DCT 244

# An Examination and Presentation of Travel in Sussex County


**By**

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**Center for Applied Demography and Survey Research**


## June, 2009


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# Project Report for

# An Examination and Presentation of Travel in Sussex County

## Prepared for

## Delaware Department of Transportation

## by

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**TABLE OF CONTENTS**

**Page**

## LIST OF FIGURES

**LIST OF FIGURES (continued)**

**Figure** **Page**

## Introduction - Project Focus

The project had three main areas of focus:

1) Research methods for improved dissemination and management of transportation data.

2) Research methods of integrating travel information.

3) A compilation of available travel data for Sussex County.

Sussex County has experienced accelerated land development and population growth in the past several years and there is major concern with the transportation problems that now exist. In this project, Sussex County was the focus of a compilation and presentation of available travel and demographic data including traffic counts, traffic forecasts, origins and destinations, projections and their impacts, trip purpose, employment, seasonal variation, and trip generation.

There is a large amount of travel data available for Sussex County spread across many sources and it was expected that compiling it would prove to be labor intensive. In projects that involve large amounts of data compilation it is often the case that once the project is over much of the information compiled is then only available in summary reports or on compact disks, and in effect returns again to a state of low accessibility. To whatever extent possible it was a goal that once information was compiled for this project, methods would be investigated and demonstrated to make the information more available for future work. Delaware could benefit from a better management and presentation of travel and traffic data. There are large sets of information such as traffic counts, travel speed, congestion data, and level of service information that could better support many applications if methods could be developed to better access, reference, and archive this information

The DelDOT Division of Planning uses a wide variety of information. An extensive examination of information needs and issues and a review of effective organizational schemes for transportation data has been conducted in previous research.* The DelDOT Division of Planning's use of information systems most often starts with a request for information or a problem or issue that must be addressed. From there, staff must collect and find necessary information, prepare and analyze the data, and then present it. This day after day "Find → Use → Present" process is much of the focus of the Division of Planning's use of information systems, and anything that can assist at any stage of this process can make a significant improvement. Therefore, a large part of this project was involved in how best to improve capabilities to find, use, and present travel data.

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- http://www.cadsr.udel.edu/DOWNLOADABLE/DOCUMENTS/transformingdataintoinfo.pdf
- http://www.cadsr.udel.edu/DOWNLOADABLE/DOCUMENTS/DataFinal.pdf

## Dissemination and Management of Travel Data

There is a very large and varied body of travel data. There are reports, maps, presentations, data tables, and web sites to name just a few types of information. In many studies, large efforts can be made in compilation of information and this project examines how the results of those efforts can be preserved and built upon. As travel in Sussex County was studied, methods of capturing that information for future reference were examined. Management of transportation planning data has been the subject of previous research, and projects and from that research emerges the types of features that could lead to a successful approach:

- A system that can best involve transportation planners and analysts in the administration and maintenance of a resource for transportation data. Travel data is from many groups and each could make a large contribution. Providing access by various groups and individuals to an evolving information resource is a goal. Users need the ability to upload and edit contents of data libraries and take part in the organization of the information.
- Documentation of data sources and citations. Recognition of contributions and achievements.
- Document management capabilities that can effectively organize and display information relevant to the particular interests at the time. Beyond management of data files in folder hierarchies, there is a need to view library contents in various ways for planning applications.
- Access to extensive query and search methods that can be applied to the transportation library.
- Ability to group and access content by various user and group designations.

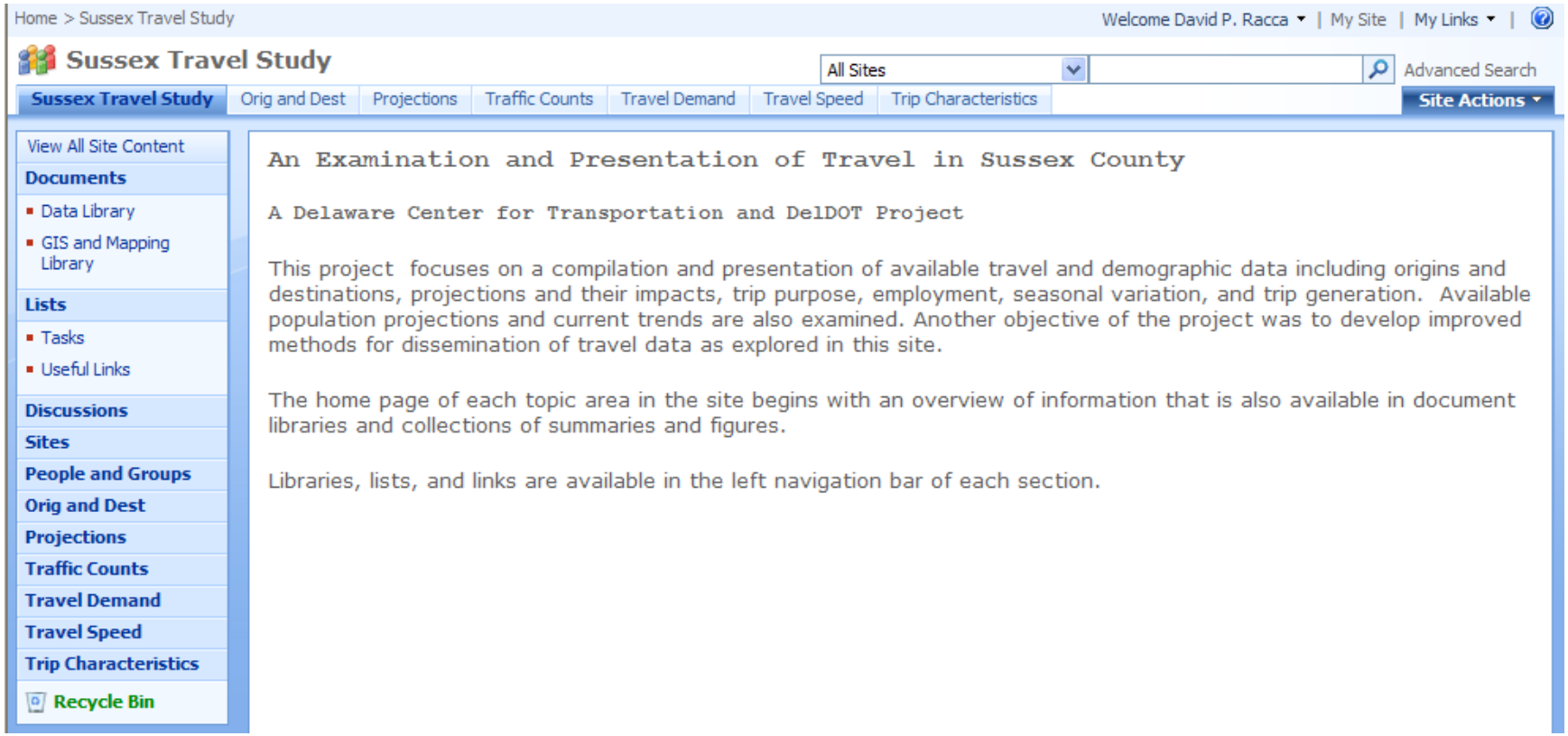
User involvement and document management were the main drivers of how information would be managed in this project and the decision was made to explore MicroSoft SharePoint as the technology that could best serve. Previous information management efforts at DelDOT have employed SharePoint and it has extensive document management capabilities and is designed to support collaborative efforts. Sharepoint is seen as something that can work at a small scale in terms of managing data for a particular project, but also something that can be developed in large scale efforts.

### Project Web Site

The URL for the project site is http://molly1.cadsr.udel.edu/sussextravel and it is primarily a MS Sharepoint based web accessible document library. Data organization and tagging as described below can be seen at the site. There is a range of information and data types. All data compiled for the project is viewable and archived at the site.*

* Those interested in gaining access to the site for viewing can contact David Racca, dracca@udel.edu , 302 831-1698.

**Figure 1, Screen Capture of Project Home Page**



A primary document library was established to hold the various types of data compiled (http://molly1.cadsr.udel.edu/sussextravel/Shared%20Documents/Forms/AllItems.aspx ). Even for this one area, "Travel in Sussex", there is a great deal of information. Research and development of the project site represents the work done toward showing how data can be flexibly organized, archived, and viewed.

## Data Libraries and Organization

All data and documents were compiled in a MicroSoft Sharepoint data library that has the following features:

**Figure 2, Features of the Document Library**

Organizational Areas
Document Tagging.
Custom Queries andViews of the Data
Document upload and download
Windows Explorer View
Versioning
Document Launch

The top level organization of the site was in main categories of travel information as shown in figure 3 below.

**Figure 3, Primary Organizational Areas**

Trip Characteristics
Travel Demand
Traffic Counts
Travel Speed Measurements
Projections
Origins and Destinations
Capacity

One of the primary benefits of document management systems is the ability to classify or tag information items to support various searches and views of the data library. For a large collection of data, information associated with the individual items will allow users to search and filter searches and views for the particular area of interest. The first level of tags is the subject matter or topic addressed and the list of topics used as tags is shown in figure 4. A data item could belong to more than one of the topic areas below.

**Figure 4, Topic Tags**

Count
Speed-Time
Signals
TIS
GIS
Site
Survey
TDFM
Projection
Capacity
LOS
OandD (Origins and Destinations)
Plan
Report
Other, User defined

Travel information is of many types and formats and an information type tag was used as shown in figure 5. These tags let the user know how they might use the information in their software. Other types can be added to this list by users.

**Figure 5, Information Format Types**

Graphic/Image
Presentation
Shapefile
Event Table
Table
Text
Geodatabase
Google (KMZ,KML)
Program
Hyper Link
Map
Contact
User defined.

The data file extension also serves as a tag as shown in figure 6 below.

**Figure 6, File Extension Tags**

GIF
JPEG
DOC
XLS
PPT
PDF
DBASE
ACCESS
TXT
EXCEL
HCU
KMZ, KML
HTM
User defined

Data was also tagged with a spatial extent of the information:

**Figure 7, Spatial Extent Tags**

DE
Kent
Sussex
New Castle
WILMAPCO
City of ……
Write in. (e.g. Rt 301 Project area)

Together these data tags and others can be used to develop listings of the data library of interest to the user. Views can be developed and saved for later use such as:

- Show all traffic count data available for Sussex County.
- Show all presentation documents for the topic travel demand.
- Search all GIS files of the type used by Google.
- Show all files contributed by Bill Johnson.
- Show all reports containing projections.

Other information is also captured for data in the collection as shown in figure 8.

