

SECTION 7 POTENTIAL APPLICATIONS

7.1 Introduction

An extensive inventory of GIS applications has been developed as a result of the interview process, user surveys, and the review of Morrow County reports, map products, and existing GIS data, as well as Geo-centric's experience with best practices. The enclosed inventory of existing applications is organized by agency, and serves to document and communicate to all stakeholders the huge potential of Morrow County's Enterprise GIS. Morrow County stakeholders will need to determine exact priorities based upon issues such as cost, relative benefits, policy and maintenance needs. All of the Potential Applications are opportunities that certainly can be realized, in time.

7.2 Auditor's Office

The Auditor's Office can use GIS in numerous aspects of mission critical tasks. Given the wide range of uses for an Auditor's Office, it is understandable that this section is the largest of the report.

Potential Applications

Access Real Estate and CAMA data
Board of revision support
Change Finder change detection service
Current Agricultural Use Valuation calculations and soils types
Data downloads - web access for Real Estate/CAMA data
Discovery of additions and amenities
Enhanced field data collection through aerial imagery
Identification of easements
Neighborhood mapping, delineation and analysis
Analyze appraised values
Appeals documentation
Appeal volume thematically displayed by tax district or neighborhood
Comparables
Foreclosure mapping and analysis
Identify area valuation adjustment factors
Price per square foot comparison and analysis
Property value anomalies (outliers)

Sales Ratio analysis / mapping
Sales studies and analysis
Sketch Check change analysis service
Value Analysis Dashboard
Routing field appraisers
Smart phone parcel data access
Data visualization

Access Real Estate and CAMA data

This application is one of the most beneficial to users of the Auditor’s highly valued Real Estate/CAMA information. Enormous benefits accrue to the office through the ability to quickly retrieve all kinds of information with a few keystrokes. This includes not only the Real Estate/CAMA data but other sources of information supporting the analysis and development of these data and supporting various business processes. Often, these other sources of information are located in another office, with a separate indexing system, including

- Recorded Plats
- Recorded Instruments, e.g., deeds, liens
- Tax Maps
- Surveys
- Building Sketches
- Imagery (orthophotos, oblique and street level)

The end result of providing universal access is greatly improved efficiencies for staff in finding, reconciling and analyzing information both for themselves and for the general public, private firms, and the academic and non-profit sectors of Morrow County.

Observations: Large reductions in foot traffic through the office and less phone calls have been seen in the Auditor’s Office after providing Real Estate/CAMA data through the DDTI, Inc. the Auditor’s public access website. The Engineer’s Tax Map Office will also see this substantial Return on Investment, post conversion.

Board of revision support

As the permanent Secretary of the Board of Revision, the Auditor uses GIS applications to provide information to help reach a decision on property assessment prior to the issuance of the real estate tax list. Property valuation complaints are also supported using the information provided through the Thompson Reuters’ Real Estate/CAMA system modules and the DDTI web solution. Pictometry also provides a view of the property in question (and comps if so desired) so the Board and the appellant may look at it and discuss items of interest.

Observations: Such an array of tools to provide information surely assists in proper decision making as well portraying a professional and cutting edge illustration of Auditor’s operations to these BOR attendees who by definition have “an axe to grind”.

Change Finder

Change Finder is a service from Pictometry International Corp. that identifies and inventories possible changes in building structures including additions to existing homes, new buildings and buildings that have been demolished. This is accomplished using two sets of orthoimagery from different years (and/or a building footprint layer). Once these changes have been identified, the Change Analysis application is used to visually inspect the change candidates and independently verify the results.

This has provided for more accurate taxation; more uniformly applied, and thus fair, taxation; and increased revenues from previously unidentified improvements. Through the automated process, field time is vastly reduced from manually comparing tens of thousands of structures to imagery or in-the-field visits. Also, properties that are difficult or impossible to access can now be evaluated.

Observations: This should be planned to coincide with the next sexennial appraisal in 2017. Using Change Finder (or similar service) during the year prior, then these corrections will migrate into the tax rolls in time. Other similar services are available.

Current Agricultural Use Valuation (CAUV) calculations and soils types

CAUV is an application that benefits enormously from GIS usage versus the manual methods of the past where the soils maps were inaccurate and incapable of overlay with the parcels and tilled areas. Using GIS technology, the soil areas can be exactly determined by overlaying the soils with the parcel boundary. Forested areas and tilled areas can then be calculated for these areas. Automatic calculations can provide the results of the particular soil type value reductions for a particular tax district’s rates.

