

Data Sets That Enable the Plan: Storm Water Project Tracking

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Abstract

Initiated by users, the Project Tracking data set records where projects have been completed throughout Charlotte. All project closing information is electronically received by the Storm Water GIS Team, processed, and distributed monthly throughout the enterprise. The Project Tracking data set is used daily to track project locations, costs, types of work as well as yearly to prepare GASB-34 Asset Tracking for the Federal Government, determine trends in land development short-comings, and forecast staffing and contract resources.

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- III. Project Tracking: How it works
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 - B. ESRI ArcMap Shape Files
 - i. Data displayed with Parcel Information
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Background

Charlotte

Home of the second largest banking community in the United States and to one and a half million in its metropolitan area, Charlotte is the 20th largest city in the United States and still growing strong. Three-hundred-six 'Fortune 500' companies are located in this North Carolina City with many having headquarters in the "Queen City". With this high rate of commerce, come the employees that make up many of Charlotte's residents. The City government strives to provide efficient services to its residents at minimal cost. These services include transportation infrastructure, sanitation, water, sanitary sewer, and stormwater management.

Storm Water

With the continuing expansion of the Queen City in commerce and residents, the utility infrastructure required to support this growing society continues to expand. Charlotte's Storm Water Services utility was established in 1993 by acquiring the City's first National Pollutant Discharge Elimination System (NPDES) permit, one of the earliest storm water utilities in the nation.

Storm Water Service's goal is "to provide the community with a quality storm drainage system that is safe, clean, and cost-effective". The utility was set up to address problems that were caused wholly or in part by storm water runoff from public streets.

Charlotte's Storm Water Utility is strategically divided into four teams to accomplish its task. The Administrative Team (A-Team) houses financial functions for the division. As well, it maintains oversight for resident communications, GIS, and technology management. Water Quality team (Q-Team) manages the enforcement of the environmental regulations mandated by the NPDES permit. The Engineering Team (E-team) works with consultants to plan and construct neighborhood-wide Capital Improvement Projects (CIP's) of the stormwater management systems. The Maintenance Team (M-Team) provides repair on a citizen-by-citizen basis. This results in all requests for service being funneled to this group for appraisal before being redistributed to other teams for work. M-Team works closely with the other three Storm Water Teams to track, execute, and close citizen requests.

This paper will focus on M-Team's process to complete work through using a GIS data set, generated by their group, and how this data works in conjunction with Charlotte's Enterprise GIS to aid in Storm Water tasks.

Storm Water Program: Executing work

Process

Each M-Team project begins with a "Request for Service". Customers call the City's 311 program or complete an online form to report their storm water issue. An inspector then visits the site and determines if the problem qualifies for service and what priority it should be assigned. Each request is classified based on the following criteria:

- ‘A’ - High priority problem that may consist of living space flooding, imminent structure damage, or flooding that poses a threat to the traveling public.
- ‘B’ - Medium priority that may consist of crawl space flooding, severe erosion threatening secondary structures, pipe or drainage structure failure, or erosion that adversely affects water quality.
- ‘C’ - Low priority that may consist of moderate erosion or standing water.
- ‘DNQ’ - The problem does not receive runoff from a public street. Permission is then obtained from the affected property owners; the project is then designed and constructed. The request is then closed out.

Managing Work: Project Tracking

The City of Charlotte is divided into eight watershed work areas. Once a citizens request has been qualified, it is assigned to one of these watershed work areas according to the geographical location. Each watershed has an assigned number of Drainage Specialist, based on workload, to handle request. A project begins by assessing the problem and determining the scope of work. After permission is granted from the affected property owners, the project is designed to City standards and assigned to a contractor for construction. Drainage Specialists each had a different way of designing and producing project documentation. A system was needed to bring the best of each Drainage Specialist’s means and methods together with the ability to track all aspects of work geographically.

Project Tracking: How it works, how we use it

Microsoft Excel Worksheet

The different spreadsheets that make up the Project Tracking workbook were already in place. However, various copies of “the original” were floating around and there was no standard for its use. Because of the inconsistencies in process, Drainage Specialist’s would choose whether or not to use the spreadsheets. Additional inconsistencies included M-Team members who chose to use different routes of submission. Some chose to print them while others would email.

