Geospatial Strategic Business Plan for the State of New Jersey

Office of Information Technology

Office of GIS

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1 EXECUTIVE SUMMARY

The New Jersey state geospatial program, as led by the New Jersey Office of Information Technology, Geographic Information Systems (OGIS), has long been recognized as strong and effective and ahead of its peers in terms of innovation. OGIS supports an active and engaged geospatial community that participates in governance activities through the informal New Jersey Geospatial Forum. This community benefits from a solid base of statewide framework data layers that are maintained and regularly shared between agencies at all levels of government as well as with the private sector, non-profits, and the general public. This data sharing is supported by the New Jersey Geographic Information Network (NJGIN), the state's geospatial portal and metadata catalog, which has provided reliable access to these data and associated metadata for nearly a decade.

Despite these successful geospatial program components, there are still requirements that are not being met and which require further strategic investments and sustainable funding. This strategic business plan presents the business case for making the necessary investments to address these unmet needs. The following goals are focused on improving framework data:

- o   A predictable funding source and plan for **recurring orthoimagery capture**

- o   Maintenance of and **enhancements to existing road centerlines**

- o   **Completion of statewide parcel data** and better alignment of tax map and digital parcel maintenance workflows

- o   The **new development of statewide address data**

These "core four" data sets are used by virtually every stakeholder in the geospatial community and support activities ranging from local government operations to transportation planning to emergency response and disaster recovery. While the investment required to keep these data current and relevant is not small, the benefits will be far reaching and substantial. Furthermore, these data sets serve as the foundation for a variety of derivative products required by the geospatial community such as open space and land use/land cover data.

In addition to improvements to the "core four" data sets, this plan makes the business case for new investments in:

- o   **Modernization of NJGIN** architecture, interface and functionality

- o   **Governance evolution** and potential formalization

The estimated $2 million required over a five year period will result in a geospatial data portfolio and access portal that will fully meet the needs of New Jersey's engaged geospatial community and rival any state's geospatial program.

2 CURRENT SITUATION

2.1 THE NEW JERSEY GEOSPATIAL COMMUNITY

New Jersey has a large and highly engaged GIS stakeholder community composed of public and private sector organizations that implement the technology. At workshops conducted as part of the information gathering activities for this project, the size and breadth of this community was evident.

FIGURE 1. WORKSHOP ATTENDEES BY SECTOR
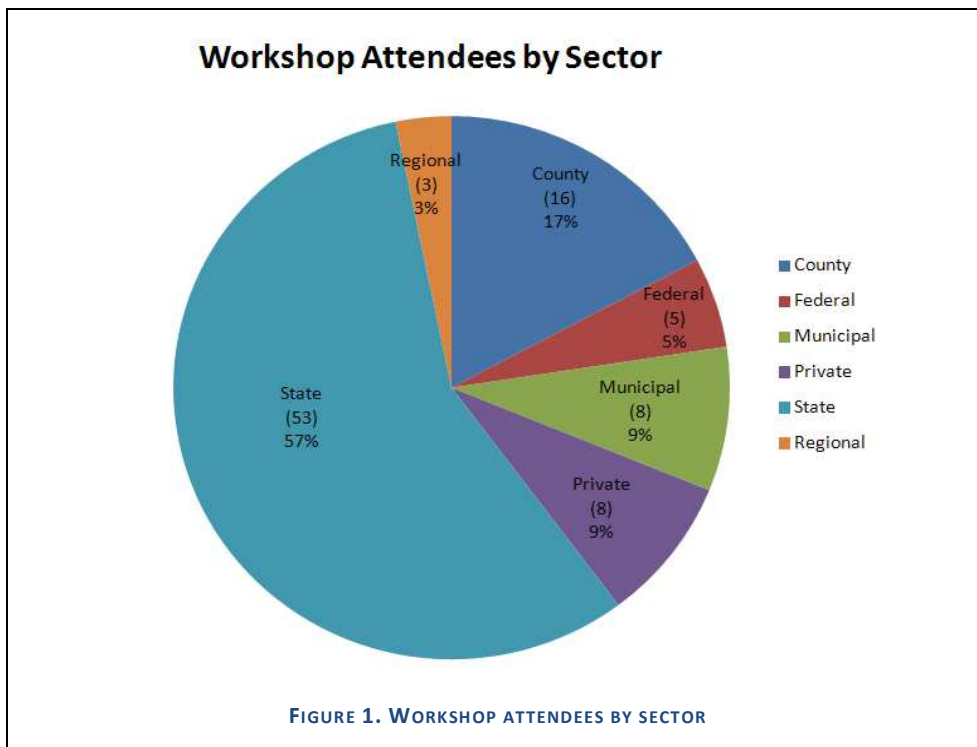
The membership of the New Jersey Geospatial Forum is also an indicator of the diversity and engagement of the geospatial community. Currently there are 896 members representing local, state and federal government as well as universities, the private sector, land surveyors, regional authorities, non-government organizations and a liaison from the US Geological Survey (USGS). Geospatial data and technology are key to the daily operations of each of these sectors in the State of New Jersey.

2.2 WHAT IS THE NEW JERSEY SPATIAL INFRASTRUCTURE STATUS?

2.2.1 NSGIC 9 Criteria for a Successful Statewide GIS Program

The National States Geographic Information Council (NSGIC) is an organization made up of state GIS managers and coordinators as well as representatives from federal agencies, local governments, the private sector, academia and professional organizations. NSGIC serves as a strong advocate for state interests and provides guidance on the development of successful statewide GIS programs. The "NSGIC 9 Criteria for a Successful Statewide GIS Program" identifies the characteristics of successful programs and serves as a model for developing programs. The following describes New Jersey's rating against these criteria:

- **A full-time, paid coordinator position is designated and has the authority to implement the state's business and strategic plans:**

  The New Jersey Office of Geographic Information Systems (OGIS) was established by executive order (#122, Whitman) and charged to "coordinate the implementation of geographic information systems across State agencies, and ensure the adoption and use of consistent policies and standards to optimize the use of geographic information systems technology and geographic information." The director of OGIS serves as the state coordinator. (Note: Whitman EO 122 is listed on http://nj.gov/infobank/circular/eoindex.htm#whitman as having been rescinded by Christie EO #40, but the text of EO 40 actually only affects the portion of EO 122 pertaining to the now defunct New Jersey Geographic Information Council, not the portion pertaining to OGIS.)

- **A clearly defined authority exists for statewide coordination of geospatial information technologies and data production:**

  See #1 above.

- **The statewide coordination office has a formal relationship with the state's Chief Information Officer (CIO):**

  OGIS is an operating unit within the Office of Information Technology (OIT). The head of OIT, although statutorily titled Chief Technology Officer, serves the functional role of Chief Information Officer for the state.

- **A champion (politician, or executive decision-maker) is aware and involved in the process of geospatial coordination:**

  Both the State CIO and the State Treasurer are aware of and supportive of the state's geospatial coordination activities.

- **Responsibilities for developing the National Spatial Data Infrastructure and a State Clearinghouse are assigned:**

  The executive order that established OGIS charges it to "oversee the development and implementation of a statewide geographic information clearinghouse" and "serve as the state's liaison with national geographic information systems organizations and initiatives."

- **The ability exists to work and coordinate with local governments, academia, and the private sector:**

  Since 2004, the New Jersey Geospatial Forum has existed to provide a forum for communication and coordination among the various levels of government, academia, and the private and nonprofit sectors on issues related to geospatial technology.

- **Sustainable funding sources exist to meet project needs:**

  Staff salaries and routine, ongoing costs such as hardware and software for OGIS are part of OIT's operating budget. Funding for specific initiatives such as aerial imagery flights and other

framework data maintenance activities have generally been funded on an ad hoc basis rather than from an established program budget.

- o **GIS Coordinators have the authority to enter into contracts and become capable of receiving and expending funds:**

  By virtue of being part of OIT, OGIS has authority to enter into contracts and receive and expend funds.

- o **The Federal Government works through the statewide coordinating authority:**

  OGIS has a well-established and fruitful relationship with USGS through the USGS geospatial liaison program. Some federal agencies that have natural ties to their corresponding state agencies, such as USEPA and NJDEP, and USDOT and NJDOT, work directly. But OGIS is generally kept aware of those activities through communication with the other state agencies.

2.2.2 Framework Data Development Status

The following "report card" represents the current "grade" given to framework data layers as self assessed by OGIS.

Parcels	B+
Roads	B+
Orthoimagery	A
Geodetic Control	A
Hydrography	A+
Land Use/Land Cover	A
Elevation	B+
Administrative Boundaries	A
Critical Infrastructure	C

Green layers are New Jersey framework layers; Others are "**Federal framework**" layers

2.2.2.1 PARCELS

Background and Current Status of Parcel Data

Independent parcel layer development projects at the county and municipal scale have occurred over the past 15 years using a variety of mapping criteria and techniques. To facilitate the development of a statewide parcel framework layer, OGIS provided funding assistance to support several county parcel mapping projects between 2003 and 2008.

Currently, 19 of the 21 NJ counties have been successful in creating a digital parcel layer and 2 counties have parcel mapping projects scheduled for completion in 2012. Parcel maintenance has always been a challenge with some counties being more actively engaged in this process than others. Data development efforts occurred over a long time span resulting in non-standardized database structures and accuracy requirements. Tax maps used to create the initial parcel layer were often out of date and therefore do not reflect current conditions.

In 2008, OGIS embarked on a project to gather these data sources and create a normalized, standard, statewide parcel layer. This normalization was required to create a consistent database structure and spatially consistent parcel geometry overall. A component of this normalization process was to use the new administrative boundaries that the state had developed. Administrative boundaries were updated by integrating existing high quality data sets from multiple sources, including NJDOT street centerlines, NJDEP hydrography (i.e. streams, rivers), digital tax maps, etc.

The result of the normalization project was the development of a statewide parcel layer with a consistent data structure, administrative boundaries, and reliable edge matching of parcel linework between municipalities and counties. This process utilized the 2007 digital orthoimagery as the base layer to support the normalization process.

Uses and Benefits of Parcel Data

o   The statewide parcels provide a base for mapping activities throughout the state. For example, address points can be derived from parcels and used to support other systems such as fire and emergency management (i.e. E911) preparation and response.

o   These data can be used to geographically track public health indicators and identify disease clusters. This will allow health officials to identify trends and take more effective action to reduce the spread of disease.

o   Parcel data supports planning and engineering activities such as evaluating the feasibility of some projects. Parcels can be used to derive an approximate right-of-way in the initial stages of design and construction projects.

o   Parcel data can be linked to other databases, such as those containing data on permits and utility bills. Linking parcels also provides context for land use permitting, zoning and property assessment data, which allows for meaningful spatial analysis of those data.

Desired Improvements to Parcel Data

o   Improve quality of data attributes and positional accuracy of property lines depicted
o   Stabilize funding sources to support data maintenance
o   Create and adhere to regular data update cycle
o   Improve methods for reconciliation with Assessor's attribute data, which is maintained in a separate centralized mainframe DBMS
o   Align processes for tax map updates and parcel maintenance

2.2.2.2 ROADS

Background and Current Status of Roads Data

The current roadway network for New Jersey contains over 39,000 miles of publicly maintained roads. They are mapped with a spatial accuracy that generally aligns within the road right-of-way as shown on the 2007 NJ orthoimagery above. The linear referencing system (LRS), which is a method of storing geographic locations by using relative positions along a measured linear feature, is based on mileage calculated from driving the roadways for inventory purposes and is compatible with New Jersey Department of Transportation (NJDOT) systems. This data set is public domain and available for download on the state's website at http://www.state.nj.us/transportation/gis/data.shtm .

An enhanced roadway centerline data set has been developed and was released to the public in June 2012. Additional elements within this data set include private roads, address ranges, alternate road names, municipal codes, zip codes, etc. Many of these data were conflated from 2010 TIGER data. This enhanced data set is structured for geocoding, making use of US Thoroughfare, Landmark and Postal address standards for road names. The geometry is segmented at physical intersections and specified features.

Uses and Benefits of these Data

The pre-existing and enhanced Roadway data sets support numerous DOT information systems and are used to support Federal reporting requirements including the Highway Performance Monitoring System (HPMS). The enhanced data set supports geocoding, enabling a user to locate a feature or attribute along the roadway network using an address.

