

Mississippi Pollutant Point Source Location Project Using ArcPad

Gary Hennington
Greg Jackson
Daryl Cook

Managing the environmental impacts of human influence on surface waters for the state of Mississippi includes the monitoring of many different sources. One important source of pollution is Publicly Owned Treatment Works which discharge treated wastewater to the surface waters of the state. This project designed a field collection procedure utilizing an ArcPad interface for field collection specialist to survey and verify all of the permitted point source discharge locations in the state.

Publicly Owned Treatment Works (POTW) is a waste treatment facility owned and/or operated by a public body or a privately owned treatment works that accepts discharges that would otherwise be subject to Federal Pretreatment Requirements. Typically this is a city or community owned and operated wastewater treatment facility. The POTW charges its customers a fee for water and sewer services to maintain the operation of the treatment plant. The facility also includes the sewer lines and pump stations used to convey the raw sewage to the treatment plant. The sewage is treated using any number of methods from lagoons to mechanical plants. The waste is removed from the sewage, and the by-products are water and sewage sludge. The sewage sludge, or solids, is disposed of in a landfill. The water, referred to as effluent, is piped to a receiving stream. The level and amount of treatment that the wastewater receives is dictated by the size of the receiving stream and the receiving streams ability to assimilate the effluent without causing any impact to the receiving stream. The Federal Clean Water Act allows this if a National Pollutant Discharge Elimination System permit has been issued to the facility. The focus of our project is to locate and map each of these effluent discharge pipes in the state.

The first step in creating a successful field collection project is to accurately define the information to be collected. Initially, the survey teams were to collect many attributes for each POTW. Some of these attributes included the proper use of chlorination and dechlorination for POTWs. These complex requirements were quickly dropped because of access restrictions and other groups within the agency collect this data on a scheduled basis. The collected information was limited to the name of the facility, the unique identifier for the facility, the unique identifier for the front gate and any outfall, the location of the front gate of the facility and the actual discharge into a stream, the field team, and the date.

Two field collection members per team were determined to be adequate for timely facility inspections. In many cases, one team member would serve as navigator, the other team member as driver. Rather than geographically dividing the state, the field teams set the pace for the number of facilities each could cover in a week's time. As one week ended, a new set of counties was laid out for the next week. The counties covered by any team each week were in the same local region of the state.

Compaq iPAQ 3800 series units were used as the base PDA for field collection. To these units were added an expansion sleeve with two PCMCIA slots. One slot housed a five-gigabyte card, while the other was filled with a Pretec CompactGPS. ArcPad 6.0 was used as the data collection software. Choosing this software made later data retrievals and integration seamless with existing ESRI software products.

It was determined early in the project design that the digital raster graphics (DRGs) maps, or scanned topographic maps, along with the Digital Ortho Quarter Quads (DOQQs) would be used in the field. This data was already projected into the Mississippi Transverse Mercator Projection (MSTM). ArcPad does not support project-on-the-fly for imagery. To overlay vector information on the imagery, the only realistic means was to also use MSTM projected shapefiles. The projected shapefiles, which included governmental boundaries, hydrography, and cadastral, were already available by county. Because of potential memory challenges and draw speeds, a single ArcPad project was developed for each county. This also made later downloads easy to manage, as an entire completed county would be downloaded.

Since the amount of data to be collected was simplified, the needed fields could fit onto one form page. The page was designed manually using a text editor to edit XML tags. Trial-and-error design quickly produced the proper look and feel of the form. There were two pick lists on the form that obtained values from separate files. One file was a static list of field teams, the other was easily created for each county through queries made to an existing permit tracking database. When a facility name was picked from the latter pick list, a Visual Basic Script was run to automatically populate the facility permit number. There were a number of automated and manual routines developed to create the necessary files for each county.

A pilot county was selected to field test the collection design, the collection units, and to estimate the required man-hours needed for the entire state. The first discovery of the pilot project was the need for preparation work before going into the field. Sufficient time should be budgeted to allow for calling of the facilities and getting accurate directions to discharge locations. The second change to future collections involved the imagery. The DRGs and DOQQs were thought to be necessary for the placement of impossible to reach points in the field. The data collector was to walk as far as possible to the discharge site and then use the imagery to make a best guess as to the location of the discharge pipe. This technique was never needed during the pilot study. The imagery only served as a toy that could lock the machine if too much was accessed at one time. The imagery was deleted from future county uploads.

The amount of field time required to gather the needed information was discovered to be about twenty sites per day per team. It was found to be most efficient if the teams collecting the data made the calls to the facilities. This cut down on confusion and communication problems. This meant that teams would be in the office one to two days in between field visits. This timing meshed well with the need for downloading and error checking the data. As each team would finish a group of counties, the collected

information was downloaded to a central GIS server. This downloaded data was visually check for general location accuracy and marked as survey completed. New county information was loaded onto the iPAQ system and the field team would be ready for the next round of collection.

At the time of this publication every POTW for the entire State of Mississippi has been surveyed. Only about two-thirds of the state has been checked and verified. The next steps of the project will include uploading this information to the Mississippi enSite Permit tracking database for use by all MDEQ employees. These locations will be made available through the Spatial Warehouse Information Management System (SWIMS), and ArcIMS application running on intranet at MDEQ.

The field collection method has revolutionized the way MDEQ will collect information in the future. Field collectors cannot only collect data more accurately by visually checking the calculated location and transferring the data electronically, but can also be guided back to previous sample locations in the future. This exercise was not without lessons. The GPS systems used have since been replaced with more field durable NAVMAN units. Without the need for large imagery, the hard disks are also not needed. This saves on new unit purchases and greatly reduces the risk of system failure in the field. During this six-month project, only one system suffered data loss as a result of a hard-drive crash. In the end, the downloaded field-collected information was relatively error free and is leading to fast compilation times for the entire data collection project.

Gary Hennington
President
Information Management Systems, Inc.
1608 Chambers Street
Vicksburg, MS 39180
Telephone: 601-961-5183
Fax: 601-961-5357
gary@ims4gis.com

Greg Jackson
TMDL Section Chief
Mississippi Department of Environmental Quality
2380 Highway 80 W
Jackson, MS 39204
Phone: 601-961-5098
Fax 961-5357
Greg_Jackson@deq.state.ms.us

Daryl Cook
GIS Program Manager
Information Management Systems, Inc.
1608 Chambers Street
Vicksburg, MS 39180

Telephone: 601-961-5321

Fax: 601-961-5357

gary@ims4gis.com