NEW JERSEY TRAFFIC AND REVENUE STUDY

Background Report

Final Report

January 2008

Prepared for:

State of New Jersey
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GLOSSARY OF DEFINED TERMS

Atlantic City Expressway (ACE)
Annual Average Weekday Traffic Flows (AADTw)
Annual Average Daily Traffic (AADT)
Annual Average Growth Rate (AAGR)
Complete Economic and Demographic Data Source (CEDDS)
Comprehensive Port Improvement Plan (CPIP)
CRA International (CRAI)
Deleware Department of Transportation (DelDOT)
Delaware Valley Regional Planning Commission (DVRPC)
EDR Group (EDRG)
Electronic Toll Collection (ETC)
Federal Highway Administration (FHWA)
Garden State Parkway (GSP)
Gross Domestic Product (GDP)
Gross Regional Product (GRP)
Internal-Internal (I-I)
Level of Service (LOS)
Metropolitan Planning Organization (MPO)
Metropolitan Statistical Area (MSA)
New Jersey Turnpike (NJTP)
New Jersey Turnpike Authority (NJTA)
New Jersey Department of Transportation (NJDOT)
North Jersey Regional Model (NJTPA)
North Jersey Regional Transportation Model (NJTRM)
North Jersey Transportation Planning Authority (NJTPA)
Origin-Destination (O-D)
Port Authority Interstate Network (PAIN)
Port of Inland Distribution Network (PIDN)
Port of New York and New Jersey (PANYNJ)
Revealed Preference (RP)
South Jersey Regional Model (SJTPO)
South Jersey Transportation Model (SJTRM)
State Preference (SP)
Traffic Analysis Zones (TAZs)
Transport Research Board (TRB)
US Highway 1/9 (US-1/9)
U.S. Highway Capacity Manual (HCM)
Vehicle Miles Traveled (VMT)
Wilbur Smith and Associates (WSA)

DISCLAIMER

This report has been prepared for the State of New Jersey as an initial overview of issues relevant to traffic and revenue projections to assist in the preparation of the possibility of monetizing a number of the transport assets at present owned and operated by the State (or its agents). This report is intended to provide an overview of relevant issues and does not provide investment grade analysis.

The analysis and projections of traffic and revenue contained within this document represent the best estimates of Steer Davies Gleave at this stage. While the forecasts are not precise forecasts, they do represent, in our view, a reasonable expectation for the future, based on the information available as of the date of this report.

However, the estimates contained within this document rely on numerous assumptions and judgments and are influenced by external circumstances that are subject to changes that may materially affect the conclusions drawn.

In addition, the view and projections contained within this report rely on data collected by third parties. Steer Davies Gleave has conducted independent checks of this data where possible, but does not guarantee the accuracy of this data.

No parties other than the State of New Jersey can place reliance on it.

1. INTRODUCTION

Statement of Objectives

1.1 The State of New Jersey is considering the possibility of monetizing a number of the transportation assets at present owned and operated by the State or certain authorities in, but not of, the State. These include the New Jersey Turnpike (NJTP), the Atlantic City Expressway (ACE), the Garden State Parkway (GSP) and Route 440 (between the New Jersey Turnpike and the Outerbridge Crossing).

1.2 The State has appointed a financial advisor to help it understand how such a process might be carried out – and it has appointed Steer Davies Gleave, together with CRA International (CRAI) and the EDR Group (EDRG), as traffic and revenue advisors. Our report is to provide assistance in the estimation of the traffic that might be carried on the assets, and the toll revenue that might be generated.

1.3 Our overall work for this assignment consisted of two phases:

- Phase 1: Scoping; and
- Phase 2: Asset by Asset Appraisal of Future Traffic and Revenue streams.

1.4 The objective of the Phase 1 work was to prepare an initial review of the likely levels of traffic and revenue on the target roads across the likely duration of the forecast period. This work comprised the collection and collation of existing traffic data for each road, an initial review of the key drivers of future traffic growth and a literature review of elasticity parameters (a key determinant of traffic responsiveness to changes in tolls).

1.5 In Phase 2 work we have built on the analysis carried out for Phase 1 and developed a modeling framework that can explore the base assignment to the target facility under a range of scenarios – and for different traffic types. It has been built to allow sensitivity testing of a range of factors including values of time – and allows for rapid testing of different tolling scenarios. We have adopted a number of existing modeling tools to act as focused network models and have developed separate spreadsheet based revenue models to focus on the important traffic categories and the choices that road users would face.

Approach and Analysis Undertaken

1.6 In conjunction with our partners at CRAI and EDRG, we have undertaken the following key tasks as part of both work phases:

- Developed an overview of traffic and revenue on the road assets to understand the composition of traffic volumes by time of day and location.
- Reviewed the key economic issues and the likely impact on traffic of estimated growth in key economic parameters.

- Developed a modeling framework to explore the base assignment to the target facility under a range of scenarios – and for different traffic types.
- Undertaken a number of travel time surveys to assist in the model validation process, in particular to check that modeled travel times are representative of observed journey times.
- Undertaken an internet based attitudinal survey with New Jersey residents to support our forecasting assumptions.
- Reviewed relevant North American 'price elasticity of demand' studies to assess the likely impact of toll changes on traffic volumes.

1.7 In carrying out this work we reviewed and relied on third party reports and data without independent verification. However in most instances we used recent data collected by recognized experts or firms with nationally recognized credentials.

Report Contents

1.8 The purpose of this document is to describe the background to our work and the adopted forecasting methodology in detail. Separate reports present our traffic and revenue forecasts for the four road assets and provide an overview of the key assumptions made as part of the process to develop these forecasts. These reports also describe the existing conditions of each of the road assets; this is not covered in the background document.

1.9 This document is structured as follows:

- Chapter 2 describes how the traffic forecasting model has been developed;
- Chapter 3 presents the economic growth forecasting framework; and
- Chapter 4 presents the results from the behavioral literature and on-line research undertaken as part of the project.

1.10 Supporting documentation is included in a number of appendices.

2. TRAFFIC FORECASTING MODEL DEVELOPMENT

Overview of Forecasting Methodology

2.1 In comparison to other toll roads, in particular to 'greenfield' toll roads, forecasting traffic and revenue for the NJTP, Route 440, GSP and ACE provides some different challenges. There are a number of reasons for this.

2.2 First, all of the subject roads are existing roads and have been open for decades. As a result we have precise knowledge about the amount of traffic that is currently carried by each of the roads and how much toll revenue is collected. The various transaction databases allow us to segment current demand and revenue in detail by time and location. This data also allows us to consider how traffic levels have changed over time, how traffic has responded in the past to changes in toll rates and what the relation between traffic and past economic growth has been.

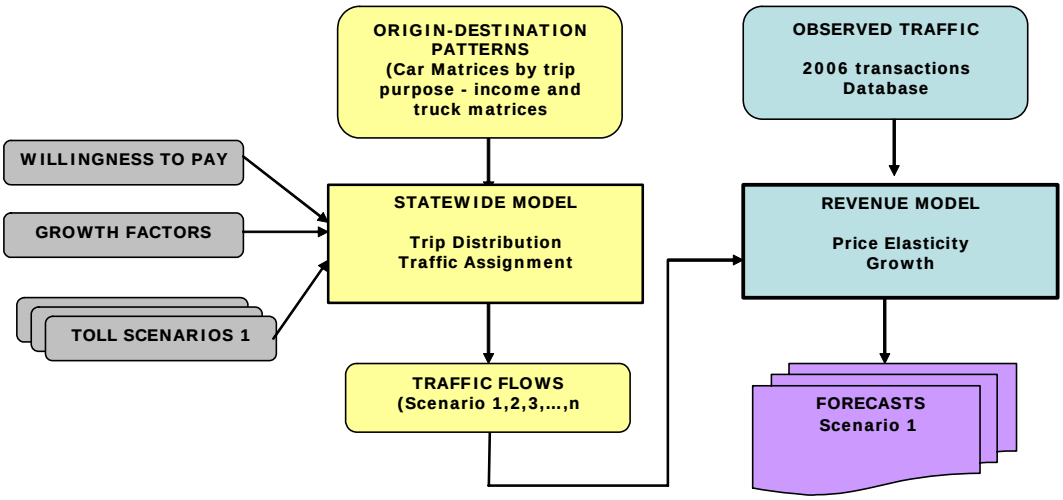
2.3 Secondly, route choice is a minor issue, since there is not a lot of scope for traffic to avoid the tolls by diverting to non tolled alternative routes. For shorter local and regional movements there might be some scope to divert away from the motorway network to avoid paying tolls. However for interregional and longer distance movements the costs associated with significant increases in journey time through using the local road network far outweigh the cost of the toll.

2.4 As a consequence, the key issue in this study is to understand how traffic levels will be changing over time and what the impact of capacity constraints are. Important inputs into this process are assumptions with regards to economic growth, population, and major developments (mainly port and infrastructure) that are planned to take place in the study area or surroundings and that may impact on traffic levels.

2.5 We have developed a modeling framework that can explore the base assignment to the target road assets under a range of scenarios – and for different traffic types. The central component of this framework is a spreadsheet based revenue model – this has been built to allow rapid testing of different tolling scenarios and to carry out a wide range of sensitivity tests to explore the impact on demand and revenue of a range of factors including growth rates, values of time, changes in trip distribution etc.

2.6 Our forecasting methodology is illustrated in Figure 2.1 overleaf.

FIGURE 2.1 FORECASTING METHODOLOGY



2.7 The spreadsheet based revenue model uses the observed 2006 toll demand and revenue data as a basis from which future year forecasts are derived. Within the model demand and revenue are segmented by:

- Geography (toll plazas and toll barriers)
- Time of day (AM Peak, PM Peak, Off-Peak)
- Day of Week (Weekday and Weekend)
- Vehicle Type (Cars and Trucks)
- Payment Method (Cash, E-ZPass)
- Journey Purpose (Work and Other)

2.8 At the same time, we have adopted a number of existing modelling tools to act as focused network models to inform the revenue model in terms of:

- Impact of congestion
- Changes in trip distribution
- Diversion
- Traffic Growth

2.9 The following sections describe the development of these network models.

Review of Available Model Systems

2.10 Traffic forecasting activities began with a review of the available travel demand modeling systems covering the New Jersey highway system in whole or in part. Three such model systems were identified:

- the New Jersey State-wide model, developed for the New Jersey Department of Transportation (NJDOT);
- the North Jersey Transportation Planning Authority (NJTPA) model; and
- the South Jersey Transportation Planning Organization (SJTPO) model.

2.11 With the assistance of NJDOT, we obtained copies of model run scripts, data and documentation for each of these model systems. Each of these is described below.

New Jersey State-wide Model

2.12 This model was originally developed in 1995 by consultants URS Corporation for the NJDOT, as a tool to use in evaluating the effects of interstate competition and other major highway improvements on regional trip making and goods movements. The model has been revised since then, most notably through an update to the truck trip table development process in 1999. It continues to be applied on occasion, particularly in studies where truck movement forecasting is important. However, there is no formal and on-going process to keep it up to date with network or trip making changes.

2.13 The State-wide model was developed by combining five different regional models in use during the mid-1990s. These were the North Jersey Regional Transportation Model (NJRTM); the Port Authority Interstate Network (PAIN); the South Jersey Regional Transportation Model (SJRTM); the Delaware Valley Regional Planning Commission (DVRPC) model; and the Delaware Department of Transportation (DelDOT) model. A base year of 1990 was selected for the State-wide model because each of the five regional models had a base year and associated data in the period 1989-1991.

2.14 Networks from the individual regional models were merged to form a single network covering the State-wide model area (all of New Jersey and adjacent portions of surrounding states, for a total of 35 counties). It is worth noting that the merged State-wide network was one of the largest model networks that had ever been developed at the time, with approximately 61,000 links and 22,000 nodes.

2.15 In parallel with the network merging, the zone systems from the individual regional models were also reconciled, again using the NJRTM model as a basis. The resulting zone system included roughly 2,800 zones.

2.16 Auto trip tables from the individual regional models were “woven” together into a single trip table consistent with the State-wide model’s zone system. A single auto trip purpose was retained in the State-wide trip table.

2.17 The 1999 truck trip table update was developed by applying standard trip generation relationships (based on zonal socio-economic data) and using a gravity model to distribute the resulting trip ends. The update also identified and analyzed special truck trip generators such as truck terminals and warehouses, as well as major inter modal facilities. Separate tables were developed for medium and heavy trucks.

2.18 A traffic assignment model based on the network and trip table data was implemented using the TRANPLAN software package; the model was later converted to run using the TP+ package. The model utilizes an equilibrium assignment principle based on generalized cost, a linear combination of travel time, distance and toll. Weights assigned to the different generalized cost components are different for each vehicle class (auto, medium and heavy truck) to reflect different values of time and vehicle operating costs. A BPR function is used to update link travel times as a function of congestion. The assignment uses daily trip tables and factors link capacities to represent a 24-hour analysis period.

2.19 The State-wide model TP+ assignment model script together with network and trip table data and assignment results files for years 2000 and 2025 were provided to the SDG team.

North Jersey Transportation Planning Authority Model

2.20 The regional travel demand forecasting model of the NJTPA has been developed over time. The study team was provided scripts, documentation and files for a version of the model dating from 1996, developed by URS Consultants. This version is very similar to the NJTRM that was used in the development of the State-wide model, as described above. We are aware that a major revision and update of the NJTPA model is currently underway, but data and results from the new model were not yet available to be used at the time that the Traffic and Revenue study travel forecasting activities were underway.

2.21 The NJTPA model covers 13 counties in northern New Jersey, with external zones representing connections to the New York and Pennsylvania networks. The model network is largely the same as that incorporated in the State-wide model, including node numbering details. The NJTPA and State-wide model zone systems are also almost identical, including the zone numbering. Differences are primarily due to the State-wide model's incorporation of other regional model systems.

2.22 Automobile trip tables recognize four trip purposes: home-based work, home-based shop, home-based other and non-home based. Trips by medium and heavy trucks are represented in separate tables.

2.23 The NJTPA model assigns traffic following equilibrium assignment principles based on generalized cost, which is defined a linear function of travel time and distance for nontolled links, and of travel time and toll level for tolled links.

2.24 Travel times are updated to reflect congestion using either the conventional BPR formula for high-type facilities, or a different relationship for lower-standard roads. The model carries out assignments for three time periods: AM peak (6:30 – 8:30 AM), PM peak (3:30 – 6:00 PM) and off-peak.

2.25 The study team received NJTPA model scripts, documentation, input data files and files of output run results for 2007 and 2018.

South Jersey Transportation Planning Organization Model

2.26 The SJTPO regional model was developed by a group led by Garmen Associates. It centers on the region of Atlantic, Cape May, Cumberland and Salem counties, although it extends into parts of Delaware and Pennsylvania by incorporating portions of the DVRPC model. This model is a very substantially revised and updated version of the SJRTM model that was used in the mid-1990s for the development of the State-wide model.

2.27 The highway network used in the SJTPO was derived from both the earlier SJTRM as well as the current DVRPC model. In addition, the current version of the SJTPO incorporates a highly detailed representation of the Atlantic City street and parking systems.

2.28 The zone system reflects the network density of the updated model and is considerably changed from the earlier model. With respect to trip tables, the SJTPO model utilizes a very detailed disaggregation of trips into 24 detailed purposes, including a variety of home-oriented, shore-oriented, casino-oriented, commercial vehicles, heavy trucks, external trips, as well as others. Auto trips can be distinguished as single- and high-occupancy vehicle (SOV/HOV) trips if required.

2.29 Overall, the model system implements the full conventional four-step travel forecasting process. The system design is somewhat unusual in the way that it accounts for the monthly and daily variations in trip making by different purposes. A full application of the system involves forecasting travel demand for a "full activity" day, in which each individual trip purpose is assumed to be pursued at the highest intensity that occurs over the course of a year. The trip tables resulting from this run are then factored to represent the actual trip making levels and patterns for a particular analysis month, day and time period. Four representative days (weekday, Friday, Saturday and Sunday) and four time periods are defined as follows:

- AM peak (6:00 – 9:00 AM);
- Mid day (9:00 AM – 4:00 PM);
- PM peak (4:00 – 7:00 PM); and
- Night (midnight – 6:00 AM and 7:00 PM – midnight).

2.30 Prior and external to traffic assignment, trips are split into those that are constrained to void tolled paths and those that are free choose any path (tolled or not) through the network. This is done using a binary logit diversion model applied to each individual Origin-Destination (O-D) pair in the network. The utility used in the logit model is a non-linear function of the travel time difference between the constrained and unconstrained paths (handling differently time savings and loss) and the toll payment.

2.31 Traffic assignment uses equilibrium assignment based on generalized cost (combination of time and distance). Impedances on the ACE and GSP are reduced to "incentivize" users, who would otherwise avoid them due to their higher time and distance compared to alternative routes.

2.32 The study team received model scripts, data files, documentation, and files produced by complete model runs for years 2007, 2010, 2017 and 2025.

State-wide Model Development

2.33 Based on the detailed review of the available travel demand model systems, we decided to base our traffic forecasting work on the State-wide model. We recognized, however, that we would need to update, adapt and enhance the model in order to make it more suitable for the analyses to be conducted.

Network Preparation

2.34 While there are many advantages to using the State-wide model system for the highway network analysis, one drawback is that the highway network information has not been kept up to date. To address this drawback, we updated key components of the highway network. The updating process consisted of three sets of activities. First, we updated the highway network to reflect the 2007 and out-year highway networks of the NJTPA and SJTPO models. Second, we ensured that major projects identified in the Metropolitan Planning Organization (MPO) long range plans were included in our future year network. Third, we updated the toll levels used by the model.

2.35 Both the NJTPA and SJTPO models have been maintained more regularly than the State-wide model, and their highway networks can be expected to contain an accurate representation of the current and future roadway characteristics, with the future coding based on the anticipated future improvements. Due to the limited timeframe of our undertaking and the low relevance of many roads to our study, we verified and updated network attributes for the four study roads (NJTP, GSP, ACE and Route 440), and key Interstate, US and State highways for both the base year (2007) and future year (2025) networks.

2.36 Table 2.1 provides the list of highways for which we verified and updated highway network coding.

TABLE 2.1 LIST OF HIGHWAYS INCLUDED IN NETWORK VERIFICATION AND UPDATE PROCESS

Interstates	US Highways	State Highways
I-295	US 40	NJ 55
I-95 (Trenton area)	US 322	NJ 18 (from I-195/NJ 138 to US 9)
I-195	US 30	NJ 42
I-287	US 9	NJ 33 (between NJ Turnpike & US 9)
I-80	US 206	NJ 21 (between US 46 to I-280; near Clifton / Passaic)
I-280	US 202	Palisades Parkway
I-78	US 1	
I-278	US 130	
I-76	US 22	
I-676	US 46	

2.37 The key State-wide model network link attributes used during highway assignment are the area type (first digit of the LINKGRP1 field), facility type (second digit of the LINKGRP1 field), and the number of lanes (LINKGRP2 field). During our update, we verified that the correct information for each of these attributes was coded in the State-wide model network that we received. This was done in part by comparing the State-wide network LINKGRP1 and LINKGRP2 values against the corresponding link attributes in the NJTPA and the SJTPO models.

2.38 Since the State-wide model was originally developed from the NJTPA model, it is not surprising that the NJTPA model LINKGRP1 field also contains the concatenation of area type and facility type. However, the NJTPA model contains the number of lanes in the field labeled DIRCODE. In the SJTPO model, number of lanes is contained in the field LANES, while area type and facility type are coded in the AT and FT fields, respectively.

2.39 The facility types defined in the SJTPO model do not correspond exactly to the facility types used in the State-wide model, so we converted the SJTPO values to State-wide values using the translation table presented in Table 2.2.

TABLE 2.2 TRANSLATION OF FIELD VALUES BETWEEN SJTPO AND STATE-WIDE MODEL

SJTPO (FT)	State-wide (Second Digit of LINKGRP1)
1	1
2	1
3	3
4	3
5	4
6	5
7	6
8	7
9	8
10	8

2.40 The second step of the highway network update was to verify that the coding of future year networks reflects projects that are included in MPO long range plans, and to update the coding as necessary. Typical updates included adding lanes to existing roads and adding interchanges.

2.41 In addition to the network updates based on the NJTPA and SJTPO models and the MPO long range plans, we also improved the State-wide model coding to better represent actual infrastructure characteristics. This included coding the NJTP auto-only lanes as such, with prohibitions for trucks to use these links. We also recoded the ACE toll collection for the Berlin Cross Keys, Williamstown, and Winslow exits so that these were represented in the network as exit toll rather than as mainline toll collection facilities.

2.42 The final step of the highway network update was to represent current toll rates[1]. For the GSP, toll plazas were coded for two-way collection to avoid creating unrealistic differences in assigned traffic volumes in the O->D and D->O directions, with half of the current one-way toll rate applied in each direction. Due to limitations of the modeling software package, we applied NJTP toll rates on a segment basis rather than an entrance-exit basis. The segment level toll rates were derived from current NJTP traffic and revenue levels. Since there are currently no tolls on Route. 440, we added toll collection locations in two sections: 1) between the NJTP and the GSP, and 2) between the GSP and the Outerbridge Crossing.

[1] All modelled toll rates are input in 2006 dollars.

2.43 For each of these new collection locations, we assumed toll rates of $0.12/mile for cars and $0.45/mile for trucks, in 2006 prices. This translates into auto/truck tolls of $0.24/$0.90 and $0.36/$1.35 for sections 1 and 2, respectively. We also updated the coded toll values for the Delaware and Hudson River crossings into and out of New Jersey to match current toll levels.

Trip Table Development

2.44 As discussed above, the State-wide model system contains many attractive features that led us to select it as the base of our highway modeling framework. Despite these features, some of its components needed improvement for the purposes of the Traffic and Revenue study. This section describes the methodology that we employed to update the State-wide model's highway trip table for use in this study.

2.45 There are three limitations to the State-wide model's highway trip table in its current form. First, it was developed in the mid-1990s and there are now more recent data for some geographic areas that are covered by the trip table. Both the NJTPA and SJPTO (including DVRPC model) MPO models have been updated since the creation of the State-wide model's trip table. Thus, we incorporated this more recent trip table information into the State-wide model trip table. A second limitation is the fact that the State-wide model automobile trip table does not contain any trip purpose information. For the Traffic and Revenue study, it was important to represent the distribution of travelers' values of time so we not only divided automobile trips into "Work" and "Other" purposes but also disaggregated trips by each purpose into four income groups. (These automobile trip purposes are in addition to the truck trip purpose.)

2.46 Finally, a third limitation is that the trip table represents daily trips rather than trips by time period. Given the potential differences in toll facility usage levels between the peak and off-peak periods, it was important for this study to disaggregate the trip table into distinct time periods. The following paragraphs further describe the updates and enhancements that we applied to address these trip table limitations.

Updating Trip Data for Available Geographic Areas

2.47 As mentioned above, the NJTRM and SJTRM (including DVRPC model) MPO models have been updated since the State-wide model highway trip table was developed in the mid-1990s. We updated selected geographic portions of the State-wide trip table with the more recent travel data from these regional models.

2.48 Figure 2.2 through Figure 2.4 depict the relationship of the NJTPA and SJTPO model traffic analysis zones (TAZs) to the State-wide model TAZs. As these figures illustrate, portions of the NJTPA and SJTPO models' trip tables that represent to trips in specific geographic areas are directly transferable into the corresponding portions of the State-wide model trip table. The yellow and blue Internal-Internal (I-I) portions of the NJTPA and SJTPO models, respectively, directly correspond to portions of the State-wide trip table.

2.49 Similarly, the orange and red Internal-External and External-Internal (I-E / E-I) portions also fit into the State-wide trip table. For these parts of the trip table, we updated the travel volumes in the year 2000 State-wide model table with the information contained in the NJTPA and SJTPO year 2007 table. To update the SJTPO portion of the State-wide trip table, we first established the correspondence between SJTPO TAZs and State-wide TAZs; this step was not necessary for the NJTPA model since the State-wide TAZ definitions were derived from the NJTPA model.

2.50 Among the SJTPO model files provided to the study team were the trip tables for weekday January and July analysis days. We developed a representative trip table by computing a weighted average of these, with weights 75% and 25% corresponding to the fraction of months of non-summer and summer travel conditions.

FIGURE 2.2 NJTPA MODEL TAZ

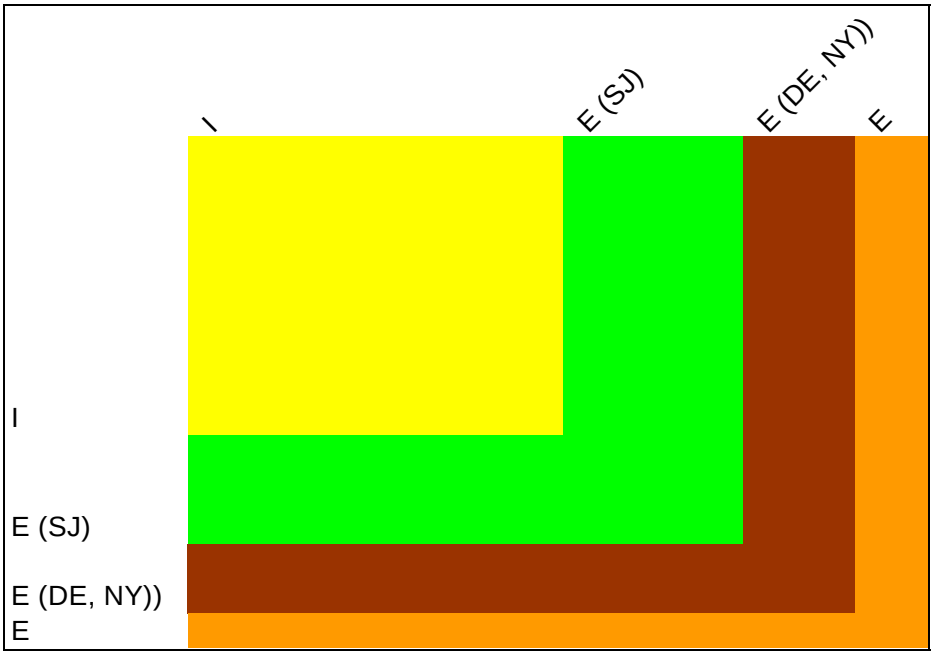


FIGURE 2.3 SJTPO MODEL TAZ

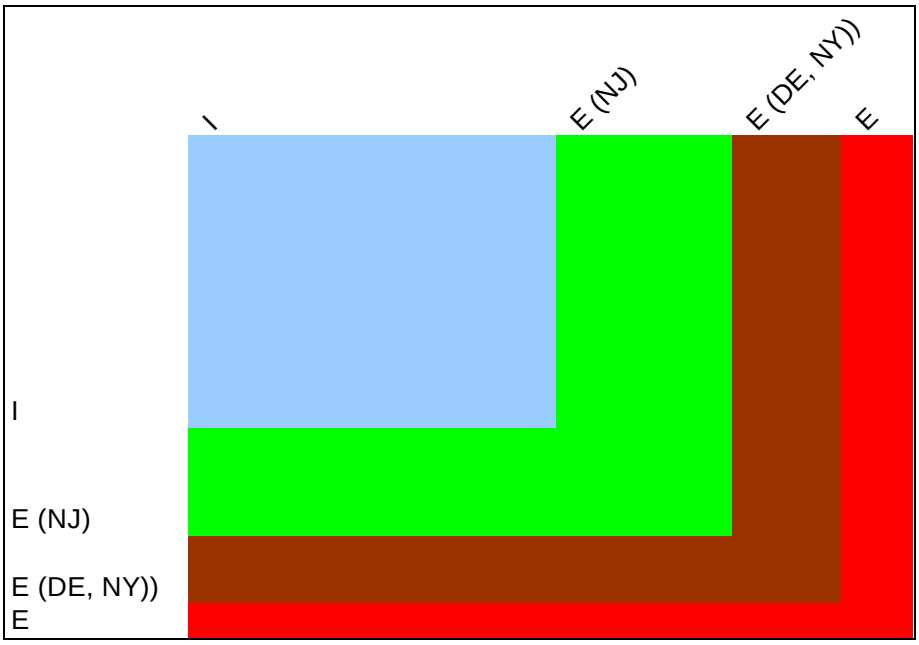
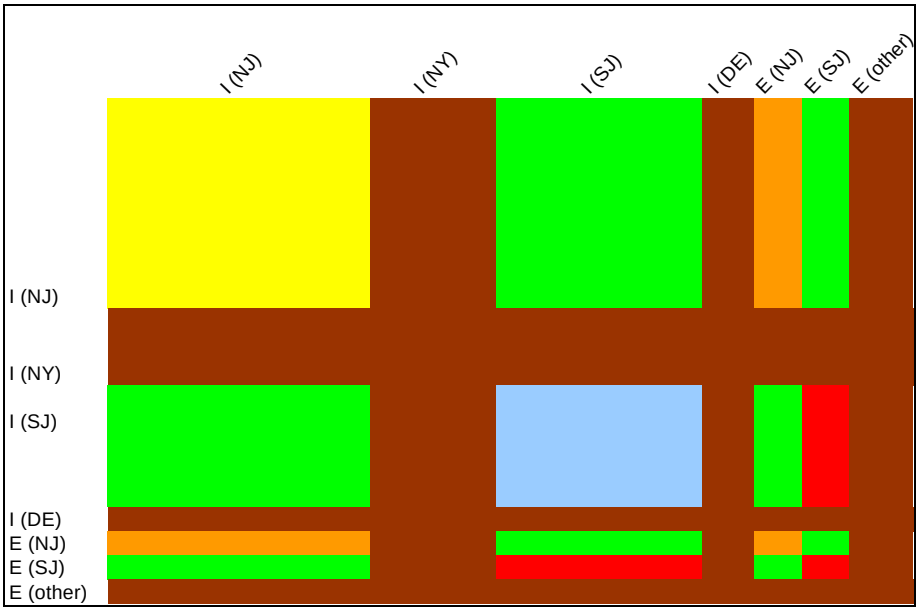


FIGURE 2.4 STATE-WIDE MODEL TAZ



2.51 The green portions of the State-wide trip table contain trips that move from the northern to the southern part of New Jersey or *vice versa*. A trip that exits one model area and travels to the other is represented in the trip table as a movement from the origin to an external TAZ on the boundary between the two areas; similarly, a trip that enters one model area from the other is represented as a movement from the external boundary TAZ to the destination.

2.52 We reconstructed the end-to-end trip from the two "half trips" by applying a three-step weaving process. First, we identified the set of External TAZs in the NJTPA and SJTPO models that connect to the SJTPO and NJTPA portions of the State-wide highway network, respectively. For each of these connecting locations, we identified the correspondence between the respective TAZs in the two model systems. Second, we computed the total amount of traffic passing through each connection point as the average of the NJTPA and SJTPO volumes for the connection. Third, we distributed trip-ends in the NJTPA and SJTPO TAZ according to the original distribution of trips to and from the connection points.

2.53 After populating the State-wide trip table with 2007 data for the NJTPA and SJTPO portions, we grew all other geographic segments from 2000 to 2007 levels. A compound annual growth rate of 1.97% was applied (total period growth of 14.67%) which represents the growth in state-wide New Jersey Vehicle Miles Traveled (VMT) from 1999 to 2005.

Disaggregating by Trip Purpose and Income

2.54 As noted above, a limitation of the State-wide model's trip table is that it does not contain information on trips by purpose. The internal portions of the NJTPA and SJTPO trip tables do include a breakdown by purpose, and thus we preserved this detail while updating the State-wide trip table. As noted earlier, we included the Work, Other, and Truck purposes in our application of the State-wide model. The NJTPA model includes the following purposes: Home Based Work (HBW), Home Based Shop (HBS), Home Based Other (HBW), Non Home Based (NHB), and Truck. We designated NJTPA HBW trips as our Work purpose, NJTPA HBS, HBO, and NHB trips as our Other purpose, and NJTPA Truck trips as our Truck purpose. For each of the 23 trip purposes considered in the SJTPO model, we made a determination regarding the most appropriate aggregate purpose to group it with.

2.55 While trip purpose information was contained in the NJTPA and SJTPO I-I trip table portions, the same was not true for the external trips. Both the NJTPA and SJTPO models recognize the external trips as being auto or truck (without indication of purpose); moreover, these trips are in O-D format as opposed to Production-Attraction (P-A) format. In order to incorporate the trips that result from the weaving process into our trip table, we allocated the auto trips to the Work and Other purposes using a 39%/61% split based on results from the NJTPA/PANYNJ (Port Authority of New York and New Jersey) Household Interview Survey. To preserve the O-D format, we balanced the trip table resulting from the weaving process.

2.56 Similarly, the other geographic segments of the State-wide trip table do not indicate the purpose of auto trips. We also allocated these auto trips to the Work and Other purposes using the 39%/61% split determined by the NJTPA/PANYNJ Household Interview Survey.

2.57 To further refine our model's sensitivity to tolls, we also disaggregated auto trips by income group. In order to support this and the time of day development, we maintained trip data in P-A format where it was available in this format and feasible to do so; otherwise we balanced them in O-D format.

2.58 We employed a four-step process to distribute auto trips by income levels. The first step was to identify at the county-level the income distribution of households according to Census 2000 data. In order to utilize the data on trip rates by income levels that are provided in the NJTPA model, we defined income groups based on the values of the NJTPA model. This model divides income levels (in 1986 dollars) into 4 brackets: [<$14,999], [$15,000-$29,999], [$30,000-$49,999], [>$50,000].

2.59 In order to relate these 4 income brackets to data available from the 2000 Census, we inflated the ranges to 2000 dollars using consumer price indices from the Bureau of Labor and Statistics. This resulted in income brackets of: [<$23,566], [$23,567-$47,133], [$47,134-$78,567], [>$78,558]. Census 2000 data includes the number of households in 10 income ranges. In order to fit the resulting income ranges to the Census 2000 ranges, we rounded them to match break points in the Census data. This led to income brackets of [<$24,999], [$25,000-$49,999], [$50,000-$74,999], and [>$75,000]. Using the Census data, we determined for each county how many households belong to each of the four brackets.

2.60 The next step was to convert the household income distribution to a distribution of trips by income for each county. To later apply these distributions to our trip tables, we identified a separate distribution for each of our trip purposes. To convert between the household distribution and the trip distribution, we relied upon the purpose-specific trip rates provided by the NJTPA model. The NJTPA model contains different trip rates for HBS, HBO, and NHB; we averaged the distribution of these to apply to our other purpose.

2.61 Once we had county-level distributions of trips by income group for each trip purpose, we conducted the third step which applied the county-level distribution of trips by income to the TAZs in the county. Then we executed the final step of the process by applying the TAZ-level income distribution of trips by purpose to each of our auto purpose trip tables.

Distributing Trips by Time of Day

2.62 Travel conditions can vary substantially throughout the day and consequently the usage levels of toll roads can vary as well. In order to better represent the conditions that travellers experience and the decision they make, we disaggregated the daily trip table to represent the different travel periods of the day. We used the time of day factors contained in the latest NJTPA model script to allocate daily trips to each of the time periods. The NJTPA model includes an AM peak period (6:30-8:30 AM), a PM peak period (3:30-6:30 PM) and an off-peak (OP) period that covers the remainder of the day[2]. For some purposes, the NJTPA model time of day factors are specified in both the P-A and A-P directions. For trips available in the P-A format, we applied the respective factors for each direction; for trips available in O-D format, we applied the sum of the P-A and A-P factors.

2.63 The final step of our trip table preparation involved limited adjustments to the level of trips for TAZs near the external boundaries of the State-wide network in cases where the forecasted highway volumes were significantly different from corresponding traffic count volumes.

Application of Future Growth

2.64 In parallel to the development of trip tables, growth projections for each trip purpose were also developed. These projections were developed at the county level, and were applied to the TAZs in the counties at each trip end.

Highway Assignment Procedure

2.65 Highway assignment is the process where an automobile trip table is loaded onto the highway network in a way that respects the user equilibrium principle that no traveler acting alone has an incentive to change the path that he or she is traveling on. Since the State-wide model system serves as the foundation of our modeling approach, we also developed our highway assignment procedure from the State-wide model's approach, introducing however a few notable changes. These changes include adjustments to handle assignment by time of day and by trip purpose, a modification to the volume-delay curve for certain link classes, and a refinement of the generalized cost equation.

2.66 The State-wide model system assigns three vehicle classes (autos, medium trucks, and heavy trucks) to the highway network considering a 24-hour period. As noted earlier, we prepared our trip table to contain one class of trucks, and with auto trips split out by purpose and income level; moreover, trips were distinguished by time of day.

[2] We prepared trip tables for each of these time periods, but to keep the overall modeling analysis simpler and to speed model execution, we only assigned trips for the AM and OP periods.

2.67 In order to mirror the trip table, we also needed to develop a highway network for the AM and OP periods. Based on the area type, facility type and number of lanes, we updated the free flow speeds and hourly capacities of the highway links (including those which had had their attributes updated during the network updating process) using the speed and capacity relationships of the NJTPA model. We then prepared the network for the AM peak period by factoring up the hourly capacity by 2, and the OP network by factoring the hourly capacity by 9. In addition, during our review of loaded network speeds from early model runs, we found that assigned speeds on the NJTP were low and attributed this in part to portions being located in densely developed area types (for which the default free-flow speeds are relatively low).

2.68 Given the relatively straight and flat horizontal and vertical alignment of the road and its very limited number of entrances and exits, we revised the free-flow speed on the NJTP to 70 mph in order to better reflect actual travel conditions.

2.69 An equilibrium highway assignment with a gap convergence criterion of 0.05 was used. The original State-wide model assignment specified a maximum of 15 equilibrium iterations to be used; we set this parameter to 50 so that the gap convergence criterion would be attained during all assignments. The link volume-delay relationships follow the conventional BPR function (a=0.15, b=4.0) for high-type roadways (toll ways and freeways). We differed from the State-wide model by applying a modified BPR function (a=0.135, b=5.35) for lower-type roadways (arterials, collectors, etc.). The modified BPR function was estimated from graphical presentations of the relationships used in the NJTPA model for similar facility types.

2.70 By using the original link volume-delay relationships and factors to convert hourly capacity into each time period, it was found that the model over-estimated highway delays. In order to correct this, the capacities per period and volume delay functions were reviewed and updated using recent travel time and traffic count data. The re-calibrated volume delay functions provided a significantly improved fit to the observed travel time data.

2.71 The original State-wide model's assignment loads vehicles onto the network by selecting the path that minimizes a generalized cost that incorporates time, distance, and toll elements. We maintained this generalized cost framework while specifying parameter values to support our more disaggregate assignment framework and updating the parameters to better match existing conditions. We also introduced a motorway bonus parameter into the generalized cost framework to reflect the different perceptions of time spent traveling on a high-type vs. other facility. The motorway bonus parameter was implemented as a 30% reduction in the perception of time spent traveling on motorway (toll way and freeway) links.

2.72 We represented the generalized cost in dollars, and so needed to apply a value of time (VOT) to the travel time (after application of the motorway bonus) in order to convert it into dollars. The VOT is the monetary equivalent of a unit of time spent during a trip.

2.73 As noted above, one of our enhancements to the State-wide model was to split auto trips by trip purpose and income level in order to better represent the distribution of VOTs among travelers. To support this enhancement, we used a different VOT for all eight of the auto trip tables (Work and Other purposes with 4 income groups each). We derived the VOT for each auto segment from the average wage rate.

2.74 To this end, in each county we identified how many households were within each of the 10 Census income ranges that we related to our 4 income groups. Using this distribution of households and an assumed average annual household income for each of the 10 Census ranges, we calculated the average household income for each of our income groups.

2.75 Using U.S. Department of Transportation (U.S. DOT) guidelines, we then converted annual household income levels to an average hourly wage rate for each income group by dividing by 2080 hours and converted to VOT by assuming the VOT for Work and Other purposes to be 50% and 35%, respectively, of the average wage rate. Table 2.3 presents the average household income, the average wage rate, and VOTs for Work and Other purposes by income group.

TABLE 2.3 VALUES OF TIME BY INCOME GROUP AND TRIP PURPOSE (2006 DOLLARS)

	Average Annual Household Income	Average Wage Rate ($/hr)	Work VOT ($/hr)	Other VOT ($/hr)
Income Group 1	$17,351.61	$8.34	$4.17	$2.92
Income Group 2	$45,036.42	$21.65	$10.83	$7.58
Income Group 3	$75,343.61	$36.22	$18.11	$12.68
Income Group 4	$153,774.81	$73.93	$36.97	$25.88

Source: CRA International, 2007

2.76 For trucks, we assumed a VOT of $54.25/hr in 2006 dollars. This value closely matches a recent study into truck VOTs[3].

2.77 The generalized cost also includes a distance component. To convert trip distance to monetary units, we applied a vehicle operating cost (VOC) factor. NJTPA model documentation from the mid-1990s applied a value of $0.00575 / mile. We grew this value to $0.01 / mile for autos and $0.02 / mile for trucks. This growth is in line with the 10-year trend in the price of gasoline[4].

[3] Smalkoski, Brian, and David Levinson, "Value of Time for Commercial Vehicles Operators in Minnesota", December 2003. Smalkoski and Levinson found an average value of $49.42, which converts to $55.25 in 2006 dollars.

[4] For example, see the U.S. Department of Energy, Energy Information Administration fuel price information available at http://www.eia.doe.gov/oil_gas/petroleum/data_publications/wrgp/mogas_history.html. These historical series show fuel prices increasing roughly 85% for the last 10 years.

Highway Assignment Validation NJTP

2.78 Since the State-wide model was going to be used to forecast diversion under different toll scenarios based on the characteristics of the toll roads and the main competing routes, a number of travel time surveys were undertaken to assist in the model validation process.

2.79 The AM and OP trip tables were assigned to the highway network model developed for each period and the modeled travel times predicted by the model between various key points were compared to the travel time surveys. The process was repeated until the network reproduced the observed travel times and speeds in the two periods.

2.80 Figure 2.5 and Figure 2.6 show a comparison between the State-wide model and observed average speed along the NJTP in the AM peak for each direction. The same information for the OP period is presented in Figure 2.7 and Figure 2.8.