**Figure 8, Other Cataloging Information**

Title
Description
Keywords
Contact
Created By
Date of Creation
Related Documents

Some of the above descriptive information and references, like Date of Creation and Created By are captured by the system. Descriptions, titles, and keywords need to be entered by the user adding an entry to the document library. Numerous other descriptive items (columns) can be added to a document library or list to support filtered views and searches of the collection. Some of these can be added from a large list of predefined, commonly used columns, and users can define their own descriptive information much as one would who is designing a data table for an application. This is information about information, or what is called metadata. Tagging and documenting data is crucial in finding it and determining its fitness for a particular use. If too much metadata is required it can discourage users from cataloging it. A balance needs to be struck between requiring too little or too much metadata. Allowing the inclusion of links or contacts for the data can often suffice for more detailed questions about data, and the focus can be more on descriptive titles and topic areas. The Sharepoint system also allows for contact information to be kept for contributors, including email addresses and phone numbers.

**What makes this different from other means of data sharing resources that have been developed?**

There have been numerous approaches to managing the ever increasing flood of information. For transportation data there have been warehouses and clearinghouses, and a number of examples of custom web interfaces to collections of transportation data that include querying capabilities and mapping. So the question is "What makes a site as described in this project likely to be a useful approach? Success of a data sharing or collaborative site could be judged on the amount of energy and resources put into the site, and the extent the energy and resources invested translates to something truly useful in terms of productivity and useful knowledge that supports goals and mission.

Development costs and ongoing maintenance would be a primary consideration for the site to be created and continued. A traditional approach to information systems development might begin with a strategic plan. Meetings would be needed for all the targeted users who would get together to develop a mission statement and a needs assessment, a systems architecture, and a design. This is a lengthy and extensive process often using large amounts of contracted services and staff time. It requires agreement

and support from a number of people and organizations from the start, and involves a number of organizational issues and responsibilities. Sometimes it is an issue where the system will be centered and who will be in charge of development. Information Technology departments naturally feel that it is their responsibility to direct and administer the system and more often than not, that is the directing body. Often a primary concern in the beginning is user access and security, and what users can and cannot do.

Brain storming sessions and needs surveys are scheduled and various strategies for user input are put into place, but basically it's a particular agency's initiative. The focus is often specifying completely what the system will be and will not be as part of managing and controlling the process. It is a goal to first outline the complete specifications and functionality. Where the group directing the development is taking a technical support role rather than dictating the functionality and features of the resource, meeting the needs of users becomes a very significant communication effort that has to be controlled and tracked to carry thru and create the actual product. It's a process of absorbing and considering the input so as to proceed with the real work of development. The developers of the system and users are set apart from the start. Eventually an approach is formulated and could be in the form of a data warehouse or a custom website, and a development schedule is created, that would be followed by plans for training users and presenting the system. The system goes thru versions and testing and eventually is open for business. It can usually be said that the developer has done their job and what results is in line with the strategic plan, the needs assessment, and user input.

With that traditional approach, **all cost and time and effort to this point, often extending up to a year or more, has done nothing for the user, and in fact has taken away time from the users.** But the plan and the hope is that once the system is operational it will meet current and future expectations and be of great use. This is a very big bet however carefully thought out and well meaning and organized the effort. Technologies can change quickly. User interests and needs can change. Maintenance budgets change. For judging success, user benefits derived from the completed resource may be estimated, but almost never are evaluations made in terms of cost and benefit, taking into account all the time and money dedicated from all involved from the start. It is the position taken here that with slashed budgets and less personnel (year 2008), that such a traditional effort toward the creation of a transportation planning data resource is difficult to afford and unlikely to be initiated, can be risky, and costs may outweigh benefits.

There are certainly very complex operational systems such as financial, human resource management, inventory systems, and many other types that require such an extensive investment and traditional approach. The focus here though is a system that will effectively manage and make available transportation data in a very broad and sometimes unpredictable sense, and support planners and analysts in the very near term.

The user group in this context is not the general public but a specialized group. It is a collection of planners, researchers, and analysts throughout Delaware that maintain, produce, and use a wide variety of transportation data, many who possess advanced technical skills in processing, analyzing, and presenting information, and have experience developing information systems to meet their needs, though information management is not the focus of their work. Such individuals are often very familiar with making technology work for them and will craft their own information tools from a wide selection of what might be available. Having timely and quality data in whatever common format is often sufficient to support their work.

They will take the information and use it in Excel, PowerPoint, Access, ArcGIS, or Google to name a few common desktop software available, or perhaps import it to Travel Demand Forecasting Models, 911 Routing software, custom web mapping applications, to name a few advanced applications they may be using. A particular user interface is not the priority. It's the data. In the experience of the author it is observed that individuals who work with large amounts of transportation data are actively interested in finding more information and determining access and availability and in that sense they are naturally collaborative and often enthusiastic about discussing and sharing data.

The functionality of an information resource considered here is the extent it can support the planning and analysis work done by this group. They are highly skilled and familiar with information systems as part of their job and often know exactly what data they want, though it changes sometimes quickly from one application to the next. The idea is that this group should take part from the very start in the development, organization, content, costs, and maintenance of the resource. A resource around a document library is appropriate since the creation, accessibility, operability, and preservation of information is the focus. The tools around the document libraries are of a high level allowing users to actually develop the pages, construct views, and incorporate other resources. A level of real development is then available to the group. That degree of involvement, access, and control of an information resource is what is most different about the demonstrated approach.

A suggested strategy is to take advantage of the document library and communications pages and capabilities that come with Sharepoint and to involve users in the design and maintenance as much as possible from there. The resource develops with use in small increments and with user submissions and involvement rather than making the attempt to fully define and create the system before it is put into use. Focused initially on the document libraries the resource is data centric, and the focus is around the quality and usability and preservation of information rather than around a particular user interface. It is believed that without continued user involvement, the resource cannot be maintained or grown so a sense of ownership is important and a more democratic development is encouraged. Users would be encouraged to contribute and help structure the design of the document library. Pages are available to reference links to other web pages, and resources and documentation of those links allows information to be found just as documentation and tagging allows data files in the library to be found. The desired result

is a quickly usable resource with minimum startup. A summary of features for an effective information resource mentioned so far is:

- Minimal development costs
- Maintenance costs kept to a minimum
- Developed to the greatest extent by users and their needs and interests
- Continually promote involvement and sense of ownership of users
- Changeable, flexible
- Promote communications
- Focus on accessibility and interoperability
- Functional and usable in the near term
- Works well with existing resources. As web based it can incorporate other web based resources.
- Scalable, works with small and large implementations, works even for single projects, could be modular

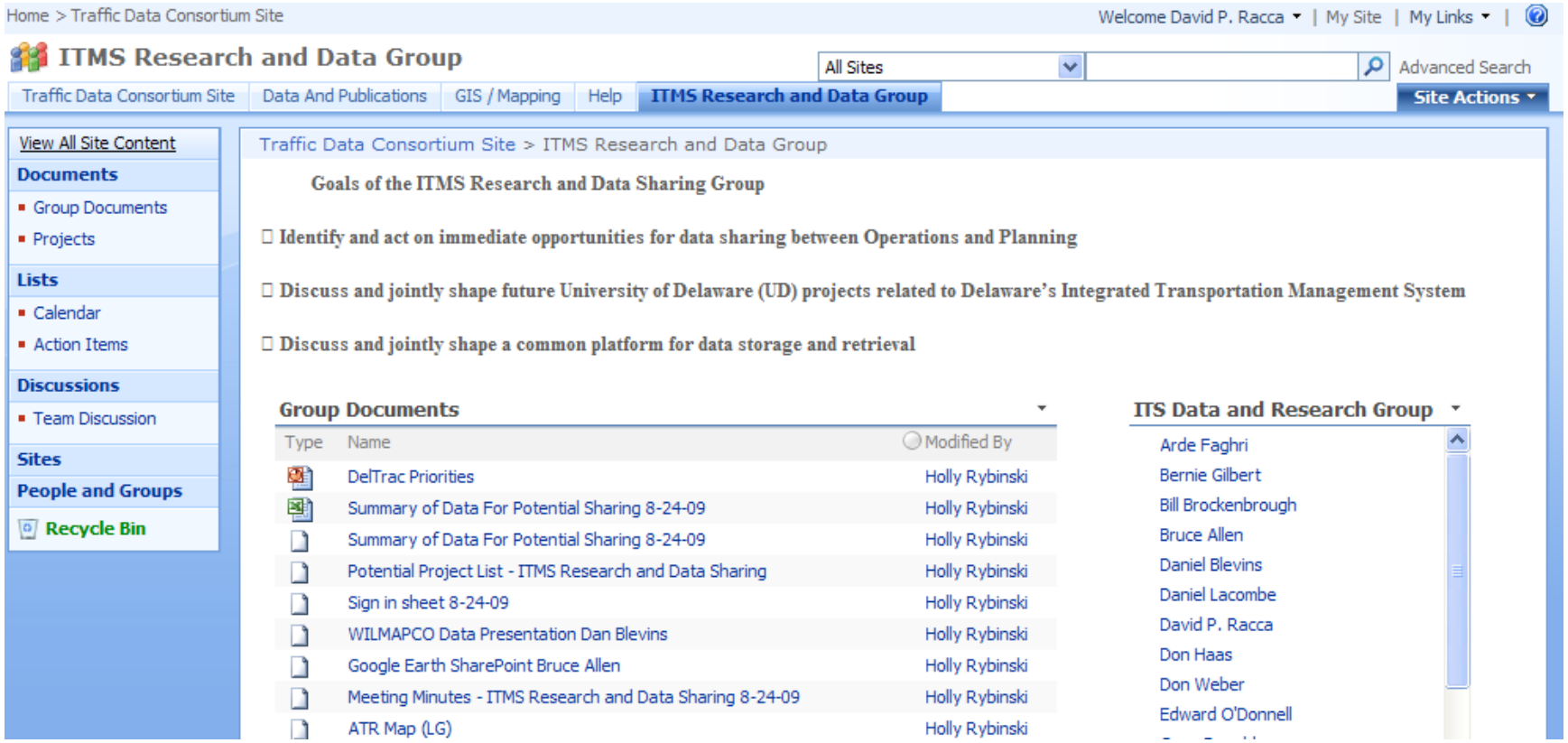
**Test case: Application to Traffic Data Management**

Coincident with this project the Integrated Traffic Management System (ITMS) Research and Data Sharing Group was established to foster a more coordinated approach to traffic management efforts by DelDOT and the University of Delaware. Goals of the group are:

- Identify and act on immediate opportunities for data sharing between DelDOT Operations and Planning
- Discuss and jointly shape future University of Delaware projects related to Delaware's Integrated Transportation Management system
- Discuss and jointly shape a common platform for data storage and retrieval

This was a perfect opportunity to further investigate and demonstrate the potential for the type of site developed for this project, and it involved the same target audience. The Traffic Data Consortium Site was developed as a demonstration site and included libraries for data and publications, user and group sites that handled the groups documents, discussion forums, a link to a GIS web application, and links to other resources. This demonstration site used what was learned about tagging and organization from this project's site. Some transportation planners immediately began to make contributions and insert and download data into the site in order to share data with the University. The general response was very favorable. A very minimal amount of time was used to develop the site demonstration, perhaps 2 weeks time, spread out over a couple months. The development of a starting point for an information resource that could have immediate utility was demonstrated.

