New Jersey Geospatial Forum Transportation Task Force Final Report November 6, 2006

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Goals and Objectives

The goal of the Transportation Task Force of the New Jersey Geospatial Forum, as established in our first task force meeting in January 2005, is to document the status of transportation based applications in New Jersey and to make possible recommendations about further development strategies. We first focused our efforts on compiling information on street centerline land bases used by public agencies (state-wide, regional, county, and municipal organizations), to support their GIS transportation applications.

This issue was selected by the task force members because of its relevance to the OGIS stated objective of sponsoring the development of a statewide transportation layer. Issues arise because several data developing agencies in New Jersey have already committed to significant investments in disparate street centerline datasets to support their respective business needs. An objective of this task force is to document the different land bases being implemented and investigate alternatives to mitigate this issue.

This Draft Report is the product of the data collection phase of the Task Force. Comments on the draft are welcome.

Process

The Transportation Task Force met 4 times in 2005 and once in 2006. Attendance at the meetings varied between 10 and 15 participants. The members attending represented state-wide agencies (NJDOT, NJ TRANSIT, NJ Turnpike Authority, OGIS, Rutgers), MPOs (NJTPA, SJTA, DVRPC), Counties (Bergen, Union) and consultants (Civil Solutions, MapText, Inc., and Michael Baker Jr, Inc.). This mix provided the Task Force with participation from a good cross section of the GIS community.

Several meetings were highlighted by a presentation by a transportation data provider. At the first meeting, Jim Carl/NJDOT and Kirk Weaver/Michael Baker, Jr Inc. presented the current status of NJDOT's land base model under development. At the second meeting, Bruce Harrison/OGIS provided an overview of the procurement status of the Tele Atlas commercial dataset and a proposed pilot project being considered to combine TeleAtlas data with the NJDOT model. At other meetings, participants shared their current activities and viewpoints on various issues. The survey instrument used for the data collection was also initiated and discussed at a meeting.

Recommendations

The Task Force reached consensus on the following recommendations.

- The Task Force members recognized a variety of problems with the existing data sources:
    - There are multiple existing street centerline databases being created, used and maintained by a number of state, regional and local organizations;
    - Although these existing databases generally work well for the work flows of their respective organizations, having multiple custodians does lead to duplication of effort and the lack of a single, standard statewide base;
    - Some of the databases do not carry information on address ranges (i.e., NJDOTs database);
    - Some of the databases do carry information on address ranges, but the positional accuracy, attribute accuracy and timeliness are issues (i.e., TIGER);
    - Some of the databases are proprietary and may only be used inside of single organizations (i.e., use of Navtech by NJTransit);
    - Most of the databases have no, or limited, attribute information on turn restrictions and intersection control;
    - Maintenance of the databases is quite uneven across organizations, and often relies on a new set of digital orthophotography to be produced with a long (5 years or so) wait time.
- The group debated at some length whether to advocate for standardization of a common transportation base maintained by a single steward versus the development and standardization of a common set of interface tools to access data from multiple street centerline files. These two alternatives were both viewed as acceptable solutions to the problem of multiple base maps created and maintained by multiple organizations. After considerable discussion, the group decided to advocate for a single, statewide database. The group concluded that a formal Feasibility Study would be required to implement this recommendation. The group discussed the possibility of a multi-agency collaboration, perhaps with NJDOT and E911 agencies cooperating to create and maintain some attributes/geometry. This single base would require the automation of segmentation for the variety of users and applications. The group also discussed the possibility of using a commercial vendor to design, build and maintain a single base. This is a strategy used by several states, including Massachusetts.
- The group also spent time discussing whether to recommend that addresses be incorporated into parcel mapping projects (street address locations tied to parcel centroids, driveway access points, or to addressable building structure points) as opposed to maintaining street address ranges on the transportation base(s). A careful decision on this matter might be particularly beneficial for first responders'

emergency service efforts. (For example, the Union County Bureau of GIS is currently designing a system with the county E911 program to utilize parcel centroid locations and link them to both addresses and phone numbers.)   The Task Force recommends that this topic be included in a formal Feasibility Study. This topic would also need to be coordinated with any task forces working on parcel mapping standards.

- The group discussed whether to advocate for increasing the frequency of state-wide orthophotography, perhaps reducing resolution (thereby decreasing processing time and cost of each overflight), in an effort to generate up-to-date records of recent land use changes occurring throughout the state. The objective here is to increase the timeliness and utility of the orthos in planning applications or as a reference for delineating street centerlines. Given input from the USGS, it seems unlikely that the decrease in resolution would be acceptable, and more input is needed regarding the impact of reducing resolution on other on-going applications, including parcel mapping.

- In the absence of more frequent orthophotograpy, the group decided to advocate for a new statewide approach to the transmittal of digital subdivision plats. The approach might include:
  o Require subdivision submissions to be submitted digitally, georeferenced to NJ State Plane NAD 83 and referenced to road alignments.
  o Require reporting of all new subdivisions to NJDOT so that they may be responsible for obtaining GPS centerlines. (An alternative of requiring the counties to obtain GPS centerlines was also discussed.)
  o The group also considered using the upcoming changes to PAMS to prompt the need for street updates.
  o The group also considered coordination with E911 of address changes and the naming and numbering of new streets to prompt the need for coordination of street updates.
  o More input is needed on the practice of submitting digital subdivisions plats among all NJ counties.

Executive Summary of Responses

This section provides summaries for organizations surveyed by the Task Force. These include state agencies (NJDOT, PennDOT and NJTransit), regional organizations (NJTPA, DVRPC and SJTPA), authorities (NJ Turnpike), counties (20 of 21) and municipalities (2). The full text of the responses is provided in Appendices A through G.

Twenty of the 21 New Jersey counties responded to the survey. Cape May County was the sole non-respondent. A total of 24 professionals responded for the 20 counties. Of these, 13 provided job titles of GIS Director, GIS Specialist or GIS Coordinator. There were also responses from 2 Engineers and Public Works employees, 7 Planners and 2 Emergency Service and Public Safety professionals. An additional summary for the counties, given in Appendix C, was created from the responses to each of the questions by all of the responding counties. For this summary, responses were shortened and reworded to make them more comparable across all counties.

Summary of Land Base(s) Used

The first question concerned the current transportation land base (s) used and the accuracy of that base. NJDOT utilizes two roadway land bases – one a "legacy" base developed using aerial photography with updates performed through heads-up digitizing. The newest NJDOT land base is a single-centerline spatial representation of NJ's public roads with each road assigned a Standard Route Identifier (SRI) and contained in an ESRI Feature Class. This land base will be enhanced to show "dual-centerlines" for divided highways. The legacy base meets National Map Accuracy Standards. Accuracy is unknown for the new centerline land base file.

PennDOT's land base uses Microstation Design files digitized from 7.5 minute quad sheets. It is currently being updated to a minimum DOQQ with some counties upgraded to current 1:200 scale ortho-photography. PennDOT also uses GDT/TeleAtlas for address geocoding. A goal of PennDOT is to have all roads within the state digitized at 1:200 to 1:100 scale. Currently, positional accuracy is +/- 50' while attribute accuracy is to the foot.

NJTransit maintains two land bases – the Navteq Commercial Street Base, and a land base of the commuter rail Right-of-Way (ROW) developed from a LIDAR Survey. Accuracy of Navteq is thought to be 1:24000 for horizontal, no vertical is specified, and 98% correct for all features shown. For LIDAR, absolute accuracy is 0.50' (horizontal) and 0.35' (vertical); relative accuracy is 0.35' (horizontal) and 0.25' (vertical).

Common to all MPOs is the use of NJDOT's centerline file. Accuracy level for this base, as stated by the MPOs, is 1" = 2000'. Other land bases used include the TIGER files (poor horizontal accuracy), GDT/TeleAtlas (accuracy thought to be +/- 3 meters) and a

Regional Base Map (RBM) still being used by DVRPC but soon to be phased out (accuracy 1" = 2000').

The survey included the NJ Turnpike Authority. The full text of the response is given in Appendix A. For the Turnpike portion of NJTA, the land base is GDT's Dynamap/2000 (V9.1) and the accuracy level is unknown. The Parkway portion of the NJTA does not currently have a land base in use. The current plan is to develop an Enterprise GIS Program that will integrate both of these major toll roads and include applications that can be leveraged by the entire NJTA. The Dynamap/2000 (V9.1) was purchased in 1999. No applications are being used or developed at this time. A needs assessment will be performed to determine applications to be used by NJTA's proposed Enterprise GIS.

Three counties reported having no centerline bases (Essex, Hudson, Middlesex). Several counties use unenhanced TIGER (Passaic, Warren). Others had realigned TIGER with various orthoimagery sources (Atlantic, Cumberland, Sussex). Several counties reported using GDT (Ocean, Somerset). Camden reports using the NJDOT streets. Burlington uses a combination of a GPS-derived network and GDT. Hunterdon created its own GPS-derived network with some attribute (but no address ranges). Several other counties developed their own centerline files from various sources of orthoimagery (Morris, Monmouth, Salem, Union). It is unclear in several of these cases what attributes have been developed. The final group of counties report that they are creating their centerline files as part of parcel conversion (Bergen, Gloucester, Mercer). Again, it is not clear from the responses whether address ranges will be assigned from parcels or not.

Responses were received from the Township of Franklin in Somerset County and the City of Trenton in Mercer County. Franklin has a well organized GIS effort. The centerlines were developed from the 2002 orthoimagery. Franklin reported using them for E-911 dispatch applications. The township reported using subdivision plans as the source for maintaining the base for new roads. Trenton reports that its centerline base was completed at the same time as the parcel layer (by Civil Solutions)

Origin Dates and Duration of Land Base(s)

The second question concerned the origin dates and durations of the land base. NJDOT's legacy land base has been in existence since the 1950's while the newest land base initial version was completed in 2002. PennDOT's land base emerged in the 1980's with GIS linking to and using a cartography base in the 1990's. NJTransit's Navteq and LIDAR land bases have been in existence since 1997 and 2005 (anticipated), respectively.

For the MPOs, the various land bases used have been in existence for a time period spanning from 1990 to 2005. DVRPC's RBM is the oldest and, as stated previously, will be phased out shortly. The newest base is NJDOT's centerline file, with associated SRIs, and annual updates to it. TIGER files have been in existence for over a decade.

For the counties, Atlantic County reported the earliest use (1991). Atlantic County is also the only county that reported an update relationship with the Census. Hunterdon was also an early adopter (1996). Most of the other counties began using centerline files in the late 1990s.

Applications Currently Supported by the Land Bases

The third question asked what applications were currently supported by the land base. Land base applications within the NJDOT include various GIS activities such as data dissemination, geocoded roadway attributes, mapping, Straight Line Diagram functions, query development and many planning functions. PennDOT has very similar activities. NJTransit's applications supported by the land bases are GIS activities involving bus activities (Navteq); and, incident mapping, planning / design efforts and asset

For the MPOs, there were a variety of applications supported by the land base(s). The centerline / SRI system is used to access, analyze and map attributes. The GDT base appears to be the best resource for address matching and geocoding. TIGER files are used in general cartography applications, grant applications and in support of various transportation planning operations. NJTPA uses TIGER extensively for their transportation modeling applications (North Jersey Regional Transportation Model).

The counties provided brief descriptions of GIS applications supported by the land base. A wide variety of applications were described. The two most frequently mentioned applications were use as base maps in cartographic map production and for traffic and transportation management, modeling and routing. Other applications were mentioned multiple times: planning and land use, 911, engineering, storm water, work order management, and law enforcement.

Reasons for Selection of Particular Land Bases

The final question asked for reasons for the selection of particular land bases. NJDOT uses the land bases to meet cartographic mapping standards, match their roadway inventory program and to incorporate data contained in Management Systems. PennDOT's land base is used because it is owned by them and digitized from the best available source at the time of development. NJTransit's Navteq base maintains seamless coverage over a multi-jurisdictional region and was selected by staff after a attribute / positional accuracy comparison between several commercial datasets. Their LIDAR base was selected to facilitate mapping of commuter railroad right-of-way.

The MPOs provided reasons for their land base selection. NJDOT's centerline file is free, contains all attribution and produces accurate mapping. Currently, this file represents all higher-level roadways but will soon incorporate the lower order systems. TIGER files are free and are tied to census demographics and provide address ranges

for address geocoding. GDT files were also obtained free by the MPOs. DVRPC currently uses them now but feels they will be obsolete when addresses are added to the road centerline file. DVRPC's RBM, although being phased out, was last digitally updated in 2000.

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The counties responded with a variety of reasons for particular choices of land bases. The responses generally fell into two groups. One group mentioned availability and low cost, and often added the need for files with address range information. The other group mentioned accuracy and completeness, and often stated that the commercial sources were not positionally accurate enough. This later group was mainly those counties that had developed their own centerline files.

Additional Responses for Counties

Counties were asked several additional questions. One was the response to the question of whether private roadways were included were all over the map. Four counties responded with clear affirmative answers. Many others reported that "some" private roads were included.

Another question to the counties asked about maintenance and update. The most frequent answer is that there was not a plan for maintenance in place. Several counties reported relying on 5-year cycles of orthoimagery (Atlantic, Monmouth, Morris, Union). Two reported that they are now, or plan to, use subdivision information for updates (Bergen, Hunterdon). Others are relying on the parcel mapping projects to provide updates (Burlington, Gloucester, Mercer).

An additional question was asked about the acquisition of street address information. The majority of the counties (that weren't using TIGER or GDT) did not report activities to acquire address information. There were several responses of interest. Atlantic County reported that it is reviewing the methodology for and possible development of address attribution by conflation from the parcel layer. Hunterdon uses the addresses from the parcel layer. The county has developed a data layer with a point location for each addressable structure. The plan is to use these data (with parcel data) for E-911 dispatch. Somerset and Burlington had partnership relations with GDT. But with the purchase of GDT by TeleAtlas, these enhancement partnerships are unclear.

A question on how new roads are found and processed also had the majority of the counties not responding. There seem to be few formal processes in place.

There were also many interesting responses to a question about participation in E-911 programs. Some counties seem to have little or no interaction with E-911. Others seem to be cooperating and/or integrating their GIS with E-911 efforts. Detailed responses to this question, given in Appendices C and D, may be of interest.

Appendix A: State and Authority Responses

Bureau of Transportation Development (BTDD), NJDOT

Land Base used to support GIS transportation-based applications / Land Base accuracy.

There is currently one Land Base being used by BTDD. The Land Base is a single-centerline spatial representation of approximately 12,000 miles of New Jersey's roadways. The roadway network represents all roads in New Jersey that are eligible for Federal Aid, and most routes that are functionally classified higher than "Local". The Land Base contains seven subtypes that indicate the routes designation as Interstate, US, NJ, Toll, 500 Series County Routes, Other County Routes, or Other.

