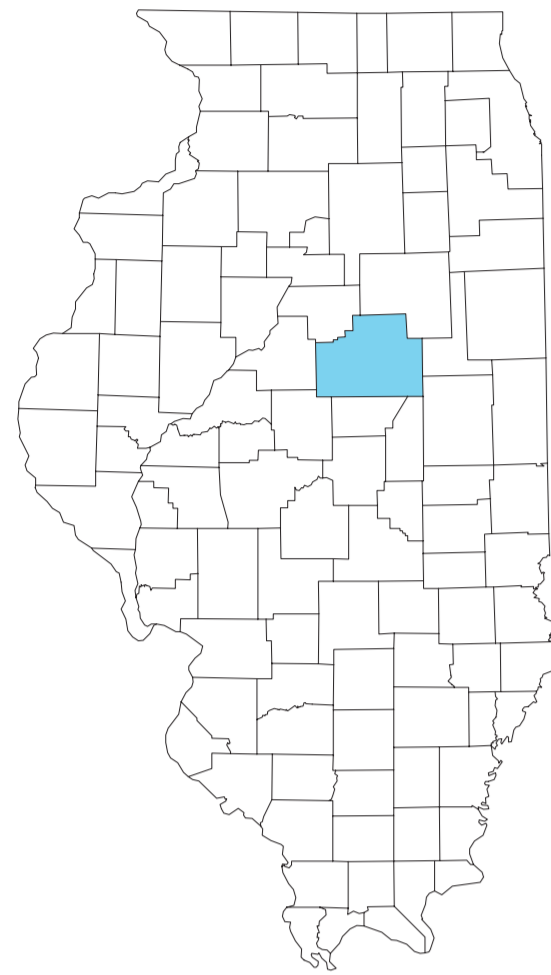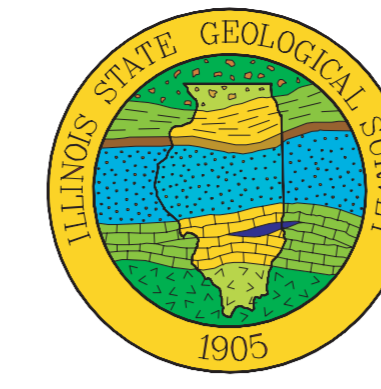State of Illinois
Department of Natural Resources

