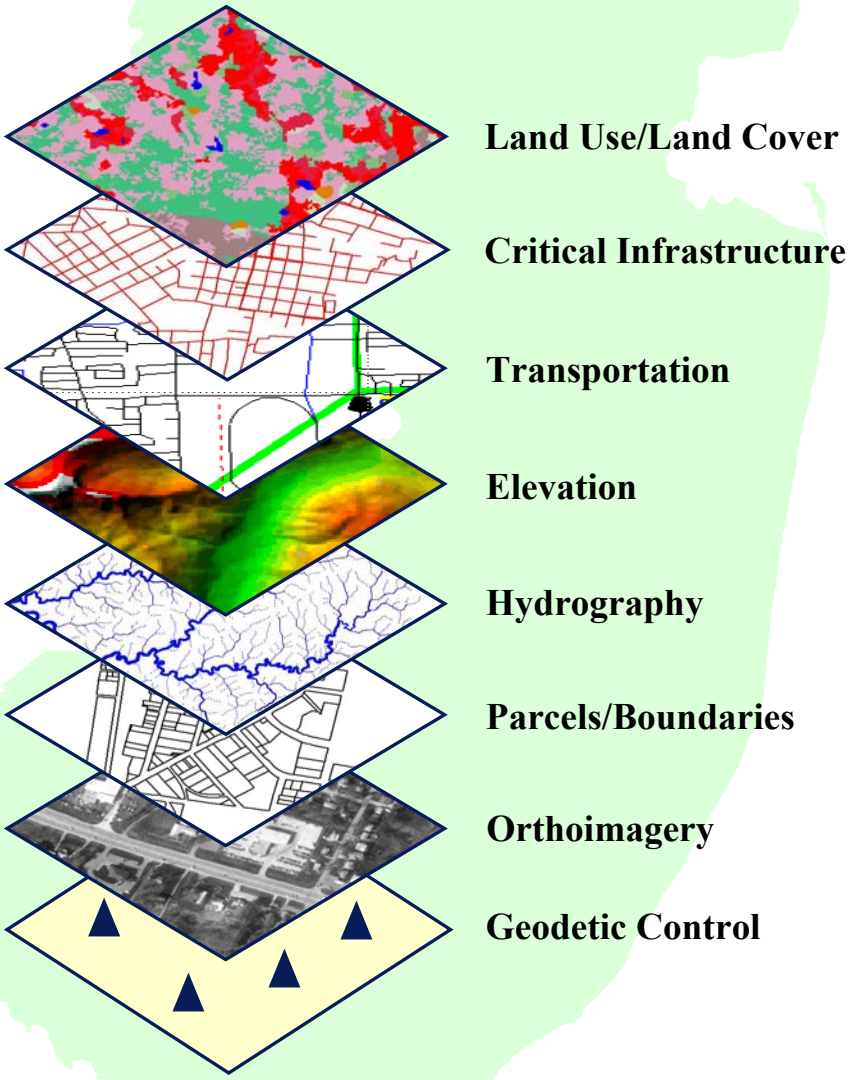
New Jersey
Spatial Data Infrastructure Implementation:

I-Team Strategic Plan

March 2002



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Geodetic Control:	**Josh Greenfeld, NJIT**
Orthoimagery:	**Suzy Hess, NJ OGIS***
Parcels/Boundaries:	**Bruce Harrison, NJ OGIS**
Hydrography:	**Larry Thornton, NJ DEP**
Elevation:	**Suzy Hess, NJ OGIS***
Transportation:	**Joe Perry, NJ DOT**
	Lou Millan, NJ Transit
Critical Infrastructure:	**Tom Rafferty, NJ State Police**
Land Use/Land Cover:	**Larry Thornton, NJ DEP**

*Editor

New Jersey Spatial Data Infrastructure Implementation:
I-Team Strategic Plan
Executive Summary

Introduction

In New Jersey, Geographic Information Systems (GIS) *and* geographic information are significantly affecting how government does business. Approximately 80% of all data used by federal, state, regional and local governments have a spatial or geographic component. To date, federal, state, regional and local governments have invested millions of dollars in the production of digital geographic data specific to New Jersey. The investment in these data is leveraged when user organizations are aware of and have access to the data. However, the investment in these spatial data rapidly depreciates if they are not properly maintained.

Historically, New Jersey's geographic data layers have been funded largely by individual agency appropriations with limited intergovernmental coordination. This process has proved to be ineffective and costly. Spatial data needs to be viewed as any other critical *capital* asset. In order to allocate limited financial resources more efficiently and to avoid duplicative spending, the budgeting process for New Jersey's spatial data infrastructure needs to occur over the long-term life cycle of the geographic data.

A new approach to spatial data financing, development and maintenance is now emerging in New Jersey. Based on recommendations provided by the Federal Office of Management and Budget (OMB) in *Collecting Information in the Information Age* (Appendix A), a statewide Implementation Team or 'I-Team' has been established to prepare a strategic plan for financing, developing and maintaining New Jersey's spatial data infrastructure.

Overview of the Strategic Plan

The following Strategic Plan identifies the organizational structure of New Jersey's I-Team and outlines a development and maintenance strategy for nine initial Enterprise spatial data layers. These include the seven framework datasets that form the foundation for the National Spatial Data Infrastructure (NSDI) and two additional priority datasets that have been identified by the NJ Department of Environmental Protection and the NJ State Police. Cost estimates for each of the datasets are included as a key part of the Strategic Plan. It is anticipated that the New Jersey I-Team planning process will be ongoing and additional geographic data layers will be identified in the future. New Jersey's Strategic Plan to implement a statewide spatial data infrastructure currently includes:

NSDI Framework Data:	*NJ Priority Data:*
Geodetic Control	Critical Infrastructure
Orthoimagery	Land Use/Land Cover
Cadastral (Parcels)	
Government Boundaries	
Hydrography	
Elevation	
Transportation (Road Centerlines)	

New Jersey's I-Team members include representatives from Federal, State, and county government, higher education, and the private sector (Appendix B). In addition, eight (8) Planning Work Groups have been organized and assigned the task of developing I-Team Strategic Plan Chapters based on stakeholder input. The Planning Work Groups are organized as follows:

Planning Work Groups:	**Planning Work Group Chairs:**
Geodetic Control	Josh Greenfeld (NJIT)
Orthoimagery	Suzy Hess (NJ Office of GIS)
Cadastral (Parcels)/Government Boundaries	Bruce Harrison (NJ Office of GIS)
Hydrography	Larry Thornton (NJ DEP)
Elevation	Suzy Hess (NJ Office of GIS)
Transportation (Road Centerlines)	Joe Perry (NJ DOT) Lou Millan (NJ Transit)
Critical Infrastructure	Tom Rafferty (NJ State Police)
Land Use/Land Cover	Larry Thornton (NJ DEP)

Approach

The financing, development and maintenance of New Jersey's spatial data infrastructure will occur following a partnership model. This model requires a commitment from organizations that create and maintain spatial data to work together in a logical stewardship manner. The model encourages the identification of logical roles and responsibilities for production and maintenance of these datasets and relies heavily on the use of the Internet as the vehicle for data sharing. The model also encourages public and private stakeholders to leverage their investments in standardized spatial data layers and content.

In order to build the necessary geographic information infrastructure to support enterprise initiatives such as e-Gov and e-911, the spatial data layers identified above need to be developed in a completely integrated manner for the entire geography of New Jersey. An estimated total *capital* investment of $10,651,684 will be required to achieve this vision.

Enterprise Data Summaries

Chapter 1. Geodetic Control: An estimated **$200,000** is required to complete a statewide network for Cooperative CORS (Continuously Operating Reference Stations) in New Jersey. This enterprise data layer will provide an active geodetic control network consisting of ten (10) CORS stations. GPS users will be able to tie their positioning observations to the network without physically having to occupy a geodetic control point. A statewide system of CORS stations offers lower cost, as well as efficient and accurate positioning necessary to support New Jersey's spatial data infrastructure needs. Once the geodetic control framework layer is in place and readily available throughout the State, all geospatial data will be brought into a common coordinate system at the time the data are collected.

TOTAL COST	FY02 PLANNED INVESTMENT	BUDGET SHORTFALL
$400,000	$200,000	**$200,000**

Chapter 2. Orthoimagery: The New Jersey Office of GIS has initiated a statewide Orthophoto Mapping Program to produce high-resolution color infrared (CIR) orthoimagery. Statewide orthoimagery at a 1:2,400 scale will provide the foundation for deriving other high-resolution enterprise datasets. These include parcels/government boundaries, hydrography, transportation, critical facilities and land use/land cover.

One of the key characteristics of the New Jersey Orthophoto Mapping Program is its flexibility to support a majority of GIS base mapping needs at all levels of government and the private sector. An estimated **$876,684** is required to complete a statewide high-resolution coverage (1:2,400 scale, 1.0 ft. ground resolution, 1"=200') CIR orthoimagery.

TOTAL COST	FY02 PLANNED INVESTMENT	BUDGET SHORTFALL
$1,519,157	$ 642,472.86	**$ 876,684**

Chapter 3. Cadastral (Parcels)/Government Boundaries: To complete a statewide cadastral (parcel) layer with integrated government boundaries, an estimated **$2,000,000** will be required. This figure represents varying degrees of work needed to develop a seamless parcel base with integrated government boundaries for the entire State. This spatial data layer is the foundation for New Jersey's e-Enterprise. Much of the data utilized within *all* levels of government have a geographic element (i.e., coordinate point, street address, or block/lot number). An accurate and seamless parcel/government boundary layer will allow the data to be shared and integrated across the Enterprise. The data will also support many of the State's mission critical applications such as e-911, emergency management and open space acquisition.

TOTAL COST	FY02 PLANNED INVESTMENT	BUDGET SHORTFALL
$2,400,000	$400,000	**$2,000,000**

Chapter 4. Hydrography: An estimated **$2,075,000** is required to complete an integrated hydrographic dataset for the State. This NSDI framework layer will combine spatially accurate hydrographic features with several data attribute tables to generate an integrated hydrographic data layer. The dataset will also incorporate the National Hydrography Dataset (NHD) structure along with supplemental New Jersey specific information to support numerous Federal, State and local government initiatives that require high-resolution hydrographic data.

TOTAL COST	INVESTMENT TO DATE	BUDGET SHORTFALL
$2,155,000	$80,000	**$2,075,000**

Chapter 5. Elevation: An estimated **$2,250,000** is required to complete a statewide coverage of high-resolution digital elevation data. To generate reliable flood hazard maps or to determine the flow patterns of water or hazardous spills during a storm or natural disaster requires accurate data describing the elevation patterns of land. This data can be extracted through the development of digital elevation models (DEMs) calculated as contour intervals. The State of New Jersey intends to develop high-resolution elevation data in partnership with the USGS National Elevation Dataset (NED). In addition, the high-resolution seamless elevation data will meet FEMA specifications for Digital Flood Insurance Rate Map (DFIRM) products, having a contour interval of 2 feet statewide.

TOTAL COST	INVESTMENT TO DATE	BUDGET SHORTFALL
$2,250,000	-	**$2,250,000**

Chapter 6. Transportation (Road Centerlines): State and local government, utilities, and private industry have made considerable investments in developing a multitude of transportation datasets in New Jersey. In advancing an NSDI framework data development effort in New Jersey, the feasibility of incorporating existing legacy datasets into a new standardized transportation data layer is currently being investigated by the Transportation Planning Work Group.

To meet the immediate business needs of multiple state, regional, and local government agencies, the State of New Jersey plans to license a statewide commercial transportation dataset that includes street centerlines with address locating capabilities. Funding for this data has been included in the State of New Jersey, Office of Information Technology Fiscal Year 2002 Budget. Acquisition of a commercial street centerline dataset is intended to augment rather than supplant the NSDI transportation framework proposal discussed in Chapter 6. The Transportation Planning Work Group recognizes that a number of key issues need to be addressed in order to advance an integrated NSDI transportation framework layer for New Jersey.

TOTAL COST	FY02 PLANNED INVESTMENT	BUDGET SHORTFALL
$250,000	$250,000	**$ 0.0**

Chapter 7. Critical Infrastructure: An estimated **$2,450,000** is required to complete a statewide critical infrastructure data layer. Emergency management depends on accurate, up-to-date information on community services and buildings that may be in harm's way. Critical facilities include buildings that may serve as emergency shelters, schools, hospitals, emergency operation centers, fire departments and other public safety facilities, airports, and utilities. Emergency management and planning needs to take into account the places where people congregate in addition to homes and workplaces. The State plans to create a comprehensive, geographically referenced database for all critical facilities that relate to vital community services. Though the data are relatively static, they will be updated periodically by the State in cooperation with county and municipal governments.

TOTAL COST	INVESTMENT TO DATE	BUDGET SHORTFALL
$2,700,000	$250,000	**$2,450,000**

Chapter 8. Land Use/Land Cover (LU/LC): To complete a 2002 Land Use/Land Cover dataset, an estimated **$800,000** will be required. The 2002 aerial photo-based LU/LC data layer will be a spatially accurate, detailed vector dataset describing land use/land cover conditions for the entire state based on high-resolution (1:2,400 scale, 1.0 ft. ground resolution, 1"=200') CIR (color infrared) orthoimagery.

As part of the New Jersey I-Team Initiative, it is envisioned that the proposed Land Use/Land Cover mapping will be accomplished by editing and augmenting the existing 1995/97 LU/LC dataset. In addition, the new enterprise data layer will retain the 1995/97 legacy data attributes, to facilitate change detection and trend analyses.

TOTAL COST	INVESTMENT TO DATE	BUDGET SHORTFALL
$800,000	$ 0.0	**$800,000**

Chapter 1: Geodetic Control

Theme:
A geodetic control network is the wire-frame or the skeleton on which continuous and consistent mapping, Geographic Information Systems (GIS), and surveys are based. To understand the function of geodetic control we have to realize that a map or a plane survey is a flat representation of the curved world. If we want the maps to become an authentic representation of the real world we have to be able to "paste" small pieces of (flat) map contents onto a curved world. The Geodetic Control is the mechanism that enables us to perform this "pasting" seamlessly, accurately and consistently.

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

With the advent of the Global Positioning System (GPS), the framework of the geodetic control network for New Jersey should preferably be 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. Spatial data is georeferenced to the geodetic network by processing roving GPS receiver data with data from CORS stations. Hence, CORS stations offer lower cost, efficient and accurate positioning necessary to support NSDI needs.

Status:
The state of New Jersey has a highly accurate traditional geodetic network in place. New NAD83 (North American Datum of 1983) coordinates for a statewide network of 3,157 horizontal monuments were published in August 1999 (project 17657). The new coordinates include 1,163 GPS monuments whose GPS-derived elevations also were published at that time. Statistics indicate that the NAD83 (1996) coordinates for most of the nearly 1,200 New Jersey GPS monuments, in particular, are compatible with the coordinates for the existing CORS to within 2 centimeters (1 inch) horizontal accuracy and 4 centimeters (2 inches) vertical accuracy. That makes the New Jersey geodetic network one of the densest and most accurate in the entire United States. Information for these monuments, which are all part of the National Spatial Reference System, are available in FGDC Spatial Data Transfer Standard (SDTS) point profile format, used for the transfer of data into a GIS. The most recent Federal Base Network (FBN) and the Cooperative Base Network (CBN) of New Jersey is shown in *Map A (Chapter1)*.

NAD83 (1996) coordinates are expressed as geographic (latitude, longitude, orthometric height) but are also projected onto New Jersey State Plane coordinates whose units are meters.

Two CORS stations are already operating in New Jersey. One at Sandy Hook (operated by the coast guard) and the other at the New Jersey Institute of Technology (operated by the surveying program at NJIT). A statewide plan for Cooperative CORS to support GIS and surveying activities was developed by the New Jersey Society of Professional Land Surveyors (NJSPLS) and NJIT. The proposed network is composed of about 10 CORS stations spaced at 70 Km from each other. This will ensure any GPS receiver throughout the state of New Jersey will be within 35 Km or less of the nearest CORS station. By strategically placing the CORS stations so that the maximum distance to the nearest station is 35 km, the users will get optimal results in a time efficient manner. This will also establish the framework for the CORS network to be used for Real-time GPS in the future. The New Jersey CORS network design is shown in *Map B (Chapter1)*. The actual location of the CORS may differ slightly from that shown in *Map B (Chapter 1)* because of the necessity to identify suitable installation facilities.

