

## GEOGRAPHIC INFORMATION SYSTEM (GIS) LONG RANGE PLAN

### *Purpose*

The purpose of this GIS (Geographic Information System) Long Range Plan is to define a common unified vision and establish a mutual framework for City Departments to efficiently and effectively utilize the City's GIS technology. It is also critical to have this plan in place as a support to the overarching goals found in the adopted Land Use Plan. As you can see throughout the Land Use Plan mapping is a theme that is constant for visual reference and documenting historic growth patterns of Mount Holly. This plan builds upon the successes of the previous GIS efforts, evaluates present conditions, assesses industry trends, and prepares a road map for the future of GIS at the City of Mount Holly. Initiatives for this plan include:

- Ensuring the efficient provision of geospatial data and services resulting in cost-savings for the delivery of city services, and management of city assets and property.
- Ensuring continued improvement of workflows and business process improvements resulting from GIS applications integrated with city business systems.
- Ensuring strategic business driven deployment/acquisition of GIS related technologies and geospatial data to improve services and operations.
- Extending city services by providing citizens and businesses with access to geospatial data in the form of easy to use applications to stay informed and provide input about the community in a method that saves them and the city time and money.
- Centralized administration of a city-wide information system to ensure efficient use of data, applications, and GIS related resources to reduce redundancy and duplications of efforts.
- Regional coordination initiatives to produce cost-savings, public safety benefits, and economies of scale from large data acquisitions.

### *History & Successes of Mount Holly GIS*

Before we plan for the future of mapping related initiatives, it is important to reflect on where GIS started with the City. GIS is a vital part of any City's operations in the 21<sup>st</sup> Century and Mount Holly is no different. Mount Holly is a City of approximately 16,135 people in the most Eastern part of Gaston County along the Catawba River and Mountain Island Lake. The most southern boundary begins at I-85 reaching to the north along Highway 16. Mount Holly's GIS System, as part of the Planning Department, was established in 1999 and is one of two, city-operated GIS Systems in Gaston County. Its function is to provide accurate geographical information to citizens and staff. From the early stages with Light Tables and hand drawn maps, the City's GIS System has become more interconnected with all departments within the City. We have a license and operate on one of the newer GIS platforms in ESRI's ArcGIS 10.6 and ArcGIS online. We have upgraded our printing, scanning and laminating abilities, which enables us to handle many of the projects in-house.

The GIS System covers all departments such as Planning, Utilities, Streets & Solid Waste, Police, Fire and Parks & Recreation. The Planning Department has multiple in-house projects and our Utilities Department maintains over 100 miles of water lines, 90 miles of sewer lines, thousands of storm water features requiring a large part of the City's GIS resources. Other mapping requirements are accounted for such as the Official Traffic Map, emergency maps for the Police and Fire Departments. The Parks and Recreation Department has increased their need for mapping with newly constructed portions of the Catawba River Corridor Greenway system and Mountain Bike Trails at the Mountain Island Dam Park. The City's GIS has also been highly involved with the Census for the last 12 years. The City participates in the Bi-annual Census Boundary and Annexation Survey, which reflects any annexations made by the City. We also participate in Centennial Census Activities that includes the LUCA program (verification of addresses), the PSAP (Census Areas) program and the Census' New Construction Program, which includes housing addresses that will be constructed before the start of the 2020 Census.

### Why does the City need GIS?

Mount Holly GIS and the Planning Department personnel manage large and disparate data sets, many of which contain a spatial component, such as an address or geographic location. GIS provides data management tools that utilize the geographic data to create meaningful information. From that information, creative solutions may be derived, making the best use of limited staff and financial resources. From those proposed solutions, City departments can make confident, data-driven decisions and recommendations. With the use of GPS, the City can attain a certain level of precision of the location of their infrastructure in repairs, construction and cataloging of those points.