Microsoft Excel is a part of the standard computer desktop at the City. Training to use Visual Basic code to create macros for it is easily obtainable through the City’s Technology Learning Center. With these tools available, Drainage Specialist Brian McMahan began working with the M-Team leader to establish a standard for Project Tracking workbook use and submission. He compiled the spreadsheets that would be

Storm Water Maintenance FY-2004 D

Project Number: 67143-711
Contract: FY-2004 D

Project Information Workbook

Drainage Specialist: Brian K. McMahon
Phone No.: (704) 336-7835
Inspector: Carlos Alvarez

Contractor: Blythe Development
Address: 1435 E. Woodhollow Blvd.
Chapel Hill, NC 27573
Supervisor: Pete Gerry
Phone No.: (704) 388-0023

Property Owner Information

Date: March 8, 2006
Main Request No.: 1490737
S.W. Ranking: A
PO Number: 0004630

Property Owner Name: Ryan Davis
Project Name / Address: 4727 Inwood Ave.
Phone Number: 704-564-1532

Worker Information

Proposed Project Scope: Remove and replace existing manhole @ 2+00, water plug existing 36" RCP from 2+00 to 2+41, replace existing 18" CMP/RCP system from 2+41 to 3+96 with 30" RCP as shown on attached sheet. 2+00 to 1+60 rework existing tie-in upon (approx 10 ft) remove overgrowth and debris from channel, stabilize slopes with C-125 matting and nail bottom with C-300 if needed.

Est. Project Cost: 32,600.56

Save & Print Workorder, Item sheet, & Notice to Proceed

The first sheet of the Project Tracking workbook

needed to open, plan, design, and then close a project into one workbook. This was accomplished utilizing macros that performed different functions. A primary benefit in this system was to input primary data only once and then allow macros to populate the additional Project Tracking spreadsheets within the workbook. An additional benefit of the Project Tracking workbook was that it automatically produced necessary construction documents and saved the project to disc. The documents produced include work order, anticipated project quantities, notice to proceed, time of concentration data and pipe installation cut sheets. These are automatically generated and printed in the quantity needed to proceed with the project.



Tabs available for analysis and reporting in the workbook

The final sheet in the workbook, the Closeout form, is the most powerful and provides the most information for the tracking and assessment of a project. The closeout sheet records the request(s) for service that are closed through the Drainage Specialist's work, the parcel identification number(s) where the project was completed, if easements were acquired, how much money was spent, and the hard structures that were used to construct the project. The status of the GIS asset inventory is also tracked here, data crucial to the GIS staff capturing this important stormwater data set. When this information is entered in its entirety, a red button at the bottom of the sheet is selected by



the Drainage Specialist. Four copies of the Closeout Sheet and supporting documentation are then printed. These are distributed to the Drainage Specialist, A-Team, M-Team leader and the City file. The user is then prompted to save the document under a unique name in the user's project folder and the information from the Closeout Sheet is sent in database file III format (dbfIII) to the GIS staff. GIS Staff save these records to a 'New' directory. Quarterly these records are compiled by the staff into one database file and quality checked for data completeness. The resulting database file becomes the basis for the Project Tracking data set.

This spreadsheet became the official project work, tracking, and submission tool for the M-Team in 2000. Storm Water Service's then began to see the consistency in reporting based on the new database. Critical tools and data that are required for the City's record keeping are rolled into this single source.

ESRI ArcMap Shape Files

Once the data is compiled in the Excel worksheet, the parcel identification, the request number, and the starting/ending date fields are quality checked for population and correctness. If errors or omissions are found, the record is removed from the database, and the responsible Drainage Specialist corrects the errors and the record is then resubmitted. From here, the worksheet is saved as a database then queried for completion and for errors. When the record is corrected, it is e-filed (dbfIII) and saved into the 'Master Database' directory. The GIS staff then opens the file in Microsoft FoxPro to check the parcel identification numbers for correct formatting by running a FoxPro program. With these steps complete, the data is resaved as a database file and is ready to be joined to the Mecklenburg County parcel data set.