Source:
The primary source for geodetic data is the National Geodetic Survey (NGS). NGS, known by other agency names in the past, 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 whose horizontal and/or vertical coordinates are precisely surveyed and computed. In the past NGS was the only agency establishing, maintaining, and publishing high accuracy geodetic control. Due to the nature of the surveying technologies most horizontal control was on mountain peaks, and vertical control followed roads and railroads. To support mapping efforts state agencies such as NJ-DOT would come off the NGS control and survey down to the area of interest using lower accuracy procedures and instruments, but adequate for their mapping projects. Therefore, many geodetic survey stations established with that technology are considered inaccessible by today's surveyors or inappropriate for using GPS technology. The control network continues to diminish in size as stations are destroyed due to construction and vandalism.

With the advent of modern technologies such as GIS, GPS and other electronic instruments, many state, county and local government agencies have undertaken the task of establishing geodetic control. Some of them elected to submit the data to NGS. Data submitted to NGS that comply with standards and specifications are incorporated into the NSRS. Many entities elect not to submit their data to the NGS but will provide those data upon request, while some entities will not provide those data outside the agency. The NSRS is made available free of charge by NGS through direct Internet access (http://www.ngs.noaa.gov/datasheet.html); other methods (CDs, paper products, etc.) incur a cost of dissemination.

State Statute requires professional licensed surveyors in New Jersey to establish geodetic control. Surveyors and their clients should be encouraged to publish geodetic control coordinates within their own jurisdictions and in conjunction with the NGS.

Standards:
Standards for both the establishment of geodetic control and for data transfers are well documented. See FGDC (Federal Geographic Data Committee) Geospatial Positioning Accuracy Standards, Part 2:Standards for Geodetic Networks (FGDC-STD-007.2-1998), and the FGDC Spatial Data Transfer Standard (SDTS), Part 6:Point Profile (FGDC-STD-002.6).

Priority:
The geodetic control layer is of very high priority for Professional surveyors, GIS developers and spatial data gatherers in New Jersey. The rationale being that if geodetic control is readily available throughout the state, all geospatial data will be brought into a common coordinate system at the time the data are collected. This is especially important for the development of a seamless parcel map for the state.

Since geodetic control is a fundamental infrastructure for geo-spatial analysis activities, the higher the interest level in a geographic area, the higher the priority for good geodetic control. Since much of the data collection for geospatial data in New Jersey will be done with GPS receivers, the establishment of a CORS system for the state is of the highest priority. Without such a network, high accuracy data (1.0 ft. ground resolution or better) will be more expensive and time consuming to compile.

Estimated total investment in this theme:
The estimated *total* investment in this theme is $400,000.

Estimated current state and local contributions:
The State of New Jersey, Office of Information Technology has budgeted $200,000 for Fiscal Year 2002.

What is needed:
A coordinated effort by the Federal Partners Team and the NJ Office of GIS to identify entities that will benefit from the New Jersey CORS network and to establish a streamlined funding mechanism for their cost-share contributions to help offset the anticipated budget shortfall.

What is the likely source:
Municipal Government
County Government
NJ Department of Transportation
NJ State Police
U.S. National Geodetic Survey
U.S. Federal Emergency Management Agency
U.S. NOAA – National Weather Service
U.S. Geological Survey
NJ Utilities such as PSE&G and Water companies
Port Authority of New York/New Jersey
New Jersey Society of Professional Land Surveyors.

Estimated total investment needed to complete this theme:
The estimated total investment needed to *complete* this theme is $200,000.

Estimated current allocation of funding including current state and local contributions (Needed, Budgeted, Budget Shortfall):

Needed:	$400,000
Budgeted:	$200,000
Budget Shortfall:	**$200,000**

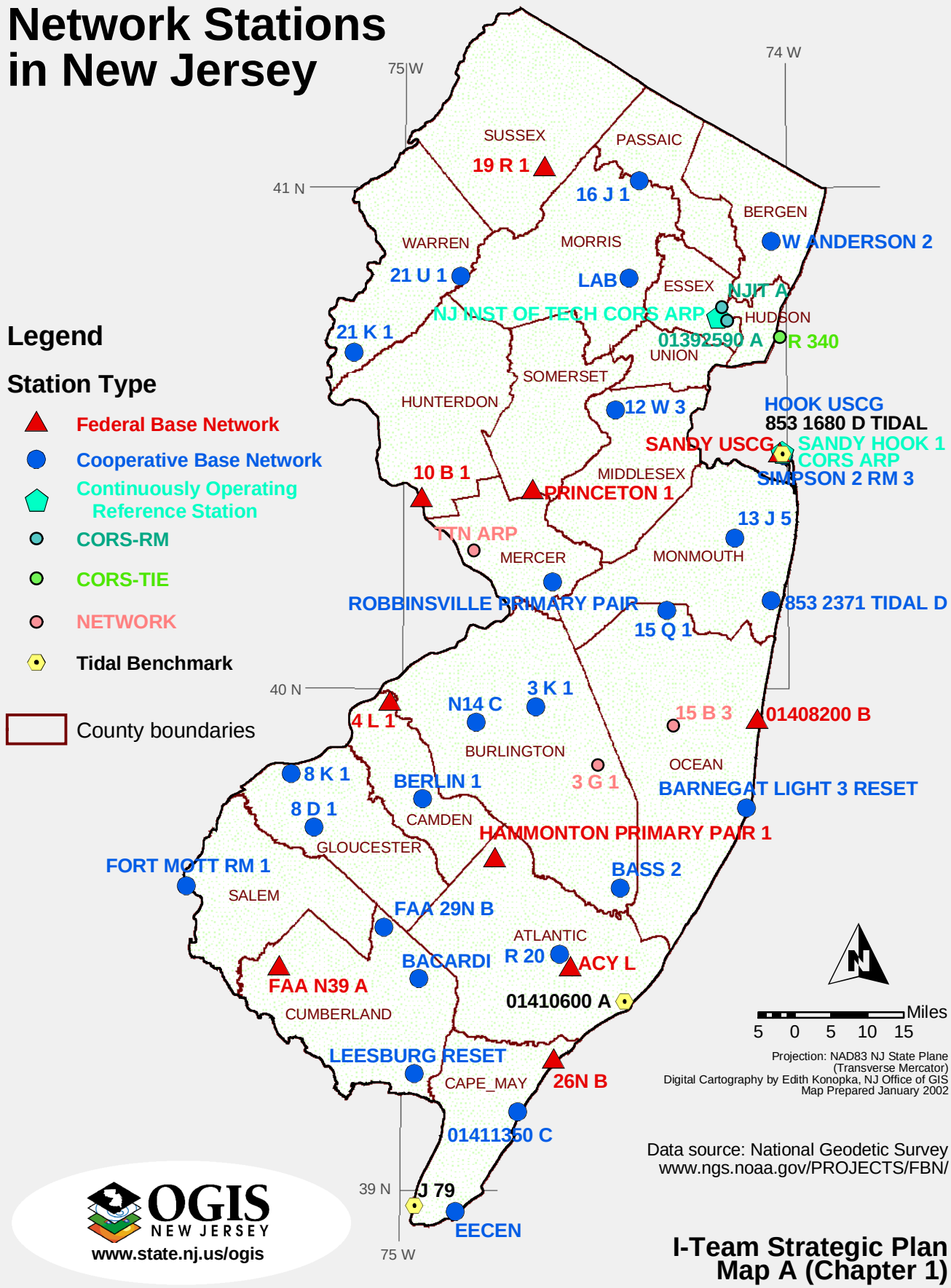
Possible ways to overcome this gap:
A coordinated effort by the Federal Partners Team and the NJ Office of GIS is needed to identify all public and private sector entities that will benefit from the New Jersey CORS network. In addition, a funding mechanism needs to be established for public and private sector cost-share contributions to help offset the $200,000 budget shortfall.

Most appropriate data steward:
The likely location for the New Jersey CORS network center is at the existing CORS station at New Jersey Institute of Technology (NJIT).

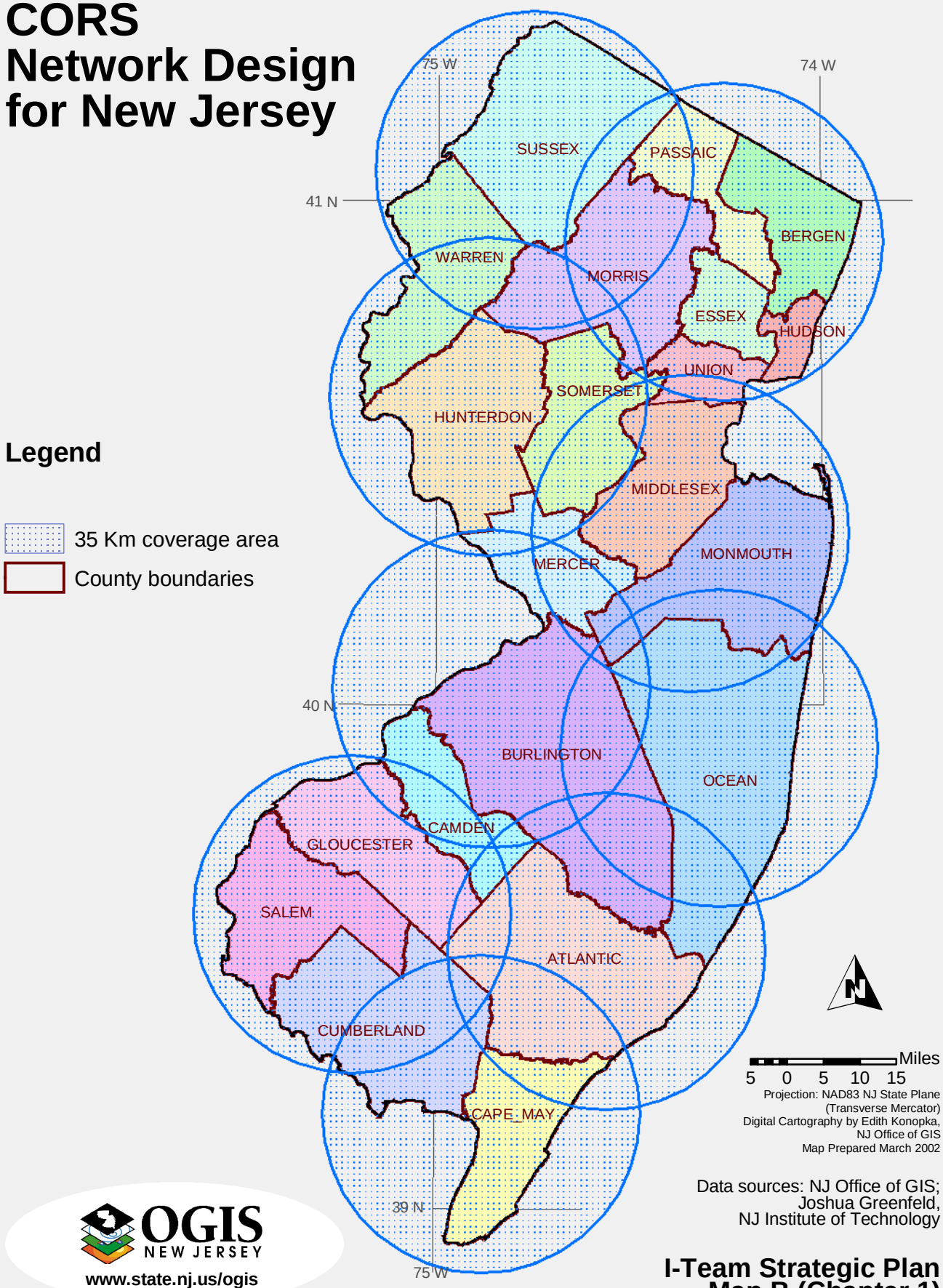
Maintenance:
The New Jersey CORS network plan calls for one station to serve as the data depository and data dissemination center for the entire network. Data from individual CORS stations will be automatically forwarded to a computer at that central station and users will be able to download the data via Internet access. General maintenance occurs on-site at the network center while very little or no maintenance occurs on-site at the other stations because they can be monitored and accessed from the network center. The technology for such a system is available from several GPS vendors who have implemented alike systems in other states. The likely location for the New Jersey CORS network center is at the existing CORS station at New Jersey Institute of Technology.

Estimated maintenance cost:
The estimated cost to maintain the proposed New Jersey CORS network on a yearly basis is $10,000.

Geodetic Control Network Stations in New Jersey



CORS Network Design for New Jersey



Legend

35 Km coverage area

County boundaries

Miles

5 0 5 10 15

Projection: NAD83 NJ State Plane (Transverse Mercator)
Digital Cartography by Edith Konopka, NJ Office of GIS
Map Prepared March 2002

Data sources: NJ Office of GIS; Joshua Greenfeld, NJ Institute of Technology

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I-Team Strategic Plan Map B (Chapter 1)

Chapter 2: Orthoimagery

Theme:
Orthoimagery, or digital orthophotography, provides a positionally correct depiction of the earth. Since the geographic locations of all features appearing on an orthoimage are represented in their true position (coordinate), this dataset is typically regarded as the 'official' GIS base map.

Status:
The State of New Jersey, Office of Information Technology, Office of GIS plans to acquire a statewide layer of high-resolution (1:2,400 scale, 1.0 ft. ground resolution, 1"=200') orthophotography in digital color infrared format (CIR) during 2002-2003. All products from the New Jersey Orthophoto Mapping Program will be placed in the public domain. During December 2001, the New Jersey Purchase Bureau awarded an 18-month contract to BAE Systems, ADR Inc. (Pennsauken, NJ) to complete this work by June 2003. One of the key characteristics of the New Jersey Orthophoto Mapping Program is its flexibility to support a majority of GIS base mapping needs at all levels of government, the private and non-profit sectors, and the academic community.

Source:
The last set of statewide public domain CIR digital orthophotography for New Jersey was flown in 1995/1997, and developed in cooperation with the USGS National Mapping Division, National Aerial Photography Program (NAPP). See *Map A (Chapter 2)*. The 1995/1997 statewide orthoimagery dataset was compiled and produced by the U.S. Geological Survey (USGS) with funding support from state and federal agencies. Standard USGS digital orthophotos (1:12,000 scale, 1-meter ground resolution, 1"=1,000') are currently available for download from the New Jersey Spatial Data Clearinghouse: http://njgeodata.state.nj.us.

Standards:
The orthoimagery dataset derived from the New Jersey Orthophoto Mapping Program will be tested for positional accuracy using the Federal Geographic Data Committee (FGDC), Geospatial Positioning Accuracy Standards, Part 3: National Standard for Spatial Data Accuracy (NSSDA). The State will use NSSDA procedures to validate the accuracy of contractor-delivered orthoimagery. Specifically, the digital orthophoto products will have a $\pm$ 4 ft. horizontal accuracy (95% confidence level, NSSDA) for 1.0 ft. ground resolution; and a $\pm$ 6 ft. vertical accuracy (95% confidence level, NSSDA) sufficient to meet the horizontal accuracy requirement for orthorectification. (See FGDC-STD-007.3-1998).

Other relevant FGDC standards include Geospatial Positioning Accuracy Standards, Part 1:Reporting Methodology (FGDC-STD-007.1-1998); Geospatial Positioning Accuracy Standards, Part 2:Standards for Geodetic Networks (FGDC-STD-007.2-1998); and the Content Standard for Digital Geospatial Metadata (FGDC-STD-001-1998). These and other FGDC standards can be viewed at http://www.fgdc.gov/standards/standards.html.

Priority:
The development of a high-resolution orthoimagery framework layer is a very high priority for the State of New Jersey. The current 1995/1997 CIR statewide orthoimagery (1:12,000 scale, 1-meter ground resolution, 1"=1,000') no longer supports a majority of GIS base mapping needs of state, county, regional, and municipal government agencies.

In addition, up-to-date high-resolution orthoimagery is needed to serve as the foundation for a seamless statewide parcel base of New Jersey and other spatial data infrastructure layers such as transportation (road centerlines), hydrography, government boundaries, critical infrastructure, and land use/land cover.

Estimated total investments in this theme:
Production costs for the New Jersey Orthophoto Mapping Program are $1,281,657 and quality assurance costs are $237,500. The estimated *total* investment in this theme is $1,519,157.

Estimated current state and local contributions:
The State of New Jersey, Office of Information Technology has encumbered $642,473 for Fiscal Year 2002.