Observations: This will have to wait until the parcels are converted to GIS format. This is an example of an application that can begin with areas that are converted and accepted by Morrow County.

Data downloads - web access for Real Estate/CAMA data

A common method for data downloads is through an FTP site. This mechanism works well enough. However, this method does require constant maintenance of staff to answer data requests and periodically load or update the desired information onto the FTP site. Another option would be to develop a web-based access mechanism that is batch updated with the latest information and provides access to most data sets with no staff intervention. This would allow staff to concentrate on other tasks rather than cater to someone requesting information that could be automatically provided.

Observations: This will need to wait for the completion of the parcel conversion project.

Discovery of additions and amenities

This application is a combination of comparing CAMA data to what is in the field and may include the use of oblique imagery. Separate years of aerial imagery are compared to identify modifications to structures and properties. Change Finder, from Pictometry is an excellent tool in this regard.

Observations: There are vendors that will provide a similar service as Change Finder but apply the discovery process to comparing CAMA sketches to orthoimagery. In Change Finder, the most recent aerial photograph of an improvement is compared to a previous aerial photograph-derived dataset. Changes are detected from these photographs and thus existing sketch errors are not caught and corrected. Sketch Check change detection service uses sketch vectors currently in your CAMA system. These sketches are exported into a shapefile and overlaid on recent aerial photography. This enables correction of invalid sketches efficiently resulting in accurate sketches, values and appraisals.

Enhanced field data collection through aerial imagery

This entails the assistance of collecting information on the condition of structures, other changes to properties and factors that may affect value such as environmental nuisances and other conditions in the immediate vicinity of the property. Staff time savings are realized when doing this from a desk versus driving and walking all around the County.

Observations: Distributing angled aerials throughout the County will allow other departments to more efficiently gather field information and better enforce other regulations.

Identification of easements

Easements are not currently tracked. Perhaps in the future, GIS will afford the tracking of them. Easements are best identified during the transfer process. The process of identifying all existing easements through deed research is too labor intensive for the benefit received.

Observations: If there would be a way to data mine the Recorder's Instruments for the word "easement" then perhaps the collection of existing easements might be do-able. Optical Character Recognition technology continues to improve so perhaps this will one day be possible.

Neighborhood mapping, delineation and analysis

Creating a neighborhood boundary layer is a straightforward process using the neighborhood code in the CAMA database. Classification of the parcels within each neighborhood allows for an inspection of the parcel characteristics using various visualizations methods, see data visualization below. Classification of parcel data using price/sq. foot, sale amounts or other characteristics can help determine if the neighborhood is homogenous and identify anomalies in values and characteristics.

Observations: The use of this appraisal support applications is contingent upon completion of the parcel conversion project, development of robust internal GIS infrastructure resources.

Analyze appraised values

Classification of the values for parcel improvements and land using various visualizations methods can provide the appraisal staff with valuable information, see data visualization below.

Observations: The use of this application will depend on the viewpoint and methods employed by your chief appraiser.

Appeals documentation

Maps, graphs, charts and images of Board of Revision appeal properties and supporting comparables' information can be assembled. These materials along with the adjudicated results can then be filed for access if needed in the future.

Observations: Such an array of tools to provide information surely assists in proper decision making as well portraying a professional and cutting edge illustration of Auditor's operations to these BOR attendees who by definition have "an axe to grind".

Appeal volume thematically displayed by tax district or neighborhood

Tagging of parcels involved in Board of Revision appeals can be thematically displayed on a map to discern any patterns or concentrations. This can be used during the revaluation process to target areas of special concern.

Observations: Such an array of tools to provide information surely assists in proper decision making as well portraying a professional and cutting edge illustration of Auditor's operations to these BOR attendees who by definition have "an axe to grind".

Comparables

Using the GIS per se to determine comparable properties is quite difficult given the complex algorithms required. Reliance on your CAMA system to identify these will provide a more accurate and defensible "comp".

Observations: GIS software can provide a visual display of the locations of comparable properties for use in confirming the validity of their physical location in the field, to provide this mapping as part of the appeals process and assist in routing to them if field verification is necessary.

Foreclosure mapping and analysis

"Sheriff sale" data is available for download through the DDTI Auditor's web page and can provide valuable information to map the properties that go to Sheriff sale auction. This can help

targeting of Community Development Block Grant funds, targeting of building code enforcement for abandoned properties, and to give local authorities a heads up on where these properties are located so pro-active stabilization or remediation efforts can occur.