This Plan is one step in building the foundation for a less centralized GIS system that will allow members of every City department to access GIS data and tools. An interconnected GIS will allow departments to share data sets, reduce repetition and will assist department staff in managing resources, assets, and service to citizens effectively and efficiently. GIS is a tool that can foster better communication and understanding of the City's resources to City personnel, other government agencies, and to the public. Mount Holly's GIS will provide a powerful analytical tool that will support enable effective management of the City's infrastructure, development planning, and emergency response. GIS provides increased transparency and accountability for citizens. With the combination of the cloud, sharing of data, maps, and pertinent information, GIS is allowing increased engagement with citizens and more succinctly showing trends in the community visually, which enables a more constructive conversation for government employees.

### *Mount Holly GIS by Department*

As mentioned before, the use of this tool helps other departments in the City. The following describes briefly some of the functions by each department.

**Planning:** Code Enforcement, Map creation, Data interpretation, Statistics, Demographics, Zoning Maps, Topography, Environmental, Voting Districts, Census activities, Aerial Photos, Land Use, and Greenways.

**Parks & Recreation:** Park Facilities including Trails and Greenways and Bike Trails.

**Utilities:** Water lines and Sewer lines and structures such as Yard Inlets, Culverts, Valves, Storm Water structures, Water Treatment facilities and Tanks, Hydrants, Valves, Water Sample Sites.

**Streets & Solid Waste:** Street Maps, Traffic Maps, Street Projects, Garbage Routes, Leaf Routes, Master Sign Plan and Street festivals.

**Fire:** Hydrants, Response Routes by distance (Gaston County), Insurance Maps, Response Area Map and Greenway Response Map. The Fire Department utilizes their own Active 911 for fire response, which is linked to the County and Google Earth to offer Hydrants and building plans.

**Police:** Street Maps, Crime Area Mapping, City Limits, Site mapping, Patrol Zones, Police Officer Vehicles driving distances, and Greenway Response Map. The Police Department has their own GIS 911 through Southern Software.

### *Local & Regional Coordination*

The City participates in both Local and Regional GIS coordination. Much of the participation is related to data sharing, data acquisition, and overall coordination. For example, Mount Holly participated in the 2019 Ortho imagery Project along with other agencies across the Charlotte region to help reduce the cost of purchasing expensive aerial photos through economies of scale. We also are highly involved with the 2020 Census and lead up events such as the LUCA program (verification of addresses) and PSAP (Census Areas) program. We also participate in the Census's New Construction Program that counts the addresses that should be included in the 2020 Census. Members of the Planning Staff also participated in local meetings of the Census Complete Count Committee in an effort to inform ourselves and the public of the upcoming Census Count in 2020. Another area of coordination will come to fruition when we merge our wastewater with Charlotte Water. The City also coordinates with the County to update our City Limits and Zoning on a regular basis to be placed on the County's GIS platform.

### Other Regional Municipalities with GIS

Many other municipalities within the State piggyback on their respective County for their GIS Interactive Maps links on the Web. Below are some of the local governments in the region with a description of the services they provide.

- **Salisbury:** Has open code violation reporting on their website. They also offer open ESRI GIS maps to explore several themes within the City such as Parks and local attractions.
- **Gastonia:** They offer previously created maps in digital format and several ESRI open source maps on their website.
- **Concord:** Provide an Interactive Geocortex mapping System by combining the 3D and 2D capabilities of ESRI's latest JavaScript API to deliver cutting-edge mapping applications.
- **Charlotte:** Uses Polaris (Mecklenburg County's Property Ownership and Land Records Information System) this is an interactive GIS server that allows for themes and layers to be viewed.

## Goal Development

### Process

In February 2020, a questionnaire was distributed to each department requesting feedback on the current strengths, weaknesses, opportunities and threats. From those questions the responses were reviewed and evaluated for opportunities to improve the GIS system based on the needs within each department of the City. The survey was intended to better understand balance between the needs of the departments and the capabilities of the ESRI software and mapping.