What is needed:
A financial commitment from the U.S. Geological Survey with respect to the Innovative Partnership Proposal Application (Program Announcement 00HQPA0007) recently submitted by the New Jersey Office of Information Technology.

In addition, a coordinated approach by the Federal Partners Team and the NJ Office of GIS is needed to identify other federal agencies that will benefit from the New Jersey Orthophoto Mapping Program and to establish a streamlined funding mechanism for their cost-share contributions. The overall goal is to leverage federal, state, and regional government funds in obtaining 2002 high-resolution CIR orthoimagery for the public domain as part of the National Spatial Data Infrastructure (NSDI).

What is the likely source:
Delaware Valley Regional Plan Commission (DVRPC)
North Jersey Transportation Planning Authority (NJTPA)
South Jersey Transportation Planning Organization (SJTPO)
U.S. Homeland Security Office
U.S. Army Corp of Engineers
U.S. Census Bureau
U.S. Federal Emergency Management Agency
U.S. Environmental Protection Agency
U.S. Department of Transportation

Total investments needed to complete this theme:
The total investment needed to *complete* this theme is $876,684.

Estimated current allocation of funding including current state and local contributions (Needed, Budgeted, Budget Shortfall):

Production Costs:		Quality Assurance Costs:	
Needed:	$1,281,657	Needed:	$ 237,500
Budgeted:	$ 604,973	Budgeted:	$ 37,500
Budget Shortfall:	**$ 676,684**	Budget Shortfall:	**$ 200,000**

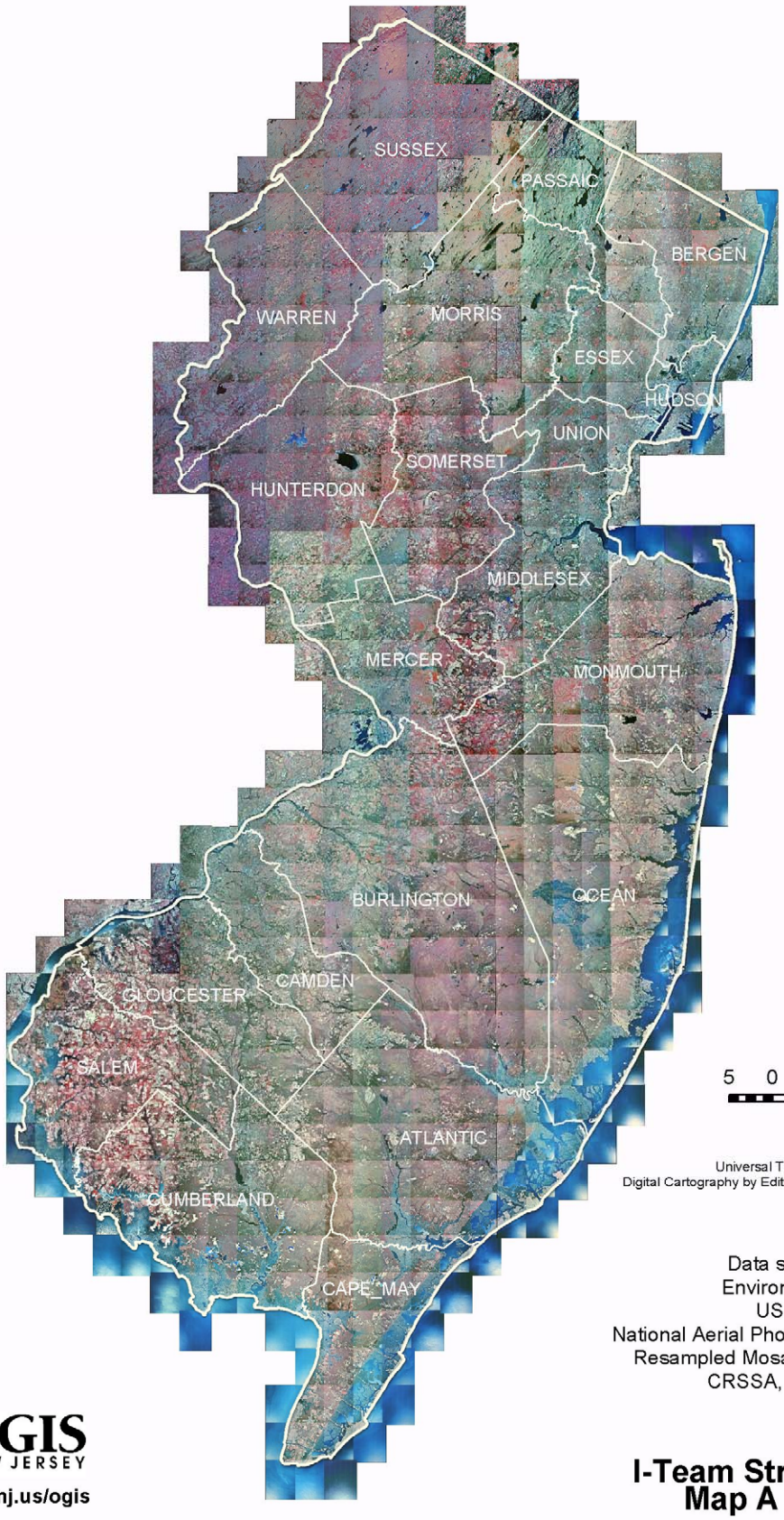
Possible ways to overcome this gap:
The New Jersey Office of Information Technology, Office of GIS has applied for federal assistance from the U.S. Geological Survey under an Innovative Partnership Proposal.

Most appropriate data steward:
The NJ Office of Information Technology, Office of GIS is the most appropriate data steward for this NSDI framework data layer. The EROS Data Center (EDC) in Sioux Falls, South Dakota (http://edcwww.cr.usgs.gov/eros-home.html) will be used as the primary archive point for the original aerial roll film and uncompressed TIFF image files.

Maintenance:
The NJ Office of Information Technology, Office of GIS anticipates a 3-5 year orthoimagery update cycle.

Estimated maintenance cost:
Not known at this time.

1995/1997 NAPP Orthoimagery Mosaic



5 0 5 10 15
Miles

Projection: NAD83
Universal Transverse Mercator Zone 18
Digital Cartography by Edith Konopka, NJ Office of GIS
Map Prepared March 2002

Data sources: NJ Dept of Environmental Protection;
US Geological Survey National Aerial Photography Program;
Resampled Mosaic by John Bognar CRSSA, Rutgers University

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I-Team Strategic Plan
Map A (Chapter 2)

New Jersey Orthophoto Layouts

Legend

NJ Orthophoto
Mapping Program (2002-2003)
5,000 ft x 5,000 ft Tiling System

1995/1997 NAPP
Quarter Quadrangle (3.5 min)
boundaries

5 0 5 10 15 Miles

Projection: NAD83 NJ State Plane
(Transverse Mercator)
Digital Cartography by Edith Konopka, NJ Office of GIS
Map Prepared March 2002

Data sources: NJ Department of
Environmental Protection;
NJ Office of GIS

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I-Team Strategic Plan
Map B (Chapter 2)

1995/1997 Quarter Quadrangle Orthophotography
City of Trenton, NJ

Feet
500 0 500 1,000 1,500

Projection: NAD83 NJ State Plane
(Transverse Mercator)
Source Scale 1:12,000 1 inch = 1,000 ft
Digital Cartography by Edith Konopka, NJ Office of GIS
Map Prepared March 2002

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This frame shows approximately one tenth of a 1995/97 NAPP quarter quadrangle color infra-red orthophoto

Data source: NJ Department of Environmental Protection

I-Team Strategic Plan
Map C (Chapter 2)

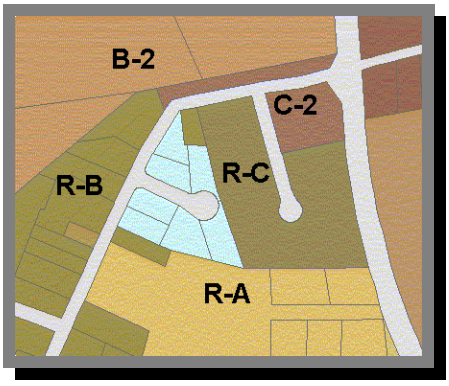
Chapter 3: Cadastral (Parcels)/Government Boundaries

Theme:

One of the priority initiatives for the New Jersey Office of Geographic Information Systems (NJ OGIS) is the development of a statewide land ownership or parcel data layer. A parcel data layer has been identified as a key component of New Jersey's spatial data infrastructure. This geographic data layer will play an important foundational role in the development of New Jersey's e-Enterprise allowing for the integration of individual government stovepipe systems in place across the state. Additionally, the development of a parcel dataset will complement the New Jersey Division of Taxation Property Assessment and Management Systems (PAMS) currently under development. Moreover, parcel data is a critical dataset for emergency preparedness and response planning relative to the recently enacted "New Jersey Domestic Security Preparedness Act".

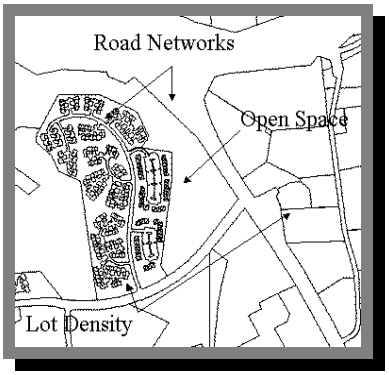
Example of a portion of a parcel data layer displayed over a digital orthophoto.

From a Geographic Information System (GIS) standpoint, parcels are polygon map features that indicate land ownership and can be used alone or in conjunction with other layers to establish spatial relationships. A statewide, seamless parcel data layer would serve as a foundation for many types of mapping and analysis through visual display, attribute selection and linkage to associated tabular data.



Parcels color-coded by zoning classification.

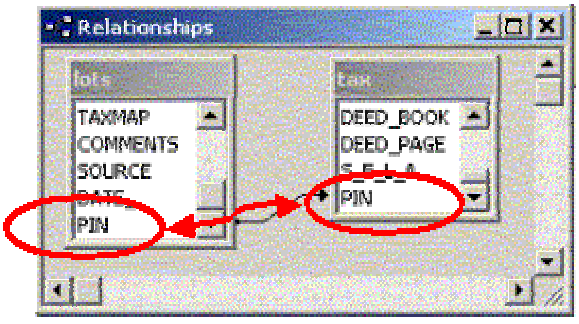
Visually, property boundaries add context to maps that allows users to better orient themselves. Simply displaying the property lines provides the user with general information about lot density, open space and road networks.



Parcel boundaries illustrating lot density, open space and road networks. The features can be linked to associated tabular data for specific information.

Lot lines or areas can also be categorized though attributes to indicate their type, such as right-of-way, condominium, or hydrographic boundary. Parcel attributes can be used to query, select, or analyze data in projects such as open space ranking, business location analysis and emergency response scenarios.

Parcels can be linked through the unique parcel number to property assessment data, providing further analysis capabilities. Property assessment and other associated tabular data can be linked to query and map features such as state owned land, parks, airports and other properties, affording state, county, municipal and business users with a tremendously useful planning and analysis tool. The parcel features may also be linked to images of the tax maps or enhanced to include the required elements as specified in the New Jersey official Tax Map Regulations – the Blue Book. The latter methodology would position New Jersey to move toward a statewide digital tax map system.



Parcel attribute table related to tax data table through the unique Parcel Identification Number (PIN) field.

For additional information, the needs and significant benefits of a digital parcel layer are well documented in "Digital Parcel Mapping- Standards and Strategies for New Jersey's

Parcel Mapping Communities", published by URISA, with significant input from New Jersey's GIS community.

Status:
Currently, several counties and individual municipalities have developed digital parcel layers and are using them for mapping, analysis and making more informed business decisions. In addition to local projects, NJOGIS is committed to the development of the New Jersey Parcel Data Model, which includes a parcel mapping pilot project scheduled to take place in Atlantic County. This project coincides with the NJMAPP (see Appendix C) program and the establishment of local government geodata nodes on the NJ Geographic Information Network (NJGIN). Under the program, the state will provide GIS training, hardware, software, technical support and Web applications to counties, and counties will add data to New Jersey's Geographic Information Network in return. *Map A (Chapter 3)* shows a preliminary status of parcel mapping in the State. The NJ OGIS is seeking input as to what areas are mapped, as well as accuracy and availability so that we can continue to build a seamless statewide coverage. A status map can also be viewed and modified on the web at
http://njgeodata4.state.nj.us/i-map/parcelmapstatus/default.asp.

Standards:
Standards for parcel layer development are currently under revision. The proposed standards are based on the ESRI ArcGIS Parcel Data Model and geodatabase technology, but are also tied to the Federal Geographic Data Committee (FGDC) National Standard for Spatial Data Accuracy (NSSDA), FGDC Cadastral Data Content Standard and the FGDC standards for orthoimagery and geodetic control. These and other FGDC standards can be viewed at http://www.fgdc.gov/.

Priority:
Parcel data layer development is a high priority for the New Jersey as well as many local governments. OGIS has begun the process of developing a statewide parcel data model and intends to move forward with the above-mentioned parcel pilot project.

Estimated total investment in this theme:
To complete a statewide cadastral layer with integrated government boundaries, an estimated *total* of $2,400,000 will be required. This figure represents a varying degree of work needed to develop a seamless parcel data layer with integrated government boundaries for the entire State. A statewide seamless parcel data layer is the foundation for New Jersey's e-Enterprise. Much of the data utilized within all levels of government have a geographic element (i.e. street address or block/lot number). An accurate and seamless parcel/government boundary layer will allow this data to be shared and integrated across all levels of government as well as the State's business community. The data will also support many of the New Jersey's mission critical applications such as e-911, emergency management, economic growth and open space preservation.

Estimated current state and local contributions
The State of New Jersey, Office of Information Technology has budgeted $400,000 for Fiscal Year 2002.

What is needed:
The development of the parcel data layer requires development and establishment of high-resolution CIR orthoimagery (1:2,400 scale, 1.0 ft. ground resolution, 1"=200'), geodetic control, transportation, hydrography and government boundary data layers.

What is the likely source:
Federal Government
State Government
Local Government

Estimated investments needed to complete this theme:
The estimated investment needed to *complete* this theme is $2,000,000.

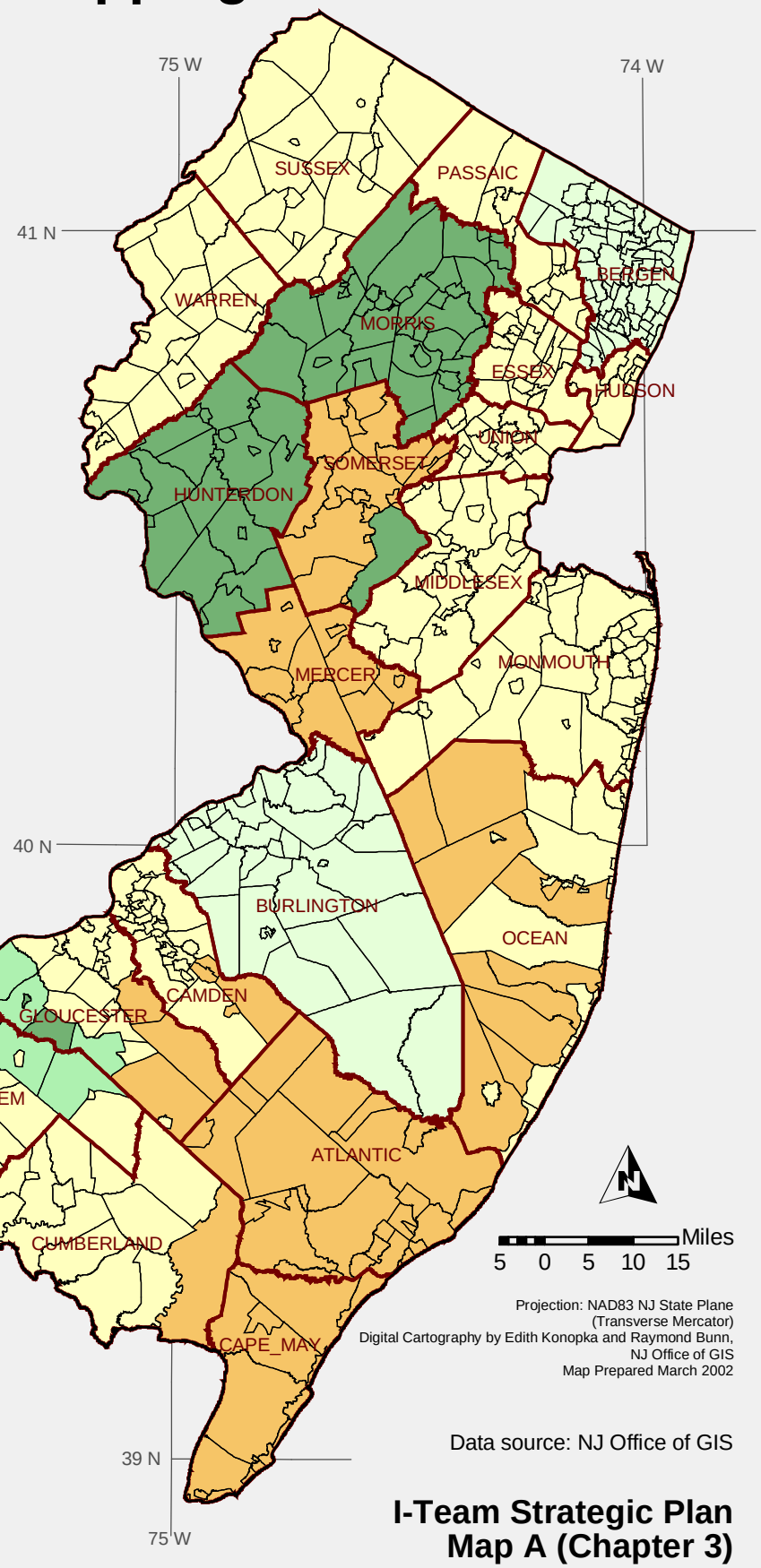
Estimated current allocation of funding include current state and local contributions (Needed, Budgeted, Budget Shortfall):

Needed:	$2,400,000
Budgeted	**$** 400,000
Budget Shortfall:	**$2,000,000**

Most appropriate data steward:
As part of the Parcel Data Model project, the NJ Office of GIS is developing tools to increase the efficiency of the maintenance process. Parcel data will be shared openly through NJGIN and the features will be maintained consistently at the local government level.