There are 4,297 +/- unique routes contained in our existing Land Base. Each route has a ten digit Standard Route Identifier (SRI) assigned to it as a naming convention, and a set of Begin and End milepoints. The routes are contained in an ESRI Shapefile Feature Class for use in our GIS applications.

I can provide no data on the accuracy of the Land Base. The Land Base was developed from several resources in a cooperative effort. The Land Base matches closely with the 1995 Digital Orthophoto Quadrangles, but I can provide no specific tolerance for horizontal accuracy.

How long the Land Base has been implemented (if Land Base is being developed, provide time frame development efforts have been under way).

The Land Base being used by BTDD was developed over several years using a variety of resources. For the most part, our existing Land Base was completed in 2002. We make efforts to routinely update it to reflect current field conditions.

The BTDD is currently directing the development of a new Land Base, which will conform to the new GIS Transportation Data Model recently adopted by NJDOT. The Land Base is being developed through a consultant effort by Michael Baker Jr., Inc. The new Land Base will contain data for every public road in the state of New Jersey, which totals approximately 39,000 miles. The routes will be divided into eight route Feature Classes and will display dual-centerlines with separate SRI's for divided highways.

The new Land Base began development in the fall of 2003, and is scheduled for completion in the spring of 2005. It is being developed by performing "heads up" digitizing over the 2002 High Resolution Orthophotos. The orthophotos are 1:2400 scale with a one foot pixel resolution. For the new Land Base, we reformatted the SRI to a seventeen character field which allows us to also uniquely identify ramps, which will also be included.

Description of applications supported on Land Base.

The BTDD uses the current Land Base in GIS applications to help disseminate data to our customers. The Land Base is used in our GIS applications to geocode roadway attribute data such as traffic count locations, highway maintenance features and roadway accident data. It is used to develop maps that depict a variety of information. It is also used into help us perform

queries on our data. We often have to join and segment data based on various attributes, and our current Land Base is the linear referencing system used in the geoprocessing of the data.

The existing Land Base is an integral component in our Automated Straight Line Diagrams Program (SLD). The SLD uses the Land Base to facilitate the process of displaying roadway geometry and inventory data on an SLD page. The SLD will take full advantage of the new Land Base that is being developed to provide an even greater level of detail to our customers.

The Highway Performance Monitoring System, which is a federally mandated program, relies heavily on our existing Land Base as a way to provide spatial locations and other data regarding New Jersey's highways to the FHWA.

Reasons for Land Base selection.

At this time, it is the only one we have. Our current Land Base closely matches our on going roadway inventory program. The SRI used in the Land Base is NJDOT's standard for identifying the roads in New Jersey. Other programs and management system, within NJDOT, are using the SRI in their programs, which makes their datasets more compatible and easier to use in a GIS environment.

New Jersey Department of Transportation, IT

Name/Title/Respective Agency:

Patricia Hicks, GIS Specialist, NJDOT-IT-GIS

Land Base(s) used to support GIS transportation-based applications; Land Base accuracy:

NJDOT GIS data development and map compilation efforts rely on a large degree to the derivation of agency-generated themes from the interpretation of aerial photos, as well as the recompilation of features from an older source to a more accurate, planimetric source.   Yet, data automation and data transfer are also utilized. The DOT has used aerial photography with heads-up digitizing to update and realign the road centerlines of every road in the State of New Jersey. Recompiling is accomplished by transferring data delineated on or to unrectified photography to a rectified or orthophoto base map based on a series of local fits of common photo-identifiable features, such as roads. Data automation involves the conversion of analog data to digital data in the creation of a digital database in the GIS with accuracy evaluated by proof plotting to create a digital copy that is within +/- one line width of the original. Data transfer can involve ASCII or binary file formats that can be input or converted for compatibility with the GIS system. The roads of New Jersey are the main GIS land base that is generated with these methods.

These techniques result in a land-base accuracy that meets the National Map Accuracy Standard (NMAS) to guarantee true positional accuracy of data layers. The NJDOT has produced a series of maps at quad (1:24000) scale which meet NMAS standards. However, it should be noted that there are often special projects that can be at varying scales, sometimes down to 1:200, truly exceeding the NMAS standards. In the past, roads were often digitized above 1:1200 but below 1:4000, as imagery becomes blurry below the 1:1200 ranges.   The scale of aerial photography has also improved with improvements in technology, resulting in improvements in scale and accuracy. The most recent 2002 overflights do not use the USGS Quarter Quad Index. Instead it divides the state into 9201 tiles with each representing 5000' x 5000' of land area, allowing for scales closer than 1:1200. The official survey base of the state is known as the New Jersey State Plane Coordinate System whose geodetic positions have been adjusted on the North American Datum of 1983 (NAD 83) as per Chapter 218, Laws of New Jersey 1989. Although this official survey base is defined in meters, the NJDOT will often generate mapping done in miles or feet.

How long land base has been implemented:
In the early 1950's, land bases were created using Scribing techniques. Later with the development of computer applications and technological equipment and improved standards and methodology, compatibility with other agency data and improvements to accuracy occurred to what we see today.

Brief description of applications supported on land base:
The roads of New Jersey serve as the primary land base supporting GIS applications at NJDOT. Database and spatial information exists that allows for other diverse applications reflecting current conditions within the State, such as Average Vehicle Occupancy, Aviation,

Bridge Data, Capital Plan and Projects Management, Congressional Districts, County Data, Environmental Data (from DEP), Highway Inventory, Legislative Districts, Municipal Data, Pavement Data, Study and Development, Traffic Counts, Data Model Development, Active Construction, State Tourist Map Development, Milepost and SRI information. In addition, Inter-Agency special mapping and data support is provided on occasion.

Reasons for land-base selection:

Cartographic (locational) data input into the GIS system must be derived from or mapped to georeferenced base maps that meet or exceed National Map Accuracy Standards (NMAS), as defined by the U.S. Bureau of the Budget, Revised June 17, 1947. Recompiling data from sources which are not planimetric to georeferenced base maps is always required. Base maps at any scale must meet NMAS at a minimum. Data, including point locations, derived from GPS technology must also meet a standard and be documented. Thus, the land-base selection was chosen to meet standards and agency needs.

New Jersey Transit

Name/Title/Respective Agency

Glenn Newman, GIS Manager, NJ TRANSIT

Land Base(s) used to support GIS transportation-based applications/Land Base accuracy

There are two (2) land bases utilized for support of GIS applications at NJ TRANSIT. The Navteq street dataset is used to support the mapping of NJ Transit bus infrastructure and also serves as the primary street reference for programs implemented throughout the agency. Mapping generated by LIDAR technology is anticipated to support the planning/engineering of rail projects, incident area mapping and asset management.

Navteq commercial street base – Navteq does not publish accuracy standards; the following is provided based on dialog with Navteq staff – Absolute accuracy - Horizontal 1:24000 (comparable to USGS 7 ½ min quadrangles, Vertical data – N/A; Attribute accuracy – Navteq states 98% correct for all features shown
LIDAR survey – Railroad Right of Way - *Absolute Accuracy – Horizontal .50 foot, Vertical 0.35 foot; *Relative Accuracy Horizontal 0.35 foot, Vertical 0.25 foot)

As stated in the NJ TRANSIT Rail GIS Conformed Proposal by DMJM Harris, dated 11/26/03

How long land base has been implemented (if land base is being developed, provide timeframe development efforts have been underway)

Navteq – Licensed for use by NJ TRANSIT since 1997
LIDAR – LIDAR survey completed spring 2003. Start of implementation of internal GIS applications with the LIDAR land base – winter 2006.

Brief description of applications supported on land base – Navteq

The Navteq dataset serves as the primary land base supporting GIS applications involving NJ TRANSIT bus operations. It is used to support mapping of bus routes, bus stops and time points. In addition, the land base serves as a primary reference for implementation of the paratransit program, customer information applications, crime analyses, transit analyses, and several ITS (Intelligent Transportation System) applications.

Navteq is accessible agency-wide via an enterprise GIS network and includes the street network encompassed by the NJ TRANSIT service area, covering parts of 4 states (NJ, NY, PA, DE)

LIDAR –
When complete, the LIDAR land base is intended to support several applications including 1) Incident mapping (tied to the existing train management and control system); 2) Land base

coverage for support of planning and engineering design efforts on the ROW and 3) Asset Management.

Reasons for land base selection
Navteq -
The NJ TRANSIT service area covers 4 states. There is no single jurisdiction at the state or regional level tasked with maintaining state, county and local streets coverage for the full extent of the service area. At present, commercial map datasets are the only entities committed to maintaining a seamless coverage of this geographic extent.

NJT staff considers up-to-date street attribute data and correct connectivity (street configuration) the most critical data components for implementing successful GIS transit applications. Positional accuracy is important but not as critical. Prior to the land-base selection, NJT staff performed attribute and positional accuracy comparison tests on several commercial datasets in 1996-1997. At the time, Navteq performed best in the comparison tests.

LIDAR-
Airborne LIDAR (Light Detection and Ranging) technology was employed for mapping the NJ TRANSIT commuter railroad right-of-way (ROW). NJT staff selected this method because it enabled the project to be completed without incurring difficult logistics to obtain privileges to physically occupy the ROW. The mapping effort covered approximately 500 linear miles and was performed in a 2 week period. The stated absolute and relative accuracies were considered adequate to meet our GIS application objectives.

Pennsylvania Department of Transportation

Name/Title/Respective Agency;
Frank DeSendi, Manager, Geographic Information Division, Pennsylvania Department of Transportation

Land Base(s) used to support GIS transportation-based applications

PennDOT uses Microstation Design files digitized from 7.5 minute quad sheets. However, the land base is being upgraded to a minimum DOQQ with some counties being upgraded to current 1:200 scale orthophotography. Each Microstation file is one county and called a Center Line File (CLF). The state road network, approximately 40,000 miles is linked by cumulative distance tied to PennDOT's legacy Roadway Management System. A county also contain all public roads, toll roads, ferries, drainage, impound areas, swamps, and dams. Some private roads are in the files; at the time of digitizing the cartographer could not determine public or private. Despite ortho-imagery, this is still a problem.

Boundary files created by PennDOT for GIS transportation based applications are political subdivisions, legislative districts, school districts, MPO/RPO regions. The source for political subdivisions is unknown. This agency has been maintaining boundaries for over 90 years. Most of the original documentation is lost. PennDOT has been doing the official reapportionment mapping of legislative districts for decades. Those boundaries are based largely on the political subdivisions. A joint effort with the PA Department of Education has yielded the School District file. PennDOT uses the school district file to look at roadway maintenance activities in the context of school district affected.
Finally, PennDOT does address geo-coding through a subscription service to Tele Atlas/GDT North America. The service inexpensively returns a lat/long for an address with a location confidence code. The Lat/Long is mapped on PennDOT's land base.
In the PA Map initiative, a pilot for the USGS's National Map, PennDOT will be supplying the road and boundary layers. The plan is for PennDOT to incorporate locally created road data into its land base. The goal is to have the entire state digitized at 1:200 – 1:100 scales and be a conglomeration of state and locally created/maintained data, owned by the state, available to all.

Land Base Accuracy (qualifies both positional and attribute accuracy);

Currently, positional accuracy is generally +/- 50 feet. In some areas of the state it is closer to +/- 10 feet depending upon the ortho-imagery available. Attribute accuracy is to the foot. All state road data captured in the primary legacy systems is using the same LRM at the offset level.

Our references to street names come from our cartographic map products, Microstation text and dropped cells (shields). We would prefer to put it into Oracle Spatial, but that is not viable at this time.

How long land base has been implemented (if land base is being developed or in planning stages, please provide a timeframe that development or planning efforts have been underway);

PennDOT's land base was digitized by cartographers in the mid 1980's. GIS began linking and using the Cartography base in the early 1990's. After cartography digitized the CLF's, they copied the CLF's to incorporate cartographic license for map publishing. The GIS group stayed in the CLF's. Cartography still does some maintenance on the CLF's.

The time frame put upon PennDOT to complete our portion of the PA Map is June 2007. In all honesty, I do not believe we can be done. There have been some issues concerning funding and available resources so I have not been instructed to move on the local roads in earnest.

Brief description of GIS applications supported (or to be supported) on land base

A lot of the applications are basic dynamic segmentation queries for decision support. Roadway maintenance activities are planned by mapping and overlaying criteria for widening, crack sealing, etc. Completed activities are compared to plan to review effectiveness. Project mapping for legislative meetings, traffic monitoring site placement and traffic volume maps, crash analysis, bridge, and pavement are all mapped for various reasons from the 500 attribute GIS database. Some of the applications have gone to web based services – roadside spray, cultural resources, traffic http://164.156.5.83/itms/default.asp, and video log http://164.156.5.83/ividlog/video_locate.asp. The Intranet has a large variety of data accessible from a map or straight line display - document management, traffic, roadway, bridge, project, and maintenance.

Reasons for land base selection

Owned by PennDOT digitized from the best available source at that time.

NJ Turnpike Authority

Name/Title/Respective Agency

Elizabeth Johnson, GIS/Database Manager, NJ Turnpike Authority

Land Base(s) used to support GIS transportation-based applications/Land Base accuracy

Currently the NJTA uses one land base for support of its GIS applications.

Prior to the consolidation of New Jersey's two major toll roads, the NJTA's GIS for the NJ Turnpike (NJTPK) and the Garden State Parkway (GSP) were in various stages of early development. The GIS data was developed and compiled independently for the separate roadways prior to the consolidation and is, therefore, at different levels of detail and completeness. The street dataset used for NJTPK is GDT, Inc.'s Dynamap®/2000 (V 9.1).   At present, the GIS for the GSP have no land base reference.

The NJTA is currently in the early planning stages of developing an Enterprise GIS program that will integrate the existing department-level GIS systems currently used for the two roadways and will develop them further to include applications that can be leveraged by the entire organization. A needs assessment is expected to be conducted this year, which will include a detailed survey of our GIS data requirements.

The specific level of accuracy for the street data provided by the version of Dynamap® the NJTA is currently using is unknown.

How long land base has been implemented (if land base is being developed, provide timeframe development efforts have been underway)

Dynamap® /2000 (V 9.1) was purchased by the NJTA in 1999.

Brief description of applications supported on land base –

A needs assessment needs to be conducted to determine the applications to be used with the NJTA's proposed Enterprise GIS.

