DGS Statemap Geologic Mapping Strategic Plan

Geologic investigations of the surface deposits and underlying strata provide data that are essential for local, regional, and national planning because geology affects peoples' daily lives. Results of investigations provide the basic data and interpretations for generating geologic reports, maps, and cross sections. These products provide the basis for decisions about how society makes use of earth materials and systems; decisions that affect resource development and land use, transportation, water resources, public health, agriculture, energy production, waste disposal, environmental protection and restoration, science education, and recreation, to name a few applications.

The Delaware Geological Survey (DGS) is charged with statutory responsibility for dealing with its Federal counterpart agencies, the U.S. Geological Survey and the U.S. Bureau of Ocean Energy Management (BOEM), in matters related to geology, hydrology, and mineral and energy resources. The DGS participates in the STATEMAP component of the National Cooperative Geologic Mapping Program, defined by the National Geologic Mapping Act of 1992 and reauthorized by the U.S. Congress in 1992 and 1999. The DGS also cooperates with Delaware State agencies, the U.S. Army Corps of Engineers, and BOEM for geologic mapping offshore of Delaware for sand resource assessment.

Mapping strategy

Fieldwork

Given Delaware's low relief, the State has few geologic exposures (outcrops, stream exposures, or road cuts) in the Piedmont and even fewer in the Coastal Plain. Exploring the subsurface by drilling is essential. Our strategy is to obtain samples from a large number of holes to increase confidence in stratigraphic delineations and to enhance the ability to correlate with historic logs from wells or boreholes. To achieve this, the DGS maintains a truck-mounted CME-55 drill rig (Figure 1), a trailer-mounted Giddings soil sampler, and has a Delaware licensed driller on staff.

Cores are archived in the DGS Core and Sample Repository and are frequently reexamined during the mapping process. The samples are invaluable because they are often from areas that can no longer be accessed because the sites are now developed. Geophysical logs are collected from the majority of DGS drill holes and serve as an additional means of subsurface geologic correlation. Prior to map production, formation boundaries are refined with a series of shallow (<11 ft deep) hand auger holes. Hand augering also allows for data collection in areas that cannot be accessed by the truck-mounted drill rig or the Giddings rig.

Additional Data Collection

Data from DGS drilling and hand augering efforts are supplemented with data from new commercially-drilled wells, such as drillers' logs, and geophysical logs. The DGS database is selectively updated with well completion reports that are not currently in DGS system. Additionally, data are obtained from site-specific consultant reports on projects throughout the State, such as reports of findings for highway and building construction and site reclamation. These data are used delineate the depth of the base of the surficial units in developed areas and, where possible with excellent quality logs, to determine the lithology of the underlying deposits.

Figure 1. Typical STATEMAP drill site setup. Split spoon cores are collected, described, catalogued, and housed at the DGS for future reference and review.

Map Preparation

The DGS prepares base maps using new LiDAR of the State (flown in early 2014 and delivered in February 2015) as a Hillshade DEM. Contours for the map are generated from this LiDAR. The framework layers for published maps also include the most up-to-date road layer provided to the DGS by the counties.

To produce geologic maps, stratigraphic contact picks are made on the newly-obtained cores, hand augers, and logs. Historic borings and logs are then interpreted based on the field data. All data are interpreted honoring local geomorphology. After interpretations are finalized, geologic maps are digitized in house by the DGS

cartographer. When appropriate, cross sections are constructed to aid in understanding the subsurface stratigraphy. Final peer-reviewed maps are published digitally as a print-on-demand PDF in the DGS Geologic Map Series and available via the DGS website (http://www.dgs.udel.edu/publications).

Strategic Plan Goals

Long-term mapping goals were determined through discussions of mapping priorities between the State Geologist, the STATEMAP geologists, and the Delaware Geological Mapping Advisory Committee (DGMAC). The DGMAC is comprised of at least six members from Survey stakeholders appointed by the State Geologist. The primary purposes of the DGMAC are to provide: (1) advice and guidance on priorities for geologic mapping, and (2) to review the DGS's proposals under the STATEMAP component of the National Cooperative Mapping Program managed by the U.S. Geological Survey. The committee, upon request of the State Geologist, may also provide advice and guidance in support of DGS general responsibilities for improving knowledge of the State's geology, hydrology, mineral resources, natural hazards, and data dissemination that in turn supports the Survey's mission to provide objective earth science information, advice, and service to its stakeholders, the citizens, policy makers, industries, and educational institutions of Delaware. The DGMAC meets with the DGS annually and communicates with DGS scientists throughout the year. Presentations by the DGS during the meeting and dialogue that follows provide valuable guidance for the direction of the STATEMAP program. The long-term mapping goals identified are as follows:

1) Map the surficial geology of the entire Coastal Plain region of Delaware at a scale of 1:24,000 by 2030.
2) Map the surficial geology of the Piedmont region at a scale of 1:12,000 (or 1:24,000) by 2030.
3) Revise the bedrock geologic map of the Piedmont region (DGS Geologic Map Series No. 10) by 2020.
4) Map the surficial geology of the Atlantic offshore of Delaware between the shoreline and 8 miles offshore at a scale of 1:24,000 by 2020.

