U.S. Department of the Interior
U.S. Geological Survey

Prepared in cooperation with the
Great Lakes Restoration Initiative

Scientific Investigations Map 3330

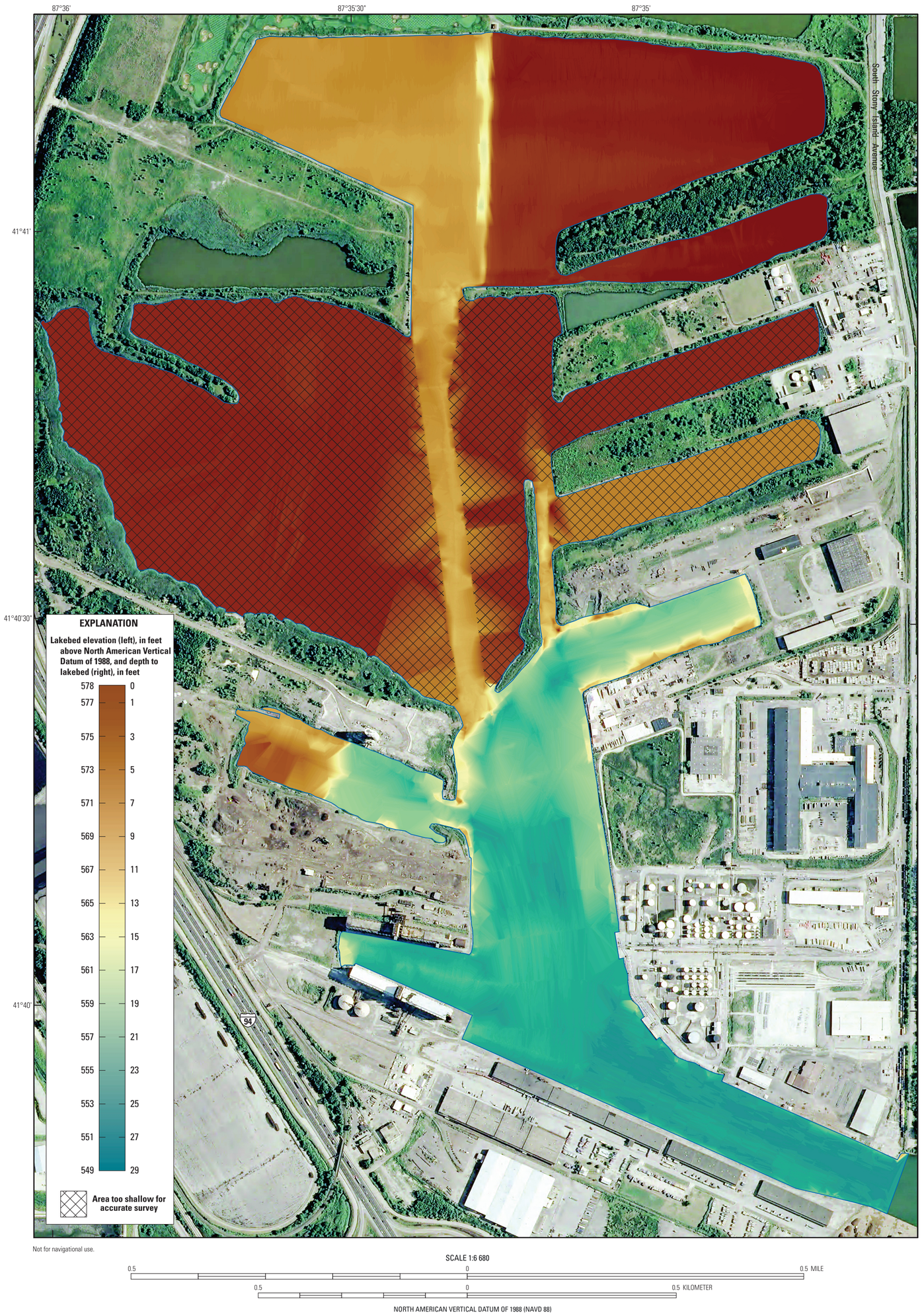

Figure 1. Bathymetry of Lake Calumet, Cook County, Illinois, collected on July 26, September 11, and November 7, 2012.