Observations: This is currently available; a priority to do it is all that is required.

Identify area valuation adjustment factors (e.g., adjacent junk yard)

Buffer analysis or visual inspection can be employed to identify parcels that may be within a zone of influence from nearby land uses or activities. These can be both positive, e.g., parks, golf courses and other recreational amenities, etc. and negative, e.g., junk car lots, asphalt plants, water treatment facilities, transmission towers/lines, etc.

Observations: The weight or inclusion of these factors will depend on the viewpoint and methods employed by your chief appraiser.

Price per square foot comparison and analysis

Value ranges of price per square foot can be thematically mapped to provide visual cues relative to confirming the validity of comparable properties, identifying outliers and confirming homogeneity of neighborhoods.

Observations: The use of this application will depend on the viewpoint and methods employed by your chief appraiser.

Produce thematic maps of appraisal data

This is a generalized description of the ability of mapping any CAMA data or characteristics to support any particular analysis of these data. See data visualization below.

Observations: The use of this application will depend on the viewpoint and methods employed by your chief appraiser.

Property value anomalies (outliers)

Classification of appraised value will help identify outliers or confirm proper valuation for similarly classified parcels.

Observations: This is especially useful during the final stages of the triennial and sexennial revaluations.

Sales Ratio analysis/mapping

An Assessment-to-Sales Ratio study is a widely accepted standard to establish the reliability and accuracy of a mass appraisal. If this study identifies irregularities, these may be mapped for further investigation and possible adjustment.

Observations: This is especially useful during the final stages of the triennial and sexennial revaluations.

Sales studies and analysis

This is much less technical than ratio studies and is meant to convey the use of thematic mapping to display sales patterns or geographic distribution, temporal (time-based) analysis and statistics generation.

Observations: These more generalized maps are good for the public, press releases, annual reports, etc. to highlight trends or concerns.

Sketch change detection

As discussed above under Discovery of additions and amenities, Sketch Check change detection uses sketch vectors currently in your CAMA system and compares these to recent orthoimagery.

Observations: Williamson Central Appraisal District in Georgetown, Texas reported the below Return on Investment for sketch change detection:

Estimated Cost of Manual Re-Measure = \$644,740
Estimated Sketch Validation Cost = \$58,050

Sketch Validation Results:

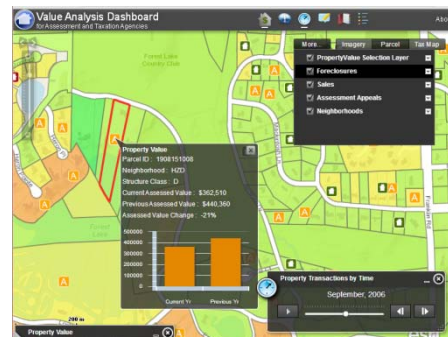
11% invalid findings
Total value added to role: \$88,530,128
Estimated Total Taxes in Year 1: \$2,213,253
Return on Investment for Year 1
Taxes Gained = \$2,213,253
Total Cost to District = \$135,620
ROI = 1632%

Observations: This Return on Investment cannot be certain for Morrow County; also bear in mind that Williamson Central Appraisal District contains 1.6 million parcels. However, given the length of time that the sketches have been maintained and the possibility for transposition and other normal human error, I believe this very well could pay for itself, raise additional revenues into the future and result in more accurate information.

Value Analysis Dashboard

This buzzword has been co-opted by GIS and CAMA Consulting firms and ESRI.

In the consulting businesses market, it has been used to describe a merging of several different applications, in different windows, all on your desktop. So you navigate



through multiple screens to review and analyze the data. For example, as you move down the street in Pictometry, your Real Estate/CAMA system data screens would update to the new location in Pictometry, as well as a “Street view” pictures application.

In the ESRI world, it is an ArcGIS Server / ArcGIS Viewer for Flex application that provides a view into changes in property assessments and tax revenues. In-house developed expertise, or a consultant, can develop the template to show the information your appraisers deem important.

Observations: A web-based application could be developed here to combine many of the appraisal related applications discussed above into one interface, a customized version of the ESRI Value Analysis Dashboard. An internal discussion and decision should be made as to the value of this versus staff using the ArcGIS Server public access viewer.