Reasons for land base selection

Unknown

Appendix B: Regional Agency Responses

Delaware Valley Regional Planning Commission

Name/Title/Respective Agency

Will Stevens, GIS Manager, DVRPC

Land Base(s) used to support GIS transportation-based applications/Land Base accuracy

There are four (4) land bases currently in use for support of GIS applications at DVRPC:
- DVRPC Regional Base Map– road centerlines (being phased out), boundaries, rail, and hydrological features originally digitized from USGS quads. Scale = 1"=2000';
- County road centerline files – obtained through Region-wide Transportation GIS project. Will incorporate NJ DOT road centerlines when complete for most NJ counties in our region. Horizontal scale = 1".
- TANA/GDT – obtained from PennDOT for entire 9-county region. Accuracy unknown.
- DOT road centerline file – 1"=2000' or better.

How long land base has been implemented (if land base is being developed, provide timeframe development efforts have been underway)

- DVRPC Regional Base Map - 1990
- County data – 2004, anticipate 2005 release of NJ DOT data.
- TANA/GDT – 2005
- DOT data – 1995?

Brief description of applications supported on land base –

DVRPC Regional Base Map – Serves as mapping base for all DVRPC mapping needs including report graphics, planning support, and Internet mapping applications.
County data – Road centerlines (including DOT linear referencing system) will replace road features from Regional Base Map. Will be more useful to planners because of access to attributes developed by counties and DOT's.
TANA/GDT – Most up-to-date resource for address matching applications including Share-a-ride and survey respondent locations.
DOT data – Utilized to analyze and map DOT data.

Reasons for land base selection
DVRPC Regional Base Map – DVRPC has maintained the RBM series for over 20 years. It has been updated every 5 years based upon aerial photography which DVRPC has maintained since 1959 and updated every 5 years since 1965. Digitizing the RBM was DVRPC's first steps into the digital mapping world in 1990. Has been updated digitally in 1995 and again in 2000.

County data – Allows DVRPC to take advantage of work already being done by the counties. Also makes any data developed by the counties or DVRPC more compatible, which increases data sharing and revenue saving opportunities.

TANA/GDT – Free offer from PennDOT filled a need for address matching. Will become obsolete when address data is added to road centerline files by the counties.

DOT data – Planners rely heavily on data from DOT's for transportation studies. Data extracted from DOT files did not register with DVRPC RBM files. To produce more accurate mapping, DOT road centerline files are used.

Comments:

The ideal situation would be to have each entity utilize the same land base data. It seem reasonable to allow the agency responsible for the state's roads, NJ DOT, to develop and maintain that data. Instead of having counties, municipalities, and other agencies duplicate effort, their time and money would be better spent providing update info or attribute information the DOT would not normally collect. Additional money may need to be provided to the DOT to map the roads at a scale that satisfies all interests. That being said, you may find it impossible to convince entities to give up the investments already made in creating and maintaining accurate road centerlines.

In our Region-wide Transportation GIS project, the object was to create a methodology for effortless data transfer. We gave counties the option of using DOT line work or their own line work with the DOT linear referencing system added. Most of the counties have little invested in their road centerline file and will use NJ DOT line work when available; others will incorporate the DOT LRS on their own line work.

North Jersey Transportation Planning Authority

Name/Title/Respective Agency

Keith Miller, Manager of GIS & Forecasting, NJTPA

Land Base(s) used to support GIS transportation-based applications/Land Base accuracy

NJTPA relies heavily on TIGER lines from the US Census Bureau for a transportation land base. We also use NJDOT's GIS layers that are available for higher-level roads

How long land base has been implemented (if land base is being developed, provide timeframe development efforts have been underway)
We have been using TIGER land base for several years. We are using NJDOT's land base were appropriate, and as it is being developed.

Brief description of applications supported on land base

The TIGER land base supports many of our transportation planning operations. We need to be able to locate and map all of the federally-funded transportation projects that occur on specific roads and railways. We also need to score these projects based on several parameters ranging from physical attributes of the project to surrounding demographics and land use. We have an on-line mapping application (the NJTPA Online Transportation Information System, or NOTIS) that lets the public query and map transportation projects that are in the planning and programming stages. TIGER roadways are also used as a background for our travel demand model (the North Jersey Regional Transportation Model, or NJRTM).

Reasons for land base selection

Not all of the projects that NJTPA needs to map on higher-level roads that have historically been mapped by NJDOT.
For the project scoring system, we need to be able to match the Census geography to correctly identify which block group it goes through, for evaluating environmental justice concerns. We also need to know which municipalities and congressional districts the project is in.

South Jersey Transportation Authority

Name/Title/Respective Agency

Joel T. Falk, Project Manager/GIS, SJTA

Land Base(s) used to support GIS transportation-based applications/Land Base accuracy

TIGER line files are used for regional demographic analysis. Generalized paratransit routing is also based on TIGER. It is anticipated that we will switch over to GDT (TeleAtlas) when it becomes available via state license where better address geocoding or horizontal accuracy is required. Ultimately, the NJDOT dataset will be used.

TIGER Line Files – VERY poor horizontally, over 300'+ off in some instances.
GDT/TeleAtlas Street Centerlines – Although based on TIGER data, verbal conversations with GDT have indicated that all of their NJ line work is within their desired threshold of +/- 3 meters.
NJDOT SRI Centerlines – I don't know what the stated accuracy of this data will be, but I imagine it will be relatively good.

How long land base has been implemented (if land base is being developed, provide timeframe development efforts have been underway)

TIGER Line Files – Imported into GDB feature classes, February 2005
GDT/TeleAtlas Street Centerlines – not yet available from NJOGIS
NJDOT SRI Centerlines – not yet available from NJDOT

Brief description of applications supported on land base –

TIGER Line Files -
Used for transportation grant applications where proximity to existing bus service needs to be analyzed.
Used to geocode employment centers to determine transportation deficiencies.
Used as general cartographic base when appropriate.
GDT/TeleAtlas Street Centerlines -
Will replace TIGER where improved horizontal accuracy and improved address geocoding is required.
NJDOT SRI Centerlines –
Should be the best out there when it becomes available. Maintenance for NJDOT will be an issue.

Reasons for land base selection

TIGER Line Files – Free, tied to census demographics.
GDT/TeleAtlas Street Centerlines – Will supposedly be free with better horizontal accuracy and improved address ranging.
NJDOT SRI Centerlines - Free, with all the inherent attribution and functionality.

Appendix C: County Responses, by each Survey Question

County Representative - Name/Title/Respective Agency

Atlantic: Matthew Duffy, GIS Specialist, Atlantic County Office of GIS
Bergen: Sean Zhang, County GIS Coordinator, Department of Planning and
                Economic Development
Burlington: Merrilee Torres, GIS Specialist 1, Burlington County Department of
                Information Technology
Camden: Curt Noe, GIS Manager, Camden County Public Works
Cape May: No response.
Cumberland: Kim Brown, GIS Coordinator, Cumberland County
Essex: Mihir Shah, Staff Engineer, Public Works
Gloucester: Mark Waters,GIS Specialist , Gloucester County Office of Data
                Management
Hudson: Stephen Marks, Director, Hudson County Division of Planning and
                Jonathan Luk, GIS Specialist, Hudson County Division of Planning
Hunterdon: Patty Leidner, GIS Coordinator, Hunterdon County
Mercer: Kathleen Sar / Mercer County Planning
Middlesex: Alex
Monmouth: Eric Anderson/GIS Coordinator/Monmouth County GIS
Morris: Nora Santiago, Assistant Planner and Steve Rice, GIS Manager, Morris
                County
Ocean: Scott Cadigan, GIS Specialist II, Planning and Mike Tarricone, Sheriff's
                department
Passaic: Mike Lysicatos, Senior Planner, Passaic County
Salem: Carl Wentzel, Dept Head, Emergency Services and Diana Ford, Chief of
                Admin Services, Engineering
Somerset: Jim Girvan, Planning Director, Somerset County
Sussex: David Kunz, GIS Manager, Sussex County
Union: Mathew Mathan, Bureau Chief, Bureau of GIS, Division of IT
Warren: David Dech, Planning Director, Warren County

Land Base(s) used to support GIS transportation-base applications/Land Base accuracy

Atlantic: Centerlines heads-up digitized from 1995/97 orthophotography, attributes
                from 1990 TIGER, accepted for use by Census in 2004/2005.
Bergen: Street centerline dataset off existing tax maps along with the parcels.

Burlington: County GIS Section's GPS road centerlines – accuracy is +/- 3 ft (no address ranges) and GDT's Dynamap 2000 product (has address ranges).

Camden: DVRPC Year 2000 digital orthophotography and NJDOT LRS line work.

Cape Map: No response.

Cumberland: Currently uses a road network developed from orthos and TIGER, no addresses. Currently in the middle of a county-wide parcel project and expect to get a completely new and more accurate roads layer.

Essex: No digital land base currently in use.

Gloucester: County-wide parcel database, road centerlines, digital orthophotography

Hudson: N/A

Hunterdon: Uses a GPS-derived road network with +- five foot horizontal accuracy.

Mercer: Road Centerlines and Parcel Data created by Civil Solutions.

Middlesex;   Middlesex County does not have or use a GIS transportation land base.

Monmouth: 1997 centerlines photogrammetrically derived from 100' scale photography (+/-2.5'). Update almost completed using photography acquired in 2003.

Morris: Morris County developed a street centerline file in-house. It was digitized using 1999 aerial photography and was described as "pretty accurate".

Ocean: GDT data.

Passaic: Passaic County uses the latest TIGER Files for their street network. They have not developed any files in-house. They also do not use any transit files.

Salem: No digital land base currently in use for Emergency Services. Engineering has centerlines created from DVRPC orthos.

Somerset: Somerset County currently uses a road network they purchased from GDT that had been enhanced using 2000 orthophotos from DVRPC. The orthos are one and a half foot pixel resolution with +- five foot horizontal accuracy, therefore the road network, at best, has a +- five foot horizontal accuracy.

Sussex: Sussex County uses a realigned TIGER file from the mid 1990s. The file was realigned using aerial photography from 1995-1997 (all roads). Sussex County also uses NJDOT files with state and county roadways referenced by mile marker.

Union: The street centerline land base is derived from overflights performed in 1999 and 2004. 1"-100' (1/2 foot pixel) orthophotography was generated for 18 of the 21 towns in Union County. 1"-50' orthophotography was generated for Elizabeth, Linden and Rahway. The 2004 overflight was used to update changes to the land base originally compiled from the 1999 flight. The land base contains street name attributes that are referenced from county sources.

Warren: Warren County currently uses the road network they received from a CD provided by the New Jersey DEP. This is a TIGER road network. It includes private roads but it is not very accurate. As they work on other activities such as a parcel mapping parcel, they adjust the road network to more accurately reflect true conditions

How long land base has been implemented? (if land base is being developed, provide timeframe development efforts have been underway)

Atlantic: 1991, first adjustment of TIGER to orthoimagery, readjusted to 1995/1997 orthoimagery

Bergen: 2001, major update is under way now and expected for completion by the year-end 2005. The updates are mainly from new subdivisions.

Burlington: 1999, GPS road centerlines was completed in 1999, started using the GDT product in 2003

Camden: 2004, GIS-T line work development is still on-going, waiting update of NJDOT LRS line work.

Cape May: No response.

Cumberland: 2001, current parcel-layer development.

Essex: N/A

Gloucester: 2000.

Hudson: Land base is under development. Data assessments will be conducted throughout each County agency. The Division of Planning is working with the Hudson County TMA, NJ Transit, NY Waterway, and NJTPA to develop its land base geodatabase. Much of the data will be derived from the NJ DOT Roadway dataset and TeleAtlas dataset.

Hunterdon: 1996 for the original data collection.

Mercer: 2002 data, and presently working on 2004.

Middlesex: N/A

Monmouth: County began by using GDT data in the late 1990's. This information was then replaced in 1999 by centerline information developed from 1997 imagery.

Morris: Have used the current road centerline file since 2000.

Ocean: Used for the past few years.

Passaic: They have been using the TIGER file for, at least, the last couple of years.

Salem: DVPRC centerlines used for last few years.

Somerset: Somerset has had this road network in house since 2001.

Sussex: Sussex County has been using the realigned TIGER file since the late 1990s. They are thinking of updating their road network by acquiring a commercial product database. The Sussex County contact believes that the state might be acquiring a statewide license for GDT data and they would use that data, mainly for the address data (geocoding purposes). They would update the data to realign to aerial photos as they did with TIGER data.

Union: The street centerline file was originally compiled from the 1999 overflight. The overflights are scheduled to be performed in 5 year increments.

Warren: They have been using the current road network since the time they received the CD from NJDEP which, they believe was around 1999. The

county is currently in the process of developing an ARCGIS centerline file. They anticipate that it will be completed by the end of the year (possibly even sooner). This centerline file will include private roads (roads in developments).

Brief description of GIS applications supported on land base

Atlantic: Census Bureau acceptance. Used by several departments for general planning and map creation.

Bergen: Support the county ARCIMS site. In great demand by OEM and police for their 911 related projects. Used internally to support the development of other land based data such as county facilities, traffic/transportation inventories, historic sites, open space, etc.

Burlington: Support general mapping by the GIS Section, Resource Conservation, Engineering, Emergency Management, Health, Highway & Prosecutors Departments as well as some address matching on an as needed basis. In the past the GPS roads were used to develop recycling routes. They also aided in the determination of what road segments must be maintained by street sweepers & for calculating road miles in specific project areas. The GDT roads are also being used by our Transportation Department as the geographic reference for a bus routing software and are being integrating into Public

Camden: Focus of GIS in Public Works is Highway Asset Management (on county roadways). Assets include signs, signals, pavement markings and stormwater drainage.

Cape May: No response.

Cumberland: Primary use of the road network is in support of transportation planning. The data are also used extensively as a cartographic element.

Essex: NA

Gloucester: All applications as deemed necessary by elected officials, county administrators & department heads to include applications in support of municipal programs.

Hudson: GIS application is limited to desktop software using shapefiles and personal geodatabase at this time. Server-client oriented structure with ArcSDE and ArcIMS should be completed and implemented some time in 2006.

Hunterdon: Hunterdon County's primary use of the road network is in support of planning and engineering. The data are also used extensively as a cartographic element. They are not used for geocoding, which is done through parcels.

Mercer: Open Space/ Farmland Preservation/ Land Development Projects.