Overview

The U.S. Geological Survey collected bathymetric data in Lake Calumet and a portion of the Calumet River in the vicinity of Lake Calumet to produce a bathymetric map (figs. 1 and 2). The bathymetric survey was made over 3 days (July 26, September 11, and November 7, 2012) (fig. 3). Lake Calumet has become a focus area for Asian carp rapid-response efforts by state and federal agencies, and very little bathymetric data existed prior to this survey. This bathymetric survey provides data for a variety of scientific and engineering studies of the area; for example, hydraulic modeling of water and sediment transport from Lake Calumet to the Calumet River.

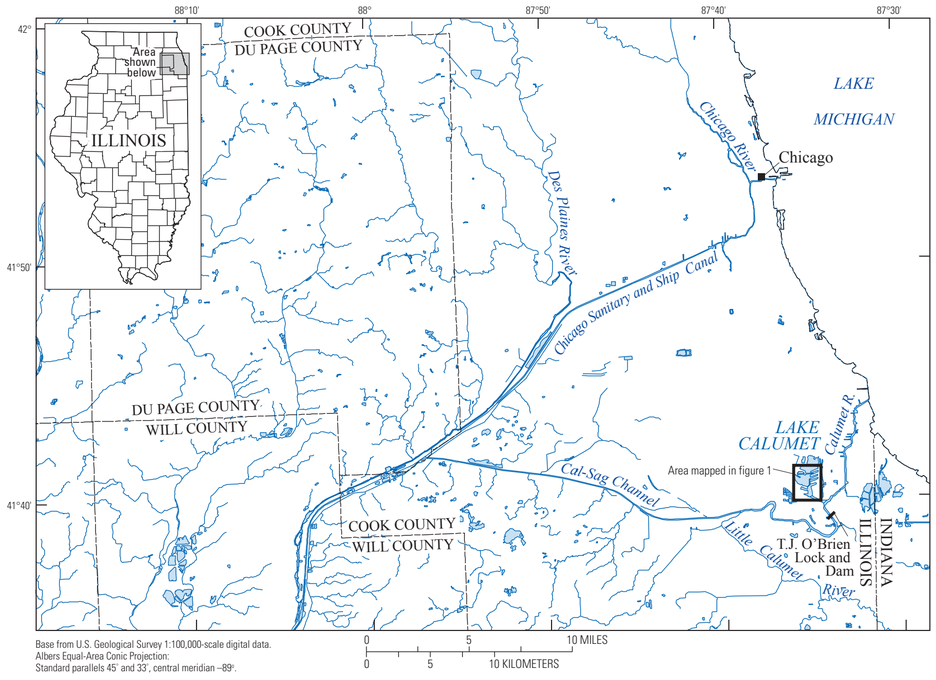

Figure 2. Location of Lake Calumet in Cook County, northeastern Illinois.

Methods

The bathymetric survey was made from a 14-foot johnboat traversing along planned survey transect lines (fig. 3). Water-depth data were collected using a four-beam acoustic Doppler current profiler (ADCP). Boat position was recorded continuously using a Global Positioning System (GPS) synchronized to the ADCP. The raw mean water depth measured by the ADCP was verified by a bar check before and after each day of surveying and periodically checked during the survey. Portions of Lake Calumet, especially the western bay, are very shallow (at times, less than 1 foot) and were difficult to navigate. Although the ADCP is capable of accurate depth readings to a minimum depth of approximately 0.8 feet, the difficulty of accessing the shallow depths by boat resulted in less transect coverage in that portion of the lake.