The roadway centerlines data set also is used by a variety of government and private entities to support daily activities and serves as a base cartographic layer to create maps in paper and electronic formats at any presentation scale.

This data set supports the creation of parcel and municipal boundaries in instances where the roadway centerline acts as the boundary. Maintaining this coincident geometry is important for consistency in other, derived data.

Desired Improvements

- Continue to enhance roadway attribution to support routing capabilities that would include details for turn restrictions, speed limits, etc.
- New Jersey desires to develop a long-term maintenance plan and update processes.
  - The maintenance for this data set will be a shared responsibility between OGIS and NJDOT with local government as a key contributor to the process.
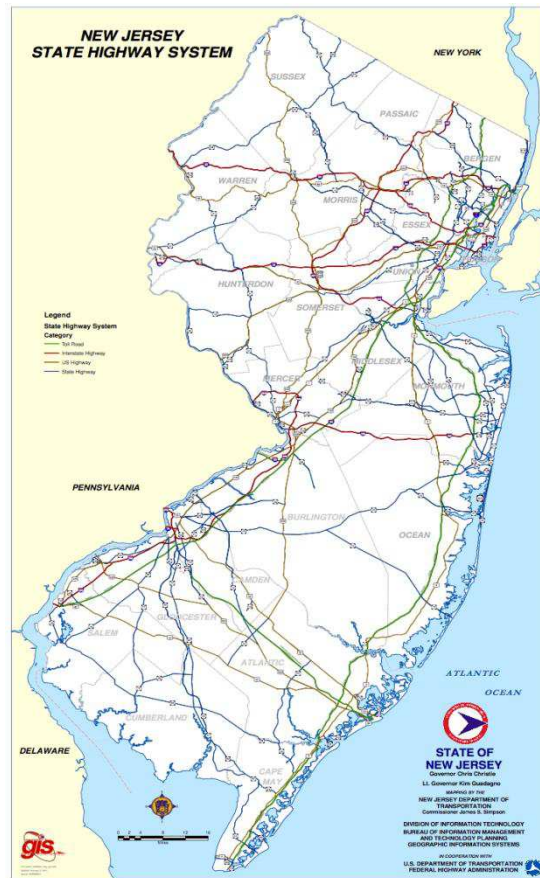
FIGURE 3. NEW JERSEY STATE HIGHWAY SYSTEM, NJDOT GIS

2.2.2.3 ORTHOIMAGERY

Background and Current Status of Orthoimagery

Digital orthoimagery combines the image characteristics of a scanned aerial photograph with a spatial reference system thus providing a locationally accurate representation of each image. Since the geographic locations of the natural and manmade features appearing on orthoimagery are represented in their true position, this data set is typically regarded as the 'official' GIS base map.

The State of New Jersey currently has 3 complete sets of orthoimagery from 1995/1997, 2002 and 2007/2008 that have produced reliable, license-free data. These data collections were supported by ad hoc funding from various agencies.

The statewide flight in 2007 was delivered at a scale of 1 inch = 200 feet. There were four bands collected (RGB and IR) at 12 bits per pixel. The total cost for this data set was approximately 1.7 million dollars.

The state secured funding and initiated a project for another flight completed in spring 2012. Post-acquisition image processing is underway. This mission is using similar technologies and strategies employed for the 2007 mission with corresponding deliverables. Although this project was priced at a significantly lower cost compared to the 2007 mission, the project was almost cancelled due to difficulties in gathering ad hoc funding.

Uses and Benefits of Orthoimagery

Orthoimagery serves as a statewide basemap and provides a foundation for the development of many baseline and derivative products such as parcels, buildings, roads, land use/land cover, hydrography, infrastructure, and impervious surfaces.

This data set also supports a variety of other mapping activities, including:

- Transportation modeling and preliminary design planning

- Infrastructure planning and maintenance scheduling

- Land use classification and change detection

- Encroachment identification

- Evacuation routing

- Tactical planning and surveillance

- Support for public meetings

- Support for decision making

- Reduced requirement for fieldwork (data capture, field inspections, etc.)

Desired Improvements to Orthoimagery

The principal need for this data set is a recurring funding program to support ongoing data maintenance. Scheduling predictable, periodic re-flights will enable the state to focus on evaluating new technology and vendors as opposed to scrambling to secure funding. This will ultimately allow the state to make better use of tax dollars and also allow other agencies to more proactively plan updates to data sets derived from the orthoimagery (i.e. roads, land use/cover, etc.). A predictable schedule and funding level would also open up the possibility for local governments to contribute the difference in cost to acquire higher-resolution imagery, a common aspect of statewide programs in other states.
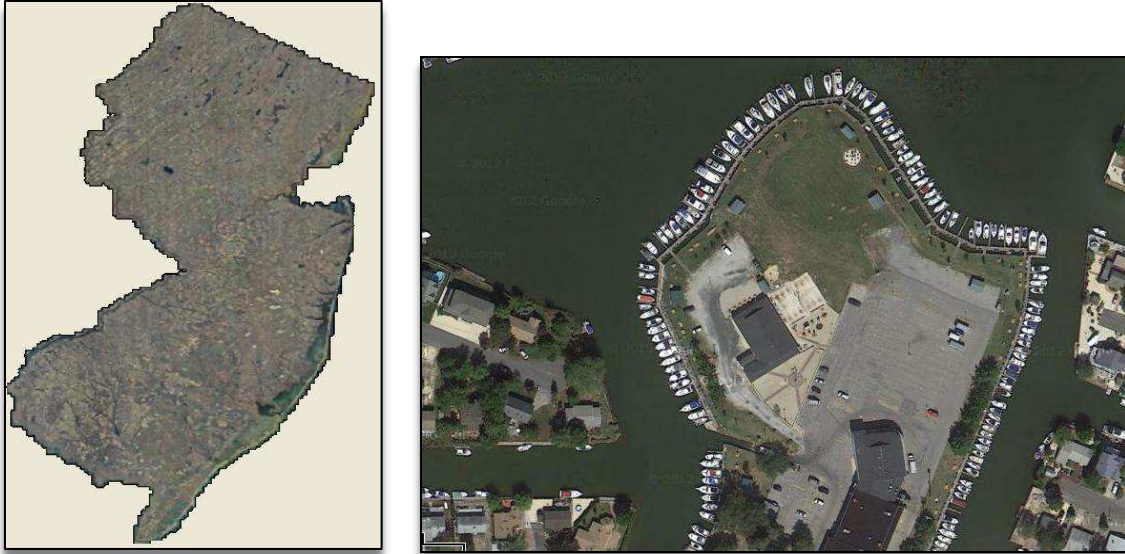
FIGURE 4. STATEWIDE ORTHOIMAGERY MAP AND SAMPLE IMAGERY ON BARNEGAT BAY

2.2.2.4 GEODETIC CONTROL – CONTINUOUSLY OPERATING REFERENCE STATION (CORS)

Background and Current Status of the CORS Network

A geodetic control network is the skeleton on which continuous and consistent mapping, GIS, and surveys are based. To understand the function of geodetic control it must be considered that a map or a plane survey is a flat representation of the curved world. In order for the maps to become an authentic representation of the real world, small pieces of (flat) map content must be "pasted" onto a curved world. The Geodetic Control is the foundation that enables this "pasting" to be seamless, accurate and consistent.

Traditionally, geodetic control points are established as permanent physical monuments that are precisely marked, located, and documented. Locating spatial features with respect to geodetic control enables an accurate locational representation of these features. Interest and activity regarding geodetic control has dramatically increased at all government levels as the need for accurate maps and surveys used in geographic and land information systems continues to increase.

With the advent of the Global Positioning System (GPS), the preferred framework for geodetic control networks is based on CORS (Continuously Operating Reference Stations). CORS stations provide an active geodetic control network which enable GPS users to tie their positioning observations to the geodetic network without physically having to occupy a geodetic control point. Data corrected by GPS users are increased in accuracy by using time-related data from CORS stations.

Historically, the primary source for geodetic data is the National Geodetic Survey (NGS). NGS has been responsible for establishing and maintaining a nation-wide geodetic control network since 1807. This network, currently called the National Spatial Reference System (NSRS), contains monumented survey stations that correspond to precisely surveyed and computed horizontal and/or vertical coordinates. Technological advancements now allow many state, county and local government agencies to create

and publish geodetic control coordinates within their own jurisdictions and in conjunction with the NGS. In New Jersey, state statute requires the use of a certified land surveyor to collect and publish such data.

The State of New Jersey has a highly accurate traditional geodetic network in place. NAD83 (North American Datum of 1983) coordinates for a statewide network of 3,157 horizontal monuments were published in August 1999 (project 17657).

In addition, there are currently 19 NGS-approved NJ CORS sites (Belvedere, Bridgeton, Dayton, Flemington, Galloway Twp, Middle Twp, Monroe Twp, Middletown, Morristown, Mt. Laurel, Neptune Twp, Newark, Newton, Piscataway, Sandy Hook (2), Sewell, Toms River and Trenton) plus two in Delaware and one in Pennsylvania covering the State of New Jersey in its entirety. All receivers are installed on publicly owned buildings and are monitored by network software that resides at the original CORS station located at the New Jersey Institute of Technology.

Uses and Benefits of the CORS Network

The CORS stations offer lower cost, efficient and accurate positioning necessary to support GPS field data collection techniques. These CORS data are available to the public via web download and can be used to improve the accuracy of GPS and other spatial data. Real time availability to these data is available through a subscription service.

Desired Improvements to the CORS network

As the current network is privately operated by Leica Geosystems and the NJ Institute of Technology, the state is not responsible for accessibility or maintenance of the system. State control of the maintenance of the CORS network may reduce the risk of service interruption.
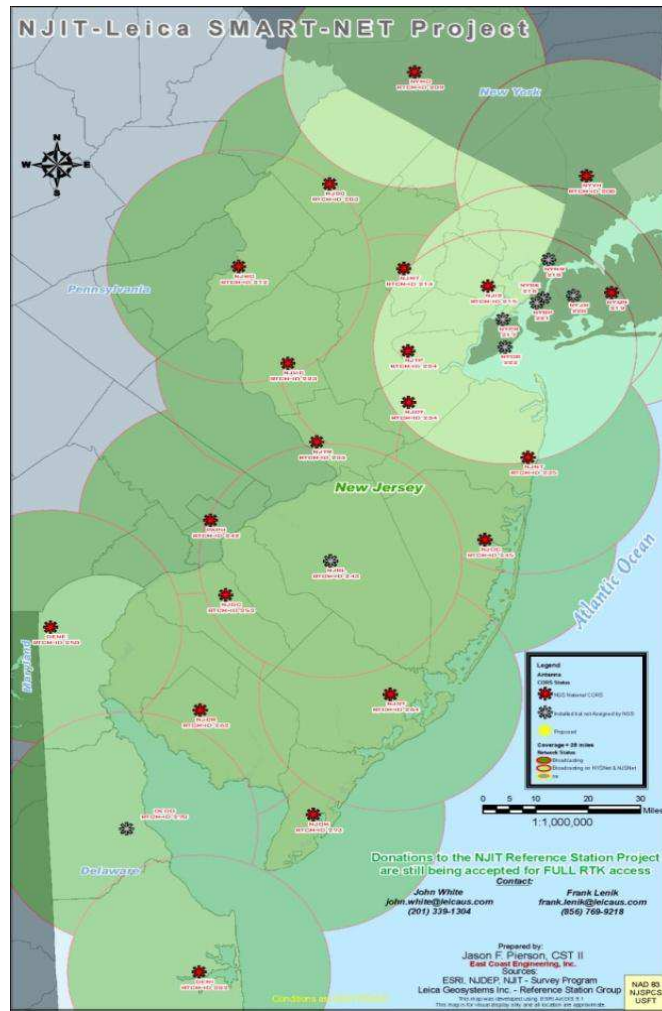

FIGURE 5. NJIT-LEICA SMART-NET PROJECT. SOURCE: EAST COAST ENGINEERING, INC.