Maintenance:
NJGIN provides the infrastructure to maintain parcels at the county level or below. Tools and methodologies exist that will allow municipalities or their authorized consultants to update parcel or tax map data through the NJGIN portal. Under this maintenance program, the State will receive a copy of the updated parcel data layer on a regular basis.

Status of Parcel Mapping in New Jersey as of March 11, 2002



Legend

Status

- Incomplete/Unknown
- Proposed 2002
- Proposed 2003
- Features Nearing Completion (active work in progress)
- Partially Mapped (no known activity)
- Features Mapped
- Complete (conforms to Parcel Data Model)

- Municipal boundaries
- County boundaries

Projection: NAD83 NJ State Plane (Transverse Mercator)
Digital Cartography by Edith Konopka and Raymond Bunn, NJ Office of GIS
Map Prepared March 2002

Data source: NJ Office of GIS

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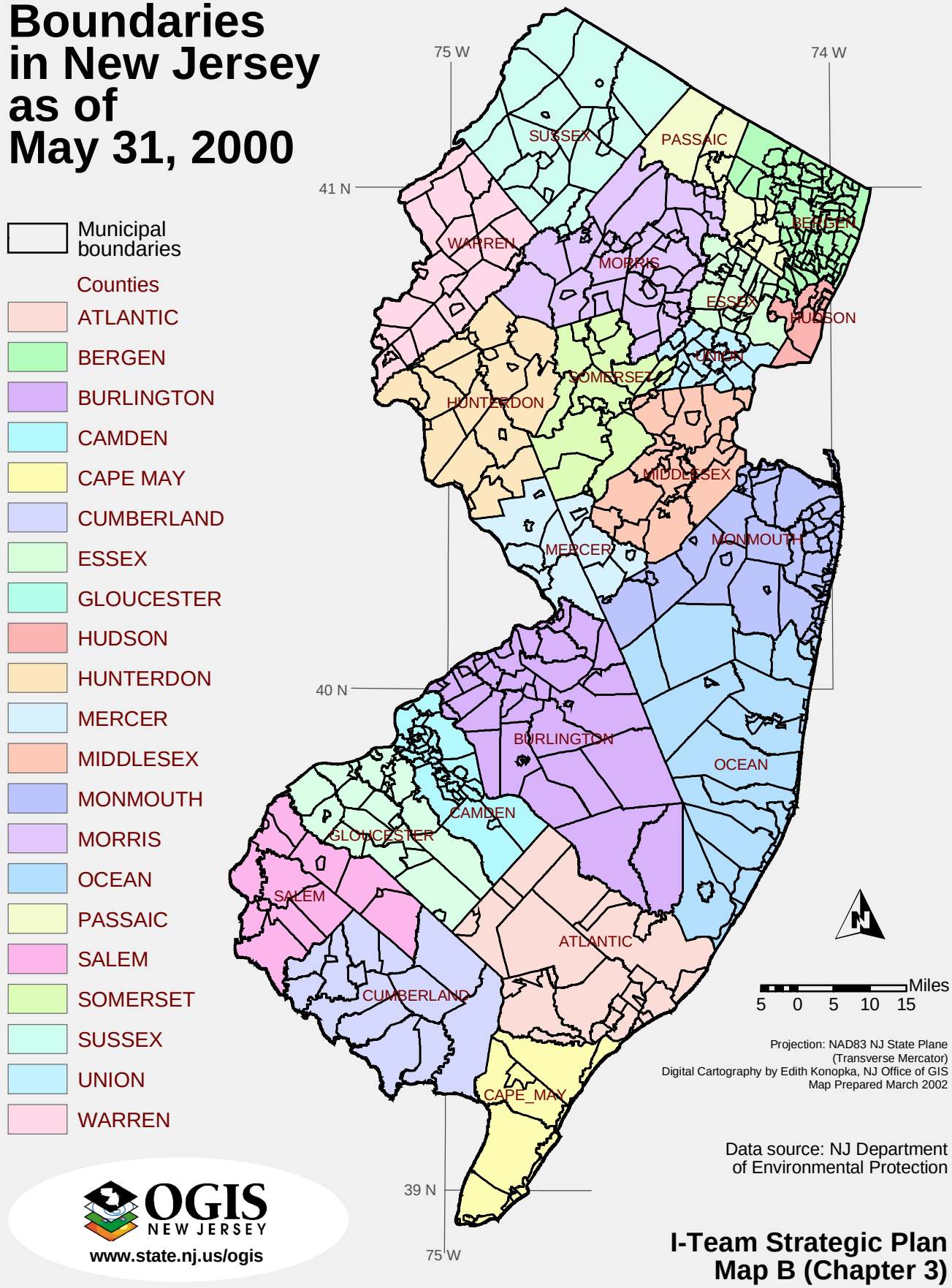
I-Team Strategic Plan Map A (Chapter 3)

Government Boundaries in New Jersey as of May 31, 2000



Projection: NAD83 NJ State Plane
(Transverse Mercator)
Digital Cartography by Edith Konopka, NJ Office of GIS
Map Prepared March 2002

Data source: NJ Department of Environmental Protection

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I-Team Strategic Plan
Map B (Chapter 3)

Chapter 4: Hydrography

Theme:
The New Jersey integrated hydrography dataset will combine spatially accurate hydrographic features with several data attribute tables to generate an integrated data layer that will support a wide variety of hydrologic based analyses. These data attribute tables will conform to the structure of the National Hydrography Dataset (NHD) http://nhd.usgs.gov/. The proposed dataset will also include New Jersey specific attributes such as Surface Water Classifications, alternate local water body names for streams, lakes and ponds, tidal and non-tidal water feature designations, and links for water quality information from the New Jersey Surface Water Quality Monitoring Network Database. By combining the NHD data attribute structure along with supplemental New Jersey specific information, this integrated hydrography dataset will support numerous federal, state, regional and local government initiatives.

Source:
The primary source for the vector hydrographic layer(s) will be the existing 1:24,000 stream and water body coverages existing for the state of New Jersey. These layers were generated from the 1:24,000 DLG files of the USGS. The DLG layers were modified by the state to improve spatial accuracy of some components at the 1:24,000 scale, and to add some additional attributes that are used in various state analyses to the database. A portion of the water body vector layer has also been spatially corrected to the 1995/1997 1:12,000 scale color infrared (CIR) digital orthophotography, as part of a non-tidal wetlands mapping project. These water body areas, however, have not been fully attributed.

The attribute sources will include:
- U.S. EPA for the RF3 Reach Files;
- NJ DEP for the Surface Water Classifications;
- U.S. Geological Survey for digital line graphics (with modifications by NJ DEP);
- GNIS and NJ DEP for the water body and stream naming strategy; and
- STORET database for the Surface Water Quality Network attributes.

Status:
The State of New Jersey, through the Department of Environmental Protection, presently has a JFA (Joint Funding Agreement) in place with the U.S. Geological Survey through which the U.S. EPA Reach file data tables are being added to the existing hydrographic vector layers to produce NHD compatible datasets. The NHD layers will be produced in two phases. The first will involve the hydrologic units forming the Delaware River drainage. The remaining hydrologic units in the state will be developed in the second phase. Delivery of the first phase products is scheduled for June 2001; delivery of the second phase products is November 2001.

The approved Surface Water Classifications for the State of New Jersey have been developed and attached to the state edited hydrographic vector layers. These attributes will need to be conflated to the NHD compatible datasets.

In addition, the fully attributed vector layers will need to be spatially edited to match, at a minimum, color infrared (CIR) digital orthophotography captured in 1995 and 1997 (1:12,000 scale, 1-meter ground resolution, 1"=1,000'). The DLG data layers, generated from lower resolution base maps originally referenced in NAD27, do not match the 1995/1997 orthoimages referenced in NAD83.

Black/white aerial photography was captured for ten (10) New Jersey counties in March 2000, as part of a Delaware Valley Regional Planning Commission (DVRPC) project. The black/white orthoimagery derived from the 2000 overflight is at scale of 1:2,400 (1"=200') with a ground resolution of 1.5'.

Plans are also underway, as part of the New Jersey Spatial Data Infrastructure initiative, to produce high-resolution color infrared (CIR) digital orthophotography for the entire state (See Chapter 2). This high-resolution CIR digital orthophotography will be derived from a 2002 overflight and will be available by June 2003.

Standards:
The two standards for the NHD will be applicable to this dataset: "USGS Technical Instructions for the National Hydrography Dataset-High Resolution," November 1997, and the "USGS National Mapping Program Technical Instructions: Standards for National Hydrography Dataset," July 1999.

The New Jersey Surface Water Quality Standards will be those reported in N.J.A.C. 7:9B

The Surface Water Quality Network standards are those reported in the STORET DATABASE.

Lake and Stream naming conventions will be those as reported in Geographical Names Information System (GNIS), and those developed by the NJ DEP.

Existing 1:12,000 scale orthoimagery was produced to meet National Map Accuracy Standards (NMAS) for 1:12,000 scale orthoimagery. Files were produced through a joint venture with USGS and a coalition of New Jersey State Mapping Advisory Committee (SMAC) partners as part of the National DOQ program. (DOQ standards are provided in "National Mapping Program Technical Instructions: Standards for Digital Orthophotos" USGS National Mapping Division, 1993)

The 2002 color infrared (CIR) orthoimagery derived from the New Jersey Orthophoto Mapping Program will have a $\pm$ 4 ft. horizontal accuracy (95% confidence level, National Standard for Spatial Data Accuracy (NSSDA) for 1.0' Ground Resolution Distance, and a $\pm$ 6 ft. vertical accuracy (95% confidence level, NSSDA). See Federal Geographic Data Committee (FGDC), Geospatial Positioning Accuracy Standards, Part 3: National Standard for Spatial Data Accuracy (FGDC-STD-007.3-1998).

Priority:
A pilot study is proposed to help refine data tasks and complexities. All data tasks involved in spatially correcting all linework and, in conflating the spatially accurate vector layers with all attribute tables should be attempted for one complete area. It is anticipated that the study area will be New Jersey Watershed Management Area 20.

In addition, since several state of New Jersey programs presently use hydrography data layers, it is proposed that the 2000 black/white orthoimagery from DVRPC be used as the mapping base for spatially correcting the linework. This image resolution exceeds that needed for NHD compliance, and will allow delineation of hydrographic features at a spatial accuracy sufficient for on-going state programs. When available, the 2002 high-resolution CIR statewide orthoimagery will be used as the delineation base. In this way, the update of this integrated hydrography dataset can begin as soon as funding is procured, and the pilot study is completed, without significantly holding up ongoing or planned state initiatives that require spatially accurate hydrography data layers. New Jersey counties with 2000 black/white orthoimagery will define the priority schedule.

Estimated total investment in this theme:
The estimated *total* investment is this theme is $2,155,000.

Estimated current state and local contributions:
The NJ Department of Environmental Protection has allocated $80,000 for a pilot study.

Estimated total investment needed to complete this theme:
The estimated total investment needed to *complete* this theme is $2,075,000.

Estimated current allocation of funding including current state and local contributions (Needed, Budgeted, Budget Shortfall):

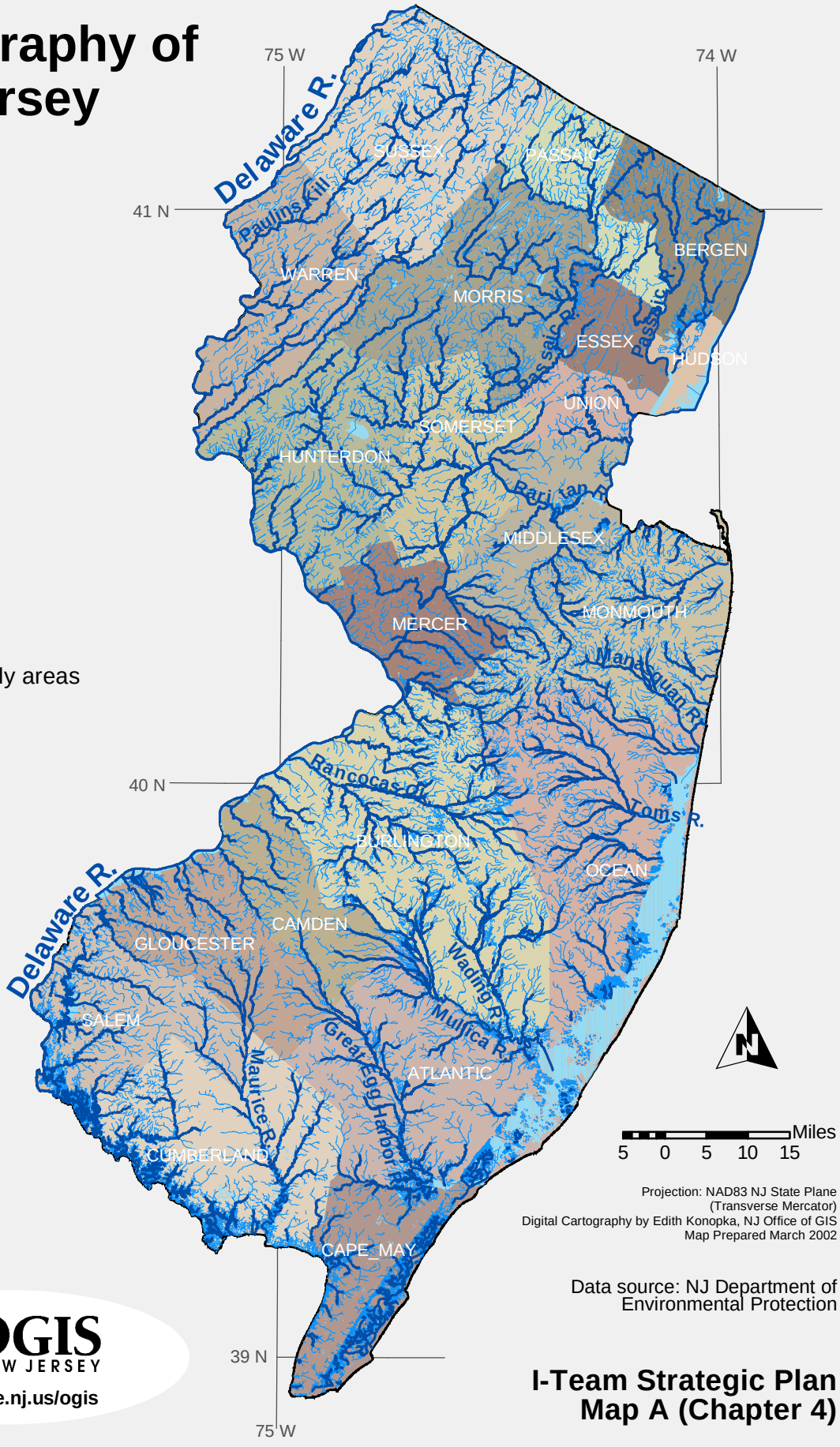
Needed:	$2,155,000
Budgeted:	$ 80,000
Budget Shortfall:	**$2,075,000**

Describe Ways to Fund This Gap:
Funding to complete the development of this statewide integrated hydrography dataset, will come from a coalition of federal, state, regional, and local government partners with interests in hydrographic data. These partners will be coordinated through the Federal Partners Team, the NJ Department of Environmental Protection, and the New Jersey Office of GIS. A Hydrography Task Force is being created for this purpose. The State Mapping Advisory Committee (SMAC), a standing committee of the NJ Geographic Information Council, will also serve as a coordinating agency.