### Results & Feedback

While some Departments rely more heavily on our GIS, many departments could benefit from it and its expansion. The City's use of our GIS system seems to rely mostly on producing paper maps and data for many of our departments. While some departments such as Utilities rely on our GIS almost daily for our water and sewer infrastructure. Other departments use our GIS for annual audits by outside agencies to maintain State and Federal compliance and our printing capabilities. Planning relies on GIS for paper maps, economic development, analytics, site evaluation and data comparisons, census data, and environmental analysis. Departments such as Police and Fire rely on GIS for Response Area maps and Insurance Maps, Hydrant and Crime maps. Parks relies on GIS for Facility Maps, Trail location and distances, Greenways and printing for special events. Streets also rely heavily on GIS for Street Maps, Official Traffic Sign maps, location of utilities and Pavement Survey mapping.

From the survey response, the need for a more accurate GPS system and the ability to remotely access our GIS system from the field became apparent. Especially our Utilities Department for maintenance of our public infrastructure. For example, during emergency situations like water main breaks occurring after normal business hours. The use of a more accurate GPS system could increase response time during these situations with improved ease of location of infrastructure. Software and hardware improvements would be necessary to accomplish through access to ESRI's ArcPro Online coupled with Tablets.

One of the results of the survey showed a need for greater and more efficient visual communication with the public. A means to accomplish this is through Dashboards on our website that can relay themes to the public. Network Analyst is another ESRI software that would be beneficial and would allow for route editing in order to find more efficient routes for garbage collection. There are more software enhancements that can always be included, but the feedback from the questionnaire was to go after initial packages that can benefit the City now and build towards a more comprehensive ESRI system over time.

With all City Departments having their own respective GIS needs. A process was identified to form a GIS Council that can meet as needed to address each department's needs and projects. This could comprise one individual from each department, the GIS representative and the IT Director. Our IT Department will comprise an important part of any GIS initiative and application throughout the City's Departments and computer network system.

## Recommendations & Goals

The following recommendations and goals were established based on the trends in the GIS community, input from the various departments in the City and other areas of need identified in other adopted Mount Holly planning documents. The recommendations and goals create a mutual framework and promote subsequent decision-making throughout the life of this plan. They are broken into Short Term, Intermediate and Long Term phases.

### ***Short Term (1 to 5 years)***

1. Adopt GIS Long Range Plan as of the Comprehensive Land Use Plan.
2. Look for opportunities to improve mapping documentation as part of the Land Development process and updates to the Land Use Plan.
3. Develop a GIS Request Form for internal and external requests by departments or the public.
4. Conduct an inventory and evaluation of the current GIS system, which should then be compared to the potential needs outlined in the plan. The outcome of this could be developed into a GIS Capital Improvement Plan.
5. Form a GIS Council with members of department staff with a goal of creating a more interconnected GIS system.
6. Coordinate and develop a GIS Licensing and Supply Budget with the IT Department.
7. Continue education and training of GIS staff as appropriate.
8. Establish tracking and project management system with the help of GIS for improved reporting.
9. Formalize GIS data standards to ensure consistency and quality of GIS data over the long term.
10. Create a GIS Training Plan to include additional methods, techniques and technologies to inform the public and train staff of Mount Holly's GIS applications and data.

### ***Intermediate (5 to 8 years)***

1. Explore and develop a centralized web-based mapping application, stemming from the need for public interaction with the City of Mount Holly.
2. The GIS Long Range Plan should be reviewed and updated every 5 to 10 years considering the constant changes in the technology field.
3. Explore upgrading of the City's GPS system and look to improve it to sub-meter capabilities.

### ***Long Term (8 years or more)***

1. Review the need for additional workspace and resources in the GIS System as the City grows as part of the Land Use Plan
2. Study the use and benefit of ArcGIS Enterprise to city infrastructure management.