Routing field appraisers

The development of routing maps for use in the sexennial revaluation project will enable travel efficiencies for field appraisal staff as well as provide a systematic and methodical process to help ensure all properties are visited and thus return trips to the field minimized.

Observations: The existing routing maps need to be replaced with a maintainable, GIS map product.

Smart phone parcel data access

Smart phones have certainly become a popular avenue for data discovery. This platform presents several difficulties in meeting expectations. A lack of standards across mobile technology companies raises the specter of having to decide which vendor to develop an application for or the nearly impossible task of developing numerous applications that will work on all devices such as an iPhone or iPad, an Android- based device, a Blackberry, a Windows phone or a personal hand-held computer.

Observations: There is most likely not a huge market in Morrow County for this.

Data Visualization

The Auditor’s Office is an excellent candidate for data visualization. Data visualization is the graphical display of the Auditor’s data or the results of analysis’ of these data. Often the potential is not realized due to inaccessibility of various data, often residing in different systems with disparate and/or proprietary formats. However, in Morrow County, integration of many data sets into standardized formats helps to overcome this data fragmentation that is prevalent in many local governments.

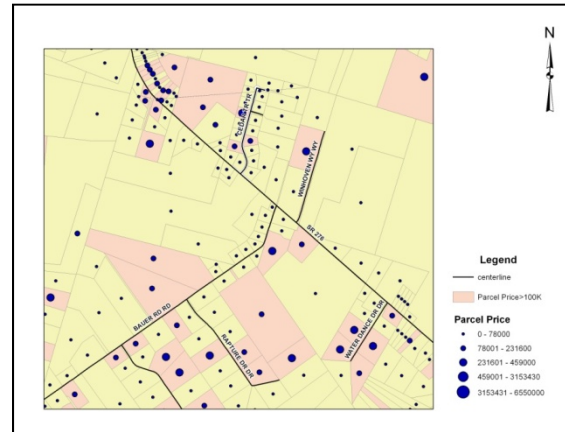
There are many kinds of visualization maps. A thematic map is a generalized term referring to maps that display themes of information. More specifically, there are:

Graduated color maps – Graduated color maps have defined areas of shading in proportion to data values. When you draw GIS layers with graduated colors, the attribute values are grouped

into classes and each class is identified by a particular color. Depending on what data variables are being displayed, normalization of the data may be necessary.

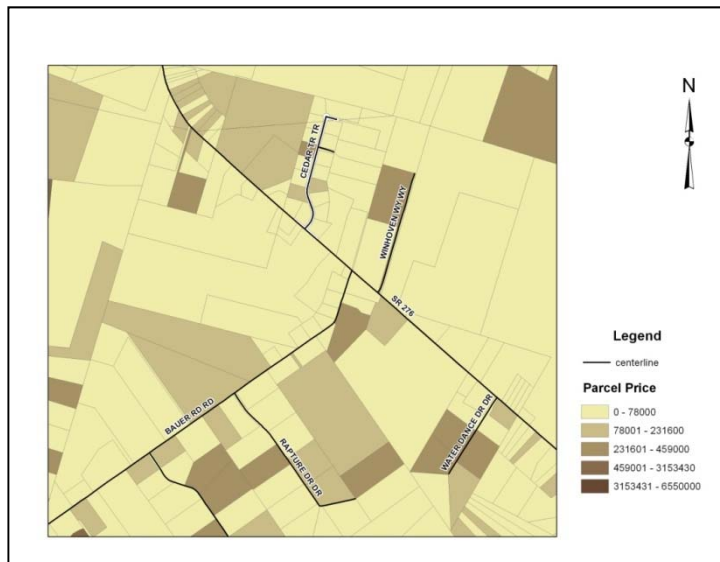
For example, after classifying sales price values for a particular neighborhood, an unusually wide range of values may be discovered. This extensive range of values is indicative of possible outliers, or parcels over or under valued as compared to comparable parcels within the neighborhood. These renegade parcels will compress the remaining valid parcels into a smaller range, thus masking potentially useful information.

After identifying and removing these suspect parcels and re-doing the classification, a different picture emerges thanks to the lack of a distorting influence from the outliers.