FIGURE 2.5 NJTP OBSERVED VERSUS STATE-WIDE MODEL TRAVEL TIMES IN THE AM PEAK PERIOD (NORTHBOUND)

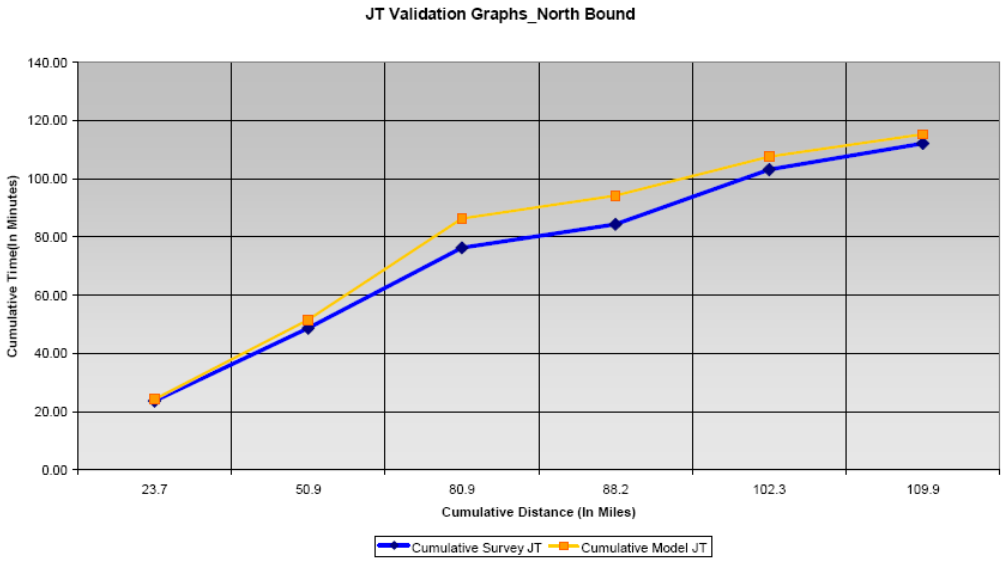


FIGURE 2.6 NJTP OBSERVED VERSUS STATE-WIDE MODEL TRAVEL TIMES IN THE AM PEAK PERIOD (SOUTHBOUND)

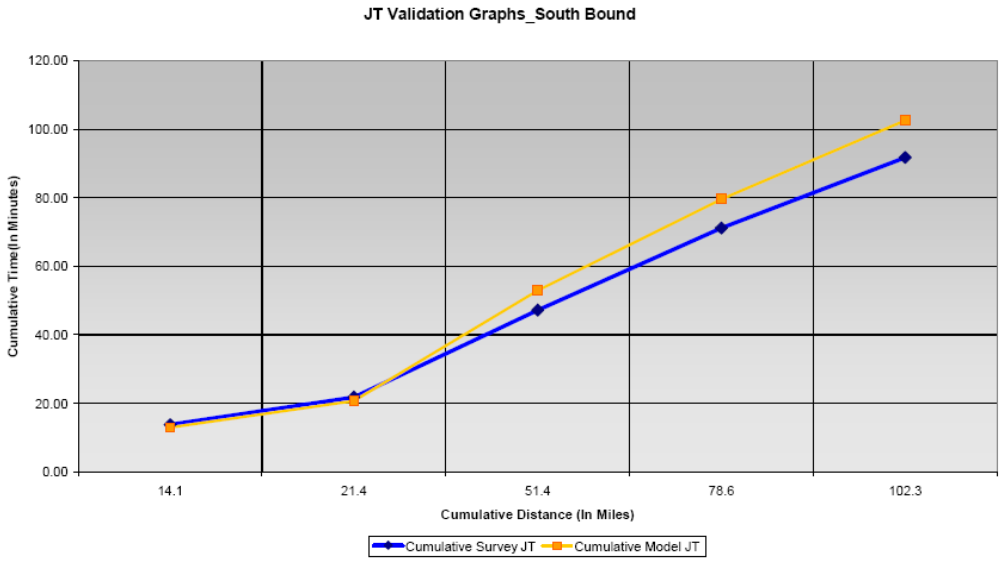


FIGURE 2.7 NJTP OBSERVED VERSUS STATE-WIDE MODEL TRAVEL TIMES IN THE OP PERIOD (NORTHBOUND)

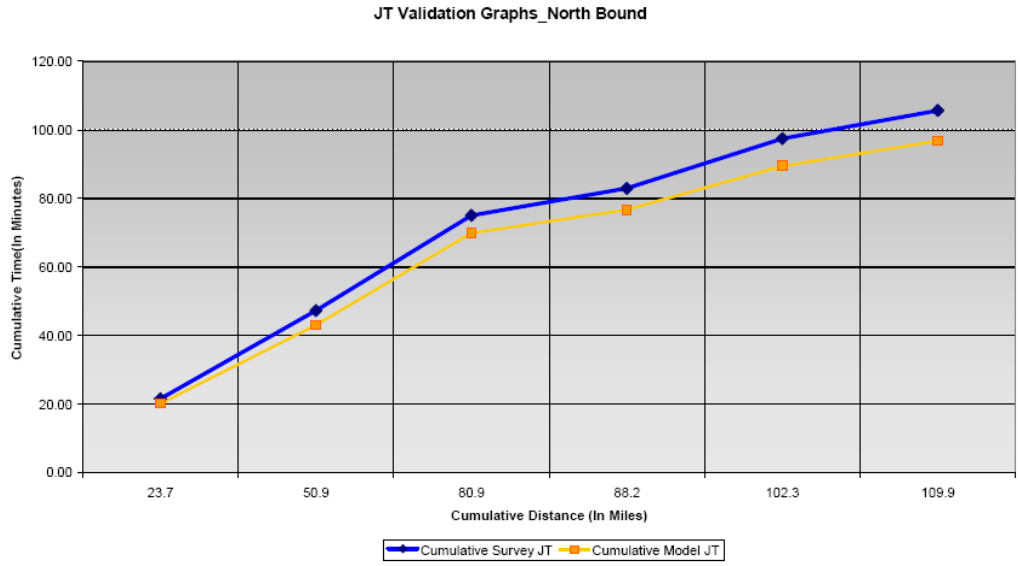
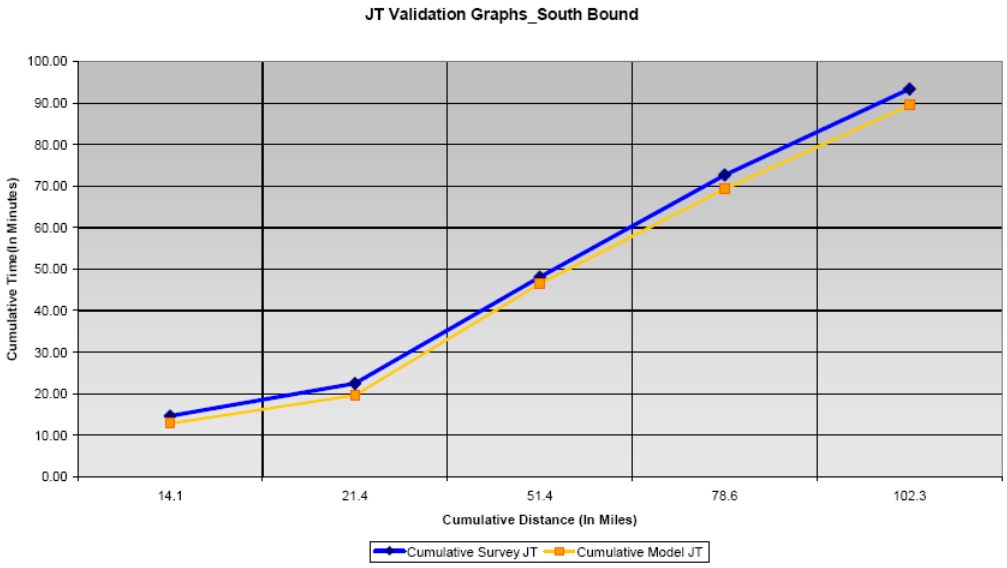


FIGURE 2.8 NJTP OBSERVED VERSUS STATE-WIDE MODEL TRAVEL TIMES IN THE OP PERIOD (SOUTHBOUND)



2.81 The observed average speed on the AM peak in the Northbound direction is 58 mph. Speeds are lower between Exits 14 and 18E, where they can reach 45 mph. In the opposite direction and in the OP period speeds are much higher, fluctuating between 62 and 66 mph. As it can be seen in the previous figures the model travel times are very close to the observed, and so are the speeds.

2.82 Travel time surveys were also undertaken through a section of US1/9 that runs parallel to the NJTP between Exits 11 and 14. This un-tolled alternative route competes with the NJTP for key destinations in the Newark area including Newark International Airport, Elizabeth and Linden. The route provides predominately 'at-grade' access and has a speed limit of 50 mph. The travel time surveys carried out show that even in off peak periods, average speeds are typically less than 40 mph.

2.83 Figure 2.9 and Figure 2.10 compare the model travel times for US1/9. In the Northbound direction it can be appreciated that the model travel times are approximately 20% lower than the observed. Average model speeds for this road is 45 mph.

FIGURE 2.9 US1/9 OBSERVED VERSUS STATE-WIDE MODEL TRAVEL TIMES IN THE OP PERIOD (NORTHBOUND)

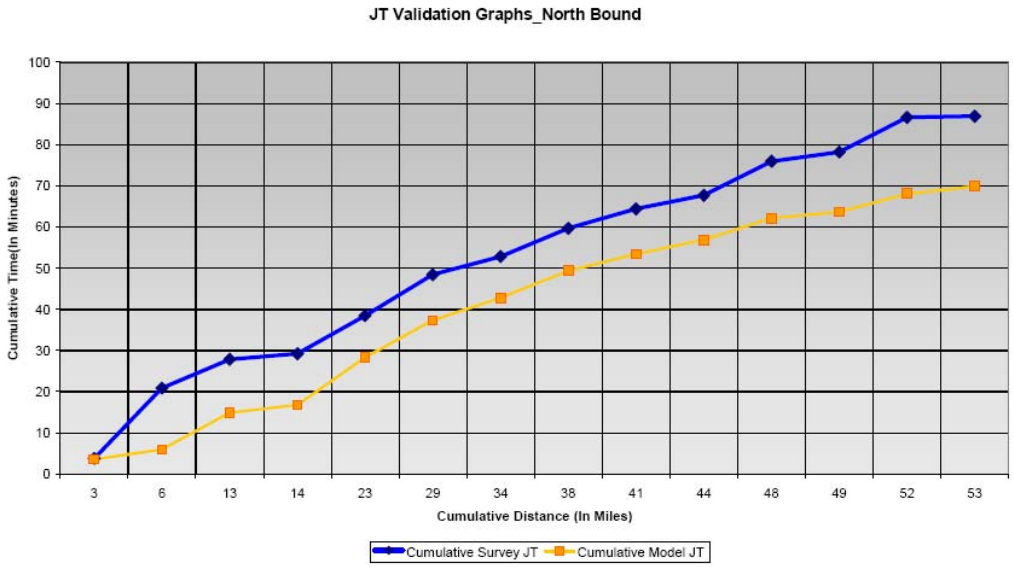
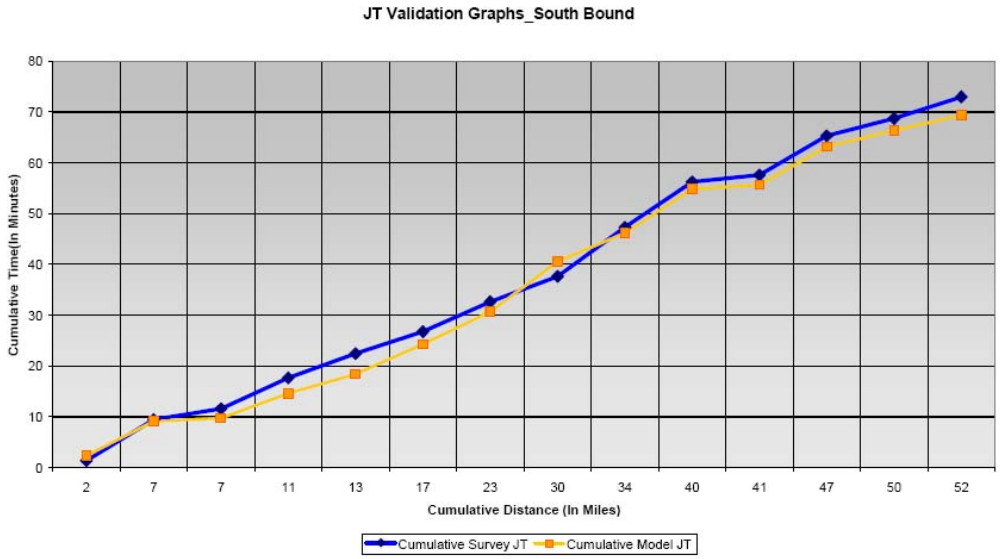


FIGURE 2.10 US1/9 OBSERVED VERSUS STATE-WIDE MODEL TRAVEL TIMES IN THE OP PERIOD (SOUTHBOUND)



Highway Assignment Validation GSP

2.84 Figures 2.11 to 2.14 present the same information for GSP. In both periods it can be appreciated that the travel time on this route are being accurately modeled.

FIGURE 2.11 GSP OBSERVED VERSUS STATE-WIDE MODEL TRAVEL TIMES IN THE AM PEAK PERIOD (NORTHBOUND)

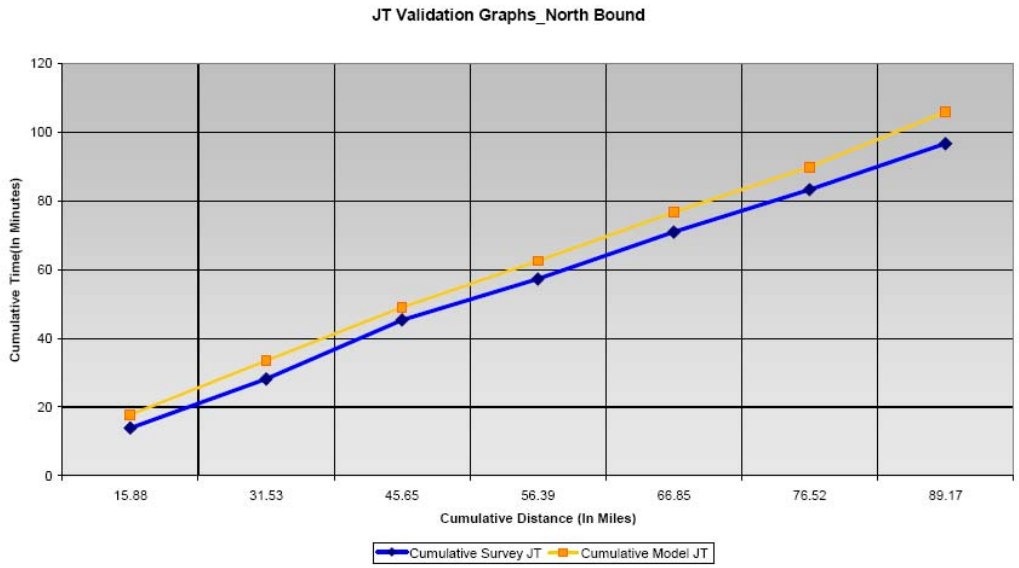


FIGURE 2.12 GSP OBSERVED VERSUS STATE-WIDE MODEL TRAVEL TIMES IN THE AM PEAK PERIOD (SOUTHBOUND)

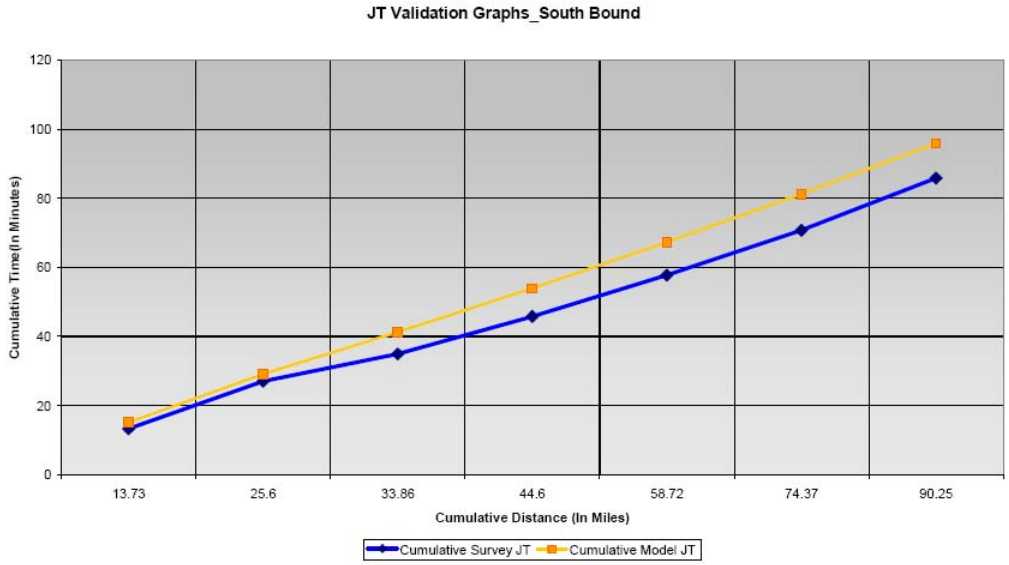


FIGURE 2.13 GSP OBSERVED VERSUS STATE-WIDE MODEL TRAVEL TIMES IN THE OP PERIOD (NORTHBOUND)

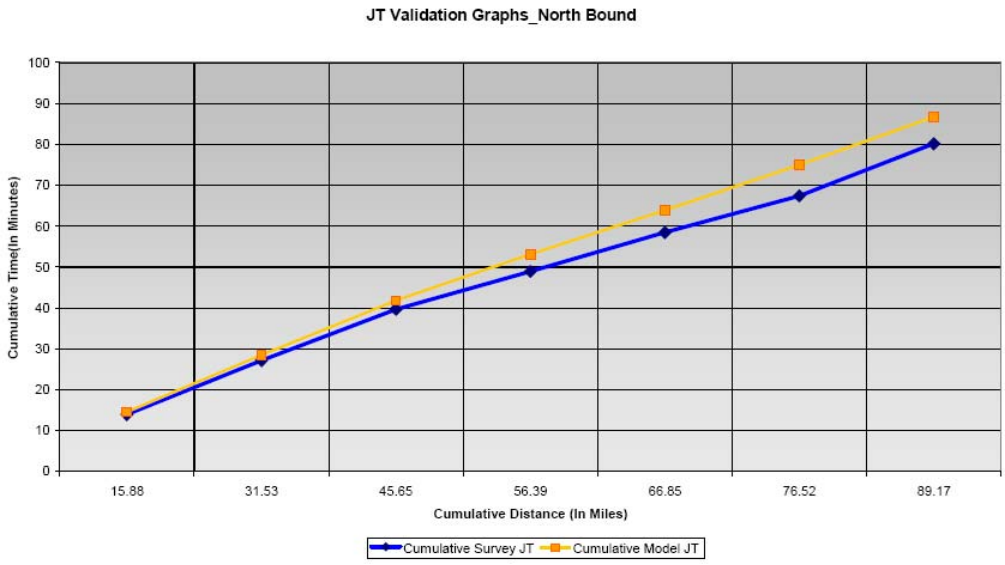
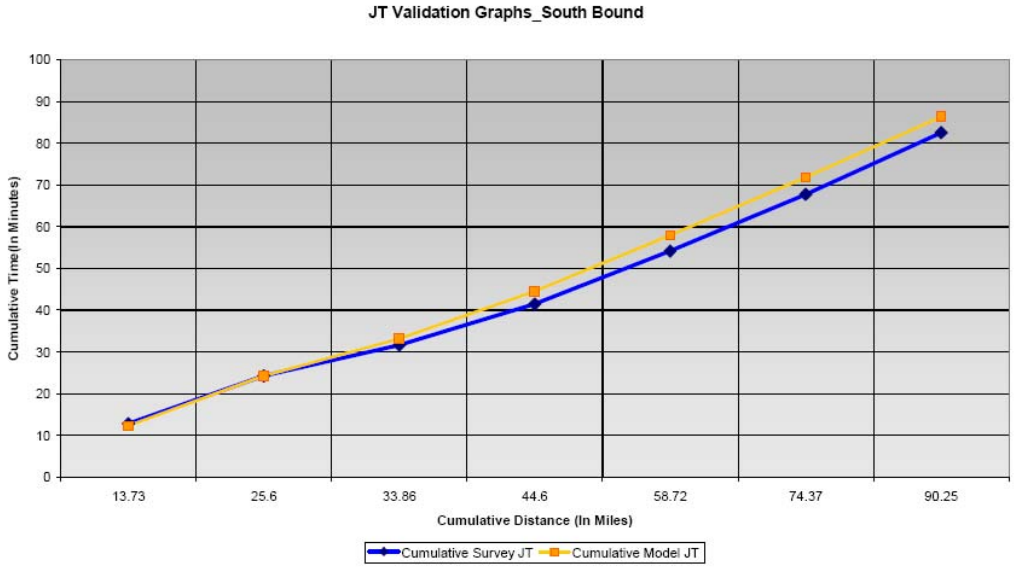


FIGURE 2.14 GSP OBSERVED VERSUS STATE-WIDE MODEL TRAVEL TIMES IN THE OP PERIOD (SOUTHBOUND)



2.85 In the South, US-9 competes with the GSP for short distance journeys. US-9 is a free road that extends along the seashore from Cape May to Toms River. The route has a 50 mph speed limit but does suffer from considerable peak-hour congestion and is regulated by traffic lights. The observed average traffic speeds on this road is 40 mph but in some sections speeds can be as low as 25 mph. The modeled travel times for this route are presented in Figure 2.15 and Figure 2.16.

FIGURE 2.15 US-9 OBSERVED VERSUS STATE-WIDE MODEL TRAVEL TIMES IN THE OP PERIOD (NORTHBOUND)

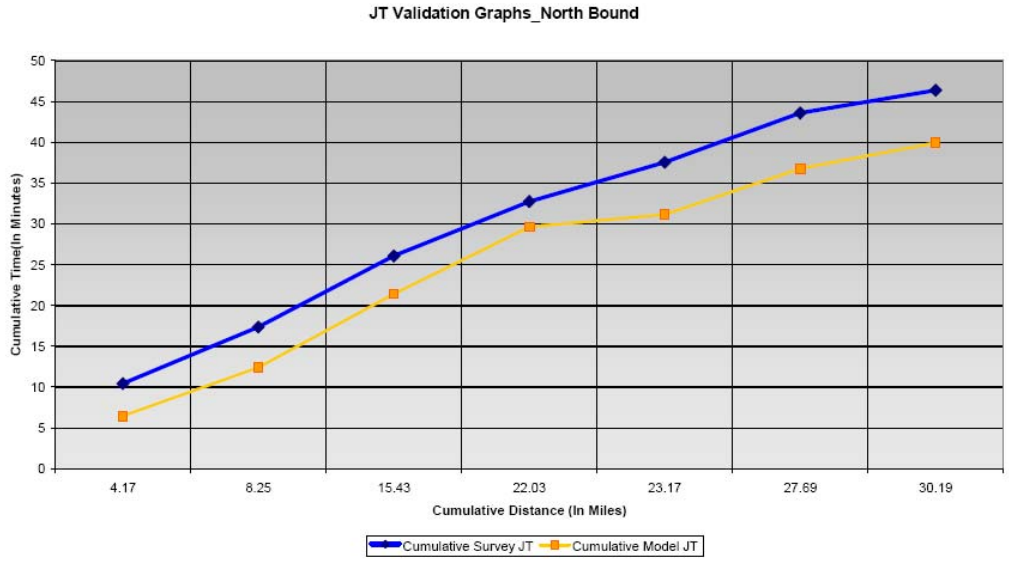
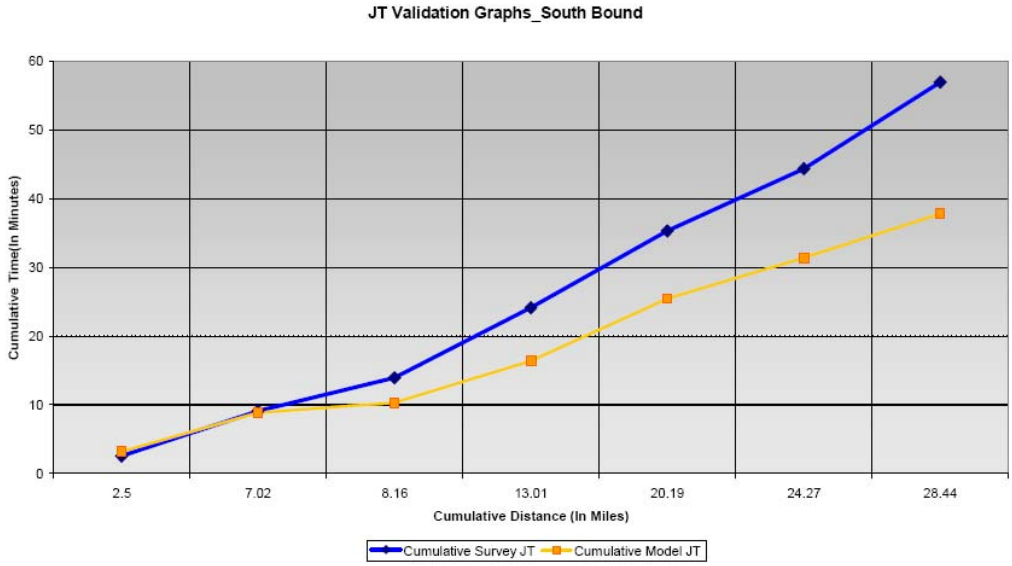


FIGURE 2.16 US-9 OBSERVED VERSUS STATE-WIDE MODEL TRAVEL TIMES IN THE OP PERIOD (SOUTHBOUND)



2.86 In the Northbound direction the model replicates the travel time and speeds well. However, in the opposite direction in the model the road appears to be faster. In terms of forecasting traffic our model would be slightly conservative, since it would tend to forecast higher levels of diversion due to toll increases.

Highway Assignment Validation ACE

2.87 In this section we included the comparison between model and observed travel times for the ACE and the competing route US-322. The un-tolled US-322 runs to the south of the ACE in an almost parallel direction linking Atlantic City with Williamstown and Route 42. As such it provides an equivalent route to the ACE although with a reduced lane geometry specification and average speed around 40 mph. The modeled travel times for these routes are presented in Figures 2.17-2.20.

FIGURE 2.17 ACE OBSERVED VERSUS STATE-WIDE MODEL TRAVEL TIMES IN THE OP PERIOD (EASTBOUND)

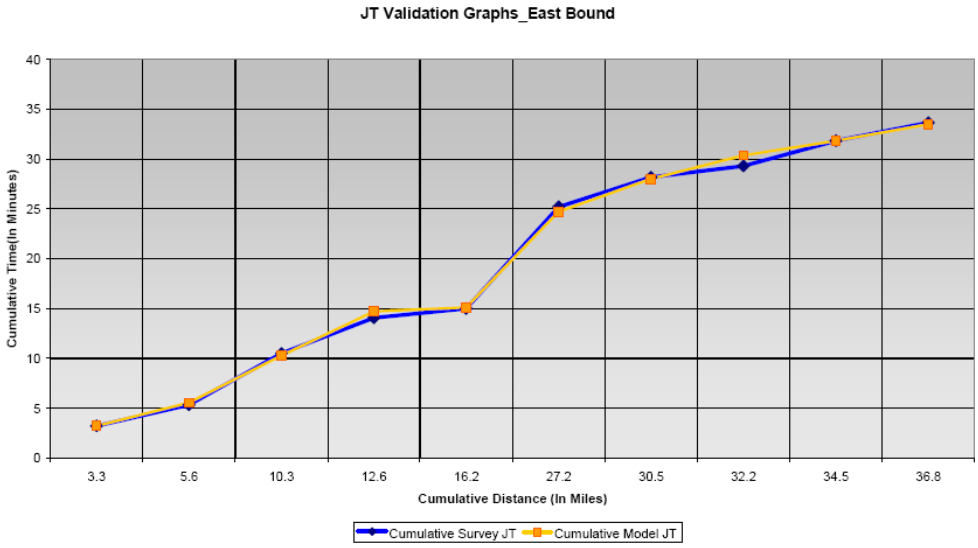


FIGURE 2.18 ACE OBSERVED VERSUS STATE-WIDE MODEL TRAVEL TIMES IN THE OP PERIOD (WESTTBOUND)

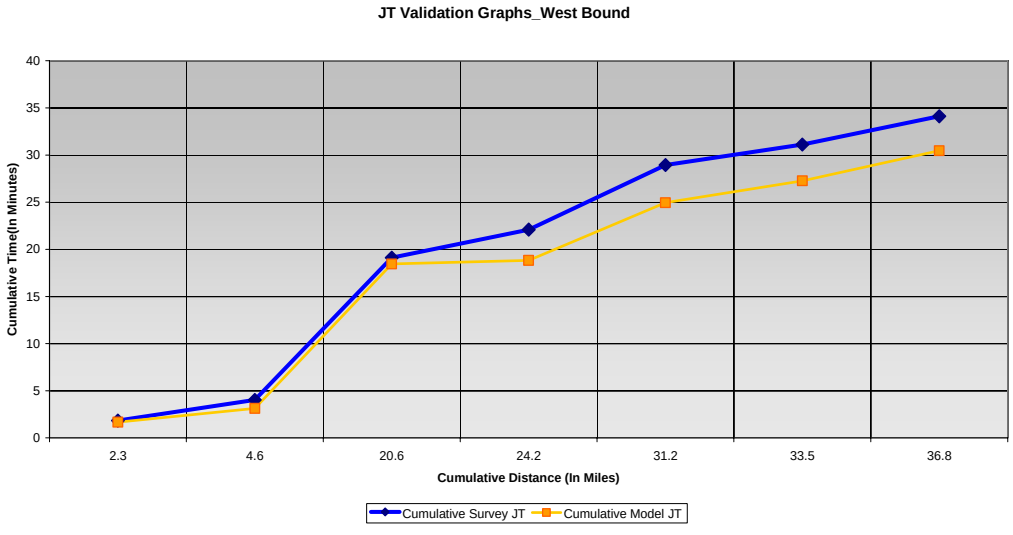


FIGURE 2.19 US-322 OBSERVED VERSUS STATE-WIDE MODEL TRAVEL TIMES IN THE OP PERIOD (EASTBOUND)

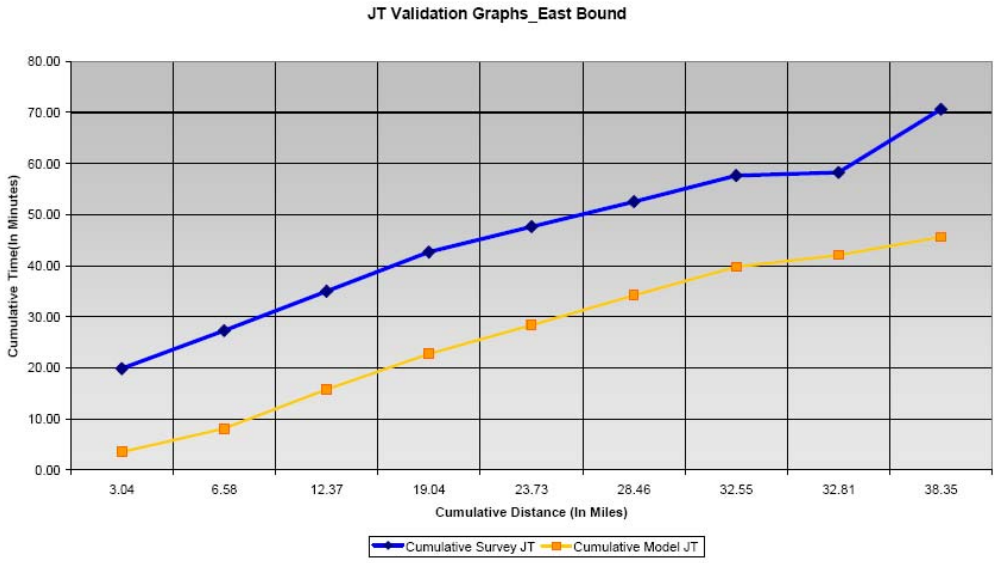
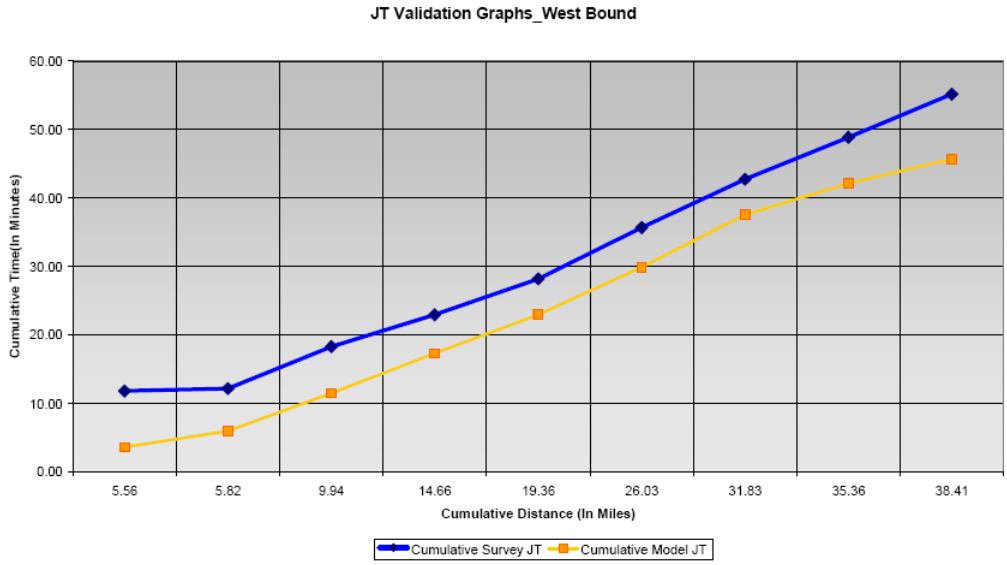


FIGURE 2.20 US-322 OBSERVED VERSUS STATE-WIDE MODEL TRAVEL TIMES IN THE OP PERIOD (WESTBOUND)



2.88 As it can be appreciated in the previous figures, the model simulates accurately speeds on the highways but underestimates delays on lower standard roads. Also in this case, in terms of forecasting traffic diversion on the ACE, our model would be slightly conservative, since it would tend to forecast higher levels of diversion due to toll increases.

2.89 However, we are confident that the time savings benefit derived from the toll roads are being accurately modeled and if anything the outputs from the model would be on the conservative side. We are therefore confident that the State-wide model provides a robust base from which to estimate traffic capture.

Revenue Model

2.90 As mentioned before, the core component of the modeling framework is a spreadsheet based Revenue model. This model uses the observed 2006 toll demand and revenue data as a basis from which future year forecasts are derived. The State-wide model is used to inform the revenue model in terms of:

- Impact of congestion
- Changes in trip distribution
- Diversion
- Traffic Growth

2.91 A Revenue model was developed for each of the project's roads to convert the outputs from the State-wide model to an estimation of transactions and revenue over the 100 year study period.

Input Data

2.92 The Revenue model used 2006 observed transaction and revenue information for the NJTP, GSP and ACE. As Route 440 is currently un-tolled, information from 2005 traffic counts was used with a toll rate based on the toll per mile on the northern sections of the NJTP and GSP.

2.93 Within the Revenue model demand and revenue are segmented by:

- Geography (toll plazas and toll barriers)
- Time of day (AM Peak, PM Peak, Off-Peak)
- Day of Week (Weekday and Weekend)
- Vehicle Type (Cars and Trucks)
- Payment Method (Cash, E-ZPass)
- Journey Purpose (Work and Other)

Input from State-wide Model

2.94 The input for the Revenue model consisted of the peak and off peak flows calculated by the State-wide model for key growth and toll scenarios at each of the sections or tolling points on the roads. These values were calculated for three segments, Car Travel to Work, Car Other Trip purposes and Truck.

2.95 These input values were converted into factors based on a base growth and toll scenario for each of the user groups for both peak and off peak. The factors are used by the spreadsheet as the indicator of the elasticity of traffic to a combination of toll and growth specific to individual sections of each road.

Variables

2.96 The Revenue model is capable of running sensitivity tests on a range of variables including annual base growth, peak spreading, road capacity upgrades, tolling scenarios and the level of suppression of excess traffic.

Calculation

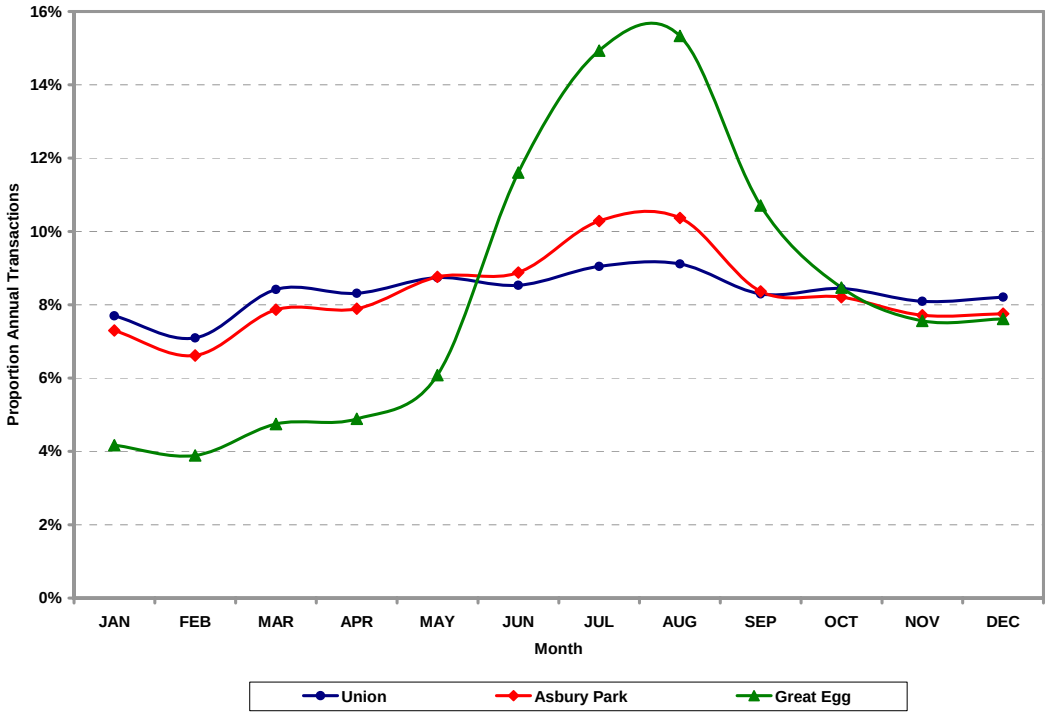
2.97 The variables, combined with the base data and factors from the State-wide model are calculated on a section by section basis for the NJTP and by tolling point on the GSP and ACE. On Route 440 there are assumed to be two barrier style tolling points, one between the NJTP and GSP and the second between the GSP and Route 35.

2.98 The information on the traffic flows from the State-wide model is used to factor base traffic according to the growth and toll scenario values for the scenario for each year. For each year, the Revenue model then calculates if resulting peak hour traffic flows are in excess of maximum capacities (as defined by the HCM) for each section or tolling point. If demand is greater than the defined capacity then an assumed proportion of the excess is spread into the off-peak period with the remaining excess entirely suppressed.

2.99 This modeled traffic is then multiplied by an average toll to estimate the revenue by section or tolling point.

2.100 The Revenue model converts traffic per period into Annual Average Daily Traffic (AADT) and revenue using the annualisation factors derived for each tolling point taking into account the traffic profile for each specific tolling point during the year, day of the week and time of the day. For example, Figure 2.21 shows the monthly transactions profile registered on three toll barriers (Union, Asbury Park and Great Egg).

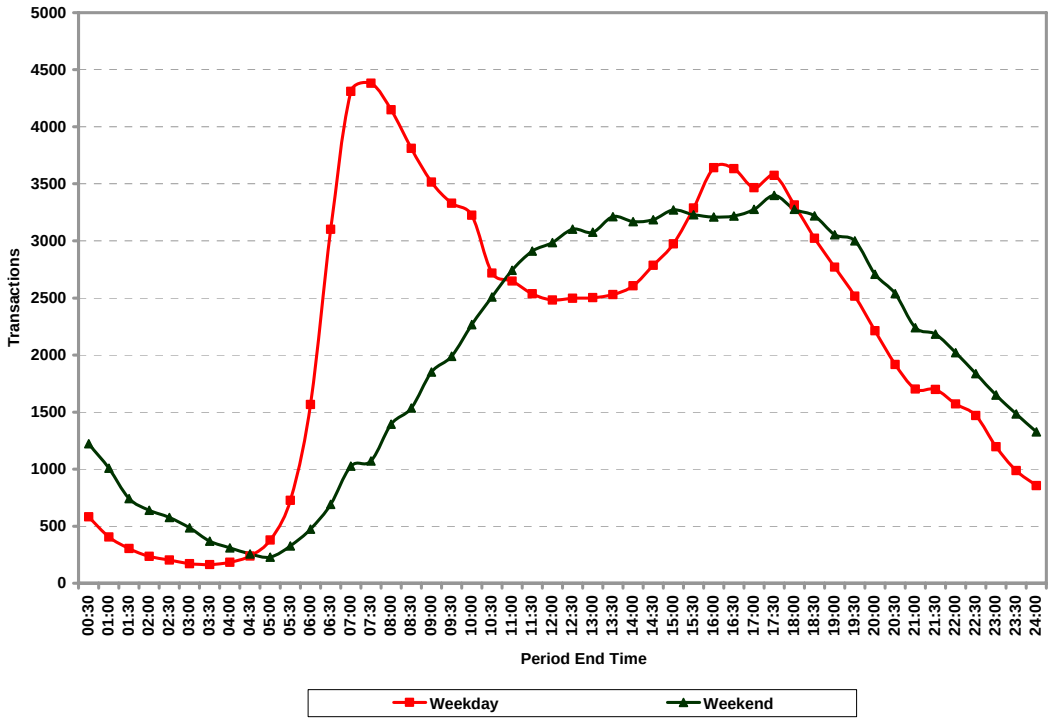
FIGURE 2.21 GSP - MONTHLY PROFILE OF 2006 TRANSACTIONS VOLUMES



Source: NJTA / SDG Analysis

2.101 Figure 2.22 presents the daily profiles for the northbound-paying toll plaza, Union barrier. The weekday AM peak period indicates commuters traveling from southern New Jersey to the Newark area. The PM peak period, less pronounced, shows that commuters also travel in the opposite direction, albeit to a lesser extent. The weekend transactions profile displays a smooth trend, with the peak period extending from 12:00 to 20:00.

FIGURE 2.22 GSP - UNION TOLL BARRIER WEEKDAY AND WEEKEND DAILY PROFILE (NORTHBOUND)



Source: NJTA / SDG Analysis

2.102 This analysis was carried out for each tolling point in order to derive specific factors to convert the model period into annual figures. Table 2.4 below shows as an example the factor applied in the case of GSP's toll barriers.

TABLE 2.4 PERIOD FACTORS TO CONVERT PERIOD FLOWS INTO AADT

Barrier	As a % of AADT		
	AM	PM	OP
Union	12%	15%	74%
Raritan	6%	22%	72%
New Gretna	4%	16%	79%
Essex	10%	15%	75%
Hillsdale	12%	18%	70%
Toms	10%	16%	74%
Great Egg	8%	19%	73%
Cape May	9%	17%	74%
Bergen	13%	18%	69%
Asbury	14%	12%	74%
Barnegat	9%	16%	76%

Output

2.103 The spreadsheet produces a line of annual transactions, revenue and average transaction value for the entire study period for each of the four roads. This information is also split down by vehicle type. Revenue and average transaction value are derived in both nominal and 2006 prices.

3. ECONOMIC GROWTH FORECASTING FRAMEWORK

Introduction

3.1 The purpose of this section of the report is to summarize likely growth patterns in New Jersey, with a focus on those aspects of growth that may contribute most directly to overall highway demand.

3.2 The Overview – the Spatial Pattern of Growth section provides a spatial overview of overall growth patterns in and around New Jersey. The Baseline Growth Model Forecasts section outlines existing projections of population, employment, and freight growth, including a description of forecast methodologies and assumptions. The Additional NJ Growth Factors section details sources of population and employment growth that may be additional to existing forecasts. Finally, the Forecast Ranges and Alternatives section synthesizes the work of the previous three sections to present a range of possible population and employment forecasts.

Overview – Spatial Pattern of Growth

Northeast Economic Region

3.3 New Jersey is situated in the middle of a metropolitan axis stretching from Washington, DC to Boston, MA. The employment centers in this region (New York City, most notably) serve as the primary drivers of income generation in the region's smaller cities, peripheral areas, and much of the Eastern U.S. New Jersey's growth both depends upon and supports the growth of the broader axis, but its central position in this economic axis makes it a desirable location for future growth. Table 3.1 displays population and employment growth rates for select geographies from 1995 to 2005. Figures 3.1 and 3.2 show, respectively, actual and forecasted Gross Regional Product (GRP), population, and employment growth rates from 2000 to 2005 for select geographic regions (the Mid-Eastern Region is defined by the U.S. Bureau of Economic Analysis, and covers DE, DC, MD, NJ, NY, and PA). Overall, this data demonstrates that the Mid-Eastern Region (and New York, in particular) has lagged the US in growth. This discrepancy is due in large part to the rapid growth of "Sunbelt" cities[5]. Notwithstanding, the region as a whole is has shown respectable GRP growth, and the State of New Jersey has, by most measures, grown faster the surrounding region.

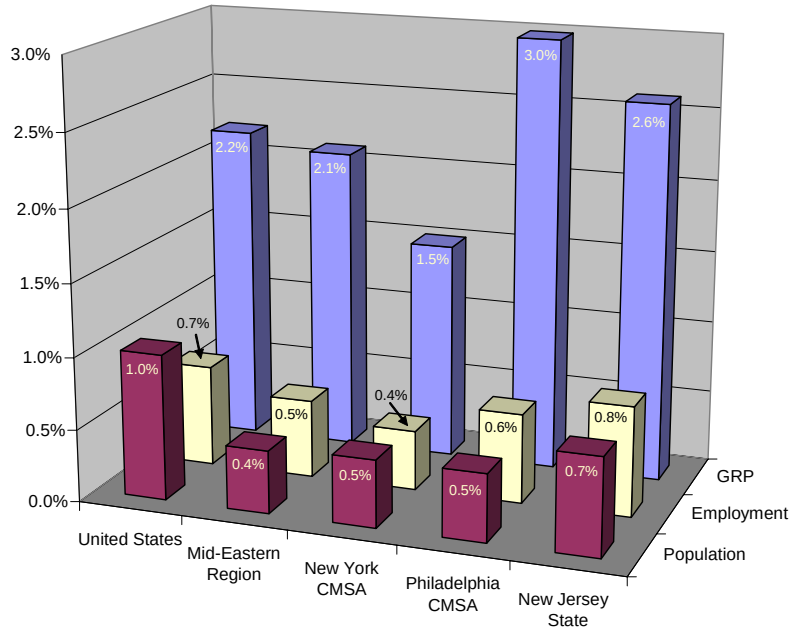
[5] The Sunbelt describes a broad region stretching (roughly) from Atlanta across the Southern U.S. to Los Angeles. It is characterized by rapid growth since WWII, and particularly since 1970. This growth is commonly attributed to the popularization of air conditioners, large amounts of developable land, and pleasant winter temperatures. Wikipedia provides a good discussion of the Sunbelt's properties; see also "Warm Areas Continue Hottest Job Growth", U.S. Dept. of Labor, Bureau of Labor Statistics (May, 1997).

TABLE 3.1 POPULATION AND EMPLOYMENT GROWTH FOR SELECT REGIONS, 1995-2005

Region	Variable	1995	2005	Avg. Ann. Growth Rate, 1995-2005
United States	Population	266,278,393	296,410,404	1.13%
	Employment	148,982,794	172,587,009	1.58%
Mid-Eastern Region	Population	45,186,033	47,396,604	0.49%
	Employment	24,375,730	27,257,049	1.18%
New York CMSA	Population	20,479,798	21,903,623	0.70%
	Employment	10,823,912	12,224,997	1.29%
Philadelphia MSA	Population	5,586,177	5,823,233	0.42%
	Employment	2,988,112	3,380,258	1.31%
New Jersey State	Population	8,083,242	8,717,925	0.79%
	Employment	4,330,143	4,936,017	1.40%

Source: Woods & Poole [1]

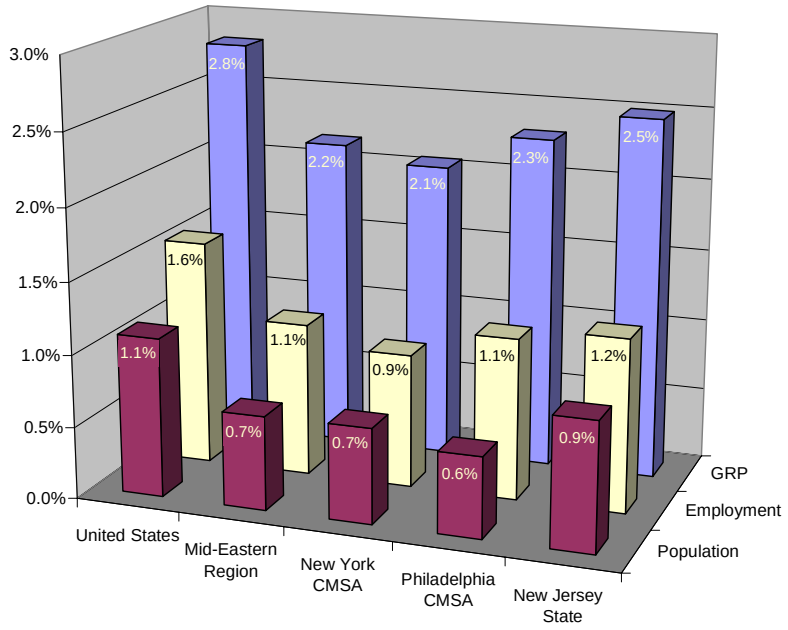
FIGURE 3.1 ACTUAL GRP, POPULATION, AND EMPLOYMENT GROWTH (2000-2005)



Source: Woods & Poole

(1) WOODS & POOLE ECONOMICS, INC. PRODUCES EXTENSIVE FORECASTS OF US, REGIONAL, STATE LEVEL, AND COUNTY LEVEL VARIABLES TO 2030.

