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LAND INFORMATION Bulletin

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South Georgia Regional Development Center

Mapping the "Roads Not Taken"

Georgia relies on GIS to update crucial transportation data

Roads and highways are part of a complex web of transportation in every state. People depend on accurate and up-to-date road information for travel, and for a host of professional applications such as planning and economic analysis. Keeping abreast of a rapidly changing transportation system posed a huge challenge for the Georgia Department of Transportation. To address the issue, they forged a cooperative partnership with the 16 state regional development centers to use GIS to create an accurate statewide transportation data layer.

Maintaining accurate, up-to-date information on existing road and highway networks is a complex process. Throw in new construction, unannounced road closings, and other changes in the ever-shifting transportation web within each state, and the task is even more daunting. Why is it important to keep transportation data current? The data are used as tools to address issues such as environmental impacts, statewide and community planning, economic development and, of course, for the production of accurate road maps and other cartographic products.

Timely capture of new street data in communities is accomplished using local Regional Development Center staff and global positioning systems (GPS).

The Georgia Department of Transportation (GDOT) began creating a statewide transportation GIS data layer several years ago. It began with a vector (line) product, which complied with the published U. S. Geological Survey standards for vector data. This format standard is typically referred to as DLG or Digital Line Graph. From that beginning, the University of Georgia Information Technology Outreach Services adjusted the location of each centerline in the statewide database to correspond to recent 1:12,000-scale DOQQ (digital ortho-rectified quarter quad) aerial photographs of the entire state. Features in the DOQQ images were "ground-truthed" (that is, verified on the ground for accuracy) through an image-rectification process, providing images that were a great tool for improving the accuracy of the initial DLG data.

Although accurate, the new data set was incomplete, thanks in part to the rapid rate of growth in the state. Traditionally, GDOT has relied on timely notification from counties about new public roads and road closings through local certificates of acceptance (LCA) A local certificate of acceptance documents the transfer of ownership of roadways and rights-of-way from private developers to the community. Unfortunately, and

mostly due to the difficulty of enforcing this mandate, many counties have not faithfully participated in the past. Without this information, GDOT had little way of knowing when to send field crews out to map these features using GPS, leaving many "roads not taken" by field crews. The result was out-of-date data and maps—an inconvenience for users, both in government and the private sector, and costly and time-consuming for the GDOT to visit each new road in the state for capture.

Finding another route

The GDOT began searching for other means of receiving updates and explored options at the local level. For years, the state's 16 regional development centers (RDC) had performed GIS collection, and other tasks for the State Department of Community Affairs. The RDC's also served most regions of the state, offering planning assistance, GIS, and other services. Because of their "grass-roots" approach, they were well connected to local contacts in just about every community statewide. This accessibility to local officials, combined with the RDC's GIS technical expertise, prompted the drafting of a contract between GDOT and the regional development centers.

Spearheaded by the Middle Georgia RDC, a pilot project began to develop methodologies for identifying, collecting, and submitting new or reshaped road centerline data. Data dictionaries were devised to ease the capture of vital information in the field using digital global positioning system (DGPS) equipment. Information such as street name, surface type, number of lanes, median type, serviceability rating were among the data included in this dictionary. Guidelines for converting GPS data to a common GIS format were outlined to promote consistency among the results delivered by each RDC.

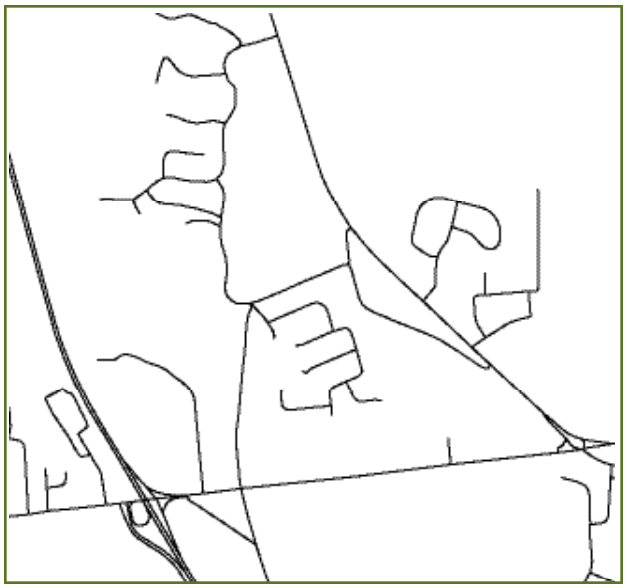
Hitting the road

In July of 2000, all 16 Georgia regional development centers began collecting and submitting road centerline data to GDOT. The RDCs around the state began to communicate with local officials at 911 centers, road departments and other local contacts to locate new and/or previously unidentified street segments that should be captured. GDOT also drew upon recent local certificates of acceptance to identify some roadways that needed mapping.

