

Using VBA to Automate Geospatial Data Processing and Preparation for CGIT's Stormwater Mapping and Modeling Project

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As part of an ongoing effort to improve infrastructure mapping on the Virginia Tech campus, the Center for Geospatial Information Technology at Virginia Tech (CGIT), working with Virginia Tech's Site and Infrastructure Development Department (S&ID), has begun a complete re-mapping of the stormwater facilities on campus. Once the data is collected, the resulting Geographic Information System (GIS) can be used for planning decisions, maintenance support, and hydrologic/hydraulic modeling of the system. This research demonstrates the potential to save time, ensure consistency, and reduce tedium by using Microsoft's Visual Basic for Applications.

The field survey is being completed by a consulting firm in two parts. First, crews equipped with tablet-style computers collect attribute information about each stormwater structure (inlets, culverts, pipes, etc.). In the second part, crews with GPS equipment locate the stormwater structures with a precision of about two inches horizontally, and about 3 inches vertically. The attribute records and the location records are processed and joined, resulting in an Access database containing the location and attributes of each stormwater structure. With the field data collected, the task shifts to drawing the structures in a CAD or GIS application such as Autodesk's AutoCAD or ESRI's ArcMap. AutoCAD was selected as the initial drawing format, as both the consultants and VT's S&ID department are more familiar with using AutoCAD for their engineering work.

Normally, drawing such a large number of structures in AutoCAD would require many hours of tedious manual drafting, subject to human error. Adding the necessary attribution, through either object data records or database links, would take almost as long. By using Visual Basic for Applications, these tedious processes can be greatly accelerated. Since most of the necessary information to draw the stormwater system had been collected in Access, it was possible to write a macro that constructed the AutoCAD drawing from the Access database in a matter of seconds. The information about each structure (attribution) can be added during this process, either as object data, database links, or both. While some fine adjustment of the drawing may still be required, a majority of the drafting work has thus been automated. Working with the consultants in a reciprocating relationship ensured that the final macro would be as useful as possible. In exchange, CGIT was able to guide the data collection, helping to ensure a satisfactory final product.

Eventually the stormwater data will be converted from AutoCAD into an ESRI geodatabase format, which has more options for analysis and mapping. In this software environment, the additional data necessary for the hydrologic/hydraulic model can be generated. One of the primary tasks is the delineation and characterization of the areas that drain to each stormwater inlet. While the data requirements vary based on the selected modeling method, most methods require some measure of the land cover, slope, and infiltration rate for each drainage area. Many of these tasks can be automated or semi-automated with Visual Basic for Applications, using either raster- or vector-based processes.

Using VBA in AutoCAD and ArcMap has the potential to save time, ensure consistency, and reduce tedium in both the mapping and modeling phases of this project. While an initial investment must be made to develop the necessary code, the resulting benefits are significant. By developing the VBA macros while data collection is occurring, the time interval between the end of surveying and the completion of the final product is shortened. Using VBA macros to process the data for the hydrologic/hydraulic model provides an assurance that the data was generated in a consistent and repeatable manner. Finally, the use of VBA macros can drastically reduce the amount of tedious work required, improving the quality of the final product.