2.2.2.5 HYDROGRAPHY

Background and Current Status of Hydrography

The New Jersey hydrography data set delineates surface water features such as lakes, ponds, streams, rivers, canals, dams and stream gages. These data are designed to support general mapping as well as analysis of surface-water systems through upstream or downstream tracing of the flow network. The data set uses reach codes and linear referencing to link specific information about surface water such as discharge rates, water quality, and fish population.

The current New Jersey hydrography data set is the first statewide data set in the nation to be produced at a scale of 1:2,400 with complete attributes based on the US Geological Survey (USGS) National Hydrography Dataset (NHD) http://nhd.usgs.gov/. This data set was reviewed and revised against Geographic Names Information System (GNIS) names.   This structure forms the basis for a uniform and consistent water feature referencing database and supports a wide variety of hydrologic based analyses at the federal, state, regional, and local levels.

In 2008, the New Jersey Department of Environmental Protection (NJDEP) signed an NHD Stewardship Agreement and became the official stewards of hydrography data for the state. NJDEP is also the steward for the land use/land cover (LULC) data set; the data sets are maintained in tandem.

Currently, maintenance update frequencies of hydrography data correspond with the availability of new framework data layers such as orthoimagery and elevation data, as well as related data sets, such as land use/land cover, which affect NHD coding. NJDEP Bureau of Geographic Information Systems (BGIS) is committed to the stewardship and maintenance of this data set.

Funding to complete the development of this statewide integrated hydrography data set came from USEPA and USGS. Prior to project commencement, guidance was provided through an ad hoc committee that included representatives from the federal partners, NJDEP and OGIS.

Uses and Benefits of Hydrography

The hydrography data set is a critical input to delineate sub-watershed (HUC14) boundaries for the state. Without the hydrography data set, many hydrologic connections would have to be determined manually. The land use/land cover (LULC) data set also is greatly enhanced by the hydrography data set as the water body features are used as an input in developing water features for the LULC.

The hydrography data set also is used to analyze surface water systems, which aids in stream regulation and water quality monitoring (i.e. EPA monitoring points). The hydrography data set is an excellent resource to aid in the analysis of water use and water management.

Desired Improvements to Hydrography

The state desires to continue stewardship and cooperation with USGS to maintain exceptional data. However, the update process with USGS is onerous and could be improved. For example, the GNIS names do not include many of the local stream names that are included in the finer resolution data set. Therefore, NJDEP has to maintain two sets of names in order to meet USGS requirements.

Although USGS provides access to the data in a web-based viewer and allows users to extract and download NHD features by sub-basin for individual use, the design does not lend itself to convenient access of the data by NJDEP and NJ GeoWeb application viewers. Integration with the state's viewers and applications is essential to the NJDEP as well as other consumers of the hydrography data.
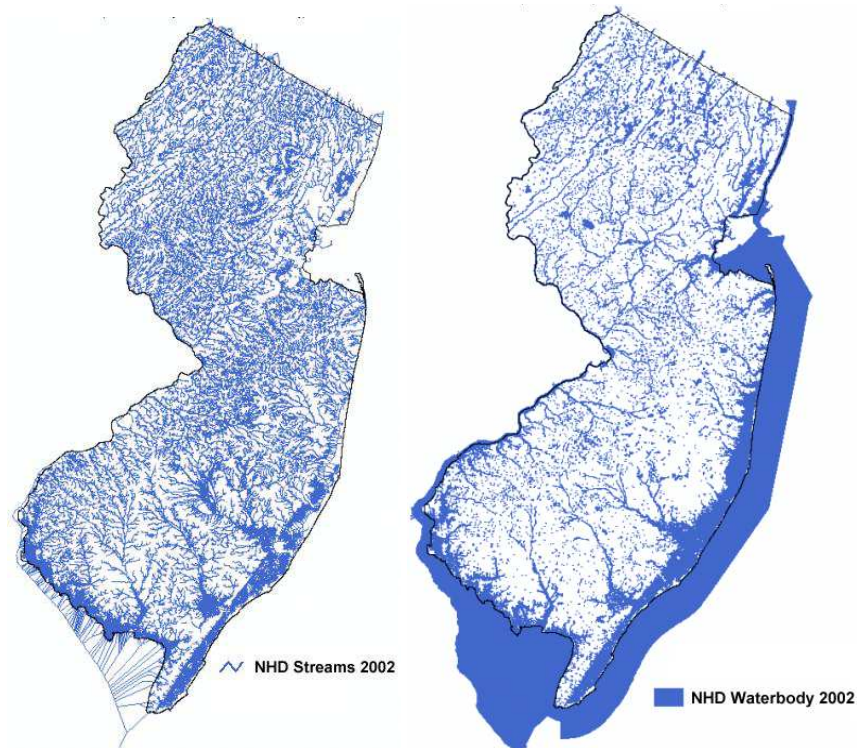
FIGURE 6. NEW JERSEY STREAMS AND WATER BODIES. MAP SOURCE: NEW JERSEY DEP GIS

2.2.2.6 LAND USE/LAND COVER

Background and Current Status of Land Use/Land Cover Data

The New Jersey land use/land cover (LULC) data set is a series of polygons that depict land characteristics. Land use is a "hot topic" in New Jersey due to the dense population of the state. Over the past 25 years, several statewide inventories have been completed to help monitor and track these physical changes. The 2007 LULC layer is a spatially accurate, detailed vector data set describing land use and land cover conditions for the entire state. This data set is based on an update of the previous 2002 LULC data set. Previous iterations include 1995 and 1986.

The NJDEP has served 1986, 1995, 2002, and 2007 LULC data via digital downloads and as layers in the interactive mapping application i-Map NJDEP (http://www.nj.gov/dep/gis/depsplash.htm).

NJDEP is the data steward for both the hydrography and LULC data sets because they are maintained in tandem and are spatially in sync with one another. Funding for the LULC data set has come from a

variety of internal and external sources and NJDEP contracts for data updates following each new statewide orthoimagery flyover.

Uses and Benefits of Land Use/Land Cover Data

The NJ Highlands Council used NJDEP LULC data as a source of information to develop its Land Use Capability Zone Map as part of its Regional Master Plan. The goal of the plan is to protect natural, scenic and other Highland resources, including but not limited to forest, wetlands, stream corridors, steep slopes, and critical habitat for flora and fauna.

The NJ Statewide Smart Growth Model used the LULC data as part of the analysis to assist in the designation of areas to encourage new development in defined growth areas and discourage development in environmentally sensitive areas.

The impervious surface information contained in the LULC data set is used for used for watershed, aquifer and groundwater recharge mapping efforts.

The LULC data set serves as a base layer that supports a variety of projects, activities and statewide initiatives including:

- Urban growth and land use change maps

- Stream encroachment monitoring and land use regulation

- Open-space acquisition opportunities

- Farmland preservation

- The Surface Water Quality Standards (SWQS) that establish designated uses and specify the water quality (criteria) necessary to protect the state's waters

- National Environmental Performance Partnership Program (NEPPS) for assessing trends in environmental quality and for long term strategic planning

- Generation of NJDEP Wildfire Maps

- Threatened and endangered species habitat mapping

FIGURE 7. NEW JERSEY LAND USE/LAND COVER DATA DRAPED OVER 2007 ORTHOIMAGERY.

Desired Improvements to Land Use/Land Cover Data

- Reliable and predictable access to current, high-resolution orthoimagery as an imagery source for land use data maintenance

- Recurring funding program to support ongoing data maintenance (i.e. predictable, based on future orthoimagery flights)

2.2.2.7 ELEVATION

Background and Current Status of Elevation Data

Elevation refers to a spatially referenced vertical position above or below a datum surface. Elevation data can be used as a representation of the terrain, depicting contours and providing a three-dimensional perspective.

There are many ways to represent elevation data. The standard product that the USGS produces and uses is represented as a digital elevation model (DEM) collected in 30- or 10-meter grid spacing with coverage in 7.5- by 7.5-minute blocks. There currently is an existing 10M DEM for the State of New Jersey.

An emerging collection method for elevation data is Light Detection and Ranging (LiDAR). LiDAR data are typically captured via aircraft and stored as a "cloud" of spatially referenced points. The point cloud can be filtered for points that are classified as bare earth (as opposed to points that represent tops of buildings or trees). These bare earth points can be used to generate high resolution DEMs and highly accurate contour lines.

Independent collection projects by state, local and federal agencies, which were completely disjointed in the earlier day of LiDAR, now are better coordinated by the NJ Geospatial Forum's Elevation Task Force. This task force has been successful in addressing planning, project overlap and general lack of communication. The coordination has saved contributors considerable funding and expedited mission planning.

At this time, the entire state has LiDAR coverage, albeit compiled from several sources. Data collected through a variety of LiDAR missions with differing standards and temporal disparities exposed the need to develop a uniform methodology to combine these data sets into a single statewide data set. NJDEP executed a pilot project for Watershed Management Area (WMA) 11, which is primarily located in the Delaware River portions of Hunterdon and Mercer Counties, to combine LiDAR data sets from four separate sources and to standardize this process for the remainder of the state. This project was completed in Fall 2011.

The LiDAR flown for the entire state will allow, at a minimum, development of a 10FT or 3M DEM. A 2M or 1M-resolution DEM is feasible in many areas.

Burlington and Camden Counties were re-flown in 2011, but were only fully processed in low lying areas in the vicinity of stream channels. The entire data set will need to be processed in order to meet the needs of the state.

Uses and Benefits of Elevation Data

Elevation data can be used for watershed management, view shed mapping, transportation planning, and flood hazard mitigation and prevention. In addition, elevation data are often combined with other spatial data layers for regional hydrologic modeling studies.

NJDEP is currently working on a project to compile a high resolution statewide DEM based on the best available LiDAR data. The intent is to submit this data set to USGS for inclusion in the National Elevation Data set (NED). Additionally, NJDEP intends to use this high resolution DEM to re-delineate sub-watershed boundaries for the entire state.

Elevation data also can be processed to derive slope and aspect data which are important for planning, hazard mitigation, evacuation route evaluation, and flight path encroachment.
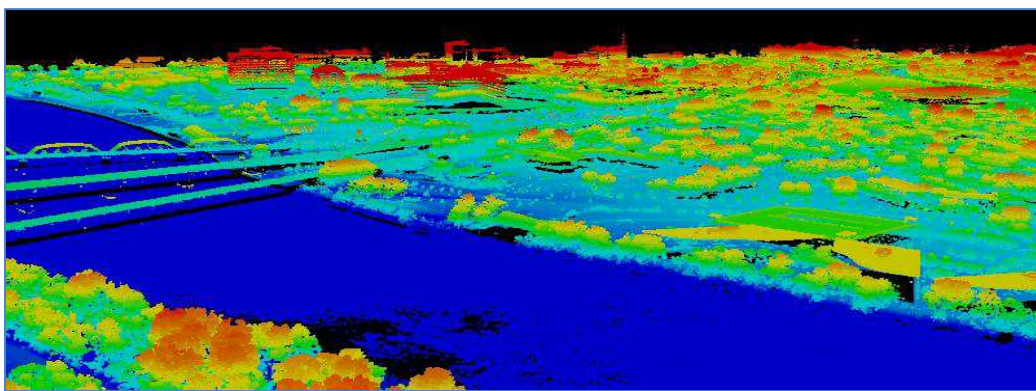

FIGURE 8. SAMPLE NEW JERSEY LiDAR DATA

Desired Improvements to Elevation Data

The state desires a stable funding source and the development of a maintenance plan. NJDEP and OGIS currently depend on federal sources for piecemeal acquisition. Additionally, the state wants to have a consistent statewide DEM that is derived from standard collection parameters. Future elevation data acquisitions would ideally include classified LiDAR point clouds and break lines to support contour generation.

2.2.2.8 ADMINISTRATIVE BOUNDARIES

Background and Current Status of Administrative Boundaries

The New Jersey administrative boundaries data set is stewarded by OGIS. This data set includes state, county, and municipal boundaries. The accuracy of this data set was improved in 2008 based, in large part, on 1:2,400 scale orthoimagery.

Each segment is tagged with record-level metadata to track the dozens of sources, such as digital tax maps, road centerlines, hydro centerlines, land use/land cover and orthoimagery, used to determine boundary locations. Extensive research was performed to resolve state-to-state water boundaries.