Data Processing

The raw data from the ADCP was exported as an output file in International System of Units (SI) of measurement in a text format. The ADCP output file was then re-formatted using the Velocity Mapping Tool (VMT) software* to apply a water-level tide file correction and produce an x, y, z (northing, easting, and lakebed elevation) format. The water-level tide file data for each day of survey was obtained from the U.S. Army Corps of Engineers gaging station at the T. J. O'Brien Lock and Dam (fig. 4). A Geographic Information System (GIS) was then used to calculate a triangulated irregular network (TIN) of the lakebed elevations. The TIN was then converted using a natural neighbor interpolation to produce a smooth raster surface.

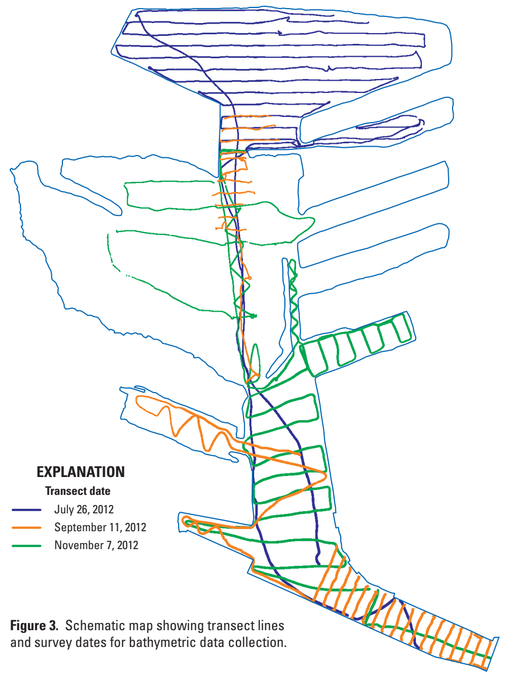

Figure 3. Schematic map showing transect lines and survey dates for bathymetric data collection.

*Parsons, D.R., Jackson, P.R., Czuba, J.A., Engel, F.L., Rhoads, B.L., Oberg, K.A., Best, J.L., Mueller, D.S., Johnson, K.K., and Riley, J.D., 2013, Velocity Mapping Toolbox (VMT)–A processing and visualization suite for moving-vessel ADCP measurements: Earth Surface Processes and Landforms, v. 38, no. 11, p. 1244–1260, doi: 10.1002/esp.3367.

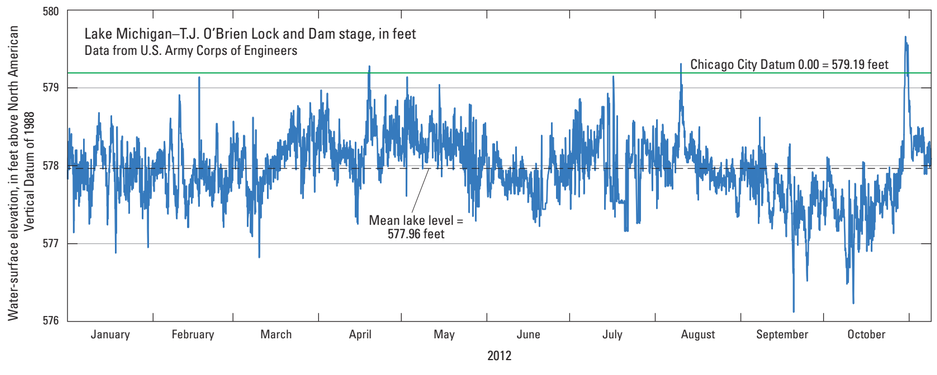

Figure 4. Water-surface elevation hydrograph for Lake Michigan at the T.J. O'Brien Lock and Dam, Cook County, Illinois, January—October 2012, showing the variation in lake level.

Projection: Transverse Mercator
North American Datum of 1983 (NAD 83)

Orthography from the U.S. Department of Agriculture Farm Service Agency, Aerial Photography Field Office National Agriculture Imagery Program (NAIP) Natural Color Imagery for Illinois, accessed November 2012 at http://www.fsa.usda.gov/FSA/apfoapp?area=home&subject=prog&topic=nai

Bathymetric Survey of Lake Calumet, Cook County, Illinois

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