**Figure 9, Screen Capture of ITMS Research and Data Group Home Page**



Further development could be described more as strategic development rather than strategic planning and would depend on winning use and the support of users. Work on the site will continue once a study of traffic conditions expected to start in Spring 2010 begins in New Castle County. Various performance data will be compiled and the ITMS Data Sharing site will be used to manage the project data and support communications between DelDOT, the University of Delaware and a private consultant who are bringing skills together. For this upcoming project, administration and use of a collaborative site will be examined and prepared more fully, in particular improved security, improved data tagging, additional research in the administration requirements, and development of user guidelines and educational materials for the site. The site in this project focusing on Sussex County will be combined with the ITMS site, demonstrating that with each new project a larger resource can result building on each effort. An important aspect of using such demonstrated sites is that the approach is scalable, offering benefits to a small or large group/effort. At minimum the ITMS data sharing site will be useful for the New Castle County project and hopefully that project based effort will address broader issues and contribute to capabilities to handle wider interests. A more extensive implementation of the Sharepoint based collaborative sites would at some point need to address in a more detailed manner focus areas such as listed below.

**Figure 10, Focus Areas of Site Development**

- Operations
  - Membership - Users And Groups
  - Access and data sharing
  - Communications
  - Support, Training And Education
  - Site Use Guidelines
  - Publications
- Administrative
  - Finance
  - System Preservation
  - Technical Staffing - Contracting
  - Server Maintenance
- Facilities
  - UD ITMS Lab
  - Document Library Servers
  - Spatial Server (GIS server)
  - Archives
- Data Spatial Reference
  - Locational Standards
  - Network And Facilities Representation
  - Maintenance
- Interoperability
  - Between Transportation Agency Data Resources
  - DelDOT Traffic Count Site and other web resources
  - Geographical Information Systems
  - Academic Programs

## Integration of Travel Data

This project was focused on determining the availability and collection of travel data measurements and estimates such as traffic volumes, travel speeds, and projections. Some of the information is generated continually such as with the annual traffic count program or the University of Delaware Travel Speed Surveys, and represents a body of information to examine travel through time and season. This data is mostly referenced to portions of the road network and the road portions vary in size and composition. A standardized method of referencing the information would be required to relate and integrate information from different sources, for example:

- the comparison of traffic peak hour estimates with measurements from permanent traffic counters.
- examination of travel speed measurements as they relate to measured volumes.
- models of capacity as they relate to volumes and speeds.

Determining how traffic data could be related or integrated was a primary part of the investigation as the information was studied and collected during the project.

Some of the information is generated continually such as with the annual traffic count program or the University of Delaware Travel Speed Surveys and represents a body of information to examine travel through time and season. An effective means of archiving and accessing the information through time also depends on a stable method of referencing travel data to the road network.

### Delaware Linear Referencing System and Events

Integrating travel data ultimately comes down to how portions of the road network are identified. Data for travel speeds, road inventories, and traffic counts were most often referenced to the road network using the route and mile point scheme of the Delaware Linear Referencing System. There is currently no other standard method of referencing portions of the road network. Alternatives might include identification schemes based on geographical coordinates or on a set of internal object identifiers for road segments but after continued research no such method was found in use as a standard in Delaware.

### Linear Referencing System Events and Overlay

Linear referencing (LRS) has many advantages such as the ability to reference very small portions of roads between intersections and points on roads, as well as referencing portions of road that span several intersections. Linear LRS events include a specification of the route and beginning and end mile point, and data associated with that portion of road between those mile points. Events are stored in rows and columns as tables. A LRS point event such as the location of an accident would include a route designator and one mile point value. Once a standard LRS network is established, entire centerline representations can be specified through event tables.

Data currently available in event tables or as a result of this project are listed in figure 11.

**Figure 11, Examples of Data Available as Event Tables**

AADT
Road Inventory
HPMS figures
Permanent Traffic Counter Counts
Travel Speed Survey (UD)
Intersection Locations
Accidents
Pavement Condition

In terms of integration, one of the most powerful capabilities offered by LRS is the ability to overlay LRS events. It is possible to relate many types of data that are associated with a particular piece of road specified by route and beginning and end mile points. For two event tables, values associated with a road segment in common could be associated with each other. If for example it is known that 1100 cars flowed per hour on a road segment defined between two mile points, this could be related to speeds kept in another event table between those mile points. As another example, roads associated with permanent traffic counters could be specified by an event table (figure 12). In another event table roads could be associated with capacities used in the travel demand forecasting. (figure 13) The intersection overlay of these two events could create a new event table that included overlapping events from the previous two tables and the result would be an association of Permanent Traffic Station roads with travel demand forecasting capacities (figure 14). Measurements of volumes for each Permanent Traffic Count Station could then be related road capacities and this type of overlay was created when examining traffic counts for Sussex as shown in the next section.

**Figure 12, Event table for roads associated with Permanent Counter Stations (ATRID)**

| ATRID | RDWAYID | BEGMP | ENDMP | OFFSET |
|---|---|---|---|---|
| 101201-1 | 478 | 0 | 2.31 | -600 |
| 8081-3 | 543 | 0 | 2.82 | -600 |
| 8087-1 | 951 | 0.22 | 6.58 | -600 |
| 8087-1 | 952 | 1.61 | 6.32 | -600 |
| 8087-1 | 953 | 0 | 0.53 | -600 |
| 8079-1 | 953 | 0.84 | 4.1 | -600 |
| 8079-1 | 954 | 0 | 0.59 | -600 |
| 8095-1 | 954 | 1.63 | 3.98 | -600 |
| 8072-1 | 954 | 4.16 | 8.86 | -600 |
| 8073-5 | 956 | 0 | 1.65 | -600 |
| 101201-1 | 957 | 0 | 1.64 | -600 |
| 8076-1 | 960 | 0.03 | 2.73 | -600 |
| 101201-1 | 960 | 7.82 | 22.74 | -600 |
| 8081-3 | 969 | 0 | 4.24 | -600 |
| 8083-1 | 969 | 6.23 | 13.73 | -600 |
| 8073-5 | 973 | 9.06 | 18.3 | -600 |
| 8073-5 | 973 | 18.3 | 9.06 | -600 |

**Figure 13, Event table for Travel Demand Forecasting Network roads associated with Capacity value (CALIB_CAP)**

| RDWAYID | STMP | ENDMP | CALIB_CAP |
|---|---|---|---|
| 953 | 0.979 | 3.08 | 1500 |
| 953 | 0.53 | 0.84 | 1500 |
| 953 | 0 | 7.66 | 1500 |
| 953 | 0.84 | 0.979 | 1500 |
| 954 | 7.804 | 8.3 | 1500 |
| 954 | 10.69 | 11.37 | 1500 |
| 954 | 7.45 | 7.804 | 1500 |
| 954 | 4.64 | 5.507 | 1500 |
| 954 | 3.99 | 4.16 | 1500 |
| 954 | 3.41 | 3.99 | 1500 |
| 954 | 1.63 | 3.41 | 1500 |
| 954 | 17.3 | 17.61 | 1500 |
| 954 | 1.2 | 1.61 | 1500 |
| 954 | 0 | 1.2 | 1500 |
| 954 | 5.507 | 7.45 | 1500 |
| 954 | 4.16 | 4.64 | 1500 |
| 955 | 2.46 | 1.94 | 700 |
| 955 | 0.01 | 1.5 | 700 |

**Figure 14, The result of intersecting event tables for Permanent Counter association and capacity**

| RDWAYID * | BEGMP | ENDMP | ATRID | CALIB_CAP |
|---|---|---|---|---|
| 953 | 3.587 | 4.1 | 8079-1 | 1500 |
| 953 | 3.08 | 3.587 | 8079-1 | 1500 |
| 953 | 0.979 | 3.08 | 8079-1 | 1500 |
| 953 | 0.53 | 0.53 | 8087-1 | 1500 |
| 953 | 0.84 | 4.1 | 8079-1 | 1500 |
| 953 | 0 | 0.53 | 8087-1 | 1500 |
| 953 | 0.84 | 0.979 | 8079-1 | 1500 |
| 954 | 7.804 | 8.3 | 8072-1 | 1500 |
| 954 | 7.45 | 7.804 | 8072-1 | 1500 |
| 954 | 4.64 | 5.507 | 8072-1 | 1500 |
| 954 | 3.41 | 3.98 | 8095-1 | 1500 |
| 954 | 1.63 | 3.41 | 8095-1 | 1500 |
| 954 | 0 | 0.59 | 8079-1 | 1500 |
| 954 | 5.507 | 7.45 | 8072-1 | 1500 |
| 954 | 4.16 | 4.64 | 8072-1 | 1500 |
| 956 | 0 | 0.06 | 8073-5 | 700 |
| 956 | 0.06 | 0.295 | 8073-5 | 700 |
| 956 | 0.786 | 1.65 | 8073-5 | 700 |
| 957 | 0.29 | 1.64 | 101201-1 | 1500 |

**O**ther operations that can be used with linear referencing systems include dissolving of events on particular variables, location tools for determining routes and mile points of points where coordinates are known, and transformations between two linear referencing systems. As the data exists in tables various types of tabular queries and operations are also possible. Linear referencing can also be used to transfer data between to road centerline representations (conflation).

Current versions of the Delaware Linear Referencing System as embodied in the DelDOT Centerline file need update and some correction but it is quite functional and a number of data sets have been basede on it over the last few decades. Now that geographical information systems are using increasingly accurate data layers that are often developed in reference to high resolution, corrected aerial photography, there may be efforts to correct mile point values to match computer generated lengths of road center line representations, but it is believed that historical data sets can be transformed in to updated linear referencing systems. Mile points in data files used in this project can be specified to three decimals, the 1/1000$^{th}$ place providing a smallest measure of 5.3 feet (1.6 meters) which is sufficient to capture the length of any road segment used or attribute.

# Compilation of Available Travel Data

## Travel Speed – University of Delaware Travel Time and Delay Studies

Two sources of travel speed measurements were found. One is "Application of Global Positioning To Travel Time and Delay Measurements" project conducted over the last several years by the Delaware Center for Transportation thru the Department of Civil & Environmental Engineering at the University of Delaware. This ongoing project uses the state-of-the-art equipment in receiving satellite position information for collecting real-time state-wide traffic data. Peak travel times are sampled year round. Statistics for the road segments under study include:

- Mean Peak Travel Timed (time to traverse the segment)
- Mean Peak Travel Speed (average speed that was required to traverse the segment)
- Total Peak Delay (time spent in delay)
- Peak Delay Source
- Mean Peak Running Speed (Speed if congestion were not encountered)
- Percent Time in Delay (the primary statistic examined)
- Posted Speed Limit

In Sussex, data was collected on Saturdays and Sundays in peak travel directions. Friday evening data collection was averaged with data collected on Saturday morning since both times represent southbound traffic to the shore. Available information included project reports (http://www.ce.udel.edu/dct/research/publications.htm ), a geographical information system file showing data for the summers of 2006 and 2007, and raw data for the full year for 2006 and 2007. The well known problem area is on Route1 near Lewes and the shore as shown in the figure 15 on the next page. Beach traffic combined with major shopping centers and outlets produce a very high volume of traffic throughout the day in all directions where it is not uncommon for percent travel time in delay to be in the neighborhood of 50% or more.