Middlesex: N/A

Monmouth:	County has only used the centerline information for one GIS application. A video log was collected during the spring of 2002 and linked to each centerline segment within the GIS. The application was developed so that the user can simply click on the line segment and the associated video would then begin playing. The data has also been used by several departments for general planning and map creation.
Morris:	The road file is being used in a major project to develop a road network to use for a sub-area transportation model being developed for the county. Morris County has also integrated the road centerline file into a storm water management program. The street names in the file are being used for reverse 911 address geocoding. Morris County and 911 are trying to set up address matching, however their file does not contain full address ranges yet and, while Morris County would like to have this, there is not project imminent to do so. The railroad files are used mostly for display purposes.
Ocean:	Engineering, improvement projects; general map development.
Passaic:	They use the street files mostly as a base for thematic mapping. They have also been using the TIGER files to help develop a network to use for transportation modeling. They use both ArcView and MapInfo.
Salem:	Engineering – Improvement projects; general map development.
Somerset:	Somerset uses the road network to support a work order management system. Law Enforcement uses the network for vehicle location, and there are plans to use the network for dispatching in the near future. There are plans to add functionality such as reverse 911 locating, bus routing at school districts and geocoding for Meghan's Law notifications after address ranges have been improved (see #8 below).
Sussex:	Sussex County mainly uses the road data as part of their base map to overlay other data. The road data is also included on Sussex County's ArcIMS application. The county developed a linear referencing system as has data on the ArcIMS application linear referenced to the 100th of a mile.
Union:	All 21 towns in Union County subscribe to the land base. All county departments are able to access the street centerline dataset for their respective uses. The Bureau of GIS is responsible for generating the base data. The Bureau of GIS adds no other attributes to the land base other than street names. Some of the applications supported on the land base include planning and law enforcement.
Warren:	Warren County is currently performing a build out analysis. This build out analysis will consider factors such as environmental constraints, preserves, farmland, and current zoning and will also include the road network. This will also help Warren County develop input factor scenarios for a subregional transportation model. Warren County also uses the road network as an overlay on other maps such as existing and planned public sewers, open space and farmland maps, and transportation modeling maps.

Reasons for land base selection

Atlantic: Countywide consistent GIS dataset that can be used by all County departments as it is developed into a routable enterprise service network that would be used as the base for: County services, County asset management, County Planning, County Public Works, County Public Safety, County Public Health, municipal support and public information.

Bergen: The streets/roads are the most relevant and natural dividing lines when it comes to any land-based management and analysis.

Burlington: No address ranges on county GPS centerlines. Agreement with GDT in 2003, with GDT to align the geometry of their roads and use the parcels to update address ranges. Also rely upon our GPS roads for georeferencing our parcels.

Camden: Availability and low cost.

Cape May: No response.

Cumberland: N/A

Essex: N/A

Gloucester: Accuracy and completeness

Hudson: Availability

Hunterdon: The road network was initially created as a basis for conflating and rubber-sheeting scanned parcel maps in order to create a countywide parcel dataset. It was decided that creation of the road network through GPS would be the most cost effective method of obtaining complete, accurate road network.

Mercer: Accuracy.

Middlesex: N/A

Monmouth: Create a countywide consistent GIS dataset that can be used by all County departments.

Morris: Morris County decided to create their own centerline file because they were interested in accuracy. The centerline file was developed during the process of developing parcel data. They have also created right-of-way information by recording this information as offsets to the road centerlines.

Ocean: Free to the division and more accurate than TIGER.

Passaic: The TIGER database was the most readily available. The county also liked the database behind the TIGER file (especially the address information).

Salem: Developed as part of countywide parcel mapping effort.

Somerset: The GDT road network represented the best combination of data quality and affordability at the time of acquisition.

Sussex: Sussex County chose to use the TIGER file because it was readily available and free. It was a good starting point for overlaying onto aerials for improving the road network.

Union: Commercial sources were not considered accurate or comprehensive
            enough to support county GIS applications. Some of the commercial
            sources were reviewed and found to be lacking street data. This land
            base is able to incorporate new street centerline data from the County
            Planning Dept as new subdivisions are constructed.
Warren: The NJDEP road network was easily available. The county was starting a
            project for developing build out scenarios and the NJDEP CD provided to
            them included the road network so they decided to use it.

If there is a land base developed or implemented by the county, does it include private roadways? (If only certain types of private roadways are included, please elaborate).

Atlantic: Contains some driveways, private roads and tax streets.
Bergen: All roads, anticipate the additions of roads (private and public) will be
               minimal, updates from site plan and subdivision applications.
Burlington: Includes some private roadways but not all, have been adding private
               roads as needed for various projects and to support parcel mapping.
Camden: No.
Cape May: No response.
Cumberland: Yes, if they are adopted at the local level as roads. Haven't considered it
               as of yet, but probably will have a need to for the 911 Center.
Essex: N/A
Gloucester: Generally no, with the exception of access roads around a major mall
               (Deptford Mall)
Hudson: Roadways are currently limited to what is available by NJ DOT and
               TeleAtlas.
Hunterdon: This dataset does include private roads, including corporate parks, malls
               and driftways.
Mercer: Yes, if there are parcels on it.
Middlesex;   N/A
Monmouth: The existing centerline file contains both public and private roadways (i.e.
               condominium complexes). Data also includes long private driveways, but
               some smaller private driveways may not be present due to mapping
               convention implemented.
Morris: The centerline file includes private roadways. There were a number of
               people who helped with the development of the file so the choices of
               including or not including a road or driveway might not have been
               consistent; however, Morris County believes that most roads in residential
               developments and office parks were digitized and that the file is pretty
               comprehensive.
Ocean: N/A

Passaic: They have not developed an in-house network. The TIGER file contains private roadways.
Salem: Centerline file contains the majority of private roadways. Private roads mapped were in support of parcel mapping effort.
Somerset: This dataset does include some private roads.
Sussex: The Sussex County road network contains private roads to the extent that TIGER includes private roads. The county has not added any additional roads.
Union: Private roadways are included in this base to varying degrees. Streets serving private subdivisions (condos) are included. Access roads within shopping malls or hospitals are included but not to the same level of thoroughness as public roadways. "Any street with a name is included in this land base".
Warren: The TIGER file includes private roads. The new centerline file will also include private roadways such as those in private developments.

Is there a maintenance program underway to update their land base, and if there is, does it specifically include updating the private roadway network?

Atlantic: Currently the data is on a five year update cycle, or as ortho-photography with a finer resolution is acquired.
Bergen: Currently update being done by a consultant. Routine updates planned to be in-house from site plan and subdivision applications.
Burlington: County GPS roads are under constant maintenance, users report new roads as they are discovered or they are identified during parcel mapping.
Camden: Awaiting updated NJDOT line work, no intention of including private roadways.
Cape May: No response.
Cumberland: Still considering how to do updates. Can not tell from the application in the planning department if the change will actually be completed. May need to rely on local engineers.
Essex: N/A
Gloucester: Updates are done annually based on parcel data & road updates.
Hudson: No maintenance program is underway.
Hunterdon: Hunterdon continually updates the road network. The GIS division is made aware of new roads through the filing of new subdivision plans and by yearly requests for data to the 26 municipalities. Private roads will continue to be maintained and updated.
Mercer: Yes.
Middlesex: N/A
Monmouth: Currently the data is on a five year update cycle.

Morris: Morris County performed a great deal of maintenance to the centerline file to get the file ready for developing the travel demand model. New aerial photography has been flown and Morris County plans to update the centerlines using these aerials in the fall including seeking out new roads. They plan on updating the centerline file whenever new aerials are flown which, Morris County believes, is on a five year cycle.

Ocean: N/A

Passaic: They have not and do not plan to update the TIGER file. There are also no plans to develop a maintenance program.

Salem: DVRPC centerlines are currently being updated through a parcel maintenance contract. New centerlines are being created using the State 2002 digital orthophotography.

Somerset: Somerset is a partner in the "community update program", but since GDT was purchased by TeleAtlas, that program has been on hold and no data updates have occurred. The county is hoping/planning to use geometry from the new statewide mapping to update their road base. They have not yet finalized a detailed plan for ongoing maintenance.

Sussex: Aside from the prospect of replacing their current file with a GDT file, Sussex County and aside from the initial adjustment of the data to aerials, the county does not perform any set maintenance whether on private roads or otherwise and does not process any new road information.

Union: There is a new overflight anticipated to occur in 2009. In addition, the County is finalizing plans for the street centerline base to be combined with the County 911 program as well as a county-wide parcel mapping project. The objective is to create a dataset where phone numbers are linked to mapped parcels positioned on the street centerline base. The program will enable the land base to incorporate street name attributes compiled through the 911 program.

Warren: Warren County had been updating the current file when they see a discrepancy; however, with the current project of creating a centerline file, they have stopped updating the TIGER file. They have not developed a process for maintaining the centerline file once completed. They will see if they will be able to maintain it in house. If the job becomes too onerous, they may decide to use a consultant to help maintain the file. As they develop the centerline file, there are quality controls in place including comparisons to tax records.

The County's current data gathering efforts (re: street addresses)

Atlantic: Reviewing methodology for, and considering development of, a line transportation network database using the property boundaries to conflate the addresses from the parcel layer to the transportation network

database while concurrently editing the rapidly developing areas and converting tax roads to municipal or development roads

Bergen: N/A

Burlington: Street addresses are not collected at this time. We collect road name, direction (from road name), street type, suffix, jurisdiction, SRI number, alternate name, # lanes, presence of a shoulder or ditch, one way/ two way, type, posted speed limit, striping, and surface material.

Camden: N/A

Cape Map: No response.

Cumberland: Currently in the middle of a county-wide parcel project and expect to get a completely new and more accurate roads layer.

Essex: N/A

Gloucester: N/A

Hudson: N/A

Hunterdon: Street addresses are found in the parcel data. The county has also developed a data layer representing a point location for each addressable structure within the county. Plans have been made to use these data, along with the parcel data, for E-911 dispatch.

Mercer: N/A

Middlesex: N/A

Monmouth: Currently seeking funds through a Homeland Security grant to create address ranges.

Morris: No project is imminent for collecting street address information.

Ocean: N/A

Passaic: The county is using street address information on the TIGER files. There are no data gathering efforts (no resources available).

Salem: N/A

Somerset: GDT was given Somerset's parcel data, which includes addresses, for use in improving address-ranges on the road network.

Sussex: The county plans on obtaining address data from the GDT file.

Union: N/A

Warren: The county is thinking about getting street address information but it is not currently in the midst.

How are new roads (public and private) processed?

Atlantic: No formal process is in place. Currently developing a mechanism for perpetual road updates via site plans.

Bergen: Routine updates planned to be in-house from site plan and subdivision applications.

Burlington: Collected by driving the road with a Trimble ProXR GPS unit, reviewed against orthoimagery.

Camden: N/A
Cape May: No response.
Cumberland: N/A
Essex; N/A
Gloucester: N/A
Hudson: N/A
Hunterdon: New roads are "found" through the county planning office when subdivision plans are filed and approved. Once the roads have been built, the GIS division collects the centerline by GPS.
Mercer: N/A
Middlesex: N/A
Monmouth: Through update program. No formal process is in place to address new road creation on an annual basis.
Morris: Aerials will be flown in the fall to add new roads. The aerials are flown on a five year cycle and all roads are updated at that time.
Ocean: N/A
Passaic; The county does not add any new roads, whether public or private, to the TIGER files.
Salem: Currently through parcel maintenance.
Somerset: Currently, there is no process for maintaining the centerline file.
Sussex: There is no set maintenance program for processing new road information (whether public or private).
Union: N/A
Warren: Currently, there is no process for maintaining the centerline file.

How does the County participate in the E911 program?

Atlantic: Not known. (The County is reviewing different programs and they are considering a regional restructuring.)
Bergen: Stated that centerlines were in demand from E911.
Burlington: The GDT roads are integrated as a base map in the County's 911 software. The Burlington County IT Department's GIS Section has one employee who is dedicated to working full time on projects for Emergency Management & Public Safety.
Camden: N/A
Cape Map: No response.
Cumberland: It will be used in the 9-1-1 Communications Center as will the parcels.
Essex: Have not yet been successful in contacting Mr. Frank Delgotto for information related too E911.
Gloucester: N/A
Hudson: N/A

Hunterdon:	Plans have been made to use these data, along with the parcel data, for E-911 dispatch.
Mercer:	N/A
Middlesex:	N/A
Monmouth:	The E911 program using a software program called New World for dispatch. This software uses a text file to search for address and/or intersection information. At this time, the text file is updated manually as new road/addresses are approved.
Morris:	Street names in the road centerline file are being used for reverse 911 address geocoding. Morris County and 911 are trying to set up address matching, however the file does not contain full address ranges yet and, while Morris County would like to have this, there is not project imminent to do so.
Ocean:	Sheriff's Department currently uses a text based system. Each local municipal E911 coordinator calls the County to let them know when new sites are added. They manually add this information into the database. No mapping capability at this time, though there is interest. Hagstrom map sheet numbers are also added to the database to help locate each address.
Passaic:	The county has no GIS information sharing efforts related to E911.
Salem:	Emergency Services - Replacing existing CAD program at the end of June. New CAD program "Interact" has a mapping component. They are currently investigating the availability of digital data…no technical requirements could be provided by contact.
Somerset:	N/A
Sussex:	There is currently no sharing of GIS information between E911 and the county.
Union:	N/A
Warren:	E911 has their own system. There is currently not a great deal of data sharing. E911 was reluctant to share data. Although the county can't recall the exact reason for the reluctance, the county believes it had something to do with the sensitivity of the information and possible something to do with their program. The county has provided E911 with some GIS maps (e.g., location of schools, fire houses, etc.).

Appendix D: County Responses

Atlantic County

1)   Name/Title/Respective Agency (county representative)

Matthew Duffy/GIS Specialist/Atlantic County Office of GIS

2)   Land Base(s) used to support GIS transportation-based applications/Land Base accuracy

1995/97 centerlines photogrammetrically derived (Heads-up digitized @ set scale) from NJDEP/USGS 400 scale photography (+/-1 meter). Update almost completed using photography acquired in 2000, with specific individual updates using NJ 2002 photography

3)   How long has land base has been implemented? (if land base is being developed, provide timeframe development efforts have been underway)

County originally adjusted roadway centerlines from the 1990 TIGER Census line-work to 1991 3-meter pixel resolution B/W aerial ortho-photography. This line-work was then adjusted to the 1995 aerials and is now the 1995-base. This was completed at the end of 1999 into the beginning of 2000. The updates to the 2000 aerials will soon be completed and published on the IMS/NJGIN website. This data will be available this summer.

4)   Brief description of GIS applications supported on land base

IMS/NJGIN site http://njgin.aclink.org
The 1995-base was submitted to the Census Bureau between 2002/2003. In 2004/2005 acceptance by the Census Bureau was received by ACOGIS. This letter stated the use of Atlantic County's line-work would be included with next issuance of the TIGER line-work files. I will submit this letter for reference. The data has also been used by several departments for general planning and map creation.

5)   Reasons for land base selection

Create a countywide consistent GIS dataset that can be used by all County departments as it is developed into a routable enterprise service network that would be used as the base for: County services, County asset management, County Planning, County Public Works, County Public Safety, County Public Health, municipal support and public information.