Since these boundaries often are used to "clip" other statewide data sets to define the jurisdictional extent of a data collection effort, it is important to have these boundaries represented with a high degree of accuracy. Modifying a boundary has a cascading effect on other derived data sets .

Uses and Benefits of Boundary Data

The New Jersey administrative boundaries data set supports the development and maintenance of a statewide parcel layer as well as the development of legislative and zoning districts.

This data set supports a variety of county and municipality-based mapping and analysis efforts. It can be used as a cartographic base layer overlaid with other data sets to determine which properties belong to which municipalities or counties.

Accurate determination of districts for emergency dispatch is another key use of this data set. This is especially usefully in cases where there are shared services for emergency response.
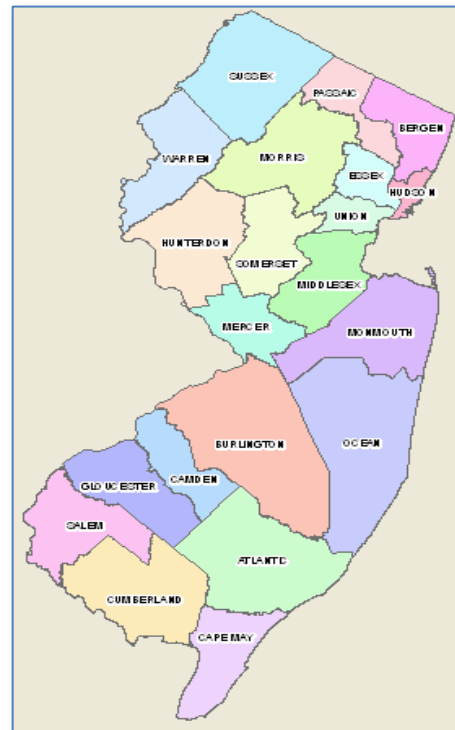

FIGURE 9. NEW JERSEY COUNTY BOUNDARIES

Desired Improvements to Boundary Data

The state desires to implement a maintenance program to ensure statewide data are maintained and continuously improved through local input. For example, counties should be encouraged to utilize a standardized method for submitting boundary updates to the state. Ideally, the state would be notified as soon as an update occurs.

2.2.2.9 CRITICAL INFRASTRUCTURE

Background and Current Status of Critical Infrastructure

New Jersey takes an "all hazard" approach to emergency management in that the same people and data are used for multiple event types. The 2002 New Jersey Spatial Data Infrastructure Implementation Plan identified a need for over 50 key infrastructure layers to support New Jersey's all hazard emergency management. Some of these critical infrastructure layers were completed in 2009 as part of the Homeland Security Information Program (HSIP) Freedom Program. To augment HSIP data, some emergency response agencies develop and maintain their own infrastructure feature classes that may contain details specific to agency requirements for response.

Uses and Benefits of Critical Infrastructure Data

Critical infrastructure data support disaster and emergency management activities for all hazards in New Jersey and is used to support hazard preparedness, response recovery, and mitigation. By taking stock of critical infrastructure, various stakeholders can pledge appropriate levels of resources and create operational plans for its maintenance and repairs. Quality infrastructure data can aid in the creation of mitigation plans that help prepare for future damages and catastrophic events.

In emergency response scenarios, key infrastructure information is utilized in staging areas, at an event location, or as a means to get resources to intended destinations. Critical infrastructure can be overlaid on a damaged area to display and quantify damages and plan for recovery.

Desired Improvements to Critical Infrastructure Data

- Develop data maintenance and long-term maintenance plans

- Address data sharing challenges

2.2.3 New Jersey Geographic Information Network (NJGIN)

Background and Current Status of NJGIN

A readily accessible catalog of available data that includes detailed documentation (metadata) about accuracy and sources is a crucial underpinning of the State's strategy to enable widespread sharing of geospatial data. The New Jersey Geographic Information Network (NJGIN) portal site is maintained by OGIS. The online geospatial catalog and information resource was initially launched in 2004 as an upgrade to the NJ Spatial Data Clearinghouse. The current version of the site was launched in 2008, and the ArcIMS feature and image services are now somewhat outdated. There are new demands for more

flexible and user-friendly data discoverability and map services that cannot be met with the current system, and the technology offers no support for new geospatial metadata standards. While the catalog is available to anyone who wants to publish relevant metadata, the process often proves to be cumbersome with very stringent data format requirements and poor feedback to registered users trying to contribute.

FIGURE 10.CURRENT NEW JERSEY GEOGRAPHIC INFORMATION NETWORK WEBSITE

Uses and Benefits of NJGIN

NJGIN provides state agencies and the broader geospatial community in New Jersey with access to important data sets through the metadata catalog, data download function, and published map services. While NJGIN is in need of modernization, it does provide the following important capabilities and benefits in its current form :

- Allows users to search existing metadata records using a custom query builder that filters on content type, content theme, or keywords
- Provides centralized access to many key data layers and allows users to download many data sets or connect to live map services
- Allows registered users to publish and edit metadata records which are then vetted by OGIS
- Provides users with the ability to receive automated notifications when metadata records are updated or added
- Grants centralized access to NJ geospatial resources including a user directory, state service and software contract details, and information on the Geospatial Forum

Desired Improvements to NJGIN

Stakeholders have expressed the need for the following improvements to the NJGIN portal:

- o **Need for "One Stop Shopping" for all New Jersey spatial data:** Consolidate the data holdings that are distributed through NJGIN and make data layers easier to find.

- o **Need better access and documentation of on-line web services:** Web services can provide tremendous self service efficiencies to advanced users, however, those services must be accompanied by appropriate documentation and service definitions (e.g., end points, APIs, etc.). Desired services include consumable map services (e.g. Open GIS Consortium Web Map Service, continuation of existing imagery services, tile services, and feature services). In addition, capability services are needed by users to perform common geospatial functions such as geocoding, routing, or address validation.

- o **Need for more capabilities and enhanced user experience:**

  - o Improved user interface that is less technical and more customer oriented

  - o More effective search engine that puts "best" results at top and presents information in plain English

  - o Additional web services including additional dynamic WMS services, new tile-based services, relevant feature services (WFS), and "capability services"

  - o Allow users to upload local data to perform spatial or attribute quality checks

  - o Mark-up tools that will allow local stakeholders to identify errors and request changes to statewide data sets

- o **Improved communication and coordination tools** with the stakeholder community to ensure that all members, and especially local governments, are kept informed about relevant statewide initiatives. This would include more proactive communication with community members, perhaps through the use of social media, rather than reliance on passive messaging on the NJGIN homepage.

- o **Need for better support of ISO metadata standards.** International metadata standards for geospatial data have been endorsed by the Federal Geographic Data Committee (FGDC) and both Federal and state agencies are encouraged to transition to ISO metadata to enable geospatial interoperability.

2.2.4 Governance

Background and Current Status of Governance

The New Jersey Office of GIS (OGIS) and an appointed Council were formally established by Executive Order #122 on January 30, 2001. While OGIS has been fully functioning within the NJ Office of Information Technology (OIT) since 1999, Governor Christie eliminated the appointed Council in 2010. The NJ Geospatial Forum has been serving informally as the coordinating body for geospatial activity in the state since 2004. The Geospatial Forum operates without formal authority but provides a mechanism to carry concerns through the state's governance structure to decision makers at the appropriate meetings. The Forum also serves to inform OGIS and influence the state office with regard to stakeholder priorities. The Forum's Executive Committee is comprised of 10 members representing distinct sectors of the geospatial community including federal, state, regional, county and municipal governments, nonprofits, education, private sector, and land surveyors. Within state government, the GIS Coordinators Round Table provides a channel for GIS representatives from state agencies to voice their concerns and priorities.

Uses and Benefits of Governance

The current arrangement provides an effective, grass-roots structure for GIS coordination in the state. While the Geospatial Forum and Executive Committee cannot mandate initiatives, create geospatial policy, or set standards in the state, their political independence allows the group to remain focused on the technical and practical issues facing the geospatial community rather than the political whims of any one administration.

Desired Improvements to Governance

The Executive Committee would like to increase participation in the Geospatial Forum and improve communication with the diverse set of stakeholders. As meetings are typically held in Trenton, geospatial stakeholders in more remote parts of the state are less inclined to attend and participate.

There is a need for better communication and coordination with the GIS stakeholder community through an annual report or more regular, proactive communication about relevant topics and events.

While the informal coordination structure provides political independence, the Geospatial Forum and Executive Committee need more authority to push initiatives and set policy/standards. Some sort of formal recognition would provide the coordinating body with more clout.

2.3   "CORE FOUR" STRENGTHS, WEAKNESSES, OPPORTUNITIES & THREATS

2.3.1   Notion of the "Core Four" Data Sets

OGIS has identified four geospatial data sets as the focus of the programmatic goals presented in this Plan. As these data sets comprise base data for nearly all geospatial activity in the state, they are deemed the "Core Four" for the purposes of planning important future investments. The "Core Four" is made up of the following key layers, recognizing that the first three are existing data sets and the fourth is planned for development:

1.   Orthoimagery

2.   Road centerlines

3. Parcels

4. Addresses

OGIS has identified these as priority areas for investment as they are used by virtually all stakeholders across all sectors including federal, state, local, private and non-profit. These data sets can be used to construct base maps for various thematic or sector-specific purposes. They also serve as a baseline for many derivative data products including:

- From orthoimagery: parcels, buildings, roads, land use/land cover, hydrography, infrastructure, impervious surfaces, etc.

- From roads: addresses, parcels, administrative boundaries, etc.

- From parcels: protected lands, zoning, political districts, administrative boundaries, addresses, thematic maps, etc.

- From addresses: evidence of new roads, parcels, buildings, etc.

Furthermore, these important data sets are being singled out to highlight that stewardship and funding gaps currently exist which threaten the long term viability and maintenance of these data.

2.3.2 Parcels

Strengths
- Statewide composite of parcel data is nearly complete

    – Boundary issues have been resolved

    – The data model complete and published

- There has been good cooperation from all counties

    – 19 out of 21 are complete (last 2 countywide data sets are available in draft form to be finalized in 2013)

Weaknesses
- Redundancy with tax map preparation creates extra work

- Difficulty linking parcels to MOD-IV tax database

    – E.g. Condo records not consistently coded to easily associate with parent parcel

- Data model needs to address many-to-one and one-to-many relationships (e.g. qualifiers, condominiums, add-lots)

- No universally accepted definition of MOD-IV, Parcels, & Tax Maps creates substantial "Gray Area" for data maintenance efforts

    – These distinct but related elements need to be clarified in order to make progress

Opportunities

- Municipalities may soon be allowed to submit digital tax maps to Division of Taxation

    – Potential to generate parcel data from digitally submitted tax maps

- Some towns are currently maintaining digital tax maps and could provide CAD file(s) to counties and Division of Taxation regularly

    – E.g. Town of Kearny, City of Vineland

- Learn from and leverage existing parcel data maintenance processes

    – For example, NJ Meadowlands Commission maintains digital parcels for several towns and provides to Counties

- Convergence of tax maps and parcel data is beginning to occur

    – Morris County working with Jefferson Township to create parcel data that can be certified

- Make linkage to addressing and NG911

    – Massachusetts has done this successfully to gain State 911 funding for parcel work

    – Good parcels is a step towards statewide addressing

Threats

- Municipalities do not necessarily keep tax maps up-to-date

    – Required, but no mechanism for enforcement

    – Cost is a disincentive

- No assurance that changes are being reported by municipalities

    – Minor subdivisions (involving less than 3 parcels) do not have to be reported to counties

- Failure of the PAMS system

    – Reminder that major change is not easy nor inexpensive

2.3.3 Roads

Strengths

- Planned improvements were completed Summer 2012

    – 6,000+ miles of private and missing public roads added

    – Addresses and other attributes added

- Data are fully public

- TeleAtlas license was not inclusive

- OGIS and DOT have agreed to collaborative maintenance effort

    - DOT to maintain final geometry, LRS, some attributes

    - OGIS to maintain additional attributes (e.g. road names, address ranges, postal codes, municipal codes) and draft geometry

Weaknesses

- New road data set will not be routable

- Tools are still in development to capture new/changed roads or tie into existing business processes

Opportunities

- Maintenance process for roads and addresses could be aligned

- Local sources can be leveraged

    - Authority over addressing rests at the municipal level

    - Public Service Answering Points (PSAPs; over 200 across the state) generate numerous updates that are currently not captured centrally

- Metropolitan Planning Organizations (MPOs) could play coordinating role for data maintenance or at least provide source for communicating changes

- Census is very interested in statewide roads data as source for TIGER

    - Potential source of funding and/or collaboration?