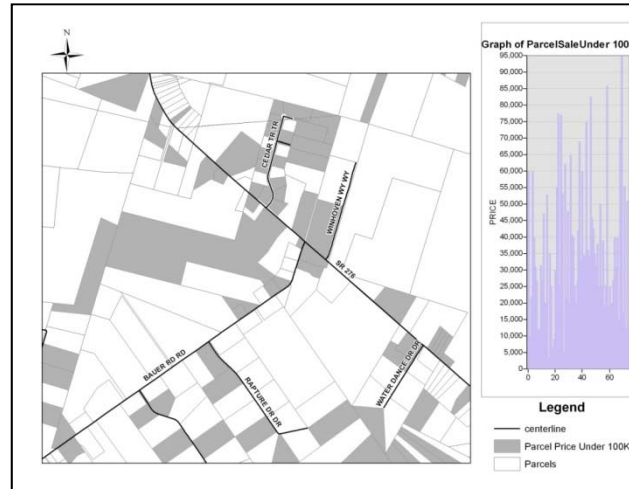


However, these maps will not allow you to discern the value of individual features; you can only tell that the displayed data is within a certain range of values. In order to overcome this generalizing, a proportional symbol map can be used.

Proportional symbols maps (bubble maps) – Proportional symbols maps will allow for the display of geographically referenced magnitudes of values. More intuitive maps can be made as the data is not constrained by the shape and/or sizes of the areas being used to create the data representation. Proportional symbols maps can be color-coded as well, providing a map displaying two variables – one driving the size of the symbol and the color coding of it displaying additional analysis for that particular symbol.

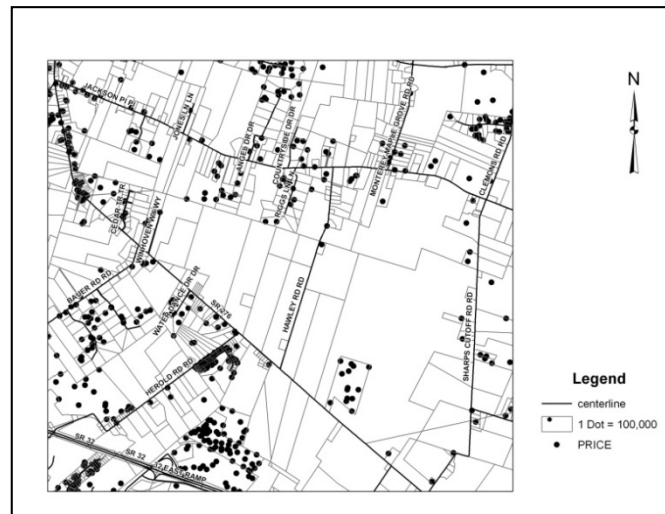


Composite maps – Composite maps combine charts and graphs of the data being displayed thematically. An application can be developed to join the graph or chart to the geographic area selected on the map. Then, when an area is selected on the map, the graph or chart automatically changes to represent the selected area. Images that are pertinent to the map can also be added to the composite as well as hyperlinks for digital versions.



Dot density maps - Dot density maps show density graphically. Using a dot density map is comparable to graduated color maps, but instead of the amount being displayed with color classifications, it is shown by the density of dots within an area. The dots are randomly dispersed within each area; they don't represent actual subject locations. The denser the dots are, the greater the density of features in the subject area.

You will need to assign how many values a dot represents and their size, color and symbol. You may need to try several combinations of dot value and dot size to see which one best shows the pattern. Typically you will select value and size combinations that ensure the dots are not so close as to form a solid mess that obscures the patterns. Conversely you won't want them displayed so far apart as to make the areas of density hard to distinguish.



3-D maps – Using 3-D Analyst, an extension to ArcMap, data can be extruded to highlight in 3-D any outliers or other anomalies or to display trends for particular subsets of data.

I hope that all the above visualization comments will provide food for thought and further the use of GIS in property assessment and appraisal. Some of these techniques can be integrated into County-wide data sets and accessed repeatedly by staff through either desktop GIS products or woven into the fabric of web based applications.

7.3 Board of Elections

The Board of Elections can be a user of GIS tools to develop products that assist with the electoral process. Products include high quality mapping of the County’s precincts with the accompanying polling locations.

The development of polling and precinct mapping can provide an excellent foundation for the redistricting process. Redistricting in the past has been an incredibly tedious and painstaking manual process. However, with GIS, the redistricting process can be implemented using tools that significantly reduce the effort needed as well as speed up the process. The resulting GIS format precincts can easily be filed with the Secretary of State.