FIGURE 3.2 FORECASTED GRP, POPULATION AND EMPLOYMENT GROWTH IN SELECT REGIONS (2005-2030)



Source: Woods & Poole

New Jersey Regions

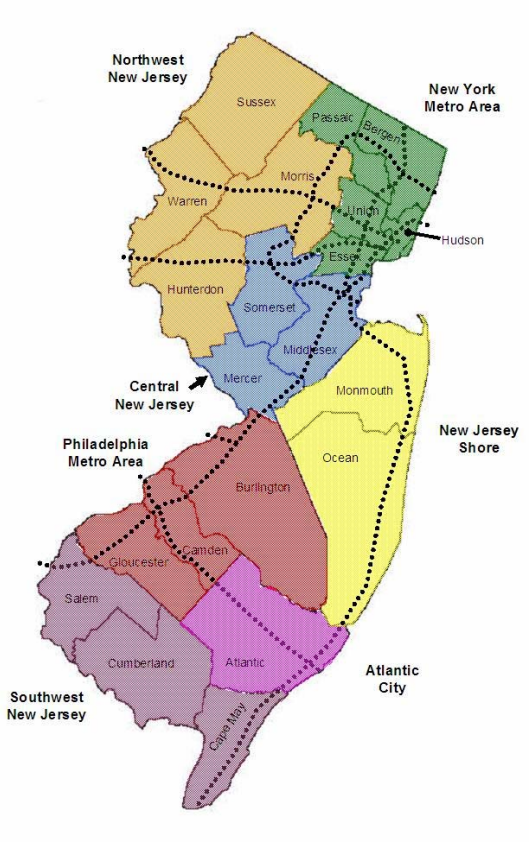
3.4 To better illustrate growth patterns within New Jersey, we aggregated the State's 21 counties into 7 regions (Figure 3.3). These are defined to reflect functionally similar areas, with a particular focus on highway alignments and corridors. Figure 3.4 shows levels of population, and employment for each region, and Figure 3.5 shows 25-year forecasts, including GRP.

3.5 *New York Metro Area* – Bergen, Passaic, Essex, Hudson, Union Counties. This region includes Newark and Jersey City, and it contains roughly 40% of all New Jersey jobs[6]. Its relatively high density limits future growth opportunities and creates high levels of traffic congestion, particularly during peak periods. As such, it has and is likely to continue to grow more slowly than less dense New Jersey areas. Furthermore, this area contains a large number of warehousing and distribution facilities, particularly near Newark Airport and marine ports. *Key Market Segments: Labor Market (NYC), Delivery Freight, Supply Chain Freight, Import/Export Freight, Through Freight, Tourism.*

[6] Source: Woods & Poole

3.6 *Northwest New Jersey* – Sussex, Morris, Warren, and Hunterdon Counties. Northwest New Jersey has recently undergone a growth spurt. Whereas previously, this region was relatively distant from metropolitan centers, as the Philadelphia and New York Metropolitan Areas have expanded (particularly the latter), these counties have become within driving distance of significant employment levels, and their own development has ensued. Notwithstanding high employment growth, the region is primarily suburban/rural in character, with much of the growth following residential developments. Population and employment are forecasted to be relatively high in these counties[7], with a significant number of residents continuing to commute to denser employment centers. *Key Market Segments: Labor Market (NYC), Delivery Freight*.

FIGURE 3.3 REGION DEFINITIONS



Source: EDRG

3.7 *Central New Jersey* – Mercer, Middlesex, and Somerset Counties. These three counties are extremely diverse – they generally have high incomes (particularly Somerset County), they contain a growing number of high-skill employment (some of which is associated with Princeton University), and they house a cluster of warehouse and distribution establishments. In addition, this region occupies a unique geographical location with quick access to New York City, water ports, and intermodal rail facilities.

[7] Source: Woods & Poole

3.8 More explicitly, the shortest-path land route from points south to points northeast is through Mercer and Middlesex Counties. Within this corridor, Mercer County is the approximate dividing line between the New York and Philadelphia labor markets. As such, a significant number of Middlesex and Somerset residents commute to New York/Newark area jobs. All these features have contributed to rapid economic growth over the last decade – a trend that is forecasted to continue in the future[8]. *Key Market Segments: Labor Market (NYC, Phil.), Delivery Freight, Supply Chain Freight, Import/Export Freight, Through Freight.*

3.9 *Philadelphia Metro Area* – Burlington, Camden, Gloucester Counties. The Philadelphia region is characterized by a large number of office parks, with some employment specialization in pharmaceutical, biotech, and computer-related industries. It contains some Philadelphia commuters, but most residents commute to local jobs[9]. This is partially due to the relative lack of transit facilities and limited crossings across the Delaware River. Despite this, strong growth in the greater Philadelphia area is forecasted to drive growth in these three counties[10]. *Key Market Segments: Labor Market (Phil.), Delivery Freight, Supply Chain Freight, Through Freight.*

3.10 *New Jersey Shore* – Monmouth and Ocean Counties. The New Jersey shore is characterized by seasonal tourism and high residential growth. The region's employment fluctuates with the tourism seasons, and more than 40,000 of its homes are seasonal[11]. However, a large number of permanent Monmouth county residents commute to New York/Newark area jobs. Due to the relatively high quality of life that proximity to the shore provides, population is forecasted to grow faster than any other part of the state[12]. *Key Market Segments: Labor Market (NYC), Delivery Freight, Tourism.*

3.11 *Atlantic City* – Atlantic County. Growth in this county mostly depends on casino, entertainment, and beach tourism. The city has current plans to expand casino/convention facilities, but county growth will likely be constrained, as its casinos now compete with newer northeast casinos. *Key Market Segments: Delivery Freight, Tourism.*

3.12 *Southwest New Jersey* – Cape May, Cumberland, and Salem Counties. Generally, these three counties are characterized by low population and employment levels. Cape May attracts many tourists and also contains over 40,000 seasonal homes, but in Salem and Cumberland Counties, a significant amount of land is still used in agriculture or is preserved. Population and employment is forecasted to grow slowly in this region[13]. *Key Market Segment: Tourism.*

[8] Source: Woods & Poole

[9] Source: U.S. Census, Journey to Work

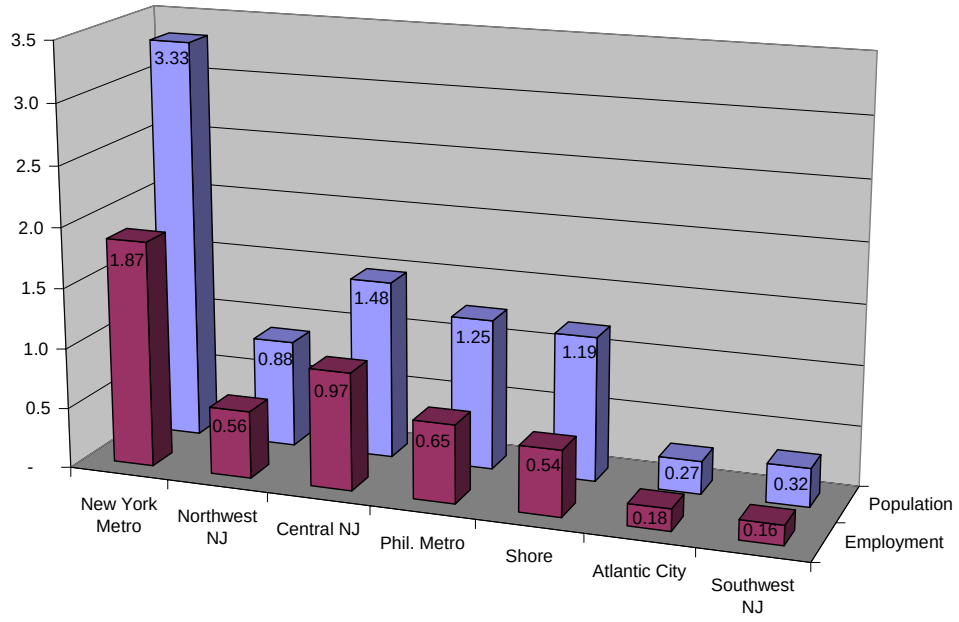
[10] Source: Woods & Poole

[11] Source: New Jersey Commerce, Economic Growth & Tourism Commission

[12] Source: Woods & Poole

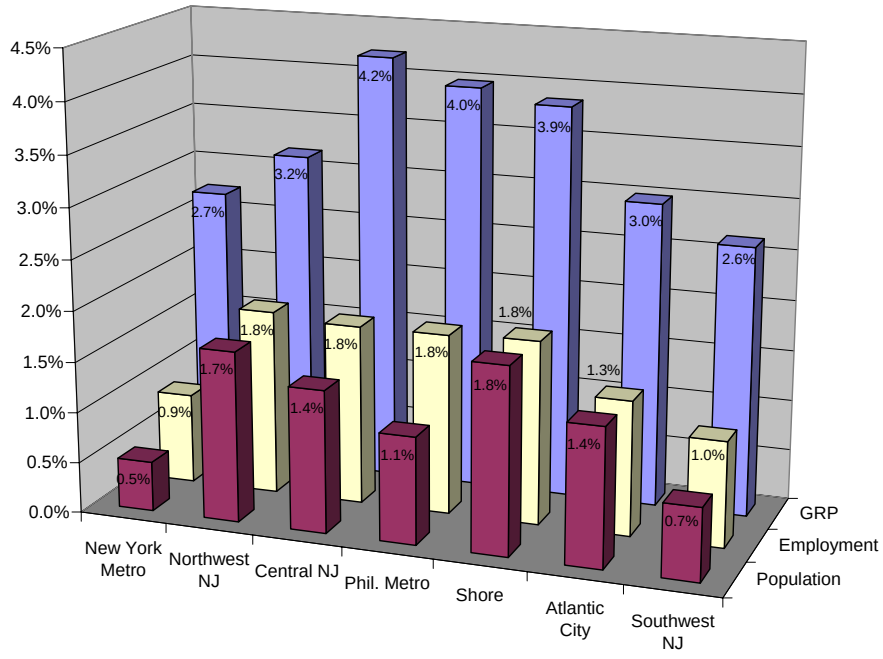
[13] Source: Woods & Poole

FIGURE 3.4 POPULATION AND EMPLOYMENT LEVELS (M)



Source:Woods & Poole

FIGURE 3.5 FORECAST GRP, EMPLOYMENT, AND POPULATION GROWTH (2005-2030)



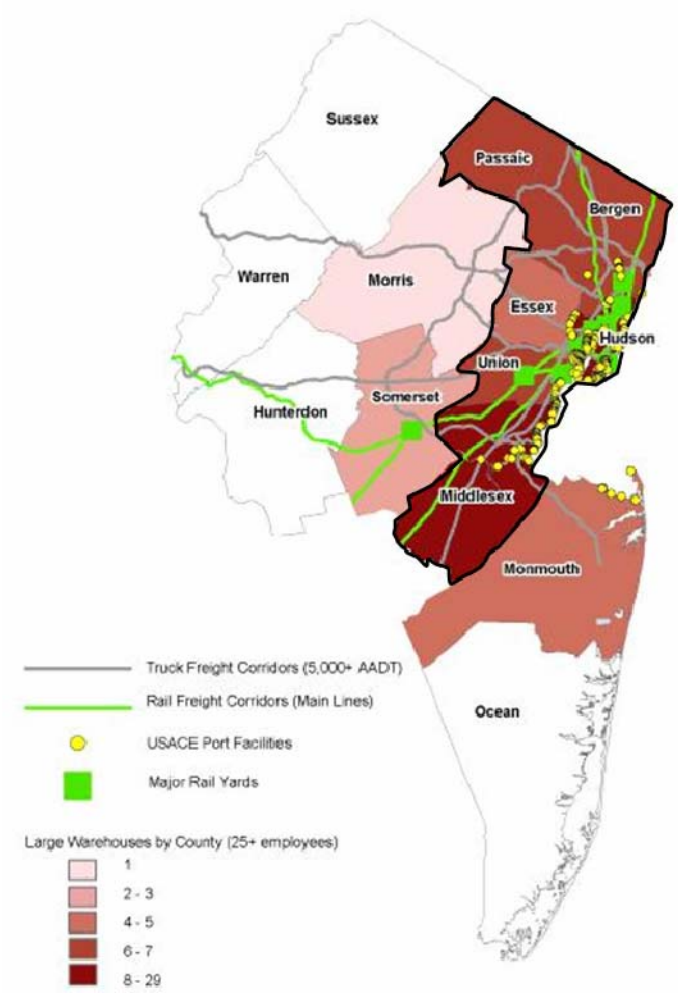
Source:Woods & Poole

New Jersey Gateway Area

3.13 In addition to the seven regions defined above, we focus on the "gateway" Counties of Middlesex, Union, Essex, Hudson, Passaic, and Bergen (Figure 3.6) because of their critical importance to freight movement. The region's importance stems from five interrelated reasons. First, it collectively houses the major port facilities of Newark International Airport and the marine ports of Newark and Perth Amboy. As such, millions of tons of import/export freight move through the region each year. Second, the corridor is an important component of the shortest land path from the Northeastern US to all South-Atlantic States. Thus, an enormous amount of non-local freight traffic is drawn through the area en route to other domestic destinations. Third, the region has good accessibility to the metropolitan areas of New York City, Philadelphia, and Pittsburgh, and therefore is a good staging location for warehousing and distribution activity. Moreover, 40% of the US population is accessible within a single day's drive from New Jersey. Fourth, in addition to air and water ports, the region has good rail access and contains several rail intermodal facilities. Moreover, seven major highways merge in the area: Interstates 78, 80, 95, 280, and 287, plus the NJTP and GSP. This region thus serves as one of the most concentrated intermodal "intersections" in the country (see Figure 3.6). Finally, as a result of the first four points, a large number of warehouse and distribution facilities have clustered in the region (as a state, New Jersey trails only Los Angeles and Chicago in its amount of warehouse square footage).

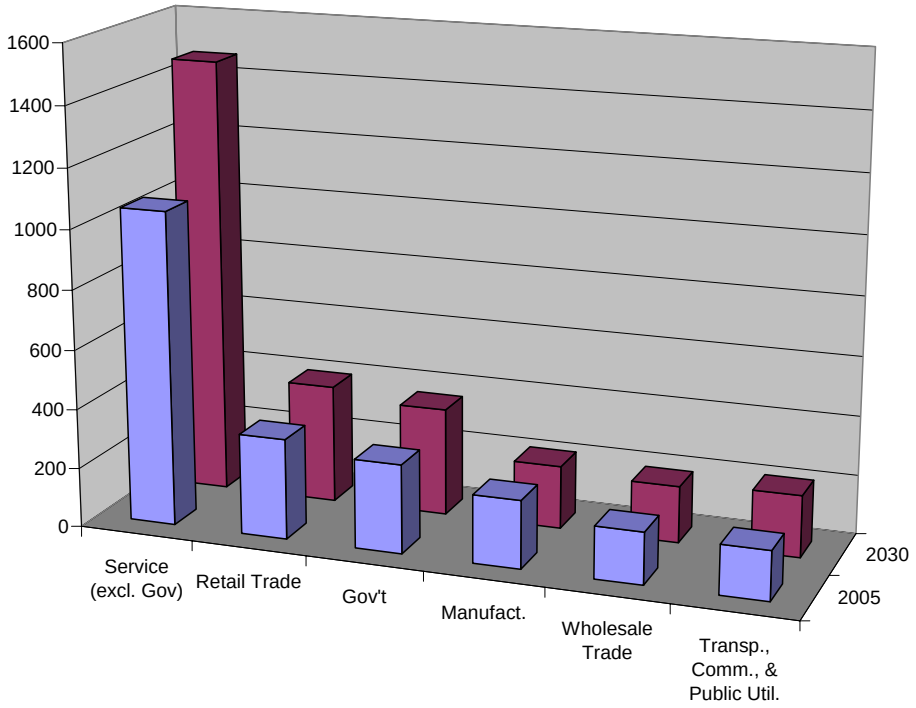
3.14 The freight movement into and through these counties is to a large degree dependent on the continued operation of the facilities described above. However, the overall benefits of the location are largely structural and unlikely to drastically change in the future. As a result, while global and regional trade trends will undoubtedly fluctuate in the future, this region is likely to attract significant levels of freight and associated warehouse and distribution facilities. Figure 3.7 shows levels and forecasts of several types of employment for the Gateway Region.

FIGURE 3.6 FREIGHT RELATED FACILITIES IN NORTHERN NEW JERSEY



Source: North Jersey Transportation Planning Authority, Access & Mobility 2030, Final Report, Appendix E: Freight System Performance Assessment.

FIGURE 3.7 PROJECTED GATEWAY REGION EMPLOYMENT IN SELECT INDUSTRIES (THOUSANDS OF JOBS)



Source: Woods & Poole

Baseline Growth Model Forecasts

3.15 Overall growth forecasts are derived by looking at existing forecasts of population, employment, and other variables. The purpose of this section is to outline the scope, methodologies, and vetting processes used in the development of each of these data series. These are then used to consider the most likely range of forecasts. All data is provided in Appendix A. Table 3.2 provides a regional and statewide summary of these projections, which indicate a substantial range of projections, particularly at the state level.

TABLE 3.2 POPULATION AND EMPLOYMENT FORECASTS, 2005-2025 (SOURCES AS INDICATED)

Region	Variable	Source	2005	2025	Avg. Annual Growth 2005-2025
United States	Population	W&P	296,410,404	360,820,672	1.09%
		Census	295,115,661	349,890,680	0.93%
Mid-Eastern Region (DE, DC, MD, NJ, NY, PA)	Population	W&P	47,396,604	53,402,178	0.63%
		Census	47,022,734	49,817,648	0.30%
	Employment	W&P	27,257,049	33,055,017	1.06%
New York CMSA	Population	NYMTC	22,244,700	25,187,400	0.66%
		W&P	21,903,623	24,715,154	0.64%
	Employment	NYMTC	11,743,900	14,142,250	1.02%
		W&P	12,224,997	14,495,192	0.93%
Philadelphia MSA	Population	W&P	5,976,485	6,623,893	0.54%
		DVRPC	5,504,466	5,946,890	0.40%
	Employment	W&P	3,453,195	4,227,215	1.12%
		DVRPC	2,739,237	3,121,456	0.70%
New Jersey State	Population	W&P	8,717,925	10,219,852	0.86%
		RECON	8,717,900	10,002,500	0.74%
		MPOs	8,735,892	9,844,660	0.63%
		DLWFD *	8,685,200	9,817,400	0.62%
	Employment	W&P	4,872,452	6,045,487	1.20%
		DLWFD **	3,999,100	4,403,200	1.01%
		RECON	4,235,900	5,082,200	1.00%
		MPOs	4,104,204	4,812,708	0.86%
	GSP (bil. $2000)	RECON ***	392.80	498.60	2.69%
		W&P ***	399.10	482.70	2.10%

* Values are 2004 to 2025 ** Values are 2004 to 2014 *** Values are 2005 to 2015

Woods & Poole

3.16 Woods & Poole Economics, Inc. produces extensive forecasts of US, regional, state level, and county level variables to 2030. These are compiled in their Complete Economic and Demographic Data Source (CEDDS) product[14]. The most recent version of this data product was published in January, 2006, and it corresponds to a "base-year" of 2003 (i.e., 2004 and all future years are projected). Raw Woods & Poole projections are shown in Table A.1 in Appendix A.

3.17 Woods & Poole develops its forecasts using a "top-down" approach. First, projections of personal income, earnings (by industry), employment (by industry), and population are made. These initial 2030 projections are developed using the "export-base" approach. In the second step, the U.S. is divided into 172 Economic Areas, following definitions by the U.S. Bureau of Economic Analysis. Total growth is then "allocated" to each region, again using an "export-base" technique for each region. Finally, growth within each Economic Area is further allocated to counties using similar techniques. This "nested" approach to county-level forecasting insures that forecasts are consistent across large geographies – i.e., that county-level forecasts properly aggregate to States, Metropolitan Statistical Areas (MSA) and Regions.

3.18 While the Woods & Poole forecasts are not "vetted" against local knowledge, past forecasts are reviewed for accuracy against actual economic growth. Their analysis demonstrates that forecasts have been relatively more accurate for large geographies (Regions, States) than smaller areas (Counties). In addition, population forecasts have tended to be more accurate than employment forecasts.

New Jersey's Department of Labor and Work Force Development (DLWFD)

3.19 New Jersey's Department of Labor and Workforce Development publishes county-level forecasts of population, labor force (by occupation), and employment (by sector). The most recent data was published in September, 2006, and has a "base-year" of 2004. Population projections extend to 2025; however, employment projections are only for 2014. Raw DLWFD data is shown in Appendix A, Table A.2.

3.20 The three data series of employment, labor force, and population are developed such that each is the result of and the input to at least one other series. The population projections are developed based on a model simulating birth rates, death rates, and migration rates, with the latter module using the industry employment projections as a key input. The employment projections, in turn, are developed using a time-series regression analysis with population projections among its key inputs.

[14] All descriptions of the CEDDS data in this and other sections are taken from "2006 CEDDS Technical Documentation", published by Woods & Poole (January, 2006)

3.21 The above methodology is used to estimate "preliminary" projections of the three variables. These initial forecasts are then reviewed internally and externally, adjusted, and published as "final". This "vetting" process is as follows:

3.22 The preliminary industry employment projections were adjusted if there was known independent information about future events which would impact the employment projections for a given industry. Usually, this information was about a future plant or business openings or closings that would have a significant impact on employment.

3.23 The preliminary industry and occupational employment projections were reviewed by staff in the Division of Labor Market and Demographic Research department[15] to ensure the reasonableness of the projections in light of present conditions, emerging trends at the state or local level, and any known developments.

3.24 Local experts from outside of the Division in a series of focus group meetings also reviewed the employment projections[16].

Other Population and Employment Forecasts

3.25 Several other organizations publish population and/or employment forecasts at the county or state level. The following sections briefly describe the sources utilized in the analysis.

R/ECON

3.26 The Rutgers Economic Advisory Service (R/ECON) publishes long-term forecasts of many socioeconomic variables covering the time-period 2005-2026, with a "base-year" of 2004. The forecasts are made at the state level and for select county aggregations, but results are not available for every county[17]. R/ECON's forecasts are derived using an econometric time-series model. It is a system of 220 equations, each of which is based on historical data for New Jersey and the nation. This model is tailor-made for New Jersey's economy, based on historical data for the period 1970–2004. National forecasts of employment, wages, and prices drive the model's New Jersey forecasts[18]. Raw state-level R/ECON forecasts are shown in Appendix A, Table A.3.

[15] The Division of Labor Market and Demographic Research collects labor market, population, and other economic statistics for the State of New Jersey. They perform and publish statistical analysis on this data, and also develop forecasts for population and employment.

[16] Source: Outline of Methodology, obtained from Tom Sheppard, position, New Jersey DLWFD

[17] All forecasts taken from "Forecast of October 2006", by Mantell, N., and M. Lahr, published by Rutgers Economic Advisory Service (R/ECON)

[18] Source: A Description of R/ECON™ I-O Regional Input-Output Model Developed by Rutgers University's Center for Urban Policy Research", Obtained from Michael Lahr, New Jersey Center for Urban Policy Research, January 2008

Metropolitan Planning Organizations

3.27 Several Metropolitan Planning Organizations (MPO) separately publish population and employment forecasts covering counties in their jurisdictions. These are:

- NJTPA
- DVRPC
- SJTPO
- New York Metropolitan Transportation Council (NYMTC)

3.28 Each organization publishes county level projections, and these projections are frequently "vetted" in a way similar to DLWFD projections. However, these forecasts cannot be aggregated into a comprehensive statewide forecast because they were not developed using consistent methodologies. As such, the projections listed above are used only as reference points for county level results developed in the Forecast Ranges and Alternatives section below. Forecasts for NJTPA, DVRPC, and SJTPO are shown in Appendix A, Table A.4; NYMTC projections (with historical data) are shown in Appendix A, Table A.5.

Freight Forecasts

Recent Trends

3.29 Air and water ports in and near New Jersey serve as both the origin and destination of many truck trips. Figure 3.8 shows the facilities under operation of the Port Authority of New York and New Jersey (PANYNJ) (Perth Amboy in Middlesex County is not shown). These ports (with Perth Amboy) draw freight from within New Jersey and all over the country, and they serve as a major entryway for international imports. Tables 3.3 and 3.4 show recent trends in air and marine shipments through New Jersey and New York Ports. These tables reveal that, between 2003 and 2006, total freight movement increased rapidly, for the country as well as the PANYNJ, and for exports as well as imports. However, they also reveal that exports are growing faster than imports for PANYNJ water ports (imports even decreased slightly from 2005 to 2006). Over the last four years, total U.S. shipping (imports and exports) increased by 4.5% per year for water-borne freight and 6.3% per year by air, with area ports growing at comparable rates. Tables 3.4 and 3.5 also show that the market share of PANYNJ facilities has been relatively stable over the past four years, at about 6% for marine freight and 20% for air freight.

FIGURE 3.8 FACILITIES OPERATED BY PANYNJ

Source: PANYNJ

TABLE 3.3 WATER-BORNE IMPORTS AND EXPORTS THROUGH PANYNJ FACILITIES, 2003-2006 (KTONS/YR)

	Year	PANYNJ	All US Ports	% of US
Imports	2003	74,183	969,875	7.65%
	2004	76,369	1,052,219	7.26%
	2005	80,085	1,096,982	7.30%
	2006	77,214	1,102,999	7.00%
Annual Average Growth 2003-2006		1.34%	4.38%	
Exports	2003	10,251	363,466	2.82%
	2004	11,021	386,970	2.85%
	2005	11,998	389,796	3.08%
	2006	16,114	420,091	3.84%
Annual Average Growth 2003-2006		16.27%	4.94%	
Imports + Exports	2003	84,438	1,333,343	6.33%
	2004	87,389	1,439,189	6.07%
	2005	92,084	1,486,779	6.19%
	2006	93,327	1,523,090	6.13%
Annual Average Growth 2003-2006		3.39%	4.53%	

Source: World Institute for Strategic Economic Research (WISER)

TABLE 3.4 FREIGHT MOVEMENTS THROUGH JFK AND NEWARK AIRPORTS, 2003-2006 (KTONS/YR)

	Year	JFK	Newark	All US Airports	% of US, JFK + Newark
Imports	2003	781.8	103.3	3,912	22.6%
	2004	809.8	127.5	4,382	21.4%
	2005	777.4	122.3	4,378	20.6%
	2006	779.3	124.7	4,495	20.1%
Annual Average Growth 2003-2006		-0.11%	6.47%	4.74%	
Exports	2003	414.3	36.6	2,635	17.1%
	2004	482.9	40.7	2,969	17.6%
	2005	506.2	43.5	3,031	18.1%
	2006	567.0	44.8	3,359	18.2%
Annual Average Growth 2003-2006		11.03%	7.03%	8.43%	
Imports + Exports	2003	1,196.1	139.9	6,546	20.4%
	2004	1,292.7	168.2	7,350	19.9%
	2005	1,283.7	165.8	7,409	19.6%
	2006	1,346.4	169.5	7,854	19.3%
Annual Average Growth 2003-2006		4.02%	6.62%	6.26%	

Source:WISER Trade

Factors Affecting Growth

3.30 The recent growth in freight movement through New York and New Jersey ports is due to several interrelated factors. First, the last several decades has witnessed a transformation of the U.S. economy from being manufacturing-based to service-based. At the same time, several global economies emerged as major goods-producers. China, Southeast Asia, and India are the largest of these. The confluence of these changes increased demand for international freight to a point where the shipping industry as a whole could justify the construction of dramatically larger container ships, such as the Mærsk Line vessels, each accommodating over 10,000 TEUs[19].

3.31 Looking forward, global shipping trends are likely to continue their dramatic growth following lower unit shipping prices flowing from larger ships and streamlined dock operations. However, as global demand for freight movement increases, the amount of imports and exports through PANYNJ facilities depends on several other factors:

[19] See, for example, the *Economist's* survey of the global shipping industry, June 15th, 2006.

- *Relative quality of facilities.* The growing size of container vessels continues to exert pressure on all port facilities to accommodate deeper draft ships. Ports that can maintain deeper channels and docks will capture an increasing share of international demand at the expense of shallower facilities[20].
- *Relative capacity of facilities.* In addition to deeper facilities, overall import/export capacity *relative to other ports* is also important to maintaining and increasing competitiveness. Port capacity is determined by dockside facilities (cranes, storage areas, etc.) and capacity to move containers quickly to warehouse/distribution facilities. The latter category is perhaps PANYNJ's greatest limitation to growth (particularly for imports); thus, several proposals, such as the Port Inland Distribution Network (PIDN) are being developed to expand capacity[21].
- *Major changes in shipping routes.* U.S. ports will also be affected by changes in shipping routes. Expansions of canals (notably the Panama Canal) to accommodate larger vessels, and the opening of new Arctic shipping lanes will affect the relative oversea travel times to and from New York City, thereby affecting growth rates[22].
- *Relative access to markets*. Finally, land routes by highway, barge, and rail will affect a port's ability to deliver its imports to producers and consumers. This, in turn, depends on three factors: (1) a port's spatial proximity to major consumer markets, (2) a port's direct access to intermodal freight facilities, and (3) a port's access to quality warehousing and distribution facilities. Other things equal, ports with more direct access to consumer and producer markets (either directly or via warehousing distribution facilities) will be more competitive[23].

Forecasts

Comprehensive Port Improvement Plan

3.32 The Comprehensive Port Improvement Plan (CPIP) Consortium published "Port of New York & New Jersey Comprehensive Port Improvement Plan, Vol. 1" in Sept., 2005. All tables and quotes are taken from this document. The report forecasts U.S. and PANYNJ freight demand through 2060 as part of an effort to determine strategies for increasing future port capacity. Tables 3.5 and 3.6 report forecasts for different types of freight for the U.S. and PANYNJ facilities, respectively. Table 3.7 shows the Port's 1999 and projected share of container flow throughput relative to other large U.S. ports.

[20] Chapter 6 of the CPIP Study provides a good discussion of the channel dimensions required to accommodate future vessel fleets.

[21] See CPIP Study and Portway Extensions Study for discussions of PANYNJ capacity constraints.

[22] The Economist's survey of the global shipping industry (June 15th, 2006) provides an excellent discussion of these issues.

[23] See Portway Extensions Study for further discussion of these concepts.

TABLE 3.5 FORECASTED GROWTH IN TOTAL U.S. FREIGHT MOVEMENTS (KTON/YR)

	Vessel Type	1999	2020	2060	AAGR, 1999-2020
Imports	Containers	77,763	165,833	338,375	3.7%
	Dry Bulks	121,334	230,024	429,308	3.1%
	Crude Oil	400,609	617,187	1,029,883	2.1%
	Other Liquid Bulks	122,094	216,579	399,127	2.8%
	Semi Bulks	42,248	77,737	155,445	2.9%
	Vehicles	4,569	5,331	8,209	0.7%
	General Cargo	13,689	27,379	55,568	3.4%
	Total Imports	**782,306**	**1,340,070**	**2,415,915**	**2.6%**
Exports	Containers	58,593	99,771	188,429	2.6%
	Dry Bulks	193,460	272,964	495,329	1.7%
	Crude Oil	5,284	4,969	7,436	-0.3%
	Other Liquid Bulks	32,127	58,216	113,627	2.9%
	Semi Bulks	18,334	6,920	11,776	-4.5%
	Vehicles	876	2,700	6,216	5.5%
	General Cargo	35,560	59,040	104,000	2.4%
	Total Exports	**344,234**	**504,580**	**926,813**	**1.8%**
Total Imports + Exports		**1,126,540**	**1,844,650**	**3,342,728**	**2.4%**

Source: CPIP Consortium

3.33 The forecasts in Tables 3.6 and 3.7 are made "on the assumption that dredging of all ports [to 50'] keeps up with increase in ship size, such that the accessibility of all ports relative to each other is the same as at present."[24]

[24] Source: CPIP Study

TABLE 3.6 FORECAST DEMAND FOR PANYNJ FACILITIES

Freight Type	Unit	1999	2005	2030	2060	Avg. Ann. Growth, 1999-2030
Containers*	mTEU/yr	2.8	3.6	7.1	11.3	4.95%
Vehicles	Units/yr	517,000	518,000	759,000	1,098,000	1.51%
General Cargo	kTon/yr	738	855	1,606	2,528	3.79%
Dry Bulk	kTon/yr	1,553	1,947	3,861	6,170	4.79%
Liquid Bulk	kTon/yr	1,559	1,849	3,315	5,086	3.63%

*** Differs from Table 3.7 because it includes empty and military containers**

Source: CPIP Consortium

TABLE 3.7 PROJECTED DEMAND FORECAST FOR PANYNJ FACILITIES (THOUSAND LOADED TEUS/YR)

Port*	1999	2020	2060	1999 Share	2060 Share
Los Angeles	5,112	11,074	22,535	32.7%	36.1%
PANYNJ	1,937	3,614	7,195	12.4%	11.5%
Seattle	1,472	2,888	5,861	9.4%	9.4%
Charleston	1,171	2,114	4,078	7.4%	6.5%
Norfolk	938	1,682	3,275	6.0%	5.3%
Houston	924	1,855	3,649	5.9%	5.9%
Miami	853	1,847	3,773	5.5%	6.0%
Oakland	853	1,771	3,521	5.5%	5.6%
Savannah	703	1,276	2,485	4.5%	4.0%
New Orleans	520	958	1,887	3.3%	3.0%
Philadelphia	325	548	1,052	2.1%	1.7%
Baltimore	318	616	1,241	2.0%	2.0%
Portland	259	458	895	1.7%	1.4%
Jacksonville	149	295	597	1.0%	1.0%
Boston	104	174	330	0.7%	0.5%
Total	15,637	31,173	62,375		

*** Refers to all ports clustered in area; PANYNJ values differ from Table 3.6 because they only include non-military, loaded containers**

Source: CPIPConsortium

Freight Analysis Framework (FAF2)

3.34 The Federal Highway Administration maintains a website[25] with domestic and port-of entry freight flows and forecasts, by origin/destination state, commodity, and mode of shipment. "Base-year" data are derived using the 2002 Commodity Flow Survey (CFS) and other related databases, but projections are based on Global Insight's proprietary economic and freight modeling tools. Total forecasted imports and exports through PANYNJ facilities, including U.S. market share, are shown in Table 3.9.

TABLE 3.8 PROJECTED FREIGHT MOVEMENT THROUGH PANYNJ FACILITIES (KILO TON/YR)

	Year	PANYNJ	All US Ports	% of US
Imports	2002	75,342	745,221	10.1%
	2020	104,868	1,156,764	9.1%
	2035	138,801	1,550,255	9.0%
Annual Average Growth 2002-2035		2.55%	3.27%	
Exports	2002	9,518	367,995	2.6%
	2020	17,714	567,721	3.1%
	2035	23,539	747,181	3.2%
Annual Average Growth 2002-2035		4.46%	3.12%	
Imports + Exports	2002	86,426	1,197,290	7.2%
	2020	125,046	1,836,177	6.8%
	2035	165,780	2,415,237	6.9%
Annual Average Growth 2002-2035		2.78%	3.08%	

Source: Freight Analysis Framework (FAF2)

Portway Extensions

3.35 NJDOT published the final version of the "Portway Extensions Concept Development Study" in September, 2003. The study was designed to consider the traffic related impacts of increased PANYNJ container throughput. Freight projections used in the Portway Extensions Study were derived based on those made by CPIP, but were presented as a "Low" and "High" range by specific port facility. These are shown in Table 3.10.

[25] http://ops.fhwa.dot.gov/freight/freight_analysis/faf/index.htm

TABLE 3.9 PORTWAY EXTENSIONS FORECAST RANGE FOR PANYNJ FACILITIES (TEUS/YR)

Port	County	2001 – Actual	2025 – Low	2025 – High
Port Elizabeth – Maher	Union	1,383,191	2,268,794	2,843,247
Port Elizabeth – Maersk	Union	650,065	1,210,638	1,517,168
Port Newark – PNCT	Essex	390,017	542,382	679,712
Port Newark – Marsh St.	Essex	18,137	103,360	129,530
Port Newark – American Stevedoring	Essex	58,613	111,342	139,533
Port Jersey – Global	Hudson	298,554	391,948	491,188
Bayonne – MOTBY	Hudson	0	475,368	595,730
Howland Hook	Staten Island, NY	498,399	509,634	638,672
Red Hook (excluding barge)	Long Island, NY	10,344	19,649	24,624
PANYNJ Total		3,307,320	5,633,115	7,059,404

Source: Portway Extensions Concept Development Study

3.36 The Portway Extensions Conceptment Development Study additionally estimates the traffic impact of the PANYNJ PIDN plan. The goal of the PIDN is "to shift container traffic from trucks to alternative modes (rail and barge). This would help delay or reduce the need for highway improvements. At a program level, the PIDN aims to establish rail and barge services between the PANYNJ and a series of "dense trade clusters" located generally within a 75 to 400 mile radius." As such, the PIDN has significant implications for the amount of truck traffic generated by the ports in the future. The Study estimates that with no PIDN, container movements will generate "truck moves" at a rate of 1.48 truck move per container shipment. This number is estimated to drop to 0.94 with the PIDN[26].

North Jersey Transportation Planning Authority

3.37 Finally, the NJTPA published "Freight System Performance Assessment" as Appendix E of its Access & Mobility 2030 Final Report (April, 2005). Forecasts published in this report are based on the sources described in the preceding three Sections, as well as several others, such as the USACE Harbor Navigation Study. Table 3.11 displays forecasts of port movements, rail movements, highway freight demand, air freight, and distribution/warehousing space.

[26] Numbers are based on Portway Extension Study Tables VII.2, VII.3, and VII.4, and are calculated as annual averages. NJTPA

TABLE 3.10 NJTPA'S FREIGHT-RELATED FORECASTS

Mode	Scenario*	Avg. Ann. Growth	Base Year Volume	2025 Forecast
Marine (PANYNJ and private terminals)	Int'l Container, Scenario 1	3.5%	2,798,578 TEUs (2001)	6,398,107
	Int'l Container, Scenario 2	4.6%	2,798,578 TEUs (2001)	8,236,786
	Other Freight (approx.)	1.4%	93,107,904 tons (2003)	126,421,680
Rail	All Container, Scenario 1	5.6%	1,827,734 TEUs (2003)	6,015,930
	All Container, Scenario 2	3.9%	1,827,734 TEUs (2003)	4,177,251
	Non-Container Freight	2.4%	12,819,526 tons (2003)	21,826,764
Highway (AM peak, Portway Extension model network)	All Container, Scenario 1	3.0%	34,785 VMT (2000)	72,669
	All Container, Scenario 2	3.2%	34,785 VMT (2000)	76,344
	Other Trucks (average)	2.1%	328,864 VMT (2000)	551,409
	Non-Truck (average)	1.3%	10,545,579 VMT (2000)	14,678,449
Air	All Freight inc. air-truck	2.5%	964,117 tons (2003)	1,659,796
Warehouse	Warehouse Space	2.8%	671,218,968 s.f. (2004)	1,198,725,181

*** Scenario 1 based on CPIP/Portway Extensions forecasts; Scenario 2 based on Harbor Navigation Study**

Source: Access &Mobility 2030, NJTPA

Additional NJ Growth Factors

3.38 The baseline growth rates discussed in the Woods & Poole study through the Other Population and Employment Forecasts sections identify a plausible range of forecasts. However, each forecast corresponds to a "best estimate" by the organization making the projections. Depending on the methodology used, these forecasts may not account for growth from planned development projects or economic development/redevelopment initiatives. The latter category of development incentives, it should be noted, is designed to improve the growth prospects of particular geographic areas or industrial sectors.

3.39 Thus, additional factors for potential growth are considered for each New Jersey County. Two key questions to be considered are

- what growth is captured in the existing forecasts, and
- what are potential points of divergence from published forecasts.

3.40 Two potential sources of additional growth are considered here. The first covers existing and planned construction projects, and the second looks at development and redevelopment initiatives and programs that might lend to growth rates above what existing forecasts predict.

3.41 The Planned Development and Expansion Projects in NJ and Economic Development Initiatives sections below describe planned developments and economic development initiatives, respectively. The Additional Economic Development-Related Growth (Overlay) section estimates the additional growth that may flow from these factors.

Planned Development and Expansion Projects in NJ

3.42 Large-scale development projects may significantly increase employment and population. These projects may include office, industrial, commercial, residential, sport institutional and port expansion projects. This section identifies such projects (by county), providing a brief description and (when possible) describing development characteristics such as type (office, retail, casino, industrial, etc), square footages, number of units and hotel rooms. Sources are listed in Appendix B[27].

Newark/Jersey City Area

- *Prudential Center (Essex County)* – a new 19,500-seat arena that is home to the NHL's New Jersey Devils franchise. Opened in October, 2007.
- *Meadowlands Xanadu (Bergen County)* – a 4.8 million-square-foot family entertainment, sports, retail, office and hotel complex located at the Meadowlands Sports Complex. The planned opening date is Fall 2008.
- *Meadowlands Sports Complex (Bergen County)* – replacement of the existing New York Giants football stadium (capacity 78,000) with a new 82,000 seat stadium. The 55-acre project, includes 520,000 square feet of gross developable space. Planned opening 2009.
- *Secaucus Junction (Hudson County)* – a $1 billion office and retail project atop the Secaucus Junction rail station; which includes a 600 room hotel/conference center, 112,000 square feet of retail, and a 4,400 car parking garage. Includes 1,850 residential units.
- *Secaucus Transit Village* – a 60-acre transit village development including 1,700

[27] In addition to the sources listed in Appendix B, EDRG used phone interviews to cross-reference the above list with select state agencies. These include New Jersey Economic Development Authority, Office of Smart Growth, Department of Labor and Workforce Development, and Office of Economic Growth.

residential units. Currently in the planning phase.

- *Secaucus Brookfield* – a mixed-use development with 150,000 square feet of retail space, 2.2 million square feet of office space, a Hotel with 800 rooms, and 471 residential units. Currently in design phase.
- *Harrison MetroCentre (Hudson County)* – mixed-use development that includes three million square feet of "Class A" office space, 300,000 square feet of retail space, approximately 3,500 housing units, a hotel, and the new 25,000-seat Red Bull Park, the future home of the New York Red Bulls major league soccer team. Broke ground Sept 2006.
- *Trans-Hudson Expressway Tunnel (Hudson County)* – In 2006, the Federal Transit Administration (FTA) advanced the Trans-Hudson Express (THE) Tunnel project to the preliminary engineering phase of the federal "new starts" process. The proposed tunnel would double commuter rail capacity between New Jersey and New York. Construction of the $6 billion project would begin in 2009, with completion slated for 2016.

Atlantic City (Atlantic County)

- Harrah's Expansion – a 47-story, 964-room hotel tower, 172,000 square feet of entertainment/retail space, and additional slot and table games. Scheduled completion in 2008.
- Trump Taj Mahal Expansion – a 39-story, 786-room tower scheduled for completion in mid-2008.
- Pier at Caesars - a major new retail development near the halfway point of the Atlantic City Boardwalk. The first stores opened their doors in 2006, and as of early 2007, the center was 98 percent leased and committed with a tenant roster that includes Gucci, Coach, Louis Vuitton, Bottega Veneta, Salvatore Farragamo, Tiffany & Co., and Burberry.
- "The Walk" – This Phase II expansion of the existing outlet center creates an 8-block shopping district between the Convention Center and Boardwalk. The expansion will add 350,000 square feet of retail space to the existing 320,000 square feet, as well as Class A office space and residential units. Completed in 2007.
- Borgata Hotel Expansion – "The Water Club" will feature a 43-story, 800-room hotel with 18,000 square feet of meeting space. Completion expected in 2008.
- Sands Casino – The existing casino is being demolished for replacement with a $1.2 billion "mega" casino. Construction begins in 2007.

Economic Development Initiatives

3.43 Public and private organizations offer numerous economic development initiatives within New Jersey, targeting a variety of geographies, demographic groups, and industrial sectors. These initiatives may have a cumulative effect of increasing the overall growth prospects within select Counties and at the State level. The purpose of this section is to illustrate the key features of these development initiatives.

3.44 Appropriate diagrams and data tables also indicate the extent of these initiatives and

programs. This information casts a further perspective on development opportunities within the New Jersey area whilst some of the potential impacts are discussed in the subsequent Additional Economic Development-Related Growth (Overlay) section.

Portfields Initiative

3.45 The PANYNJ, in conjunction with the New Jersey Economic Development Authority (NJEDA), manages the Portfield Initiative program. The initiatives are designed to "help create opportunities to put brownfield sites back into productive use to support ocean, rail and air freight-related distribution and warehousing operations."[28] Within this initiative, sites are selected with characteristics making them good candidates for redevelopment into desired usage. These sites are then eligible for financial assistance, bond financing, regulation streamlining, or marketing assistance from PANYNJ and NJEDA. The following map shows the 17 sites that had been selected as of September, 2005 (see Figure 3.9). Combined, these sites total over 1500 acres in Essex, Hudson, Middlesex, and Union Counties.

[28] Source: Portfields Initiative Market Overview and Potential Site Locations, published by PANYNJ and NJEDA, September, 2005.