Illinois State Geological Survey

William W. Shilts, Chief
Champaign
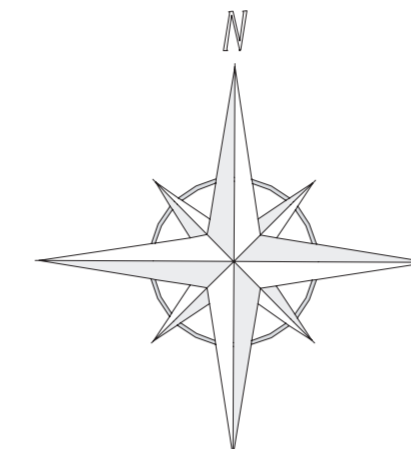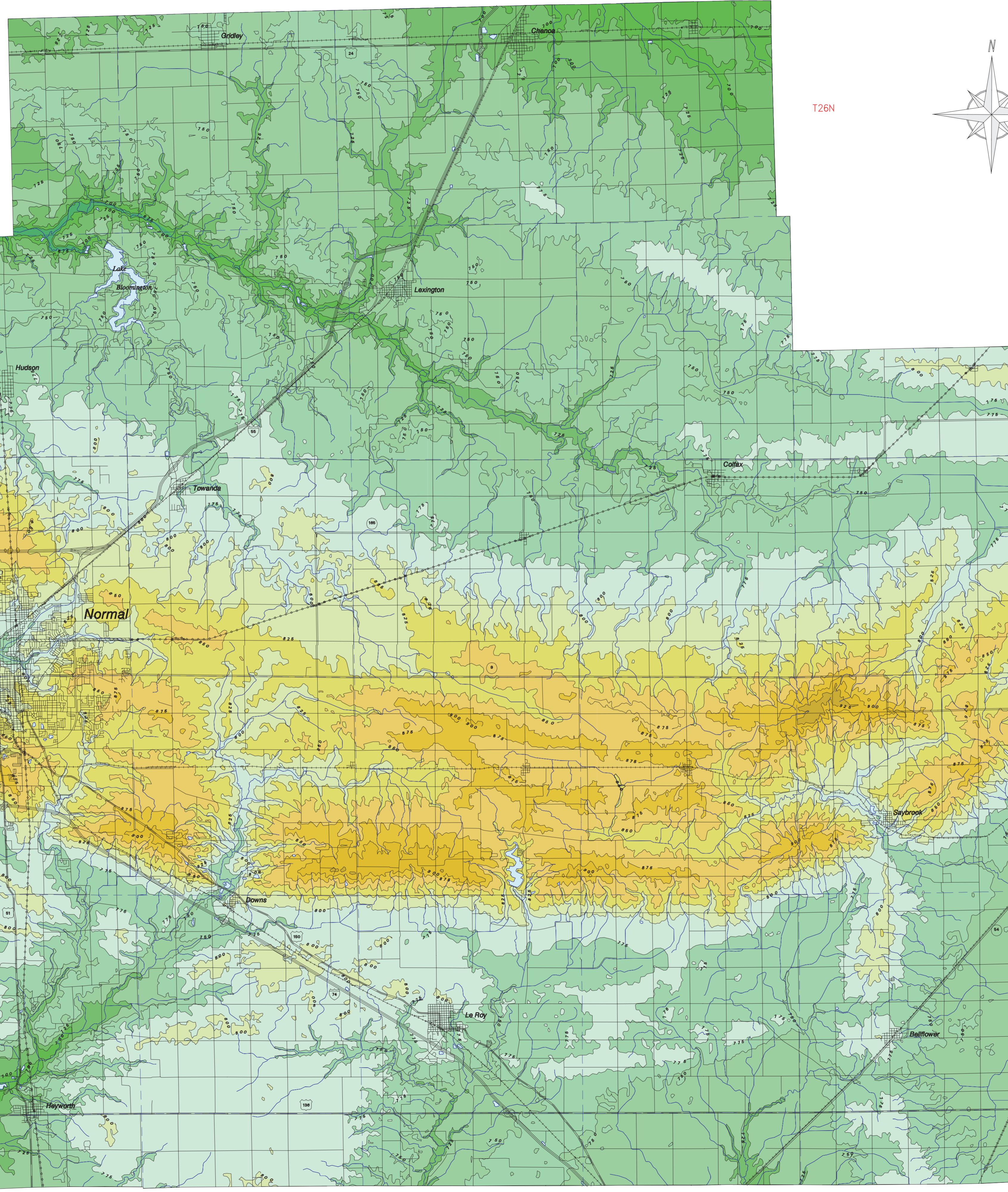
Ground Surface Topography of McLean County, Illinois

compiled by Melisa M. McLean and Matthew H. Riggs

1997

Scale 1:100,000
1 inch equals approximately 1 1/2 miles

Lambert Conformal Conic Projection

Contour Interval 25 Feet

- Greater than 925
- 900 - 925
- 875 - 900
- 850 - 875
- 825 - 850
- 800 - 825
- 775 - 800
- 750 - 775
- 725 - 750
- 700 - 725
- 675 - 700
- 650 - 675
- 625 - 650
- 600 - 625
- Less than 600
- Water Bodies

- 000 Elevation Above Mean Sea Level
- Contour Line
- Township Line
- Interstate Highway
- US Highway
- State Highway
- Other Roads
- Railroad
- Abandoned Railway
- Hiking/Biking Path
- Streams

In cooperation with the U.S. Geological Survey (USGS), digital topographic lines in USGS digital line graph (DLG) format were prepared for all 7.5-minute quadrangles encompassing McLean County. DLG files are available from the USGS National Digital Cartographic Database. The digital representation of the surface topography was used to assign elevations to lithologic units found in water wells and engineering borings in the ISGS project database and to create the upper surface of a three-dimensional model of subsurface geology in the county. The surface topography map provided the surface from which the thickness of Quaternary deposits map (McLean et al., 1997) was created.