6)   If there is a land base developed or implemented by the county, does it include private roadways? (If only certain types of private roadways are included, please elaborate).

When it was originally digitized, the goal was 'if it is viewable and discernable @ the desired map scale, it will be digitized'. Some of this line-work was then sorted and attributed after the fact, by field checking when needed. Currently, the 2000-base continues this effort and does

contain some driveways, private roads and tax streets. Currently, a methodology for constant and persistent updates is under construction.

7)   Is there a maintenance program underway to update their land base, and if there is, does it specifically include updating the private roadway network?

Currently the data is on a five year update cycle, or as ortho-photography with a finer resolution is acquired.

8) The County's current data gathering efforts (re: street addresses)

Reviewing methodology for, and considering development of, a line transportation network database using the property boundaries to conflate the addresses from the parcel layer to the transportation network database while concurrently editing the rapidly developing areas and converting tax roads to municipal or development roads

9) How are new roads (public and private) processed?

No formal process is in place. Currently developing a mechanism for perpetual road updates via site plans

10) How does the County participate in the E911 program?

I do not know. As I understand it to be, the County is reviewing different programs and they are considering a regional restructuring. I will research this further and submit additional information.

Bergen County

1)   Name/Title/Respective Agency (county representative)

Sean Zhang
Director, Division of Data Resources & Technology,
Department of Planning and Econ. Dev.
County of Bergen
I am the county GIS coordinator, though without formal title yet.

2)   Land Base(s) used to support GIS transportation-based applications/Land Base accuracy

We have developed a street centerline dataset off existing tax maps along with the parcels.

3)   How long land base has been implemented? (if land base is being developed, provide timeframe development efforts have been underway)

The initial dataset was developed in 2001. A major update is under way now and expected for completion by the year-end. The updates are mainly from new subdivisions.

4)   Brief description of GIS applications supported on land base

It is used to support the ARCIMS site the county is maintaining and updating. The street center line dataset is also in great demand by OEM and police for their 911 related projects. The data is used internally to support the development of other land based data such as county facilities, traffic/transportation inventories, historic sites, open space, etc.

5)   Reasons for land base selection

The streets/roads are the most relevant and natural dividing lines when it comes to any land-based management and analysis. I am not sure what else needs to be elaborated.

6)   If there is a land base developed or implemented by the county, does it include private roadways? (If only certain types of private roadways are included, please elaborate).

All roads have been counted for in our initial data development and we will continue on this. Considering the Bergen County is so fully developed, we anticipate the additions of roads (private and public) will be minimal. Our office also handles site plan and subdivision applications, which allows us to keep tract of roadway change relatively easily.

7)   Is there a maintenance program underway to update their land base, and if there is, does it specifically include updating the private roadway network?

The update currently under by is being done by a consultant. After that, I plan to maintain routine updates in-house. Again, the updates will include all types of roads.

8) The County's current data gathering efforts (re: street addresses)

9) How are new roads (public and private) processed?

10) How does the County participate in the E911 program?

The street center line dataset is also in great demand by OEM and police for their 911 related projects.

Burlington County

1)   Name/Title/Respective Agency (county representative)

Merrilee Torres, GIS Specialist 1, Burlington County Department of Information Technology, GIS Section

2)   Land Base(s) used to support GIS transportation-based applications/Land Base accuracy

Burlington County GIS Section's GPS road centerlines – accuracy is +/- 3 ft (no address ranges) and GDT's Dynamap 2000 product (has address ranges)

3)   How long land base has been implemented? (if land base is being developed, provide timeframe development efforts have been underway)

Burlington County GIS Section GPS road centerlines was completed in 1999 and has been under maintenance for new roads ever since. We started using the GDT product in 2003 and receive quarterly updates.

4)   Brief description of GIS applications supported on land base

Currently they are both used to support general mapping by the GIS Section, Resource Conservation, Engineering, Emergency Management, Health, Highway & Prosecutors Departments as well as some address matching on an as needed basis. In the past the GPS roads were used to develop recycling routes. They also aided in the determination of what road segments must be maintained by street sweepers & for calculating road miles in specific project areas. The GDT roads are also being used by our Transportation Department as the geographic reference for a bus routing software and are being integrating into Public Safety's 911 CAD mapping interface.

5)   Reasons for land base selection

Burlington County GPS road centerlines: high accuracy and control of attributes. The ability to update as needed.
GDT roads: In 2003 we established an agreement with GDT to share data. Through this agreement GDT sends Burlington County their Dynamap 2000 product quarterly for the Burlington area plus all adjacent counties. Burlington County supplies GDT with our GPS road centerlines and parcel data. GDT is supposed to align the geometry of their roads to ours and use the parcels to update address ranges. We entered into this agreement to acquire the GDT data for free because we do not have address ranges on our GPS roads. We also rely upon our GPS roads for georeferencing our parcels.

6)   If there is a land base developed or implemented by the county, does it include private roadways? (If only certain types of private roadways are included, please elaborate).

It does include some private roadways but not all. The initial layer creation was funded by a grant which only covered public paved roads. Since completion of the grant, we have been adding private roads as needed for various projects and to support parcel mapping. These

mostly included condo, apartment, and industrial complexes but there are some malls. Not all private roads are currently mapped.

7)   Is there a maintenance program underway to update their land base, and if there is, does it specifically include updating the private roadway network?

The Burlington County GIS Section GPS roads are under constant maintenance with new roads being collected via GPS nearly every week. Private roads are being collected as discovered if they are in the area designated for maintenance at that time or needed for a particular project. Township and county users report new roads as they are discovered or they are identified during parcel mapping.

8) The County's current data gathering efforts (re: street addresses)

Street addresses are not collected at this time. We collect road name, direction (from road name), street type, suffix, jurisdiction, SRI number, alternate name, # lanes, presence of a shoulder or ditch, one way/ two way, type, posted speed limit, striping, and surface material.

9) How are new roads (public and private) processed?

They are collected by driving the road with a Trimble ProXR GPS unit. The antennae are mounted on the roof and an offset is applied in the software to collect data an appropriate distance to the left based on the width of the vehicles roof so that the centerline is being mapped. Attributes are entered in the field. Data is then downloaded in the office, differentially corrected and exported to a shapefile or coverage. It is reviewed against the NJ 2002 orthos and any obvious errors removed. Intersections between roads are made and then the data is added to a version of the road feature class in the SDE geodatabase, reconciled and posted.

10) How does the County participate in the E911 program?

The GDT roads are integrated as a base map in the County's New World 911 software. When a call comes in, it is using the GDT addressing to map the point location of that call. The Burlington County IT Department's GIS Section has one employee who is dedicated to working full time on projects for Emergency Management & Public Safety. He assisted in the integration of the GIS data with New World and will continue to be involved.

Camden County

1)   Name/Title/Respective Agency (county representative)

Curt Noe , GIS Manager, Camden County Public Works

2)   Land Base(s) used to support GIS transportation-based applications/Land Base accuracy

DVRPC Year 2000 digital orthophotography and NJDOT LRS line work

3)   How long land base has been implemented? (if land base is being developed, provide timeframe development efforts have been underway)

Since 2004, GIS-T line work development is still on-going. Awaiting update of NJDOT LRS line work.

4)   Brief description of GIS applications supported on land base

Focus of GIS in Public Works is Highway Asset Management (on county roadways). Assets include signs, signals, pavement markings and stormwater drainage.

5)   Reasons for land base selection

Availability and low cost.

6)   If there is a land base developed or implemented by the county, does it include private roadways? (If only certain types of private roadways are included, please elaborate).

Yes, awaiting updated NJDOT line work, no intention of including private roadways.

7)   Is there a maintenance program underway to update their land base, and if there is, does it specifically include updating the private roadway network?

8) The County's current data gathering efforts (re: street addresses)

9) How are new roads (public and private) processed?

10) How does the County participate in the E911 program?

Cape May County

No response received.

Cumberland County

1) Name/Title/Respective Agency (county representative)

Kim Brown, GIS Coordinator, Cumberland County

2) Land Base(s) used to support GIS transportation-based applications/Land Base accuracy

Currently uses a road network developed from orthos and TIGER. No addresses. Use both GPS and digitizing from orthos. We are currently in the middle of a county-wide parcel project. From that we expect to get a completely new and more accurate roads layer.

3) How long land base has been implemented? (if land base is being developed, provide timeframe development efforts have been underway)

The data was originally published in February, 2001.

4) Brief description of GIS applications supported on land base

Cumberland County's primary use of the road network is in support of transportation planning. The data are also used extensively as a cartographic element.

5) Reasons for land base selection

6) If there is a land base developed or implemented by the county, does it include private roadways? (If only certain types of private roadways are included, please elaborate).

This dataset does not include private roads, it does include both operating and abandoned railroads. If they are adopted at the local level as roads, yes. Otherwise, we haven't considered it as of yet, but probably will have a need to for
the 911 Center.

7) Is there a maintenance program underway to update their land base, and if there is, does it specifically include updating the private roadway network?

The updates to this new coverage are still being considered. It is
simply not known who, when or how often?! Oddly enough, my office is in the planning
department, and, no, we don't (process changes from applications),
because we can't tell from an application whether it will actually go
all the way through the system and get filed. I think we (will) be relying on the
local engineers and engineering firms.

8) The County's current data gathering efforts (re: street addresses)

Not as of yet, hopefully someday!!

9) How are new roads (public and private) processed?

10) How does the County participate in the E911 program?

It will be used in the 9-1-1 Communications Center as will the parcels.

Essex County

1)   Name/Title/Respective Agency (county representative)

Mihir Shah, Staff Engineer, Public Works

2)   Land Base(s) used to support GIS transportation-based applications/Land Base accuracy

No digital land base currently in use.
Engineering does use a video log that was developed to collect traffic signs a couple years ago.

3)   How long land base has been implemented? (if land base is being developed, provide timeframe development efforts have been underway)

N/A
4)   Brief description of GIS applications supported on land base

N/A

5)   Reasons for land base selection

N/A

6)   If there is a land base developed or implemented by the county, does it include private roadways? (If only certain types of private roadways are included, please elaborate).

N/A
7)   Is there a maintenance program underway to update their land base, and if there is, does it specifically include updating the private roadway network?

N/A

8) The County's current data gathering efforts (re: street addresses)

N/A

9) How are new roads (public and private) processed?

N/A

10) How does the County participate in the E911 program?

Have not yet been successful in contacting Mr. Frank Delgotto for information related too E911.

Gloucester County

1)   Name/Title/Respective Agency (county representative)

Mark Waters / GIS Specialist / Gloucester County Office of Data Management

2)   Land Base(s) used to support GIS transportation-based applications/Land Base accuracy

County-wide parcel database, road centerlines, digital orthophotography

3)   How long land base has been implemented? (if land base is being developed, provide timeframe development efforts have been underway)

Since 2000. Updates are done annually based on parcel data & road updates

4)   Brief description of GIS applications supported on land base

All applications as deemed necessary by elected officials, county administrators & department heads to include applications in support of municipal programs.

5)   Reasons for land base selection

Accuracy and completeness

6)   If there is a land base developed or implemented by the county, does it include private roadways? (If only certain types of private roadways are included, please elaborate).

Generally no, with the exception of access roads around a major mall (Deptford Mall)

7)   Is there a maintenance program underway to update their land base, and if there is, does it specifically include updating the private roadway network?

Yes, see item three (3) above. Private roadways only as stated in item six (6) above.

8) The County's current data gathering efforts (re: street addresses)

N/A

9) How are new roads (public and private) processed?

N/A

10) How does the County participate in the E911 program? N/A

Hudson County

1)   Name/Title/Respective Agency (county representative)

Stephen Marks, Director, Hudson County Division of Planning and Jonathan Luk, GIS Specialist, Hudson County Division of Planning

2)   Land Base(s) used to support GIS transportation-based applications/Land Base accuracy

ESRI's ArcGIS 9.x

3)   How long land base has been implemented? (if land base is being developed, provide timeframe development efforts have been underway)

Land base is under development. Data assessments will be conducted throughout each County agency. The Division of Planning is working with the Hudson County TMA, NJ Transit, NY Waterway, and NJTPA to develop its land base geodatabase. Much of the data will be derived from the NJ DOT Roadway dataset and TeleAtlas dataset.

4)   Brief description of GIS applications supported on land base

GIS application is limited to desktop software using shapefiles and personal geodatabase at this time. Server-client oriented structure with ArcSDE and ArcIMS should be completed and implemented some time in 2006.

5)   Reasons for land base selection

Availability

6)   If there is a land base developed or implemented by the county, does it include private roadways? (If only certain types of private roadways are included, please elaborate).

Roadways are currently limited to what is available by NJ DOT and TeleAtlas.

7)   Is there a maintenance program underway to update their land base, and if there is, does it specifically include updating the private roadway network?

No maintenance program is underway.

8) The County's current data gathering efforts (re: street addresses)

The County of Hudson is currently conducting data assessments. Attribute information will be derived from MOD IV tax information and eventually include information from the tax maps.

9) How are new roads (public and private) processed?

N/A

10) How does the County participate in the E911 program?

N/A

Hunterdon County

1)   Name/Title/Respective Agency (county representative)

Patty Leidner, GIS Coordinator, Hunterdon County

2)   Land Base(s) used to support GIS transportation-based applications/Land Base accuracy.

Hunterdon County currently uses a GPS-derived road network with +- five foot horizontal accuracy.

3)   How long land base has been implemented? (if land base is being developed, provide timeframe development efforts have been underway)

The original data collection was completed in 1996.

4)   Brief description of GIS applications supported on land base

Hunterdon County's primary use of the road network is in support of planning and engineering. The data are also used extensively as a cartographic element. They are not used for geocoding, which is done through parcels.

5)   Reasons for land base selection

The road network was initially created as a basis for conflating and rubber-sheeting scanned parcel maps in order to create a countywide parcel dataset. It was decided that creation of the road network through GPS would be the most cost effective method of obtaining complete, accurate road network.

6)   If there is a land base developed or implemented by the county, does it include private roadways? (If only certain types of private roadways are included, please elaborate).

This dataset does include private roads, including corporate parks, malls and driftways. .

7)   Is there a maintenance program underway to update their land base, and if there is, does it specifically include updating the private roadway network?

Hunterdon continually updates the road network. The GIS division is made aware of new roads through the filing of new subdivision plans and by yearly requests for data to the 26 municipalities. Private roads will continue to be maintained and updated.

8) The County's current data gathering efforts (re: street addresses)

Street addresses are found in the parcel data. The county has also developed a data layer representing a point location for each addressable structure within the county. Plans have been made to use these data, along with the parcel data, for E-911 dispatch.