FIGURE 3.9 PORTSFIELD INITIATIVE SITES (SOURCE: PANYNJ)

Site	County	Developable Acres
1	Hudson	16.1
2A	Hudson	27
2B	Hudson	20
3	Essex	37.7
4	Essex	30
5	Essex	41.5
6	Essex	52
7	Union	28.9
8	Union	16.72
9	Union	179
10	Hudson	124
11a	Union	9.2
11b	Essex	24.2
12	Essex	26.3
13	Union	240
14	Middlesex	70
15	Middlesex	312
16	Middlesex	169
17	Middlesex	80.7

Urban Enterprise Zones

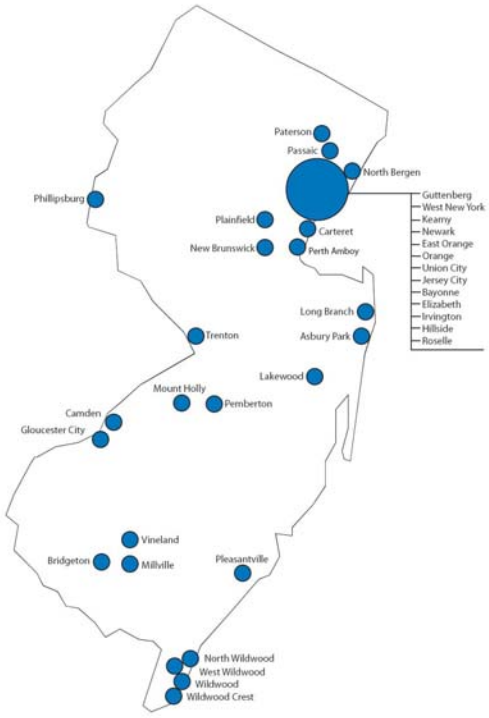
3.46 Managed by the New Jersey Commerce, Economic Growth & Tourism Commission, the Urban Enterprise Zone (UEZ) Program is the state's most comprehensive development initiative. It is targeted to improve New Jersey's "most challenged urban centers," and in 2005, it committed $50 million to 161 projects around the state. The program currently has 32 designated zones in 12 counties (see Figure 3.10 overleaf), and has generated 157,000 fulltime jobs and 27,000 part-time jobs in its 20-year history[29].

3.47 Eligible businesses can receive sales tax exemptions on equipment and supplies, including building materials, and corporate tax credits for hiring within designated employee groups. Additionally, qualified retail businesses may charge only 50% (3%) of the mandated 6 percent sales tax on all "in person" customer purchases[30]. Other benefits range from subsidized unemployment insurance costs to priority financial assistance for labor training. And companies in UEZs may be eligible for a $1,500 tax credit for each new full-time employee matching certain residence.

[29] Source: "Fiscal Year 2005 Annual Report," published by New Jersey Commerce, Economic Growth & Tourism Commission, Office of Urban Programs

[30] NJ current sales tax rate has increased to 7% and the UEZ rate is 3.5%

FIGURE 3.10 NEW JERSEY URBAN ENTREPRISE ZONES



County	Acres in UEZ	% of total County
Atlantic	2,455	0.6%
Bergen	13,304	5.0%
Burlington	16,015	3.0%
Camden	6,852	4.1%
Cape May	2,103	1.1%
Cumberland	13,733	3.7%
Essex	10,382	6.0%
Gloucester	275	0.1%
Hudson	7,602	18.6%
Hunterdon	1,084	0.4%
Mercer	2,554	1.7%
Middlesex	4,934	2.2%
Monmouth	2,523	0.8%
Morris	3,747	1.1%
Ocean	5,412	1.1%
Passaic	5,139	2.6%
Salem	388	0.1%
Somerset	372	0.2%
Sussex	1,688	0.5%
Union	5,558	7.9%
Warren	2,275	0.6%
New Jersey Total	108,394	1.9%

Source: New Jersey Smart Growth

Brownfields

3.48 The Brownfields Redevelopment Loan Program is an initiative to encourage urban revitalization. The program enables developers entering into a Brownfields Redevelopment Agreement with the State to borrow up to $750,000 from the NJEDA to meet remediation costs. Reimbursement comes from new state tax revenues generated by the project. In addition, the NJEDA works in conjunction with the New Jersey Department of Environmental Protection (NJDEP) to assist companies involved in hazardous discharge site investigation and cleanup with loans of up to $1 million for as long as 10 years[31].

[31] Source: Location New Jersey

3.49 The Brownfields program currently has 88 sites in 14 Counties registered on its "Brownfield Site Mart" webpage. Together, these comprise at least 1,640 acres of potential redevelopment, with the majority of properties located in heavily urban areas. Table 3.12 tabulates currently registered Brownfields by County.

TABLE 3.11 NEW JERSEY'S REGISTERED BROWNFIELDS

County	Registered Brownfield Sites, March 2007	Minimum Acres of re-developable land
Atlantic	8	60
Bergen	2	15
Burlington	1	151
Camden	3	4
Cape May	0	0
Cumberland	8	19
Essex	11	43
Gloucester	8	367
Hudson	0	0
Hunterdon	0	0
Mercer	13	25
Middlesex	2	258
Monmouth	0	0
Morris	0	0
Ocean	0	0
Passaic	12	27
Salem	14	9
Somerset	1	250
Sussex	0	0
Union	4	163
Warren	1	250
New Jersey Total	88	1641

Source: Brownfields Site Mart Website, March 2007

Other Statewide Initiatives

3.50 Five additional statewide economic development initiatives are described below. Table 3.13 shows some measures of the utilization of each of these programs in each County.

- *Innovation Zones*. These are established to spur collaboration between the State's public research universities and technology businesses, with the goal of translating academic research into commercial product development. Zones are eligible for financial, infrastructure, workforce, and housing support.
- *Foreign Trade Zones (FTZs).* New Jersey has five FTZs located in Morris, Union/Hudson, Mercer, Ocean, and Salem. Businesses operating in FTZs can be exempt from duties, and may have access to streamlined customs procedures.
- *New Markets Tax Credit (NMTC)*. The NMTC Program is a federal income tax credit designed to foster the development of commercial or mixed-use properties in low income communities. Investors in businesses and development projects located within a New Markets Zone are provided a 39% federal income tax credit based on the amount of the investment. The credit is claimed over a seven-year period.
- *Community Renewal Initiative.* Administered by the U.S. Department of Housing and Urban Development (HUD), Renewal Community tax incentives encourage businesses to open, expand, and hire local residents.
- *Business Employment Incentive Program (BEIP).* The NJEDA offers BEIP grants to firms expanding or relocating in the state that create at least 10 new jobs in the high-tech/biotech field or 25 new jobs in other sectors.

TABLE 3.12 COUNTY-LEVEL METRICS OF SELECT STATEWIDE ECONOMIC DEVELOPMENT INITIATIVES

County	Innovation Zone (acres)*	Foreign Trade Zone (Y/N)**	New Market Tax Credit (acres)*	Community Renewal Initiative (acres)*	BEIP Grants (No. of grants, 1996-2007)***
Atlantic			104,408		1
Bergen	392		1,952	4,108	41
Burlington	252		5		22
Camden	4,934		44	6,641	11
Cape May					0
Cumberland			51	2,553	8
Essex	1,423		1,557	10,915	16
Gloucester	1,200		17		11
Hudson		Y	2	829	78
Hunterdon	176			1,325	3
Mercer		Y		5	26
Middlesex	11,997		56	159	38
Monmouth				0	5
Morris	226	Y		1,597	35
Ocean		Y			4
Passaic	422		1,504	576	9
Salem		Y	3,857		1
Somerset	20,123		5,458	500	35
Sussex			29,897	2,893	1
Union	212	Y	9,972	1,909	16
Warren	137		2,569	1,005	0
New Jersey Total	41,493		161,349	35,015	361

***Source: New Jersey Smart Growth**

****Source: U.S. FTZs Board website**

*****Source: NJEDA**

Local Initiatives

3.51 In addition to the statewide programs described above, some New Jersey Cities have their own agencies and programs to promote economic development. Although such local initiatives are used widely throughout the state, they are used most intensively in cities of Newark/Jersey City, Camden, Trenton, and Atlantic City.

Additional Economic Development-Related Growth (Overlay)

3.52 This section considers the growth impacts that may result from the planned projects and economic development initiatives described in the Planned Development and Expansion Projects in New Jersey and the Economic Development Initiatives sections. All impacts are assumed to be additional to the 2025 forecast ranges presented in the Forecast Ranges and Alternatives section. These results are estimated as a possible range of additional impacts, where the "Low" scenario is set to zero (i.e., all future growth is fully captured in existing forecasts). "Central" and "High" scenarios are developed based on a range of assumptions as to the overall effectiveness of economic development initiatives and impacts of planned developments, combined with characteristics of these incentives and developments.

Effects of Planned Developments

3.53 All development projects listed in the Planned Development and Expansion Projects in New Jersey section are included in the final forecast scenarios shown in the Forecast Ranges and Alternatives section. These are separated into two groups: those that have been methodologically included into DLWFD population and employment forecasts, and those that have not[32]. As such, the first category is included in the forecast scenarios, and the second category is included in the "additional growth overlay". Full results are discussed in the section "Planned Development and Expansion Projects in New Jersey" section.

3.54 In addition, the Trans-Hudson-Expressway project is not included because it is a transit tunnel, and therefore is not a major generator of highway trips. The Meadowlands Sports Complex is already addressed because it is largely replacing a similar existing facility at the same location, and therefore may not generate any net permanent jobs. Table 3.14 lists three projects that are sufficiently new to not have been incorporated in published forecasts.

[32] Based on communication with Tom Sheppard, position New Jersey Dept. of Labor and Workforce Development.

TABLE 3.13 LARGE-SCALE DEVELOPMENT PROJECTS CURRENTLY IN PLANNING PHASE (INCLUDED IN "ADDITIONAL GROWTH OVERLAY" SCENARIOS)

Project	County	Sq. Ft. Retail	Sq. Ft. Office	Hotel Rooms	Res. Units	Increase in Pop.	Increase in Employment
Prudential Center†	Essex	**					**
Meadowlands Sports Complex†	Bergen	250,000	270,000			0	1,330
Meadowlands Xanadu†	Bergen	1,000,000	3,800,000			0	16,200
Secaucus Junction‡	Hudson	112,000	1,000,000	600	1,850	3,700	4,262
Secaucus Transit Village‡	Hudson				800	1,600	0
Secaucus Brookfield‡	Hudson	150,000	2,200,000	800	471	0	0
Harrison MetroCentre‡	Hudson	300,000	3,000,000		3,500	7,000	12,300
Harrah's Casino Expansion†	Atlantic	172,000		964		0	413
Trump Taj Mahal Expansion‡	Atlantic			786		0	197
Pier at Caesar's†	Atlantic					0	0
"The Walk" †	Atlantic	350,000	250,000*			0	1,350
Borgata Hotel Expansion‡	Atlantic			800		0	200
Sands Casino†	Atlantic	250,000*		1,000*		0	500

† **Projects included in forecast scenarios**

‡ **Projects included in "Additional Growth Overlay"**

*** Estimated based on project description and values for similar projects**

**** Not available**

Sources shown in Appendix B

3.55 Employment is estimated based on project characteristics and ratios of sq. ft./employee and hotel rooms/employee. Using values of one employee per 1,000 sq. ft. for retail use, one employee per 250 sq. ft for office space, and one employee per four hotel rooms yields growth of 36,752 jobs and 12,300 people in New Jersey.

Effects of Economic Development Initiatives

3.56 Economic development initiatives may also yield population and employment growth beyond the estimates presented in the Baseline Growth Model Forecasts section. Such programs are intended to attract investment capital into targeted geographic areas or industrial sectors. This capital may be attracted from elsewhere in the country or from international investors. As such, the results of successful programs may be considered exogenous to "normal" economic development. Effects of redevelopment programs and initiatives are determined, by County, based on two considerations:

- *Scope of programs in County.* Counties with a large number of redevelopment programs or with a large portion of land area under the jurisdiction of specific programs are reasoned to have a greater amount of additional government-induced growth.
- *Existing County Growth Patterns.* Counties with low forecasted growth rates are reasoned to get a greater share of additional growth because they are receiving a wider range of local and statewide economic development initiatives.
- *Overall Statewide Effect.* Finally, taken together, the additional development induced by economic development initiatives should not push total statewide employment or population growth beyond a reasonable upper-limit. This constraint is based on the assumption that there is a fixed amount of money available for statewide programs, and that jurisdictions are "in competition" for additional growth.

3.57 The estimates are developed based on the county-level attributes shown in the tables and figures in the Economic Development Initiatives section. Assumptions are made regarding potential employees per unit of metric in the tables (e.g., per acre or per grant), and estimates are categorized by industrial sector and county based on an interpretation of the specific initiative's target. Those incentives that do not target a specific set of industries are allocated to all industrial sectors based on county-level proportions predicted by DLWFD for 2014.

3.58 This methodology yields an estimate of 51,500 additional statewide jobs by the year 2025, with 105,000 additional New Jersey residents. Complete results are shown in Appendix A and are discussed further in the Forecast Ranges and Alternatives section.

Forecast Ranges and Alternatives

3.59 The analysis in the Baseline Growth Model Forecasts and Additional NJ Growth Factors sections yield a range of alternatives for county level forecasts. This section summarizes these results, providing 4 growth scenarios and 3 estimates of "additional growth".

EDRG-DLWFD

3.60 This section presents summary forecast estimates, including assumptions and methodology. A "base" forecast is established that draws on the various sources discussed in the Baseline Growth Model Forecasts section, recognizing methodological differences. The DLWFD forecasts are selected as the best overall source for county-level forecasts because (1) they are developed in a consistent manner, (2) employment forecasts are disaggregated by industrial sector, and (3) they undergo a vetting process with local officials. It should be noted that DLWFD employment forecasts are only for 2004-2014; 2025 levels are calculated based on growth rates calculated for this period.

3.61 To ensure that forecast scenarios fall within a reasonable range, the DLWFD county-level projections are aggregated to state totals and compared with other state forecasts. The employment growth projection of 1.01% per year lies roughly in the middle of the range forecasted by three other sources (See Table 3.2)[33]. In addition, it is very close to the R/ECON projection, which is taken to be the most accurate forecast *at the state level*. As such DLWFD's total employment projection are adopted as the state and county growth scenario.

3.62 The statewide DLWFD population projection (0.62% per year) is the lowest among the range of sources, and it assumes a strong rise in the labor force relative to overall population. The R/ECON population projection is therefore adopted as the "Central" statewide growth scenario[34].Statewide 2025 population levels calculated using this growth rate are allocated to counties based on proportions calculated from the DLWFD 2014 forecasts.

TABLE 3.14 STATEWIDE SUMMARY RESULTS FOR FORECAST SCENARIOS (AVG. ANNUAL % GROWTH, 2005-2025)

	Statewide Growth Scenario
Population	0.74%
Employment	1.01%

Source: EDR Group, based on R/ECON and DLWFD projections

[33] The following formula is used to calculate average annual growth rates: [(Xt+_t - Xt) / Xt] / _t

[34] Using R/ECON's population projection with DLWFD employment projections yields an increasing labor force participation rate, but with a slower rate of growth.

3.63 To translate the population projections to the county level, the growth rates shown in Table 3.14 are used to calculate 2025 statewide levels (using 2004 DLWFD values as a "base"). These are then allocated to counties based on proportions derived from unadjusted 2014 DLWFD forecasts.

3.64 The statewide employment projections are translated into county and sector levels by first calculating 2025 levels using the same method as for population. These statewide totals are then allocated to county/sector categories using a "biproportional matrix balancing" technique, where county and sector totals (DLWFD 2014) are used in the allocation. County-level results for population and employment are displayed in Tables 3.15 and 3.16; results with full sector breakout are shown in Appendix A.

Woods & Poole

3.65 In addition to those described in the EDRG-DLWFD section, Woods & Poole forecasts are provided as an alternative source. It should be noted that (1) Woods & Poole uses a slightly different employment definition than DLWFD, and (2) sector categories (shown in Appendix A) are different than those used in the EDRG-DLWFD section. County-level forecasts are summarized in Tables 3.15 and 3.16.

Additional Growth Layer

3.66 The additional growth layers derived in the Additional Economic Development-Related Growth (Overlay) section are also shown in Tables 3.16 and 3.17 (with sector-level data shown in Appendix A).

3.67 This may be perceived as the absolute upper-limit to New Jersey's growth prospects for 2025. While this value is higher than any published forecast, it is slightly below actual employment growth from 1995-2005 (Table 3.16). As such, it is within the range of possibilities, particularly if the redevelopment initiatives discussed in the Economic Development Initiatives section are successful in drawing outside investment capital into New Jersey.

TABLE 3.15 SUMMARY COUNTY RESULTS FOR POPULATION FORECASTS

	2025 Forecast Scenarios*	W&P	Add'l Growth Overlay Scenarios* (2005-2025)
County			
Atlantic	326,881	324,012	3,421
Bergen	1,005,173	963,069	10,521
Burlington	543,983	555,039	5,694
Camden	582,211	547,232	6,094
Cape May	105,485	122,000	1,104
Cumberland	172,435	161,495	1,805
Essex	874,237	858,308	9,150
Gloucester	344,768	341,587	3,609
Hudson	644,562	683,255	6,746
Hunterdon	161,805	178,011	1,694
Mercer	420,815	424,964	4,404
Middlesex	903,061	954,857	9,452
Monmouth	739,723	805,808	7,742
Morris	581,189	607,087	6,083
Ocean	693,216	745,449	7,256
Passaic	556,964	549,321	5,830
Salem	76,763	73,568	803
Somerset	383,405	423,392	4,013
Sussex	191,140	204,148	2,001
Union	589,264	558,152	6,168
Warren	137,989	139,098	1,444
New Jersey	**10,035,071**	**10,219,852**	**105,033**

***Source: EDRG**

TABLE 3.16 SUMMARY COUNTY RESULTS FOR EMPLOYMENT FORECASTS

	2025 Forecast Scenarios*	W&P	Add'l Growth Overlay Scenarios* (2005-2025)
County			
Atlantic	180,940	223,160	3,203
Bergen	569,222	712,704	4,007
Burlington	261,715	361,342	2,609
Camden	261,600	305,162	3,379
Cape May	55,658	71,260	210
Cumberland	73,479	81,575	2,332
Essex	436,524	524,546	5,261
Gloucester	133,782	158,259	957
Hudson	293,001	363,622	6,785
Hunterdon	64,334	103,619	574
Mercer	282,941	307,535	1,357
Middlesex	489,237	660,794	5,612
Monmouth	317,723	429,654	440
Morris	375,861	491,440	2,215
Ocean	201,016	262,281	791
Passaic	210,327	265,033	1,113
Salem	27,267	34,261	282
Somerset	217,067	314,845	4,377
Sussex	57,188	77,027	1,677
Union	291,521	318,350	3,543
Warren	47,148	55,381	810
New Jersey	**4,847,552**	**6,121,850**	**51,536**

***Source: EDRG**

External Zones

3.68 Finally, Woods & Poole forecast data is provided in Appendix A (Tables A.11 and A.12) for a selected set of counties proximate to New Jersey.

4. BEHAVIORAL RESEARCH

4.1 This section provides an overview of the behavioral research component of the study. This included a review of the existing evidence on relevant behavioral parameters and a survey that collected fresh data on users of the NJTP, the GSP, and the ACE.

4.2 The section is structured as follows:

- The Review of Existing Evidence section reviews key issues in a range of literature from New Jersey, the surrounding region and across the United States. The Key Issues include topics such as response to tolls, alternatives available and varied pricing options. The results of this section provide the basis for our fieldwork.
- The Behavioral Research section presents the theory, methodology, and results of our Behavioral Survey. The areas tested include people's perception of issues such as tolls and congestion, alternatives available, their value of time and changes over time. The final section presents a summary of the results for the three individual roads, the NJTP, GSP and ACE.

4.3 The survey questionnaire is included in Appendix D. This is a complete and unedited script of the internet questionnaire, the definitive and final version used by TNS Custom Research to program the computerized questionnaire that went live on the internet.

Review of Existing Evidence

4.4 This section summarizes the relevant literature that has been found on the subject of demand forecasting parameters and discusses key issues of relevance to the modeling and forecasting work.

4.5 We had identified that these issues included price elasticities of demand for toll roads, and values of time. The area of interest was New Jersey but the geographical focus for the purpose of the literature review was widened to accommodate relevant evidence from elsewhere in the United States. The literature review was done mainly by Internet, and refers to documents that were publicly available at the time of writing.

Key Issues

4.6 There are several key issues that deserve special consideration. The following list is not intended to be exhaustive, but aims to cover some of the most important issues.

Low Tolls

4.7 The tolls in New Jersey are quite low, and have been kept low relative to inflation for many years. It is likely that the overall cost levied by the State on motorists (in terms of both tolls and fuel taxes) is too low relative to the marginal cost per trip of maintaining the

highway network. Recent research by Ozbay et al[35] showed that if the marginal costs per trip were to be met by fuel tax alone the taxation rate would have to increase more than tenfold. It is not too far fetched to suggest that in the absence of contractual or regulatory restrictions, a private operator seeking to maximize gross revenue would be interested in raising tolls by a significant factor, in the region of 5 to 10 times their present level.

Nonlinear response to price changes

4.8 The response to a change in tolls is not necessarily linear; indeed, the logit model that is often used to predict choices implies that the elasticity of demand to price depends on the competitive position as measured by the difference in utility between the option under consideration and the alternative(s), and the scale of the measured utility relative to the random error component of the model. What this means in practice is that (a) if the option under consideration is quite similar to the other competing alternatives in terms of utility, the price elasticity of demand will be greater than if there is a big difference in the utilities, (b) greater sensitivity to price will result in a greater elasticity, and (c) the effect of a large change in prices will not probably be the same as linearly extrapolating the effect of a small change in prices. Therefore one has to exercise caution in extrapolating results based on small price differences to forecast the effects of much bigger price changes.

Changes over time

4.9 There is clearly a big difference, at least perceptually, between increasing tolls 500% overnight and doing so incrementally over, say, five years. There is not much evidence on what the response to a large step-change would be. All the evidence that has been found so far is based on incremental changes made over years and sometimes decades.

Distributions vs. Point Estimates

4.10 In recent years it has become best practice in discrete choice modeling to estimate the distributions of key parameters such as the value of time, not just point estimates. It has been shown that these 'random parameters' models tend to fit the data better and are behaviorally more realistic. In a recent Transport Research Board (TRB) presentation, Moshe Ben-Akiva[36] argues that not taking into account the distribution of the value of time can lead to misleading results in studying different road pricing scenarios, as shown in Figure 2.1. The difference visible in the graph is probably due to the distributional approach better representing the proportion of the market that is prepared to pay higher

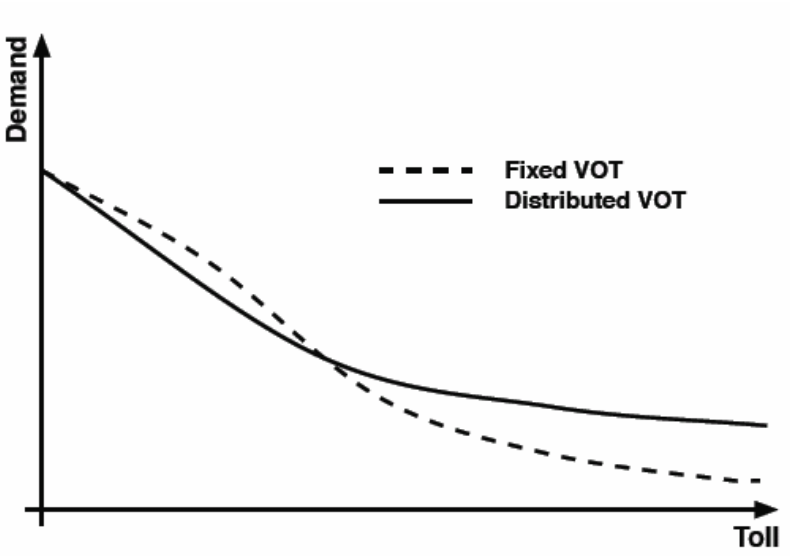
[35] Ozbay, K., Bartin B., Berechman J. (2001), 'Estimation and Evaluation of Full Marginal Costs of Highway Transportation in New Jersey', Journal of Transportation and Statistics, Volume 4 Number 1, Bureau of Transportation Statistics. Available online at time of writing:

http://www.bts.gov/publications/journal_of_transportation_and_statistics/volume_04_number_01/paper_06/

[36] Moshe Ben-Akiva (2004),'Crucial Considerations for Forecasting Consumer Reaction to Tolls', presentation to the 83rd annual Transport Research Board meeting.

tolls.

FIGURE 4.1 THE EFFECT OF TAKING INTO ACCOUNT THE DISTRIBUTION OF THE VALUE OF TIME[37]



Time-of-day Pricing, Value Pricing, Congestion Charging

4.11 To make best use of a highway, 'value pricing' or congestion charging can be very beneficial. The NJTP already has time-of-day pricing but with a relatively low differential in price of approximately 15% between peak and off-peak periods. The United States Department of Transportation (USDOT) Federal Highway Administration (FHWA) has a major research program in progress on value pricing[38], with several pilot projects already in existence. From the point of view of forecasting the response to potential changes in the toll schedule, the extent to which the differential between peak and off-peak tolls is changed is important, because the types of response will differ.

4.12 Increasing the peak toll will result in some people paying it, others shifting their trip time earlier or later, others ride-sharing, still others shifting to alternative routes or modes. On the other hand, changing the tolls on all time periods will result in a different response as the option of changing the time of the trip is made redundant.

Alternatives

4.13 There are several ways in which people can adapt to a hike in the tolls. Behavioral adaptation could potentially include changing (in approximate order of how drastic the change is):

[37] Ibid.

[38] http://www.ops.fhwa.dot.gov/tolling_pricing/value_pricing/index.htm

- *Time period* - in the case of relative changes in the tolls applying to specific time periods.
- *Route* - in many cases, however, alternative routes offer considerably longer and more uncertain journey times
- *Vehicle occupancy* - ride sharing can reduce the trip costs per passenger.
- *Mode* - flying for long-distance through passenger traffic, rail for certain other ODs (the NJ Transit rail network focuses on trips to and from New York),
- *Destination* - in some cases people might consider going to a different city if there is a big difference in the cost of the trip
- *Activity* - some people might offset the higher costs of travel by doing the activity less often, or not at all.

4.14 Recent research by Ozbay et al[39] on the behavioral response to the time of day pricing initiative on the NJTP showed that the most common responses to increased peak-hour tolls and reduced off-peak tolls were to travel by alternative routes, to reduce use of the Turnpike, to increase ride sharing, and to increase travel in off-peak periods. However it is important to note that approximately 93% of individuals did not change their travel behavior at all in response to the changes to the toll schedule in the year 2000. The research concluded that faced by a small differential between peak and off-peak tolls being introduced, the demand was very inelastic. This is not surprising, but unfortunately it is not possible to extrapolate the resulting demand elasticities to much larger changes to the tolls.

Politics and Research

4.15 While from a theoretical point of view it is desirable to obtain geographically-specific and up-to-date evidence on how people might respond to significant hikes in tolls, there are political issues. These things are always controversial, and it is clear that in the past road pricing policy has been in the vein of keeping taxes low and voters happy. Therefore, it is to be expected that there is the risk of triggering a backlash if market research on the subject is not done in a sensitive way. On the other hand, sanitizing the research to the extent that the relevant questions are not asked would be counter-productive.

[39] Ozbay, K., J. Holguín-Veras, O. Yanmaz-Tuzel, S. Mudigonda, A. Lichtenstein, M. Robins, B. Bartin, M. Cetin, N. Xu, J.C. Zorrilla, S. Xia, S. Wang, and M. Silas (2005). 'Evaluation Study of New Jersey Turnpike Authority's Time-ofday Pricing Initiative'. Publication FHWA-NJ-2005-012.FHWA, U.S. Department of Transportation. Available online at time of writing:

http://knowledge.fhwa.dot.gov/cops/hcx.nsf/All+Documents/BA2414CE1EAC182685256DC500674090/$FILE/njtpa_final_report_may_31_2005.pdf

Theoretical Considerations

Elasticities

4.16 Todd Litman has written a useful paper on Transportation Elasticities[40] that looks in detail at the theory, the factors that affect them, and goes on to review the elasticity values that have been obtained in a range of different studies. Amongst the theoretical points of relevance the following are particularly important:

- the difference between elasticities (also known as arc elasticities) and shrinkage factors (the percentage change in demand divided by the percentage change in price is a shrinkage factor, not an elasticity)[41]. Shrinkage factors work in a similar way to elasticities for small price changes, but diverge for larger changes.
- factors affecting price sensitivity[42]

Stated Preferences and Revealed Preferences

4.17 Stated preference (SP) data is based on observations of what people say they would do, while revealed preference (RP) data is based on observing actual behavior. There are measurement problems and technical issues with both types of data. However, there is general consensus that it is not a good idea to use stated preference data as the sole source of data for a model, ideally revealed preference data should also be used to ensure consistency with real observed behavior. This can mean adjusting the scale of a set of stated preference model parameters so that the model behavior is more consistent with the available revealed preference data, even if data on observed behavior is only available at the aggregate level.

4.18 Evidence from several studies of California toll roads where both RP and SP data were collected[43] showed that values of time based on SP data were approximately half the size of the values of time based on RP data - a very significant difference. This is consistent with our own anecdotal evidence of SP experiments about toll roads, which suggests that people will deliberately seek to understate their willingness to pay tolls in exchange for travel-time savings.

[40] Todd Litman (2005), 'Transportation Elasticities', Victoria Transport Policy Institute (www.vtpi.org). Available online at time of writing: http://www.vtpi.org/elasticities.pdf

[41] Ibid., page 4.

[42] Ibid., pages 8 - 10.

[43] Brownstone, D. and Small, K. A. (2004), 'Valuing Time and Reliability: Assessing the Evidence from Road Pricing Demonstrations', University of California at Irvine. Available online at time of writing: http://orion.oac.uci.edu/~dbrownst/votvor.pdf

Evidence

4.19 In this section the most important sources of evidence are considered one by one.

Official Guidance on the Value of Time

4.20 In 1997, the USDOT issued guidance on values of time for use in cost-benefit analysis[44], subsequently updating some parts of this guidance in 2003[45]. This guidance includes a summary literature review, and some references to the use of values of time in demand forecasting. Most sources referred to are U.S. studies conducted in the 1990s, and so are quite dated, but still provide useful contextual information. Values of time are recommended as percentages of the hourly wage rate, for categories based on mode, journey purpose and O-D trip type (local, interurban, etc.). For instance, surface travel on personal (non-business) trip purposes has a recommended value of time of 50% of the wage rate. This recommendation is consistent with (and perhaps partly based on) the recommendation of Kenneth Small, who reviewed the available evidence in 1992[46]. For significant changes to the transport system such as major improvements or the addition of new modes or routes, it is recommended that specific values should be used that are based on local data, with fresh data being used if no appropriate historical data is available. Dan Brand of CRA emphasized this, underlining the inappropriateness of the official evaluation values of time for the purposes of forecasting.

Policy Issues for Congestion Charging

4.21 Calfee and Winston[47] undertook a nationwide Stated Preference (SP) survey to look at some of the political issues related to congestion charging and a range of factors that could influence the willingness of travelers to pay tolls in exchange for travel-time savings:

- tolls versus payment for a technological fix that speeds up travel;
- where the money collected goes:
  - to maintenance and construction
  - to state highway fund
  - to mass transit
  - redistributed to poorer citizens

[44] Office of the Secretary of Transportation, U.S. Department of Transportation (1997), 'The Value of Saving Travel Time: Departmental Guidance for Conducting Economic Evaluations'. Available online at time of writing: http://ostpxweb.ost.dot.gov/policy/Data/VOT97guid.pdf

[45] Office of the Secretary of Transportation, U.S. Department of Transportation (1997), 'Revised Departmental Guidance: Valuation of Travel Time in Economic Analysis'. Available online at time of writing: http://ostpxweb.ost.dot.gov/policy/Data/VOTrevision1_2-11-03.pdf

[46] Kenneth A. Small (1992), 'Urban Transportation Economics'. Harwood Academic Publishers, Philadelphia.

[47] Calfee, J. and Winston, C. (1995), 'The Value of Automobile Travel Time: Implications for Congestion Policy', Journal of Public Economics, 69(1), 83-102.

- whether the toll road is public or private.

4.22 They found that the willingness to pay for travel-time savings was generally unaffected by any of these factors - none made a significant difference. They estimated a very low stated willingness to pay for time savings (approximately $4 per hour), and argued that this could be due to self-selection of people with low values of time on long-distance car commuter routes, with other people choosing to travel by plane. However, it is also possible that the low value of time produced by this study is to do with the measurement methodology used. Brownstone and Small[48] compare value of time estimates based on RP and SP data from two existing toll road systems in California, and find that the SP estimates are consistently much lower (about half the size) compared to the RP estimates.

NJTP Time of Day Pricing Study

4.23 Ozbay et al wrote a research paper[49] that summarizes a much bigger (348 pages) research report[50] on behalf of NJDOT looking at the impact of the introduction of time-of-day pricing on the NJTP. This research is relevant, recent, and appears to be of good quality (although Ozbay drew our attention to the fact that the RP data is based on a telephone survey sample that is believed to have a certain bias towards higher-than average income households).

4.24 Revealed preference evidence is provided on:

- values of time;
- disaggregate price elasticities of demand for different time periods and journey purposes, based on data for individual travelers;
- aggregate price elasticities of demand for different time periods, based on aggregate traffic data before and after the introduction of time-of-day pricing.

4.25 The study found relatively high values of time and low elasticities, with elasticities in the peak periods even lower than those in the off-peak periods. The authors consider these results to make sense in the context of relatively little competition from alternative modes and routes. They even suspect that people change between time periods in response to travel time (congestion) rather than the difference in tolls, which is relatively small – the time of day pricing scheme has peak period tolls on average 15% higher than tolls for off-peak periods, and the absolute level of tolls is quite low.

[48] Brownstone and Small (2004), op cit.

[49] Ozbay K., Yanmaz-Tuzel O., and Holguín-Veras J. (2006), 'Theoretical Derivation of Value of Travel time and Demand Elasticity; Evidence from NJ Turnpike Toll Road", paper submitted for publication and presentation at the Transportation Research Board's 85th Annual Meeting, Washington D.C., 2006. Available online at time of writing: http://www.mdt.mt.gov/research/docs/trb_cd/Files/06-2506.pdf

[50] Ozbay et al (2005), op cit, p 142.

4.26 The study also includes a major literature review and related reference lists looking at both values of time and demand elasticities. Other material of relevance includes:

- a descriptive survey looking at user responses to the introduction of time-of-day pricing, and
- an analysis of all the toll facilities in the U.S. including descriptive statistics on the toll levels, and a statistical analysis of the factors affecting the toll levels.

Evaluation Study of PANYNJ's Time of Day Pricing Initiative

4.27 This is another major study done on behalf of NJDOT, undertaken in parallel to the NJTP study and by a team including two of the lead authors of the NJTP study (Hoguín-Veras and Ozbay). Both the executive summary[51] and the final report[52] were available on the Internet at the time of writing. The report includes a useful literature review covering other studies that have obtained demand elasticity estimates, both in the United States and elsewhere.

4.28 Unlike the NJTP work, there was no econometric analysis done as part of this study, and shrinkage factors are reported instead of true elasticities. More seriously, there is no consideration of cross-effects between the peak and off-peak toll levels (the authors acknowledge that the peak and off-peak time periods are essentially substitute services and one would expect this to be an important effect), nor between the different tolled facilities that are close to one another.

4.29 Results of the analysis of the available traffic data before and after the changes to the tolls include short-term shrinkage factors (percentage change in demand divided by percentage change in price) for different user groups (cars and commercial vehicles) of each tolled facility, at different times (times of day and week / weekend). These were calculated comparing price and demand data for April - August 2000 and April - August 2001. The values reported describe the percentage increase in off-peak traffic before and after each tolled period, in response to the percentage decrease in the toll compared to its value before the start of time-of-day pricing. The advantage of this is that it gives an idea of how people tend to shift their departure times. Curiously, the shrinkage factors relating the decrease in peak hour traffic to the increase in the peak-hour toll are not reported. Also, the new tolls charged differed from one facility to another, meaning different percentage changes to prices, but cross-elasticities are not reported (presumably it was not possible to

[51] Holguín-Veras J., Ozbay, K., Allison de Cerreño (2005), 'Evaluation Study of Port Authority of New York and New Jersey's Time of Day Pricing Initiative' - Executive Summary, U.S. Department of Transportation. Available online at time of writing: http://www.rpi.edu/~holguj2/PA/Executive Summary.pdf

[52] Holguín-Veras J., Ozbay, K., Allison de Cerreño (2005), 'Evaluation Study of Port Authority of New York and New Jersey's Time of Day Pricing Initiative' - Final Report, U.S. Department of Transportation. Available online at time of writing:

http://knowledge.fhwa.dot.gov/cops/hcx.nsf/All+Documents/F28934FF571FF3C685256DB10063E81B/$FILE/PANYNJ Final Report.pdf

estimate them). Another aspect of the results that requires caution is that on these tolled facilities the toll is only charged in one direction, meaning that the return journey is free.

4.30 The shrinkage factor analysis suggests that the implementation of peak-hour tolls resulted in shifts of demand to off-peak periods, and while the traffic grows both pre-peak and post-peak in response to the toll reductions, the demand shifts to pre-peak time periods seem to be stronger than those to post-peak periods.

4.31 Long-term shrinkage factors are also reported (referring to the change in demand across a two-year time period), but unfortunately this two-year period includes the 11th of September 2001, which adds considerable uncertainty to how the results should be interpreted.

4.32 The telephone survey included some simple stated preference questions; these are referred to in the report but the results of analyzing this data are not reported - reading between the lines, something probably did not work well.

Tappan Zee Bridge Study

4.33 This was a USDOT FWHA Congestion Pricing Pilot Project, conducted in 1999 by Resource Systems Group, Wilbur Smith Associates and Howard/Stein-Hudson Associates for the New York State Thruway Authority[53]. The Tappan Zee Bridge connects Westchester and Rockland counties in New York. The emphasis of the study was on evaluating the potential of congestion charging to make better use of the bridge capacity, thus reducing peak hour congestion. As part of the study, market research including focus groups and Stated Preference research was conducted. Both private road users and commercial vehicles were included in the study. The SP data was used to estimate values of time for road users and to provide inputs to modeling different congestion charging scenarios. The survey looked in detail at how road users would behave in response to peak-hour tolls. The choice model included the following options:

- Drive on the Tappan Zee bridge as now
- Drive on the Tappan Zee bridge at a different time
- Drive on the next best bridge
- Registered carpool with toll discount on the Tappan Zee bridge
- Ride a new bus across the Tappan Zee bridge
- Do not make the trip

[53] Resource Systems Group, Wilbur Smith Associates and Howard/Stein-Hudson Associates (1999), 'Tappan Zee Congestion Relief Study Final Report', New York State Thruway Authority. Available online at time of writing: http://www.tzbsite.com/tzblibrary/studies/1999-08/study-199908.pdf

4.34 The full set of choice model parameters are reported in the final report. It is stated that 'most travelers do actively consider changing some aspect of their travel in response to pricing changes', but tabulations are not provided because 'price ranges and travel times tested may be outside the range of what could be realistically implemented'. The study also collected data on the extent to which travelers were flexible with their departure times. Overall 72% of car travelers had some degree of travel time flexibility, and employees in all segments were more able to shift their trip times later than earlier.

Triborough Bridge and Tunnel Authority Facilities

4.35 URS recently prepared a report for the Triborough Bridge and Tunnel Authority on their bridge and tunnel facilities[54]. Amongst other things, the report provides shrinkage factors (approximate elasticities) for each of these facilities calculated as averages of the shrinkage factors resulting from all the above-inflation toll rises, going back approximately 30 years. This data shows how the elasticity to toll rises tends to vary according to the level of competition, in particular the proximity of other toll-free crossings. The elasticities provided in this report are also interesting because unlike much of the evidence reviewed the data does not concern the imposition of value pricing or congestion charging tolls that create a differential between peak and off-peak tolls.

California Toll Road Studies

4.36 There is a considerable amount of evidence available from toll road post-implementation studies of the SR-91 (Orange County) and I-15 (San Diego) in California. Brownstown and Small[55] provide a very useful overview of the evidence concerning the value of time, looking in particular at the sources of observed and unobserved heterogeneity and the differences between values derived from RP and SP data. They also look at the available evidence on the value of travel time reliability. When the authors re-weighted the I-15 data to match the profile of the SR-91 commuters, they found that both data sets gave a value of time of approximately $20 per hour. They also found that the RP estimates of the value of time were approximately twice the size of the SP estimates, where the SP data was drawn from samples that at least overlapped the RP samples. Some of the survey data is publicly available on the Internet.

[54] URS (2006), 'History and Projection of Traffic, Toll Revenues and Expenses and Review of Physical Conditions of the Facilities of Triborough Bridge and Tunnel Authority', Triborough Bridge and Tunnel Authority. Available online at the time of writing:

http://www.mta.info/mta/investor/pdf/disclosure2006e.pdf

[55] Brownstone, D. and Small, K. A. (2004), op cit.

Lee County Florida Bridges Studies

4.37 The variable pricing program implemented on the Lee County Bridges in Florida offered an opportunity to study the price effect isolated from congestion, as these bridges did not suffer from severe congestion[56]. In this case a 50% off-peak discount was offered to transponder users, the peak toll remaining unchanged. The effects of this change on demand are estimated using shrinkage factors. Demand was found to be relatively inelastic to the introduction of variable pricing, as was the case in New Jersey, although some shifting from peak to off-peak time periods was detected.

Indiana Toll Road Study

4.38 Looking at work carried out on the Indiana Toll Road, modeled elasticities were as follows. On the first 24 miles - close to Chicago - where volumes are comparatively high, and there is a single toll barrier with a toll of $.08/ mi and $.29/ mi, modeled elasticities were -0.23 (cars) and -0.07 (trucks). In the rest of the 125 mi of lowly used inter-urban, tolls were 3.12/ mi and 9.62 /mi, growing to 5.08 and 20.3. Here elasticities were estimated as: cars -0.69 / -0.34 and trucks -0.19 /-0.14.

Houston Toll Road Study

4.39 Looking at work carried out by Maunsell Aecom on the Houston toll road system, they found elasticities ranging between -0.08 and -0.32 related to increased toll rates implemented in 2004. The toll roads that have a predominantly radial function produced the higher elasticities, those that are more orbital in nature and serve as a bypass the lower elasticities.

Historic Traffic and Revenue Data

4.40 The analysis of traffic and revenue data should ideally be done using an econometric model that isolates the different factors influencing traffic growth. These would typically include the toll, the price of gas, car ownership, economic activity, and demographic variables such as population growth. Unfortunately it was not possible to undertake this type of detailed analysis as part of this study, and a simpler, more limited approach was required. The danger of such an approach is that looking at the change in traffic from one year to another and relating it to a change in tolls, for instance, the resulting elasticity estimate will confuse the influence of the toll with the influences of all the other factors that will have influenced the change in traffic levels over the same time period. Therefore it is important to exercise judgment as to what proportion of the change can be expected to relate to the toll, and what proportion should be attributed to other factors.

[56] Cain, A., Burris, M. W., and Pendyala R. M. (2000) 'The Impact of Variable Pricing on the Temporal Distribution of Travel Demand', TRB Paper Number 01-2257. Available online at time of writing:

http://knowledge.fhwa.dot.gov/cops/hcx.nsf/All+Documents/4AE9C4F61269518185256DC500680AC3/$FILE/TRB 2001 paper on elasticities.pdf

4.41 Using the evidence uncovered by the literature review, a hypothesis for the price elasticity was developed: -0.2 was chosen as this was quite inelastic, reflecting the absence of serious competition to the roads of interest, but not as inelastic as some of the more extreme values found in some studies.

4.42 This initial hypothesis was tested using time series data for traffic and revenue on the NJTP (1970 - 2002) the GSP (1970 - 2001), and the ACE (1970 - 2005). In each case an indicator of the real average toll was calculated by dividing total revenue by the total number of vehicles and adjusting for inflation. This indicator shows that there have been a few significant real toll increases in the past. These events made it possible to test the hypothesis of -0.2 for the price elasticity of demand.

4.43 In each case a very simple regression model was fitted to the data, consisting of a constant time-trend and a price elasticity. The optimal values of these parameters were generally found to be very consistent with the initial hypothesis in both cases, although needless to say these models are not perfect and could be improved upon. The model results are summarized in Table 4.1 It is important to note that these models separate out the effect that would appear to relate to changes to the tolls from background growth (due to changes to population, car ownership, and economic activity). This is why these elasticity values may be significantly more inelastic than the values that are obtained by directly comparing changes to traffic with changes to tolls for recent instances where toll schedules have been modified.

TABLE 4.1 RESULTS OF SIMPLE REGRESSION MODELS

Parameter	New Jersey Turnpike	Garden State Parkway	Atlantic City Expressway
Period modeled	1970 - 2002	1970 - 2001	1970 - 2005
Price elasticity of demand	-0.19	-0.20	-0.22
Time trend (average background growth per year)	2.7%	2.2%	3.7%

4.44 Further tests were undertaken to look at the impact of making the elasticity itself sensitive to the size of the price change in relation to a reference price. It was found that while this did not always improve the “fit” of the models, it did not significantly worsen it either. In the absence of better evidence it would appear reasonable to maintain the initial estimate of 0.6 for the elasticity of the price elasticity. The tests have shown that this value produces realistic optimum toll levels rather than implying that tolls would have to grow enormously to optimize revenue.

4.45 The values presented in Table 4.1 formed the basis for the elasticity values adopted in the initial Scoping Report. It is recognized that these values were only approximate, due to the way in which the simple models average effects over the whole time period and the simple indicator of toll levels used. These values were later revised, taking into account a more detailed consideration of the most recent changes to the toll schedules on the NJTP, as described in a recent report by Wilbur Smith Associates[57], and the GSP, described in a recent study by Vollmer Associates[58].

Parameter values

4.46 Considering the values of time produced by the recent NJTP work (which range from $15 to $20 per hour), it is encouraging to find that they lie within the range of other recent values of time based on RP analysis from other parts of the USA. Most of these values lie in the range $13 to $30 per hour. There is inevitably going to be some variation due to differing sample profiles, and picking suitable values to use will need to take this into account. At this point the NJTP values seem to provide a good starting point. Several of the Value of Time studies include estimates of the heterogeneity of the value of time distributions, measured in the form of the interquartile range.

4.47 There is also a considerable body of evidence available on the price elasticity of demand. As with the values of time, it is important to interpret the values and take into account the key factors which cause these values to vary, where this is possible. Some of the values found in the literature review are true elasticities and others are "shrinkage factors". So some caution is required in comparing these values. A summary of the values found in the literature is presented in Table 4.2.