Most Appropriate Data Steward:
The NJ Department of Environmental Protection is the most appropriate data steward.

Maintenance Process and Costs:
The maintenance costs and update frequencies are unknown at this time.

Hydrography of New Jersey



Legend

- Rivers
- Streams
- Water body areas

Projection: NAD83 NJ State Plane
(Transverse Mercator)
Digital Cartography by Edith Konopka, NJ Office of GIS
Map Prepared March 2002

Data source: NJ Department of Environmental Protection

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I-Team Strategic Plan
Map A (Chapter 4)

Chapter 5: Elevation

Theme:
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. The data can also be used for watershed management, viewshed 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.

There are many ways to represent elevation datasets. The standard product that the U.S. Geological Survey (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.

One of the priority initiatives for the New Jersey Office of GIS is to coordinate the development of a seamless high-resolution digital elevation model (DEM) for the entire state. A high-resolution DEM will be produced using Light Detection and Ranging (LIDAR) technology.

The State of New Jersey intends to develop high-resolution elevation data in collaboration with the USGS National Elevation Dataset (NED) initiative. The proposed high-resolution seamless elevation dataset will meet FEMA specifications for Digital Flood Insurance Rate Map (DFIRM) products, having a vertical resolution of 2 feet statewide.

Status:
Under a Joint Funding Agreement (JFA) with the U.S. Geological Survey, the NJ Department of Environmental Protection (NJ DEP) has recently acquired 10-meter DEMs for the state of New Jersey. The data have a 10-meter cell resolution. NJ DEP staff are currently converting the data files into a usable ArcInfo GRID file format for GIS users in the state. The individual quad data files have also been merged together by Watershed Management Areas (WMAs).

Source:
In New Jersey, the primary source for 10-meter DEMs is the U.S. Geological Survey (USGS). The NJ Office of GIS is currently coordinating with the NJ Department of Environmental Protection to post the USGS 10-meter DEMs to the Spatial Data Clearinghouse http://njgeodata.state.nj.us.

Standards:
FEMA Base Map Standards for new Digital Flood Insurance Rate Map (DFIRM) products - vertical RMSE of 18.5 centimeters; horizontal RMSE of 1 meter; and DEM point spacing of 5 meters. http://www.fema.gov/mit/tsd/mm_lidar.htm.

Federal Geographic Data Committee (FGDC), Geospatial Positioning Accuracy Standards, Part 3: National Standard for Spatial Data Accuracy (NSSDA). See FGDC-STD-007.3-1998. http://www.fgdc.gov/standards/status/sub1_3.html.

Federal Geographic Data Committee (FGDC), Draft Standard for Digital Elevation Data. http://www.fgdc.gov/standards/documents/proposals/prodigel.html.

Priority:
The development of a high-resolution seamless elevation dataset is a high priority for the New Jersey Office of Information Technology, Office of GIS.

Estimated total investment in this theme:
The estimated *total* investment in this theme is $2,250,000.

Estimated current state and local contributions:
The State of New Jersey has currently not budgeted any funds for this enterprise dataset.

What is needed:
A coordinated approach by the Federal Partners Team, the NJ Office of GIS, and the NJ Department of Environmental Protection, to identify all entities that will benefit from high-resolution elevation data and to develop a streamlined funding mechanism for their cost-share contributions.

What is the likely source:
Delaware Valley Regional Plan Commission (DVRPC)
North Jersey Transportation Planning Authority (NJTPA)
South Jersey Transportation Planning Organization (SJTPO)
U.S. Army Corp of Engineers
U.S. Federal Emergency Management Agency
U.S. National Oceanographic and Atmospheric Administration
U.S. Environmental Protection Agency
U.S. Department of Transportation

Total investments needed to complete this theme:
The total investment needed to *complete* this theme is $2,250,000.

Estimated current allocation of funding including current state and local contributions (Needed, Budgeted, Budget Shortfall):

Needed:	$2,250,000
Budgeted:	$ 0
Budget Shortfall:	**$2,250,000**

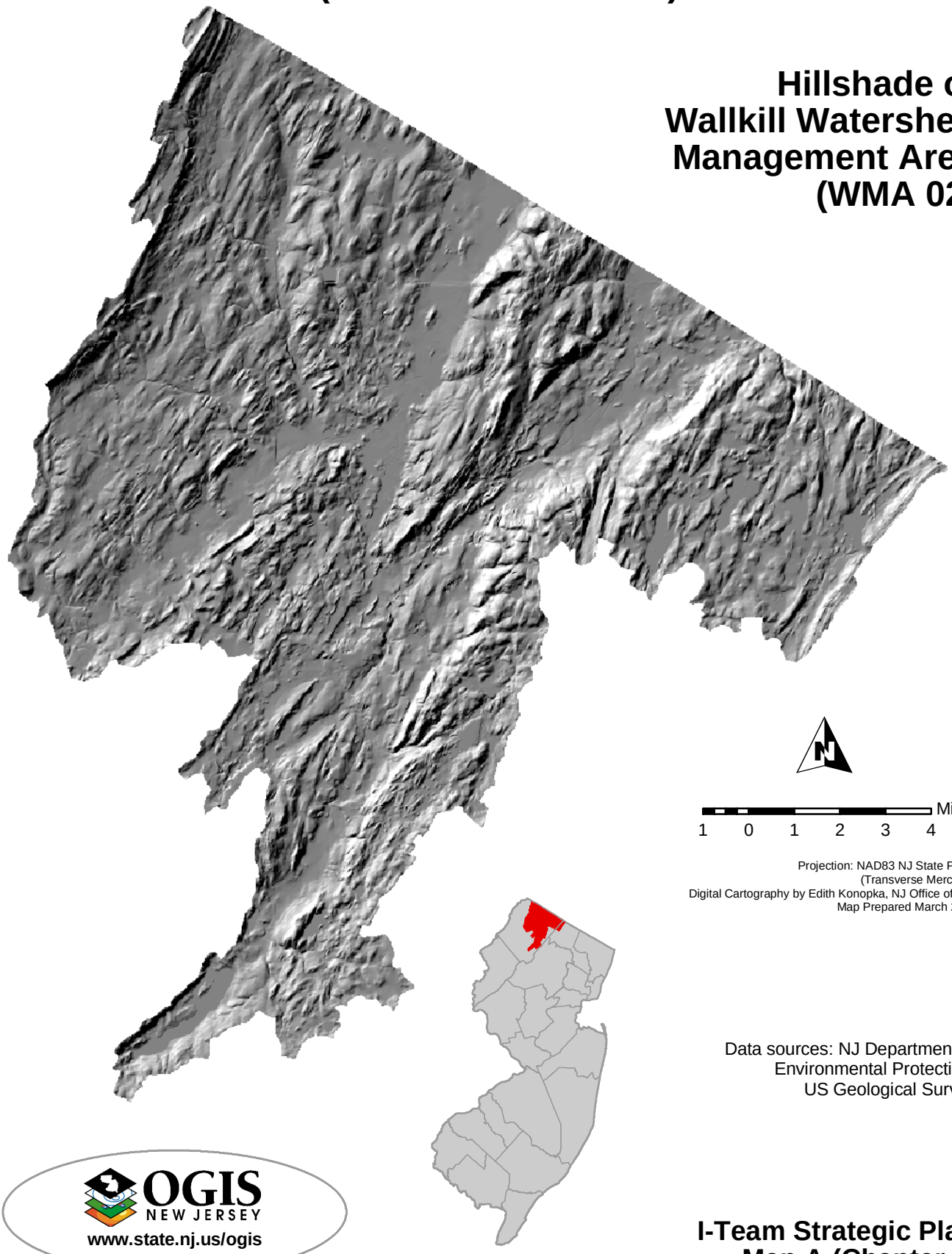
Possible ways to overcome this gap:
As part of the National Elevation Dataset (NED) initiative, the U.S. Geological Survey has developed a program of partnering with state governments to improve the quality of existing elevation data.

Most appropriate data steward:
The NJ Office of Information Technology, Office of GIS is the most appropriate data steward for this enterprise dataset.

Maintenance:
N/A

Estimated maintenance cost:
N/A

Digital Elevation Model
(10-Meter Resolution)



Hillshade of Wallkill Watershed Management Area (WMA 02)

N

1 0 1 2 3 4 Miles

Projection: NAD83 NJ State Plane
(Transverse Mercator)
Digital Cartography by Edith Konopka, NJ Office of GIS
Map Prepared March 2002

Data sources: NJ Department of Environmental Protection;
US Geological Survey

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I-Team Strategic Plan
Map A (Chapter 5)

Chapter 6: Transportation (Road Centerlines)

Theme:
Transportation data for use within geographic information systems (GIS), particularly *road centerline data*, present a particular challenge to an NSDI framework data compilation effort. Within the public sector, transportation data development efforts have typically been undertaken to satisfy particular business needs. Data development initiatives necessarily followed from desired business applications in pavement management, asset management, customer information, market research, demographics, planning, and operations support. In most cases, data are developed and maintained in-house, including such entities as roads, highways, and other rights-of-way and physical features. In other cases, spatial data are created through reference to other sources, public and private. Geocoded data are representative of the latter case.

Status:
In New Jersey, state and federal agencies, local governments, utilities, and private industry have already made considerable investments in developing transportation (road centerline) GIS data. In advancing a New Jersey I-Team initiative, there are valid questions about the feasibility of using existing transportation data resources or developing new data, and either option has several associated issues that would need to be addressed. In New Jersey, the challenge lies in balancing a multitude of considerations to assure the appropriateness, feasibility, and cost effectiveness, of any effort to develop transportation framework data. These data currently include the entire highway network (NJDOT), the public transportation network (NJ TRANSIT), TIGER/Line files, several county, municipal, and utility-sponsored road networks and land bases, and commercial map databases from at least three private vendors. Also underway is a regional MPO-sponsored effort by the Delaware Valley Regional Planning Commission (DVRPC) that may result in the creation of yet another transportation dataset. This effort is referred to as the DVRPC *Regional Transportation GIS Design and File Architecture Project* and has four primary goals:

1. Expand the use of GIS among all transportation planning partners and assist all members to improve their capacity as needed to reach a common operational level.
2. Evaluate the transportation GIS file developed and maintained by federal and state agencies, DVRPC member governments, and transit operators to determine how they can be used in an accurate and regionally consistent manner.
3. Provide for the seamless exchange of GIS data files and the integration of planning infrastructure among all member governments and operating agencies.
4. Structure the region-wide GIS design so that it can be expanded and enhanced by individual partners, while maintaining its consistency and exchangeability.

DVRPC's consultant, Johnson, Mirmiran, and Thompson/Enterinfo/TransDecisions, is exploring two alternatives that utilize member agencies' existing files to share and map data between different linear referencing systems. The first alternative will use a simplistic transformation based on controlled geometric relationships between disparate base networks within a similar projection system. The second alternative represents a

more advanced transformation system using an implementation of the NSDI Transportation Framework which will allow a more accurate and controlled transformation to be performed between disparate systems, and provides a more stable methodology for the organization, storage, and retrieval of linearly referenced data.

The effort currently underway at DVRPC provides New Jersey with a very good opportunity to observe how these issues are addressed in the DVRPC region. This effort is particularly pertinent also, because it involves many of the same governmental units and agencies that we are concerned with.

Sources:
The necessity of undertaking an I-Team transportation framework data development effort in New Jersey may be called into question because several transportation spatial data products are currently available from the private sector. Their products are designed to support business applications in market research, demographics, mapping, and in some cases, vehicle location and driver guidance. There are likely several limitations, however, regarding a potential role for private sector data products within a framework scheme, including:

- Suitability of private spatial data products for certain applications
- Limitations on data use and distribution (propriety)
- Public sector responsibility to not confer favor upon a single vendor to the exclusion of others
- Inability of governmental units to indemnify private companies for use of their products.
- Similarly, the willingness of private companies to indemnify governmental units.

What is needed:
An initial research effort would be required to assess existing data resources, determine potential data development activities, and recommend a framework data development scheme. Any proposed transportation (road centerline) data development effort in New Jersey must adequately address the following:

- What are the users' needs?
  - Who are the users?
  - Are their needs bona fide and realistic?
- Can existing public or private data resources meet those needs?
  - Is a public sector effort warranted considering the presence of private sector data products?
  - What are the benefits and limitations of each potential data resource?
  - Does the data resource meet the FGDC Framework standards? Could it be made to? What are the associated issues?
- Will new data need to be developed?
- Could a patchwork quilt solution apply, one that utilizes suitable existing resources and, if necessary, fills the gaps with new data?
- Are there incremental steps that can be taken?
- Are there alternative approaches?

It is not known whether a single spatial data product can satisfy all user needs, or the

FGDC standard, in a sustainable way. Any effort to develop transportation framework data must avoid the temptation towards a "one size fits all" approach that could easily lead to misapplication of GIS data developed or designed for a particular application. This approach, unfortunately, is often advanced within a well-intentioned GIS user community, as well as by private sector vendors seeking new markets for their spatial data products. If the framework initiative was to rely on a single data resource, the research effort must assure that all considerations and needs could be satisfied.

Any proposed framework data development scheme must be achievable and sustainable, addressing the following:

- Is the proposed data development/data integration scheme feasible?
  - Is funding available? Long term?
  - Are agency efforts or resources required? Can they be attained?
- Who will manage the effort? Is their role realistic? Appropriate?
- Who will perform the work? Is their role realistic? Appropriate?

Will data development, maintenance, and oversight responsibilities and schemes be sustainable over the long term? For more than even a year or two?

Standards:
Public and private data development activities have been advanced without overarching standards, interoperability, or very much regional oversight. The apparent "overlap" between all of these data resources gives the impression of costly redundancy. This is not entirely true, because many datasets are significantly different from each other despite the fact that they may overlap geographically. Typically, each product was developed to meet a particular business need and may not be suitable for certain other applications. These differences may include:

- Positional accuracy
- Source data and compilation method
- Frequency of updating and sources of update information
- Geometric representations of:
  - Interchanges and ramps
  - Vertical representations and over/underpasses
  - Linear representation of lanes and divided highways
  - Associated node/link structures
- Attribution content, including:
  - Address ranges, sources, and compilation methods
  - Alternate street names, highway nomenclature, and associated standards
  - Turn restrictions and one way streets
- Suitability for linear referencing, dynamic segmentation, network analysis, and supporting data and graphical structures contained therein
- Errors

Priority:
It is likely that most agencies, utilities, and companies would be reluctant to abandon transportation datasets in which they have made considerable investment and have put to good use. For this reason, the proposed research effort must seek to identify alternatives to transportation (road centerline) data development. The goal of an alternative approach

would be to offer the broader user community valid transportation data resources within a framework scheme, while retaining the value of existing data investments. Is it possible to incorporate multiple transportation datasets within a framework scheme?

Ideally, an alternative approach would facilitate interoperability between several different datasets, public and/or private, falling under the framework banner. Within the "interoperability" scheme, users of a particular digital map would be able to incorporate and fully integrate data from a variety of other framework sources. Spatially overlapping datasets would be fully capable of transferring attribute and geometric data between corresponding segments in each of the datasets. This type of approach could potentially offer considerable savings when compared to the full costs of data development and/or integration. Such a scheme could also negate any limitations to data exchange and sharing. For these reasons, it is proposed that this aspect of the research be prioritized.