Surface Topography

The surface topography of McLean County, Illinois is shown on this map. Elevations range from greater than 925 feet above mean sea level (MSL) in the east central portion of the county to less than 625 feet above MSL in the southwestern portion of the county. The most prominent features on the map are end moraines that formed near the southern margin of the Laurentide Ice Sheet between about 20,000 to 17,000 years ago during the last glacial episode (Wisconsin). These end moraines represent ice-marginal positions of two sublobes of the Lake Michigan Lobe, a lobe of the ice sheet that flowed into Illinois from the Lake Michigan basin. In the southeastern portion of the county, the end moraines curve to the east-northeast. This marks the juncture of the two sublobes. See inset map modified from Willman and Frye, Plate 1 (1970).

Methodology

The USGS provided the ISGS with scanned images of topographic contour lines from the thirty-three 7.5-minute quadrangles encompassing McLean County. The ISGS edited the linework and assigned an elevation to each line using ARC/INFO (versions 6.0 and 6.1) software according to USGS digital line graph standards. Another software package, Interactive Surface Modeling (ISM) from Dynamic Graphics, Inc., was used to create two-dimensional grid representations of the surface topography, because the quadrangles were mapped at different contour intervals. Grids are regularly spaced rectangular arrays of data points (nodes) that allow for efficient mathematical calculations of grid node values and production of contour maps. Grid representation also makes it possible to create other useful maps. For example, a map showing the thickness of Quaternary deposits (McLean et al., 1997) was created by subtracting the grid of the bedrock topography from the grid of the surface topography.

ISM requires that the contour lines for each quadrangle be converted to ASCII format files of point data, containing an x and y (location) and z (elevation) value for each point. These files were used as input to create two-dimensional grids of each quadrangle. ISM assumes that for any grid node assignment, input data points further away from the node being evaluated have less influence on that node's value than nearer data points. To determine each grid node value, ISM calculates an average value from the surrounding scattered input data (up to 15 input data points) and finds the standard deviation. ISM continues to refine the values of the grid nodes until the standard deviation is minimized (Dynamic Graphics, Inc., 1991).

Contour lines were generated for each grid in ISM. Plots of the generated contour lines were compared with USGS 7.5-minute topographic maps. Contour line errors were corrected to ensure that the elevation values produced from the grids were within 10 feet of the elevations shown on the USGS maps. After corrections were made to the grids, the thirty-three quadrangle grids were combined in ISM to produce a grid of the surface topography of the county. Contour lines were output from ISM and used to create a surface topography coverage. To create a map that best represents the ground surface topography in the county, the lines produced by the ISM software were edited with ARC/INFO to delete problem polygons created by extrapolation.

Public Land Survey boundaries were digitized from USGS 7.5-minute topographic maps. The slight skewness in the orientation of the map is due to the map projection (Lambert conformal conic). Public Land Survey lines in this part of the state do not run true north-south or east-west. Water bodies, roads and railways were obtained from USGS 1985 1:100,000 digital line graph data, and may not reflect present day conditions.

This map is one of a series produced by the Illinois State Geological Survey (ISGS) as part of a geologic mapping project in McLean County, Illinois, to assist the county in establishing a geologically based process for landfill site screening.

References Cited

Dynamic Graphics, Inc., 1991. Interactive Surface Modeling User's Guide. Dynamic Graphics, Inc. Alameda, CA, 419 p.

McLean, Melisa M., Maureen D. Kelly and Matthew H. Riggs, 1997. Thickness of Quaternary Deposits in McLean County, Illinois. Illinois State Geological Survey Open File Series 1997-1e, Scale 1:100,000.

Willman, H. B. and J. C. Frye, 1970. Woodfordian Moraines of Illinois. Illinois State Geological Survey Bulletin 94, Plate 1.

Acknowledgments

Late Wisconsin End Moraines in McLean County, Illinois
modified from Willman and Frye, (1970)

Scale 1:500,000
1 inch equals approximately 8 miles

End Moraines