[57] Wilbur Smith Associates (2004), 'New Jersey Turnpike Traffic and Toll Revenue Study', New Jersey Turnpike Authority.

[58] Vollmer Associates LLP (2004), 'Garden State Parkway Traffic and Revenue Study', New Jersey Turnpike Authority.

TABLE 4.2 ELASTICITY VALUES FROM OTHER STUDIES

Study	Type of Data	Years Covered	Elasticity Values	Competition - main choice alternatives
NJ Turnpike	Traveler survey	2000 - 2003	-0.06 to -0.18	Same road: other time periods
NJ Turnpike	Traffic counts	2002 - 2003	-0.15 to -0.31	Same road: other time periods
New York Triborough Bridge Authority Bridges and Tunnels	Traffic counts	1970 - 2005	-0.1 to -0.36	Other bridges and tunnels
Florida Lee County Bridges	Traffic counts	1998 - 1999	-0.03 to -0.36	Same road: other time periods
California Orange County SR-91	Traveler survey	1997 - 1999	-0.7 to -0.8	Same road: other time periods and toll-free lanes, also alternative toll road

4.48 Considering first the NJTP values, these all show a relatively inelastic response to price, with values ranging from -0.06 to -0.18 for the traveler survey data, and -0.15 to -0.31 for the traffic counts data. The values based on traffic count data show a more elastic response to demand than those based on the traveler survey data.

4.49 Another useful set of reference values are those obtained in the work for the Triborough Bridge and Tunnel Authority - these show a range of values corresponding to different levels of competition, and are easier to interpret because they should not contain a peak spreading element. They are also based on a long time-series of data that goes back to the 1970s.

4.50 The elasticity values for the SR-91 in California (-0.7 to -0.8) represent a case of very high competition, because they incorporate peak-spreading (people can choose to travel at an off-peak time and pay less), people have the choice of whether to use the tolled express ways or not (some lanes on the highway being toll-free), and also there is an alternative toll road that serves many of the same destinations.

Conclusions

4.51 As part of our work we undertook a review of existing studies of how the level of demand for a toll road might change in the face of changes in toll levels. We note that the toll elasticities discussed in the literature and revealed on a particular project are in some way *general* and thus one might think that the findings either can be transferred to, or compared across different projects. This is, of course, not the case: the response of toll road users to changes in toll levels is project specific, reflecting the comparative attractions of the toll road and its competitors. However, given that many projects have been constructed in congested areas, with broadly similar comparative advantage for the tolled facility, it does remain interesting to examine what has happened on other facilities across the United States.

4.52 It was found that there is a considerable body of existing evidence on so-called demand elasticities, with several studies specific to New Jersey and others relating to other States.

4.53 The tolls on the New Jersey toll roads (NJTP, GSP and ACE) are currently low – in comparison with most other facilities within the United States, and certainly with tolled facilities in other advanced economies – while the advantage in using the toll road is high. For most users, the level of tolls is well below the indifference price: the toll can, for these users, be raised very significantly before they will seriously consider using a free alternative. At this point, we would expect the revealed demand elasticity to be very low. However, if the tolls increase *significantly* the changes in behavior might themselves become measurable, until a new equilibrium is achieved.

4.54 There are recent studies available for the NJTP and for the crossings between New Jersey and New York, but not for the ACE or the GSP. The evidence from the recent research on the NJTP Time of Day Pricing Initiative suggests that the demand for the road is relatively inelastic to price. This is consistent with the available evidence from time-series data of traffic and revenue for the NJTP, GSP and ACE, which again points to the demand being relatively inelastic.

4.55 In the first phase of this study (the Scoping Study), our analysis was based on an elasticity approach – relying on imported values derived from our experience elsewhere. Elasticity estimates of -0.1 for the NJTP, -0.07 for the GSP and -0.12 for the ACE were adopted, taking into account additional local evidence from time series of transaction and revenue for the NJTP, the GSP and the ACE.

4.56 In the Phase II analysis, however, we employed the State-wide network assignment model to estimate directly the impact of toll increases on NJTP (and Route 440), GSP and ACE usage; this analysis indicated elasticity estimates in a range from -0.2 to -0.3 for the NJTP and Route 440, from-0.1 to -0.2 for the GSP and from -0.2 to -0.3 on the ACE. We have further reviewed the elasticity estimates by time of day, journey purpose and vehicle type. We have found that the out-turn weekday peak elasticities are indeed in line with our Phase I assumptions, but that off-peak elasticities are significantly higher than those adopted earlier. The results obtained from the models are, on review, unsurprising. The assignment models show traffic diverting onto the competing routes, when (as in the off-peak) capacity is genuinely available.

4.57 It is to be expected that SP values of time will be significantly lower than those obtained from Revealed Preference (RP) data, and that SP-based elasticity estimates will be significantly higher, indicating greater shifting of demand away from the facility in response to higher tolls. The evidence from those studies that have collected both SP and RP data suggests that values of time based on RP data can be up to twice as high as the corresponding values based on SP data. The review has indicated appropriate ranges of values of time which we used as a starting point furthering our modeling work. Some simple questions were included in our internet survey effort to enable these values to be cross-checked.

4.58 It was concluded that undertaking a full-scale SP survey to estimate fresh behavioral values of time and other behavioral parameters would not be feasible at this stage, but that it would still be worthwhile undertaking fieldwork to compare the markets served by the three roads of interest, and possibly also to gather evidence on other key issues that the modeling process should address.

Behavioral Research

4.59 As mentioned in the previous section, it was decided that fresh data collection was desirable to permit key assumptions to be checked and to provide additional information on the markets served by each road. The survey instrument was designed to collect data on the three main toll roads of interest, in particular data on relevant trips, usage of the toll roads, alternatives to the toll roads, use of E-ZPass, price sensitivity, perceptions of congestion, attitudes about other issues such as the recent gas price rises, and relevant socio-economic data.

Methodology

4.60 Because of several considerations including the time available to complete the data collection, it was decided to do the survey 100% online. Several research firms with online panels were considered before selecting the one that best met the requirements. The sample and questionnaire hosting were provided by TNS Custom Research Inc. TNS maintain a managed access panel that is used for a variety of online research projects. The TNS panel includes approximately 21,000 New Jersey residents - more than any other online panel.

Survey In-Scope Population

4.61 The in-scope population was defined as follows:

- Residents of New Jersey and adjacent major metropolitan areas (including Philadelphia, New York City, and small parts of Delaware and Connecticut);
- People who have driven on at least one of the roads of interest (NJTP, GSP, ACE) in the last 30 days; and
- People aged between 20 and 75.

4.62 Minimum quotas by New Jersey toll road most frequently used were set, all of which were met or exceeded in practice, as Table 4.3 shows.

TABLE 4.3 SURVEY QUOTAS AND SAMPLE SIZES OBTAINED

Segment	Quota	Sample size
NJTP	160	333
GSP	320	395
ACE	80	80
All respondents	800	808

Survey Implementation

4.63 The survey was undertaken between Friday 16th March and Tuesday 20th March 2007. The incidence rate was approximately 30%. The refusal rate for in-scope respondents was less than 4%.

Analysis of Survey Responses

4.64 In this section, the most important findings are presented, in terms of four key questions:

- What is the level of service and level of satisfaction of the users of each road?
- To what extent do the users of each road have real alternatives?
- How price-sensitive are the users of each road?
- How, if at all, have relevant factors changed in recent years, and what changes can be expected in future?

Basic characteristics of the sample

4.65 Before moving on to the key questions, some basic characteristics of the sample are presented.

4.66 Table 4.4 shows at the state level where the frequent users of the three toll roads live. Of the three roads it is only the GSP where New Jersey residents form the majority of the frequent users, representing in this case approximately 70% of the people who use this road most frequently.

TABLE 4.4 STATE OF RESIDENCE BY TOLL ROAD USED MOST FREQUENTLY

State of residence	NJTP	GSP	ACE	Total
Connecticut	10	8	0	18
Column %	*3.0*	*2.0*	*0.0*	*2.2*
Delaware	3	1	3	7
Column %	*0.9*	*0.3*	*3.8*	*0.9*
New Jersey	142	278	34	454
Column %	*42.6*	*70.4*	*42.5*	*56.2*
New York	135	93	7	235
Column %	*40.5*	*23.5*	*8.8*	*29.1*
Pennsylvania	43	15	36	94
Column %	*12.9*	*3.8*	*45.0*	*11.6*
Total	333	395	80	808
Total %	*100*	*100*	*100*	*100*

4.67 The three roads clearly serve distinct markets, with the NJTP attracting many more users from New York compared to the other roads, and the ACE on the other hand serving many more people who live in Pennsylvania.

4.68 Table 4.5 shows the distribution of household income by road used most frequently (including those that refused to reply). The results suggest that the two big toll roads have higher proportions of wealthy users, and of the two the NJTP has the highest proportion of wealthy users.

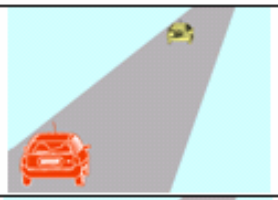
TABLE 4.5 HOUSEHOLD INCOME BEFORE TAX, BY ROAD USED MOST FREQUENTLY

Household income	NJTP	GSP	ACE	Total
under $15,000	6	3	0	9
Column %	*1.8*	*0.8*	*0.0*	*1.1*
$15,000 to $24,999	4	10	1	15
Column %	*1.2*	*2.5*	*1.3*	*1.9*
$25,000 to $34,999	8	14	5	27
Column %	*2.4*	*3.5*	*6.3*	*3.3*
$35,000 to $44,999	19	19	6	44
Column %	*5.7*	*4.8*	*7.5*	*5.5*
$45,000 to $54,999	20	28	9	57
Column %	*6.0*	*7.1*	*11.3*	*7.1*
$55,000 to $74,999	36	60	15	111
Column %	*10.8*	*15.2*	*18.8*	*13.7*
$75,000 to $99,999	64	83	18	165
Column %	*19.2*	*21.0*	*22.5*	*20.4*
$100,000 or more	121	110	19	250
Column %	*36.3*	*27.9*	*23.8*	*30.9*
prefer not to answer	55	68	7	130
Column %	*16.5*	*17.2*	*8.8*	*16.1*
Total	333	395	80	808
Total %	*100*	*100*	*100*	*100*

Perceptions of Congestion

4.69 Levels of congestion were described to users using a pictorial scale that is shown in the following figure.

FIGURE 4.2 LEVELS OF CONGESTION

Free flowing **You can travel at your own speed with no problems over-taking**	
Busy **You can travel pretty much at the speed limit, but you are forced to change lanes every now and then**	
Light congestion **You can travel close to the speed limit most of the time, but you have to slow down every so often for no apparent reason**	
Heavy congestion **Your speed is noticeably restricted**	
Stop start **You are forced to drive in a "stop-start" fashion**	
Gridlock **You are only able to move at a crawl at best, and spend quite a lot of time stationary**	

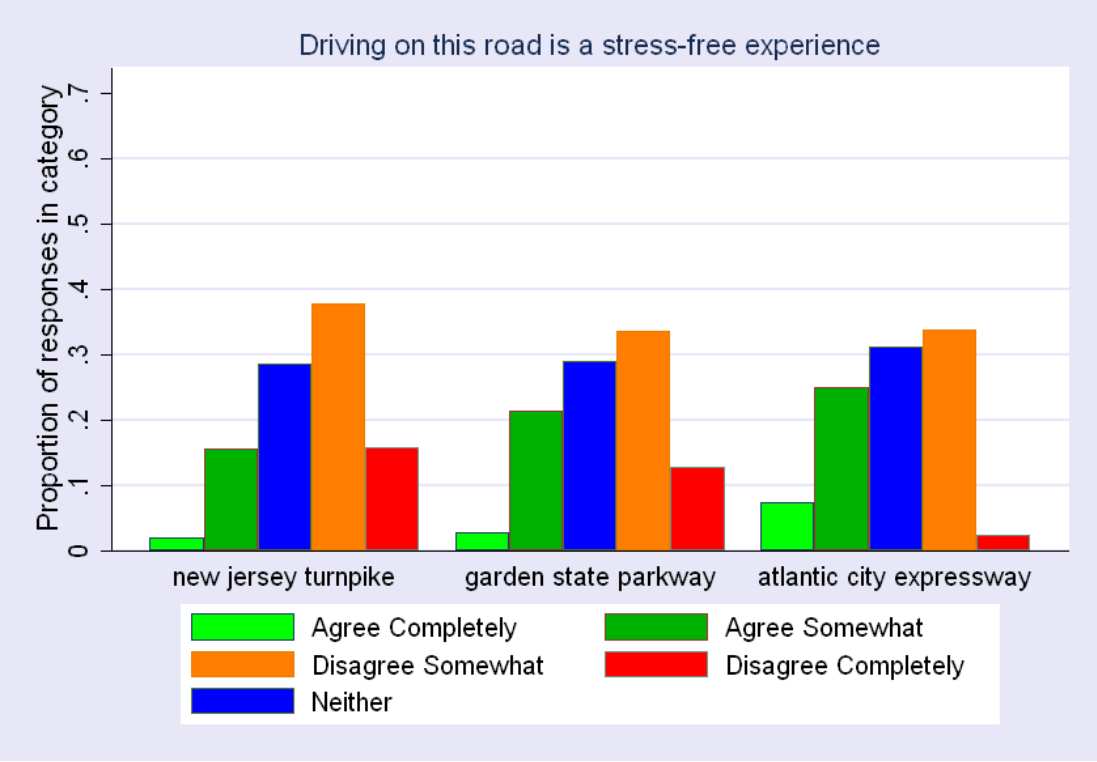
4.70 As Table 4.6 shows the main difference in perceptions of congestion is between the two bigger toll roads and the ACE. Of the two big roads, the differences in perceived level of congestion are not so distinct, but there is a suggestion that the levels of congestion on the NJTP might be slightly worse than on the GSP.

TABLE 4.6 PERCEPTIONS OF CONGESTION

% experiencing congestion (heavy traffic, stop-start or gridlock) by purpose	NJTP	GSP	ACE	Total
Commute	22%	25%	4%	21%
Business	26%	21%	13%	23%
Shopping	12%	7%	8%	9%
All other purposes	13%	8%	5%	10%

4.71 The difference between the two bigger toll roads is clearer in the responses to the attitudinal statement "driving on this road is a stress-free experience". Figure 4.3 shows that there is significantly more disagreement with this statement from frequent users of the NJTP, compared to the response of users of the GSP. This evidence also supports the impression from the previous table that congestion is less of a problem on the ACE.

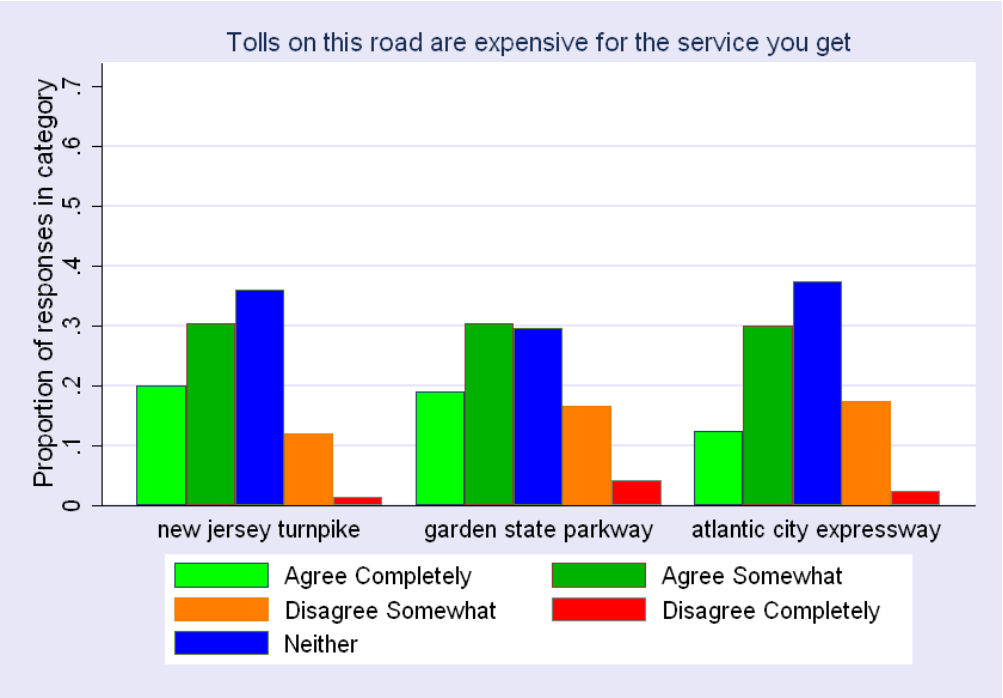
FIGURE 4.3 RESPONSE TO ATTITUDINAL STATEMENT "DRIVING ON THIS ROAD IS A STRESS-FREE EXPERIENCE"



Perception of Tolls

4.72 Turning to the perception of the actual tolls, here the differences between the perceptions of the users of the three roads show a similar pattern.

FIGURE 4.4 RESPONSE TO ATTITUDINAL STATEMENT "TOLLS ON THE ROAD ARE EXPENSIVE FOR THE SERVICE THAT YOU GET"



4.73 The evidence of Figure 4.4 is backed up by that of Table 4.7, both reinforcing the picture that the perceived level of service is worse on the NJTP, slightly better on the GSP, and significantly better on the ACE.

TABLE 4.7 PERCEPTION OF THE VALUE FOR MONEY OF THE ACTUAL TOLLS

Perception of the value for money of the tolls	NJTP	GSP	ACE	Total
very good	25	31	12	68
Column %	*7.5*	*7.9*	*15.0*	*8.4*
good	49	79	11	139
Column %	*14.7*	*20.0*	*13.8*	*17.2*
average	187	201	49	437
Column %	*56.2*	*50.9*	*61.3*	*54.1*
bad	53	60	5	118
Column %	*15.9*	*15.2*	*6.3*	*14.6*
very bad	19	24	3	46
Column %	*5.7*	*6.1*	*3.8*	*5.7*
Total	333	395	80	808
Total %	*100*	*100*	*100*	*100*

To what extent do the users of each road have real alternatives?

4.74 Table 4.8 shows that people tend to consider alternatives in the majority of the situations, but users of the ACE tend to consider them more than the frequent users of the two bigger toll roads. In the case of the NJTP and the GSP, the alternatives are considered less often for business and for personal business /leisure trips, and more often for commuting and for shopping trips.

TABLE 4.8 TO WHAT EXTENT ARE ALTERNATIVE ROUTES CONSIDERED

% Alternative routes considered	NJTP	GSP	ACE	Total
Commute	80%	78%	79%	79%
Business	71%	65%	88%	70%
Shopping	79%	82%	93%	82%
All other purposes	67%	66%	74%	67%

4.75 Table 4.9 shows that while alternative routes were considered in the majority of the cases, they were actually used in the minority of the cases. The earlier impression that there is a tendency to "shunpike" more for commuting and shopping trips relative to business and personal business / leisure trips is reinforced, as is the finding that there is a greater tendency to substitute alternative routes in the case of the ACE.

TABLE 4.9 WHETHER THE ALTERNATIVE ROUTES WERE ACTUALLY USED OR NOT

% Alternative routes used	NJTP	GSP	ACE	Total
Commute	26%	31%	46%	30%
Business	12%	15%	19%	14%
Shopping	28%	32%	43%	31%
All other purposes	13%	14%	12%	14%

4.76 Table 4.10 provides further evidence in the form of the ranking of alternatives considered to making the most recent trip by the given road at the given time. People were asked to rank three alternatives, but they were also given the option of picking "none" in each case. The most popular option in all cases was to declare "no alternative" to using the given toll road[59]. The second most popular alternative was either using the same route but at a different time of day, or using an alternative route - this latter option was slightly more significant in the case of the GSP. The propensity to switch to other modes of travel or to substitute telephone / internet was relatively low, all three options together only attracting 13% - 15% of the total selections.

[59] This could be "no alternative" at all (counts as 3 rankings), or "no other alternative" after the first alternative (counts as 2 rankings), or "no other alternative" after the third alternative (just 1 ranking). The analysis was done so that the sum of the ranked options in first, second, and third position was always the same, including when people indicated that they had no other alternative.

TABLE 4.10 ALTERNATIVES CONSIDERED - PROPORTIONS OF TOTAL RANKED OPTIONS, IN ANY ORDER

Alternative	NJTP	GSP	ACE
No other alternative	51%	54%	50%
Same route, other times of travel	17%	16%	18%
Other routes	17%	18%	18%
Other modes of transport	7%	5%	7%
Other destinations	5%	5%	5%
Using phone / internet instead	3%	3%	1%
Other	1%	1%	2%
Total	100%	100%	100%

4.77 Table 4.11 shows how often each option was ranked as the first, second or third best alternative to the use of the toll road. All the column percentages for each road and option sum to 100%. Clear tendencies are evident across all of the roads for most of the options; for instance, in all cases "same route, other times of travel" tends to get ranked most frequently as the first option people would consider, infrequently as the second, and very infrequently as the third option. "Other routes" got ranked with approximately equal frequency as the first or second alternative that people would consider. "Other modes of transport", "other destinations", and "no other alternative" all show a tendency to be ranked more often second than first, and more often again as the third alternative[60]. "Using phone or internet instead" is ranked with by far the highest frequency as the third alternative, with low frequency as the second alternative, and hardly ever as the first alternative that people would consider.

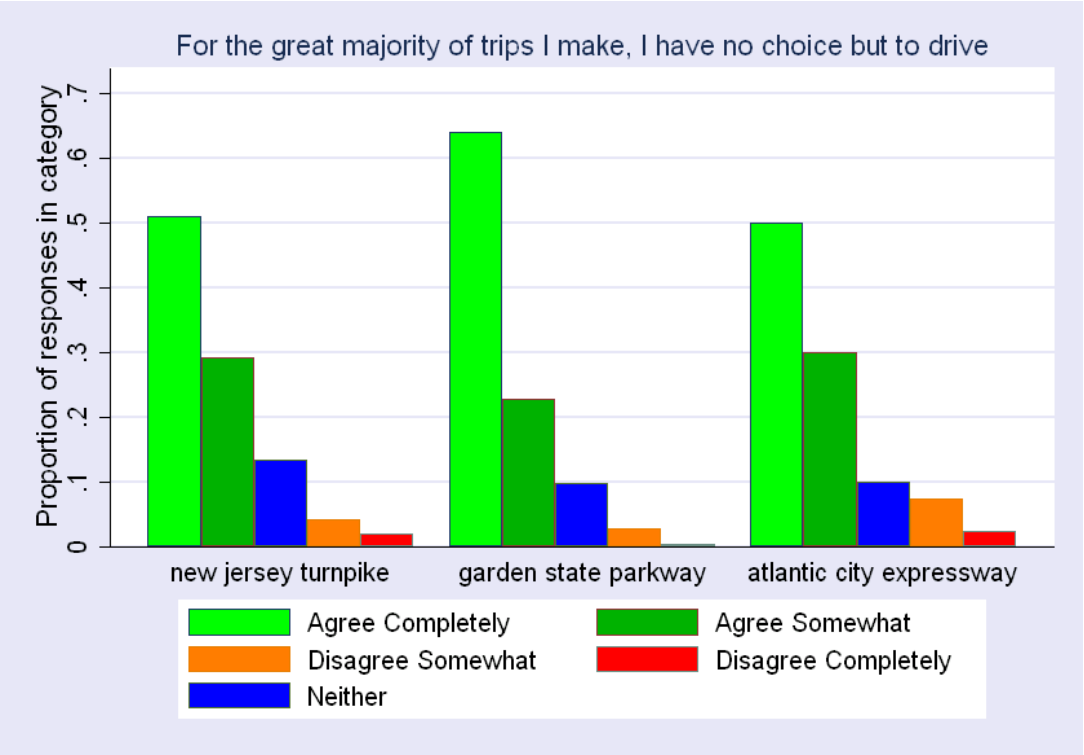
[60] It should be noted that "no other alternative" is a bit different from the other options in that if the respondent just names one alternative, then the second and third rankings are both "no other alternative" - unlike the other options it is not something that is either ranked first, or second, or third.

TABLE 4.11 RANKING PROPORTIONS OF ALTERNATIVES TO USING THE TOLL ROAD

Ranking	Alternative	NJTP	GSP	ACE
1	Same route, other times of travel	61%	68%	72%
2	Same route, other times of travel	26%	22%	28%
3	Same route, other times of travel	12%	10%	0%
1	Other routes	44%	47%	45%
2	Other routes	46%	45%	45%
3	Other routes	10%	8%	9%
1	Other modes of transport	22%	6%	0%
2	Other modes of transport	32%	26%	25%
3	Other modes of transport	46%	69%	75%
1	Other destinations	10%	5%	0%
2	Other destinations	41%	38%	33%
3	Other destinations	49%	57%	67%
1	Using phone / internet instead	14%	9%	0%
2	Using phone / internet instead	25%	22%	0%
3	Using phone / internet instead	61%	69%	100%
1	Other	22%	20%	0%
2	Other	0%	10%	25%
3	Other	78%	70%	75%
1	No other alternative	26%	26%	24%
2	No other alternative	32%	34%	33%
3	No other alternative	42%	41%	43%

4.78 The impression of great reluctance to switch to other modes of transport is backed up by Figure 4.5, which shows a very high level of agreement to the statement that they have no choice but to drive for the majority of their trips.

FIGURE 4.5 RESPONSE TO ATTITUDINAL STATEMENT "FOR THE GREAT MAJORITY OF TRIPS I MAKE, I HAVE NO CHOICE BUT TO DRIVE"



How price-sensitive are the users of each road?

4.79 The short answer would appear to be "not very" (see Table 4.12).

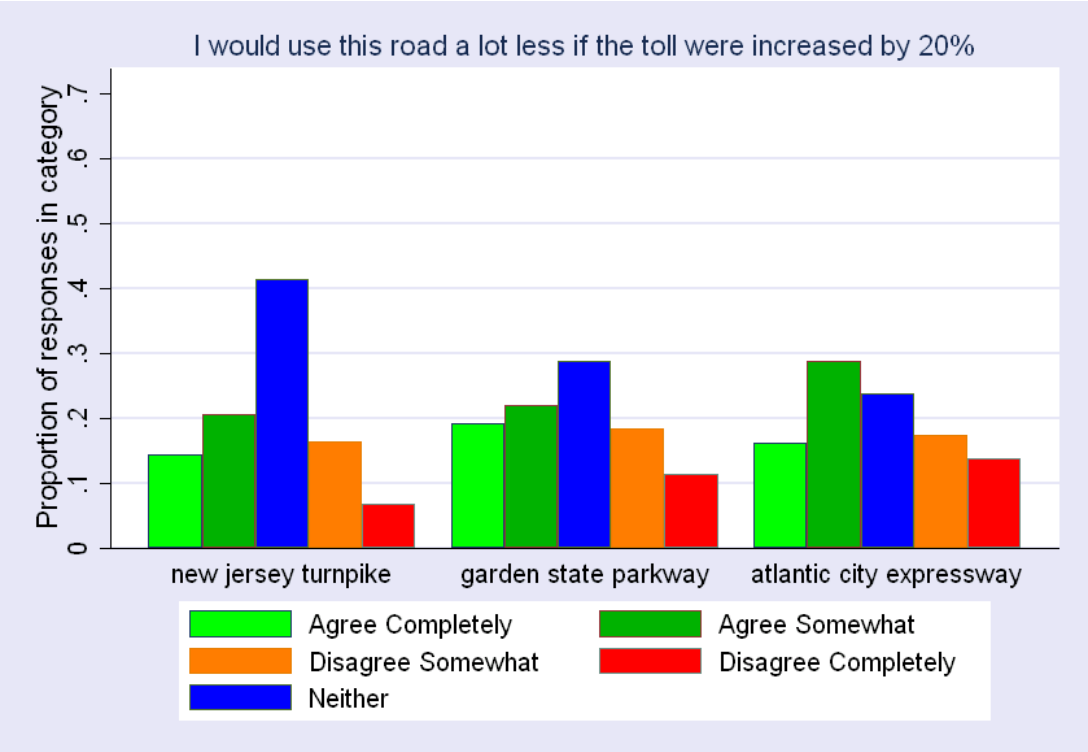
TABLE 4.12 HOW PEOPLE THINK ABOUT THE COST OF USING TOLL ROADS

How they think about the cost of the toll	NJTP	GSP	ACE	Total
The full amount on the monthly bill	44	35	1	80
Column %	*17.4*	*11.8*	*2.3*	*13.5*
The frequency of transfers from my bank account or credit cards	37	43	3	83
Column %	*14.6*	*14.5*	*6.8*	*14.0*
The average amount per trip	45	40	9	94
Column %	*17.8*	*13.5*	*20.5*	*15.9*
I don't normally think about it	127	178	31	336
Column %	*50.2*	*60.1*	*70.5*	*56.7*
Total	253	296	44	593
Total %	*100*	*100*	*100*	*100*

4.80 According to Table 4.12, the majority of users of all the roads do not normally think about their spending on road tolls. That said, again there is a familiar order to the findings: the NJTP users are the least likely to not consider the cost, whereas the ACE users are the most likely to just not think about it.

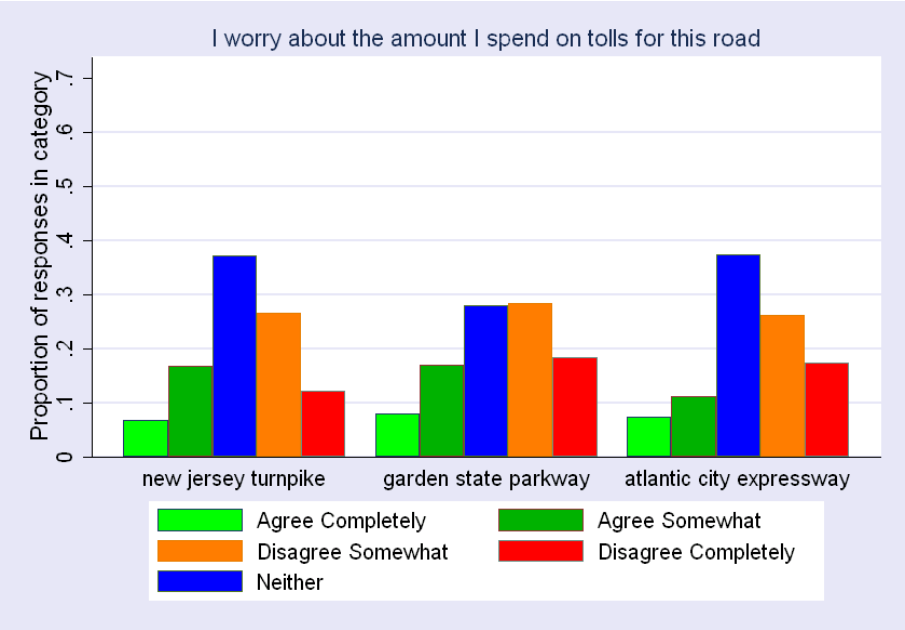
4.81 Figure 4.6 shows that the proportion of agreement with the statement "I would use this road a lot less if the toll were increased by 20%" is greater than the proportion of disagreement, the difference is not very dramatic, and there are quite a lot of "don't knows". Once again, there is an order to the magnitude of the response in that the NJTP users agree least, the GSP users agree more, and the ACE users agree the most. Curiously, the levels of "don't know" also follow this pattern, with the proportion of "don't know" being highest for the NJTP, then the GSP, and lowest for the ACE. This suggests that quite a lot of people might have really disagreed, but did not like the policy response this might cause. Faced with the decision of whether to reply untruthfully "agree" (which is against the terms of their participation in the research panel) many may have preferred to put "don't know".

FIGURE 4.6 RESPONSE TO ATTITUDINAL STATEMENT "I WOULD USE THIS ROAD A LOT LESS IF THE TOLL WERE INCREASED BY 20%"



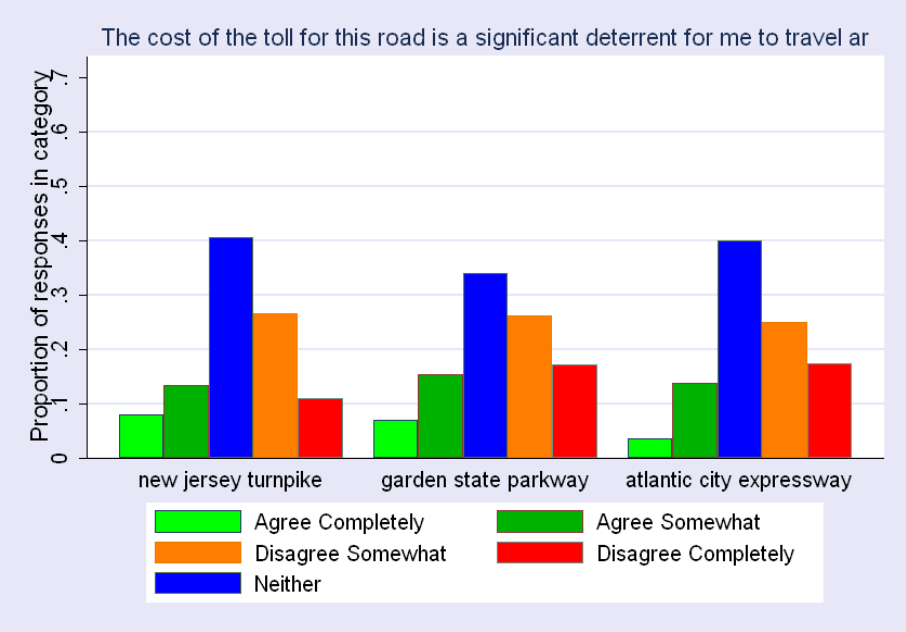
4.82 Relative price-insensitivity is also suggested by the responses to the attitudinal statement "I worry about the amount I spend on tolls for this road". In all cases, respondents were more likely to disagree than to agree with this statement, but NJTP users were least likely to disagree, and ACE users were most likely to disagree.

FIGURE 4.7 RESPONSE TO ATTITUDINAL STATEMENT "I WORRY ABOUT THE AMOUNT I SPEND ON TOLLS FOR THIS ROAD"



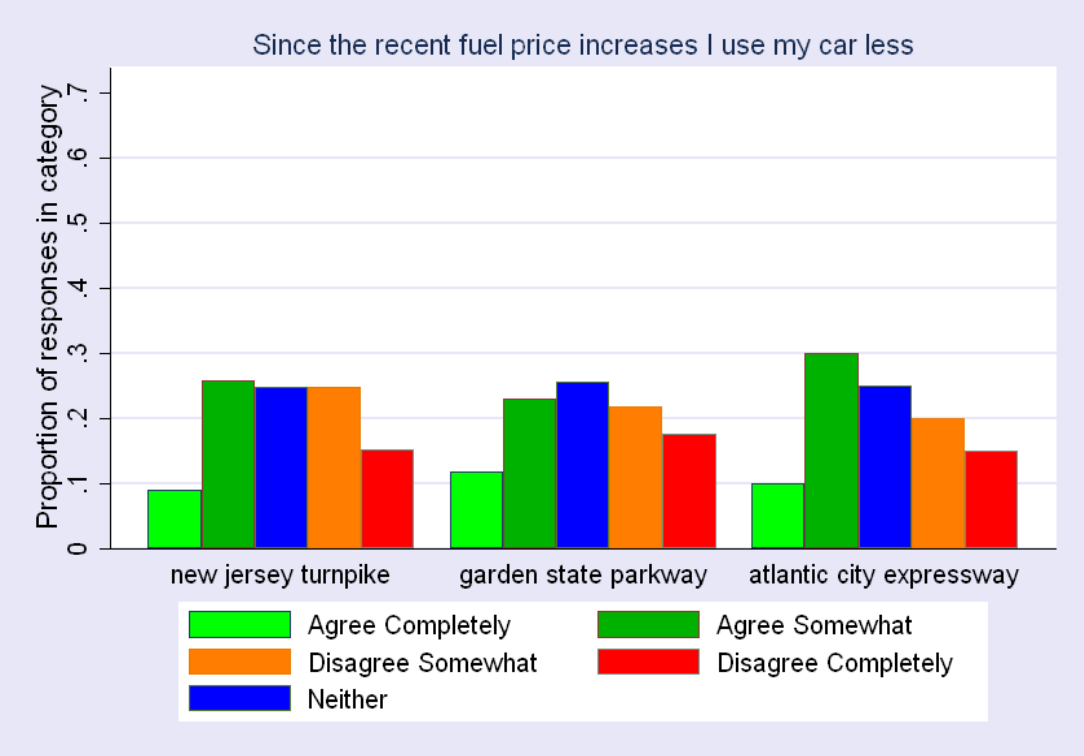
4.83 Respondents were also more likely to disagree with the statement "The cost of the toll for this road is a significant deterrent for me to travel around in New Jersey". Further analysis of the ratings data showed that the overall level of disagreement with this statement was lowest for the NJTP users and highest for the ACE users.

FIGURE 4.8 RESPONSE TO ATTITUDINAL STATEMENT "THE COST OF THE TOLL FOR THIS ROAD IS A SIGNIFICANT DETERRENT FOR ME TO TRAVEL IN NEW JERSEY"



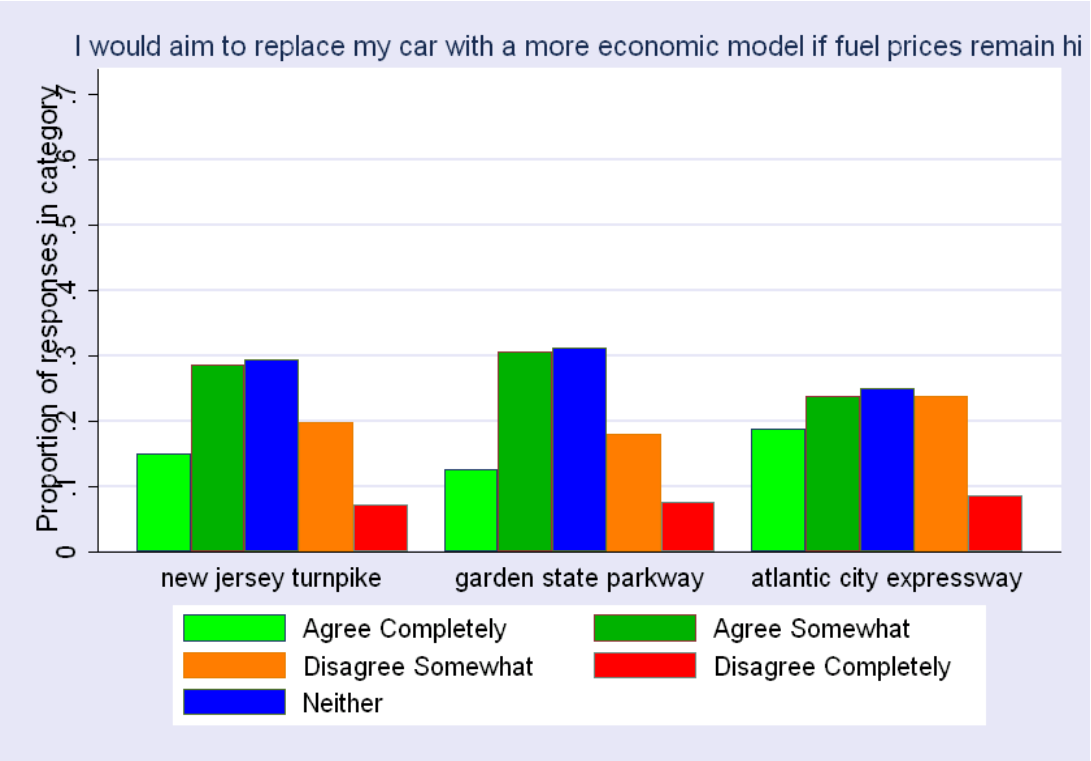
4.84 Another aspect of price-sensitivity is the response to recent fuel rises and to the prospect of future fuel price rises. When asked about changes to car use following recent gas price rises, on balance people tend to disagree more than agree with the statement "since the recent fuel price increases I use my car less", though the difference is not very big (40% disagree vs. 35% disagree for NJTP and GSP users, but 35% disagree vs. 40% agree for ACE users).

FIGURE 4.9 RESPONSE TO ATTITUDINAL STATEMENT "SINCE THE RECENT FUEL PRICE INCREASES I USE MY CAR LESS"



4.85 The issue of the price of gas was explored further by presenting people with the statement "I would aim to replace my car with a more economic model if fuel prices remain high". Perhaps unsurprisingly, there is a high degree of agreement with this statement - again this suggests that the issue of fuel prices could be important.

FIGURE 4.10 RESPONSE TO ATTITUDINAL STATEMENT "I WOULD AIM TO REPLACE MY CAR WITH A MORE ECONOMIC MODEL IF FUEL PRICES REMAIN HIGH"



Value of Time (VOT)

4.86 The survey also included two simple choice questions designed to get an idea of the VOT of the respondents, in the context of a recent trip. It had been decided earlier that in the current political context undertaking a full willingness to pay choice exercise was not a good idea and would not produce reasonable results. The findings of the two questions that were included back up the reasons for this decision, because on the face of it they indicate a generally low willingness to pay for time-savings. This is not very consistent with the other questions in the survey, and would suggest a tendency on behalf of respondents to understate their willingness to pay for travel time savings. This is consistent with evidence from published studies where it has been found that "stated preference" data can underestimate the VOT compared to "revealed preference" data by as much as a factor of 2.

4.87 People were classified as having a "low" VOT if their responses indicated a VOT of less than $7.20 / hour. People were classified as having a "high" VOT if their responses indicated a VOT of more than $30 / hour, and they were classified as "medium" VOT if their answers put them in between these two thresholds. Table 4.13 shows the results: in all cases the majority of respondents were classified as having "low" VOT. This is not really credible, hence it is not recommended that these results should be used directly as a basis for modeling and forecasting work.

TABLE 4.13 DISTRIBUTION OF RESPONDENTS BY ROAD AND BY VALUE OF TIME GROUP

VOT group	NJTP	GSP	ACE	Total
Low VOT	54%	71%	69%	64%
Medium VOT	32%	20%	23%	25%
High VOT	14%	9%	8%	11%
Total	100%	100%	100%	100%

4.88 Where these results might be more valuable is in providing an idea for the differences in the value of time between the users of each road. The results show quite clearly that users of the NJTP tend to have higher values of time than the users of the other two roads, a finding which is consistent with evidence on the income profile of the respondents.

How, if at all, have relevant factors changed in recent years, and what relevant changes can be expected in future?

4.89 Amongst the frequent users of all the roads there are more who think that congestion has got worse over the past 2 years than those who think it has got better, and the proportions of those perceiving a deterioration are higher for the NJTP and the GSP, compared to the ACE as shown in Table 4.14 below. In the case of the GSP the evidence is mixed because the difference between the proportions reporting an improvement and those reporting a deterioration in not very big. In the cases of the NJTP and the ACE those reporting that things have got worse clearly outweigh those reporting an improvement.

TABLE 4.14 PERCEIVED CHANGES IN LEVEL OF CONGESTION OVER THE LAST 2 YEARS

Perception of change over the last 2 years	NJTP	GSP	ACE	Total
Much better today	6	11	1	18
Column %	*1.9*	*2.9*	*1.3*	*2.3*
Better today	28	70	6	104
Column %	*8.6*	*18.3*	*7.6*	*13.2*
About the same today	190	184	51	425
Column %	*58.6*	*48.0*	*64.6*	*54.1*
Worse today	72	87	14	173
Column %	*22.2*	*22.7*	*17.7*	*22.0*
Much worse today	14	16	3	33
Column %	*4.3*	*4.2*	*3.8*	*4.2*
Not sure	14	15	4	33
Column %	*4.3*	*3.9*	*5.1*	*4.2*
Total	324	383	79	786
Total %	*100*	*100*	*100*	*100*

4.90 When asked about changes to tolls over the last 2 years, almost half the people thought that they had stayed about the same, although this proportion is lower for the NJTP users - approximately 50% of them perceived that tolls had gone up, with 10% perceiving that they had gone up a lot as shown in Table 4.15 below. In reality, there were no toll increases during the last 2 years for any of these roads.

TABLE 4.15 PERCEIVED CHANGES IN TOLLS OVER THE LAST 2 YEARS

Perception of recent changes to tolls	NJTP	GSP	ACE	Total
Yes – tolls are now much higher	32	17	2	51
Column %	*9.6*	*4.3*	*2.5*	*6.3*
Yes – tolls are now a bit higher	135	124	28	287
Column %	*40.5*	*31.4*	*35.0*	*35.5*
No – about the same	128	219	38	385
Column %	*38.4*	*55.4*	*47.5*	*47.7*
Yes – tolls are now a bit lower	2	4	0	6
Column %	*0.6*	*1.0*	*0.0*	*0.7*
Yes – tolls are now much lower	2	1	0	3
Column %	*0.6*	*0.3*	*0.0*	*0.4*
Not sure	34	30	12	76
Column %	*10.2*	*7.6*	*15.0*	*9.4*
Total	333	395	80	808
Total %	*100*	*100*	*100*	*100*

4.91 Respondents were also asked how, if at all, their use of the road had changed over the last 2 years (the road they used most frequently). Those reporting an increase in usage outnumber those reporting a decrease by a small amount (20% compared to 17%), although in all cases the majority report no change in their level of usage as shown in Table 4.16 overleaf.

TABLE 4.16 CHANGES TO USE OF THE ROAD OVER THE LAST 2 YEARS

Changes to use of road over last 2 years	NJTP	GSP	ACE	Total
Much more	25	29	9	63
Column %	*7.5*	*7.3*	*11.3*	*7.8*
More	40	59	9	108
Column %	*12.0*	*14.9*	*11.3*	*13.4*
About the same	194	218	53	465
Column %	*58.3*	*55.2*	*66.3*	*57.6*
Less	34	40	3	77
Column %	*10.2*	*10.1*	*3.8*	*9.5*
Much less	23	31	3	57
Column %	*6.9*	*7.9*	*3.8*	*7.1*
Not sure	8	6	2	16
Column %	*2.4*	*1.5*	*2.5*	*2.0*
Did not drive 2 years ago	2	2	0	4
Column %	*0.6*	*0.5*	*0.0*	*0.5*
Did not live in area 2 years ago	7	10	1	18
Column %	*2.1*	*2.5*	*1.3*	*2.2*
Total	333	395	80	808
Total %	*100*	*100*	*100*	*100*

4.92 People were asked "why" as an open question. The results are presented in Table 4.17 as numbers of cases rather than as percentages, because the total numbers of cases in some of the columns is small. The results show that the biggest reasons for changes in use relate to changes in circumstances (e.g. change in job location, moved house) rather than factors related to the price or level of service of the roads. For instance, for the NJTP only 7 of 57 (12%) "first mention" reasons for using the road less relate to tolls, gas prices or congestion. For the GSP the proportion of these factors out of the total is also approximately 12%. For the ACE the number of cases is too small to draw a meaningful comparison.