Tools of the trade: Hand-held GPS units and the automobile

The RDC data collectors then hit the road with GPS units in hand. Because a typical GPS receiver only records the location of the antenna itself (which was mounted on the roof of the vehicle), left/right offsets were used. This prevented the driver from having to place the car on or beyond the centerline of the roadway and becoming a hazard. The antenna mounted on the roof of a vehicle also meant that, on occasion, rather precise navigation was required to accurately mark the beginning and ending of street segments.

Once a county's centerline collection was complete, data were then converted to ESRI's Arc/Info format and inspected for quality. Minor modifications to line segment vertices and attribute data were allowed by GDOT and were performed at the discretion of each RDC technician. (see before.and after graphics of centerline data). Once the newly collected centerline data was submitted to GDOT, a comprehensive quality-inspection process began. All data characteristics were examined to ensure the data will merge



Road segments in a community before (left) and after the pilot project. Added road segments are green.

flawlessly into the state's existing data layer. After approval, all new data are included in GDOT's transportation data layer. New data are displayed in all cartographic products as well distributed digitally from that point on.

Bumps in the road

Thanks to the groundwork laid by the pilot project, the first year—ending June 30, 2001—was a resounding success for both GDOT and the RDCs. But it was not without obstacles. Georgia terrain ranges from lowlands and dense forests to bald mountain peaks. Because of this variety, collection methods that work well in one area of the state didn't necessarily work well in others. The adaptability of the collection teams and the earlier efforts to create a standardized data-collection system helped make the task manageable. Software and hardware issues also were resolved by including software/hardware upgrades as allowable costs in the contracts.

Attributes collected for each new street centerline

SOURCE	RDCSGA
COLLECTOR	McAleer
FIPS	277
RDNUM	
BEGAT	RIVER BEND LN
RDNAME	RIVER BEND
SUFFIX	CT
RDDES	00
RDTYPE	2
FACILITY	2
SURFACE	I
PSR	4
RLANENUM	1
LLANENUM	1
LNWIDTH	12
MEDIAN	4
ENDAT	CUL-DE-SAC
MAX_PDOP	3.400000
CORR_TYPE	Differential
RCVR_TYPE	Pro XR
GPS_DATE	12/2/2003
GPS_TIME	11:55:45am
GPS_LENGTH	236.712
GPS_3DLENG	236.795
AVG_HORZ_P	0.758
AVG_VERT_P	1.349

The state of Georgia is divided into 11 service-delivery regions (SDR) that do not necessarily coincide with RDC district boundaries. Since GDOT's efforts at the state level are being organized by service-delivery regions, some RDC's needed to join forces to deliver a product for their shared SDR. Because some SDRs may cover more or fewer counties than others, each RDC developed task timelines with the understanding that all data for all counties would be submitted within the 12-month period. Because of density and rate of growth in some regions, some centers enlisted several data-capture teams, while other centers delivered all the data using one team.

The cost

In the first year of this effort, the Georgia Department of Transportation provided up to $64,000 for each service-delivery region's lead agency on a cost-reimbursable basis. This allowance was to cover everything from software and hardware upgrades to employee time and travel costs. When two RDCs combined efforts to deliver a product for one service delivery region, contracts were negotiated among those two agencies for creating a budget and dividing the funds.

About RGIS

The National Consortium for Rural Geospatial Innovations–South Georgia (RGIS-SG) is located on the grounds of the South Georgia Regional Development Center in Valdosta, Georgia. It is a USDA program designed to promote the use of geospatial information and technologies by communities in rural America. RGIS–SG is dedicated to helping communities understand the concepts and benefits of using geospatial data as well as assist the communities in all aspects of GIS development.

Which way from here?

The hugely successful partnership between GDOT and the RDCs to collect centerline data is now in its fourth year. The scope of work has expanded to include other transportation data such as shared-use paths, sidewalks, bikeways and walking trails. The same strategy for collection has been applied in the case of each category of features.

Software and data

The GIS and GPS softwares utilized for this ongoing project are ESRI's ArcView, Arc/Info and Trimble's ProXR(S) GPS receivers and tdc1/tsc1 data collectors. All data are accompanied with FGDC-compliant metadata constructed using SMMS software.

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