The October 2008 report* provided tables to highlight findings that are presented on the next pages. The report included a comparison of travel time for 2007 and 2008 and noted:

- general improvement in LOS, possibly due to rising gas prices
- little congestion on I-95 and I-295
- traffic moderate to heavy and speeds below posted but still moving
- Delays on US13 in seaford area due to signalization
- Variations in peak time
- Congestion northbound on Saturday mornings can be just as high as southbound

* Faghri, A. et all, "Application of Global Positioning System (GPS) to Travel Time and Delay Measurements" , Delaware Center for Transportation, University of Delaware, October 2008, http://www.ce.udel.edu/dct/research/publications_files/Rpt.%20192,%20GPS%20Travel%20Time%2008.pdf

**Figure 15, Percentage delay in 2007 on Route 1 near Lewes and Rehobeth, mapped from a 2007 GIS file provided by DCT**

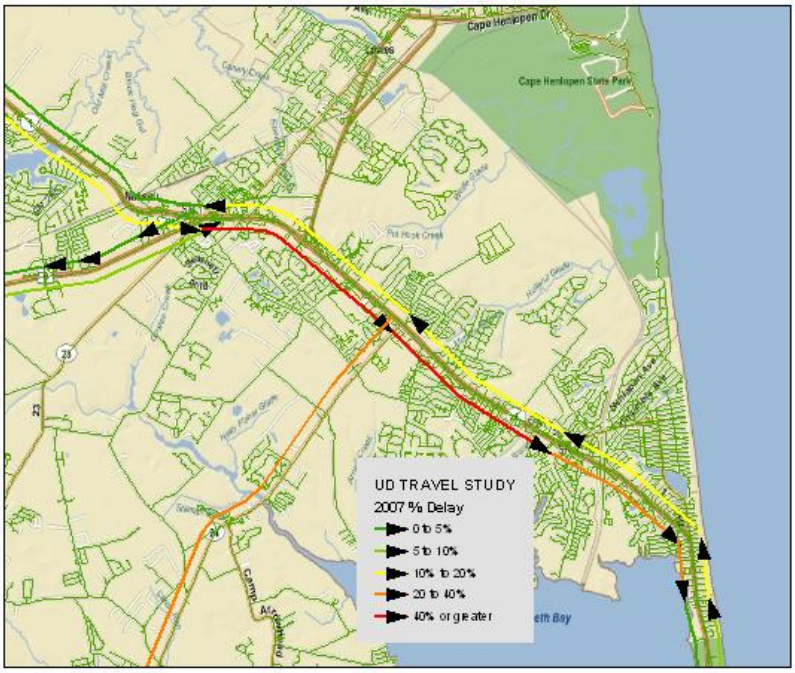
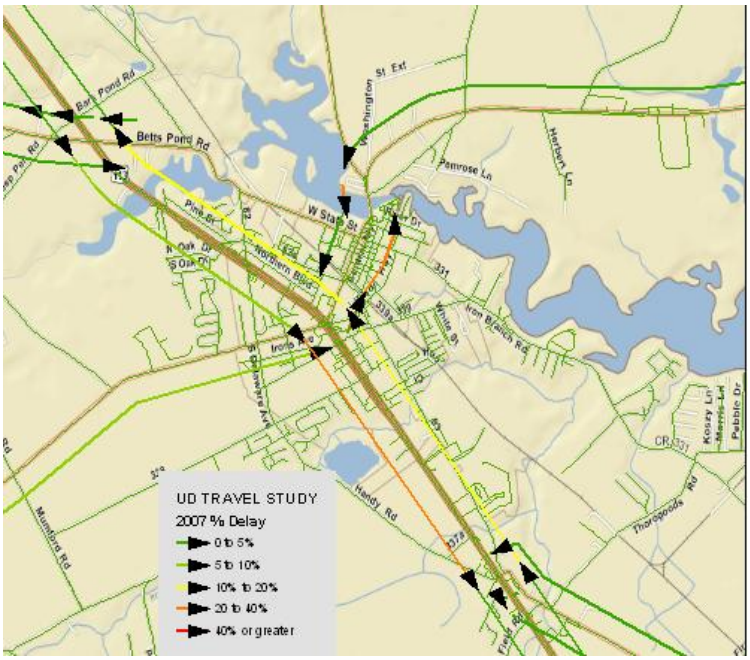



**Figure 16, Percentage delay in 2007 in Millboro, mapped from a 2007 GIS file provided by DCT**



Also included in the October 2008 report are tables for the worst road segments, the most degraded road segments, and the most improved road segments.

**Figure 17, Worst Road Segments in Sussex County**
**October 2008 DTC Report**

| ID | Route Number | Dir | Segment | LOS | LOS % | Avg. Speed (mph) |
|---|---|---|---|---|---|---|
| 137 | SR 1 | NB | Exit 97 (two on ramps) to Exit 98 | F | 80.21% | 12.9 |
| 101 | SR 1 | NB | Christiana Mall (exit 164) to Merge with I-95 N | F | 79.56% | 8.6 |
| 160 | SR 1 | SB | SR 14 to SR 36 (Slaughter Beach) | F | 78.49% | 11.5 |
| 352 | SR 24 | EB | SR 5 South to SR 23 / SR 5 North | F | 74.20% | 9.0 |
| 23 | SR 896 | NB | SR 1 to US 13 | E | 64.88% | 8.6 |
| 367 | SR 26 | EB | US 113 to SR 20 | E | 62.32% | 10.2 |
| 7 | SR 896 | SB | US 40 to Porter Rd. | E | 61.85% | 16.0 |
| 176 | SR 1 | NB | King Charles Ave (DE) to Rehoboth Avenue | D | 57.74% | 13.1 |
| 313 | SR 20 | EB | SR 24 to SR 20 E/US 113 Split | D | 56.96% | 21.7 |
| 235 | SR 404 | EB | US 13/404 W Split to US 13/404 E Split | D | 55.37% | 19.6 |
| 427 | SR 54 | EB | Waller Rd (RD 512) to US 13 | D | 53.64% | 11.6 |
| 46 | US 13 Wilm | SB | SR 141 to SR 273 | D | 48.27% | 19.2 |
| 140 | SR 1 | NB | Combo w/ US 113 (95) to Exit 97 (two on ramps) | D | 46.41% | 34.8 |
| 107 | SR 1 | NB | US 40 (exit 160) to SR 273 (exit 162) | D | 45.42% | 29.9 |
| 302 | SR 20 | WB | US 13 / SR 20 E to US 13 / SR 20 W | C | 43.87% | 21.1 |
| 91 | US 13 Wilm | SB | US 13/113 Split to 1/113 Merge (SR 1 Exit 95) | C | 43.80% | 20.4 |
| 142 | SR 1 | SB | Combo w/ US 113 (95) to Exit 93 | C | 42.61% | 27.3 |
| 8 | SR 896 | NB | Porter Rd. to US 40 | C | 42.01% | 24.0 |
| 169 | SR 1 | SB | US 9 West / SR 404 to SR 24 | C | 41.85% | 14.3 |
| 397 | US 13 Dover | SB | SR 404 W to SR 404 E | C | 41.61% | 19.8 |

**Figure 18 Location of Worst Segments in Sussex County**
**2008 DCT Report**

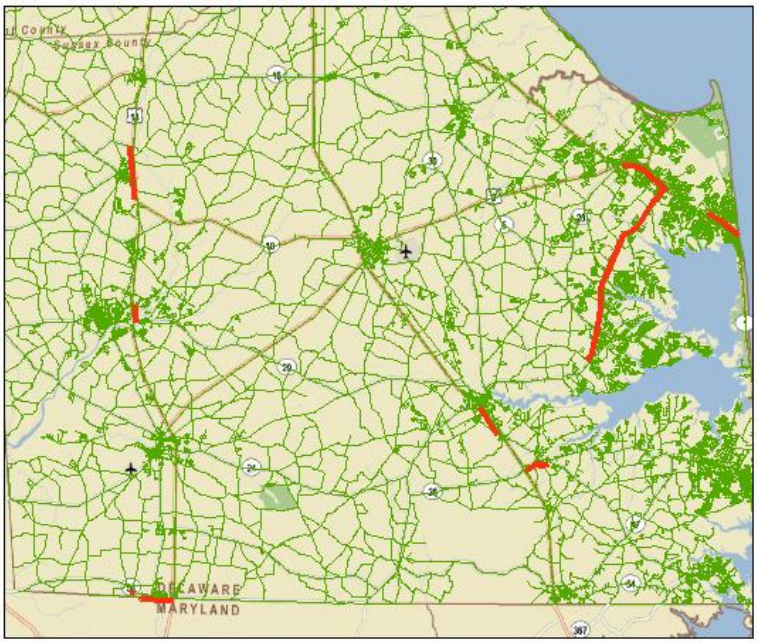


**Figure 19, 2008 Most Degraded Segments in Sussex County**

| ID | Route Number | Dir | Segment | LOS 07 | LOS 08 | %_D_PS_TS |
|---|---|---|---|---|---|---|
| 344 | SR 24 | WB | US 113 to 30/24 split | A | B | -109.12% |
| 313 | SR 20 | EB | SR 24 to SR 20 E/US 113 Split | A | D | -82.90% |
| 160 | SR 1 | SB | SR 14 to SR 36 (Slaughter Beach) | A | F | -76.15% |
| 428 | SR 54 | WB | US 13 to Waller Rd (RD 512) | A | B | -71.48% |
| 137 | SR 1 | NB | Exit 97 (two on ramps) to Exit 98 | B | F | -68.42% |
| 352 | SR 24 | EB | SR 5 South to SR 23 / SR 5 North | A | F | -64.91% |
| 49 | US 13 Wilm | SB | SR 273 to US 40 | A | C | -62.50% |
| 13 | SR 896 | SB | SR 71 to SR 15 | A | B | -56.71% |
| 1 | SR 896 | SB | I-95 to Old Baltimore Pike | A | B | -52.23% |
| 175 | SR 1 | SB | Rehoboth Avenue to King Charles Ave (DE) | A | A | -49.93% |

**Figure 20, 2008 Most Improved Segments in Sussex County**

| ID | Route Number | Dir | Segment | LOS 07 | LOS 08 | %_D_PS_TS |
|---|---|---|---|---|---|---|
| 331 | SR 24 | EB | MD line to Road 499 | A | A | 99.35% |
| 467 | I 95 | SB | Exit 3 (SR 273) to Exit 1 (SR 896) | D | A | 90.73% |
| 161 | SR 1 | NB | SR 36 (Slaughter Beach to SR 14) | D | A | 83.92% |
| 463 | I 95 | NB | Exit 3 (SR 273) to Exit 4 (SR 1) | D | A | 80.36% |
| 469 | I 95 | NB | MD Line to Exit 1 (SR 896) | C | A | 79.52% |
| 242 | SR 404 | WB | US 9 Merge to US 113 | E | A | 77.25% |
| 464 | I 95 | SB | Exit 4 (SR 1) to Exit 3 (SR 273) | C | A | 67.14% |
| 290 | SR 14 | WB | SR 1 to US 113 | B | A | 53.64% |
| 5 | SR 896 | NB | US 40 to Old Baltimore | B | A | 53.20% |
| 248 | SR 404 | WB | RT 5 to Rt 30 | C | A | 52.82% |

## Travel Speed – Public Vehicle GPS Files

State owned vehicles in Delaware are currently equipped with GPS units and the location of every vehicle, polled every 2 minutes is collected and archived each month. This could be a very valuable source of information for the study of travel speeds and the Delaware Office of Management and Budget offered their support by providing several months of information. There is data throughout the day and year and in all three Delaware counties.