TABLE 4.17 REASONS FOR CHANGE IN ROAD USE

Road used most frequently:	NJTP		GSP		ACE		Total	
Reasons for this change? – 1st mentioned	More	Less	More	Less	More	Less	More	Less
Availability of train service	0	2	0	0	0	0	0	2
Changed job to closer area	0	0	0	2	0	0	0	2
Do not work any more/retired/work from home	1	4	0	10	0	0	1	14
Due to construction	1	0	0	0	0	0	1	0
Gas prices	1	2	1	2	0	0	2	4
Increased population	0	0	2	0	0	0	2	0
Less leisure time	1	2	0	1	0	1	1	4
More Traffic	3	3	10	6	2	0	15	9
Moved closer	1	3	1	0	1	1	3	4
No longer use those roads/routes/use other routes	0	7	0	3	0	0	0	10
Not convenient	0	1	0	0	0	0	0	1
Tolls/paying tolls	0	1	0	0	0	1	0	2
Too expensive/cheaper to use other routes	0	1	0	1	0	0	0	2
Wild/crazy drivers	0	0	0	1	0	0	0	1
Travel less/Do not use thse roads/routes often	0	7	0	14	0	1	0	22
All other less usage mentions	1	6	3	4	0	0	4	10
Best route to get to the destination	2	0	1	0	0	0	3	0
Change in job/work related	18	6	18	10	0	1	36	17
Do more shopping there	1	0	1	0	0	0	2	0
Easily accessible	1	0	0	0	1	0	2	0
EZPass system	1	0	3	0	0	0	4	0
Family members/relatives/friends stay there	12	1	12	1	2	0	26	2
Go there often to gamble/go to the casinos	0	0	0	0	3	0	3	0
Have property there	1	0	2	0	0	0	3	0
Less congestion	1	0	1	0	0	0	2	0
Less tolls	0	0	5	0	0	0	5	0
Moved/moved to another area	4	3	6	12	2	0	12	15
Quicker/faster	0	0	2	0	1	0	3	0
Visiting people/customers	2	0	2	0	0	0	4	0
Travel more/going more places	2	0	4	0	3	0	9	0
All other more usage mentions	4	1	8	0	2	0	14	1
All other mentions	1	1	1	3	0	1	2	5
None/nothing/na	5	6	5	1	0	0	10	7
Don't know/no answer	1	0	0	0	1	0	2	0
Total responses	65	57	88	71	18	6	171	134

4.93 Table 4.18 provides an overview of the whole set of attitudinal statements, in the form of the mean scores where the responses were recoded as follows:

Agree completely = 2
Agree somewhat = 1
Neither = 0
Disagree somewhat = -1
Disagree completely = -2

TABLE 4.18 SUMMARY OF ATTITUDINAL STATEMENTS

Attitudinal Statement	NJTP	GSP	ACE	Total
For the great majority of trips I make, I have no choice but to drive	1.23	1.47	1.18	1.34
Tolls on this road are expensive for the service you get	0.56	0.43	0.33	0.47
Since the recent fuel price increases I use my car less	-0.12	-0.10	0.00	-0.10
I would aim to replace my car with a more economic model if fuel prices remain high	0.24	0.23	0.20	0.23
Driving on this road is a stress-free experience	-0.50	-0.32	0.01	-0.36
I feel uncomfortable using this road	-0.38	-0.57	-0.71	-0.51
It is not fair to charge for using this road	0.14	0.35	0.10	0.24
I would use this road a lot more if the toll were decreased by 20%	0.32	0.38	0.23	0.34
I would use this road a lot less if the toll were increased by 20%	0.19	0.19	0.16	0.19
The cost of the toll for this road is a significant deterrent for me to travel around New Jersey	-0.19	-0.31	-0.39	-0.27
I worry about the amount I spend on tolls for this road	-0.21	-0.32	-0.35	-0.28
This road is essential for many of the trips that I make around New Jersey	0.67	0.80	0.40	0.71

4.94 Figure 4.11 provides a graphical overview of the whole set of attitudinal statements.

FIGURE 4.11 SUMMARY OF RESPONES TO ATTITUDINAL STATEMENTS

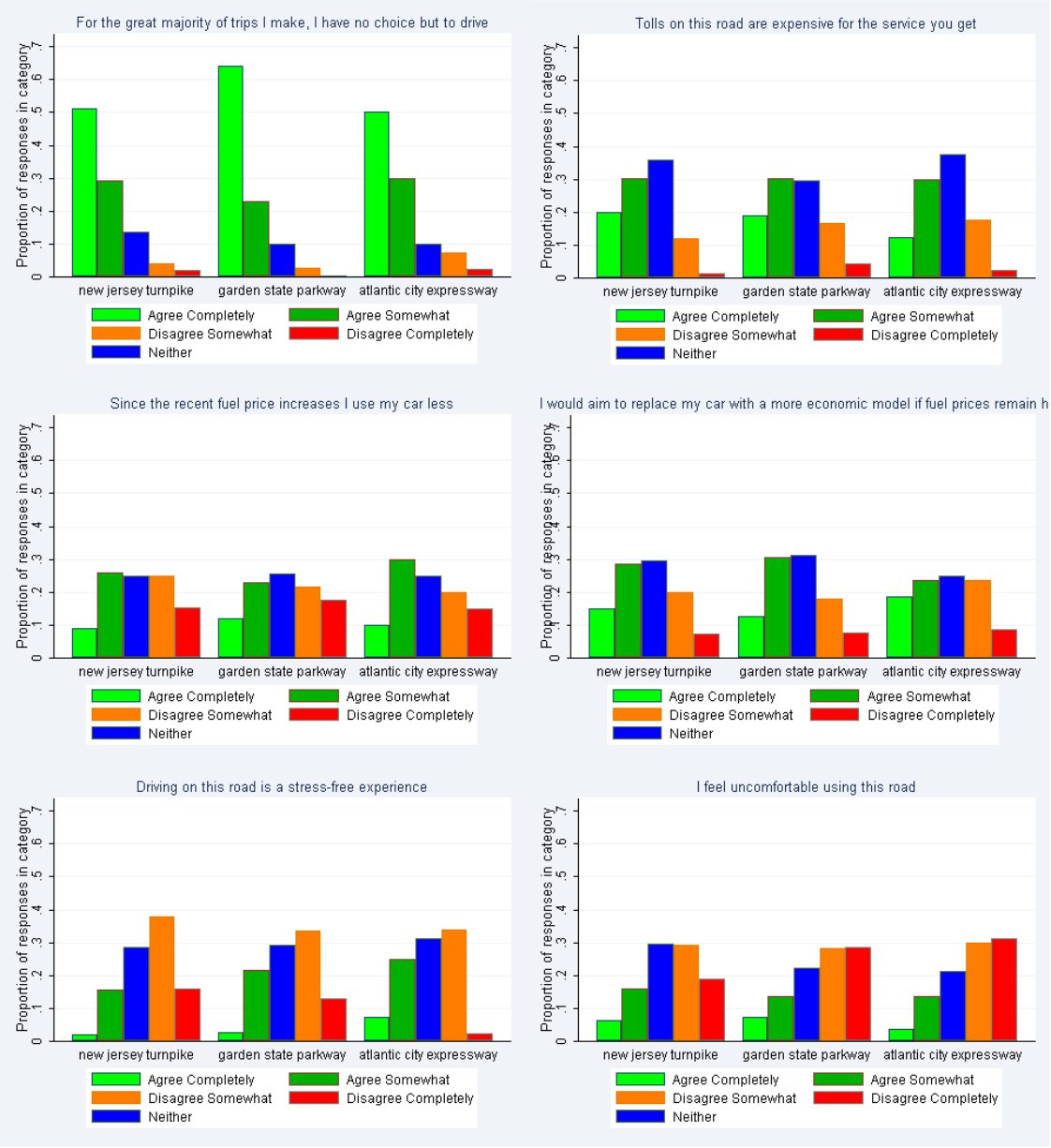
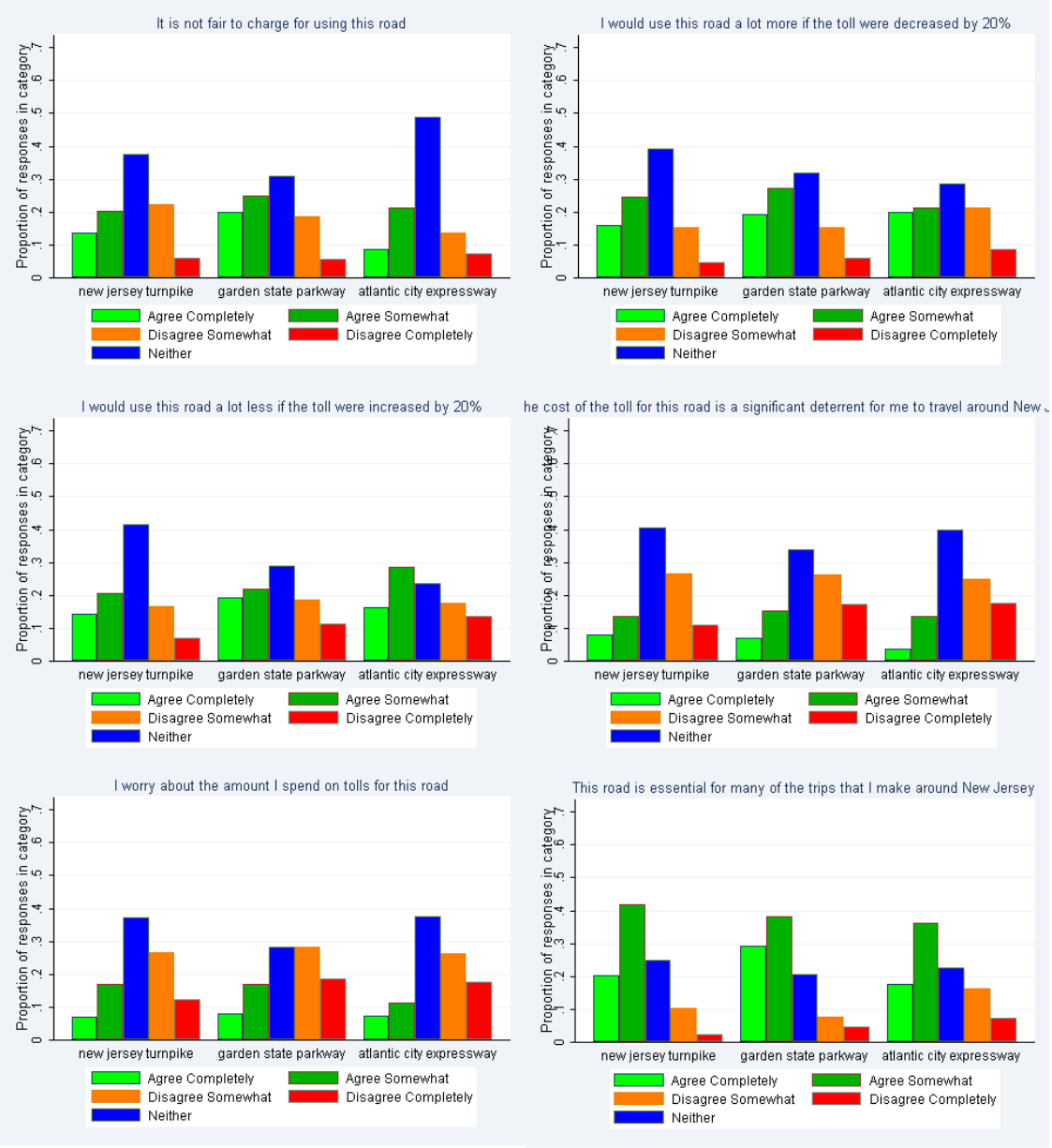


FIGURE 4.12 SUMMARY OF RESPONES TO ATTITUDINAL STATEMENTS



Summary Results NJTP

4.95 Overall, the picture that emerges of NJTP users is that they are generally not deterred from using the road by the inconveniences of tolls, stress and congestion, and they are not very sensitive to the price of the tolls - at least not at their present level. While NJTP users are undoubtedly sensitive to the idea of the tolls going up, the survey presents an accumulation of findings which show that at present many of them do not worry about the price of the tolls.

4.96 The NJTP users included a larger proportion of people with annual household income over $100,000, with more than a third of them classifying themselves in this category, compared to about a quarter in the case of users of the GSP and the ACE. Of the NJTP users, 43% lived in NJ, 41% in New York State, and the remainder in the adjoining states of Pennsylvania, Delaware and Connecticut.

4.97 While the NJTP users were more likely to complain of poor value for money, more likely to experience congestion, and more likely to describe driving on the road as stressful, compared to the users of the GSP and the ACE, these are all things that might have been expected. The more significant findings were that most NJTP users (56%) described the value for money of the tolls as being "average", many of them do not think about how much they spend on tolls, and congestion did not feature as a significant reason for using the road less.

4.98 NJTP users were more likely to describe their recent trips on the road as important, compared to users of the other roads, and they were also more likely to actually use the NJTP and to reject alternative routes, compared to users of the GSP and the ACE. The main alternative given to making that particular trip on the NJTP was to still use the NJTP, but at a different time of day.

4.99 While the NJTP users tended to spend more on road tolls than users of the other toll roads and tended to be more conscious of this spend, about half of NJTP users with EZ-Pass do not normally think about the cost of using the road (this proportion was even higher for users of the other roads). The evidence on VOT showed that the proportion of people with medium or high values of time was higher for the NJTP users than for the users of the other roads, and the direct questions about toll price changes suggested that the NJTP users may be less likely to change their behaviour in response to toll price rises than users of the other roads.

4.100 Individuals did not report big changes in their usage of the toll roads, and the reasons given for changes in usage were dominated by changes in personal circumstances. The evidence suggests that there has been a slight worsening in congestion on the NJTP over the last 2 years, but there is also evidence that the deterioration of conditions on alternative routes has been at least as bad over the same time period.

4.101 When asked about changes to the tolls over the past 2 years (there have not been any significant changes), only 49% of the NJTP users correctly answered that the tolls had not changed (or said they were not sure) - most of the rest responded that the tolls had gone up, with 10% saying that "tolls are now much higher" compared to 2 years ago. This adds to the impression that many NJTP users do not have a clear idea of how much they are paying and whether or not it has been changing.

4.102 The survey suggests that the gas price rises over the past 2 years have not had a big impact on people's use of the NJTP, and that many people would adapt to future gas price increases by switching to vehicles with greater fuel-efficiency.

Summary Results GSP

4.103 GSP users, like the users of the NJTP, are not very sensitive to the price of the tolls – at least not at their present level, which is low compared to other toll roads in the United States. While GSP users are undoubtedly sensitive to the idea of the tolls going up, the survey presents an accumulation of findings which show that at present many of them do not worry about the price of the tolls.

4.104 The GSP users set themselves apart from users of the other roads in that they seem to be even more car-dependent (87% agreed with the statement that for most of their trips they had no choice but to drive), they were more likely to say that the road is essential to them travelling around New Jersey (67% agreed), and they were also more likely to agree with the sentiment that it is unfair to charge for using the road (45% agreed). There seems to be more of a feeling that the GSP should be a public service amongst the frequent users of the road, compared to the users of the NJTP and the users of the ACE.

4.105 The GSP users had an income profile broadly similar to that of the NJTP users, but with a lower proportion of people in the highest income bracket - only a quarter of GSP users classified themselves in this category, compared to a third of the NJTP users. Of the GSP users, 70% lived in NJ, 24% in New York, and the remainder in the adjoining states of Pennsylvania, Delaware and Connecticut.

4.106 In terms of the perceived value for money, level of congestion, and stress of using the road, GSP users had slightly less negative experiences than NJTP users, but significantly more negative experiences than the ACE users. The more significant findings were that 51% of the GSP users described the value for money of the tolls as being “average”, 60% of them said that they did not normally think about how much they spend on tolls, and congestion did not feature as a significant reason for using the road less.

4.107 The GSP users’ evaluation of the importance of their most recent trip on the GSP was very similar to that of the NJTP users’ regarding the NJTP: both these groups of users regarded their most recent trip using the respective road as being more important, compared to the ACE users’ evaluation of the importance of their recent trips on the ACE. GSP users were more likely to consider alternative routes compared to the NJTP users, but less likely to consider alternative routes in comparison to the ACE users. GSP users were less likely to consider other modes of transport, compared to users of the NJTP.

4.108 About 60% of GSP users with EZ-Pass do not normally think about the cost of using the road - even more than in the case of NJTP users (50%), but less than in the case of ACE users (70%). The evidence on VOT showed that the proportion of people with medium or high VOT was lower for the GSP users compared to the NJTP users - the distribution of VOT for GSP users was very similar to that of the ACE users. The direct questions about toll price changes suggested that in terms of the likelihood of them changing their behaviour in response to a toll rise, the GSP users fall between the NJTP users (expected to be least responsive) and the ACE users (expected to be most responsive).

4.109 Individuals did not report big changes in their usage of the toll roads, and the reasons given for changes in usage were dominated by changes in personal circumstances. The evidence suggests that there has been no significant change to the level of congestion on the NJTP over the last 2 years – about half the respondents reported that the congestion they experienced on the GSP had not changed, and the remainder were split more or less evenly between reporting improvement and reporting deterioration.

4.110 When asked about changes to the tolls over the past 2 years (there have not been any significant changes), only about 63% of the GSP users correctly answered that the tolls had not changed (or said they were not sure) - most of the rest responded that the tolls had gone up, with 4% saying that "tolls are now much higher" compared to 2 years ago. This adds to the impression that many GSP users do not have a clear idea of how much they are paying and whether or not it has been changing. 4.107

4.111 The survey suggests that the gas price rises over the past 2 years have not had a big impact on people's use of the GSP, and that many people would adapt to future gas price increases by switching to vehicles with greater fuel-efficiency.

Summary Results ACE

4.112 Despite the smaller sample size, it is quite clear that ACE users tend to have different opinions and characteristics compared to the users of the two larger roads. The ACE tends to be used more often for leisure purposes than the other two roads. Using the ACE is less stressful and people are significantly less likely to experience congestion. For the ACE users, the ACE is less likely to be essential in their lives, they are less worried about the cost of the tolls, and they are less likely to say that the tolls represent poor value for money.

4.113 The household income profile of ACE users suggested that they are more likely to have medium-low household incomes compared to the users of the other roads, although the difference is not dramatic. Of the ACE users, slightly more lived in Pennsylvania (45%) than New Jersey (43%), with the remainder being split between the states of New York and Delaware.

4.114 ACE users were much less likely to describe their recent trips on the road as important, and almost half of them described their recent trip as being “not very” or “not at all” important. Compared to users of the other roads, the ACE users were more likely to use alternative routes. The main alternatives given to making that particular trip on the ACE was they would still use the ACE, but at a different time of day, or to use an alternative route.

4.115 ACE users were more likely to spend a bit less on road tolls than the users of the other roads, and of those that used the EZ-Pass system, as many as 70% said they did not normally think about the cost of the tolls at all. The evidence on the values of time showed that the ACE users had a similar distribution of values of time to the GSP users; with a tendency towards lower values of time compared to NJTP users. The responses to the direct questions about toll changes showed significantly less don’t knows – more people seemed to answer the questions directly, and the answers suggest that the demand for the ACE is likely to be somewhat more elastic in response to changes to the toll.

4.116 In common with the users of the other roads, individuals did not report big changes in their usage of the ACE. The evidence suggests that there has been a slight worsening in congestion on the ACE over the last 2 years, but less than for the other roads, and there is also evidence that the deterioration of conditions on alternative routes has been at least as bad over the same time period.

4.117 When asked about changes to the tolls over the past two years (there have not been any significant changes), only about 63% of the ACE users correctly answered that the tolls had not changed - most of the rest responded that the tolls had gone up, with 3% saying that “tolls are now much higher” compared to 2 years ago. This adds to the impression that many ACE users do not have a clear idea of how much they are paying and whether or not it has been changing.

4.118 The survey suggests that the gas price rises over the past two years have not had a big impact on people's use of the NJTP, and that many people would adapt to future gas price increases by switching to vehicles with greater fuel-efficiency.

APPENDIX A

DETAILED DATA TABLES

Table A.1: Raw forecasts by Woods & Poole, 2005 and 2025

		GROSS REGIONAL PROD. (MILL. 96 $)	TOTAL POPULATION	TOTAL EMPLOYMENT	EMPL-FARM	EMPL-AGRICULTURAL SERVICES, OTHER	EMPL-MINING	EMPL-CONSTRUCTION	EMPL-MANUFACTURING	EMPL-TRANSPORT, COMM. & PUBLIC UTIL	EMPL-WHOLESALE TRADE	EMPL-RETAIL TRADE	EMPL-FINANCE, INS. & REAL ESTATE	EMPL-SERVICES	EMPL-FEDERAL CIVILIAN GOVT	EMPL-FEDERAL MILITARY GOVT	EMPL-STATE AND LOCAL GOVT	INCOME PER CAPITA (1996 $)	PERSONS PER HOUSEHOLD	RETAIL SALES PER HOUSEHOLD (96 $)	MEAN HOUSEHOLD INCOME (1996 $)	NUMBER OF HOUSEHOLDS	TOTAL RETAIL SALES (MILL. 1996 $)
2005 Levels W&P	ATLANTIC	10,729	271,015	180,889	1,672	1,824	28	8,269	4,893	5,740	4,062	27,257	10,539	93,594	2,852	788	19,371	28,714	2.56	32,542	73,786	103,409	3,365
	BERGEN	47,557	902,561	592,388	366	6,280	154	23,594	53,829	27,373	56,135	90,842	57,987	227,909	3,167	1,859	42,893	47,196	2.6	38,187	123,159	342,402	13,075
	BURLINGTON	17,431	450,743	262,733	1,502	3,242	61	10,306	20,888	11,015	15,524	47,563	29,833	85,635	5,924	6,286	24,954	34,526	2.59	32,892	90,023	168,566	5,544
	CAMDEN	16,060	518,249	262,210	315	2,240	69	13,205	19,425	12,787	14,479	42,609	20,066	99,224	2,969	1,060	33,762	29,181	2.63	28,602	77,134	192,910	5,518
	CAPE MAY	2,557	99,286	60,093	254	839	42	4,069	890	1,567	767	15,495	6,815	18,784	396	1,421	8,754	31,761	2.31	29,665	73,777	41,828	1,241
	CUMBERLAND	4,023	153,252	72,937	1,969	614	267	3,512	10,518	3,621	2,546	12,589	3,703	18,764	729	308	13,797	23,687	2.67	28,157	64,550	52,337	1,474
	ESSEX	36,796	791,057	457,801	41	1,300	99	14,993	29,315	42,747	22,397	51,554	43,511	172,566	8,820	1,665	68,793	34,797	2.69	19,803	94,017	286,437	5,672
	GLOUCESTER	6,713	276,910	122,885	1,693	1,637	83	7,832	10,559	4,236	9,061	27,167	6,732	35,491	1,076	551	16,767	27,495	2.69	31,555	74,352	100,860	3,183
	HUDSON	23,686	603,521	299,999	0	392	18	9,022	19,632	31,802	22,232	37,571	45,451	88,533	6,757	1,363	37,226	28,183	2.56	20,023	72,437	231,875	4,643
	HUNTERDON	5,172	130,404	74,080	1,781	1,159	22	5,415	6,669	1,618	2,357	12,673	7,982	25,330	347	265	8,462	50,976	2.65	38,996	136,176	47,531	1,854
	MERCER	19,300	366,256	258,604	464	2,627	41	8,435	13,402	10,919	7,828	33,473	24,028	103,711	2,803	789	50,084	37,507	2.59	30,666	98,396	133,165	4,084
	MIDDLESEX	39,362	789,516	493,790	455	3,382	50	16,648	57,154	33,376	41,935	70,220	42,697	167,600	3,584	1,771	54,918	34,878	2.71	33,028	94,899	284,048	9,382
	MONMOUTH	22,253	635,952	338,740	1,835	5,016	94	19,319	11,533	17,167	13,441	63,676	38,499	124,180	7,944	2,858	33,178	39,771	2.65	34,202	105,700	236,250	8,080
	MORRIS	33,697	490,593	373,396	711	4,770	443	16,855	33,783	21,268	25,501	50,471	50,208	138,157	4,850	1,167	25,212	51,025	2.67	45,320	137,021	179,875	8,152
	OCEAN	10,009	558,341	205,250	343	2,854	165	14,800	6,695	6,804	5,681	45,386	21,259	72,780	2,791	1,760	23,932	28,486	2.47	28,268	70,525	222,971	6,303
	PASSAIC	14,807	499,060	225,326	95	1,393	137	12,430	27,048	9,416	13,054	42,506	16,321	72,006	1,639	1,033	28,248	29,269	2.87	32,550	84,251	170,234	5,541
	SALEM	1,871	66,346	29,376	1,269	472	23	1,450	3,165	4,193	455	4,816	1,852	7,351	186	134	4,010	26,873	2.54	18,880	68,513	25,639	484
	SOMERSET	21,779	319,900	220,637	642	2,042	442	7,561	21,212	15,898	13,195	31,156	26,331	84,503	2,060	645	14,950	50,258	2.65	37,495	133,376	119,055	4,464
	SUSSEX	3,103	153,130	59,782	945	1,046	102	4,264	2,738	2,172	1,982	9,689	6,417	22,409	369	313	7,336	35,293	2.75	22,173	97,435	54,978	1,219
	UNION	23,815	531,457	296,210	71	2,001	66	13,928	41,381	20,197	18,738	44,771	23,648	96,503	2,456	1,096	31,354	36,398	2.73	30,468	99,557	192,016	5,850
	WARREN	2,880	110,376	48,891	961	1,051	77	2,511	7,253	1,650	1,279	10,654	2,710	14,510	289	226	5,720	29,955	2.57	26,422	77,133	42,410	1,121
	NEW JERSEY	363,600	8,717,925	4,936,017	17,384	46,181	2,483	218,418	401,982	285,566	292,649	772,138	486,589	1,769,540	62,008	27,358	553,721	36,095	2.64	31,048	95,700	3,228,796	100,248
2025 Forecast W&P	ATLANTIC	15,686	324,012	223,160	1,867	2,092	26	8,666	4,588	7,213	5,239	31,286	11,905	121,269	3,021	781	25,207	34,858	2.54	38,531	89,012	124,539	4,799
	BERGEN	67,549	963,069	712,704	364	7,642	219	26,408	52,507	37,894	66,802	102,387	59,307	303,546	2,988	1,914	50,726	60,835	2.55	44,811	155,833	371,357	16,641
	BURLINGTON	28,350	555,039	361,342	1,437	4,321	63	11,073	21,009	17,934	22,977	61,653	41,438	134,582	6,721	6,259	31,875	44,641	2.42	36,514	108,746	223,015	8,143
	CAMDEN	21,519	547,232	305,162	303	2,670	75	14,223	16,839	14,524	10,972	48,492	23,021	127,117	3,264	1,055	42,607	36,508	2.52	32,805	92,563	211,832	6,949
	CAPE MAY	3,550	122,000	71,260	272	829	40	4,423	841	1,722	593	17,985	7,955	23,350	395	1,415	11,440	37,527	2.21	33,633	83,200	54,071	1,819
	CUMBERLAND	5,150	161,495	81,575	1,934	631	263	3,685	9,541	3,828	2,581	14,131	3,686	23,912	879	307	16,197	30,444	2.59	32,272	80,090	57,393	1,852
	ESSEX	49,685	858,308	524,546	38	1,456	152	16,575	25,041	48,449	23,345	56,411	43,701	218,486	8,556	1,715	80,621	42,899	2.64	23,283	113,989	315,275	7,341
	GLOUCESTER	9,774	341,587	158,259	1,608	2,046	79	8,511	10,106	4,626	12,386	35,817	7,438	51,437	1,406	548	22,251	32,747	2.54	35,542	83,559	131,748	4,683
	HUDSON	36,007	683,255	363,622	0	507	32	9,898	15,781	37,645	24,672	44,774	64,161	114,677	7,036	1,404	43,035	36,641	2.5	23,426	92,074	267,621	6,269
	HUNTERDON	8,146	178,011	103,619	2,017	1,736	36	7,324	6,512	1,756	2,589	17,554	11,212	41,956	416	273	10,238	58,959	2.59	45,434	153,896	66,424	3,018
	MERCER	27,756	424,964	307,535	436	3,442	60	9,109	12,777	12,146	8,374	36,663	26,455	134,872	2,695	813	59,693	45,773	2.52	35,954	116,949	157,183	5,651
	MIDDLESEX	63,457	954,857	660,794	452	4,266	92	18,990	57,003	43,514	44,127	84,718	64,381	270,912	5,026	1,821	65,492	45,402	2.69	38,837	122,405	348,465	13,533
	MONMOUTH	33,789	805,808	429,654	2,010	6,501	123	24,329	10,389	26,660	14,226	75,418	51,536	168,455	7,215	3,061	39,731	47,847	2.56	39,198	122,593	311,537	12,212
	MORRIS	51,884	607,087	491,440	807	5,962	612	18,088	33,646	25,711	41,591	59,753	69,941	199,243	4,307	1,149	30,630	63,034	2.61	52,852	165,450	227,652	12,032
	OCEAN	14,832	745,449	262,281	368	3,308	180	17,375	5,367	8,656	6,753	58,793	24,345	103,294	2,674	1,779	29,389	33,372	2.39	32,653	80,037	307,381	10,037
	PASSAIC	20,009	549,321	265,033	96	1,851	164	13,670	26,819	10,799	14,099	48,093	18,330	93,696	2,282	1,064	34,070	35,834	2.77	37,534	99,634	193,819	7,275
	SALEM	2,539	73,568	34,261	1,227	559	22	1,612	2,514	5,841	415	5,064	2,038	9,939	189	133	4,708	32,938	2.43	21,415	80,152	29,895	640
	SOMERSET	37,169	423,392	314,845	578	2,874	554	9,232	20,310	21,110	23,186	40,776	38,853	136,393	2,278	662	18,039	63,821	2.61	43,947	166,930	160,350	7,047
	SUSSEX	4,835	204,148	77,027	1,017	1,476	127	4,386	2,081	2,495	2,508	11,452	7,413	34,791	325	322	8,634	41,357	2.69	25,784	111,546	75,177	1,938
	UNION	29,361	558,152	318,350	80	2,558	102	16,270	38,094	21,316	14,060	49,228	24,234	111,228	2,434	1,129	37,617	43,127	2.67	35,605	115,343	205,823	7,328
	WARREN	3,592	139,098	55,381	942	1,783	89	2,992	5,909	1,744	1,286	12,314	2,883	17,962	297	232	6,948	31,772	2.51	30,807	79,959	54,673	1,684
	NEW JERSEY	534,638	10,219,852	6,121,850	17,853	58,510	3,110	246,839	377,674	355,583	342,781	912,762	604,233	2,441,117	64,404	27,836	669,148	44,838	2.57	36,170	115,526	3,895,230	140,891

Table A.2: Raw forecasts by New Jersey Dept. of Labor and Workforce Development, 2004 and 2014

	Total Population	Total Employment	Natural Resources and Mining	Utilities	Construction	Manufacturing	Wholesale Trade	Retail Trade	Transportation and Warehousing	Information	Finance and Insurance	Real Estate and Rental and Leasing	Professional, Scientific, & Technical Services	Management of Companies and Eterprises	Adm/Support Waste Mgt/ Remed. Svcs	Educational Servivices	Health Care and Social Assistance	Arts, Entertainment, and Recreation	Accommodation and Food Services	Other Services	Federal Government	State Government	Local Government
			21	22	23	31-33	42	44	48	51	52	53	54	55	56	61	62	71	72	81	91	92	93
2004 Levels DLWFD																							
Atlantic	268,300	149,850	60	551	6,216	12,672	8,689	17,502	6,033	3,672	8,176	2,199	9,734	2,499	9,667	3,192	17,281	1,840	10,356	5,774	2,331	5,549	15,853
Bergen	901,700	467,550	187	1,719	19,395	39,538	27,111	54,608	18,822	11,457	25,509	6,862	30,373	7,798	30,162	9,961	53,918	5,740	32,313	18,016	7,272	17,314	49,464
Burlington	448,700	208,150	83	765	8,635	17,602	12,070	24,311	8,380	5,101	11,357	3,055	13,522	3,472	13,428	4,434	24,004	2,555	14,386	8,020	3,237	7,708	22,021
Camden	515,600	219,900	88	808	9,122	18,596	12,751	25,683	8,853	5,388	11,998	3,228	14,285	3,667	14,186	4,685	25,359	2,700	15,198	8,473	3,420	8,143	23,264
Cape May	100,500	44,000	18	162	1,825	3,721	2,551	5,139	1,771	1,078	2,401	646	2,858	734	2,838	937	5,074	540	3,041	1,695	684	1,629	4,655
Cumberland	151,000	62,450	25	230	2,591	5,281	3,621	7,294	2,514	1,530	3,407	917	4,057	1,042	4,029	1,330	7,202	767	4,316	2,406	971	2,313	6,607
Essex	795,000	378,750	152	1,392	15,711	32,029	21,962	44,236	15,247	9,281	20,664	5,559	24,604	6,317	24,434	8,069	43,678	4,650	26,176	14,594	5,891	14,026	40,069
Gloucester	272,800	103,850	42	382	4,308	8,782	6,022	12,129	4,181	2,545	5,666	1,524	6,746	1,732	6,699	2,212	11,976	1,275	7,177	4,002	1,615	3,846	10,987
Hudson	605,400	246,050	98	904	10,207	20,807	14,267	28,738	9,905	6,029	13,424	3,611	15,984	4,104	15,873	5,242	28,375	3,021	17,005	9,481	3,827	9,112	26,030
Hunterdon	129,300	52,150	21	192	2,163	4,410	3,024	6,091	2,099	1,278	2,845	765	3,388	870	3,364	1,111	6,014	640	3,604	2,009	811	1,931	5,517
Mercer	364,400	226,750	91	833	9,406	19,175	13,148	26,483	9,128	5,556	12,371	3,328	14,730	3,782	14,628	4,831	26,149	2,784	15,671	8,737	3,527	8,397	23,989
Middlesex	783,700	414,450	166	1,523	17,192	35,048	24,032	48,406	16,685	10,156	22,612	6,083	26,923	6,912	26,737	8,829	47,794	5,088	28,644	15,969	6,446	15,348	43,846
Monmouth	635,100	265,100	106	974	10,997	22,418	15,372	30,962	10,672	6,496	14,464	3,891	17,221	4,421	17,102	5,648	30,571	3,255	18,322	10,215	4,123	9,817	28,046
Morris	487,400	298,350	119	1,097	12,376	25,230	17,300	34,846	12,011	7,311	16,278	4,379	19,381	4,976	19,247	6,356	34,406	3,663	20,620	11,496	4,640	11,048	31,563
Ocean	553,100	152,600	61	561	6,330	12,905	8,849	17,823	6,143	3,739	8,326	2,240	9,913	2,545	9,844	3,251	17,598	1,873	10,547	5,880	2,373	5,651	16,144
Passaic	498,900	183,750	74	675	7,622	15,539	10,655	21,461	7,397	4,503	10,025	2,697	11,937	3,065	11,854	3,915	21,190	2,256	12,699	7,080	2,858	6,805	19,440
Salem	65,300	23,800	10	87	987	2,013	1,380	2,780	958	583	1,299	349	1,546	397	1,535	507	2,745	292	1,645	917	370	881	2,518
Somerset	316,200	174,950	70	643	7,257	14,795	10,145	20,433	7,043	4,287	9,545	2,568	11,365	2,918	11,286	3,727	20,175	2,148	12,091	6,741	2,721	6,479	18,509
Sussex	152,100	42,800	17	157	1,775	3,619	2,482	4,999	1,723	1,049	2,335	628	2,780	714	2,761	912	4,936	525	2,958	1,649	666	1,585	4,528
Union	530,800	245,200	98	901	10,171	20,735	14,218	28,638	9,871	6,008	13,378	3,599	15,929	4,089	15,818	5,224	28,277	3,010	16,946	9,448	3,814	9,080	25,941
Warren	109,800	38,850	16	143	1,612	3,285	2,253	4,538	1,564	952	2,120	570	2,524	648	2,506	828	4,480	477	2,685	1,497	604	1,439	4,110
New Jersey	8,685,100	3,999,300	1,600	14,700	165,900	338,200	231,900	467,100	161,000	98,000	218,200	58,700	259,800	66,700	258,000	85,200	461,200	49,100	276,400	154,100	62,200	148,100	423,100
2014 Levels DLWFD																							
Atlantic	289,800	164,650	56	524	6,866	10,407	9,756	19,071	6,507	3,425	8,904	2,393	11,110	2,752	12,030	3,511	21,502	2,300	11,903	6,922	2,154	5,938	16,629
Bergen	929,400	515,950	176	1,641	21,514	32,611	30,572	59,761	20,389	10,734	27,900	7,499	34,814	8,624	37,696	11,003	67,378	7,206	37,298	21,690	6,749	18,608	52,109
Burlington	484,000	233,650	80	743	9,743	14,768	13,845	27,063	9,233	4,861	12,635	3,396	15,766	3,906	17,071	4,983	30,512	3,263	16,891	9,822	3,057	8,427	23,598
Camden	539,300	239,750	82	762	9,997	15,154	14,206	27,770	9,474	4,988	12,965	3,485	16,177	4,008	17,517	5,113	31,309	3,349	17,332	10,079	3,136	8,647	24,214
Cape May	99,200	49,550	17	158	2,066	3,132	2,936	5,739	1,958	1,031	2,679	720	3,343	828	3,620	1,057	6,471	692	3,582	2,083	648	1,787	5,004
Cumberland	158,600	67,700	23	215	2,823	4,279	4,011	7,842	2,675	1,408	3,661	984	4,568	1,132	4,946	1,444	8,841	946	4,894	2,846	886	2,442	6,837
Essex	822,700	406,250	138	1,292	16,940	25,677	24,072	47,055	16,054	8,451	21,968	5,905	27,412	6,791	29,682	8,664	53,052	5,674	29,368	17,078	5,314	14,652	41,030
Gloucester	300,000	118,100	40	376	4,925	7,465	6,998	13,679	4,667	2,457	6,386	1,717	7,969	1,974	8,629	2,519	15,423	1,650	8,537	4,965	1,545	4,259	11,928
Hudson	619,600	268,400	91	853	11,192	16,964	15,904	31,088	10,607	5,584	14,514	3,901	18,110	4,486	19,610	5,724	35,050	3,749	19,403	11,283	3,511	9,680	27,108
Hunterdon	142,100	57,950	20	184	2,416	3,663	3,434	6,712	2,290	1,206	3,134	842	3,910	969	4,234	1,236	7,568	809	4,189	2,436	758	2,090	5,853
Mercer	386,900	253,500	86	806	10,570	16,023	15,021	29,362	10,018	5,274	13,708	3,685	17,105	4,237	18,521	5,406	33,105	3,541	18,326	10,657	3,316	9,143	25,603
Middlesex	828,500	450,050	153	1,431	18,766	28,446	26,667	52,128	17,785	9,363	24,337	6,542	30,367	7,523	32,882	9,598	58,772	6,286	32,534	18,919	5,887	16,231	45,454
Monmouth	673,200	290,150	99	923	12,099	18,339	17,192	33,607	11,466	6,036	15,690	4,217	19,578	4,850	21,199	6,188	37,891	4,053	20,975	12,197	3,796	10,464	29,304
Morris	524,100	335,250	114	1,066	13,979	21,190	19,865	38,831	13,248	6,974	18,129	4,873	22,621	5,604	24,494	7,150	43,780	4,683	24,235	14,093	4,386	12,091	33,859
Ocean	615,600	175,650	60	558	7,324	11,102	10,408	20,345	6,941	3,654	9,498	2,553	11,852	2,936	12,833	3,746	22,938	2,453	12,698	7,384	2,298	6,335	17,740
Passaic	520,700	196,400	67	624	8,189	12,414	11,637	22,749	7,761	4,086	10,620	2,855	13,252	3,283	14,349	4,188	25,648	2,743	14,198	8,256	2,569	7,083	19,836
Salem	70,200	25,450	9	81	1,061	1,609	1,508	2,948	1,006	529	1,376	370	1,717	425	1,859	543	3,324	355	1,840	1,070	333	918	2,570
Somerset	343,600	195,000	66	620	8,131	12,325	11,554	22,586	7,706	4,057	10,545	2,834	13,158	3,260	14,247	4,159	25,465	2,724	14,097	8,198	2,551	7,033	19,694
Sussex	166,600	49,650	17	158	2,070	3,138	2,942	5,751	1,962	1,033	2,685	722	3,350	830	3,628	1,059	6,484	693	3,589	2,087	650	1,791	5,015
Union	553,900	267,250	91	850	11,144	16,892	15,836	30,955	10,561	5,560	14,452	3,885	18,033	4,467	19,526	5,699	34,900	3,733	19,319	11,235	3,496	9,639	26,991
Warren	120,200	42,800	15	136	1,785	2,705	2,536	4,957	1,691	890	2,314	622	2,888	715	3,127	913	5,589	598	3,094	1,799	560	1,544	4,323
New Jersey	9,188,200	4,403,100	1,500	14,000	183,600	278,300	260,900	510,000	174,000	91,600	238,100	64,000	297,100	73,600	321,700	93,900	575,000	61,500	318,300	185,100	57,600	158,800	444,700

Table A.3: Raw New Jersey State forecasts by Rutgers Economic Advisory Service (R/ECON)

Variable	2005	2015	2025
Non-ag. Employment	4,043,200	4,402,400	4,840,700
Residential Employment	4,235,900	4,620,700	5,082,200
Labor Force	4,430,400	4,872,900	5,327,800
Unemployment Rate (%)	4.4%	5.2%	4.6%
Population	8,717,900	9,346,200	10,002,500
Households	3,208,200	3,512,000	3,953,500
Household Size	2.72	2.66	2.53
Personal Income ($bill)	380.6	668.2	1,153.9
Personal IncomeperCapita($)	43,658	71,495	115,362
Retail Sales($bill)	126.6	186.3	374.3
New Vehicle Registrations	606,700	758,600	802,200
New Car Registrations	307,000	362,900	403,300
New Light Trucks and Vans	299,800	395,700	398,900
Residential Building Permits (p)	40,101	32,184	32,630
Residential Building Permits (f)	38,484	32,570	33,021
Contract Construction ($mill)	14,396	15,080	21,146
Consumer PriceIndex (1982=100)	207.9	257.4	336.2
Gross State Product ($2000bill)	392.8	498.6	684.4
Empl- Non-Agricultural	4,043,200	4,402,300	4,840,500
Empl- Goods Producing	499,300	454,600	444,400
Empl- NaturalResources	1,700	1,500	1,000
Empl- Manufacturing	328,800	293,300	276,000
Empl- Construction	168,800	159,900	167,400
Empl- PrivateServiceProducing	2,902,500	3,266,200	3,652,800
Empl- Trans.,Trade&Utilities	881,600	964,600	1,045,900
Empl- Transportation	159,700	175,700	179,300
Empl- Trade	707,600	776,100	856,000
Empl- WholesaleTrade	236,100	260,600	296,300
Empl- RetailTrade	471,600	515,500	559,700
Empl- Utilities	14,200	12,800	10,700
Empl- Information	97,100	88,700	65,600
Empl- Finance	280,200	315,900	343,300
Empl- Services	1,643,600	1,897,000	2,198,000
Empl- PublicAdministration	641,500	681,400	743,400
Empl- Federal Gov't	61,600	61,400	61,700
Empl- State Gov't	150,400	160,900	182,300
Empl- Local Gov't	429,500	459,100	499,400

Tables A.4: MPO forecasts (sources as indicated)

		Total Population	Total Employment	Total Population	Total Employment
County	**Source**	**2005**		**2025**	
Atlantic	SJRPA	266,316	135,918	330,367	189,516
Bergen	NJTPA	906,600	490,200	968,300	530,100
Burlington	DVRPC	452,776	207,598	514,950	240,051
Camden	DVRPC	511,770	217,083	513,530	233,122
Cape May	SJRPA	106,518	41,884	123,066	49,375
Cumberland	SJRPA	152,276	65,636	181,481	86,470
Essex	NJTPA	801,000	397,500	867,400	437,800
Gloucester	DVRPC	265,500	104,142	322,520	129,168
Hudson	NJTPA	633,400	273,800	740,600	339,900
Hunterdon	NJTPA	130,700	60,300	142,800	80,100
Mercer	DVRPC	362,090	214,833	391,946	253,066
Middlesex	NJTPA	785,600	428,900	926,700	524,600
Monmouth	NJTPA	639,500	259,900	705,000	330,480
Morris	NJTPA	485,400	296,900	500,900	339,000
Ocean	NJTPA	553,500	146,800	697,200	170,800
Passaic	NJTPA	504,300	190,600	573,200	214,800
Salem	SJRPA	64,446	22,710	67,500	24,860
Somerset	NJTPA	315,900	212,900	361,600	253,700
Sussex	NJTPA	153,000	42,700	184,600	58,400
Union	NJTPA	533,900	256,000	600,300	281,900
Warren	NJTPA	111,400	37,900	130,700	45,500
New Jersey	MPOs	8,735,892	4,104,204	9,844,660	4,812,708

SJRPA – South Jersey Regional Planning Alliance
NJTPA – North Jersey Transportation Planning Authority
DVRPC – Delaware Valley Regional Planning Commission