Threats

- Maintenance plan designed but not yet implemented

- Inconsistent data maintenance practices at county level

    - Some jurisdictions have multiple data sets

    - Counties want statewide roads but don't always maintain data themselves

2.3.4 Orthoimagery

Strengths

- Most widely used data set

    - Supports activities at all levels of government, non-profits, MPOs, private sector, utilities, etc.

- Allows derivation of other key data sets

  – E.g. Land Use/Land Cover

- Small geography allows for single-year flights

- Return on Investment is high

  – Cost of acquisition has decreased dramatically

  – Other states, entities are quantifying the benefits

Weaknesses

- No long term funding strategy and current ad-hoc funding is risky and inefficient

- No current legislative champion

Opportunities

- Funding secured for 2012 flight

- Subscription model programs emerging from the private sector could provide cost-effective alternative if quality is adequate

- Potential for a hybrid approach where the state subscribes/licenses data for some years, and purchases data other years

- Local government interest/activity and the potential for program to allow local buy-ups

- Multiple partnership opportunities

2.3.5 Addresses

Strengths

- Universal interest in creating comprehensive data

  – "It's the language people speak"

  – Serves broad variety of needs and applications

Weaknesses

- May not be possible to get Master Street Address Guide (MSAG) data

- Many sources of address data, but none are complete

- Different use cases require different point locations (e.g. driveway entrance and/or front door)

Opportunities

- Some counties already maintain address points

- More states are pursuing addressing initiatives – lessons to be learned

    – Has been supported by Broadband and/or NG911 funding

- LiDAR as potential source of building structures to support address locations

    – Method for identifying parcels that have multiple addresses

- NG911 requirements will elevate data importance and potentially provide funding support

- Tie into critical infrastructure priorities through identification of strategic structures

    – Could potentially get the attention of US Department of Homeland Security and/or NJ Office of Homeland Security and Preparedness

Threats

- Large and complex effort that will require significant organizational commitment and funding

- No maintenance plan yet defined

    – Will be critical and complex

3 VISION & GOALS

3.1 STRATEGIC GOAL

To create, maintain, coordinate and effectively distribute a strong New Jersey Spatial Data Infrastructure including major improvements to the "Core Four" data layers.

3.2 PROGRAMMATIC GOALS

- Overview of programmatic goals

    o "Core Four" data layer improvements including parcels, road centerlines, orthoimagery and addresses

    o NJGIN Modernization

    o Governance Evolution

The following sections will provide a **concise business case**, including cost and benefit enumeration, for making each of these investments.

3.2.1 Parcels

Required Improvements

To achieve this programmatic goal, OGIS should finalize the remaining 2 counties and integrate these data sets into the existing statewide composite to produce the first complete version of the statewide parcel data set. As these efforts are already underway, this initial statewide data set should be completed no later than 2012.

A successful maintenance program for the statewide parcel data set depends on the state's ability to streamline local maintenance processes for *tax maps* and better align the process with county maintenance for *digital parcel data*. Currently these two unique products fulfill different purposes and requirements, and efforts are often duplicated to support both. The differences between these products are summarized in the table below:

Parcel Data*	Tax Maps*
Non-certified	Certified representation of boundaries for taxation purposes
Digital	Typically hardcopy
Town/Countywide data set	Individual map sheets/CAD drawings
Ability to link to MOD-IV	No ability to link to MOD-IV (no polygon features)
Not mathematically constructed	Mathematically constructed based on a uniform standard
No licensed Land Surveyor required to produce	Requires licensed Land Surveyor
Updates are not currently required	Annual updates required by statute but unevenly enforced

* The information in the table represents a "typical data set" of each kind. For both data sets there are exceptions, and there are also efforts to innovate and achieve better alignment in a small number of jurisdictions.

Following the completion of efforts to have an initial *statewide parcel data layer*, efforts should focus on:

- Better alignment of tax map and digital parcel data maintenance processes to move toward tax maps that can be used to update digital parcel data.
- Improving the volume and quality of data attributes through better linking to the state's MOD-IV tax list[1]

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[1] The New Jersey Property Tax System (MOD-IV) maintains and updates all assessment records (MOD-IV Master File) and produces all statutorily required Tax Lists. The Tax List is filed with

How to Get There

The first of these improvements, tax map and digital parcel data alignment, will be challenging as it involves altering existing local business processes and the state does not have the authority to mandate such change. Thus recommended near-term actions focus on coordinating, supporting and incentivizing cooperation with this goal. While the potential to certify a single digital parcel data resource remains a long-term goal, there are incremental improvements that can be made in the near term that will streamline the maintenance process of both and will help sustain the accuracy and currency of statewide digital parcel data.

The diagram below shows how the maintenance of tax maps and digital parcels could potentially be better aligned to support statewide parcels. In this scenario, tax maps would be maintained and submitted digitally to both the State Division of Taxation and the County. Counties would incorporate digital municipal tax maps into a standardized countywide parcel data set to be submitted to OGIS on an annual or more frequent basis for integration with the statewide parcel data set.
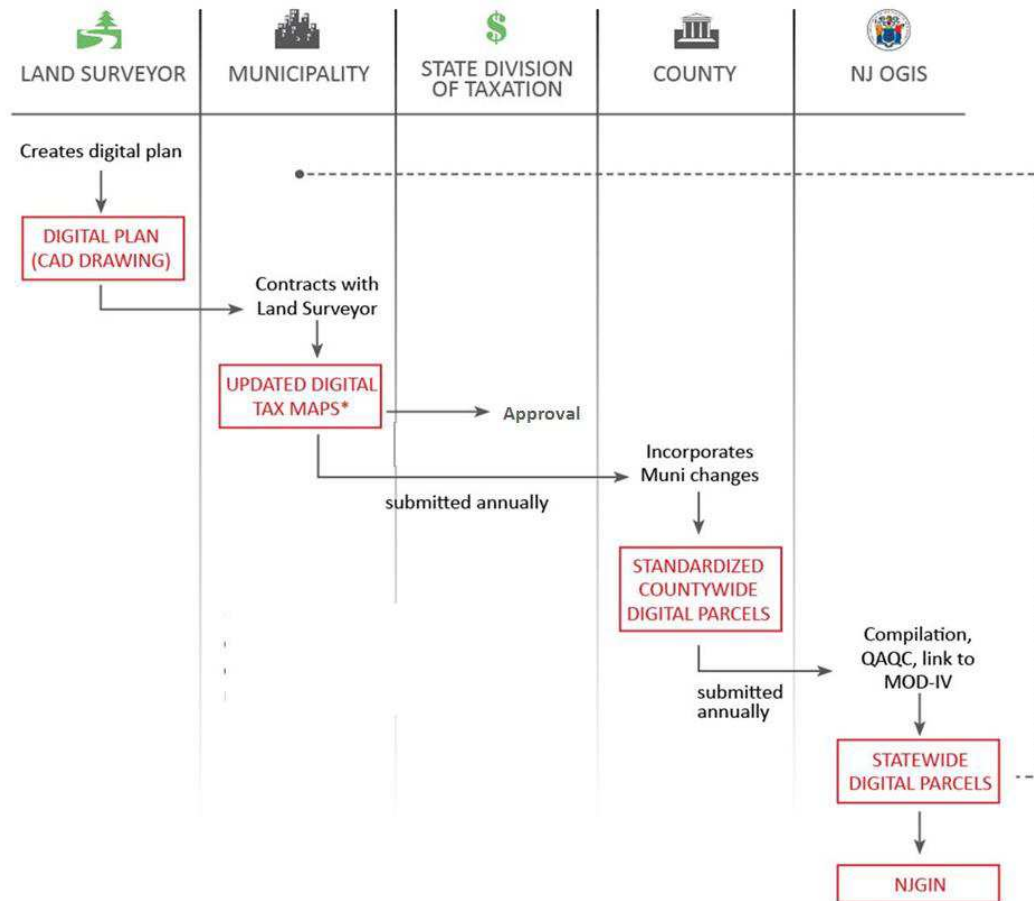

FIGURE 13. POTENTIAL MODEL FOR TAX MAP AND DIGITAL PARCEL WORKFLOW IMPROVEMENTS

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the County Board of Taxation on or before January 10th of each year. This list accounts for all parcels of real property as delineated and identified on the municipality's official Tax Map, as well as taxable values and descriptive data for each parcel.

The implementation steps toward this goal are:

- o Encourage local governments to move toward converging efforts to maintain digital tax maps and digital parcels whether on a municipal and/or county basis. Emphasize the importance of the local government role in the process, the investment that has been made in the statewide cadastral framework, and the benefits that will be achieved through such improvements. Document use cases (e.g., Morris County and Jefferson Township) that demonstrate an effective model and show potential benefits.

- o Formally clarify the definition of, and interrelationships between MOD-IV records, Parcel records, and Tax Maps through new legislation and/or regulations and guidance from the Division of Taxation. The legislation/regulations/guidance should clarify issues that ensure the tax maps can serve as the base content for county and statewide parcels. Issues may include:

    - o Minimum data maintenance and data currency

    - o Uniform minimum content

    - o Digital availability

- o Provide a data model and best practices guidance to local governments that addresses the complexity of linking parcel data and the MOD-IV tax assessment database. The data model should allow for one-to-many and many-to-one relationships as required to handle the known complexities of parcel qualifiers, condos, add lots, and minor subdivisions. Data models that handle this complexity may use associated feature classes or intersection tables to navigate these issues.

- o Encourage counties to adopt digital submission standards for subdivisions to streamline data updates and incrementally improve spatial accuracy of parcel data.

- o Provide mark-up tools for flagging administrative boundary changes on statewide digital parcel data including municipal, county and state boundaries. Supporting this workflow through communication tools will help to incrementally improve the boundary data.

- o Refine Extract, Transform & Load (ETL) processes for receiving digital tax map and digital parcel updates from local governments, normalizing data sets, and ultimately maintaining a seamless, statewide parcel data layer.

- o Distribute statewide data through map services and data downloads to facilitate access and demonstrate the importance and value of the statewide cadastral framework.

What Will It Cost?

OGIS efforts toward achieving the programmatic goal of sustainable statewide parcel data will largely focus on coordination, outreach and communications with local governments who maintain the authoritative data. Part of this coordination and outreach effort will involve providing a data model and "best practices" guidance to local governments, state agencies and the legislature to explain the

importance and benefits of tax map and parcel data alignment. Significant technical staff time will also be required to develop web-based mark-up tools and ETL processes that make cooperation and coordination more efficient. Finally, OGIS will need to invest substantial time in establishing and maintaining the required data distribution and web services to get these data into the hands of stakeholders. It is estimated that the initial OGIS staff time effort would be approximately 0.6 FTE with an ongoing staff investment of 0.1 FTE to manage the ETL processes and sustain the web services.

Expected Benefits to Counties and Municipalities

Parcel data are extremely useful in local government operations, whether in planning and zoning, public health, building inspections, assessment, education, conservation, public safety or other departments. By improving the workflow that maintains and aggregates parcels on a statewide basis, the quality and currency of the statewide composite will be vastly improved and will produce a host of other benefits to New Jersey stakeholders.

- **SIMPLIFIED DATA MANAGEMENT.**

    o Gained efficiencies through alignment of digital parcel and tax map maintenance processes and reduced duplication of effort.

    o Eliminating the workload associated with redundant requests from multiple state agencies and the private sector by enabling parcel data distribution from a single state-level source. Currently, a county may be asked to provide parcel data to many separate state agencies via separate data requests. With reliable statewide parcel data, a county would only need to provide the data to the state once.

    o Reduced staff time spent fulfilling data orders from non-state agencies, collecting fees, and accounting for fees obtained. In the end, the fees collected may not cover the time expended to distribute the data.

    o Ability to work with parcel data from adjacent counties as part of evaluating regional projects such as developments that are near to or cross county boundaries.

    o Support for broader regional property sales comparisons becomes possible with statewide parcel data. Such regional comparisons are particularly important in rural areas and at times when the real estate market is slow.