To meet the immediate business needs of multiple state, regional, and local government agencies, the State of New Jersey plans to license a statewide commercial transportation dataset that includes street centerlines with address locating capabilities. Funding for this data has been included in the State of New Jersey, Office of Information Technology Fiscal Year 2002 Budget. Acquisition of a commercial street centerline dataset is intended to augment rather than supplant the NSDI transportation framework proposal outlined above. The Transportation Planning Work Group recognizes that a number of key issues need to be addressed in order to advance an integrated transportation framework layer for New Jersey. The Work Group also recognizes that sufficient funding necessary to address the transportation framework proposal above will not be available in the current fiscal year, and recommends that the proposal be prioritized in the following fiscal year, or as soon as sufficient funding becomes available.

Estimated total investment in this theme:
The estimated *total* investment in this theme is $250,000.

Estimated current state and local contributions:
The State of New Jersey, Office of Information Technology has budgeted $250,000 for Fiscal Year 2002.

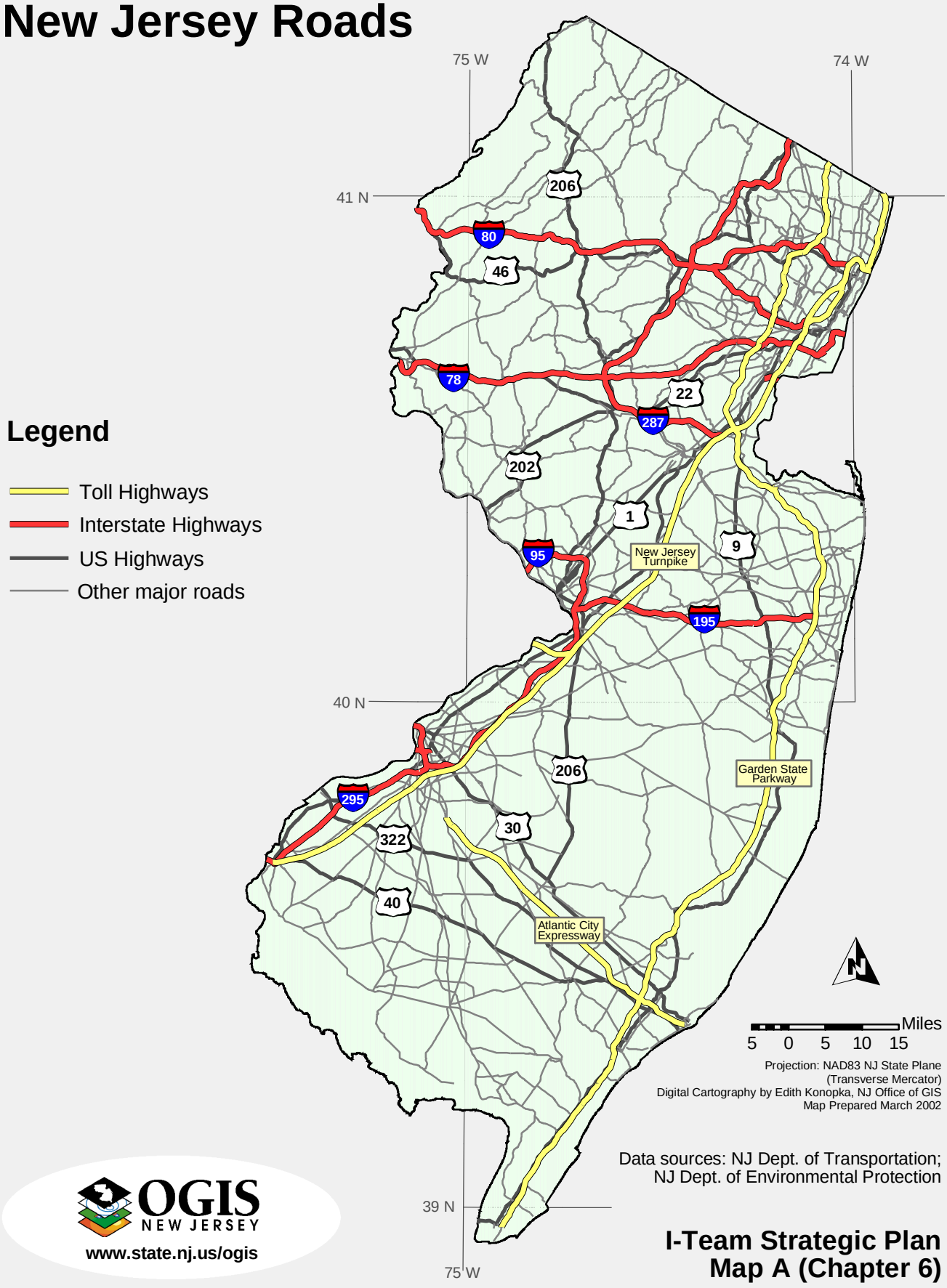
Estimated current allocation of funding including current state and local contributions (Needed, Budgeted, Budget Shortfall):

Needed:	$250,000
Budgeted:	$250,000
Budget Shortfall:	**$ 0**

Most appropriate data steward:
The NJ Office of Information Technology, Office of GIS is the most appropriate data steward.

Estimated maintenance costs:
Not known at this time.

New Jersey Roads



Chapter 7: Critical Infrastructure

Theme:
Emergency management in the state of New Jersey is coordinated through the New Jersey State Police – Office of Emergency Management (NJ OEM) and requires communication among federal, state, and local government as well as private sector entities that operate during disasters. The focal point for this communication occurs at the State Emergency Operations Center (EOC) located in State Police Headquarters in West Trenton. During emergencies state and federal agencies send representatives to the state EOC. At the same time in counties where the emergency is occurring operate their EOCs to respond to the event. The nature of the event determines which agencies are represented at the EOC. All calls relating to the event (such as resource requests and situation reports) are reported to the state EOC where they can be handled by the appropriate agency.

Emergency management takes on an all-hazard approach. Events occur in two categories – natural and technological. In New Jersey the majority of events are natural, specifically coastal and snow storms. Recently the State of New Jersey played a supporting role with the City and State of New York during the terrorist attacks on September 11, 2001. Regardless of the event they are managed in four phases – preparedness, response, recovery, and mitigation. GIS can play an important role in each of the four phases.

Preparedness is the initial phase. During this phase representatives from various stakeholder groups plan for the worst-case scenario of a disaster. Resources are pledged, operations plans are prepared and key infrastructure are identified.

Response is the second phase. During this phase the event has occurred and the EOCs are activated. Emergency responders make the initial assessment and all the energy is focused on bringing basic services back online. The key infrastructure is utilized in their emergency roles, be it staging areas, an event location, or a means to get resources to their intended destinations.

The recovery phase is third. During this third phase, the event is over and the cleanup begins. Teams are sent into the field to assess damage. The key infrastructure is overlaid against the damage area to provide analysis in establishing the amount of aid to be made available to the public. The response and recovery phases are the two that the general public is most aware of emergency activities taking place.

The final phase is mitigation. It is during this phase that the plans are reviewed. An assessment of the response and recovery occurs and recommendations are made to improve the safety of the public the next time an event of this nature occurs. Current key infrastructure is analyzed and new ones may be identified to prevent the reoccurrence of the event.

Status:
One advantage of an all hazard approach to emergency management is that the same people and data are used for multiple events. Personal relationships are forged and data sharing begins. Spatial data that are collected by one agency are passed among the other agencies that request it so everyone is looking at the same data when the event occurs. An added benefit of this is that large amounts of existing spatial data can be organized in a short amount of time to analyze the event.

Specific data layers that have been identified as key infrastructure include but are not limited to the following (*italicized items are currently in use in NJ OEM's GIS*):

EOCs	Police Stations & *Coverage Areas*	*Hospitals*
Water Treatment Plants	Fire Stations & *Coverage Areas*	Nursing Homes
Wastewater Treatment Plants	EMS Stations & *Coverage Areas*	Special Needs Housing
Sewage Pumps	Public Schools	Public Housing
Maintenance Yards	Private Schools	Emergency Shelters
Power Generating Plants	Day care facilities	*Government Buildings*
Power Substations	Senior Citizen Housing	*Armories*
Drinking Water Intakes	*Dams*	*Static Bridges*
Suspension Bridges	*Tunnels*	Train Bridges
Roadways	*Airports*	*Helipads*
Passenger Ferries	*Railroad Station Stops*	Freight Train Yards
Subway Stations & Tubes	*Bus Routes*	*Bus Garages*
Military Sites	TCPA Sites	SARA Sites
Communication Towers	Gas Lines	Electric Lines
Telecommunication Sites	*Evacuation Routes*	*Ingestion Zones*
Weather Stations	*Stream Gauges*	*Reservoirs*
Storm Surge Areas	*Floodplains*	*Prisons*
Congressional Districts	State Legislative Districts	Stadiums
Sports Arenas	*Casinos*	College Buildings & Facilities
Population Demographics	Ports	*Hydrography*

Sources:
Numerous agencies work regularly with the NJ OEM. Each provides data that are crucial to the success of emergency management and an emergency coordinator to facilitate interaction among the agencies. Likewise they should be helpful in developing the key infrastructure data. Agencies include but are not limited to the following:

New Jersey State Police – Office of Emergency Management
New Jersey Department of Agriculture
New Jersey Department of Banking
New Jersey Department of Commerce
New Jersey Department of Community Affairs
New Jersey Department of Corrections
New Jersey Department of Education
New Jersey Department of Environmental Protection
New Jersey Department of Health and Senior Services
New Jersey Department of Human Services
New Jersey Department of Labor
New Jersey Department of Law and Public Safety
New Jersey Department of Military and Veteran Affairs
New Jersey Department of Personnel
New Jersey Department of State
New Jersey Department of Transportation
New Jersey Department of Treasury
New Jersey Board of Public Utilities
New Jersey Casino Control Commission
New Jersey Judiciary
New Jersey Office of Emergency Telecommunications Services
New Jersey Office of Legislative Services
New Jersey Office of Information Technology
New Jersey Transit
New Jersey State Fire Coordinator
Port Authority of New York and New Jersey
American Red Cross
Civil Air Patrol
U.S. NOAA - National Weather Service
Salvation Army
United States Coast Guard
Verizon Telephone Company
U.S. Federal Emergency Management Agency (FEMA)
Atlantic County Office of Emergency Preparedness
Bergen County Office of Emergency Management
Burlington County Emergency Management Services
Camden County Office of Emergency Management
Cumberland County Office of Emergency Management
Essex County Office of Emergency Management
Gloucester County Office of Emergency Management
Hudson County Office of Emergency Management
Hunterdon County Office of Emergency Management
Mercer County Office of Emergency Management
Middlesex Office of Emergency Management
Monmouth County Office of Emergency Management
Morris County Office of Emergency Management

Ocean County Bureau of Emergency Management
Passaic County Office of Emergency Management
Salem County Department of Emergency Services
Somerset County Office of Emergency Management
Sussex County Office of Emergency Management
Union County Division of Environmental Health and Emergency Management
Warren County Office of Emergency Management

What is Needed:
In addition to the non-italicized items listed above, recent events have shown the need for a system capable of developing spatial data in a time-sensitive form. The rail tunnel fire in Baltimore initially showed the need to have HAZMAT routes captured spatially. As the event unfolded new communication technologies (i.e. internet infrastructure) were compromised. These new communications lines should be treated like any other public utility transmission line. The terrorist attacks in New York City demonstrated the need to have data accessible in hard and soft copies stored at alternate sites since the city's EOC was located in the World Trade Center. The anthrax events in New Jersey conveyed the need for a more automated incident tracking system so spatial analysis can be conducted in real time.

Standards:
Spatial data created in the response and recovery stages should be developed with the best possible accuracy the tabular data allow due to the time critical need for GIS data. Once in the mitigation stage these data should be updated to a more spatial accurate dataset if possible. At the least, all metadata should be captured. Spatial data will be registered to the New Jersey State Plane (NAD83) coordinate system and tied to the geodetic control section of the New Jersey Spatial Data Infrastructure initiative.

Priority:
Prior to the events of September 11, 2001 key infrastructure data sharing among the agencies listed was sporadic. Since then every agency listed has provided data to NJ OEM and the supporting agencies that requested. In this spirit of cooperation any additional datasets that are identified and exist should be the first priority in building the key infrastructure data in the state. The second priority should be to determine which datasheets that are not currently created and to provide a means to collect and maintain the data. NJ OEM is currently budgeting monies for calendar year 2002 for county offices of emergency management to purchase hardware that will enable them to capture the needed data. In return NJ OEM asks the counties to provide access to the data collected with these funds.

Estimated total investment in this theme:
The estimated *total* investment in this theme is $2,700,000.

Estimated current state and local contributions:
NJ OEM has budgeted $150,000 for fiscal year 2002 to expand the spatial data. An additional $100,000 in pass through grants has been earmarked for county offices of emergency management to gather spatial data.

What is needed:
A coordinated effort among the agencies is needed to reduce duplication of effort. A central repository of the key infrastructure data should be set up through the New Jersey Office of GIS. A back up copy should be kept at the New Jersey Office of Emergency Management for events that require their office to be sealed off from the rest of the State Police Headquarters and other state data servers.

What are the likely sources:
Every agency listed above will be responsible in some manner for gathering and maintaining the spatial data that falls under their jurisdiction.

Estimated total investments needed to complete this theme:
The estimated total investment needed to *complete* this theme is $2,450,000. Some of the funds required will also be used to complete other framework data such as transportation and hydrography.

Estimated current allocation of funding including current state and local contributions (Needed, Budgeted, Budget Shortfall):

Needed:	$2,700,000
Budgeted:	250,000
Budget Shortfall:	**$2,450,000**

Ways to overcome this gap:
Identify entities that will benefit from producing and using key infrastructure data and ask them to contribute time, money, and labor to collect data.

Maintenance:
The agencies that are tasked with the collection and ownership of the data should also be required to maintain the attributes. Since this requires a large number of agencies to interact amongst each other, NJ OEM should take the lead in coordinating the maintenance of Key Infrastructure Data.

Estimated maintenance cost:
The estimated cost to maintain the proposed New Jersey Key Infrastructure Data on a yearly basis is $1,000,000.

Chapter 8: Land Use/Land Cover

Theme:
The 2002 Land Use/Land Cover (LU/LC) data layer will be a spatially accurate, detailed vector dataset describing land use and land cover conditions for the entire state.

Source:
The New Jersey Department of Environmental Protection (NJ DEP) has undertaken several statewide LU/LC mapping projects over the last fifteen years. The first layer was compiled from 1986 color infrared (CIR) photography, using the Anderson classification system (Anderson et al, 1976) as modified by NJ DEP. The minimum mapping unit (MMU) for this project was 2.5 acres, with polygons mapped to 1:24,000 scale aerial photo base maps. Approximately 35 categories were mapped. Subsequent to that mapping, a detailed freshwater wetlands (FWW) dataset was created from the interpretation of the same 1986 CIR imagery. The FWW mapping, however, used a 1 acre MMU, with delineations derived from 1:12,000 scale aerial photo base maps, and the Cowardin classification system (Cowardin et al, 1979). Over 500 classes were mapped in this detailed effort. When both of these datasets were completed, they were converted to digital data layers separately. They were then merged together to form a baseline LU/LC data layer that the NJ DEP has used as a key GIS dataset. This spatial data layer has also been widely distributed to other stakeholder groups throughout the state of New Jersey.

Through a joint project with the USGS, the NJ State Mapping Advisory Committee (SMAC), and several other state and federal partners, updated CIR orthoimagery was acquired in 1995/97. The 1986 baseline LU/LC dataset was updated to reflect LU/LC conditions as shown on the 1995/97 orthoimagery. The update was accomplished as an edit function to the baseline dataset, using heads-up digitizing over the 1995/97 digital image files. The actual land use/land cover determinations were still based on interpretation of stereo-paired CIR aerial imagery. The Anderson classification system was again used; however, approximately 60 categories were mapped for the 1995/97 update. The MMU was also reduced to 1 acre. As part of this update process, the 1986 baseline dataset was re-evaluated in light of the additional categories and reduced MMU. The coding structure in this dataset is such that land use/land cover as it existed both in 1986 and 1995 can be extracted for all polygons, at a variety of levels. In this way, change analysis for all land categories can be undertaken for the 1986 to 1995 time period from this one data layer. Impervious surface percentages were estimated and coded for each land use polygon.