9) How are new roads (public and private) processed?

New roads are "found" through the county planning office when subdivision plans are filed and approved. Once the roads have been built, the GIS division collects the centerline by GPS.

10) How does the County participate in the E911 program?

Plans have been made to use these data, along with the parcel data, for E-911 dispatch.

Mercer County

3)   Name/Title/Respective Agency (county representative) County

Kathleen Sar, Mercer County Planning

4)   Land Base(s) used to support GIS transportation-based applications/Land Base accuracy.

Road Centerlines and Parcel Data created by Civil Solutions

3)   How long land base has been implemented? (if land base is being developed, provide timeframe development efforts have been underway)

2002 Data, and presently working on 2004.

4)   Brief description of GIS applications supported on land base

Open Space/ Farmland Preservation/ Land Development Projects

5)   Reasons for land base selection

Accuracy.

6)   If there is a land base developed or implemented by the county, does it include private roadways? (If only certain types of private roadways are included, please elaborate).

Yes, if there are parcels on it.
.

7)   Is there a maintenance program underway to update their land base, and if there is, does it specifically include updating the private roadway network?

Yes.

8) The County's current data gathering efforts (re: street addresses)

NJDOT data(?)

9) How are new roads (public and private) processed?

The parcel data (?)

10) How does the County participate in the E911 program?

I have to check with Bob Hartman our EMS / GIS person. (His email rhartman@mercercounty.org.)

Middlesex County

5)   Name/Title/Respective Agency (county representative) County

Alex

6)   Land Base(s) used to support GIS transportation-based applications/Land Base accuracy.

Middlesex County does not have or use a GIS transportation land base.

3)   How long land base has been implemented? (if land base is being developed, provide timeframe development efforts have been underway)

N/A

4)   Brief description of GIS applications supported on land base

N/A

5)   Reasons for land base selection

N/A

6)   If there is a land base developed or implemented by the county, does it include private roadways? (If only certain types of private roadways are included, please elaborate).

N/A   .

7)   Is there a maintenance program underway to update their land base, and if there is, does it specifically include updating the private roadway network?

N/A

8) The County's current data gathering efforts (re: street addresses)

N/A

9) How are new roads (public and private) processed?

N/A

10) How does the County participate in the E911 program?

N/A

Monmouth County

1)   Name/Title/Respective Agency (county representative)

Eric Anderson/GIS Coordinator/Monmouth County GIS

2)   Land Base(s) used to support GIS transportation-based applications/Land Base accuracy

1997 centerlines photogrammetrically derived from 100' scale photography (+/-2.5'). Update almost completed using photography acquired in 2003

3)   How long land base has been implemented? (if land base is being developed, provide timeframe development efforts have been underway)

County began by using GDT data in the late 1990's. This information was then replaced in 1999 by centerline information developed from 1997 imagery.

4)   Brief description of GIS applications supported on land base

County has only used the centerline information for one GIS application. A video log was collected during the Spring of 2002 and linked to each centerline segment within the GIS. The application was developed so that the user can simply click on the line segment and the associated video would then begin playing. The data has also been used by several departments for general planning and map creation.

5)   Reasons for land base selection

Create a countywide consistent GIS dataset that can be used by all County departments.

6)   If there is a land base developed or implemented by the county, does it include private roadways? (If only certain types of private roadways are included, please elaborate).

The existing centerline file contains both public and private roadways (i.e. condominium complexes). Data also includes long private driveways, but some smaller private driveways may not be present due to mapping convention implemented.

7)   Is there a maintenance program underway to update their land base, and if there is, does it specifically include updating the private roadway network?

Currently the data is on a five year update cycle.

8) The County's current data gathering efforts (re: street addresses)

Currently seeking funds through a Homeland Security grant to create address ranges.

9) How are new roads (public and private) processed?

Through update program. No formal process is in place to address new road creation on an annual basis.

10) How does the County participate in the E911 program?

The E911 program using a software program called New World for dispatch. This software uses a text file to search for address and/or intersection information. At this time, the text file is updated manually as new road/addresses are approved.

Morris County

1) Name/Title/Respective Agency

Nora Santiago, Assistant Planner and Steve Rice, GIS Manager, Morris County

2) Land Base(s) used to support GIS transportation-based applications/Land Base accuracy

Morris County developed a street centerline file in-house. It was digitized using 1999 aerial photography and was described as "pretty accurate". They also have an in-house centerline file for railroads. This file was developed using an "old source" and is in the process of being updated. The passenger rail information is probably fine; the freight lines require the most updating.

3) How long land base has been implemented (if land base is being developed, provide timeframe development efforts have been underway)

They have used the current road centerline file since 2000. The railroad file is older (not sure of age).

4) Brief description of GIS applications supported on land base –

The road file is being used in a major project to develop a road network to use for a sub-area transportation model being developed for the county. Morris County has also integrated the road centerline file into a storm water management program. The street names in the file are being used for reverse 911 address geocoding. Morris County and 911 are trying to set up address matching, however their file does not contain full address ranges yet and, while Morris County would like to have this, there is not project imminent to do so.

The railroad files are used mostly for display purposes.

5) Reasons for land base selection

Morris County decided to create their own centerline file because they were interested in accuracy. The centerline file was developed during the process of developing parcel data. They have also created right-of-way information by recording this information as offsets to the road centerlines.

6) If there is a land base developed or implemented by the county, does it include private roadways? (If only certain types of private roadways are included, please elaborate).

The centerline file includes private roadways. There were a number of people who helped with the development of the file so the choices of including or not including a road or driveway might not have been consistent; however, Morris County believes that most roads in residential developments and office parks were digitized and that the file is pretty comprehensive.

7) Is there a maintenance program underway to update county's land base, and if there is, does it specifically include updating the private roadway network?

Morris County performed a great deal of maintenance to the centerline file to get the file ready for developing the travel demand model. New aerial photography has been flown and Morris County plans to update the centerlines using these aerials in the fall including seeking out new roads. They plan on updating the centerline file whenever new aerials are flown which, Morris County believes, is on a five year cycle.

8) The County's current data gathering efforts (re: street addresses)?

No project is imminent for collecting street address information.

9) How are new roads (public & private) processed?

Aerials will be flown in the fall to add new roads. The aerials are flown on a five year cycle and all roads are updated at that time.

10) How does the County participate in the E911 program?

Street names in the road centerline file are being used for reverse 911 address geocoding. Morris County and 911 are trying to set up address matching, however the file does not contain full address ranges yet and, while Morris County would like to have this, there is not project imminent to do so.

Ocean County

1)   Name/Title/Respective Agency (county representative)

Scott Cadigan, GIS Specialist II, Planning and Mike Tarricone, Sheriff's department

2)   Land Base(s) used to support GIS transportation-based applications/Land Base accuracy

GDT data

3)   How long land base has been implemented?
(If land base is being developed, provide timeframe development efforts have been underway)

Used for the past few years

4)   Brief description of GIS applications supported on land base

Engineering – Improvement projects; general map development

5)   Reasons for land base selection
        Free to the division and more accurate than TIGER

6)   If there is a land base developed or implemented by the county, does it include private roadways? (If only certain types of private roadways are included, please elaborate).

N/A

7)   Is there a maintenance program underway to update their land base, and if there is, does it specifically include updating the private roadway network?

N/A

8) The County's current data gathering efforts (re: street addresses)

N/A

9) How are new roads (public and private) processed?

N/A

10) How does the County participate in the E911 program?

Sheriff's Department currently uses a text based system. Each local municipal E911 coordinator calls the County to let them know when new sites are added. They manually add this information into the database. No mapping capability at this time, though there is interest. Hagstrom map sheet numbers are also added to the database to help locate each address.

Passaic County

1) Name/Title/Respective Agency

Mike Lysicatos, Senior Planner, Passaic County

2) Land Base(s) used to support GIS transportation-based applications/Land Base accuracy

Passaic County uses the latest TIGER Files for their street network. They have not developed any files in-house. They also do not use any transit files.

3) How long land base has been implemented (if land base is being developed, provide timeframe development efforts have been underway)

They have been using the TIGER file for, at least, the last couple of years.

4) Brief description of GIS applications supported on land base –

They use the street files mostly as a base for thematic mapping. They have also been using the TIGER files to help develop a network to use for transportation modeling. They use both ArcView and MapInfo.

5) Reasons for land base selection

The TIGER database was the most readily available. The county also liked the database behind the TIGER file (especially the address information).

6) If there is a land base developed or implemented by the county, does it include private roadways? (If only certain types of private roadways are included, please elaborate).

They have not developed an in-house network. The TIGER file contains private roadways.

7) Is there a maintenance program underway to update county's land base, and if there is, does it specifically include updating the private roadway network?

They have not and do not plan to update the TIGER file. There are also no plans to develop a maintenance program.

8) The County's current data gathering efforts (re: street addresses)?

The county is using street address information on the TIGER files. There are no data gathering efforts (no resources available).

9) How are new roads (public & private) processed?

The county does not add any new roads, whether public or private, to the TIGER files.

10) How does the County participate in the E911 program?

The county has no GIS information sharing efforts related to E911.

Salem County

1)   Name/Title/Respective Agency (county representative)

Carl Wentzel, Dept Head, Emergency Services and Diana Ford, Chief of Admin Services, Engineering

2)   Land Base(s) used to support GIS transportation-based applications/Land Base accuracy

No digital land base currently in use for Emergency Services. Engineering has centerlines created from DVRPC orthos

3)   How long land base has been implemented?
(If land base is being developed, provide timeframe development efforts have been underway)

DVPRC centerlines used for last few years

4)   Brief description of GIS applications supported on land base

Engineering – Improvement projects; general map development

5)   Reasons for land base selection

Developed as part of countywide parcel mapping effort

6)   If there is a land base developed or implemented by the county, does it include private roadways? (If only certain types of private roadways are included, please elaborate).

Centerline file contains the majority of private roadways. Private roads mapped were in support of parcel mapping effort.

7)   Is there a maintenance program underway to update their land base, and if there is, does it specifically include updating the private roadway network?

DVRPC centerlines are currently being updated through a parcel maintenance contract. New centerlines are being created using the State 2002 digital orthophotography.

8) The County's current data gathering efforts (re: street addresses)

N/A

9) How are new roads (public and private) processed?

Currently through parcel maintenance.

10) How does the County participate in the E911 program?

Emergency Services - Replacing existing CAD program at the end of June. New CAD program "Interact" has a mapping component. They are currently investigating the availability of digital data…no technical requirements could be provided by contact.

Somerset County

1) Name/Title/Respective Agency

Jim Girvan, Planning Director, Somerset County

2) Land Base(s) used to support GIS transportation-based applications/Land Base accuracy

Somerset County currently uses a road network they purchased from GDT that had been enhanced using 2000 orthophotos from DVRPC. The orthos are one and a half foot pixel resolution with +- five foot horizontal accuracy, therefore the road network, at best, has a +- five foot horizontal accuracy.

3) How long land base has been implemented (if land base is being developed, provide timeframe development efforts have been underway)

Somerset has had this road network in house since 2001.

4) Brief description of GIS applications supported on land base –

Somerset uses the road network to support a work order management system. Law Enforcement uses the network for vehicle location, and there are plans to use the network for dispatching in the near future. There are plans to add functionality such as reverse 911 locating, bus routing at school districts and geocoding for Meghan's Law notifications after address ranges have been improved (see #8 below).

5) Reasons for land base selection

The GDT road network represented the best combination of data quality and affordability at the time of acquisition.

6) If there is a land base developed or implemented by the county, does it include private roadways? (If only certain types of private roadways are included, please elaborate).

This dataset does include some private roads.

7) Is there a maintenance program underway to update county's land base, and if there is, does it specifically include updating the private roadway network?

Somerset is a partner in the "community update program", but since GDT was purchased by TeleAtlas, that program has been on hold and no data updates have

occurred. The county is hoping/planning to use geometry from the new statewide mapping to update their road base. They have not yet finalized a detailed plan for ongoing maintenance.

8) The County's current data gathering efforts (re: street addresses)?

GDT was given Somerset's parcel data, which includes addresses, for use in improving address-ranges on the road network.

9) How are new roads (public & private) processed?

Currently, there is no process for maintaining the centerline file.

Sussex County

1) Name/Title/Respective Agency

David Kunz, GIS Manager, Sussex County

2) Land Base(s) used to support GIS transportation-based applications/Land Base accuracy

Sussex County uses a realigned TIGER file from the mid 1990s. The file was realigned using aerial photography from 1995-1997 (all roads). Sussex County also uses NJDOT files with state and county roadways referenced by mile marker.

3) How long land base has been implemented (if land base is being developed, provide timeframe development efforts have been underway)

Sussex County has been using the realigned TIGER file since the late 1990s. They are thinking of updating their road network by acquiring a commercial product database. The Sussex County contact believes that the state might be acquiring a statewide license for GDT data and they would use that data, mainly for the address data (geocoding purposes). They would update the data to realign to aerial photos as they did with TIGER data.

4) Brief description of GIS applications supported on land base –

Sussex County mainly uses the road data as part of their base map to overlay other data. The road data is also included on Sussex County's ArcIMS application. The county developed a linear referencing system as has data on the ArcIMS application linear referenced to the 100th of a mile.

5) Reasons for land base selection

Sussex County chose to use the TIGER file because it was readily available and free. It was a good starting point for overlaying onto aerials for improving the road network.

6) If there is a land base developed or implemented by the county, does it include private roadways? (If only certain types of private roadways are included, please elaborate).

The Sussex County road network contains private roads to the extent that TIGER includes private roads. The county has not added any additional roads.

7) Is there a maintenance program underway to update county's land base, and if there is, does it specifically include updating the private roadway network?

Aside from the prospect of replacing their current file with a GDT file, Sussex County and aside from the initial adjustment of the data to aerials, the county does not perform any set maintenance whether on private roads or otherwise and does not process any new road information.

8) The County's current data gathering efforts (re: street addresses)?

The county plans on obtaining address data from the GDT file.

9) How are new roads (public & private) processed?

There is no set maintenance program for processing new road information (whether public or private).

10) How does the County participate in the E911 program?

There is currently no sharing of GIS information between E911 and the county.

Union County

1) Name/Title/Respective Agency (county representative)

Mathew Mathan, Bureau Chief, Bureau of GIS, Division of IT

2) Land Base(s) used to support GIS transportation-based applications/Land Base
accuracy

The street centerline land base is derived from overflights performed in 1999 and 2004.
1"-100' (1/2 foot pixel) orthophotography was generated for 18 of the 21 towns in Union
County. 1"-50' orthophotography was generated for Elizabeth, Linden and Rahway.
The 2004 overflight was used to update changes to the land base originally compiled
from the 1999 flight. The land base contains street name attributes that are referenced
from county sources.

