Try This!* exercise). First you'll download a sample DLG file. In a following activity you'll have a chance to find and download DLG data for your area.

1. If you haven't done so already, create a directory called "USGS Data" on your hard disk.materials.
2. Next, Download the DLG.zip data archive. The ZIP archive is 1.2 Mb in size.
3. Now, decompress the archive into a directory on your hard disk.
    - Open the archive DLG.zip.
    - Create a subdirectory called "DLG" within the directory in which you save data.
    - Extract all files in the ZIP archive into your new subdirectory.
      The end result will be five subdirectories, each of which includes the data files that make up a DLG "layer," along with a master directory.
4. Launch Global Mapper.
5. Open a Digital Line Graph by choosing **File > Open Data Files**..., then navigate to the directory "DLG/Hypso." Open the file Hp01catd.ddf. The data correspond with the 7.5 minute quadrangle for Bushkill, PA. The file is encoded in Spatial Data Transfer Standard (SDTS) format. For information about SDTS, see the SDTS Tutorial (PDF format).
6. Experiment with Global Mapper's tools. Use Zoom and Pan to magnify and scroll across the DLG. The **Full View button** (the one with the house icon) refreshes the initial full view of the data set.
7. The **Feature Info** tool allows you to query the attributes of a particular feature. Try clicking a single line segment. Note that you can display the attributes of a feature in the lower left portion of the application window by simply hovering over the feature.
8. The **Measure tool** (ruler icon) allows you to not only measure distance as the crow flies, but also to see the area enclosed by a series of line segments drawn by repeated mouse clicks. Note again the location information that is given to you near the bottom of the application window.
9. The trial version of Global Mapper allows you to open and view up to four files at once. You might find it interesting to open and compare the Bushkill DLG hypsography file and the corresponding DRG you viewed in Chapter 6. Note that you can turn layers on and off, and even adjust their transparency at **Tools > Control Center**.

> *How do the contours in the DLG compare with those in the DRG? What explains the difference?*

This textbook is used as a resource in Penn State's Online Geospatial Education online degree and certificate programs. If this topic is interesting to you and you want to learn more about online GIS and GEOINT education at Penn State, check out our Geospatial Education Program Office.

‹ 5. Contouring By Hand | up | 7. Digital Elevation Model (DEM) ›

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