As part of the New Jersey I-Team Initiative, it is envisioned that the proposed 2002 Land Use/Land Cover mapping will be accomplished by editing and augmenting the existing 1995/97 LU/LC dataset. In addition, this new enterprise data layer will retain the 1995/97 legacy data attributes, to facilitate change detection and trend analyses. As new aerial photography and orthoimagery is acquired, the latest LU/LC layer would be edited to reflect LU/LC conditions on the new imagery. Additional codes would be added to the attribute table to reflect the conditions of the new imagery source. The updated layer,

however, would still retain the legacy data attributes, so that change detection and trend analyses could be completed.

Status:
The NJ DEP has completed the 1995/97 Land Use/Land Cover dataset. This base layer is in a digital format and will be updated when the 2002 orthoimagery is available.

The planned 2002 aerial photo-based LU/LC update will be a spatially accurate, detailed vector dataset describing land use/land cover conditions for the entire state based on high-resolution (1:2,400 scale, 1.0 ft. ground resolution, 1"=200') color infrared (CIR) orthoimagery.

Standards:
The LU/LC layer will be based on the Anderson classification system, as modified by the NJ DEP. Additional attributes may be added based on discussions with the user community. Classification accuracy should be 90% or better for all categories.

Priority:
Development of a new 2002 LU/LC dataset is a priority for the NJ DEP. At this time, no mapping priority areas have been established.

Estimated total investment in this theme:
The estimated *total* investment in this theme is $800,000.

Estimated contributions by sector:
Contributions may come from a consortium of federal, state, county, and municipal organizations that have a need for LU/LC data. The consortium will be organized through the New Jersey Office of Information Technology, Office of GIS. The NJ DEP does plan to be a major contributor to this effort due to the importance of LU/LC data to many NJ DEP initiatives.

Estimated investments needed to complete this theme:
It is estimated that approximately $800,000 will be needed to perform the 2002 LU/LC update. Increasing the detail of the LU/LC layer by adding new categories, reducing the MMU, or examining additional data attributes, will increase the cost. Estimates of these additional costs can not be made at this time. In addition, no monies have yet been earmarked for the LU/LC update.

Estimated current allocation of funding including current state and local contributions (Needed, Budgeted, Budget Shortfall):

Needed:	$800,000
Budgeted:	$ 0
Budget Shortfall:	**$800,000**

Possible ways to overcome this gap:
The NJ DEP Management Team is aware that LU/LC data are an important part of many statewide environmental initiatives, and realizes the need for routine, periodic updates to this dataset. The team is exploring ways to insure that some funding is set aside in Fiscal Year 2003.

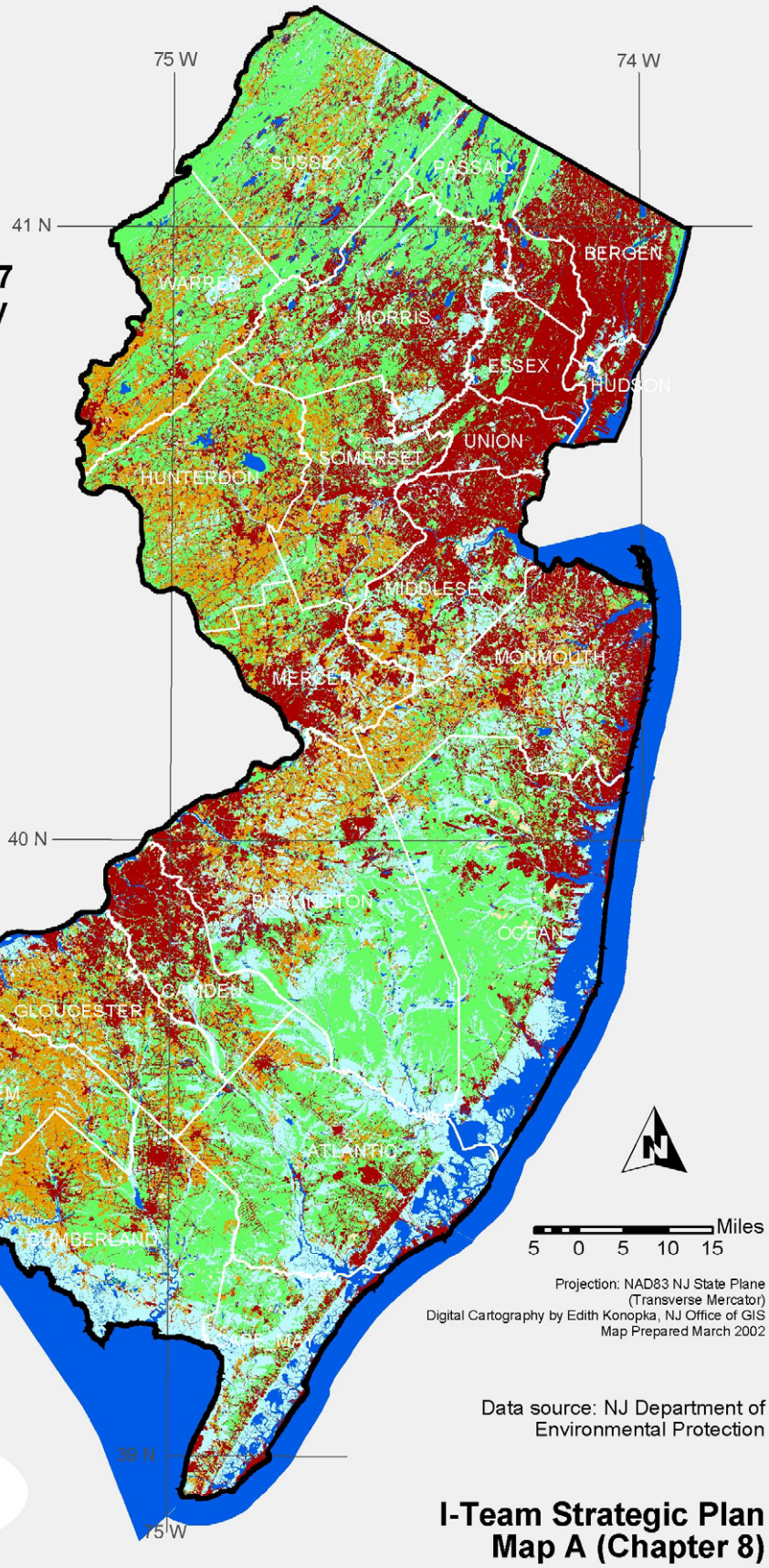
Most appropriate data steward:
The New Jersey Department of Environmental Protection is the most appropriate data steward.

Maintenance:
It is anticipated that the statewide LU/LC dataset will be updated on a five-year cycle.

Estimated maintenance cost:
Not known at this time.

Land Use/ Land Cover New Jersey

Compiled from 1995/1997 NAPP Orthophotography



Legend

Level I (Anderson et.al., 1976)

- Urban
- Agriculture
- Barren land
- Forest
- Wetlands
- Water

County boundaries

Projection: NAD83 NJ State Plane (Transverse Mercator)
Digital Cartography by Edith Konopka, NJ Office of GIS
Map Prepared March 2002

Data source: NJ Department of Environmental Protection

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I-Team Strategic Plan Map A (Chapter 8)

APPENDIX A

Implementing a new paradigm

An Outcome of OMB's Information Initiative

"Collecting Information in the Information Age"

Background

Governments at all levels (federal, state, local, and tribal) manage complex natural and social environments. They build streets, schools and airports; protect public health and the environment; and provide for public safety and disaster relief. Legislative bodies, executive branch decision-makers, and private sector businesses require accurate information about the communities, people, businesses and habitats affecting and affected by their decisions. This information about buildings, forests, waterways, weather, crime patterns, disease outbreaks, and traffic patterns is spatial data.

Spatial data have long been part of government and business processes, but its value and ubiquity are only now becoming universally recognized because of new technology that can handle large volumes of data and interoperability standards. Approximately 80% of all data used in business and government has a locational component. Much of this information has been developed over the past 30 years to serve narrow parochial missions (such as repairing streets, assessing property taxes, or dispatching emergency services). Little of it is integrated and anchored to other geographic information. With the Internet's distributed architecture and the Web's browsing and display capability, users inside and outside of government are demanding increased data pooling and sharing, based on market-driven interoperability standards.

There are a vast number of applications for geospatial data that would help Government make better decisions, conduct better operations, provide better customer service, and be more accountable. Banks, utilities, insurance companies, police departments, and other public and private sector organizations increasingly find new uses for location-based services, remote sensing, GPS and other technologies to serve citizens and customers better.

The Federal Government has a lead role to play in coordinating the development, access and use of spatial information. This role requires Federal agencies to exercise leadership and cooperate with State, Local and Tribal authorities, the private sector, and academia to develop a coordinated "National Spatial Data Infrastructure" (NSDI). An NSDI integrated across jurisdictions can be a key component for enabling E-Government and E-Commerce to flourish.

Historically, government budget authorities treated spatial data and its supporting infrastructure as data processing expenses to be funded from current year operating budgets. However, as spatial applications began to extend into nearly every aspect of our

lives, they began to cut across organization lines and exceed the capacities of single department missions and budgets. Like the national road system, each level of government has an appropriate role, as does the private sector. No one agency or level or government can or should build or fund its spatial data and decision support needs alone.

Spatial Infrastructure has become an essential part of the nation's capital infrastructure. Despite this fact, no widespread capital financing model for GIS has emerged. Spatial infrastructure, an intergovernmental capital asset, continues to be funded by "stovepiped" annual appropriations.
This mismatch between the need for long-term capital financing and the current reliance on annual appropriations remains one of the chief obstacles to the attainment of the NSDI.

Government entities at all levels, as well as private sector organizations, are making major investments in spatial data needed for operations. They fulfill governmental data mandates supporting essential public services and policy goals (such as clean air and water, efficient transportation, safe streets, emergency relief, and urban and rural sustainability). The costs of data stewardship for municipalities, water districts, and other local, state and tribal government organizations are significant. The challenge for all levels of government is to develop common criteria for spatial infrastructure investments, align annual public and private budget cycles more effectively, and pool and leverage spatial investments.

In addition, if spatial data is an important part of the nation's information infrastructure, it should be constructed, maintained, renewed, and budgeted for over its long-term life cycle as any other critical capital asset. Alternative financing mechanisms to the current annual appropriation "stovepipes" are needed.

A New Paradigm Emerges

We have an historic opportunity for all levels of government, and the private and nonprofit sectors to establish a new paradigm.

- Partnerships among State, local, Tribal, and Federal authorities, and the private sector could help share costs by capturing economies of scale and aligning their pooled capital investments in standardized spatial data layers and content.
- Mechanisms for allocating and sharing data collections and costs efficiently effectively and fairly would encourage data development and stewardship at the right place by the right organization.
- All investors in spatial infrastructure should use common criteria when investing in spatial infrastructure. Criteria would include Federal and market standards for interoperability, data format, and metadata and content standards, along with principles for public access, data security, privacy and other goals affecting governmental and business data.
- Creative financing outside of government appropriation cycles, such as infrastructure bonds or other financial products, could supplement and de-politicize the funding process, providing the liquidity to deploy and sustain shared spatial infrastructure.

In this paradigm, no Federal program or initiative needs to dictate policy to States, local, and tribal jurisdictions, or the private sector, for the NSDI to develop. Rather, all parties collaborate as partners in consortia operating in states, regions, industries or interest groups. This strategy implements the NSDI by aligning spatial infrastructure investments using common investment criteria.

Implementing the New Paradigm

As part of OMB's Information Initiative "Collecting Information in the Information Age", OMB recently completed a series of public Roundtables exploring how to improve the quality of the spatial data Government collects while minimizing the collection burden. Dialogue focused on the need to overcome the financial and institutional barriers to the sharing of spatial information among Federal, State, local, and tribal entities, and the private sector. In response to participants' recommendations, OMB (in cooperation with the Federal Geographic Data Committee (FGDC), National Performance Review (NPR), Council for Excellence in Government, Urban Logic, and other public and private sector stakeholders) has invited the spatial data community to begin several implementation actions.

- Implementation Teams (I-Teams). I-Teams will organize institutions in their state or region to build statewide portions of the NSDI. Already, New Jersey, Kentucky, North Carolina, Oregon and Metropolitan New York City have committed to establish an I-Team. Each Team, aligning the needs and resources of its State, local, tribal, Federal, and private sector partners, will prepare a comprehensive plan for compiling, maintaining, and financing spatial infrastructure in its Team area. It will identify the needs and responsibilities of the partners, align and leverage resources, and establish detailed timetables and performance measures.

- A Federal Partners Team**.** Consisting of senior officials of OMB, FGDC, USGS, NOS/NGS, Census, DOT, BLM, NRCS, and EPA, and other interested agencies. The Federal Partners Team will focus Federal agency efforts, respond to and coordinate with I-Teams, and explore new alternatives to develop needed standards

- A Financing Solutions Team (FSTeam). The FSTeam will identify and recommend intergovernmental and public-private financing alternatives to support the NSDI and the I-Teams. The FSTeam will act as investment advisors to the I-Teams and the Federal Partners. It will research and structure ways to improve how spatial infrastructure investments originate, perform and align.

- A Technology Advisory Group (TAG). Open to all vendors and led by the Open GIS Consortium, TAG will be a resource for I-Teams. It will keep I-Teams and Federal Partners informed of technology innovations and be available to solve common technology challenges. By working with I-Teams to develop and test new products and solutions, TAG will accelerate dissemination of knowledge of the substance and process of building interoperable networks and open systems. TAG also will help the FSTeam use standards to develop strategies for procurement, budgeting and capital pooling.

Make A Business Case. The FSTeam will develop a business case, value proposition and financing options for the I-Teams and Federal Partners to use in preparing their working plans and budget proposals. It will help the geospatial community to explain to legislative bodies the benefits of aligning investments to achieve the NSDI.

Explore Better Use of Existing Appropriations Structure. Currently, almost all spatial information budget processing is annual. The FSTeam will explore better ways to fund spatial infrastructure investments by aligning and optimizing appropriations, budget, and procurement cycles at all levels of government, including interagency and cross-cutting mechanisms. It will analyze cash flows and returns on investment, and compare costs and benefits. It will develop common investment criteria and explore ways to pool and leverage spatial investments.

Suggest New Funding Mechanisms. The FSTeam will use the cash flows, preliminary investment criteria and other results generated by its research and work to design sustainable capital financing options, such as infrastructure bonds or revolving funds. In the case of other national infrastructure and community development activities (such as roads, housing stock, airports, and small business development) the Federal government has used financial intermediaries (such as state bond banks, Fannie Mae, Community Development Corporations, and Small Business Investment Companies) to pool and administer local public and private resources through national investment criteria.

Electronic meeting support, knowledge management and other Web-based collaboration tools will be available to members of the FSTeam. This should minimize the need for face-to-face meetings, conserve the valuable time of its distinguished members, and begin the process of creating a public and private financing toolkit.

APPENDIX B

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APPENDIX C

The New Jersey Mapping Assistance Partnership Program

****NJMapp****

NJMapp is an innovative partnership program that provides a mechanism for the statewide development of spatial data as well as a dynamic infrastructure for the maintenance and sharing of geographic data via the Internet.

NJMapp relies on the creation of strategic partnerships with county and municipal agencies. Digital datasets created through this initiative will support decision-making across state and local government agencies.

NJMapp was created by the NJ Office of GIS to help local governments expand their own GIS capabilities through an incentive program that establishes spatial data nodes on the NJ Geographic Information Network (NJGIN).

NJGIN provides a framework to build more effective enterprise systems, including emergency preparedness and response, open space preservation and smart growth planning.

NJMapp participating counties enter into formal partnership agreements with the state and are encouraged to initiate similar partnerships with interested municipalities within their jurisdictions. Municipalities that enter into agreements with their counties may be eligible for DCA REDI Grants to fund the purchase of GIS workstations.