3) How long land base has been implemented? (if land base is being developed,
provide timeframe development efforts have been underway)

The street centerline file was originally compiled from the 1999 overflight. The
overflights are scheduled to be performed in 5 year increments.

4) Brief description of GIS applications supported on land base

All 21 towns in Union County subscribe to the land base. All county departments are
able to access the street centerline dataset for their respective uses. The Bureau of
GIS is responsible for generating the base data. The Bureau of GIS adds no other
attributes to the land base other than street names. Some of the applications supported
on the land base include planning and law enforcement.

5) Reasons for land base selection

Commercial sources were not considered accurate or comprehensive enough to
support county GIS applications. Some of the commercial sources were reviewed and
found to be lacking street data. This land base is able to incorporate new street
centerline data from the County Planning Dept as new subdivisions are constructed.

6) If there is a land base developed or implemented by the county, does it include
private roadways? (If only certain types of private roadways are included, please
elaborate).

Private roadways are included in this base to varying degrees. Streets serving private
subdivisions (condos) are included. Access roads within shopping malls or hospitals
are included but not to the same level of thoroughness as public roadways. "Any street
with a name is included in this land base".

7) Is there a maintenance program underway to update their land base, and if there is, does it specifically include updating the private roadway network?

There is a new overflight anticipated to occur in 2009. In addition, the County is finalizing plans for the street centerline base to be combined with the County 911 program as well as a county-wide parcel mapping project. The objective is to create a dataset where phone numbers are linked to mapped parcels positioned on the street centerline base. The program will enable the land base to incorporate street name attributes compiled through the 911 program.

Warren County

1) Name/Title/Respective Agency

David Dech, Planning Director, Warren County

2) Land Base(s) used to support GIS transportation-based applications/Land Base accuracy

Warren County currently uses the road network they received from a CD provided by the New Jersey DEP. This is a TIGER road network. It includes private roads but it is not very accurate. As they work on other activities such as a parcel mapping parcel, they adjust the road network to more accurately reflect true conditions.

3) How long land base has been implemented (if land base is being developed, provide timeframe development efforts have been underway)

They have been using the current road network since the time they received the CD from NJDEP which, they believe was around 1999. The county is currently in the process of developing an ARCGIS centerline file. They anticipate that it will be completed by the end of the year (possibly even sooner). This centerline file will include private roads (roads in developments).

4) Brief description of GIS applications supported on land base –

Warren County is currently performing a build out analysis. This build out analysis will consider factors such as environmental constraints, preserves, farmland, and current zoning and will also include the road network. This will also help Warren County develop input factor scenarios for a subregional transportation model. Warren County also uses the road network as an overlay on other maps such as existing and planned public sewers, open space and farmland maps, and transportation modeling maps.

5) Reasons for land base selection

The NJDEP road network was easily available. The county was starting a project for developing build out scenarios and the NJDEP CD provided to them included the road network so they decided to use it.

6) If there is a land base developed or implemented by the county, does it include private roadways? (If only certain types of private roadways are included, please elaborate).

The TIGER file includes private roads. The new centerline file will also include private roadways such as those in private developments.

7) there a maintenance program underway to update county's land base, and if there is, does it specifically include updating the private roadway network?

Warren County had been updating the current file when they see a discrepancy; however, with the current project of creating a centerline file, they have stopped updating the TIGER file. They have not developed a process for maintaining the centerline file once completed. They will see if they will be able to maintain it in house. If the job becomes too onerous, they may decide to use a consultant to help maintain the file. As they develop the centerline file, there are quality controls in place including comparisons to tax records.

8) The County's current data gathering efforts (re: street addresses)?

The county is thinking about getting street address information but it is not currently in the midst.

9) How are new roads (public & private) processed?

Currently, there is no process for maintaining the centerline file.

10) How does the County participate in the E911 program?

E911 has their own system. There is currently not a great deal of data sharing. E911 was reluctant to share data. Although the county can't recall the exact reason for the reluctance, the county believes it had something to do with the sensitivity of the information and possible something to do with their program. The county has provided E911 with some GIS maps (e.g., location of schools, fire houses, etc.).

Appendix E: Municipal Responses

Township of Franklin, Somerset County

1)   Name/Title/Respective Agency (county representative)

Michael Gallagher/GIS Administrator

2)   Land Base(s) used to support GIS transportation-based applications/Land Base accuracy

100' scale - centerline data photogrammetrically derived from 2002 imagery

3)   How long land base has been implemented?(If land base is being developed, provide timeframe development efforts have been underway)

Since 2002

4)   Brief description of GIS applications supported on land base

Development of Road Map - Public Distribution/Use

Emergency Response Zone Mapping

Emergency Response Dispatch Support

5)   Reasons for land base selection

Small part of large data development effort to implement a successful GIS program.

6)   If there is a land base developed or implemented by the Township, does it include private roadways? (If only certain types of private roadways are included, please elaborate).

The Township's data contains all roadways that existed during the initial mapping effort. Public and private road have therefore been mapped, but not differentiated in the feature class by attribute.

7)   Is there a maintenance program underway to update their land base, and if there is, does it specifically include updating the private roadway network?

The Township has begun to implement a GIS maintenance program. As part of this program, street centerlines will be added/deleted as required based on changes that have occurred within the community since 2002. The centerlines are maintained in a similar fashion to the parcel data where subdivision plans are used to identify the location of the required modifications. Therefore, the private roadway network will be included specifically.

8) The Township's current data gathering efforts (re: street addresses)
"fin
The Township had contracted with a vendor to have the street address ranges inserted into the street centerline feature class using addresses pulled from the parcel data model.

9) How are new roads (public and private) processed?

N/A

10) How does the Township participate in the E9-1-1 program?

The Township uses two different software solutions to either respond to an E911 situation, or send out an emergency notification to a designated "group" through a reverse 9-1-1 application.   The reverse 9-1-1 application relies on the parcel and street centerline layers to operate.

City of Trenton, Mercer County

1) Name/Title/Respective Agency (county representative)
Trish Long/Sr. Planner/City of Trenton, Division of Planning

2) Land Base(s) used to support GIS transportation-based applications/Land Base accuracy
Road Centerlines (from orthophotography taken in March 2000) & Parcel
Data. These data sets were created by Civil Solutions. I do not know their
accuracy.

3) How long land base has been implemented? (if land base is being
developed, provide timeframe development efforts have been underway)
City's GIS Needs Assessment was completed in 1999. I believe parcel mapping project began
shortly after that. As of October 2005, as far as I can tell, it is still not fully completed.

4) Brief description of GIS applications supported on land base
       a) zoning board case review
       b) day to day needs of a number of city Divisions
       c) preparation of grant applications

5) Reasons for land base selection
Accuracy and compatibility with parcel data.

6) If there is a land base developed or implemented by the county, does
it include private roadways? (If only certain types of private roadways are included, please
elaborate).
I do not know about county. As far as the city, I do not know if there
are any private roads.

7) Is there a maintenance program underway to update their land base,
and if there is, does it specifically include updating the private roadway network? No

Appendix F: Census Communication with Atlantic County

December 16, 2004

UNITED STATES DEPARTMENT OF COMMERCE
Economics and Statistics Administration
U.S. Census Bureau
Regional Office
Philadelphia, PA 19107-4405

Barry Hackett
Director
Office of Geographic Information Systems
Atlantic County
P.O. Box 719
Northfield, NJ 08225

Dear Mr. Hackett:

Thank you for providing the U.S. Census Bureau with your geospatial file. The Census Bureau has determined that the coordinate data contained in the road centerline file you provided meets the Census Bureau's positional accuracy standards for use in an automated update of the TIGER database.

The enclosed documents provide additional information on the road centerline file you provided.

- The first document outlines the procedures the Census Bureau uses to evaluate and test the file you submitted for geographic accuracy.

- The second document contains detailed results of the evaluation based on CE95 standards.

Once the coordinate accuracy in the TIGER database has been updated using your geospatial file, we will provide you with an updated version of TIGER/Line for your own use.

The Census Bureau appreciates your assistance in this matter and looks forward to working with you as we prepare for Census 2010. If you have any questions regarding the evaluation methods used on your file or the results, please contact Greg Brivic at 215-717-1830.

Sincerely,

Fernando E. Armstrong
Regional Director

Enclosures
CC: Matthew Duffy

U S C E N S U S B U R E A U

Spatial Analysis For: Atlantic   NJ

FIPS: 34001

Points:	110
CE95:	6.657

Horizontal Error		MTAIP Requirements	
MeanDistance	3.513	%<5m	83.636%
STD-D	1.848	%<7.6m	97.273%
VAR-D	3.416	%<100m	100.000%
CVAR-D	0.526	Max Distance	13.575
CSKEW-D	1.955	Min Distance	0.320

RMSE	
RMSE	3.969
RMSEx	3.413
RMSEy	2.027

NSSDA	
CE95	6.657
CE90	6.023

Horizontal Error (X,Y)			
MeanX	2.829	MeanY	1.249
STD-X	1.909	STD-Y	1.596
VAR-X	3.644	VAR-Y	1.561
CVAR-X	0.675	CVAR-Y	0.783
CSKEW-X	1.150	CSKEW-Y	1.306

U S C E N S U S B U R E A U

U.S. Census Bureau

Spatial Quality Assurance
Testing the Horizontal Spatial Accuracy of a Centerline File
Version 1.1

Geography Division
Linear Features and GPS Programs Branch

Spatial Quality Assurance (QA):
Testing the Horizontal Spatial Accuracy of a Centerline File
Using Global Positioning System (GPS) Control Points

Introduction

The Spatial Quality Assurance (QA) is the procedure the US Census Bureau uses to evaluate the coordinate quality of a local source file's road centerline features. The same procedure is utilized to evaluate the TIGER road centerlines before and after the MAF/TIGER Accuracy Improvement Program (MTAIP). The evaluation verifies that the spatial accuracy of the road network meets the horizontal spatial accuracy standard set by the Bureau. The current accuracy is set at a circular error of 7.6 meters or less.

A file that passes the Spatial QA is considered acceptable for use to enhance the coordinates of the TIGER database. Spatial accuracy qualification does not always ensure that a local file is used as part of the MTAIP; additional factors such as completeness, vintage, and the availability of other qualified files play an important role in the selection.

The Linear Features and GPS Program Branch [LFGPB] of the Geography Division (GEO) is responsible for the administration of the Spatial QA. The QA compares survey grade coordinates to their corresponding coordinates in the local source file. The distances between the coordinates are calculated and used to determine whether the file meets the circular error of 7.6 meters with 95% confidence standard. If the local file meets this standard, it passes the Spatial QA. It then becomes available for the TIGER accuracy improvement program. If the file does not meet this requirement, attributes or other characteristics can be used for other TIGER improvement programs.

What is evaluated?

The evaluation is based on an independent collection of survey grade coordinates for a random sample of road intersections from the local source file that meet Census GPS collection criteria. The points are referred to as the sample points and are gathered through a private contractor working for the Census Bureau. Since the collection method uses survey-quality GPS-based field techniques, the resulting control points are considered "ground truth" to which coordinates from local source files are compared. LFGPB uses these "ground truth" points to assess local files, TIGER before accuracy improvement, and TIGER after accuracy improvement.

Intersection Point Selection

The selection of intersection points requires that the intersecting road segments are named and that they intersect at angles ranging from 82° to 98°: Other considerations are taken into account, including:

- The safety of the person(s) collecting these points,
- The intersecting roads must be on the same plane,
- At least three named segments intersect; 2 of the 3 segment pairs must meet the angle criteria; these are T-intersections, see Example 1,
- Where more than three named segments intersect, 2 adjacent segment pairs must meet the angle criteria, see Example 2,
- Do not select intersections where non-road features intersect the road, see Example 4,
- Exclude Limited access (A1 class), and other major arterials,
- Exclude Jeep Trails (A5 class), Special Road Feature Types (A6 Class), and Other Thoroughfare (A7 class)
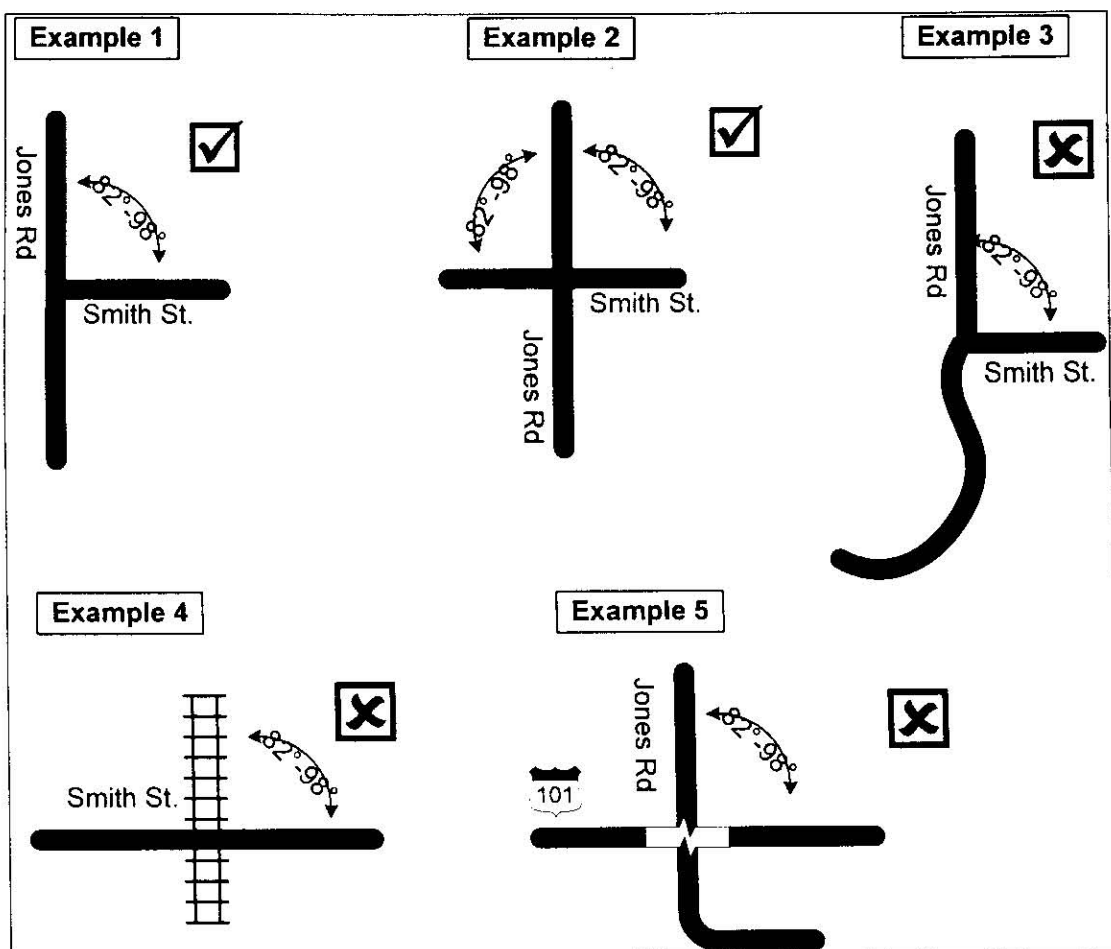

Figure 1. Examples of acceptable ☑ and unacceptable ☒ intersections.