- **SUPPORT FOR ECONOMIC DEVELOPMENT.** Statewide parcels will provide a key tool for economic development and business site selection. When businesses or their site selection consultants are looking for properties, it is critical that they are easily able to view property boundaries and key characteristics of the parcels such as current assessed values and land uses. Of equal importance can be information on abutting properties such as the number of neighbors a given parcel may have. Cities and states that have their parcels completed and on-line are at an advantage.

- **PARCEL BASE MAP.** In addition to the data content benefits described above, parcels – like orthoimagery – fulfill an important base map function. Specifically, a variety of political and administrative boundaries such as school districts or zoning are coincident with property

boundaries. For example, a given parcel should not be split by a school district boundary. Accurate parcel data will help ensure that there is no ambiguity about the taxation and services provided to that parcel. Without statewide parcels, it will be impossible to properly map such boundaries across the state and there will continue to be inequities and time spent resolving jurisdictional boundary questions.

- **IMPROVED PUBLIC DATA ACCESS.**   By providing access to reliable statewide digital parcel data, important property information is publicly available 24 hours/day via web access. Improved access to digital parcel data means that the public can answer many questions on a "self-service" basis rather than requesting information from a public employee.

- **POTENTIAL FOR SHARED APPLICATIONS.** With broad access to standardized parcel data, the state could potentially develop and host "shared applications" that would run against the multi-county parcel data set and could be made available to participating counties or municipalities. These applications would be particularly valuable to counties that have less well developed GIS programs and limited technology and budget availability for application development. The following applications support common county workflows and could be feasibly developed and hosted back to participating counties:

    o   Automated tool for identifying spills and hazards on parcels.

    o   Parcel abutter identification and owner notification within specified distances of a subject parcel or parcels.

    o   Wetland and floodplain data overlay analysis with statewide parcels to identify risks (see below for further details).

    o   Administrative areas such as zoning, emergency services, school districts, and others are best maintained as an aggregation of parcels as some cross county lines. Up to date statewide parcels will support applications that must analyze data across county boundaries.

- **SUPPORT FOR FLOOD CONTROL AND EMERGENCY MANAGEMENT PLANNING.** Consistent parcel data will aid state and regional agencies with flood control and emergency management planning.

    o   Support for state emergency response to, and planning for county and local governments can be made more efficient with centralized access to parcel data (e.g., for locating potential staging areas).

    o   Parcel based damage assessment and disaster impact analysis. Consistent cadastral data will aid federal agencies in damage assessment during emergencies which could speed disaster funding allocation.

    o   Public safety situations such as a missing persons search or, conducting a large scale evacuation can benefit from access to detailed data from neighboring jurisdictions.

Expected Benefits for State Agencies

Parcel data are also used by state programs with involvement in specific sites and with missions as varied as economic development, transportation infrastructure management, broadband infrastructure planning, property tax equalization, natural resource protection, land use and environmental permitting, large-scale emergency response and disaster recovery, energy facility siting and property management to name just a few.

- **IMPROVED MANAGEMENT OF STATE LANDS.** Reliable and current statewide parcel data would allow land managers to visually assess their lands in relation to the overall context of land ownership and quickly identify abutters that are likely responsible for encroachment and/or buffer violations. Parcel boundaries provide agency staff or their agents with immediately accessible information regarding the owners of land subject to notification, investigation or enforcement actions. In other cases, notification would be a matter of public safety and welfare such as owners of land abutting a parcel where a spill was reported might need to be informed about a threat to their water supplies.

o **SUPPORT FOR MORTGAGE CRISIS "DISTRESS" INDICATORS.** Reliable statewide parcels would provide a common, statewide platform for integrating, comparing, and analyzing key factors such as utility shut-offs, mortgage payment status, foreclosures, unemployment, crime statistics, undelivered mail, etc. Parcel data makes it possible to correlate these disparate factors and observe patterns before the situation reaches a critical point.

o **SUPPORT FOR STATE AGENCY BUSINESS PROCESSES.** Examples of the many ways in which a statewide parcel data set would support the day-to-day business of state agencies.
  - **Public Safety**
    - o Geocoding support
    - o Hot spot and crime prevention analysis
    - o Emergency planning and management support
  - **Environmental Protection**
    - o Property management
    - o Abutters identification and notification
    - o Wetlands identification
    - o Wildlife management and hunting access
    - o Flood hazard mitigation and prevention
    - o Open space land acquisition and habitat preservation/restoration
    - o Conservation easement and scenic easement management
  - **Transportation**
    - o Rights-of-way assessment
    - o Land management

- o Abutters determination

- o State aid collaboration

- o Road maintenance

- **Public Health**

  - o Assessment of health benefits resulting from mixed land use (locating residential, retail and commercial uses in close proximity to one another thus reducing demand on cars)

  - o Walkability determination

- **Homeland Security and Emergency Management**

  - o Emergency preparedness

  - o Multi-hazard mitigation plans

3.2.2 Roads

Required Improvements

The recent completion of the road centerlines project is a major milestone for OGIS and will provide a valuable resource to the geospatial community. To protect this investment, OGIS should continue to maintain and enhance the data set.

Most importantly, OGIS requires a long-term maintenance plan that clarifies data upkeep responsibilities and processes. The maintenance for road centerlines should be a shared responsibility between OGIS and NJDOT with local government as a key contributor to the process. Communication and coordination between these state agencies will need to be improved and integration with the local government workflow will need to occur. Success will depend on incentivizing local governments to supply the roads data to the state on a regular schedule.

How to Get There

- o **Support transition to the state's road centerline data** as the license for this commercial data expired on June 30, 2012. OGIS will need to provide support to transition all state application that formerly relied on the *TeleAtlas* data as the data schema has changed. State agencies should be educated on the new features and attributes available in this data set.

- o **Establish shared maintenance responsibility** for this important data set between OGIS and NJDOT and leverage the data maintenance process already in place at NJDOT. NJDOT should continue to maintain all spatial data for public and private roads but as OGIS requires additional attributes to support non-transportation users, the burden for maintaining this information will fall onto OGIS. An eventual change to a monthly update cycle to integrate new and modified

roads and attributes from local government sources must be accounted for in the maintenance process.

- o **Encourage local government efforts to use state roads data** and contribute to maintenance processes. This encouragement will need to come in several forms:

  a. Educate local governments on improved spatial accuracy of roads data. Historically, road centerlines have not aligned well with local parcel layers, thus municipalities were reluctant to use these data and opted for local copies that could be modified to "fit".

  b. Create incentives for cooperation by providing a useful data model and guidance to local governments, providing enhanced attributes, completing data updates in a timely manner, and serving back the data through web map services that can be incorporated into local applications.

  c. Tie into local business processes, such as tax map and parcel maintenance, to flag changes to the state's road network.

  d. Allow local governments that maintain road centerline data to upload revised roads data at will and quickly see their changes and contributions reflected in the statewide data set. Additionally, for local governments not maintaining road centerline data, provide easy to use mark-up tools that allow them to indicate spatial or attribute changes that need to be addressed. Streamlining these workflows and providing communication tools will encourage cooperation with, and contribution to, the overall maintenance process.

- o Make statewide data readily available via WMS and data download (see NJGIN modernization for more detail).

What Will It Cost?

With the completion of the statewide road centerlines in 2012, OGIS can shift their attention and efforts toward maintenance and improvements to this key data layer. As agencies transition their applications to the new data schema, OGIS will need to provide technical support and coordination. Significant time will also be required to coordinate with local governments and establish the web-based mark-up tools and ETL processes that will make local contributions to the maintenance process more efficient. Finally, OGIS will need to invest substantial time in establishing and maintaining the required data distribution and web services to get these data into the hands of stakeholders. It is estimated that the initial OGIS staff time effort would be approximately 0.7 FTE with an ongoing staff investment of close to 1 FTE to perform ongoing attribute data updates, manage the ETL processes, and sustain the web services.

Expected Benefits

Roads represent a crucial framework data set that is used by almost the entire geospatial community.

- o The recently released data set provides improved quality and completeness. Over 6,000 miles of new roads were added and spatial accuracy has been improved. These improvements will

lead to more accurate dispatching and more efficient routing of emergency vehicles providing overall improvements in public safety and preparedness. Similarly, the maintenance of roads will help improve emergency planning activities such as the creation of safe and efficient evacuation routes.

  o The state now has control over maintenance and can quickly correct street naming issues and other data inconsistencies and can update as often as needed.

  o While the investment in maintenance is substantial, the annual cost of the *TeleAtlas* data was significant; totaling $143K in licensing fees annually (originally $413K annually but driven down by competition).

  o The state roads data are fully public now. Restrictions on the *TeleAtlas* data prohibited the state from serving this key data set to the entire geospatial community. The return on investment is increased exponentially by broadening the availability of these data.

3.2.3 Orthoimagery

Required Improvements

Orthoimagery is one of the most popular, versatile and important data sets maintained by OGIS but without a predictable and sustainable funding source, the maintenance of this valuable resource is threatened. Funding was cobbled together from a variety of sources for an orthoimagery acquisition flight in the spring of 2012 but the current "opportunistic" system means that many interested participants do not have the time, or budgetary flexibility to participate. With a planned and recurring program, state agencies and the entire NJ geospatial community will know in advance when to expect new imagery and can plan for the upkeep of derivative products accordingly.

How to Get There

1. **Document the 2011 decision process.** After barely securing funding for a new flight, the Orthoimagery Task Force decided in December 2011 to proceed with a conventional orthoimagery acquisition project rather than license imagery from Digital Globe. While the proposed Digital Globe product would have been significantly less expensive, in the end, there were several shortcomings in the licensed model that tipped the scales toward a conventional flight:

    o Use restrictions would have prevented distribution to commercial entities (except to support government contracts)

    o Lower resolution for CIR band

    o Lower effective accuracy specifications

    o No option for local buy-ups

    o Unclear on allowance for state to assess deliverables and potentially "reject" product

For future reference and to justify the expenditure of a conventional flight, OGIS and the Orthoimagery Task Force should document the pros and cons as well as the decisions made with regard to the 2012 flight.

2. **Pay attention to outcome of licensed model in other states.** States such as Massachusetts and Michigan have opted to go with the Digital Globe licensed data model and products from these flights are scheduled to arrive in the fall of 2012. OGIS should evaluate these products first hand and gather input from other states on the quality of the deliverables.

3. **Design a hybridized recurring program** that will offer:

   o A conventional flight every 5 years that provides statewide data without distribution restriction and offers local governments a "buy-up" option to obtain higher resolution imagery. This flight should, at a minimum, meet the specifications of the 2007 flight including 1"=200' scale and 4 band (RGB and NIR) imagery at 12 bits per pixel.

   o Frequent "licensed" flyovers every 1-2 years to provide state and local government entities access to more recent imagery.

4. **Identify a legislative champion** to obtain a budgetary line item that will be sufficient to cover the costs outlined below. Once the budgetary line item is obtained, OGIS should issue formal procurements for photogrammetric services to cover the hybridized approach described above.

What Will It Cost?

Current industry estimates for the cost of a conventional statewide, 1 foot resolution, 4-band original digital capture mission are approximately $800,000 for New Jersey's 7,650 square miles. Assuming the state invests in a conventional flight every 5 years, the annual cost is estimated to be $160,000. Costs for licensed imagery are significantly less than that of a conventional capture mission and are estimated to be approximately $200,000 for the entire state. Capturing licensed imagery every 3 years would cost the state approximately $67,600 annually. Thus the total annual expenditure for both periodic conventional and licensed flight missions would be approximately $227,600 annually.

On top of contractor costs described above, OGIS would need to invest time in procurement and coordination of the flights, management of the buy-up options, quality control of data deliverables, and ultimately the data distribution and services that will make the data available to stakeholders. These efforts are estimated at 0.15 FTE.