Potential Applications:

Polling locations
Redistricting of voting precincts
Produce precinct, ward maps
Provide Internet access to polls, precincts
Voting precincts maintenance

7.4 Emergency Management Agency

In recent years, GIS has progressed to become a must-have tool in the toolbox of emergency response. GIS software can be used for pre-planning, search and rescue support, damage assessment tracking and to plan for the sites that contain extremely hazardous substances, to name a few areas.

Potential Applications:

Automated mass notification (Reverse 911)
Critical Infrastructure mapping, facility contact information
Care Center designation and mapping
Damage Assessment support

Emergency response planning
Hazmat/LEPC support
Flood elevation inundation mapping
Flood Plain structures, CI structures
Hazardous plume modeling
Search and rescue support
Natural Hazard Mitigation Plan maintenance
Staging location determination
Tabletop / full scale exercise support

7.5 Engineer’s Office

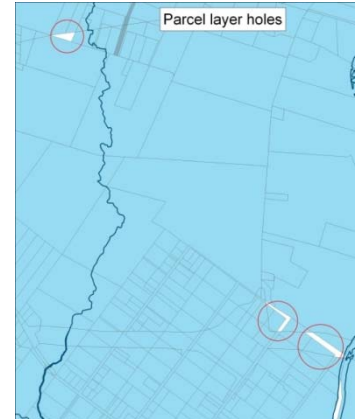
The Engineer’s Office will become a key user of GIS technology and applications. GIS is used for much more than just Tax Map maintenance. GIS supports preliminary design engineering, project management and mapping, presentation mapping, surveying related activities and asset monitoring and management.

Potential Applications:

Asset inventory management - Guardrails
Asset inventory management - Signs
Capital improvements project mapping
County Engineer road map support / development
Generate maps, form letters and mailing lists for assessments
Inventory - Roadway hazards
Pavement condition tracking
Perform field surveys - Construction
Perform field surveys - GPS
Perform field surveys – ROW
Project specific site mapping (contours, right-of-ways, streams, etc.)
Query address and owner information
Support preliminary design engineering
Support public notification and meetings
Traffic accident inventory
Drainage review residential and commercial development
Access scanned survey books, filed survey plats

Tax Map maintenance

With the release of ArcGIS Version 10, a new Land Records solution embedded within ArcGIS (no purchase of a separate extension) is available. This solution has three parts. The first is a data model entitled the Parcel Fabric which manages the spatial and topological relationships of parcel data. The second is a parcel editor toolbar, geared for parcel maintenance. And the third part is a Tax Parcel Editing template which provides workflow assistance in working with all the associated layers such as survey control, subdivisions, lots, etc. These are all integrated with the fabric data model. An important benefit of this is the ability to track parcel maintenance through time, something that has not been available to date. This is significant as there are needs to reconstruct history for title searching, litigation needs and deeded legal description interpretation, to name a few. A pristine parcel layer devoid of slivers and small gaps is required (see graphic) providing for error checking, version management, and historic rollback.



Observations: Morrow County is leapfrogging most other counties in the country as most have not yet transitioned to the parcel fabric given the large amount of work to re-format the parcel layer to the necessary specification. Historical tracking is valued by the County Engineer, Title companies, surveyors, Morrow County Tax Map staff, and others interested in determining prior ownership and prior property line configuration. The tracing of this lineage allows for improved legal description interpretation, title searches, litigation support, identification of survey references and even genealogy.

Conveyance standards support

The ability to use geospatial tools to review a deed's legal description closure and other details is a standard use of GIS technology. The geodatabase should be used to monitor and track the number of times that a parcel has been reviewed in this context, flagging those parcels that are in line for a survey upon the next transfer. This flagging system can notify staff, and perhaps more importantly, sellers and prospective buyers, of the need for a survey upon the next transfer. This can avoid serious problems with last minute transfers.

Observations: Tax Map staff currently use Simplicity Site Survey software to check closure of property transfers. The staff will need to begin using the Tax Parcel Editing template so the work that is done in checking closure, such as entering meets and bounds, distances, annotation, etc. will be directly input into the parcel fabric. No more re-drafting a parcel that was drawn in Simplicity Site Survey, just to be re-drawn on the Tax Map.

7.6 Health Department

Mapping of clusters of nuisance complaints, pockets of low immunization and client locations assist staff. GIS provides for sewage site plan evaluation by overlaying items such as topography, soil types, adjacent streams and ponds, floodplains, etc.