U S C E N S U S B U R E A U

Sample Size

The Decennial Statistical Studies Division (DSSD) has worked with the GEO to establish a statistically valid QA sample. The sample is derived from a population of named road features that intersect at approximately 90° (The actual range is 82° to 98°.) The sample size was set at 100, plus 10% overage to assure that at least 100 points are usable for analysis. When the population size is small, i.e. less than 351 qualifying intersections, then the number of sample intersections is as follows:

Sample Sizes Needed to Evaluate GIS Files		
File Size (number of intersections)	Sample Size	+10%
351 or more	100	110
201 – 350	80	88
151 – 200	70	77
101 – 150	60	66
76 – 100	50	55
61 – 75	45	50
46 – 60	40	44
<45	All	All

For any GIS file that was created from the same source, a random sample of 100 points that meet the criteria listed above is sufficient to identify the spatial quality of a file.

Formulas to Calculate Distance and RMSE

The LFGPB used the Lengths of Degrees of the Meridian table from *Elements of Cartography, 4e*[1] and JMP™ (a SAS product) to develop a 5th degree polynomial with an r^2 of 1. This polynomial allows us to calculate the distance between any two sets of coordinates using COTS software like Microsoft Access. The formula multiplicand for calculating distance using this polynomial (POLY) is:

POLY= 110241.96 + 19.754668*Latitude + 0.0026279*(Latitude-45)^2 – 0.00399934*(Latitude-45)^3 – 0.00000073471*(Latitude-45)^4 + 0.0000002279*(Latitude-45)^5

To account for best accuracy at the latitudes that cover the continental United States, the above polynomial was changed to:

POLY= 110223.37 + 19.754668*Latitude + 0.0026279*(Latitude-45)^2 – 0.00399934*(Latitude-45)^3 – 0.00000073471*(Latitude-45)^4 + 0.0000002279*(Latitude-45)^5

The formula for calculating distance is:

X Distance: Abs((([Longitude]-[Longitude])*(Cos(([Latitude]*π)/180)))*POLY
Y Distance: Abs([Latitude]-[Latitude])*POLY

Distance: $\sqrt{\text{X Distance}^2 + \text{Y Distance}^2}$

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[1] Robinson, A., Sale, R., Morrison, J., 1978. Elements of Cartography, 4e., Appendix C. Geographic Tables, pg. 401.

U S C E N S U S B U R E A U

The formula for calculating RMSE is:

$$\mathbf{RMSE} = \sqrt{\sum ((x_{lf} - x_{gt})^2 + (y_{lf} - y_{gt})^2)/n}$$

In the equation above, $\sum$ is the sum, x_{lf} and y_{lf} represent the coordinates of the local file's intersection points, x_{gt} and y_{gt} represent the independent ground truth coordinates used to calculate the spatial accuracy of the file, and n represents the number of coordinate sets used in the evaluation.

To calculate the RMSE for x and y coordinate pairs use the following formulas:

$$RMSE_x = \sqrt{\sum (x_{lf} - x_{gt})^2/n}$$

$$RMSE_y = \sqrt{\sum (y_{lf} - y_{gt})^2/n}$$

A combination of the distance formula, the count of evaluation coordinate pairs, the RMSE, and the two sets of coordinate pairs are used to calculate the spatial accuracy of a local file.

Circular Error at the 95% Confidence level (CE$_{95}$) Explained

The Census Bureau uses the U.S. Government's Federal Geographic Data Committee (FGDC) Standard to calculate spatial accuracy[2]. The Bureau's horizontal accuracy requirement states that the circular error of a local road centerline file must not exceed 7.6 meters at the 95% confidence level referred as CE$_{95}$. Horizontal accuracy is determined by comparing highly accurate independently derived control points to the corresponding points of the source file. The CE$_{95}$ can be calculated from the mean and standard deviation.

The National Standard for Spatial Data Accuracy (NSSDA) states:

"Spatial Accuracy

The NSSDA uses root-mean-square error (RMSE) to estimate positional accuracy. RMSE is the square root of the average of the set of squared differences between dataset coordinate values and coordinate values from an independent source of higher accuracy for identical points.[3] "

The NSSDA offers three methods of calculating CE$_{95}$: two for horizontal spatial accuracy and one for vertical spatial accuracy. We have evidence that the $RMSE_x \neq RMSE_y$; therefore we use the method described in Case 2[4] to calculate the CE$_{95}$. The NSSDA formula to calculate spatial accuracy adopted by the Census Bureau is

Accuracy (CE$_{95}$) = *2.4477 * 0.5 * (RMSE$_x$ + RMSE$_y$)*

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[2] FGDC-STD-007.3-1998. *Geospatial Positioning Accuracy Standards. Part 3: National Standard for Spatial Data Accuracy*
[3] ibid. Section3.2.1, page 3-4
[4] ibid. Appendix 3-A, page 3-11

U S C E N S U S B U R E A U

Running the Spatial QA

The set of ground truth points is logged into a database, reviewed for accuracy, and converted into a Geographic Information System (GIS) format. The analyst creates a copy of the points using the copy command in the GIS software. The original point layer is used for reference; the copy point layer is used to match to the respective local set of points in the local road file. The local road layer and the copy are loaded into the testing application. A snapping tolerance is preset on the road layer allowing the operator to quickly select the ground truth point in the point layer and matching it to the corresponding intersection in the local road file. Once all points are matched to their respective intersections, the analyst exports the two corresponding sets of coordinates: the reference set and the "matched to local road intersection" or copy set. The two sets of coordinates are imported into commercial-off-the-shelf (COTS) software that has all the relevant algorithms to calculate the horizontal spatial accuracy of any given file. As part of the review process, distance variances outside the normal distribution are subjected to additional analysis. The analyst typically uses orthorectified imagery to determine if any unusual occurrences exist.

Interpreting the results

Spatial analysis statistics, including CE_{95}, are reported in a standard tabular format. Refer to the sample output and to the glossary at the end of this report for an explanation of the formulas used to calculate the statistics. When reading or interpreting these statistics please also refer to the NSSDA for further explanation. All data are presented in meters with the exception of **Points**, which is in units, and those that have a percentage (%) sign following the number.

The reported CE_{95} accuracy for the sample file should be read as:

The County Road Centerline File tested for 7.052 meters horizontal accuracy at the 95% confidence level.

USCENSUSBUREAU

Spatial Analysis For:	County Name	ST
FIPS:	07001	

Points:	116
CE95:	7.052

Horizontal Error		MTAIP Requirements	
MeanDistance	3.716	%<5m	81.034%
STD-D	1.766	%<7.6m	95.690%
VAR-D	3.063	%<100m	100.000%
CVAR-D	0.473	Max Distance	8.776
CSKEW-D	2.651	Min Distance	0.621

RMSE	
RMSE	4.110
RMSEx	2.500
RMSEy	3.262

NSSDA	
CE95	7.052
CE90	6.237

Horizontal Error (X,Y)			
MeanX	1.979	MeanY	1.771
STD-X	1.528	STD-Y	2.739
VAR-X	2.334	VAR-Y	3.138
CVAR-X	0.772	CVAR-Y	0.647
CSKEW-X	1.099	CSKEW-Y	1.349

FIPS:	Federal Information Processing Standards codes (**FIPS** codes) are a standardized set of numeric or alphabetic codes issued by the National Institute of Standards and Technology (NIST) to ensure uniform identification of geographic entities through all federal government agencies. The entities covered include: states and statistically equivalent entities, counties and statistically equivalent entities, named populated and related location entities (such as, places and county subdivisions), and American Indian and Alaska Native areas.
Points:	The number of ground truth points used to perform the horizontal spatial analysis.
CE95:	The **CE95** represents the circular error of the data. The number represents the accuracy of the local road centerline file in meters and with 95% confidence; meaning that 95% of the coordinate positions in the dataset will have an error relative to ground truth that is equal to or smaller than the value reported. For example, if a GPS position measurement is accurate to 5 meters CE95, this means that there is a 95% probability that your measurement lies INSIDE a circle with a radius of 5 meters. This also means that there is a 5% probability that your measurement lies OUTSIDE the 5-meter radius circle.

Horizontal Error (apply to D, X, Y where $D = \sqrt{(x^2 + y^2)}$)

MeanDistance:	The **mean** is the arithmetic average of the data. The mean provides a measure of the center of the distribution. A problem with the mean is the exaggeration in its calculation placed on outlying observations or those observations greater than 2 standard deviations away from the mean.
STD:	The **standard deviation** is the square root of the variance. It describes the spread of the data about the mean in the same units as the original measurements. A large standard deviation suggests that a typical member is far away from the mean. A small standard deviation suggests that members are clustered closely around the mean value.
VAR:	The **variance** is a measure of how spread out a distribution is. It is computed as the average squared deviation of each number from its mean.
CVAR:	The **coefficient of variance** is the degree to which a set of data points varies. It is often called the *relative standard deviation*, since it takes into account the mean (average).
CSKEW:	**Skewness** is a measure of symmetry, or more precisely, the lack of symmetry. A distribution, or data set, is symmetric if it looks the same to the left and right of the center point. The skewness for a normal distribution is zero, and any symmetric data should have skewness near zero. Negative values for the skewness indicate data that are skewed left and positive values for the skewness indicate data that are skewed right. By skewed left, we mean that the left tail is heavier than the right tail. Similarly, skewed right means that the right tail is heavier than the left tail.

7

MTAIP Requirements

%<5m: The percentage of local file sample points that are less than 5 meters from ground truth.

%<7.6m: The percentage of local file sample points that are less than 7.6 meters from ground truth.

%<100m: The percentage of local file sample points that are less than 100 meters from ground truth.

Max Distance: The distance between the least accurate coordinate pair and ground truth.

Min Distance: The distance between the most accurate coordinate pair and ground truth.

Root-mean-square Error (RMSE)

RMSE: The root-mean-square error or **RMSE** is determined by calculating the deviations of points from their true position, summing up the measurements, and then taking the square root of the sum. Mean-squared error is the most commonly used measure of success of numeric prediction, and root mean-squared error is the square root of mean-squared-error, taken to give it the same dimensions as the predicted values themselves. This method exaggerates the prediction error - the difference between prediction value and actual value of a test case - of test cases in which the prediction error is larger than the others. If this number is significantly greater than the mean absolute error, it means that there are test cases in which the prediction error is significantly greater than the average prediction error. The root-mean-square error is also called the standard error of the estimate or the residual standard deviation. RMSE can be calculated for distance or x and y coordinate pairs, the x coordinate pairs alone, or the y coordinate pairs alone; the statistics are $RMSE$, $RMSE_x$, and $RMSE_y$ respectively.

NSSDA (National Standard for Spatial Data Accuracy)

CE95:   See definition above.

CE90:   The **CE90** represents the circular error of the data. The number represents the accuracy of the local road centerline file in meters and with 90% confidence; meaning that 90% of the coordinate positions in the dataset will have an error relative to ground truth that is equal to or smaller than the value reported. For example, if a GPS position measurement is accurate to 5 meters CE90, this means that there is a 90% probability that your measurement lies INSIDE a circle with a radius of 5 meters. This also means that there is a 10% probability that your measurement lies OUTSIDE the 5-meter radius circle.

8

Appendix G: Municipal Responses

Township of Franklin, Somerset County

1)   Name/Title/Respective Agency (county representative)

Michael Gallagher, GIS Administrator

2)   Land Base(s) used to support GIS transportation-based applications/Land Base accuracy

100' scale - centerline data photogrammetrically derived from 2002 imagery

3)   How long land base has been implemented?
(If land base is being developed, provide timeframe development efforts have been underway)

Since 2002

4)   Brief description of GIS applications supported on land base

Development of Road Map - Public Distribution/Use; Emergency Response Zone Mapping; Emergency Response Dispatch Support

5)   Reasons for land base selection

Small part of large data development effort to implement a successful GIS program.

6)   If there is a land base developed or implemented by the Township, does it include private roadways? (If only certain types of private roadways are included, please elaborate).

The Township's data contains all roadways that existed during the initial mapping effort. Public and private road have therefore been mapped, but not differentiate in the feature class by attribute.

7)   Is there a maintenance program underway to update their land base, and if there is, does it specifically include updating the private roadway network?

The Township has begun to implement a GIS maintenance program. As part of this program, street centerlines will be added/deleted as required based on changes that

have occurred within the community since 2002. The centerlines are maintained in a similar fashion to the parcel data where subdivision plans are used to identify the location of the required modifications. Therefore, the private roadway network will be included specifically.

8) The Township's current data gathering efforts (re: street addresses)

The Township had contracted with a vendor to have the street address ranges inserted into the street centerline feature class using addresses pulled from the parcel data model.

9) How are new roads (public and private) processed?

N/A

10) How does the Township participate in the E9-1-1 program?

The Township uses two different software solutions to either respond to an E911 situation, or send out an emergency notification to a designated "group" through a reverse 9-1-1 application.   The reverse 9-1-1 application relies on the parcel and street centerline layers to operate.

Trenton, Mercer County

1) Name/Title/Respective Agency (county representative)

Trish Long/Sr. Planner/City of Trenton, Division of Planning

2) Land Base(s) used to support GIS transportation-based applications/Land Base accuracy

Road Centerlines (from orthophotography taken in March 2000) & Parcel Data. These data sets were created by Civil Solutions. I do not know their accuracy.

3) How long land base has been implemented? (if land base is being developed, provide timeframe development efforts have been underway)

City's GIS Needs Assessment was completed in 1999. I believe parcel mapping project began shortly after that. As of October 2005, as far as I can tell, it is still not fully completed.

4) Brief description of GIS applications supported on land base

Zoning board case review; day to day needs of a number of city Divisions; preparation of grant applications.

5) Reasons for land base selection

Accuracy and compatibility with parcel data.

6) If there is a land base developed or implemented by the county, does it include private roadways? (If only certain types of private roadways are included, please elaborate).

I do not know about county. As far as the city, I do not know if there are any private roads.

7) Is there a maintenance program underway to update their land base, and if there is, does it specifically include updating the private roadway network?

No