In ArcMap, the parcel feature class is added to the project from the Enterprise SDE server. A join is then made from the parcel table to the newly formatted Project Tracking table. The join to the County parcel layer is done through the COMMONPID, or common parcel identification number, field in the County layer and the ADDPID, or additional parcel identifier, in the Project Tracking database. Only parcels that are identified in the Project Tracking database are kept in the join process and these are then exported to a new shapefile labeled with the creation date. The latest shapefile is then submitted to the drop zone to be updated on the Enterprise server as well as plugged into the wall map that is plotted as a part of this quarterly process. Project Tracking is attached to Storm Water's 'Add Common Themes' tool bar, an easy menu kept current by the GIS staff for users to select and grab data without having to surf multiple data access points.

The M-Team Project Tracking layer is available for continued analysis with all other Enterprise data such as construction projects, parcels, and road resurfacing. This

information allows Storm Water to plan future work based on easements acquired through existing projects, save money by working with other City entities that have projects in the same area, and assess trends on requests in areas and decide if a larger problem exists that may need to be dealt with as a CIP. Before the Project Tracking data set, many files and individual memories had to be queried, to attempt to identify flooding patterns and what previous action was taken in response to request. With Project Tracking, the facts of who, what and when can be pulled instantly using GIS to efficiently plan projects and assist in forecasting the future M-Team workload in any given area. The use of GIS in Storm Water provides the City a better understanding of where its' Storm Water fees are being spent and the communities and citizens who are benefiting from the stormwater utility.

Other Uses

GASB Reporting

The Government Accounting Standards Board establishes financial accounting and reporting standards for state and local governments. This reporting is used to help governments demonstrate financial accountability and stewardship of public resources. The report is widely used by the municipal bond industry to assess a city or county's ability to repay its debt and is one of the factors involved in determining an entity's bond rating. As part of the GASB reporting, Storm Water submits an account of the Hard Structure Inventory Items. This is the amount and value of all tangible items installed throughout the fiscal year such as pipe, culverts, and other drainage structures. Before the implementation of Project Tracking, it took weeks of compiling data from many different sources and formats to gather the required information. Now, the report can be prepared from an up-to-date version of the database containing all inventory items in a matter of minutes.

Council, Citizen, and Media inquiries

Storm Water Services receives information requests from City Council members, citizen groups and the media on a regular basis. Requests range from simple information such as, "Have Storm Water Services worked at a particular address?" to a city council member's request of, "How many projects have been constructed, how many citizens have been served, and how many dollars have been spent on repairs this year in my district?" Both inquiries can be handled easily using the Project Tracking GIS layer in conjunction with other layers to produce maps to display the information graphically or exported to a spreadsheet.

Employee and Contractor Performance

Employee and contractor performance can be assessed easily using Project Tracking. Employees are able to track their own performance throughout the year and adjust their workload accordingly to meet preset goals. Contractors' performance can be tracked to insure that construction crew output and spending rates stay on target through the year.

Workload, work force, and budget forecasting

Project Tracking is used to forecast production quotas for future departmental goals. By accurately tracking vital project information, trends can be identified and future workforce and budgetary requirements more accurately determined.

What's next: Keeping Project Tracking up-to-date

Web-based version

Project Tracking's manual record compilation through GIS staff and email could be improved by the database files from the Closeout document being deposited directly in the Project Tracking database. The current process allows records to be missed if the staff is not diligent compiling them. Dependency on the aged FoxPro for editing is also not desirable.

Storm Water is working with a consultant to make the Project Tracking workbook a tool that is available through Charlotte's intranet and stored in a SQL database. The resulting product would be an interface available to M-Team users from a single point with an engine that would compile the records to a database. Next, the GIS staff would open and quality check before building the quarterly Project Tracking data set and disseminating the updated information.

The Project Tracking system enables Storm Water's M-Team to effectively and accurately track projects in process and follow them to completion. Once completed, closed project data is available through ArcGIS to aide in project analysis and monitoring Storm Water work throughout the City. As Charlotte continues to grow, GIS solutions like Project Tracking will become increasingly important to plan stormwater solutions for citizens and to produce data to meet the future needs of Charlotte.