NJMapp Incentives

State provides:

- Data development assistance
- Technical support and Internet application development
- Hardware and software to store data and maintain local data nodes
- Training

Counties agree to:

- Host local data on NJGIN - The NJ Geographic Information Network
- Adhere to state standards
- Participate on the NJ Spatial Data Clearinghouse
- Enter into partnerships with municipalities

******If you would like more information on becoming an NJMapp partner, please send an E-mail to this address:***
geodata.group@oit.state.nj.us

APPENDIX D

New Jersey I-Team
Meeting Notes – 3 May 2001 – 2nd Meeting

Attending:

Ronald Matzner (FGDC)
Roger Barlow (USGS)
Harvey Simon (EPA)
Charlie Ridgway (FEMA)
Ronnie Taylor (NRCS)
Anne Jeffers (U.S. Census)
Matt Zimolzak (U.S. Census)
Deirdre Bishop (U.S. Census)
Larry Thornton (NJ DEP)
John Tyrawski (NJ DEP)
Tom Rafferty (NJ State Police)
Joe Perry (NJ DOT)
David Joye (NJ DOL)
Nancy L. Tindall (NJ OMB)
Hank Garie (OGIS)
Suzy Hess (OGIS)
Bruce Harrison (OGIS)
Kate McGuire (OGIS)
Barry Hackett (Atlantic County)
Matt Duffy (Atlantic County)
Katy McSorely (Bergen County)
John Butler (Burlington County)
Merrilee Torres (Burlington County)
Kathleen Meyers (Burlington County)
Kevin Thomas (Cape May County)
Brian O'Connor (Cape May County)
Michael Thorne (Monmouth County)
Eric Anderson (Monmouth County)
Jim Girvan (Somerset County)
Bob Berardo (PlanGraphics)
Nick Hutton (HNDT)
Richard Carlson (NJSPLS)
David Tulloch (Rutgers)
Josh Greenfeld (NJIT)

Update on the OMB/FGDC Initiative:

Ron Matzner reported that the OMB Information Initiative is moving forward and that FGDC has developed a website to provide the capability for I-Team participants to work collaboratively within and between teams (http://www.fgdc.gov/I-Team/). In addition to New Jersey, I-Teams have been formed in North Carolina, Oregon, Utah, and metropolitan New York City.

Ron Matzner reviewed the implementation strategy for the OMB Information Initiative and stressed that I-Team participants will work together within a structure comprising the following four interacting components:

1. Each **I-Team** will prepare a comprehensive plan for compiling, maintaining, and financing its spatial data infrastructure.
2. A **Technology Advisory Group**, led by the OpenGIS Consortium, will be available to solve common technology challenges.
3. The **Financial Solutions Team** will identify and recommend inter-governmental and public-private financing alternatives to support the NSDI and the I-Teams.
4. The **Federal Partners Team** will comprise senior officials of OMB, FGDC, USGS, NOS, U.S. Census, DOT, BLM, NRCS, EPA, and other interested agencies.

Ron also discussed the planning approach used in Utah. He indicated that Dennis Goreham (Utah Department of Administrative Services, Division of Information Technology Services) recently finalized the Utah Framework Implementation Plan. Ron also stated that Utah's Implementation Plan is being used as a model by a number of states, including New Jersey.

Hank Garie asked Suzy Hess to explain how the Utah approach has been adopted by New Jersey's I-Team Planning Work Groups. Suzy indicated that Utah's modular approach was being followed as a template by all of

the Planning Work Groups and was a very useful guide to have. She pointed out that Utah's Framework Implementation Plan includes 22 Chapters. Suzy indicated that with consensus of the I-Team members, additional chapters could be added to New Jersey's I-Team Strategic Plan. Currently, Tom Rafferty from the NJ State Police, Emergency Management Section, has volunteered to be responsible for a new chapter on *Critical Facilities* and Larry Thornton (NJ DEP) will draft an additional chapter on *Land Use/Land Cover*.

Planning Work Group Reports:

Hank asked that each of the Planning Work Group Leaders provide a status report on the progress their Work Groups had made in the past three months.

Hydrography

Larry Thornton (NJ DEP) discussed the New Jersey Integrated Hydrographic Dataset. Larry explained that this high-resolution data layer will support a wide variety of hydrologic based analyses as well as state, county and municipal initiatives involving hydrographic layers. The data attribute tables will conform to the structure of the National Hydrography Dataset (NHD). Attributes specific to New Jersey will also be linked to spatially accurate hydrographic features. These data attributes will include Surface Water Classifications, alternate local water body names for streams, lakes and ponds, tidal and non-tidal water feature designations, and links for water quality information from the New Jersey Surface Water Quality Monitoring Network Database. The estimated total cost for the New Jersey Integrated Hydrographic Dataset is $2M.

Orthoimagery/Elevation

Suzy Hess (OGIS) reported that the NJ Orthoimagery Work Group was currently working with Dr. Terry Keating (OGIS consultant) on the technical specifications for an Orthoimagery RFP. The goal is to have a plane in the air next Spring, 2002 for a high-resolution aerial photography mission. The entire State will be flown with leaf-off conditions, using either natural color or color infrared (CIR) film. If funding is available, the film will be processed into digital orthoimagery and the final data products will be distributed via the Spatial Data Clearinghouse. The estimated total cost for high-resolution orthoimagery is $3M.

The issue is whether or not to combine the high-resolution aerial photography mission with high-resolution elevation data using LIDAR technology. Detailed elevation data (2' contours) will be necessary if the State plans to update the existing FEMA Flood Insurance Rate Maps in digital format. The estimated total cost for high-resolution elevation data (meeting FEMA specs for 2' contours) is $3.5M.

Cadastral (Parcels)/Government Boundaries

Bruce Harrison (OGIS) gave a presentation on NJMapp (NJ Mapping Assistance Partnership Program). He explained how this incentive-based program will be utilized to develop and maintain several statewide datasets, including a cadastral layer. State-county-municipal government partnerships created through NJMAPP will help leverage limited State resources. In addition, NJMapp establishes an organizational model for the State, counties and municipal governments to work together to build, maintain and share critical enterprise spatial data that will support decisions at all levels of government. The estimated total cost for a statewide cadastral data layer is $5M.

Transportation

Joe Perry (NJ DOT) reported that Lou Millan (NJ Transit) was helping him draft a white paper on transportation related data issues in New Jersey. Joe explained that since a number of 'legacy' databases currently exist in both the public and private sector, database integration and maintenance is a significant concern. Other issues that have been identified include the positional accuracy of linear features and the need for a common referencing system, e.g., Standard Route Identifier (SRI). A Transportation Work Group is currently being formed and will include representatives from the DVRPC (Delaware Valley Regional Planning Commission) and the U.S. Census Bureau.

Geodetic Control

Dr. Josh Greenfeld (NJIT) reported that the NJ Society of Professional Land Surveyors had helped him prepare the draft chapter on Geodetic Control. According to Dr. Greenfeld, the geodetic control layer is of very high priority for Professional surveyors, GIS developers and spatial data gatherers in New Jersey. The rationale being that if geodetic control is readily available throughout the state, all geospatial data will be brought into a common coordinate system at the time the data are collected. This is especially important for the development of a seamless parcel map for the state.

Josh pointed out that with the advent of the Global Positioning System (GPS) the framework of the geodetic control network should preferably be based on CORS (Continuously Operating Reference Stations). Since CORS stations enable GPS users to tie their positioning observations to an active geodetic control network, physical occupation of a geodetic control point is not required. CORS stations, therefore, result in lower cost, efficient and accurate positioning necessary to support NSDI needs. Dr. Greenfeld indicated that he would be willing to maintain the proposed NJ CORS network *center* at the existing CORS station at the New Jersey Institute of Technology. The estimated total cost to establish a CORS network in New Jersey is $400,000.

Discussion

Hank pointed out that a number of the Framework data layers are interrelated and should be developed in a coordinated fashion. Specifically, Geodetic Control, Cadastral (Parcels)/Government Boundaries, and Orthoimagery/Elevation data all need to be 'linked' somehow in New Jersey's I-Team Strategic Plan.

Hank asked Ron Matzner if New Jersey would be given special consideration by the Feds in their review of a NASA Grant proposal recently submitted by the NJ Office of State Planning, since this proposal includes the acquisition of *Framework* elevation data for Cape May County, New Jersey. Ron indicated that he would try.

Next Meeting

A meeting date and location for a follow-up NJ I-Team meeting will be forthcoming.

APPENDIX E

New Jersey I-Team
Meeting Notes – 2 February 2001 – 1st Meeting

Attending:

Roger Barlow	Michael Thorne	Larry Thornton	Merrilee Torres
Anne Jeffers	Eric Anderson	Kevin Thomas	John Butler
Matt Zimolzak	Charlie Ridgway	Brian O'Connor	Ronnie L. Taylor
David Joye	Harvey Simon	John Pavek	Ronald Matzner
David Tulloch	Deirdre Bishop	Lou Mattei	Bob Berardo
Hank Garie	Suzy Hess		

Background and History of the I-Team Concept

Hank Garie informed the NJ I-Team participants that the primary goal of this group is to develop a *process* for prioritizing spatial data development in New Jersey. Ron Matzner (Federal OMB) discussed how the I-Team concept was first introduced at the NSGIC (National States Geographic Information Council) meeting last fall and stressed that this initiative was moving forward even with a change of administration. The FGDC is spearheading the I-Team concept in an effort to provide states with a 'framework' for pooling federal and state resources in a more cost-effective and efficient manner. Ron indicated that only two other I-Teams have been established to date – in Metro New York and Utah – but many additional States are expressing interest.

Proposed I-Team Approach for New Jersey

Hank Garie proposed that the NJ I-Team be nested under the newly created Geographic Information Council, e.g., functioning as a standing committee of the Council. The NJ I-Team is responsible for development of a Strategic Plan (which must have a maintenance component). Hank stressed that New Jersey's I-Team Strategic Plan should be 'modular', similar to what Utah is working on.

Ron Matzner outlined the four 'legs' to the NJ I-Team Initiative:

1. The NJ I-Team is the *core*
2. Technical Assistance is provided through the OpenGIS Consortium
3. The Financial Solutions Team will focus more on appropriations
4. The Federal Partners Team approves the NJ I-Team Strategic Plan

Discussion

Harvey Simon (EPA) voiced his concern over potential 'overlap' with other data development efforts. Ron Matzner indicated that the FGDC will be creating an Internet site where all I-Team discussions will be public.

Roger Barlow (USGS) stressed that the *data* must also be publicly available and that the potential for 'repetitive' data development must be avoided.

Ron Matzner (Federal OMB) stated that the more visibility the NJ I-Team can get the better, e.g., more visibility is better for the budget process, especially as more I-Teams are established.

Larry Thornton (NJDEP) recommended that the *I-Team Proposal for the State of New Jersey* (Working Draft dated 02/02/01) should be revised to list all of the Framework data layers.

I-Team participants recommended that additional stakeholders should be included such as representatives from the NJ League of Municipalities, the NJ Association of Counties, the US DOT, FEMA (Emergency Management Section), and the private sector.

The NJ I-Team participants identified the following initial data layers as being important:

Orthoimagery *
Elevation *
Hydrography *
Cadastral (Parcels) *
Critical Facilities
Utilities
Geology
Soils
Transportation *
Geodetic Control *
Government Boundaries *
Land Use
Biological Resources

Hank stressed that the Framework data layers (identified with an asterik) should be the initial focus of the NJ I-Team. The following NJ I-Team *Planning Work Groups* and *Work Group Leaders* were identified:

1. Orthoimagery/Elevation - Suzy Hess (NJ Office of GIS)

2. Hydrography - Larry Thornton (NJ DEP)

3. Cadastral (Parcels)/Government Boundaries - Bruce Harrison (NJ Office of GIS)

4. Transportation - Joe Perry (NJ DOT)/Lou Millan (NJ Transit)

5. Geodetic Control - Josh Greenfeld (NJIT)

Hank suggested that the goal of each *Planning Work Group* should be to develop a chapter that includes cost estimates and timeframes for each spatial data layer. Templates will be developed to ensure uniformity for each chapter.

Next Meeting

A meeting date and location for a follow-up NJ I-Team meeting will be forthcoming.

APPENDIX F

I – Team Proposal for the State of New Jersey

Conceptual Summary

The development and maintenance of National Spatial Data Infrastructure (NSDI) Framework data to support GIS activities in New Jersey will occur following a partnership model. This model requires a commitment from organizations that create and maintain spatial data to work together in a logical stewardship manner and to share data and relevant resources. The model encourages the identification of logical roles and responsibilities for creation and maintenance of Framework datasets and relies heavily on use of the Internet as the vehicle for data sharing. The goal of the NJ I-Team will be to implement the NSDI Framework for the entire geography of New Jersey in a completely integrated manner.

Cooperative Work Activities

1) **Organize A Regional I-Team:** Include all key representatives from local, state and federal agencies. Include utilities and other organizations as determined to be useful. The New Jersey I-Team should meet regularly and work remotely via on-line collaboration tools.

   Federal Commitment: *Organize Federal participants from all agencies operative in the region and insure that they participate*.

2) **Develop County GIS Partnership Agreements:** A key component of the Regional I-Team strategy will be to formalize State-County government partnerships. The New Jersey Mapping Assistance Partnership Program (NJMapp), administered by the NJ Office of GIS, will facilitate data sharing and maintenance. This program will provide county governments with seed funding to obtain technical training, maintain local datasets, procure required hardware/software for spatial data distribution, and support local GIS capacity building.

3) **Populate the NJ Spatial Data Clearinghouse:** The State of New Jersey has recently established a Spatial Data Clearinghouse (http://njgeodata.state.nj.us) as part of the national network. The Clearinghouse will be used to create an inventory of all GIS related datasets, GIS related data collection and maintenance efforts, interactive mapping efforts, and projects requiring geographically referenced information.

   Federal Commitment: *Commit resources to work with State and Local governments on identifying opportunities for cooperation. Be willing to combine funding for joint projects where there is overlap or shared need. Contribute federal equipment and expertise (satellites, airplanes, etc.) for data creation and data maintenance.*

4) **Implement the Garden State GIS Network:** The Garden State GIS Network will utilize the power of the Internet and architecture of Environmental Systems Research Institute (ESRI) World Wide Geography Network as its communications backbone. Access to the Network will take place through the Garden State Network (GSN), which is currently in place. Providing the county governments high-speed access to the GSN is vital to the success of the County Partnership Program. While state agencies utilize their existing connection to the

GSN, county governments will be provided access through the State's Gov-connect initiative, which provides high-speed access to New Jersey's local government. As the GIS user community within New Jersey matures, access to all levels of local government will become necessary.

5) **Implement a New Jersey Spatial Data Portal:** The New Jersey Spatial Data Portal will offer services to house a wide array of data including statewide enterprise, state agency and local government datasets. The vision is to store and manage spatial data centrally but have it maintained locally by its proper steward. The transactions required for maintaining the centrally stored data will take place through the Garden State Network, which connects all state and local government agencies. The Spatial Data Portal will serve data both internally and externally in support of desktop applications and dynamically in support of IMS map services and applications running on New Jersey's Intranet, Internet and the World Wide Geography Network. The Spatial Data Portal will be coupled with the New Jersey Spatial Data Clearinghouse through an existing E-government portal so users can easily search for and find spatial data, associated map services or IMS applications. Since many state and local government agencies are at different levels on the Information Technology ladder, the concept of managing data centrally and maintaining it locally will assure broad public access to the information.

6) **Develop Framework Data Layers**

Orthoimagery/Elevation: Orthoimagery will be produced at a 1"=200' mapping scale and will support statewide parcel mapping at the same scale. High-resolution elevation data will be developed at a vertical resolution of 2' statewide.

Cadastral (Parcels)/Government Boundaries: A statewide seamless parcel base will be developed using the 1"=200' orthoimagery as control. Municipal tax maps will be scanned, vectorized, and compiled against the 1"=200' orthoimagery. Each land parcel will be designated with a Parcel Identification Number (PIN), which will allow for it to be linked to its corresponding MOD4 Tax record (New Jersey's tax assessment database). Government boundaries will be recompiled from municipal tax maps and other sources.

Hydrography: A statewide hydrography datasets will be developed using the 1"=200' orthoimagery as a base reference. The high-resolution hydrography vector data layer will be linked to the National Hydrography Dataset (NHD) attributes.

Transportation: A statewide ground transportation data layer will be developed using the 1"=200' orthoimagery as a base reference. To facilitate data sharing among all levels of government, a linear referencing system, e.g., Standard Route Identifier (SRI), will be incorporated into the transportation database design.

Geodetic Control: The development of a statewide CORS (Continuously Operating Reference Station) network will require collaboration by the NGS, NOAA, NJ DOT, NJ Office of GIS, and the New Jersey Society of Professional Land Surveyors (NJSPLS). The CORS network will facilitate ongoing maintenance of the cadastral (parcels)/government boundary data layer.