## Definitions

The following definitions provide further description to topics or items that are referenced throughout the plan. Here is a link to an online dictionary: [GIS Dictionary - Geospatial Definition Glossary](#)

- **ArcGIS 10.6**—Current operating system from ESRI, which the City utilizes.
- **Dashboard**—A **dashboard** is a view of geographic information that helps you monitor events or activities. **Dashboards** are designed to display multiple visualizations that work together on a single screen. They offer a comprehensive and engaging view of your data to provide key insight for at-a-glance decision making.
- **Enterprise**—Is the foundational software system for GIS, powering mapping and visualization, analytics, and data management. It is the backbone for running the ESRI suite of applications and your own custom applications. ArcGIS Enterprise is tightly integrated with ArcGIS Desktop and ArcGIS Pro for mapping and authoring, and seamlessly connects with ArcGIS Online to share content between systems. Collaboration and flexibility are central to ArcGIS Enterprise, allowing you to organize and share your work on any device, anywhere, at any time. ArcGIS Enterprise gives you complete control over your deployment. It can be run on a single server machine, or scaled across many machines.
- **Environmental Systems Research Institute (ESRI)**—ESRI is an international supplier of geographic information system (GIS) software, web GIS and geodatabase management applications.
- **Geodatabase**—A geodatabase is a database designed to store, query, and manipulate geographic information and spatial data. It is also known as a spatial database. At its most basic level, an ArcGIS geodatabase is a collection of geographic datasets of various types held in a common file system folder, a Microsoft Access database, or a multi user relational DBMS (Database Management System) (such as Oracle, Microsoft SQL Server, PostgreSQL, Informix, or IBM DB2). Geodatabases come in many sizes, have varying numbers of users and can scale from small, single-user databases built on files up to larger workgroup, department, and enterprise geodatabases accessed by many users.
- **GIS**—A geographic information system (GIS) is a framework for gathering, managing, and analyzing data. Rooted in the science of geography, GIS integrates many types of data. It analyzes spatial location and organizes layers of information into visualizations using maps and 3D scenes.
- **GIS Capability Maturity Model**—Recently the GIS Management Institute developed tools to assess the characteristics of an organization’s GIS; an assessment of both enabling capability (technology, data, and infrastructure) and execution ability (GIS management and professional staff). To provide a better and more reliable definition of the required resources to manage the GIS program, this plan recommends employing the GIS Capability Maturity Model and its companion the Geospatial Management Competency Model. iv.
- **GPS**—GPS (Global Positioning System) is a radio navigation system that allows land, sea, and airborne users to determine their exact location, velocity, and time 24 hours a day, in all weather conditions, anywhere in the world.

- Light Table—A viewing device that is used to review photographic film or artwork placed on top of it. A horizontal form of a self-standing lightbox, it provides even illumination of the subject from below through a translucent cover and fluorescent lights that emit little heat
- LUCA Program (Local Update of Census Addresses Operation)—LUCA is the only opportunity offered to tribal, state, and local governments to review and comment on the U.S. Census Bureau's residential address list for their jurisdiction prior to the Census.
- Orthorectification—Is the process of removing the effects of image perspective (tilt) and relief (terrain) effects for the purpose of creating a planimetrically correct image. The resultant orthorectified image has a constant scale wherein features are represented in their 'true' positions.
- Orthoimagery—High resolution orthorectified images combine the image characteristics of an aerial photograph with the geometric qualities of a map.
- PSAP (Census Participant Statistical Areas Program)—Enables invited participants to review and update selected statistical area boundaries for 2020 Census data tabulation following U.S. Census Bureau guidelines and criteria.
- Shapefile—The shapefile format is a geospatial vector data format for geographic information system (GIS) software. It is developed and regulated by ESRI as a mostly open specification for data interoperability among ESRI and other GIS software products.
- Structure—Any permanent structure associated with Water, Sewer or Storm water systems within the City. For example: Drain pipes, culverts, hydrants.

## Sources

1. COMMUNICATIONS, **GIS 5 WAYS TO BUILD YOUR GIS BUSINESS CASE** *Patrick Fiorenza*
2. <https://www.esri.com/arcgis-blog/products/ops-dashboard/decision-support/dashboards-in-arcgis/>
3. Heggstuen, John, Business Insider, *One in Every 5 People in the World Own A Smartphone, One in Every 17 own A Tablet*, December, 2013.
4. GIS Capability Model - PG. 5 GIS\_Strategic\_Plan (Town of Tigard) Credit, URISA GIS Management Institute
5. Developing\_an\_Effective\_GIS\_Business\_Case.pdf
6. Collin\_Count\_Texas\_pdf