Table A.5: Forecasts by New York Metropolitan Transportation Council

		Total Population	Total Employment	Total Population	Total Employment	Total Population	Total Employment
County	**State**	**1990**		**2005**		**2025**	
Bronx	NY	1,203,800	237,800	1,349,300	253,800	1,396,900	300,100
Kings	NY	2,300,700	504,400	2,472,600	550,500	2,529,500	591,300
Manhattan	NY	1,487,500	2,565,100	1,562,900	2,776,500	1,657,800	2,995,300
Queens	NY	1,951,600	567,300	2,232,900	589,600	2,337,400	658,100
Richmond	NY	379,000	91,500	453,800	110,300	524,800	126,900
Nassau	NY	1,287,400	716,700	1,335,500	761,400	1,390,400	866,100
Suffolk	NY	1,321,800	612,500	1,464,500	751,400	1,662,000	828,200
Dutchess	NY	259,500	139,800	291,200	151,900	342,900	184,500
Orange	NY	307,600	127,500	349,300	160,100	430,500	194,700
Putman	NY	83,900	26,200	97,800	36,700	112,900	51,800
Rockland	NY	265,500	122,600	289,800	139,400	327,800	166,800
Sullivan	NY	69,300	31,400	76,900	35,800	94,200	46,000
Ulster	NY	165,300	75,700	179,400	85,300	219,700	110,600
Westchester	NY	874,900	483,500	925,300	516,200	956,800	589,200
Bergen	NJ	825,400	533,600	890,700	579,600	919,100	635,400
Essex	NJ	778,000	428,500	798,400	449,700	807,300	488,800
Hudson	NJ	553,100	273,500	632,000	304,900	729,800	389,200
Hunterdon	NJ	107,900	50,200	132,700	79,100	179,700	107,100
Mercer	NJ	325,800	223,300	370,700	262,700	447,200	308,600
Middlesex	NJ	671,700	407,300	783,500	482,300	932,000	600,300
Monmouth	NJ	553,200	264,800	651,000	317,900	774,000	405,100
Morris	NJ	421,300	287,900	472,400	355,500	512,200	413,000
Ocean	NJ	433,200	145,900	550,900	188,900	702,600	220,100
Passaic	NJ	470,900	225,000	491,800	222,300	501,800	253,900
Somerset	NJ	240,200	165,700	320,700	241,000	442,500	290,300
Sussex	NJ	130,900	41,300	153,200	58,100	196,000	81,100
Union	NJ	493,800	302,900	524,900	292,500	565,800	331,100
Warren	NJ	91,700	41,300	112,100	44,900	154,500	54,400
Fairfield	CT	827,600	509,400	918,300	550,400	1,036,800	640,700
Litchfield	CT	174,100	82,300	193,000	92,400	247,900	110,700
New Haven	CT	804,200	435,000	844,000	441,700	922,900	493,300

Table A.6: “Low” forecast scenario results

2025 Levels - Low Scenario

	Total Population	Total Employment	Natural Resources and Mining	Utilities	Construction	Manufacturing	Wholesale Trade	Retail Trade	Transportation and Warehousing	Information	Finance and Insurance	Real Estate and Rental and Leasing	Professional, Scientific, & Technical Services	Management of Companies and Eterprises	Adm/Support Waste Mgt/ Remediation Services	Educational Servvices	Health Care and Social Assistance	Arts, Entertainment, and Recreation	Accommodation and Food Services	Other Services	Federal Government	State Government	Local Government
Atlantic	318,563	177,492	51	484	7,435	7,777	10,720	20,400	6,894	3,096	9,519	2,557	12,380	2,973	14,344	3,788	25,636	2,751	13,341	8,026	1,924	6,245	17,152
Bergen	979,596	558,374	160	1,524	23,390	24,466	33,725	64,177	21,689	9,740	29,946	8,043	38,946	9,352	45,124	11,918	80,647	8,655	41,971	25,248	6,052	19,646	53,958
Burlington	530,141	256,727	74	701	10,754	11,249	15,506	29,507	9,972	4,478	13,768	3,698	17,906	4,300	20,747	5,479	37,080	3,979	19,297	11,608	2,782	9,033	24,808
Camden	567,397	256,614	74	700	10,749	11,244	15,499	29,494	9,967	4,476	13,762	3,696	17,899	4,298	20,738	5,477	37,063	3,977	19,289	11,603	2,781	9,029	24,797
Cape May	102,801	54,597	16	149	2,287	2,392	3,298	6,275	2,121	952	2,928	786	3,808	914	4,412	1,165	7,886	846	4,104	2,469	592	1,921	5,276
Cumberland	168,047	72,079	21	197	3,019	3,158	4,353	8,284	2,800	1,257	3,866	1,038	5,027	1,207	5,825	1,538	10,410	1,117	5,418	3,259	781	2,536	6,965
Essex	851,991	428,205	123	1,169	17,937	18,762	25,863	49,216	16,632	7,469	22,965	6,168	29,867	7,171	34,605	9,139	61,847	6,637	32,186	19,362	4,641	15,066	41,379
Gloucester	335,995	131,233	38	358	5,497	5,750	7,926	15,083	5,097	2,289	7,038	1,890	9,153	2,198	10,605	2,801	18,954	2,034	9,864	5,934	1,422	4,617	12,681
Hudson	628,161	287,417	82	784	12,040	12,593	17,360	33,035	11,164	5,013	15,414	4,140	20,047	4,814	23,227	6,135	41,512	4,455	21,604	12,996	3,115	10,113	27,774
Hunterdon	157,688	63,108	18	172	2,644	2,765	3,812	7,253	2,451	1,101	3,384	909	4,402	1,057	5,100	1,347	9,115	978	4,744	2,853	684	2,220	6,098
Mercer	410,107	277,549	80	757	11,626	12,161	16,763	31,900	10,781	4,841	14,885	3,998	19,359	4,648	22,430	5,924	40,087	4,302	20,862	12,550	3,008	9,766	26,820
Middlesex	880,082	479,914	138	1,310	20,103	21,028	28,986	55,160	18,641	8,371	25,738	6,913	33,474	8,037	38,784	10,243	69,315	7,439	36,073	21,700	5,201	16,886	46,376
Monmouth	720,900	311,668	89	851	13,055	13,656	18,824	35,822	12,106	5,436	16,715	4,489	21,739	5,220	25,187	6,652	45,015	4,831	23,427	14,092	3,378	10,966	30,117
Morris	566,400	368,698	106	1,006	15,444	16,155	22,269	42,377	14,321	6,431	19,773	5,311	25,716	6,175	29,796	7,869	53,252	5,715	27,714	16,671	3,996	12,973	35,629
Ocean	675,576	197,185	57	538	8,260	8,640	11,910	22,664	7,659	3,439	10,575	2,840	13,753	3,302	15,935	4,209	28,480	3,056	14,822	8,916	2,137	6,938	19,055
Passaic	542,792	206,318	59	563	8,642	9,040	12,461	23,714	8,014	3,599	11,065	2,972	14,391	3,455	16,673	4,404	29,799	3,198	15,508	9,329	2,236	7,259	19,937
Salem	74,809	26,747	8	73	1,120	1,172	1,615	3,074	1,039	467	1,434	385	1,866	448	2,162	571	3,863	415	2,010	1,209	290	941	2,585
Somerset	373,649	212,930	61	581	8,919	9,330	12,861	24,473	8,271	3,714	11,420	3,067	14,852	3,566	17,208	4,545	30,754	3,300	16,005	9,628	2,308	7,492	20,576
Sussex	186,277	56,098	16	153	2,350	2,458	3,388	6,448	2,179	979	3,009	808	3,913	940	4,534	1,197	8,102	870	4,217	2,537	608	1,974	5,421
Union	574,270	285,966	82	780	11,979	12,530	17,272	32,868	11,108	4,988	15,336	4,119	19,946	4,789	23,110	6,104	41,303	4,432	21,495	12,930	3,099	10,062	27,634
Warren	134,478	46,249	13	126	1,937	2,026	2,793	5,316	1,796	807	2,480	666	3,226	775	3,738	987	6,680	717	3,476	2,091	501	1,627	4,469
New Jersey	**9,779,721**	**4,755,168**	**1,363**	**12,977**	**199,189**	**208,351**	**287,205**	**546,542**	**184,702**	**82,944**	**255,022**	**68,496**	**331,668**	**79,638**	**384,283**	**101,493**	**686,799**	**73,704**	**357,426**	**215,011**	**51,536**	**167,310**	**459,508**
AAGR, 2004-2025	**0.60%**	**0.90%**																					

Table A.7: “Middle” forecast scenario results

2025 Levels - Middle Scenario

	Total Population	Total Employment	Natural Resources and Mining	Utilities	Construction	Manufacturing	Wholesale Trade	Retail Trade	Transportation and Warehousing	Information	Finance and Insurance	Real Estate and Rental and Leasing	Professional, Scientific, & Technical Services	Management of Companies and Eterprises	Adm/Support Waste Mgt/ Remediation Services	Educational Servvices	Health Care and Social Assistance	Arts, Entertainment, and Recreation	Accommodation and Food Services	Other Services	Federal Government	State Government	Local Government
Atlantic	326,881	180,940	52	494	7,579	7,928	10,928	20,797	7,028	3,156	9,704	2,606	12,620	3,030	14,622	3,862	26,134	2,805	13,601	8,181	1,961	6,366	17,485
Bergen	1,005,173	569,222	163	1,553	23,844	24,941	34,380	65,424	22,110	9,929	30,528	8,199	39,703	9,533	46,001	12,149	82,214	8,823	42,786	25,738	6,169	20,028	55,006
Burlington	543,983	261,715	75	714	10,963	11,467	15,807	30,081	10,166	4,565	14,036	3,770	18,254	4,383	21,150	5,586	37,800	4,057	19,672	11,834	2,836	9,208	25,290
Camden	582,211	261,600	75	714	10,958	11,462	15,800	30,067	10,161	4,563	14,030	3,768	18,246	4,381	21,141	5,583	37,783	4,055	19,663	11,829	2,835	9,204	25,279
Cape May	105,485	55,658	16	152	2,331	2,439	3,362	6,397	2,162	971	2,985	802	3,882	932	4,498	1,188	8,039	863	4,184	2,517	603	1,958	5,378
Cumberland	172,435	73,479	21	201	3,078	3,220	4,438	8,445	2,854	1,282	3,941	1,058	5,125	1,231	5,938	1,568	10,613	1,139	5,523	3,322	796	2,585	7,101
Essex	874,237	436,524	125	1,191	18,286	19,127	26,365	50,173	16,956	7,614	23,411	6,288	30,447	7,311	35,277	9,317	63,048	6,766	32,812	19,738	4,731	15,359	42,183
Gloucester	344,768	133,782	38	365	5,604	5,862	8,080	15,376	5,196	2,334	7,175	1,927	9,331	2,241	10,811	2,855	19,323	2,074	10,056	6,049	1,450	4,707	12,928
Hudson	644,562	293,001	84	800	12,274	12,838	17,697	33,677	11,381	5,111	15,714	4,221	20,437	4,907	23,679	6,254	42,319	4,541	22,024	13,248	3,176	10,309	28,314
Hunterdon	161,805	64,334	18	176	2,695	2,819	3,886	7,394	2,499	1,122	3,450	927	4,487	1,077	5,199	1,373	9,292	997	4,836	2,909	697	2,264	6,217
Mercer	420,815	282,941	81	772	11,852	12,397	17,089	32,520	10,990	4,935	15,174	4,076	19,735	4,739	22,866	6,039	40,866	4,386	21,268	12,794	3,066	9,955	27,342
Middlesex	903,061	489,237	140	1,335	20,494	21,436	29,549	56,231	19,003	8,534	26,238	7,047	34,124	8,194	39,537	10,442	70,662	7,583	36,774	22,122	5,302	17,214	47,277
Monmouth	739,723	317,723	91	867	13,309	13,921	19,190	36,518	12,341	5,542	17,040	4,577	22,161	5,321	25,676	6,781	45,889	4,925	23,882	14,366	3,443	11,179	30,703
Morris	581,189	375,861	108	1,026	15,744	16,469	22,701	43,200	14,599	6,556	20,158	5,414	26,216	6,295	30,375	8,022	54,286	5,826	28,252	16,995	4,074	13,225	36,321
Ocean	693,216	201,016	58	549	8,420	8,808	12,141	23,104	7,808	3,506	10,781	2,896	14,021	3,367	16,245	4,290	29,033	3,116	15,110	9,089	2,179	7,073	19,425
Passaic	556,964	210,327	60	574	8,810	9,216	12,703	24,174	8,170	3,669	11,280	3,030	14,670	3,523	16,997	4,489	30,378	3,260	15,809	9,510	2,279	7,400	20,325
Salem	76,763	27,267	8	74	1,142	1,195	1,647	3,134	1,059	476	1,462	393	1,902	457	2,204	582	3,938	423	2,050	1,233	296	959	2,635
Somerset	383,405	217,067	62	592	9,093	9,511	13,111	24,949	8,431	3,786	11,641	3,127	15,140	3,635	17,542	4,633	31,351	3,364	16,316	9,815	2,353	7,637	20,976
Sussex	191,140	57,188	16	156	2,396	2,506	3,454	6,573	2,221	998	3,067	824	3,989	958	4,622	1,221	8,260	886	4,299	2,586	620	2,012	5,526
Union	589,264	291,521	84	796	12,212	12,773	17,607	33,506	11,323	5,085	15,634	4,199	20,333	4,882	23,559	6,222	42,105	4,519	21,912	13,182	3,159	10,257	28,171
Warren	137,989	47,148	14	129	1,975	2,066	2,848	5,419	1,831	822	2,529	679	3,289	790	3,810	1,006	6,810	731	3,544	2,132	511	1,659	4,556
New Jersey	**10,035,071**	**4,847,552**	**1,390**	**13,229**	**203,059**	**212,399**	**292,784**	**557,160**	**188,290**	**84,555**	**259,976**	**69,826**	**338,112**	**81,186**	**391,749**	**103,464**	**700,143**	**75,136**	**364,371**	**219,188**	**52,537**	**170,561**	**468,435**
AAGR, 2004-2025	**0.74%**	**1.01%**																					

Table A.8: "High" forecast scenario results

2025 Levels - High Scenario

	Total Population	Total Employment	Natural Resources and Mining	Utilities	Construction	Manufacturing	Wholesale Trade	Retail Trade	Transportation and Warehousing	Information	Finance and Insurance	Real Estate and Rental and Leasing	Professional, Scientific, & Technical Services	Management of Companies and Eterprises	Adm/Support Waste Mgt/ Remediation Services	Educational Servvices	Health Care and Social Assistance	Arts, Entertainment, and Recreation	Accommodation and Food Services	Other Services	Federal Government	State Government	Local Government
Atlantic	335,198	188,464	54	514	7,895	8,258	11,383	21,661	7,320	3,287	10,107	2,715	13,145	3,156	15,230	4,023	27,220	2,921	14,166	8,522	2,043	6,631	18,212
Bergen	1,030,751	592,891	170	1,618	24,836	25,978	35,810	68,145	23,029	10,342	31,797	8,540	41,354	9,930	47,914	12,654	85,633	9,190	44,565	26,808	6,426	20,861	57,293
Burlington	557,825	272,597	78	744	11,419	11,944	16,464	31,331	10,588	4,755	14,619	3,927	19,013	4,565	22,030	5,818	39,372	4,225	20,490	12,326	2,954	9,591	26,342
Camden	597,026	272,477	78	744	11,414	11,939	16,457	31,318	10,584	4,753	14,613	3,925	19,005	4,563	22,020	5,816	39,354	4,223	20,481	12,320	2,953	9,587	26,330
Cape May	108,169	57,972	17	158	2,428	2,540	3,501	6,663	2,252	1,011	3,109	835	4,044	971	4,685	1,237	8,373	899	4,358	2,621	628	2,040	5,602
Cumberland	176,823	76,534	22	209	3,206	3,353	4,623	8,797	2,973	1,335	4,105	1,102	5,338	1,282	6,185	1,634	11,054	1,186	5,753	3,461	829	2,693	7,396
Essex	896,483	454,675	130	1,241	19,046	19,922	27,462	52,259	17,661	7,931	24,384	6,549	31,713	7,615	36,744	9,704	65,670	7,047	34,176	20,559	4,928	15,998	43,937
Gloucester	353,541	139,345	40	380	5,837	6,106	8,416	16,016	5,412	2,431	7,473	2,007	9,719	2,334	11,261	2,974	20,126	2,160	10,474	6,301	1,510	4,903	13,465
Hudson	660,963	305,185	88	833	12,784	13,372	18,433	35,077	11,854	5,323	16,367	4,396	21,286	5,111	24,663	6,514	44,078	4,730	22,939	13,799	3,308	10,738	29,491
Hunterdon	165,922	67,009	19	183	2,807	2,936	4,047	7,702	2,603	1,169	3,594	965	4,674	1,122	5,415	1,430	9,678	1,039	5,037	3,030	726	2,358	6,475
Mercer	431,523	294,706	85	804	12,345	12,913	17,800	33,872	11,447	5,141	15,805	4,245	20,555	4,936	23,816	6,290	42,565	4,568	22,152	13,326	3,194	10,369	28,478
Middlesex	926,040	509,580	146	1,391	21,346	22,328	30,778	58,569	19,793	8,889	27,329	7,340	35,543	8,534	41,181	10,876	73,600	7,898	38,303	23,041	5,523	17,930	49,242
Monmouth	758,546	330,934	95	903	13,862	14,500	19,988	38,036	12,854	5,772	17,748	4,767	23,082	5,542	26,744	7,063	47,798	5,129	24,875	14,964	3,587	11,644	31,979
Morris	595,978	391,490	112	1,068	16,399	17,153	23,645	44,996	15,206	6,829	20,996	5,639	27,306	6,557	31,638	8,356	56,544	6,068	29,427	17,702	4,243	13,775	37,831
Ocean	710,855	209,375	60	571	8,770	9,174	12,646	24,065	8,133	3,652	11,229	3,016	14,604	3,507	16,920	4,469	30,240	3,245	15,738	9,467	2,269	7,367	20,233
Passaic	571,137	219,072	63	598	9,177	9,599	13,232	25,179	8,509	3,821	11,749	3,156	15,280	3,669	17,704	4,676	31,641	3,396	16,467	9,906	2,374	7,708	21,170
Salem	78,716	28,400	8	78	1,190	1,244	1,715	3,264	1,103	495	1,523	409	1,981	476	2,295	606	4,102	440	2,135	1,284	308	999	2,744
Somerset	393,161	226,093	65	617	9,471	9,906	13,656	25,986	8,782	3,944	12,125	3,257	15,770	3,787	18,271	4,826	32,655	3,504	16,994	10,223	2,450	7,955	21,848
Sussex	196,004	59,566	17	163	2,495	2,610	3,598	6,846	2,314	1,039	3,195	858	4,155	998	4,814	1,271	8,603	923	4,477	2,693	646	2,096	5,756
Union	604,258	303,643	87	829	12,719	13,304	18,340	34,900	11,794	5,296	16,284	4,374	21,179	5,085	24,539	6,481	43,856	4,706	22,824	13,730	3,291	10,684	29,342
Warren	141,500	49,108	14	134	2,057	2,152	2,966	5,644	1,907	857	2,634	707	3,425	822	3,969	1,048	7,093	761	3,691	2,220	532	1,728	4,745
New Jersey	**10,290,421**	**5,049,116**	**1,448**	**13,779**	**211,503**	**221,230**	**304,959**	**580,327**	**196,119**	**88,071**	**270,786**	**72,730**	**352,171**	**84,561**	**408,038**	**107,767**	**729,255**	**78,260**	**379,521**	**228,302**	**54,722**	**177,653**	**487,913**
AAGR, 2004-2025	**0.88%**	**1.25%**																					

Table A.9: Additional growth overlay, "Middle" scenario

Add'l Overlay - Middle Scenario

	Total Population	Total Employment	Natural Resources and Mining	Utilities	Construction	Manufacturing	Wholesale Trade	Retail Trade	Transportation and Warehousing	Information	Finance and Insurance	Real Estate and Rental and Leasing	Professional, Scientific, & Technical Services	Management of Companies and Eterprises	Adm/Support Waste Mgt/ Remediation Services	Educational Servvices	Health Care and Social Assistance	Arts, Entertainment, and Recreation	Accommodation and Food Services	Other Services	Federal Government	State Government	Local Government
Atlantic	3,421	3,203	1	6	86	292	265	341	261	36	110	30	495	34	166	44	297	134	217	93	22	72	199
Bergen	10,521	4,007	1	7	108	366	331	426	327	45	138	37	619	43	208	55	372	168	272	116	28	91	249
Burlington	5,694	2,609	0	5	70	238	216	278	213	29	90	24	403	28	136	36	242	109	177	76	18	59	162
Camden	6,094	3,379	1	6	91	309	279	360	276	38	117	31	522	36	176	46	314	141	229	98	24	76	210
Cape May	1,104	210	0	0	6	19	17	22	17	2	7	2	33	2	11	3	20	9	14	6	1	5	13
Cumberland	1,805	2,332	0	4	63	213	193	248	190	26	80	22	360	25	121	32	217	98	158	68	16	53	145
Essex	9,150	5,261	1	9	142	480	435	560	429	59	181	49	813	57	273	72	489	220	357	153	37	119	327
Gloucester	3,609	957	0	2	26	87	79	102	78	11	33	9	148	10	50	13	89	40	65	28	7	22	59
Hudson	6,746	6,785	1	12	183	619	561	722	553	76	234	63	1,048	73	352	93	630	284	461	197	47	153	421
Hunterdon	1,694	574	0	1	15	52	47	61	47	6	20	5	89	6	30	8	53	24	39	17	4	13	36
Mercer	4,404	1,357	0	2	37	124	112	144	111	15	47	13	210	15	71	19	126	57	92	39	9	31	84
Middlesex	9,452	5,612	1	10	151	512	464	597	458	63	193	52	867	60	292	77	521	235	381	163	39	127	349
Monmouth	7,742	440	0	1	12	40	36	47	36	5	15	4	68	5	23	6	41	18	30	13	3	10	27
Morris	6,083	2,215	0	4	60	202	183	236	181	25	76	21	342	24	115	30	206	93	150	64	15	50	138
Ocean	7,256	791	0	1	21	72	65	84	65	9	27	7	122	9	41	11	73	33	54	23	6	18	49
Passaic	5,830	1,113	0	2	30	102	92	118	91	12	38	10	172	12	58	15	103	47	76	32	8	25	69
Salem	803	282	0	0	8	26	23	30	23	3	10	3	44	3	15	4	26	12	19	8	2	6	18
Somerset	4,013	4,377	1	8	118	400	362	466	357	49	151	41	676	47	227	60	406	183	297	127	30	99	272
Sussex	2,001	1,677	0	3	45	153	139	178	137	19	58	16	259	18	87	23	156	70	114	49	12	38	104
Union	6,168	3,543	1	6	95	324	293	377	289	40	122	33	548	38	184	49	329	148	241	103	25	80	220
Warren	1,444	810	0	1	22	74	67	86	66	9	28	8	125	9	42	11	75	34	55	24	6	18	50
New Jersey	**105,033**	**51,536**	**9**	**90**	**1,388**	**4,705**	**4,258**	**5,484**	**4,203**	**578**	**1,777**	**477**	**7,964**	**555**	**2,677**	**707**	**4,785**	**2,155**	**3,499**	**1,498**	**359**	**1,166**	**3,202**
AAGR, 2004-2025	**0.06%**	**0.06%**																					

Table A.10: Additional growth overlay, “High” scenario

Add'l Overlay - High Scenario

	Total Population	Total Employment	Natural Resources and Mining	Utilities	Construction	Manufacturing	Wholesale Trade	Retail Trade	Transportation and Warehousing	Information	Finance and Insurance	Real Estate and Rental and Leasing	Professional, Scientific, & Technical Services	Management of Companies and Eterprises	Adm/Support Waste Mgt/ Remediation Services	Educational Servvices	Health Care and Social Assistance	Arts, Entertainment, and Recreation	Accommodation and Food Services	Other Services	Federal Government	State Government	Local Government
Atlantic	6,843	6,407	1	11	173	585	529	682	523	72	221	59	990	69	333	88	595	268	435	186	45	145	398
Bergen	21,041	8,014	1	14	216	732	662	853	654	90	276	74	1,238	86	416	110	744	335	544	233	56	181	498
Burlington	11,387	5,217	1	9	140	476	431	555	426	59	180	48	806	56	271	72	484	218	354	152	36	118	324
Camden	12,187	6,759	1	12	182	617	558	719	551	76	233	63	1,044	73	351	93	628	283	459	196	47	153	420
Cape May	2,208	421	0	1	11	38	35	45	34	5	15	4	65	5	22	6	39	18	29	12	3	10	26
Cumberland	3,610	4,664	1	8	126	426	385	496	380	52	161	43	721	50	242	64	433	195	317	136	32	106	290
Essex	18,301	10,523	2	18	283	961	869	1,120	858	118	363	97	1,626	113	547	144	977	440	714	306	73	238	654
Gloucester	7,217	1,915	0	3	52	175	158	204	156	21	66	18	296	21	99	26	178	80	130	56	13	43	119
Hudson	13,493	13,570	3	24	365	1,239	1,121	1,444	1,107	152	468	126	2,097	146	705	186	1,260	567	921	394	95	307	843
Hunterdon	3,387	1,148	0	2	31	105	95	122	94	13	40	11	177	12	60	16	107	48	78	33	8	26	71
Mercer	8,809	2,714	1	5	73	248	224	289	221	30	94	25	419	29	141	37	252	113	184	79	19	61	169
Middlesex	18,904	11,225	2	20	302	1,025	927	1,194	916	126	387	104	1,735	121	583	154	1,042	469	762	326	78	254	697
Monmouth	15,485	880	0	2	24	80	73	94	72	10	30	8	136	9	46	12	82	37	60	26	6	20	55
Morris	12,166	4,429	1	8	119	404	366	471	361	50	153	41	684	48	230	61	411	185	301	129	31	100	275
Ocean	14,511	1,582	0	3	43	144	131	168	129	18	55	15	245	17	82	22	147	66	107	46	11	36	98
Passaic	11,659	2,226	0	4	60	203	184	237	182	25	77	21	344	24	116	31	207	93	151	65	16	50	138
Salem	1,607	564	0	1	15	51	47	60	46	6	19	5	87	6	29	8	52	24	38	16	4	13	35
Somerset	8,026	8,753	2	15	236	799	723	931	714	98	302	81	1,353	94	455	120	813	366	594	254	61	198	544
Sussex	4,001	3,354	1	6	90	306	277	357	274	38	116	31	518	36	174	46	311	140	228	97	23	76	208
Union	12,335	7,087	1	12	191	647	585	754	578	79	244	66	1,095	76	368	97	658	296	481	206	49	160	440
Warren	2,889	1,620	0	3	44	148	134	172	132	18	56	15	250	17	84	22	150	68	110	47	11	37	101
New Jersey	**210,065**	**103,071**	**19**	**181**	**2,776**	**9,410**	**8,515**	**10,967**	**8,407**	**1,156**	**3,554**	**954**	**15,928**	**1,110**	**5,355**	**1,414**	**9,570**	**4,309**	**6,997**	**2,996**	**718**	**2,331**	**6,403**
AAGR, 2004-2025	**0.12%**	**0.12%**																					

Table A.11: 2005 Woods & Poole data for select "external" counties

2005 Woods & Poole - External Zones

County	State	Total Employment	Total Population	Number of Households	Empl-Transp., Comm., & Public Util.	Empl-Wholesale Trade	Empl-Retail Trade	Empl-Services	Average Household Size	Average Household Income ($96)
Fairfield	CT	590,053	902,775	336,037	21,165	24,176	88,723	223,962	2.63	146,161
Kent	DE	79,517	143,968	54,927	3,004	1,749	14,529	21,804	2.55	59,686
New Castle	DE	352,454	523,008	200,814	12,955	12,934	55,698	113,075	2.52	88,971
Sussex	DE	88,881	176,548	71,918	2,605	2,781	20,358	24,043	2.41	57,768
Cecil	MD	36,312	97,796	36,420	2,053	1,745	6,829	9,833	2.64	68,645
Bronx	NY	320,055	1,357,589	477,700	19,164	14,196	42,424	169,588	2.74	55,334
Dutchess	NY	150,595	294,849	106,826	5,737	3,286	24,606	56,088	2.59	77,396
Kings	NY	671,766	2,486,235	900,607	45,004	31,116	87,194	341,605	2.72	64,842
Nassau	NY	789,377	1,333,137	453,621	35,002	43,594	135,637	309,544	2.89	133,829
New York	NY	2,630,593	1,593,200	776,148	85,327	108,807	260,160	1,141,181	1.97	150,044
Orange	NY	172,550	372,893	128,075	7,636	9,105	33,513	54,167	2.8	74,127
Queens	NY	685,896	2,241,600	798,905	87,236	33,071	96,009	278,785	2.77	74,603
Richmond	NY	130,400	464,573	166,471	9,543	2,548	25,125	61,716	2.73	90,235
Rockland	NY	147,319	292,916	96,516	7,497	6,899	23,036	56,554	2.95	113,195
Sullivan	NY	34,802	76,539	29,263	1,240	1,137	5,594	13,147	2.46	61,038
Ulster	NY	86,753	182,693	70,469	3,088	2,504	14,821	33,756	2.43	59,931
Westchester	NY	550,445	940,807	348,822	24,964	25,123	76,140	229,459	2.63	132,559
Berks	PA	214,479	396,314	152,199	9,319	8,372	40,436	66,554	2.52	68,540
Bucks	PA	351,511	621,342	232,668	9,533	20,493	67,265	132,036	2.63	96,278
Chester	PA	304,792	474,027	176,513	13,104	15,734	49,149	107,213	2.6	111,636
Delaware	PA	284,327	555,648	211,737	16,557	11,751	39,493	125,291	2.51	89,661
Lancaster	PA	296,596	490,562	183,729	11,054	16,537	54,014	86,838	2.59	70,212
Lehigh	PA	213,883	330,433	131,269	15,268	10,197	37,333	77,306	2.44	73,192
Monroe	PA	74,327	163,234	59,288	3,407	2,290	15,292	24,194	2.69	60,619
Montgomery	PA	599,904	775,883	300,945	20,611	29,951	95,773	232,626	2.5	113,243
Northampton	PA	121,340	287,767	111,284	6,039	3,663	23,662	40,154	2.49	67,740
Philadelphia	PA	773,754	1,463,281	578,452	38,613	24,885	97,205	367,469	2.43	63,271
Pike	PA	16,034	56,337	21,628	462	207	3,336	5,779	2.59	56,897

Table A.12: 2025 Woods & Poole data for select “external” counties

2025 Woods & Poole - External Zones

County	State	Total Employment	Total Population	Number of Households	Empl-Transp., Comm., & Public Util.	Empl-Wholesale Trade	Empl-Retail Trade	Empl-Services	Average Household Size	Average Household Income ($96)
Fairfield	CT	749,159	1,006,379	380,376	25,917	26,237	107,653	311,058	2.59	191,281
Kent	DE	100,733	175,452	70,777	3,510	2,114	17,961	31,844	2.43	68,895
New Castle	DE	455,509	624,893	246,966	15,368	13,092	64,276	150,972	2.44	106,853
Sussex	DE	118,573	230,660	98,274	2,862	3,760	28,858	35,955	2.29	65,598
Cecil	MD	51,133	133,317	52,750	3,084	2,583	10,332	16,033	2.51	77,953
Bronx	NY	387,726	1,570,568	555,403	25,938	16,220	47,536	217,456	2.72	69,334
Dutchess	NY	179,963	342,619	127,913	7,709	3,617	26,403	77,701	2.53	90,750
Kings	NY	829,293	2,662,152	973,821	59,089	37,467	100,246	448,929	2.68	84,526
Nassau	NY	909,429	1,370,857	474,567	44,610	53,722	156,335	373,646	2.83	169,173
New York	NY	2,746,698	1,537,770	757,828	67,139	76,796	269,632	1,240,828	1.94	174,474
Orange	NY	218,057	466,937	165,258	8,193	11,967	44,097	80,506	2.74	90,757
Queens	NY	821,378	2,500,051	912,487	106,794	30,294	110,054	361,202	2.71	90,460
Richmond	NY	186,214	606,402	222,422	16,681	2,197	31,413	94,316	2.67	116,965
Rockland	NY	180,763	340,373	115,844	8,937	8,146	26,793	79,413	2.87	135,133
Sullivan	NY	41,143	84,040	33,176	1,382	1,255	6,256	16,096	2.4	75,178
Ulster	NY	106,833	223,314	87,416	4,348	2,603	15,229	47,536	2.37	71,058
Westchester	NY	652,878	1,045,497	393,828	28,607	27,182	88,865	296,304	2.6	160,829
Berks	PA	255,506	441,167	171,477	10,460	8,243	47,762	90,597	2.47	84,200
Bucks	PA	460,359	771,508	305,891	11,646	28,381	80,069	201,095	2.49	110,007
Chester	PA	412,276	588,640	229,626	16,983	21,261	64,620	157,549	2.48	134,914
Delaware	PA	335,488	576,414	225,781	24,444	11,862	34,043	162,540	2.41	112,152
Lancaster	PA	347,712	574,894	225,160	12,390	16,732	64,571	116,671	2.48	83,703
Lehigh	PA	272,038	372,322	151,768	18,731	12,792	44,517	113,649	2.36	89,964
Monroe	PA	103,161	232,760	86,367	3,696	3,503	23,046	36,046	2.65	69,889
Montgomery	PA	721,089	861,976	343,917	25,921	31,445	110,464	305,472	2.43	134,450
Northampton	PA	149,390	345,547	136,520	8,480	4,198	28,657	54,824	2.43	79,643
Philadelphia	PA	850,772	1,376,839	558,608	36,468	19,061	98,834	465,750	2.33	79,457
Pike	PA	22,225	80,506	31,649	679	235	4,775	8,440	2.53	66,875

APPENDIX B

BIBLIOGRAPHY FOR PROPOSED AND PLANNED DEVELOPMENT PROJECTS

Appendix B: Bibliography for Planned and Proposed Development Projects

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	New Jersey Devils Website http://www.newjerseydevils.com/njd/index.php
Meadowlands Xanadu, Meadowlands Sports Complex	Brennan, John. "Fun and games = lots of jobs; Zanadu, arena rise; stadium next." The Record (Bergen Co NJ) 13 Feb. 2007: Pg. Z14.
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	"New $750 Million Stadium: Protracted negotiations between New York Giants football franchise and New Jersey authorities finally resulted in a deal to build a new 80,000-seat stadium at the Meadowlands." New York Construction 1 Jun 2005: Pg 11 Vol 52 No 11.
Secaucus Area Developments	Flickes, Michael. "Billion Dollar Mixed-Use Development Planned for Secaucus Rail Station Site." CPN Online 12 Apr 2006. www.cponline.com.
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Trans-Hudson Expressway	Trans-Hudson Expressway website http://www.accesstotheregionscore.com/
Harrah's Expansion	"Harrah's to unveil Atlantic City Project." AFX International Focus 8 Feb 2007.
Trump Taj Mahal Expansion *Pier at Caesars* *"The Walk"* *Borgata Hotel Expansion*	Atlantic City Convention and Visitors Authority website www.atlanticcitynj.com/developments_new.asp
Sands Casino	Wood, Debra. "Hotel Construction; New York and Atlantic City Brimming with New Projects." New York Construction 1 June 2006, Vol 53 No 12 Pg 101.

APPENDIX C

OVERVIEW OF TRAVEL MARKET SEGMENTS

Appendix C: Overview of Travel Market Segments

Broadly, future demand for New Jersey's highway infrastructure will hinge upon (1) commuter flows within the labor markets of New York and Philadelphia, (2) regional industrial linkages along the entire east coast, including imports and exports, and (3) tourism and other non-commute passenger travel.

C.1 Labor Markets

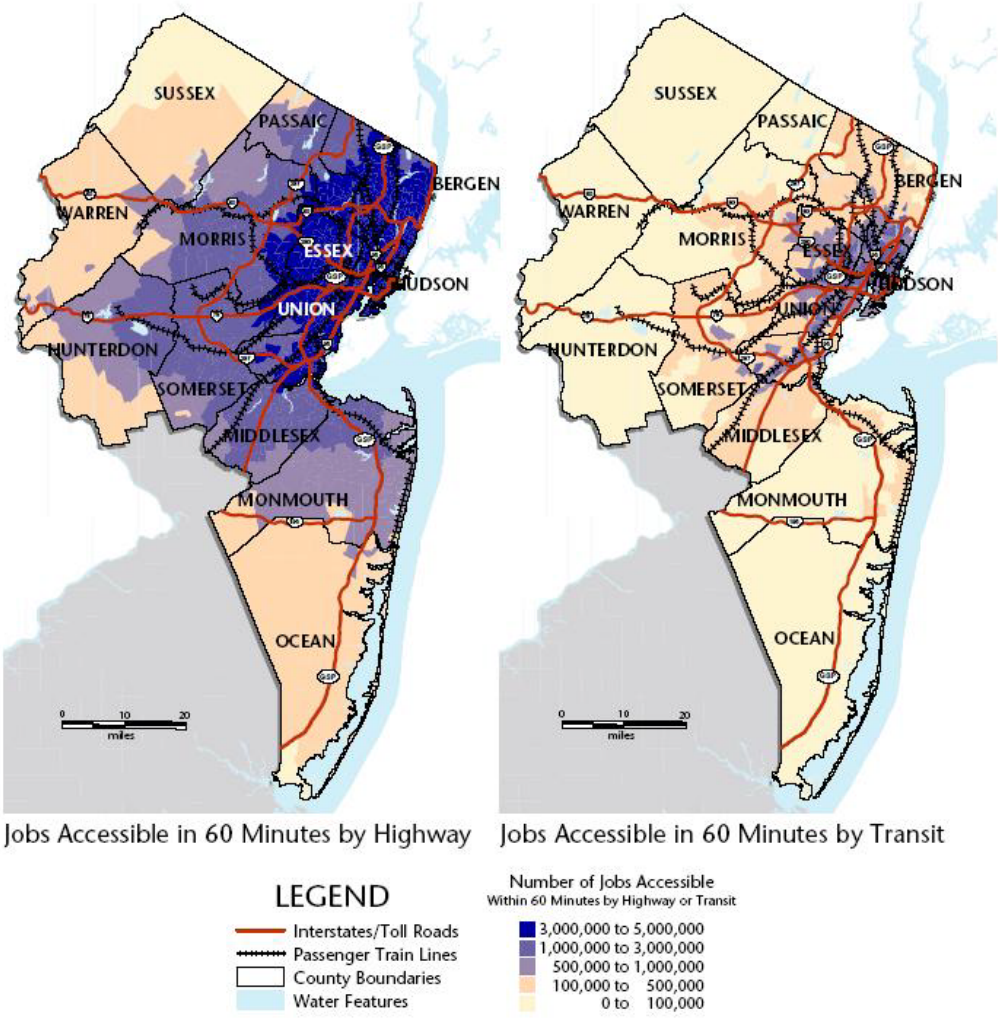
New Jersey provides bedroom communities for both Philadelphia and the larger New York City metropolitan area. While the latter has the larger influence on the state, both affect New Jersey's population growth (and its spatial distribution). Generally, growth of commute-related travel will follow population and employment growth, although the precise amount depends on mode shares and average trip lengths. Vehicle ownership rates are likely to be stable for most of this region.

New York City

As a contiguous metropolitan area, New York City affects nearly all of northern New Jersey. The entire New York City region is expected to grow moderately,[1] but most of this population growth is expected to occur in the inner and outer suburban rings, as the central area is already very highly developed (See Appendix for detailed county statistics). Figure C.1 demonstrates current employment accessibility patterns in the area.

[1] Source: Woods & Poole

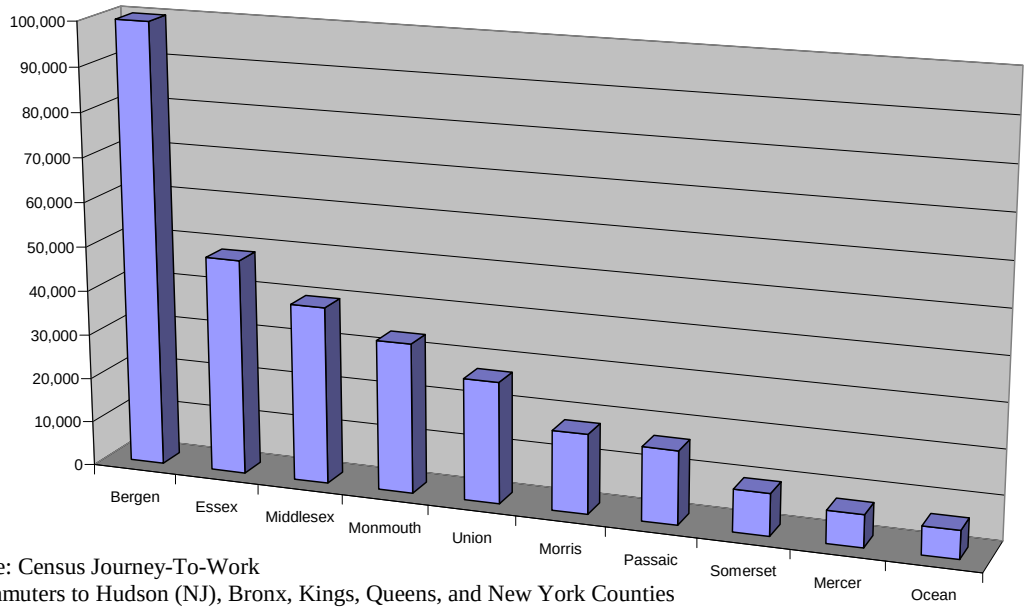
Figure C.1: Northern New Jersey Employment Accessibility Patterns, 2005



Source: North Jersey Transportation Planning Authority, *Access & Mobility 2030 Final Report*

Furthermore, actual 2000 commuting patterns reveal a highly decentralized and mobile workforce. Figure C.2 shows the number of average daily commuters from New Jersey Counties to the five central Counties of Hudson (NJ), Bronx, Kings, Queens, and New York. However, as shown in Figure C.1, New York City offers many transit options. Commute trips by passenger-vehicle therefore depend on the attributes of that mode as compared to other available modes (such as travel times and costs). Moreover, future population and employment location is affected by the relative accessibilities afforded by all commuting modes.

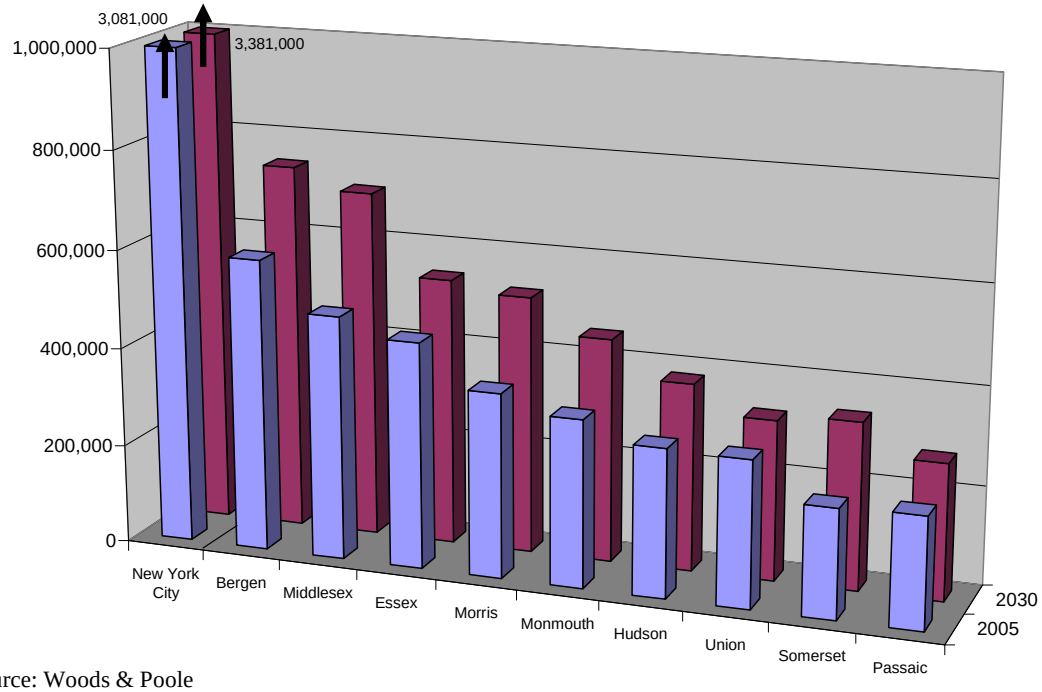
*Figure C.2: Average Daily Commuters to Central New York Area, 2000**



Source: Census Journey-To-Work
* Commuters to Hudson (NJ), Bronx, Kings, Queens, and New York Counties

Employment growth will follow similar patterns as population growth, but will tend to concentrate closer to existing employment centers. Growth will be concentrated in the corridor from Hudson through Essex, Union, and Middlesex, and Mercer. To a lesser extent, portions of Monmouth, Somerset, and Burlington counties will also attract new employment (see Figure C.3). The three counties of Somerset, Middlesex, and Monmouth have the additional attraction of having access to both the New York and Philadelphia areas.