1:24,000 was determined as the scale to be used for Coastal Plain and offshore mapping to honor the accuracy of the data (how closely the line on the map represents the actual boundary on the ground) given variable distance between data points (from 50 ft to >10,000 ft in some rural locations). A scale of 1:24,000 (1 inch represents 2000 feet) allows the geologist to include small but important geomorphic features on the surficial maps such as dunes and Carolina Bays. This scale also clearly illustrates streams and shorelines and allows the cartographer to include secondary roads on the base map. 1:12,000 was chosen as the scale for mapping surficial geology in the Piedmont in order to show greater detail along stream valleys.

Performance Measures

- Production of DGS maps and reports digital form
- Compilation and integration of information into GIS
- Number of laboratory analyses
- Square miles geologic mapped at a scale of 1:24,000 and 1:12,000
- Number of samples, drill holes, logs, and cores collected on a per 1:24,000 scale map and per calendar year

Figure 2 shows the status of the DGS STATEMAP-supported geologic mapping projects to date. All STATEMAP-funded geologic maps from these projects have been entered into the National Geologic Map Databases' Map Catalog.

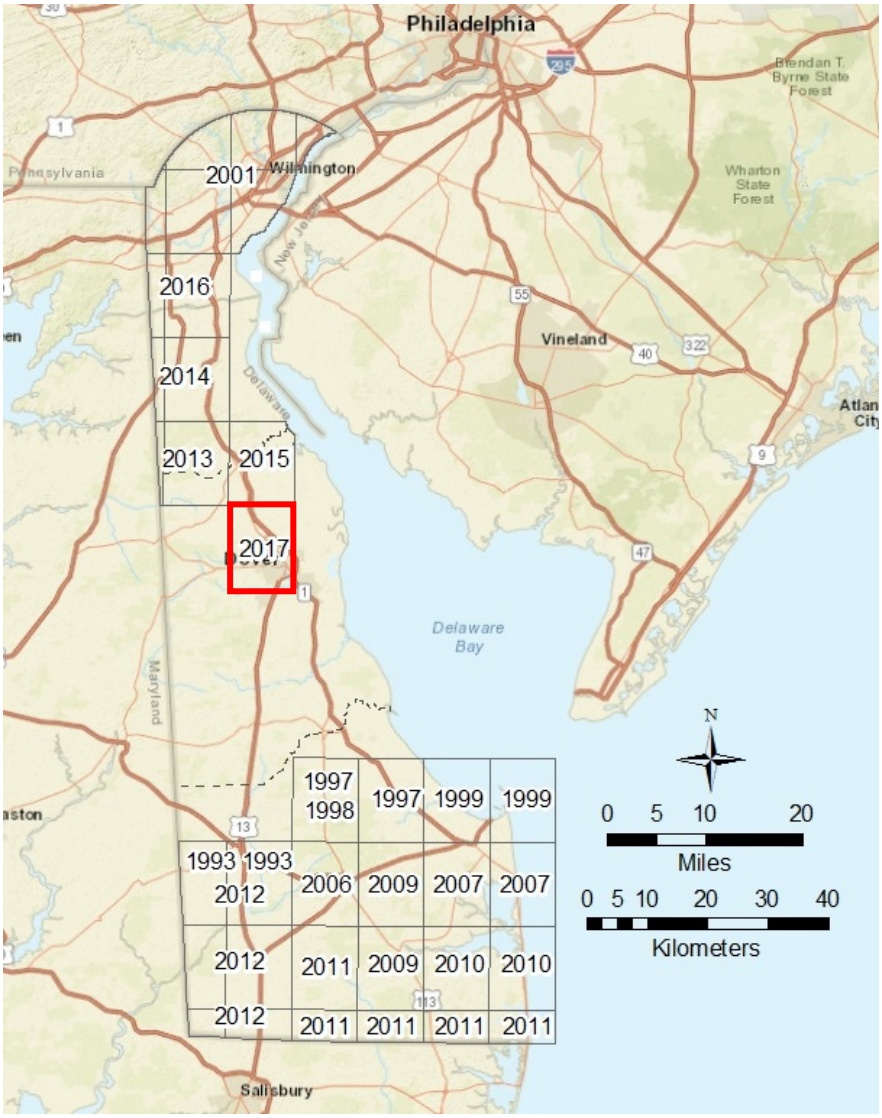

Figure 2. Map of Delaware and the upper Delmarva Peninsula with the index of Delaware 1:24,000 geologic maps funded by the STATEMAP Program overlain. Numbers in boxes indicate the STATEMAP project year. The proposed map area is outlined in red.