Optimal Points of Distribution (PODs) sites have been located for mass prophylaxis in accordance with the Centers for Disease Control [Cities Readiness Initiative](#). Individual locations can have pre-planned site plans to assist site managers with logistics and citizen processing.

Potential Applications:

Sewage site plan evaluation – topography, soil types, floodplains, etc
Access scanned site plans
Community assessments and analysis
Identify pockets of low immunization
Locate clusters of sewage nuisance complaints
Locations of clients
Map communicable disease outbreaks
Nuisance complaint owner identification
POD centers locating, logistics support – Cities Readiness Initiative
Query address and owner information
Targeted mailing
Query homes served by water wells near contamination
Access census data

7.7 Information Technology

The Information Technology staff can provide critical support in areas including programming, network infrastructure trouble shooting and management, hardware acquisition and installation, etc. IT staff do not use GIS software applications per se, but provide indispensable technology support.

7.8 Park District

The Park District has many, many uses for GIS; it is considered a best management practice for managing the natural, cultural and capital resources of park systems. Park staff continuously work with information about natural resources, threats to these and park district amenities.

Through the use of Global Positioning System (GPS) handheld units, trail mapping can be developed. This can be used to accurately portray the trails for recreation and emergency response. The locations of rare flora and fauna and invasive species can be mapped to assist in the preservation or elimination of these important elements of stewardship. GIS can support park features’ density, proximity to other natural or manmade features or frequency of

occurrence. Land cover classification can be mapped to assist in planning, design and management of natural areas and facilities. Property acquisition can be supported and park property inventories of holdings can be available to management and the public.

GIS will support the entire lifecycle of stewardship including property acquisition analysis, preliminary design, detailed design and development, construction, maintenance, marketing and education, open space preservation, wildlife corridor identification and other activities related to a geographic location.

Potential applications:

Capital project planning using historical data - last resurfaced, etc.
Develop and maintain Capital Asset inventory
E911/Computer Aided Dispatch integration – dispatcher assistance, nearest access points, premise information, routing.
Generate maps, form letters and mailing lists
Plot flood plains, soils, wetlands, protected lands, etc.
Historic aerials access
Inundation mapping
Old growth forest identification
Park access points for sheriff, fire, EMS
Parking lot maintenance management
Rare species management/protection - GPS points
Sign Inventory
Support preliminary design engineering
Trail maintenance management, footbridges, erosion
Trail planning and design
Trails onto Sheriff MDTs

7.9 Regional Planning Commission

The Regional Planning Commission relies on GIS in support lays an active role in land use planning in the county, with involvement in zoning, with the development of the Morrow County Comprehensive Land Use Plan, and other business needs .These data are combined with the existing County spatial datasets to develop customized development marketing and site selection support information for commercial real estate developers and others interested in projects that result in economic development within Morrow County. GIS mapping and analysis is an indispensable tool to review and approve development plans and other Planning Commission tasks. Potential commercial site mapping including proposed use visualization, utilities availability, contour elevations, soils, transportation ingress/egress, property lines, etc.

[ESRI Business Analyst Online](#) is suggested for demographic reports. Packaged reports can be developed for each village township as a whole, and then individual reports in 1-3-5 mile radii around key existing or developing retail corridors throughout the county. These reports also provide custom analyses when needed.

Access Scanned Plats/Tax Maps online
Census data analysis
Development support data - economic, demographic, business data (Esri Business Analyst On-line)
Develop comprehensive plan
Generate maps, form letters and mailing lists for public meetings
Produce and maintain land use
Produce and maintain zoning maps
Query address and owner information
Query orthophotos, parcels, soils, subdivisions, etc
Query property ownership and characteristics
Support development plan review
Support development plan review

7.10 Sheriff’s Office - E911

Dispatching in response to Emergency 911 calls for assistance is highly dependent upon GIS mapping. GIS is the backbone of [NextGen 911](#). Typically, when a 911 call is placed from a land line, the address that accompanies the call is automatically captured by the computer-aided dispatch system, geo-coded to an x, y location and displayed on a map for the dispatcher. Other GIS information is required such as the emergency fire or police response district that the call is located in and place name points such as a bank or restaurant name.

Potential Applications:

Automated mass notification (Reverse 911)
Routing assistance
Common place names maintenance
Delineate neighborhood/response areas and boundaries
Dispatcher console GIS mapping
Pictometry imagery
Next gen 911
Fire, hazmat pre-plan access support
Query address and owner information