Collier Soil and Water Conservation District

Gazetteer **March 2013**

Geodesign

- Collier County has been using rudimentary Geographical Information Systems (GIS) for well over 12 years.
- Their uses and abilities have waxed and waned as personnel have come and gone...some were more proficient than others... budget cuts...priorities....
- To date staff doesn't have the ability to point to a parcel on an aerial and ask for description, permits, violations, fines, SDPs, storm event impact.
- The Property Appraiser's web site is commonly used by Growth Management Division for information searches about parcel ownership.
- Commitment Tracker, was purchased but wasn't designed for county-wide uses.
- Commitment Tracker was supposed to track PUD commitments so that the county never pays for work that's supposed to be done by developers.

GIS Highlights

- With GIS, commissioners would be able to view multiple georeferenced surveys at once and get a complete snapshot of a storm event or PUD change.
- ArcGIS 3D Analyst and terrain datasheet would allow development of an accurate representation of the Special Flood Hazard Areas and functional watershed.

Geodesign to Mitigate Flood Risk

This is a snapshot of surface water flow November 18-20, 1969 by sub-areas A, B and C. Since then, county hydrology has been in a state of flux, constantly changing due to the expansion of urban boundaries and it needs a cost-effective means for restoring or minimizing the impact of change while planning for future growth. Among the many issues that can arise from increased urbanization, storm water management can pose significant challenges.

Collier County is home to just over 387,000 residents and is growing. A Primary and a Secondary canal system form a major surface water/storm water control network in the County. Together, their function is for flood prevention, storm water treatment, wetlands preservation and surface recharge of the ground water aquifers.

The secondary system consists of a network of ditches, canals, weirs and pump stations that collect storm water run-off from neighborhoods and public roadside drainage systems. The Primary system consists of canals and water level control structures that store storm water run-off from the Secondary system, roadways and neighborhoods.

Private storm water management systems also exist in Community Development Districts (CDDs) and some Planned Unit Developments (PUDs) that are regulated under terms and conditions set forth in their individual Storm Water Management System permits authorized by the South Florida Water Management District.

Harmonizing Man-Made Structures with the Environment

In strategizing to mitigate flood risk, there are many built areas within the floodplain that simply would not be approved for construction today. Permit applications must be modeled to correctly assess the impact of potential flood events so that structures can be put in place to effectively mitigate risk in these areas so as not to exacerbate flood hazards.

- Calculations can be automated within the GIS, minimizing data preparation and maximizing time spent on assessing flood-related issues.
- Floodplain maps are used not only for development of storm management infrastructure but also to develop flood-related emergency response procedures.
- Because calculations are automated within the GIS, more time can be spent assessing flood-related issues, and less time is spent on the mechanical tasks of preparing data.
- Three-dimensional modeling using the ArcGIS 3D Analyst extension also makes it easier to communicate requirements with engineers and gain buy-in from stakeholders.
- Capturing this level of accuracy supports effective analysis so that recommendations can be made for the design and implementation of new storm water management infrastructure and detention ponds throughout the county.

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As development occurs across the landscape, sustainable management and appropriate planning are required to ensure that current and future actions do not degrade, alter or destroy the existing environment. Today, it is imperative to consider the bigger picture.

An informed planning staff would consider an Economic and Social Research Institute (ESRI) terrain dataset, along with the ArcGIS 3D Analyst extension, to develop a digital elevation model (DEM), and create an accurate 3D representation of the impact to our functional watershed. The DEM is used to calculate floodplain elevations and map floodplain boundaries.

Detention Ponds to Diminish Storm Water Surges

Detention ponds are storm water management facilities designed to protect against flooding and, in some cases, downstream erosion by storing water for a limited period of time and then releasing it slowly. They are also used to collect suspended sediments, which are often highly concentrated in storm water when the sediments are washed off roadways and hard surfaces during storm events.

These ponds are a necessary fixture of growing urban areas because flood events are often greater in magnitude and frequency within increasingly urbanized landscapes. Furthermore, surfaces associated with urban areas, such as roads, parking lots, and rooftops, prevent the natural infiltration of water into soil and can potentially cause widespread flooding downstream. When analyzing existing or potential pond sites, county staff would leverage the ArcGIS 3D Analyst extension to incorporate multiple criteria into the decision-making process. This can include land availability, geographic conditions, and site-specific legal and jurisdictional considerations. Using GIS, it's also possible to evaluate the performance of a detention pond, including its attenuation efficiency (the ratio of runoff retained in a pond versus the amount flowing in) prior to construction.

By visualizing Laser Imaging Detection and Ranging (LiDAR) technology fused with GPS survey data, staff could determine the amount of sediment accumulation within each pond that should be prioritized for removal. When new development occurs, the DEM could be leveraged to forecast flow capacities along the floodplain and flag potential spill inundation areas that may require the implementation of new storm water management structures.

County staff needs to create a living terrain dataset that can be exported at any time to produce an updated DEM so we don't have to purchase new datasets every time new construction occurs and we can use our existing model to analyze how water flows over the new terrain features.

Modeling for Reduced Risk

The updated DEM is used for both hydrologic and hydraulic analysis. County staff would first produce a hydrologic DEM, conditioned to support hydrologic models that simulate storm water runoff into watercourse features. The next step is to introduce hydraulic information in the form of in-stream 3D representations.