Data was screened to identify beginning and ends of trips, and speed measurements were associated with portions of roads and for turning movements. Speed measurement location (longitude and latitude), date and time, and average speed were the principal information of interest in the data. Programs were developed to extract the speed measurements and initial tests were promising, though it was beyond the scope of this project for a complete extraction from approximately 50 million measurements available for the year and a half of data available. Computer processing of the entire data set would take an estimated 3 months. An approach was developed instead to preprocess the

information and prepare it such that selected extracts could be further processed. Measurements for a particular road or set of roads, or for a particular time of day, or for a particular time of year could form a subset which could then be fully processed.

Figure 21 below show a sample of GPS points shown as red dots for a particular route. GPS coordinates are broadcast every 2 minutes. While a shorter interval is desirable this figure shows that the route taken is clearly visible. From these points and with respect to direction routes were built and values of speed were interpolated between the points for all road segments in the path as well as each turn that was made in the estimated route.

**Figure 21, Sample Route From The Public Vehicle GPS File**

Each road segment and turn has a speed associated with it. Every GPS speed measurement has a date and time also associated with it. Individual speed measurements can be viewed or groups of measurements can be averaged together. For instance, weekday evening peak times could be selected from the database and averaged as shown in figure 22. As more measurements are examined for a particular time of day a value of the expected travel speed for each road segment and turn can be better estimated.

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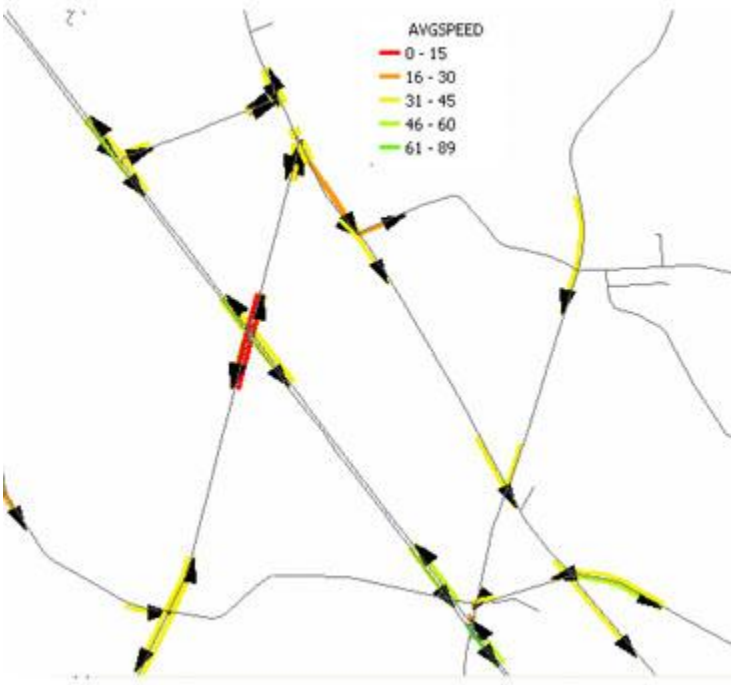
**Figure 22, Example of Average Speed Map Derived From Public GPS Data**

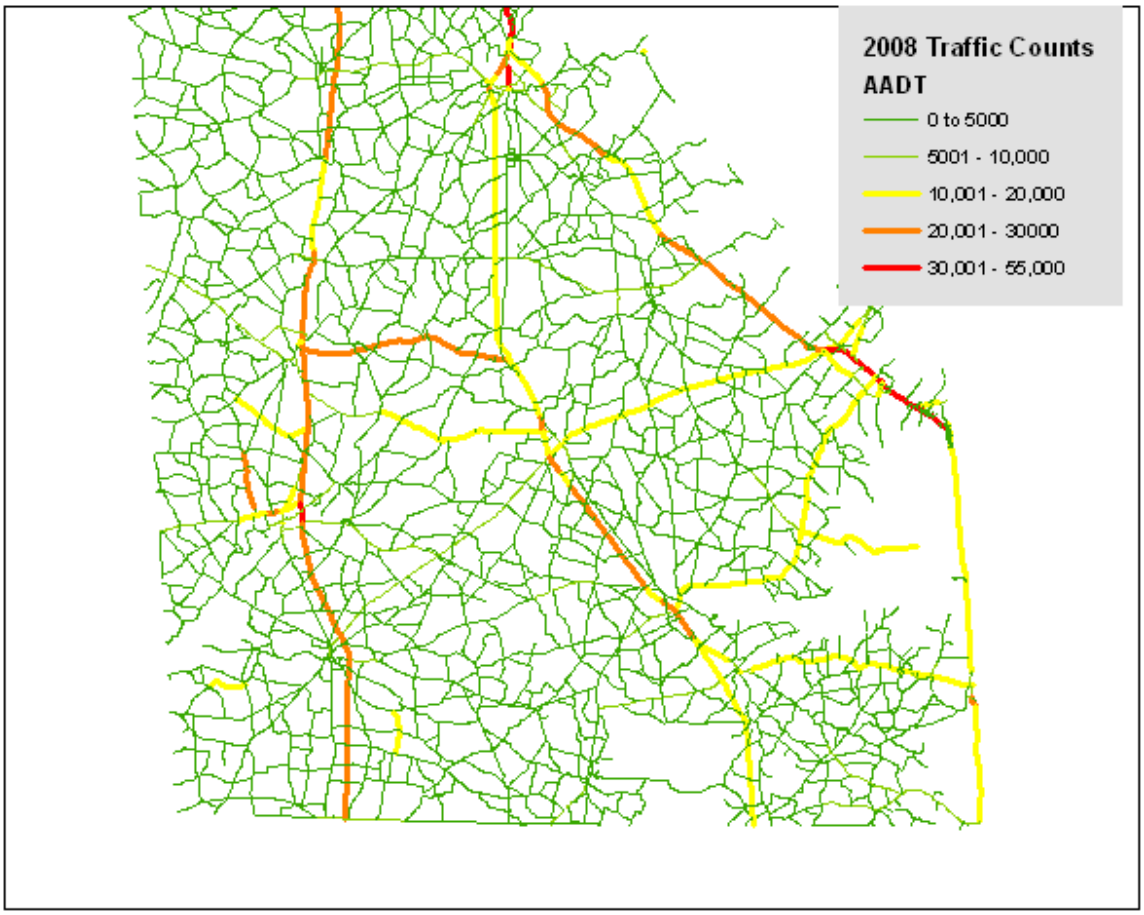



Efforts to compile this data and process are expected to continue once this project is completed.

## Traffic Counts

The primary source of traffic count data is the DelDOT Traffic Count Program. Figure 23 below shows the Average Annual Daily Traffic (AADT) for Sussex County. Largest flows are on Route 1, Route 13, Reddon Road, and Route 113. The AADT of the portion of Route 1 near Rehobeth and the concentration of outlets and commercial development is close to 55,000.

**Figure 23, 2008 AADT in Sussex County**
**From DelDOT Traffic County Program**




The DelDOT Traffic Count Program through Liam Morris has produced hourly summaries of traffic count data from permanent counters that provide a more detailed view than AADT. Databases for the permanent counters were compiled and are in the project library. In order to display and better understand traffic flows, permanent counter hourly totals were associated with portions of the road network and maps were made at various times. Some examples are on the following page. A procedure was developed to take the various time slices and produce an animation through time. A typical Saturday and the July 4rth weekend starting this year from Thursday July 2nd thru Tuesday July 6th were the subject of 2 animated videos of traffic volumes thru time and these files are available at the project site.

**Figure 24, Hourly Count versus Capacity for Permenant Traffic Counters in Sussex, Saturday July 3rd at 11:00AM**

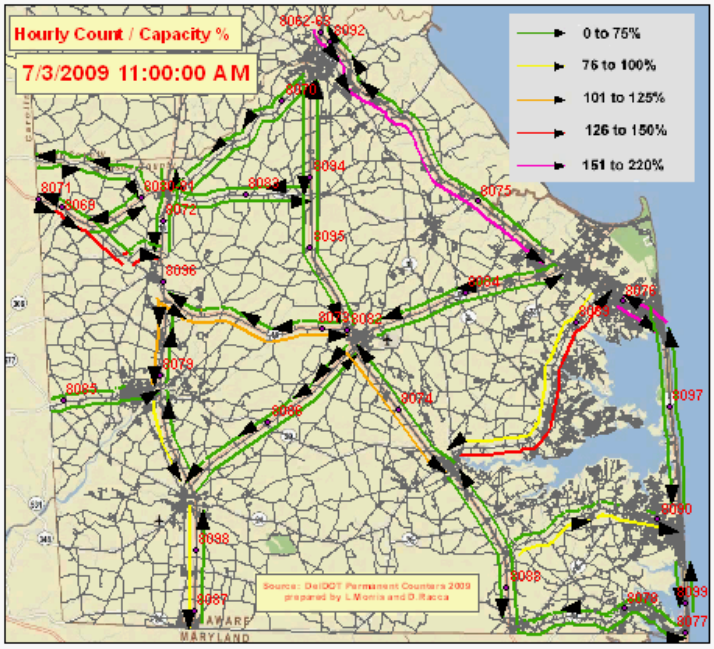
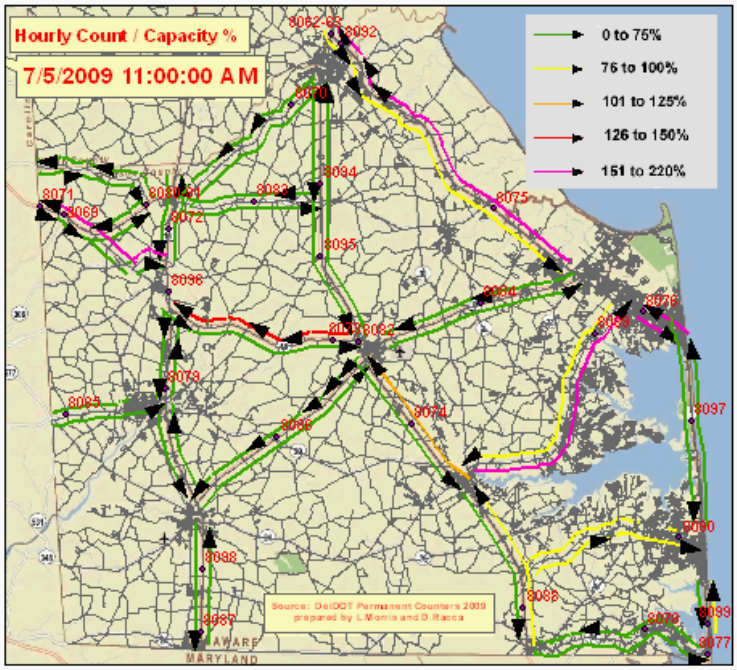



**Figure 25, Hourly Count versus Capacity for Permenant Traffic Counters in Sussex County, Monday 11am July 5th going home from the resort area**



**Travel Characteristics**

A primary source of information that can be used to examine travel characteristics is the Delaware Travel Monitoring System (DTMS) now in its eleventh year. Trip origins, trip destinations, trip purpose, distance, travel time, seasonal variations, and expected trip generation were among statistics gathered for the project. A number of tabulations are presented on the next few pages.