Expected Benefits

   o A predictable imagery acquisition schedule will obviate need for ad-hoc flyovers from other entities, such as NJ Transit, that must have current imagery for assessment of their infrastructure.

   o Return on Investment (ROI) findings from jurisdictions outside of New Jersey indicate that recurring statewide orthoimagery programs produce benefits that far exceed the monetary

investment in such programs. The resulting ROI in the State of Maine was projected to be 421% to 1264%. Benefits resulted from:

- o The **economies of scale** of a statewide program dramatically reduce the cost per participating organization in both the short and long term

- o Collaboration between organizations provides orthoimagery at a **lower cost, higher resolution, and on a better schedule** – all of which improves the availability and usefulness of the data

- o There is **no suitable substitute** for meeting the state's business and operational needs – commercial websites popular with the public, such as Google Earth and Microsoft Bing, depend largely on publicly funded imagery or commercial imagery of lower quality as a resource

o Orthoimagery serves as the core base map for most GIS installations. Orthoimagery represents the "visible geography" and thus most other data layers must be designed to properly overlay and not conflict with the imagery. It is apparent, even to a non-professional, that "something is wrong" when a road line does not match how the road is depicted in an orthophoto that shows the pavement and sidewalk.   Beyond roads, other data sets that should "match" the orthoimagery include parcels, land use/land cover, hydrography, administrative boundaries and other data with photo-identifiable features. Given its role as a core base layer, it is all the more vital that this layer be of high quality and reliable currency.

o Orthoimagery is an important asset in the state's economic development and business recruitment efforts. When businesses or their site selection consultants are looking for properties, it is critical that they be able to view those properties in the context of *current* conditions on the ground. Older or less detailed imagery may not be able to provide sufficient information for their planning or decision making.

o In addition to site selection, the private sector relies on current orthoimagery to support a variety of business related activities including:

- o Site reconnaissance (that can obviate the need for an initial site visit)

- o Route optimization

- o Asset inventory and maintenance planning

- o Operations and management

- o Communications and advertising

- o Relevant feature identification and/or delineation

- o Increased tourism

- o Redevelopment efforts

- o Population density analysis

o A stable program with a predictable schedule would allow local governments to budget funds for local buy-up to higher resolution, resulting in substantial cost savings. This option has not been feasible because the acquisition schedule has never been known far enough in advance.

3.2.4 Addresses

Required Improvements

Accurate statewide address data are necessary to support a wide variety of applications through the State of New Jersey ranging from utility services to economic development to tax assessment and emergency response and dispatching (E911). Addresses are the location identifiers *most used* by the public and by state and local governments. They provide critical information for administrative, emergency response, research, marketing, mapping, and navigation. To provide basic services, local governments use addresses to identify every residence, business, building permit, voter, and school child within their jurisdiction. Emergency dispatchers require address locations to route an emergency vehicle quickly and accurately. The USPS, commercial delivery services and direct mail firms required standardized addresses to provide their essential services.

Despite these broad reaching needs for statewide address data, the State of New Jersey does not currently have a statewide address data set. To meet these requirements, New Jersey needs to embark on a program to develop and maintain a standardized, statewide address point data set.

How to Get There

- o **Adopt the FGDC US Thoroughfare, Landmark and Postal Address Data Standard** as it is designed to satisfy the diverse needs of the New Jersey geospatial community including local government administration, postal delivery, emergency response, navigation, and address aggregation.

- o **Align with NextGen911 to the greatest extent possible**. States such as Massachusetts have leveraged NextGen911 funding to support the development of address data and tools to support maintenance of address data.

- o **Learn from jurisdictions that already maintain address data and from states pursuing statewide address points**

    - o Morris County developed a web-based address point maintenance web application that has been in use for several years. The tools are now being redesigned and deployed as an HTML5 application with additional functionality.

    - o Sussex County is currently using an ArcGIS Online application to manage and maintain countywide address point data

- o New York State is supporting the development of address points by aligning it with their broadband mapping needs. Tennessee and Massachusetts have aligned development with their states' NextGen911 address requirements.

    o **Form partnerships with local governments that offer mutual benefits**. The State of Arkansas works collaboratively with local governments to maintain high quality address points. The state provides technical assistance and a data model, standardized processing and publication through WMS. The counties clean data records, edit spatial locations, and take on the burden of field verifying data points. The result is a coordinate database of legitimate physical addresses as assigned by the county addressing authority that is of very high quality.

    o **Provide easy to use, interactive tools for data sharing.** Just as with road data maintenance, enable local governments that maintain address data to upload revisions and/or mark-up data changes on an easy to use, interactive website. This will allow local governments to rapidly see changes in the master address database and verify that their contributions are being valued.

    o **Make statewide data readily available via web map services and data download as well as associated services such as geocoding.** There will be high demand for these data and services.

    o **Provide access to the address database as a "Master Enterprise Resource" for address validation.** Such a tool would help state agencies, local governments, businesses and other stakeholders to quickly verify their own databases and, as a result, continuously improve the data supplied to the state.

What will it cost?

The cost of developing and maintaining a statewide address data layer is difficult to estimate without fully understanding the technical and functional requirements or identifying the technological approach. To document these requirements with sufficient detail, OGIS will need to expend efforts on establishing the relationships, finding the partners and determining the appropriate strategy for moving forward. To this end, it is recommended that OGIS develop a detailed business plan focused solely on address data development that will aim to provide the following detailed information:

- o **Specific functional requirements**

- o **Potential partners**

- o **Technological approach**

- o **Estimated costs** for implementation

- o **Business case that** will justify the recommended level of investment

- o **Potential funding opportunities** for making the investments

Assuming OGIS contracted for the development of such a business plan, the estimated cost would be approximately $25,000.

Expected Benefits

The development of a statewide address database will provide benefits to users in all sectors of the geospatial community. While the address data will be available for download and integration with local applications, the key benefit will be access to a "Master Enterprise Resource" and address validation service that can be used for both geospatial and non-geospatial systems. Provision of this service will allow users to verify databases containing addresses and correct erroneous data which will, in turn, improve the overall quality and mapability of the numerous state and local databases. Agencies and applications that will benefit from this investment include:

- o Health departments tracking business licensing, public health incidents, residents, etc.
- o Building permit processing and inspection tracking
- o Work order management
- o Public safety and emergency response
- o Utility billing, usage analysis, verification

Address data will also provide an alternative for applications that currently rely on parcel data for property identification. As parcel polygons do not account for multiple businesses, condo, or apartment units sharing a common parcel, these data cannot always provide the "resolution" required to meet business needs. Address points, however, can identify and direct users to the proper location for any particular unit. This "resolution" is critical for emergency response applications.

3.2.5   NJGIN Modernization

With the proliferation of state GIS data sets and broader recognition and use of GIS by larger numbers of people, state GIS program web portals have become increasingly important. The modern state GIS program web portal fulfills four key functions. They provide:

- Gateway to consolidated, publicly available state geospatial **data sets**

- Gateway and documentation to publicly available on-line data **services** and geospatial **web services**

- Primary calling card and **branding** for the state GIS program

- Connection and jumping off point for **collaboration** through social media and other types of two-way electronic interaction.

Although OGIS has maintained the New Jersey Geographic Information Network (NJGIN), an effective GIS web portal for many years (see image to the right), the site is showing its age and is in need of modernization. Specifically, the site

could be more dynamic and interactive and could do a better job of presenting its data holdings, updating the web services that are available and could present a more customer friendly image to its many users. Indeed, the NJGIN website will often provide the first impression a user has of the overall program and it will also be the primary mode of interaction with the program for many users. As such, thought and investment in this resource is an important part of a state's spatial data infrastructure.

FIGURE 14. UTAH AGRC GEOGRAPHIC INFORMATION WEB PORTAL

OGIS's counterpart in Utah, the Automated Geographic Reference Center (AGRC), recently launched the third generation of its web portal (see image to the left) which includes many of the improvements that are recommended for the NJGIN website below. The site effectively represents a customer focus with timely news, easy to find links to the most commonly accessed services (i.e., data download and base map services), linkages to social media outlets as well as prominently exposing capabilities for "search" and providing the AGRC "feedback".

Required Improvements

The following describes specific recommendations for improving the NJGIN website in terms of its visual impact, usability and in the capabilities that are provided:

- o **Effectively provide "One Stop Shopping" for all New Jersey data:** Although large amounts of OGIS, state agency and county data holdings are available from NJGIN, users are forced to browse for their data on an individual data set by data set basis through the somewhat clumsy and limited NJGIN Explorer application. This tool is aimed at GIS professionals and it is difficult to gain a synoptic view of overall data availability. The data downloads page provides a secondary and more direct listing of downloadable statewide data, but only a small subset of overall data are on this listing. In essence, the website is aimed at users that know exactly what they are looking for and does not do a good job of actively showing users what is available, or

anticipating what is most important and popular and making it easy to identify those data sets. Again, sites like Utah's with its "popular data sets" listing and well written, plain English descriptions of data sets are enhancing their "customer service" by making it as easy as possible (i.e., fewest clicks) for people to find and get what they need.

In addition, OGIS should continue work to further consolidate the data holdings that it distributes through NJGIN. Currently, there are a few other state government sources for geospatial data and resources (e.g. NJDEP) and this can serve to confuse the public and make it less convenient to find what one needs. Indeed, there are inherent benefits to having a single clearinghouse that has the data holdings of the entire state (i.e., all agencies).

- **Easy to access index and documentation of on-line web services:** Once again, NJGIN supports searches for "map services" through its website, however, the user is forced into using the NJGIN Explorer application which provides only cursory information on the services, or links that must be found in long metadata records. Some of the links that were tested for this study were broken, and others simply provided jumps to other websites where service information was exposed. While this represents a good faith effort to catalog what is available, the information presented was not customer friendly and was difficult and inefficient to decipher. Web services can provide tremendous self service efficiencies to advanced users, however, those services must be accompanied by appropriate documentation and service definitions (e.g., end points, APIs, etc.). It is strongly recommended that OGIS devote some effort to enhancing its services infrastructure (i.e., those services that it offers) as well as the presentation of those services to the public and partners through the NJGIN portal.

There are two principal types of services that the modern state GIS program offers to its users: "map services" and "capability services". The following provides a high level listing of the types of services that OGIS might consider further developing and exposing to its user base:

- Consumable **map services**:

  - In standard formats such as Open GIS Consortium (OGC) Web Map Services (WMS) for increasing numbers of "most popular" layers

  - Continuation of NJGIN's strong WMS-based imagery services

  - Tile services representing high performance, pre-rendered cartography of OGIS's high quality base maps which are increasingly useful to power mobile applications

  - Feature services for selected layers that enable the client to obtain geometry via the map service potentially using OGC Web Feature Services (WFS)

- **Capability services** that enable users to perform common geospatial functions such as geocoding or routing. Similarly, other capability services, such as address validation, may be delivered as simple database queries without necessarily providing a map.

As OGIS expands its map services publication it will need to be increasingly aware of map projection complexities. One of the benefits of map services is that commercial mapping data - e.g., from Google, Microsoft, Esri, etc. - can be "mashed up" (i.e., viewed in combination with) with the state's data. Most of the commercial data sources use a global projection, referred to as "Web Mercator", which is different than the NJ State Plane projection that OGIS data are maintained in. While it is possible to have the server convert data from one projection to another, this is computationally expensive and can slow down the services infrastructure. Hence, it will be important for OGIS to plan its services with the intended use of mash-ups in mind. One option is to produce OGIS static "base map tiles" in the Web Mercator projection while having dynamic WMS services remain in the NJ State Plane projection.

o **Community building:** Many state GIS portals are using social media and their own technical resources to build and foster communities of interest. One example might be a community of interest centered on cities and towns that are just starting with GIS and need to understand how to build and fund a GIS system. Smart uses of social media and the NJGIN portal can help communities form and can then point them to resources that can further their interests. For example, the MassGIS website has an extensive library of resources titled "Municipal GIS" that is aimed at connecting municipal GIS practitioners and pointing novices to the resources they need to get started and better educated.

o The following suggested enhancements will need to be prioritized and resourced:

- o Improved website user interface

    - More user friendly for the public

    - More customer oriented

    - Less "GIS technical"

    - More opportunities for interactivity

    - Most important/popular data and services are front-and-center

    - Web site is readable from a mobile device (i.e., has an optimized mobile version)

- o More effective search engine

    - More "Google-like" and less metadata oriented

        - Best results are at the top

    - Improved "plain English" search results for key data

    - Segregate results by OGIS data, state agency data, partner data

- o Publication of additional web services

    - Additional dynamic WMS services

    - New tile-based services (including Web Mercator projection)

- - Experiment with relevant web feature services (WFS)

    - Experiment with "capability services", perhaps beginning with geocoding

  o Establish community building and communities of interest

    - Introduce social media linkages (e.g., blog, Twitter feed, etc.)