From the DTMS, average trip distances for the journey to work, as well as for all trips, are larger in Sussex County than for Delaware as a whole. This would be expected from Sussex County's relatively lower density. Typically average trip distances for the journey to work are greater than trips overall. People are expected to drive further distances for work than for other purposes where there are generally more options and this is seen in the State figures. For Sussex though, average journey to work trip distances are a similar to overall trip distances.

Average trip times for the journey to work for Sussex County are similar to average trip times when all trips are considered, and average trip times in Sussex are similar to those found for Delaware as a whole. As the trip distances are slightly longer, with trip times the same this would suggest that travel speeds in Sussex County are on average slightly higher.

Average trips per person in Sussex over the last three years is about 2.6 which is very similar to the other counties.

For travel mode, 98% of trips are by car in Sussex compared to about 96% by car for the State. Transit percentages are low (0.2) due to limited service and low density.

Trip purpose percentages were also tabulated and are similar to what is found across the State with differences consistent with what would be expected of a population with more retirees.

**Figure 26, Average Trip Distance, Journey To Work**

**Delaware**
**Average Trip Distance**
**Journey to Work (miles)**

| Year | Average Distance |
|---|---|
| 2003 | 8.4 |
| 2004 | 8.6 |
| 2005 | 8.8 |
| 2006 | 9.3 |
| 2007 | 9.4 |
| 2008 | 9.5 |
| Total | 9.0 |

**Sussex County**
**Average Trip Distance**
**Journey to Work (miles)**

| Year | Average Distance |
|---|---|
| 2003 | 9.8 |
| 2004 | 10.8 |
| 2005 | 9.9 |
| 2006 | 10.4 |
| 2007 | 8.9 |
| 2008 | 11.2 |
| Total | 10.2 |

Source: DTMS, Center for Applied Demography and Survey Research
University of Delaware

**Figure 27, Average Trip Distance, All Trips**

**Delaware**
**Average Trip Distance**
**All Trips (miles)**

| Year | Average Distance |
|---|---|
| 2003 | 7.7 |
| 2004 | 7.6 |
| 2005 | 8.0 |
| 2006 | 7.8 |
| 2007 | 8.0 |
| 2008 | 8.4 |
| Total | 7.9 |

**Sussex County**
**Average Trip Distance**
**All Trips (miles)**

| Year | Average Distance |
|---|---|
| 2003 | 9.3 |
| 2004 | 9.6 |
| 2005 | 9.6 |
| 2006 | 9.1 |
| 2007 | 9.7 |
| 2008 | 10.8 |
| Total | 9.7 |

**Figure 28, Average Trip Time, All Trips**

**Delaware**
**Average Trip Time**
**All Trip Purposes (minutes)**

| Year | Average Trip Time |
|---|---|
| 2003 | 21.7 |
| 2004 | 21.7 |
| 2005 | 21.2 |
| 2006 | 21.8 |
| 2007 | 21.4 |
| 2008 | 21.6 |
| Total | 21.5 |

**Sussex County**
**Average Trip Time All**
**Trip Purposes (minutes)**

| Year | Average Trip Time |
|---|---|
| 2003 | 22.4 |
| 2004 | 21.8 |
| 2005 | 21.9 |
| 2006 | 22.3 |
| 2007 | 21.4 |
| 2008 | 21.1 |
| Total | 21.8 |

Source: DTMS, Center for Applied Demography and Survey Research
University of Delaware

**Figure 29, Average Trip Time, Journey To Work**

**Delaware**
**Average Trip Time**
**Journey to Work ( minutes )**

| Year | Average Trip |
|---|---|
| 2003 | 23.6 |
| 2004 | 23.3 |
| 2005 | 22.1 |
| 2006 | 23.3 |
| 2007 | 23.7 |
| 2008 | 22.9 |
| Total | 23.1 |

**Sussex County**
**Average Trip Time**
**Journey to Work ( minutes )**

| Year | Average Trip |
|---|---|
| 2003 | 28.7 |
| 2004 | 23.6 |
| 2005 | 22.7 |
| 2006 | 23.3 |
| 2007 | 21.3 |
| 2008 | 23.4 |
| Total | 23.8 |

**Figure 30, Average Trips per Person, Years 2006 thru 2008**

| | 2006 | 2007 | 2008 | 2006-08 |
|---|---|---|---|---|
| **Kent** | 2.8 | 2.8 | 2.3 | 2.6 |
| **Sussex** | 2.8 | 2.8 | 2.2 | 2.6 |
| **New Castle** | 2.9 | 2.9 | 2.5 | 2.7 |
| **Delaware** | 2.9 | 2.9 | 2.4 | 2.7 |

Source: DTMS, Center for Applied Demography and Survey Research
University of Delaware

**Figure 31, Sussex County Trip Method Percentages**

| | Sussex | Sussex | Sussex | Sussex | STATE |
|---|---|---|---|---|---|
| **Year** | **2003 to 2005** | **2004 to 2006** | **2005 to 2007** | **2006 to 2008** | **2006 to 2008** |
| **Driver of car** | 83.4 | 84.9 | 86.0 | 85.5 | 86.3 |
| **Passenger in car** | 13.4 | 13.2 | 12.0 | 12.4 | 9.9 |
| **Public Bus** | 0.2 | 0.2 | 0.2 | 0.1 | 1.4 |
| **Walked** | 2.0 | 0.7 | 0.9 | 0.8 | 0.9 |
| **School bus** | 0.2 | 0.3 | 0.5 | 0.6 | 0.5 |
| **Rode bike** | 0.4 | 0.3 | 0.1 | 0.3 | 0.3 |
| **Other** | 0.5 | 0.5 | 0.3 | 0.4 | 0.6 |

**Figure 32, Trip Purpose Percentages, Sussex County and State of Delaware, 3 year averages**

| | Sussex 2006 to 2008 | State 2006 to 2008 | Sussex 2005 to 2007 | Sussex 2004 to 2006 | Sussex 2003 to 2005 |
|---|---|---|---|---|---|
| **Work** | 30.3 | 33.1 | 29.5 | 29 | 30 |
| **Store** | 20.2 | 17.8 | 18.7 | 18.3 | 18.7 |
| **School** | 3.5 | 5.1 | 3.1 | 3 | 2.8 |
| **Drop off/Pick up a person** | 7.8 | 9.7 | 9.7 | 10.6 | 10.8 |
| **Social** | 8.2 | 6.8 | 7.5 | 7.5 | 6.6 |
| **Recreation** | 6 | 6.2 | 5.8 | 6.5 | 6.6 |
| **Eat out** | 6.3 | 5.2 | 6.1 | 5.9 | 5.1 |
| **Child Care** | 0.5 | 0.8 | 0.8 | 0.8 | 1.2 |
| **Doctors (medical)** | 4.2 | 3.9 | 4.4 | 4.7 | 5.5 |
| **Bank or Post Office** | 3.1 | 2.2 | 4.1 | 4 | 3.8 |
| **Public Transportation** | | 0.3 | | | |
| **Barber/Hairdresser** | 0.5 | 0.5 | 0.8 | 1 | 0.8 |
| **House of Worship (Church etc)** | 2.2 | 1.6 | 1.8 | 1.7 | 1.3 |
| **Other** | 7 | 6.9 | 7.6 | 7.2 | 6.8 |

**Origins and Destinations**

Origin and destination information is available from the DTMS and data for years 2000 thru 2008 was aggregated by Planning District. This provides a rough idea of where people are traveling to and from. Figure 34 below shows the largest origin destination pairs representing about 90% of the travel. About 2/3 of travel for all trips is to and from the same planning district. About 40% of all work trips are to and from the same planning district. Lewis is the leading destination for all trips and for work trips, followed by Seaford. From there it balances out a bit. Two thirds of work trips from Harrington and a third of work trips from Milford South are in Kent County.

**Figure 33, US Census Bureau Sussex County Planning Districts**


**Figure 34, Destination CCD's for Journey to Work in Sussex County Expressed in terms of the percentage of all work trips, DTMS 2000-2008**

| Destination CCD | % of Work Trips |
|---|---|
| Lewis | 21 |
| Seaford | 15 |
| Selbyvill | 10 |
| Outstate | 10 |
| Millsboro | 8 |
| Kent | 7 |
| Laurel-delmar | 6 |

**Figure 35, Journey to Work Top Origin Destination Pairs**
**Percentage of all work trips, DTMS 2000 to 2008**

| | |
|---|---|
| To/From Lewis | 12 % |
| To/From Seaford | 10 |
| To/From Kent | 7 |
| To/From Selbyville | 7 |
| To/From Laurel Delmar | 5 |
| To/From Milton and lewes | 4 |

**Figure 36, All Trips, Leading Destination CCD**
**Percentage of all trips, DTMS 2000 to 2008**

| | |
|---|---|
| Lewis | 21% |
| Seaford | 15 |
| Selbyville-Frankford | 13 |
| Millsboro | 10 |
| Laurel-Delmar | 8 |
| Georgetown | 8 |
| Outside of DE | 7 |

**Figure 37, Top Origin and Destination CCD Pairs**
**Percentage of all trips, DTMS 2000 to 2008**

| | |
|---|---|
| To/From Lewis | 14.7% |
| To/From out of state | 13.6 |
| To/From Seaford | 10.6% |
| To/From Selbyville | 10.2 |
| To/From Kent | 9% |
| To/From Laurel Delmar | 5.6% |
| To/From Millsboro | 4.6% |
| To/From Milton and lewes | 4.4 |
| To/From Milford to Kent | 4% |
| To/From Lewis and Millsboro | 3.4 |
| To/From Seaford and Laurel | 2.6 |
| To/From Georgetown and Millsboro | 2.5 |
| To/From Seaford and Bridgeville | 2.4 |

**Figure 38 CCD Origin and Destination Pairs, Estimated Percentage of All Journey to Work Trips for Sussex County Residents**

**Source: Delaware Travel Monitoring System, Survey Years 2000 to 2008**

| ORIGINS | DESTINATIONS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Bridgeville-Greenwood | Laurel-Delmar | Georgetown | Lewes | Milford South | Milton | Millsboro | Seaford | Selbyville-Frankford | Kent | Unknow or out of state | New Castle | Total |
| Bridgeville-Greenwood | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 5 |
| Georgetown | 0 | 0 | 3 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 7 |
| Harrington | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Laurel-Delmar | 0 | 5 | 1 | 0 | 0 | 0 | 1 | 2 | 1 | 0 | 3 | 0 | 13 |
| Lewes | 0 | 0 | 1 | 12 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 17 |
| Milford South | 1 | 0 | 0 | 1 | 2 | 1 | 0 | 0 | 0 | 4 | 0 | 0 | 10 |
| Millsboro | 0 | 0 | 2 | 2 | 0 | 1 | 3 | 0 | 1 | 0 | 1 | 0 | 10 |
| Milton | 0 | 0 | 1 | 4 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 7 |
| Seaford | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 2 | 0 | 16 |
| Selbyville-Frankford | 0 | 0 | 1 | 1 | 0 | 0 | 2 | 0 | 7 | 0 | 3 | 0 | 14 |
| | 5 | 6 | 10 | 21 | 3 | 3 | 8 | 15 | 10 | 7 | 10 | 1 | 100 |

**Figure 39, CCD Origin and Destination Pairs, Estimated Percentage of Journey to Work Trips For Each Planning District for Sussex County Residents**

**( Column Percentages, Where Trips are Coming From For Each CCD)**

**Source: Delaware Travel Monitoring System, Survey Years 2000 to 2008**

| | Bridgeville-Greenwood | Laurel-Delmar | Georgetown | Lewes | Milford South | Milton | Millsboro | Seaford | Selbyville-Frankford | Kent | Unknow or out of state | New Castle | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bridgeville-Greenwood | 43 | 1 | 4 | 1 | 2 | 0 | 1 | 6 | 1 | 10 | 5 | 0 | 5 |
| Georgetown | 3 | 3 | 31 | 4 | 2 | 11 | 13 | 3 | 1 | 5 | 4 | 22 | 7 |
| Harrington | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Laurel-Delmar | 7 | 73 | 10 | 1 | 0 | 2 | 7 | 15 | 8 | 1 | 27 | 11 | 13 |
| Lewes | 2 | 4 | 9 | 57 | 7 | 19 | 5 | 2 | 7 | 14 | 4 | 6 | 17 |
| Milford South | 27 | 1 | 4 | 6 | 62 | 19 | 5 | 1 | 0 | 48 | 3 | 11 | 10 |
| Millsboro | 1 | 4 | 19 | 9 | 9 | 20 | 41 | 2 | 8 | 2 | 8 | 11 | 10 |
| Milton | 0 | 3 | 8 | 17 | 11 | 26 | 1 | 1 | 3 | 10 | 3 | 28 | 7 |
| Seaford | 17 | 11 | 7 | 1 | 2 | 0 | 5 | 67 | 2 | 6 | 18 | 11 | 16 |
| Selbyville-Frankford | 0 | 1 | 8 | 4 | 4 | 4 | 22 | 1 | 71 | 2 | 27 | 0 | 14 |
| | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

**Figure 40, CCD Origin and Destination Pairs, Estimated Percentage of Journey to Work Trips For Each Planning District for Sussex County Residents ( Row Percentages, Where Trips for Each CCD Are Going)**

**Source: Delaware Travel Monitoring System, Survey Years 2000 to 2008**

| | Bridgeville-Greenwood | Laurel-Delmar | Georgetown | Lewes | Milford South | Milton | Millsboro | Seaford | Selbyville-Frankford | Kent | Unknow or out of state | New Castle | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bridgeville-Greenwood | 42 | 1 | 8 | 5 | 1 | 0 | 1 | 18 | 1 | 14 | 10 | 0 | 100 |
| Georgetown | 2 | 3 | 42 | 10 | 1 | 4 | 14 | 7 | 1 | 5 | 6 | 3 | 100 |
| Harrington | 0 | 0 | 0 | 0 | 33 | 0 | 0 | 0 | 0 | 67 | 0 | 0 | 100 |
| Laurel-Delmar | 3 | 36 | 8 | 2 | 0 | 0 | 4 | 18 | 6 | 1 | 21 | 1 | 100 |
| Lewes | 1 | 2 | 5 | 71 | 1 | 3 | 3 | 2 | 4 | 6 | 3 | 0 | 100 |
| Milford South | 14 | 1 | 4 | 11 | 18 | 5 | 4 | 2 | 0 | 35 | 3 | 1 | 100 |
| Millsboro | 1 | 3 | 18 | 18 | 3 | 6 | 31 | 4 | 7 | 2 | 8 | 1 | 100 |
| Milton | 0 | 2 | 11 | 47 | 4 | 10 | 1 | 2 | 4 | 9 | 4 | 4 | 100 |
| Seaford | 6 | 4 | 4 | 1 | 0 | 0 | 3 | 65 | 1 | 3 | 12 | 1 | 100 |
| Selbyville-Frankford | 0 | 0 | 5 | 5 | 1 | 1 | 13 | 2 | 51 | 1 | 20 | 0 | 100 |
| | 5 | 6 | 10 | 21 | 3 | 3 | 8 | 15 | 10 | 7 | 10 | 1 | 100 |

**Figure 41, Origin and Destination Pairs, Estimated Percentage of All Types of Trips for Sussex County Residents**
**Source: Delaware Travel Monitoring System, Survey Years 2000 to 2008**

| | Selbyville-Frankford | Bridgeville-Greenwood | Lewes | Georgetown | Seaford | Laurel-Delmar | Milford South | Millsboro | Milton | outside or unknown | Kent County | New Castle | **total** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bridgeville-Greenwood | 0.0 | 1.7 | 0.1 | 0.2 | 1.2 | 0.1 | 0.5 | 0.0 | 0.0 | 0.2 | 0.4 | 0.0 | 4.7 |
| Georgetown | 0.4 | 0.2 | 0.8 | 3.5 | 0.7 | 0.3 | 0.3 | 1.2 | 0.5 | 0.3 | 0.2 | 0.1 | 8.5 |
| Laurel-Delmar | 0.3 | 0.2 | 0.1 | 0.3 | 1.3 | 5.6 | 0.0 | 0.3 | 0.1 | 1.7 | 0.1 | 0.0 | 10.2 |
| Lewes | 1.0 | 0.1 | 14.7 | 0.8 | 0.1 | 0.2 | 0.5 | 1.7 | 2.2 | 0.7 | 0.6 | 0.1 | 22.6 |
| Milford South | 0.0 | 0.5 | 0.6 | 0.3 | 0.1 | 0.0 | 1.7 | 0.3 | 0.3 | 0.2 | 2.0 | 0.0 | 6.1 |
| Millsboro | 1.1 | 0.0 | 1.7 | 1.3 | 0.3 | 0.3 | 0.2 | 4.6 | 0.4 | 0.7 | 0.2 | 0.1 | 10.8 |
| Milton | 0.1 | 0.0 | 2.2 | 0.6 | 0.1 | 0.1 | 0.3 | 0.4 | 1.1 | 0.2 | 0.4 | 0.1 | 5.5 |
| Seaford | 0.2 | 1.2 | 0.1 | 0.7 | 10.6 | 1.3 | 0.2 | 0.3 | 0.1 | 1.2 | 0.3 | 0.1 | 16.2 |
| Selbyville-Frankford | 10.2 | 0.0 | 1.0 | 0.4 | 0.2 | 0.3 | 0.1 | 1.1 | 0.2 | 1.7 | 0.2 | 0.1 | 15.4 |
| | 13.4 | 4.0 | 21.3 | 8.1 | 14.7 | 8.2 | 3.8 | 9.9 | 4.8 | 6.8 | 4.5 | 0.5 | 100.0 |

**Figure 42, CCD Origin and Destination Pairs, Estimated Percentage of All Types of Trips For Each Planning District for Sussex County Residents**

**( Row Percentages, Where Trips for Each CCD Are Going)**

**Source: Delaware Travel Monitoring System, Survey Years 2000 to 2008**

| | Selbyville-Frankford | Bridgeville-Greenwood | Lewes | Georgetown | Seaford | Laurel-Delmar | Milford South | Millsboro | Milton | outside or unknown | Kent County | New Castle | **total** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bridgeville-Greenwood | 0.3 | 36.6 | 2.2 | 4.8 | 26.3 | 2.7 | 11.0 | 0.8 | 0.5 | 4.8 | 9.1 | 0.8 | 100.00 |
| Georgetown | 4.9 | 2.7 | 9.6 | 41.4 | 8.7 | 3.8 | 3.0 | 13.9 | 5.6 | 3.1 | 2.8 | 0.6 | 100.00 |
| Laurel-Delmar | 3.2 | 1.5 | 1.1 | 3.3 | 13.2 | 55.1 | 0.1 | 3.3 | 0.6 | 17.0 | 1.2 | 0.4 | 100.00 |
| Lewes | 4.4 | 0.5 | 64.9 | 3.7 | 0.5 | 0.7 | 2.3 | 7.3 | 9.6 | 3.2 | 2.5 | 0.4 | 100.00 |
| Milford South | 0.6 | 8.8 | 9.0 | 4.3 | 2.0 | 0.4 | 27.9 | 4.3 | 5.1 | 3.5 | 33.4 | 0.6 | 100.00 |
| Millsboro | 10.2 | 0.1 | 15.4 | 11.9 | 3.0 | 2.7 | 2.1 | 42.7 | 3.5 | 6.0 | 2.1 | 0.5 | 100.00 |
| Milton | 2.5 | 0.2 | 40.4 | 10.0 | 0.9 | 1.1 | 5.7 | 6.3 | 20.4 | 3.2 | 7.5 | 1.8 | 100.00 |
| Seaford | 1.3 | 7.4 | 0.9 | 4.2 | 65.5 | 8.3 | 1.0 | 1.8 | 0.3 | 7.3 | 1.8 | 0.3 | 100.00 |
| Selbyville-Frankford | 66.0 | 0.1 | 6.5 | 2.8 | 1.1 | 1.9 | 0.4 | 7.4 | 1.1 | 11.0 | 1.4 | 0.3 | 100.00 |
| Totals | 13.4 | 4.0 | 21.3 | 8.1 | 14.7 | 8.2 | 3.8 | 9.9 | 4.8 | 6.8 | 4.5 | 0.5 | 100.00 |

**Figure 43, CCD Origin and Destination Pairs, Estimated Percentage of All Types of Trips For Each Planning District for Sussex County Residents**