    - Develop content for initial community, e.g., "municipal GIS starter kit")

  o **Implementation of ISO metadata standards.** International metadata standards for geospatial data have been endorsed by the Federal Geographic Data Committee (FGDC) and both Federal and state agencies are encouraged to transition to ISO metadata to enable geospatial interoperability. The ISO metadata standard supports improved metadata development and management capabilities that may directly support organizational data activities including documentation of data models, analytical methods, application schemas, and symbology, greater flexibility due to increased number of elements and fewer mandatory elements, and increased use of fixed domains to support standardization of information[2]. A variety of applications are available to support the implementation of ISO metadata.

How to get there

The main requirement for improving the website is a commitment from OGIS to dedicate staff time, and potentially some funding, to the design and implementation of an improved web portal and expanded web service offerings. The following provides an overview of the sequence of implementation steps:

- o OGIS prioritizes the improvement of its NJGIN website and **commits to improvements** within a 1 year timeframe

- o OGIS evaluates and selects an appropriate **content management system** (CMS) for housing the new site. A modern CMS is critical for establishing a graphical framework and organizational structure while enabling easy expansion and maintenance of content without a need for web programming. A modern CMS would also provide a platform for integrating/linking with social media capabilities.

- o Commence planning and transition to **ISO metadata standard**

- o Completion of **website design** and navigation planning

- o **Website development** including:

    - Establishing new look-and-feel through style sheets

    - Page layouts

    - Content development (e.g., improved plain English descriptions of key data sets)

    - Implementation of website search, and potentially specialized "data set search"

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[2] http://www.fgdc.gov/metadata/geospatial-metadata-standards

- Implementation of appropriate social media hooks/linkages
  - o Parallel development of expanded and better documented **web services**
    - System requirements planning as new web services can consume significant computer resources (e.g., disk space for statewide tile caches; compute power and throughput for dynamic web services)
    - Tile cache planning and development
    - Expansion of WMS to cover additional data sets
    - Experimentation with feature services and/or a geocoding service
  - o **Launch of a new website** with appropriate communications and public relations
  - o Transition to **website maintenance** to keep content fresh and growing

What will it cost?

The actual cost of development will depend heavily on whether OGIS intends to design and build the new site based on "do it yourself", in-house labor, or whether contractors will be involved in components of the development. Utah performed all design and development in-house and reports that the level of effort was approximately 50% of a fulltime equivalent (i.e., .5 FTE). Furthermore, Utah reports that they average 30 hours/month for ongoing website maintenance to keep the content fresh and engaging. This annualizes to approximately 20% of an FTE.

OGIS might consider a hybrid approach of engaging professional contractors for CMS selection and initial design and then collaborate in the development of the website (e.g., the contractor develops the framework and style sheets; OGIS develops the detailed content).

Expected Benefits

As described earlier, the major benefits are threefold:

- Projecting a strong, positive image of OGIS to the user community
  - o Further establishes OGIS/NJGIN as the authoritative source for NJ geospatial data and resources
  - o Public demonstrations of OGIS's technical skills and vision
  - o Fostering a user community and resources to assist that community
- Gaining OGIS efficiencies by streamlining the processes of keeping the website current and further guiding users into increased utilization of web services
  - o CMS technology streamlines website maintenance

- o Effective web services lead to reduced data downloading. Accessing a service that utilizes current data is more effective than periodically downloading data every time they are updated.

- Gaining end user efficiencies by streamlining the processes of finding, accessing and when necessary downloading OGIS data

    - o Efficiencies **for State Government users**

        - o Streamlines and consolidates state agency geospatial data distribution

        - o Simplifies state agency data discovery

            - Consolidated repository for sister agency data

            - Consolidated repository for contributed local government data

        - o Consumable services can benefit agency data management (e.g., no need to have a copy of orthoimagery on agency servers)

    - o Efficiencies **for public users and partners**

        - o Ease in finding authoritative data via a "one stop shop"

        - o Ease of data consumption: web services as well as downloads

        - o Seeing/experiencing the benefits of an effective web portal should catalyze greater willingness to share data with state agencies

3.2.6 Governance

New Jersey does not currently have a governmentally authorized model for governing geospatial activity and initiatives in the state. Previously, a GIS Council had been established via Executive Order in 2001, but it was inactive by 2004 and was officially eliminated in 2010 by Governor Christie. In spite of this setback, the GIS community and OGIS have maintained good faith efforts at remaining coordinated and are utilizing the NJ Geospatial Forum as a *de facto* governance body. The following provides an overview of the status quo:

1. *Statewide:* NJ Geospatial Forum established 2004 without formal legal authority

    - Serves as GIS coordination body for the state

    - Informal arrangement, forum is open to all that wish to participate

    - Representation and active participation from many stakeholders including: Federal, State, Regional, County, Municipal, Non-profit, Education, Private Sector, and Land Surveyors

    - Informs OGIS and influences priorities

2. *State Government:* GIS Coordinators Round Table

    a. Representation from state agency GIS leads

Required Improvements

Given the gap in formal recognition and authority for GIS governance there is some interest in re-establishing a formally recognized GIS Council. At the same time there is also recognition that GIS coordination and governance have not stalled since 2010 and there are no obvious problems emanating from a lack of governance. As such, OGIS and the GIS community are facing the question of "if it isn't broken, why fix it?" Toward that end, the following provides a pro and con view of considering new legislative and/or gubernatorial action to re-create a formal GIS Council in NJ.

- o **Pros**
    - o Formal designation can be designed to provide a voice that is aimed at informing the administration and legislators, and may have more success attracting attention at senior levels of government.
    - o Provides a formal platform to push multi-agency initiatives such as orthoimagery or addressing. Helps to articulate the case across state government as a formal part of state government.
    - o When necessary, could have the formal authority to set policy and adopt standards on behalf of state government

- o **Cons**
    - o Current structure is familiar to stakeholder community and is working. At the same time, it is aimed at a broader group of stakeholders and may have challenges attracting senior level attention.
    - o The process of appointing council members would likely be a political one and thus well informed geospatial constituencies - such as the NJ Geospatial Forum and its Executive Committee - would have less control and/or influence over council appointments. Further, political appointments would not necessarily have the technical knowledge of its current leadership
    - o There is some risk that the value and influence of effective "grass roots" organizations such as the NJ Geospatial Forum would be reduced as they are eclipsed by the new council.

How to get there

Given that there is not complete consensus on which path to take the first step is for OGIS and the NJ Geospatial Forum to continue discussions and determine whether there should be active effort aimed at either retaining or formalizing geospatial governance in NJ. Without a clear driver, and given that creating a new council would undoubtedly require the expenditure of some "political capital" there appears to be time for NJ to continue to consider the preferred path forward, and be prepared for

opportunism (e.g., some type of issue that elevates the profile of geospatial activity within state government).

The following provides an overview of recommended steps moving forward under both a "status quo" and a "formalization" strategy:

- o If **status quo** is retained:

    - o Seek to articulate the current, informal governance model in clear terms (e.g., via the NJGIN and NJ Geospatial Forum websites)

    - o Issue a request to the Governor to acknowledge and endorse the current informal structure (e.g., via a letter of support)

    - o Strengthen the current model by increasing participation

        - ▪ Potentially by rotating meetings to various locations throughout the state

        - ▪ Creating compelling, action-oriented agenda on current topics that require input and/or prioritization

    - o Create a web-based annual report to keep participants informed of meetings, agenda, activities and decisions that are made, or will be considered at future meetings

- o If **"formalization"** is pursued:

    - o Determine whether gubernatorial or legislative formalization is more desirable

        - ▪ Request Governor to issue new Executive Order

        - ▪ Or, seek sponsors for legislation

    - o Form a work group between OGIS and NJ Geospatial Forum to draft proposed enabling legislative language

What will it cost?

The funding costs of this effort are minimal or absent. The main costs will be:

1. Under the **status quo**: use of volunteer time to strengthen the NJ Geospatial Forum and OGIS time to continue and strengthen coordination through existing informal mechanisms and meetings.

- o Under **formalization**: Use of political capital to get formalization onto the administration's and/or legislature's agenda. Followed by, OGIS staff time in working with the administration and/or legislation on the enabling language.

Expected Benefits

It is difficult to forecast benefits before a preferred path - i.e., between the status quo and formalization - is chosen. That said, the following general benefits would apply to the simple act of "clarifying governance":

- Increased understanding of NJ's governance model should boost participation and will clarify options for strengthening the chosen model

- The desirability of seeking cooperation on statewide initiatives can be clearly positioned on the governance agenda

- Clarity on priority setting process, and articulation of current priorities can be clearly positioned on the governance agenda

- By articulating the governance structure improved communication among stakeholders can be fostered as stakeholders learn how to better aim their concerns and ideas at those who establish priorities and make decisions

3.3 BUDGET SUMMARY

The following table summarizes anticipated expenditures to implement these recommendations.

Recommended Activity	Initial OGIS Investment*	Ongoing annual OGIS Investment	Overall 5 Year Investment	Description of Expenditure
Statewide parcel data completion & maintenance	$ 60,000	$ 10,000	$ 100,000	Cost represents completion, maintenance and distribution of statewide parcel data layer
Statewide roads maintenance	$ 70,000	$ 90,000	$ 430,000	Cost represents support for transition to new data schema, maintenance, and distribution of data layer
Recurring orthoimagery program	$ 242,600	$ 242,600	$ 1,213,000	Cost represents conventional flight every 5 years at an estimated cost of $800,000 and a licensed flight every 3 years at a cost of $200K, plus OGIS management and distribution
Development of statewide address data**	$ 25,000	$ 10,000	$ 65,000	Cost represents development of address business plan. Cost to develop statewide addresses is TBD. Annual OGIS cost represents maintenance efforts once data is complete.
NJGIN modernization	$ 50,000	$ 20,000	$ 130,000	Cost represents overhaul of existing user interface, improvements capabilities including data retrieval, download, web services, feature services, capability services
TOTAL INVESTMENT	$ 447,600	$ 372,600	$ 1,938,000	

*Assumes annual loaded FTE cost of $100,000

**Does not include actual cost to develop statewide address data

4 APPENDIX: STRATEGIC BUSINESS PLANNING METHODOLOGY

4.1 PROJECT TEAM

4.1.1 Project Oversight

New Jersey Office of Information Technology, Office of GIS

- o Andrew T. Rowan, Ph.D., GISP
- o Douglas M. Schleifer, GISP
- o Edith H. Konopka, Ph.D., GISP

4.1.2 Project Consultants

- o Applied Geographics, Inc.
- o Baker

4.2 PROJECT ACTIVITIES

4.2.1 Update I-Team 2002 Report

Updated current status and desired improvements for framework data layers and added new essential content regarding benefits and uses of these layers.

4.2.2 Information Gathering

Ten workshops were completed in November and December 2011. These workshops were focused on the specific needs of stakeholders from a variety of sectors. Workshops included:

- o State Agencies – General Project Kick-Off
- o Transportation Agencies
- o Environmental Agencies
- o Office of GIS
- o Emergency Management Agencies
- o Counties and Municipalities
- o Data Focused: Roads and Addresses
- o Data Focused: Addresses, Parcels, MOD-IV Tax Assessment, Digital Tax Mapping
- o New Jersey Geospatial Forum
- o New Jersey Geospatial Forum Executive Committee Meeting

4.2.3 Report Authoring

- o Development, circulation, review and approval of a draft report outline

- o Development of budget to support plan recommendations

- o Final report

4.2.4 Roll-out of the New Jersey Strategic Business Plan

- o Education and outreach meetings to begin sharing and describing the plan to the broader stakeholder community

- o Advocacy for carrying out the recommendations

- o Internal meetings to discuss and act upon implementation strategies