**( Column Percentages, Where Trips are Coming From For Each CCD)**
**Source: Delaware Travel Monitoring System, Survey Years 2001 to 2008**

| | Selbyville-Frankford | Bridgeville-Greenwood | Lewes | Georgetown | Seaford | Laurel-Delmar | Milford South | Millsboro | Milton | outside or unknown | Kent County | New Castle | **total** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bridgeville-Greenwood | 0.1 | 42.9 | 0.5 | 2.8 | 8.3 | 1.5 | 13.6 | 0.4 | 0.5 | 3.3 | 9.4 | 7.3 | 4.7 |
| Georgetown | 3.1 | 5.7 | 3.8 | 43.3 | 5.0 | 4.0 | 6.6 | 11.9 | 10.0 | 3.8 | 5.2 | 9.8 | 8.5 |
| Laurel-Delmar | 2.4 | 3.8 | 0.5 | 4.2 | 9.1 | 68.2 | 0.3 | 3.4 | 1.3 | 25.3 | 2.8 | 7.3 | 10.2 |
| Lewes | 7.4 | 2.8 | 68.9 | 10.2 | 0.8 | 1.8 | 14.0 | 16.7 | 45.4 | 10.4 | 12.4 | 19.5 | 22.6 |
| Milford South | 0.3 | 13.6 | 2.6 | 3.2 | 0.9 | 0.3 | 45.2 | 2.7 | 6.6 | 3.1 | 45.0 | 7.3 | 6.1 |
| Millsboro | 8.2 | 0.3 | 7.8 | 15.9 | 2.2 | 3.5 | 6.0 | 46.9 | 7.9 | 9.5 | 5.0 | 9.8 | 10.8 |
| Milton | 1.0 | 0.3 | 10.5 | 6.8 | 0.3 | 0.8 | 8.3 | 3.5 | 23.6 | 2.6 | 9.1 | 19.5 | 5.5 |
| Seaford | 1.6 | 30.3 | 0.6 | 8.3 | 72.2 | 16.3 | 4.3 | 2.9 | 1.0 | 17.2 | 6.4 | 9.8 | 16.2 |
| Selbyville-Frankford | 75.9 | 0.3 | 4.7 | 5.3 | 1.2 | 3.7 | 1.7 | 11.5 | 3.7 | 24.7 | 4.7 | 9.8 | 15.4 |
| | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

## Travel Demand Forecasting

As seen with traffic count data the challenge for Sussex County is during the Summer. Figures for summer population are about 100,000 people more than in the off season. Traffic loadings in the travel demand forecasting model during the off season show less significant problems that during the summer but the data from the permanent traffic counters clearly show the challenges during the summer.

**Figure 44 Summer Population**
**DelDOT Travel Demand Forecasting Model 2008**

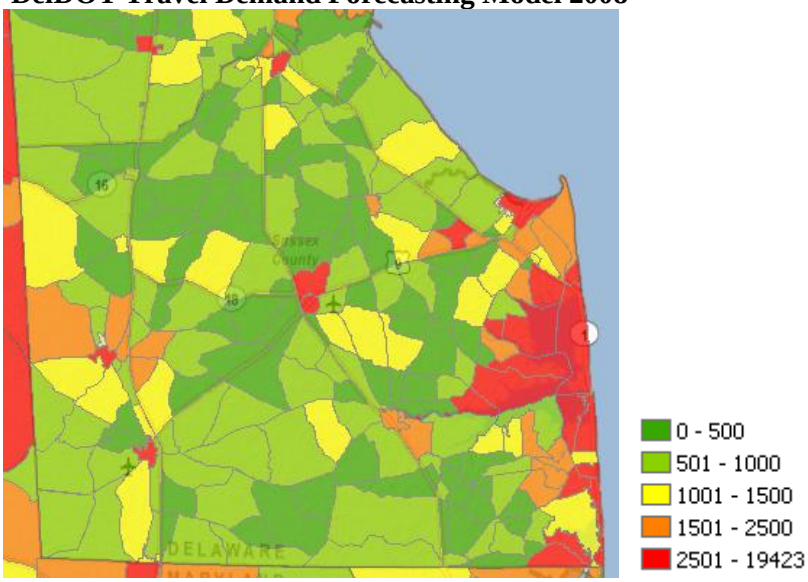



**Figure 45, Non Summer Population**
**DelDOT Travel Demand Forecasting Model 2008**

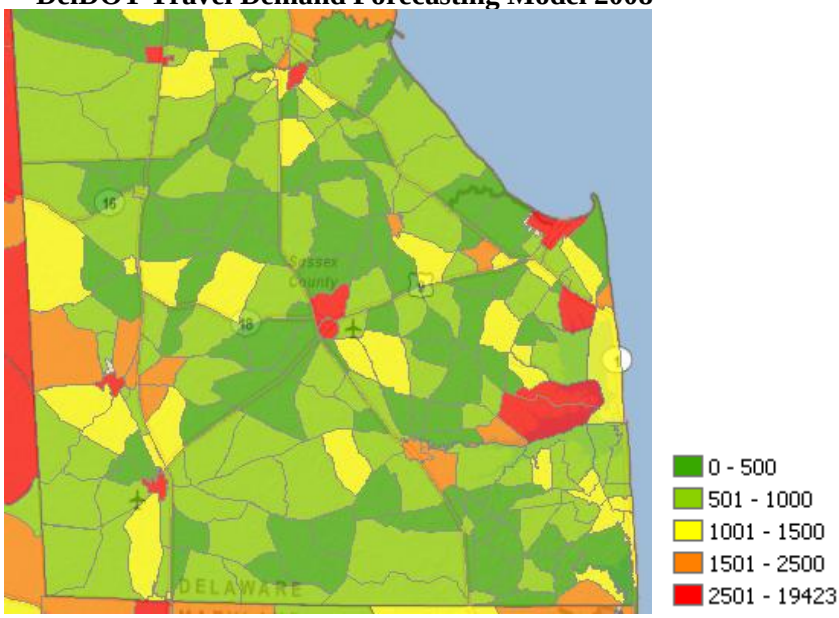
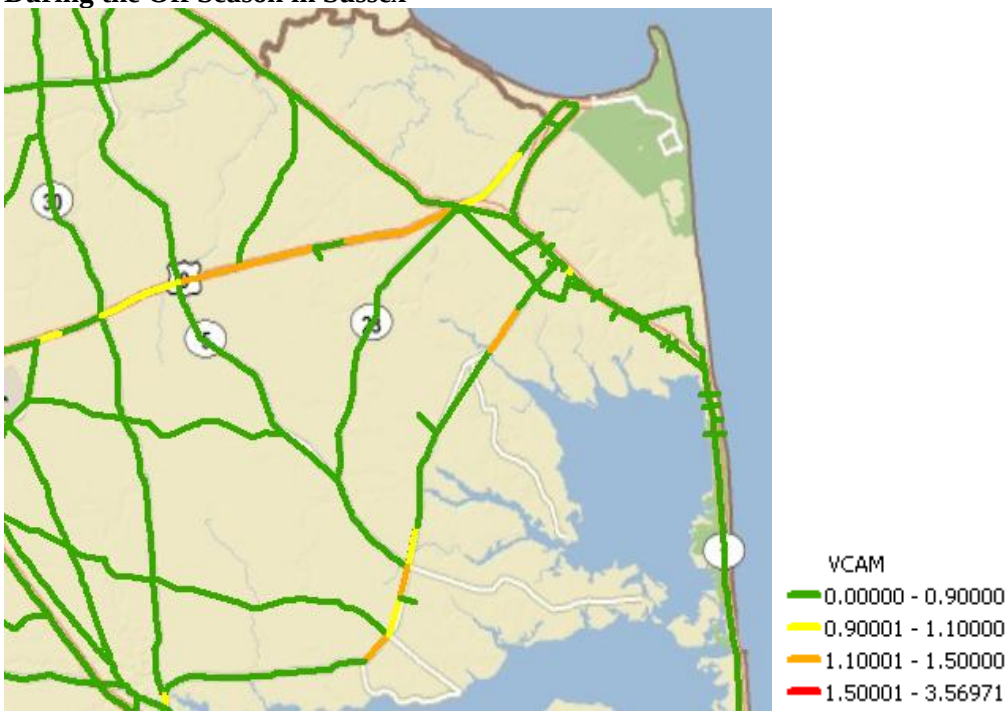


**Figure 46, Volume to Capacity Ration For AM Peak During the Off Season in Sussex**



**Conclusions**

This project brought available information together to examine travel in Sussex County. Measures for traffic volumes, travel speeds, travel characteristics, and origin and destination information were the main focus.

The concerns for Sussex County are principally in the summer months where resident populations increase by about 100,000. A number of tables and figures in this report provide a picture of the highlights of travel in the county. The compilation and processing of traffic count data illustrates the places of concern are on the major roads and progress was made in displaying that large amount of data collected each month. Developing and maintaining a view of traffic for such a large area is seen as an ongoing task where additional data and analysis is added on a continuous basis. The document libraries developed in the project provide a good start to that end.

Travel information includes a very wide range of reports, tables, presentations, geographical information systems data, and other types of information. Obtaining and relating that information proved to be a very time consuming and difficult task. Much of the data exists in a number of pockets within State organizations and is generally not available in a manner where it can be immediately related to other information. Much of the data that was obtained was in a format that required a significant amount of processing though the information was often effectively used for its prime purpose of collection in the various programs it was produced. Significant improvements could be made in the effective management and access of transportation information to support planning and analysis applications.

This project demonstrated and promoted the idea of collaborative transportation information systems. The principal features of such systems are facilities to promote involvement of users. Involving users in an information resource by allowing them to upload information into the site and to have control over the design and organization of the site seems to be a necessary requirement for a successful group effort. In the absence of large funding for a dedicated data management group, and with the amount of information being so large and varied, maintenance and development of an information resource seems beyond the capabilities of any one group to sustain. Significant progress beyond typical web sites and personal libraries would require building a sense of ownership and stewardship within the transportation community that involves many groups.

The pilot data management site created for the project demonstrated a method for managing and preserving transportation data in a system that allowed for the involvement of users. The site was instrumental in involving data providers and analysts. It included methods of organizing and tagging data to allow multiple views of the information. The site will continue to be developed in efforts to increase capabilities of managing and using transportation data. The system was demonstrated to representatives of local, State, and transportation agencies and there was a very favorable response.

Involving users is a distribution of control and management. Even with a limited group of contributors, a major issue is data system security and additional research needs to be done to determine the best way to allow access outside of an internal computer network.

Integration of transportation data depends to a large extent on how information is linked to transportation facilities. Whether it is a measurement of traffic volume, speed, capacity, projected conditions, or level of service, the data needs to be referenced to portions of the transportation network. The principal way information was located was through use of the Delaware Linear Referencing system and at this time remains the only standard approach in Delaware. Linear event tables ( route and mile point range) were used to manage and relate traffic data in this project and integration based on linear referencing was demonstrated.

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