*Figure C.3: Current and Forecasted Employment in New York Metropolitan Area**

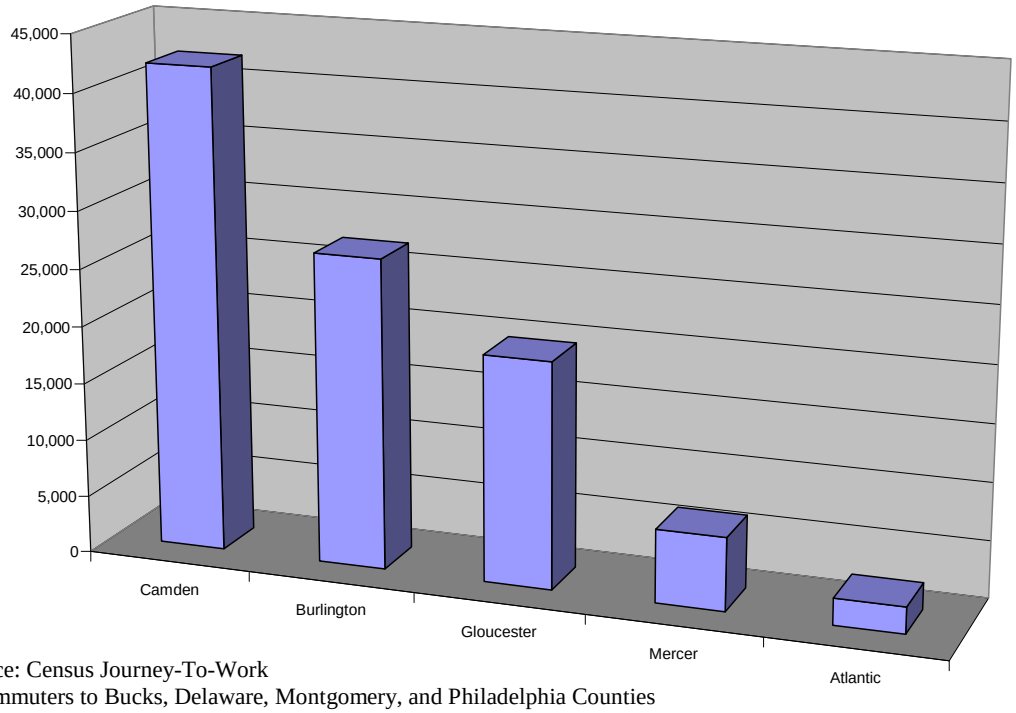


Source: Woods & Poole
* New York City area includes Bronx, New York, and Richmond Counties

Philadelphia

The larger Philadelphia metropolitan area will have a smaller impact on New Jersey than New York, both because Philadelphia is considerably smaller than New York City, and because the Delaware River serves as a more limiting barrier to access than the Hudson River. More explicitly, the bridges and tunnels between New Jersey and Manhattan have considerably greater capacity than those across the Delaware near Philadelphia. As such, the economic growth of Mercer, Burlington, Camden, and Gloucester is likely to depend more activities in New Jersey than in Philadelphia. Figure C.4 shows commuting trends in the year 2000.

*Figure C.4: Average Daily Commuters to Philadelphia Area, 2000**

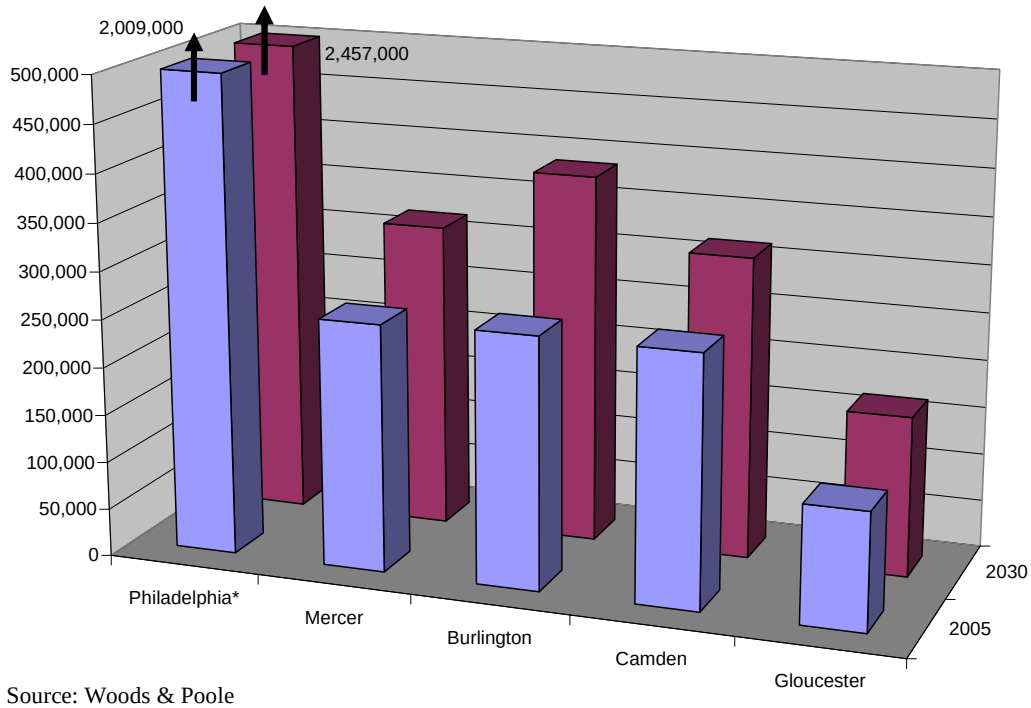


Source: Census Journey-To-Work
* Commuters to Bucks, Delaware, Montgomery, and Philadelphia Counties

Employment growth in these counties is forecasted to be generally higher than regional averages.[2] Figure C.5 demonstrates that Burlington County is poised for the highest growth. For these New Jersey Counties, future employment will likely develop around Camden and along the Delaware River.

[2] Source: Woods & Poole

*Figure C.5: Current and Forecasted Employment in Philadelphia Metropolitan Area**



Source: Woods & Poole
* Philadelphia area includes Bucks, Delaware, Montgomery, and Philadelphia Counties

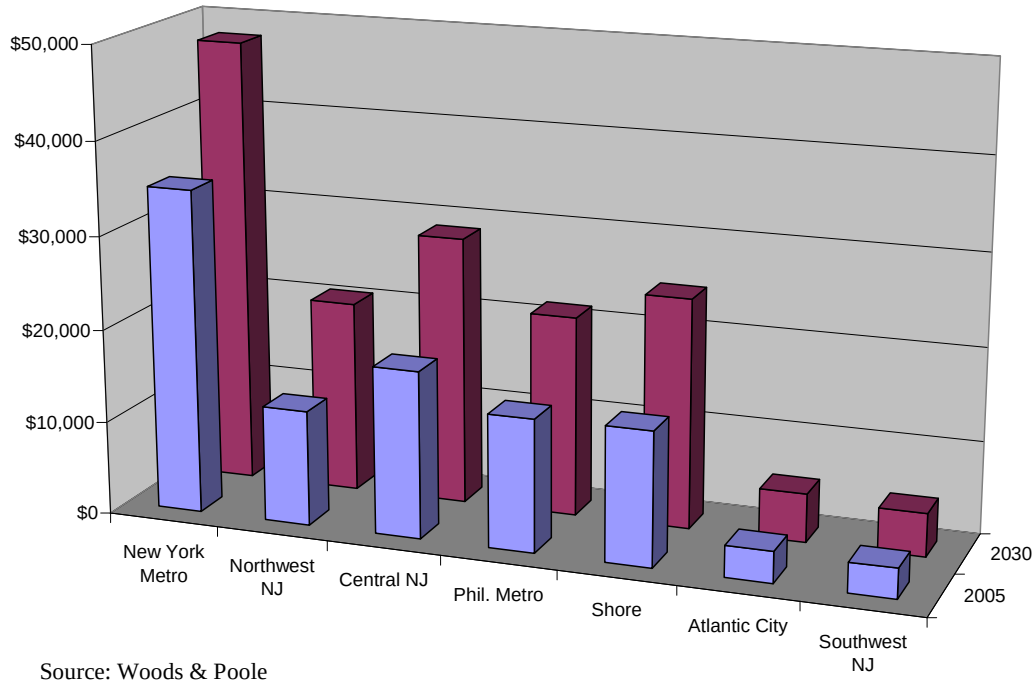
C.2 Local Truck Freight Market

Local freight is defined as having an origin, destination, or intermediate stop in New Jersey. As such, this category includes (1) local deliveries to retail stores, (2) business-to-business shipments as part of production, and (3) truck movement that either originates or terminates at a local air or marine port.

Retail/Delivery Freight

This category of freight movement is generated by final demand for finished goods. Three to five axle trucks typically makes these deliveries from regional warehouses, with travel distance and frequencies dependent on the commodity being shipped (e.g., electronics vs. furniture), the type of retail establishment (e.g., regional mall vs. gas station), and local demographics. In general, these deliveries are concentrated around residential and tourist areas. Shipments roughly follow the regional distribution of retail sales. Figure C.6 confirms that despite lower overall economic activity, the highly residential areas of Northwest New Jersey and the Shore region have high demand for retail shipments.

Figure C.6: Actual and Forecasted Retail Sales ($1996)

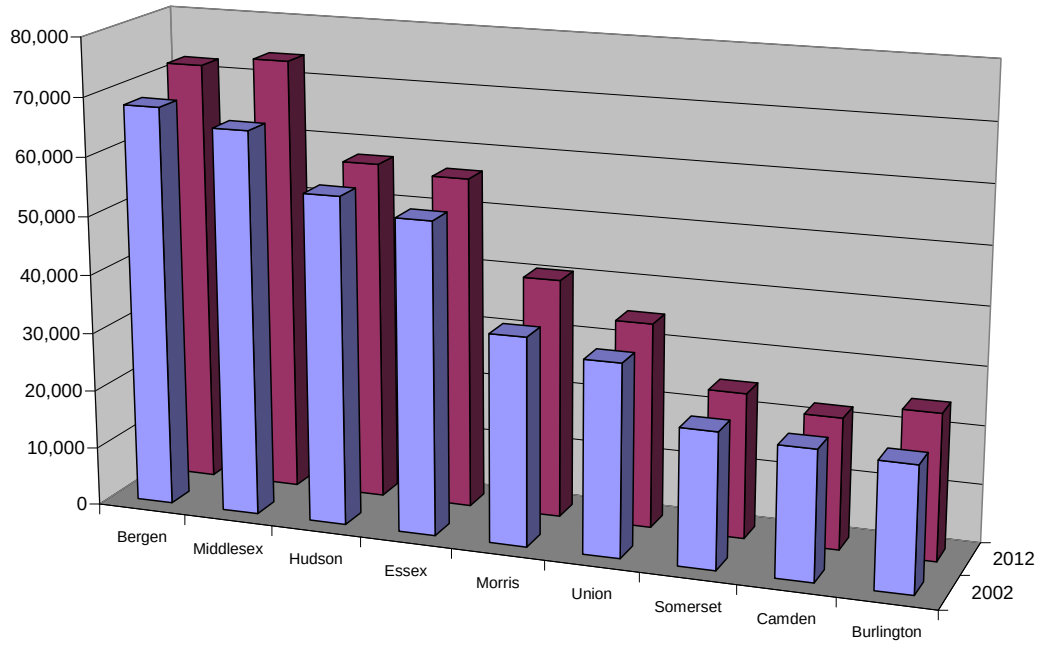


Source: Woods & Poole

Supply Chain Freight

Intra and interstate truck movement is also generated by industrial activity. This category tracks freight movement through the supply chain. While this type of activity occurs in all sectors, several sectors comprise a large portion of shipments. Figure C.7 shows the top nine counties containing employment in NAICS Sectors 42 (wholesale trade), 48 (transportation), and 49 (courier and warehousing). As such, it identifies those counties that have a high volume of truck traffic entering and leaving. It clearly identifies the warehousing/ distribution cluster in the Gateway region, and also identifies it as a high growth region). Additionally, a significant amount of trucking-related employment exists in the I-287 loop area (Morris and Somerset) and along the southern part of the New Jersey Turnpike (Burlington and Camden).

Figure C.7: Employment in Wholesale Trade (42), Transportation (48), and Warehousing (49) Sectors



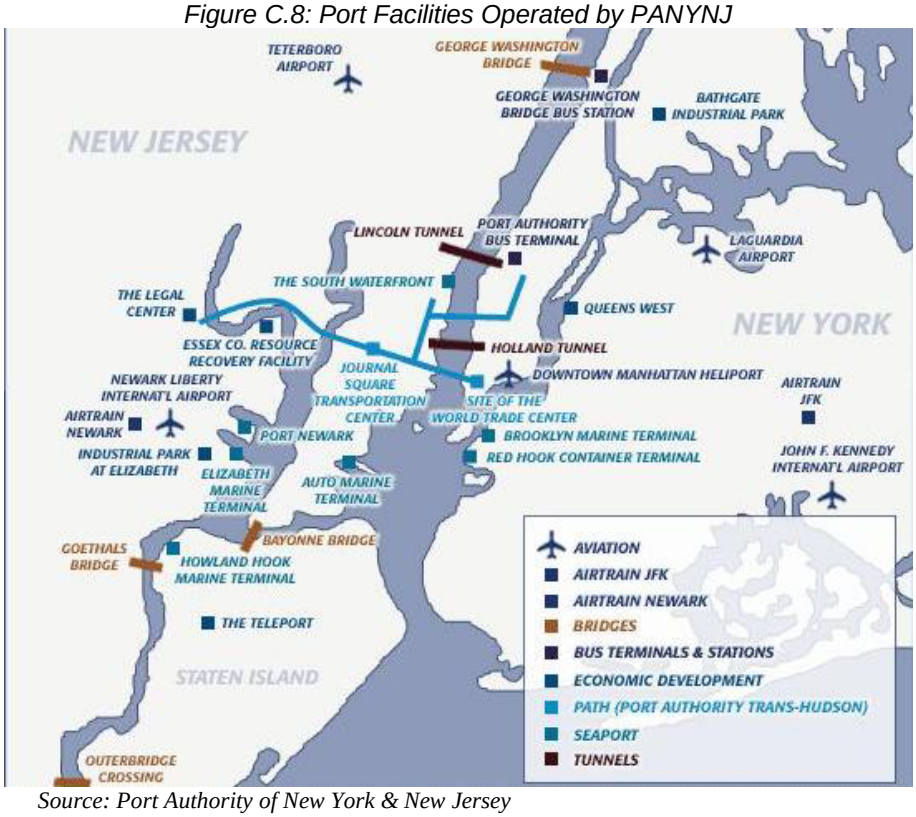
Source: New Jersey Dept. of Labor and Workforce Development

Import/Export Freight

Finally, the air and water ports managed by the Port Authority of New York and New Jersey (PANYNJ) are a significant source of freight truck trips. PANYNJ facilities are shown in Figure C.8 (the port of Perth Amboy in Middlesex County is not shown).

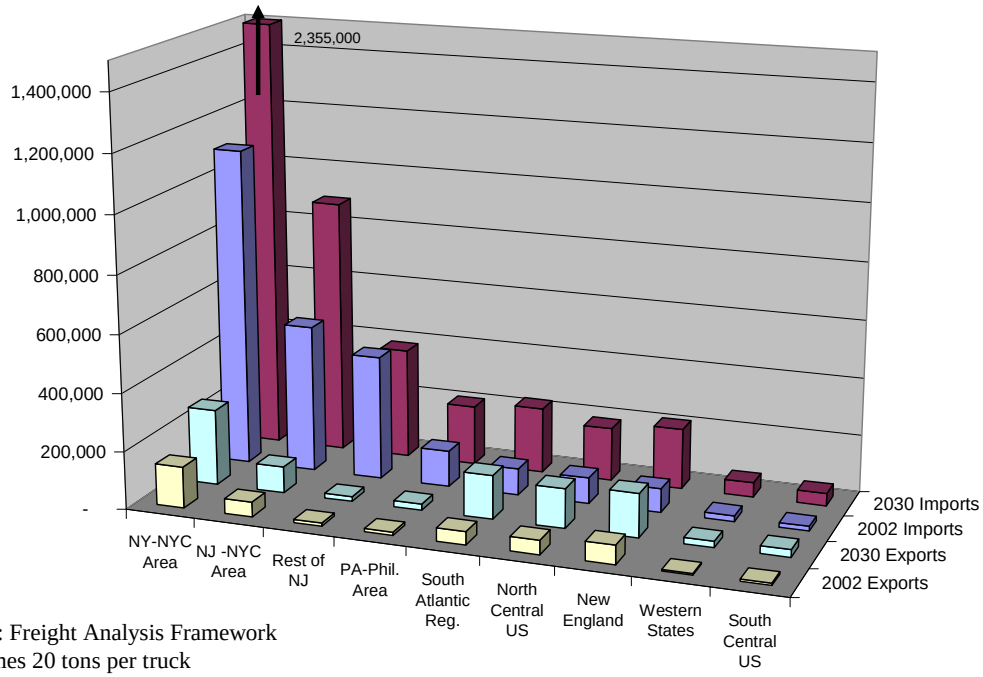
Figure C.9 compiles origin/destination trends for New York City area seaports. More explicitly, it shows the final destination of imports and origin of exports that move through these seaports, *but only that amount carried by truck*. It reveals several trends. First, imports dwarf exports, both now and in the future. Second, the majority of freight either originates from or is destined for the New York Metropolitan area. However, a significant fraction of demand derives from New Jersey – both inside and outside the New York City area. Beyond New Jersey, a diminishing fraction of port activity relates to the Philadelphia region, South Atlantic States, and points west. Finally, Figure C.9 shows the dramatic growth of imports expected through area ports. This high growth is a function of long-range trends with our global trading partners (see Section 3.4.2 for a more complete discussion of these issues).

Figure C.8: Port Facilities Operated by PANYNJ



Source: Port Authority of New York & New Jersey

*Figure C.9: Truck freight movement to and from New York City area seaports by origin/destination region (annual truckload-equivalents)**



Source: Freight Analysis Framework
* assumes 20 tons per truck

C.3 Through-Truck Freight

Through traffic is defined as that which does not have an origin or destination connected to New Jersey industry or any regional ports. It is generated by (1) state-to-state economic activity along the eastern US coast, and (2) import/export activity through other Atlantic Coast ports. It should be noted that while the shortest-path distance between New England and the Southeast is through New Jersey, there are many highway routes between them – many of which bypass New Jersey altogether. Moreover, route choice from southeast states to northeast states depends on a number of factors such as the commodity being carried, highway congestion, and the precise origin and destination.

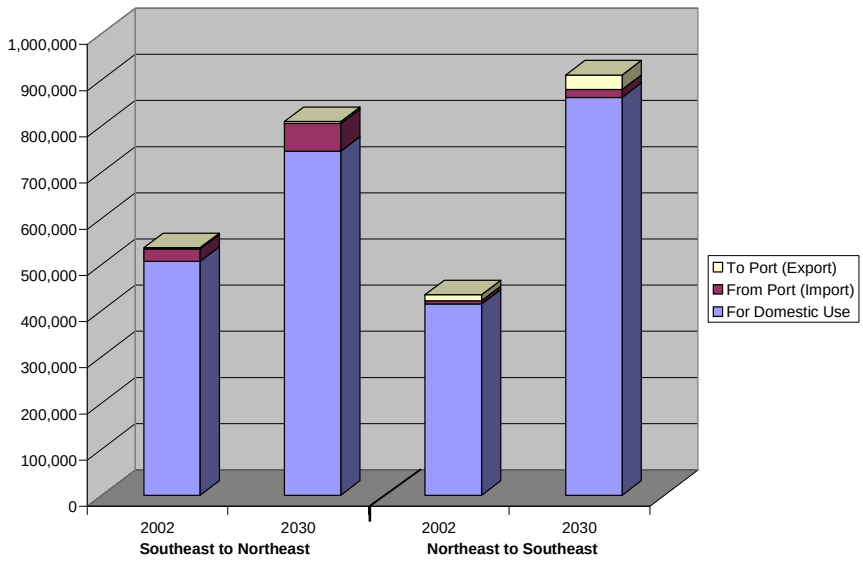
Domestic Supply-Chain Freight

Much of the "through" freight trips in New Jersey result from economic exchange between New England and the South-Atlantic States (DE, MD, DC, VA, NC, SC, GA, FL). Supply chain movement between these to regions is expected to grow substantially over the next thirty years, with the south-to-north direction growing the fastest (see Figure C.10).

Import/Export Freight

Truck movement through New Jersey also depends on port activity in adjacent states, although the magnitudes are much smaller than domestic supply-chain freight. Of particular importance are the ports of Baltimore, Philadelphia, Norfolk/Newport News, and Halifax. Each of these ports serves origins and destination patterns that connect through New Jersey. Figure C.10 shows combined import/export and domestic freight shipments between the Northeast (and Albany, but excluding NYC) and the Southeast (Philadelphia, MD, DC, DE, VA, NC, SC, GA, and FL).

*Figure C.10: Freight truck movement from Northeast to Southeast US (annual truckload-equivalents)**



Source: Freight Analysis Framework

* assumes 20 tons per truck; Northeast region includes New England and Albany (NY) but excludes NYC; Southeast region includes Philadelphia, MD, DC, DE, VA, NC, SC, GA, and FL.

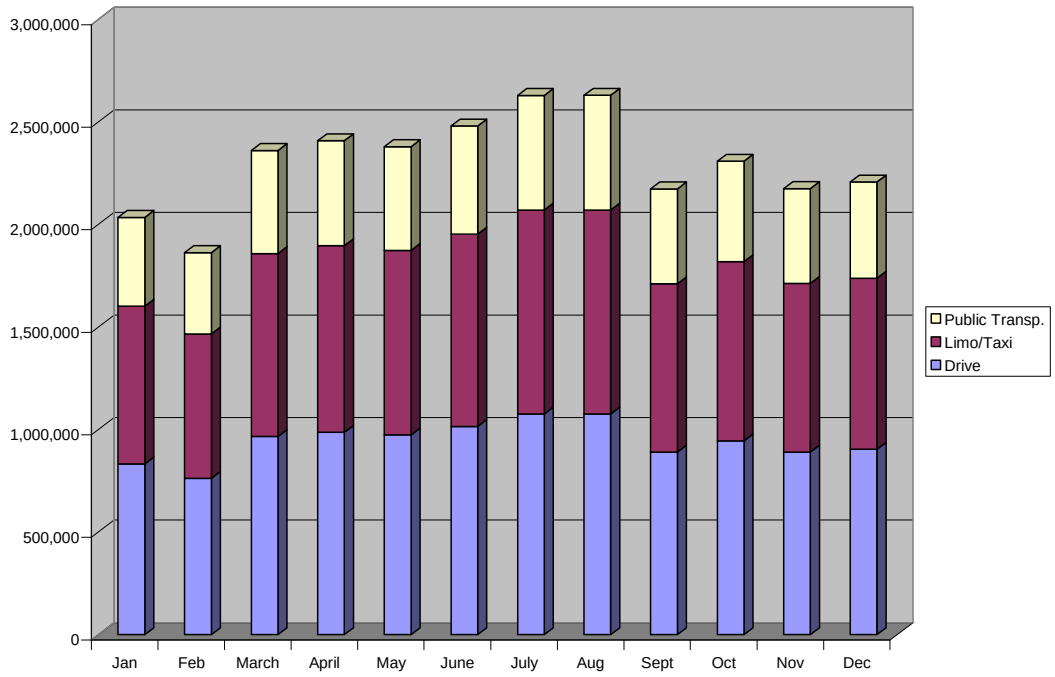
C.4 Tourism

New Jersey's tourism industry generally has three separate spatial components associated with New York City, Atlantic City, and the New Jersey shoreline. Each region caters to separate consumers, and each has different cycles of seasonality.

New York City

As a world-renowned center of tourism, the New York area contains several features significant to tourism, including museums, Ellis Island and the Statue of Liberty, airports, shopping, and the Meadowlands sports complex. Among these, stadium events can create large traffic spikes (Giant's stadium seats over 80,000), but the regional airports have the largest sustained effect on passenger travel on New Jersey's highways. Figure 17 shows the number of New Jersey residents that use all regional airports, broken down by month and by mode of travel to the airport.

*Figure C.11: New Jersey Residents' use of Regional Airports, by Mode to Airport (monthly passengers)**



Source: Port Authority of New York & New Jersey, *Monthly Traffic Reports Nov. 2005 – Oct. 2006*
* Airports include Newark, JFK, LaGuardia, and Teterboro

New Jersey Shore

Summer tourism generates additional highway passenger travel through several components. First, the New Jersey Shoreline Counties contain nearly 100,000 seasonal homes (see Table C.1). These generate significant long-distance travel, particularly between June and September (with additional traffic spikes on holiday weekends). Second, the beach attracts a significant number of same-day and weekend trips – these trips are supported by an extensive accommodation industry, and the seasonality patterns are the same as discussed above. Statewide, roughly 40,000 tourists made day-trips to New Jersey in 2005[3], with roughly 28% of these drawn to the beach/waterfront, and with roughly 90% of trips made by car[4]. Finally, New Jersey tourism has an overall seasonality pattern as shown in Figure C.12

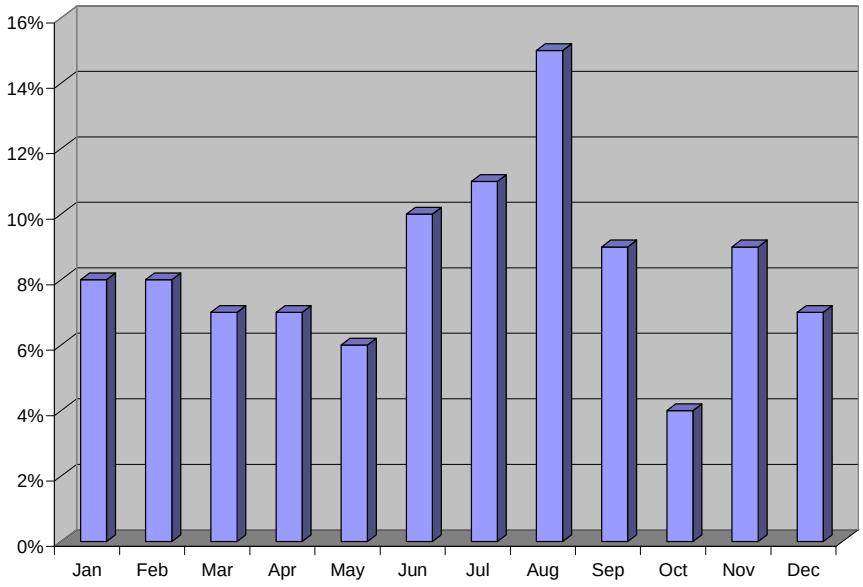
Table C.1: Seasonal Homes on the New Jersey Shore

County	No. of Seasonal Homes, 2005
Cape May	43,124
Ocean	33,200
Atlantic	11,700
Monmouth	7,726
Shore Total	95,750

Source: New Jersey Commerce, Economic Growth & Tourism Commission

[3] Source: New Jersey Commerce, Economic Growth & Tourism Commission
[4] Source: D.K. Shifflet & Associates, *New Jersey FY2005 Visitor Profile*

Figure C.12: Seasonality of Overnight and Same-Day Tourist Trips to New Jersey, 2005

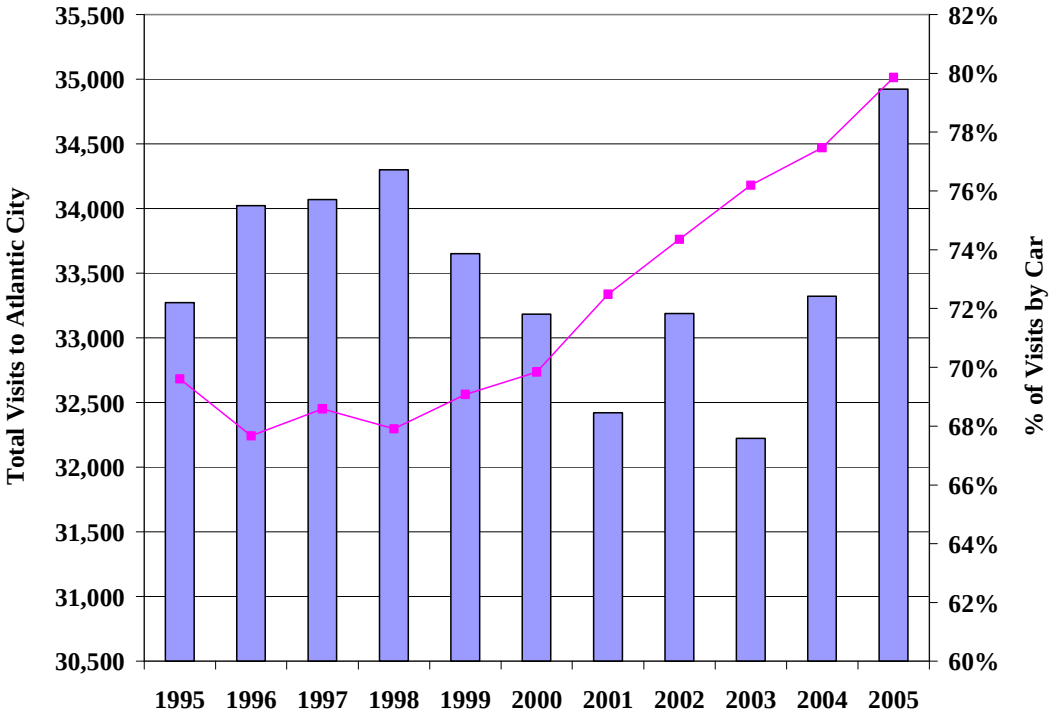


Source: D.K. Shifflet & Associates, *New Jersey FY2005 Visitor Profile*

Atlantic City

Tourism dominates the Atlantic City economy, and approximately 85 percent of visitors arrive with the primary purpose of gambling. With casino revenues of more than $5.0 billion in 2005, Atlantic City is second only to Las Vegas. Atlantic City's proximity to New York and Philadelphia results in a high volume of day trips. In fact, the 2004 Visitor Profile found that some two-thirds of visitors do not stay overnight. Figure C.13 shows the relationship between total trips and car trips to Atlantic City. In 2005, more than 80 percent of visitors arrived by car. Over the 10 years, an additional 20-30 percent of visitors have arrived by bus. In contrast, only a few hundred visitors arrive by air or rail. It is not surprising that Atlantic City fared better than Las Vegas in the wake of 9/11.

Figure C.13: Annual Trips to Atlantic City by Car



Source: Atlantic City Convention and Visitors Authority and South Jersey Transportation Authority.

APPENDIX D

BEHAVIORAL SURVEY

Q1. What is your age?

Q2. What is your gender?

Q114. Which state do you currently live in?

If other than Connecticut, Delaware, New Jersey, New York or Pennsylvania, then end survey

Q120. Thinking just about the last thirty days, on about how many of those days did you personally drive a vehicle in any part of New Jersey?

- 20 days or more
- 10-19 days
- 5-9 days
- 1-4 days
- None
- Don't know

If "None" or "Don't Know", then end survey

Q140. And thinking again about just the last thirty days, on how many of those days did you personally drive a vehicle on each of the roads New Jersey Turnpike, Garden State Parkway, Atlantic City Expressway, Pennsylvania Turnpike, NY State Thruway, I-78, I-80, I-280 and I-287?

- 20 days or more
- 10-19 days
- 5-9 days
- 1-4 days
- None
- Don't Know

If "None" or "Don't Know" for NJTP, GSP and ACE, then end survey

Q141. Which of the following roads do you use most frequently (if selected above)? If all three selected above, which do you use most frequently and second most frequently?

- New Jersey Turnpike
- Garden State Parkway
- Atlantic City Expressway

Q145. Based on your answers to the previous questions, you qualify for a survey about road users in the State of New Jersey. The results will influence future transportation policies in the region. This survey should take about 15 minutes of your time. For your help, you'll earn an additional 40 NFO MySurvey.com reward points. A total of 50 NFO

MySurvey.com reward points will be credited to your account upon completion of the 15 minute survey.

Would you like to continue with this survey?

The following questions are about your driving over the last 30 days.

Q212. When answering the following questions, please refer to these descriptions:

- To or from your usual place of work or education: this is for those in full or part-time employment or education. This does not include informal or irregular education such as evening classes.
- As part of doing your job: this includes any trip in work time, but it does not include your commute.
- For shopping: This includes both regular or grocery shopping, and other trips related to shopping, whether or not you actually buy anything.
- For a leisure activity or personal business: This includes visits to see friends, social gatherings, sports events, cultural events, medical appointments, informal education or evening classes, job interviews, christenings, weddings, funerals, driving as a leisure activity, or anything else.

Thinking again about just the last thirty days, on about how many of those days did you personally drive for the following trip purposes (To or from your usual place of work or education, As part of your job, For Shopping, For a leisure activity or personal business)? (Select One for each purpose)

- 20 days or more
- 10-19 days
- 5-9 days
- 1-4 days
- None
- Don’t Know

Q216. Thinking again about just the last thirty days, on about how many of those days did you personally drive to each of the following places (New York, Philadelphia, Newark, Newark Airport, Atlantic City, Jersey City)? (Select One for each destination)

- 20 days or more
- 10-19 days
- 5-9 days
- 1-4 days
- None
- Don’t Know

Q221b. The most recent time that you drove a vehicle for each of the following types of trip, how many people were in the vehicle in total, including yourself (To or from your usual place of work or education, As part of your job, For Shopping, For a leisure activity or personal business)? (Select One for each purpose)

- 1
- 2
- 3
- 4
- 5+
- NA

Q221d. The most recent time that you drove a vehicle for each of the following types of trip, who paid for most of the costs of the trip (parking, fuel, any tolls) (To or from your usual place of work or education, As part of your job, For Shopping, For a leisure activity or personal business)? (Select One for each purpose)

- I paid for all of it
- I paid part of it, my employer will pay the rest
- I paid part of it, someone else will pay the rest
- My employer will reimburse the whole cost
- Someone else will pay the whole cost
- Not applicable

Q225. For each of the following trip purposes, chosen sequentially as that the program loops through all of them, omitting those where the answer to Q212 was none or don't know (To or from your usual place of work or education, As part of your job, For Shopping, For a leisure activity or personal business). Hence this block of questions is repeated a maximum of 4 times, once for each trip purpose:

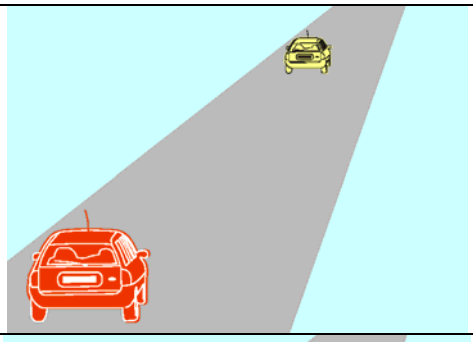
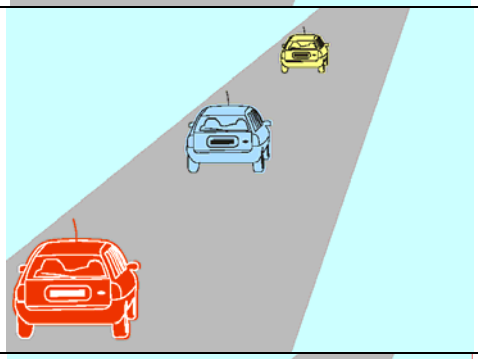
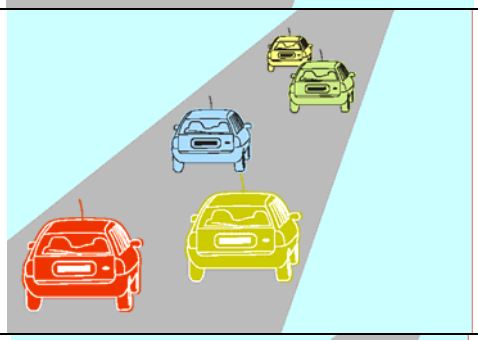
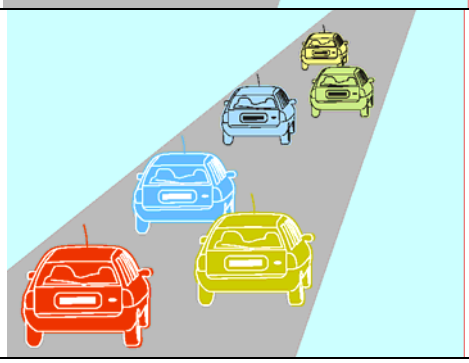
Q227. Please recall the most recent occasion when you personally drove (particular purpose), and you could have used the (response from Q150) whether or not you did actually use it). Can you remember having made such a trip in the last 30 days?

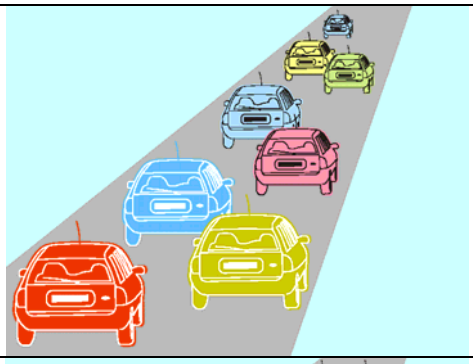
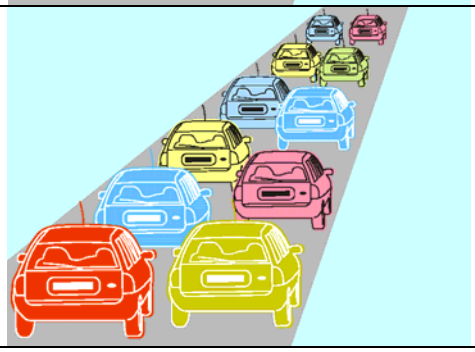
Ask if Q227 = YES. Q230. On that most recent trip (particular purpose), did you in fact use (response from Q150)?

Ask *if Q230 = YES.* Q233. At the time of day you were traveling most recently (particular purpose) using (response from Q150), were there alternative routes available to you that you might have considered taking?

Ask if Q233 = YES. Q235. Which alternative route(s) might you have considered using? (Please be as specific as possible.)

Ask if Q227 = YES. Q243. Considering the most recent trip you made (particular purpose) using the (response from Q150), which of these best describes the level of congestion that you experienced on the (response from Q150)? Please down scroll to review all options. (Select One)

Free flowing **You can travel at your own speed with no problems over-taking**	
Busy **You can travel pretty much at the speed limit, but you are forced to change lanes every now and then**	
Light congestion **You can travel close to the speed limit most of the time, but you have to slow down every so often for no apparent reason**	
Heavy congestion **Your speed is noticeably restricted**	

Stop start **You are forced to drive in a "stop-start" fashion**	
Gridlock **You are only able to move at a crawl at best, and spend quite a lot of time stationary**	

- Free flowing
- Busy
- Light congestion
- Heavy congestion
- Stop start
- Gridlock
- Can't remember the last time you made a trip (particular purpose) on the (response from Q150)
- Not Applicable

This section will ask about changes over the past 2 years.

Q260. Now thinking now about all the driving you do, for any purpose, how does your use of the (response Q150) today compare with 2 years ago? (Select One)

- Much more
- More
- About the same
- Less
- Much less
- Not sure
- Did not drive 2 years ago
- Did not live in area 2 years ago

Ask if Q260 is not “About the same” or “Did not drive 2 years ago” or “Did not live in area 2 years ago”. Q270. What are the main reasons for this change? (Please be as specific as possible)

Ask if Q260 is not “Not sure”, “Did not drive 2 years ago” or “Did not live in area 2 years ago”. Q271. And how has the level of congestion that you experience on the (response from Q150) changed, compared to 2 years ago? (Select One)

- Much better today
- Better today
- About the same today
- Worse today
- Much worse today
- Not sure

The following questions ask about a recent ROUND TRIP, meaning a trip when you personally drove somewhere and then returned.

Q320. Thinking now about the very last time you made a round trip using the (response from Q150) for some part of that trip, what was the purpose of your trip? (This answer becomes particular purpose 2) (Select One)

- To travel to or from your usual place of work or education
- To travel as part of doing your job
- For shopping
- For any other purpose

Q325. Thinking about the round trip, did you use the (response from Q150) in both directions? (Select One)

- Yes, in both directions
- No, just driving out
- No, just driving back

Q330 About how often do you personally drive (particular purpose 2) using the (response from Q150) for part of the trip? (Select One)

- 5 days per week or more
- 2 - 4 days per week
- 1 - 4 days per month
- Less frequently
- Never

Q335. On what day did you set out? (Select One)

- Monday
- Tuesday
- Wednesday
- Thursday
- Friday
- Saturday
- Sunday

Q340. At about what time did you set out, the last time you made a round trip using the (response from Q150) for part of the trip? (Select One hour from 24 hours)

Q341. This part asks for the approx. time of the trip within the given hour. Display on same screen as Q340. (Select One)

- 00-09
- 10-19
- 20-29
- 30-39
- 40-49
- 50-59

Q341a. Approximately how many minutes was the one-way drive time, from when you set out from your initial starting point until you reached your final destination? (Type a whole number of minutes below)

Q342. Did you travel back on the same day? (Select One)

Ask if Q342 = No. Q343. On what day did you travel back? (Select One)

- Monday
- Tuesday
- Wednesday
- Thursday
- Friday
- Saturday
- Sunday

Q344. At about what time did you return, the last time you used the (response from Q150)? (Select One hour from 24 hours). *If Q342 = Yes then the respondent should only be able to answer items later than the response to Q340.*

Q345. This part asks for the approx. time of the trip within the given hour. Display on same screen as Q344. (Select One)

- 00-09
- 10-19
- 20-29
- 30-39
- 40-49
- 50-59

Q345. Approximately how many minutes was the one-way drive time, from when you started your return journey until when you arrived at the end of your journey? (Type a whole number of minutes below)

Q350. How important was it that you made that round trip, to that destination, at that time? (Please consider the personal consequences for you if you had not made it then) (Select One)

- Extremely important
- Very important
- Moderately important
- Not very important
- Not at all important

Q360. What alternatives did you have, to making that round trip how and when you did? From the list below, please identify your first, second and third best alternatives. (Type in a whole number from 1 – 3 for those that apply) *Each respondent has to at least answer 1 if they do not choose no alternatives, but can answer up to 3.*

- Same road, other time(s) of travel
- Other route(s)
- Other mode(s) of transport
- Other destination(s)
- Using phone/internet instead
- No alternatives (*if this is marked, this is the only one that needs marked)*
- Other (specify)

Randomly chosen for each respondent (as they qualify). Outbound – base on Q341a, Return – base on Q345a. Split into 2 separate questions but randomly rotate order shown for Q395 and Q396.

Ask if Q341a (outbound) or Q345A (return) is greater than 9 minutes. Q395. Thinking again about your recent round trip (particular purpose 2) on the (response from Q150), please respond "true" or "false" to the following statement.

If the (outbound/return) half of my journey could have been *(insert first time saving minutes from grid below)* minutes faster, this would have been worth at least *(insert first value from grid below)* to me on that occasion.

Ask if Q341a (outbound) or Q345a (return) is greater than 9 minutes. Q396. Thinking again about your recent round trip (particular purpose 2) on the (response from Q150), please respond "true" or "false" to the following statement. (Select one)

If the (outbound/return) half of my journey could have been *(insert second time saving minutes from grid below)* minutes faster, this would have been worth at least *(insert second value from grid below)* to me on that occasion.

Journey length greater than or equal to (mins)	Time saving (mins)	First Value ($)	Second Value ($)
10-14	3	$0.40	$1.50
15-29	5	$0.60	$2.50
30-59	10	$1.20	$5.00
60 - 69	15	$1.80	$7.50
70 or more	20	$2.40	$10.00

The following questions are about paying for the use of roads.

Q410. Do you have an E-ZPass (or another transponder pass that works on the E-ZPass system)? (Select One)

Ask if Q410 = YES. Q415. How long have you had that pass? (Select One)

- Less than a month
- 1-6 months
- 7-11 months
- 1-2 years
- 3-5 years
- 6-7 years
- More than 7 years
- Not sure

Q417 Approximately how much did you personally, as a driver, spend in the last 30 days on road tolls in New Jersey? (Select One)

- $0
- $1-$9
- $10-$49
- $50-$99
- $100-$199
- $200-$299
- $300-$399
- $400 or more
- Not sure

Ask if Q410 = YES. Q420. Which of these best describes the way you think about the cost of the tolls on the (response from Q150)? (Select One)

- The full amount on the monthly bill
- The frequency of transfers from my bank account or credit cards
- The average amount per trip
- I don't normally think about it

Ask if Q410 = YES. Q430. All things considered, how do you personally rate the E-ZPass system, compared to paying cash? (Select One)

- Much better
- Better
- Slightly better
- Same
- Slightly worse
- Worse
- Much worse

Ask if Q410 = YES. Q440. How often do you take advantage of E-ZPass off-peak discounts, considering all the times you personally drive on the (response from Q150)? (Select One)

- Always
- Frequently
- Sometimes
- Infrequently
- Never

Ask if Q410 = YES. Q450. When you are planning to drive using the (response from Q150), do you take into account the E-ZPass discounts that are available? (Select One)

- Yes- all of my trips on the (response from Q150)
- Yes- most of my trips on the (response from Q150)
- Yes- some of my trips on the (response from Q150)
- Yes- a few of my trips on the (response from Q150)
- No, none of the my trips on the (response from Q150)

Ask if Q410 = YES. Q460. Have you been using the (response from Q150) more or less often since you started using E-ZPass? (Select One)

- Much more often
- More often
- The same
- Less often
- Much less often

Q511. How do you rate the value for money of the tolls on the (response from Q150)? (Select One)

- Very good
- Good
- Average
- Bad
- Very bad

Q521. Have you personally experienced a significant change in the tolls on the (response from Q150) over the last 2 years? (Select One)

- Yes – tolls are now much higher
- Yes – tolls are now a bit higher
- No – about the same
- Yes – tolls are now a bit lower
- Yes – tolls are now much lower
- Not sure

Q711. Could you please tell us how you feel about the statements below? ((response from Q150) is the name of the road used most recently.) (Select one from Agree completely, Agree somewhat, Neither, Disagree somewhat, Disagree completely for each one)

- For the great majority of trips I make, I have no choice but to drive
- Tolls on the (response from Q150) are expensive for the service you get
- Since the recent fuel price increases I use my car less
- I would aim to replace my car with a more economic model if fuel prices remain high
- Driving on the (response from Q150) is a stress-free experience
- I feel uncomfortable using the (response from Q150)
- It is not fair to charge for using the (response from Q150)
- I would use the (response from Q150) a lot more if the toll were decreased by 20%
- I would use the (response from Q150) a lot less if the toll were increased by 20%
- The cost of the toll for the (response from Q150) is a significant deterrent for me to travel around New Jersey
- I worry about the amount I spend on tolls for the (response from Q150)
- The (response from Q150) is essential for many of the trips that I make around New Jersey

Now, a few questions about you before we finish.

Q800. What is the five-digit zip code for your home address? (Type in a 5 digit number)

Q801. What is your total household income before taxes? Like all of your answers, information about your income is completely confidential and will not be disclosed to anyone. (Select one)

- Under $15,000
- $15,000 to $24,999
- $25,000 to $34,999
- $35,000 to $44,999
- $45,000 to $54,999
- $55,000 to $74,999
- $75,000 to $99,999
- $100,000 or more
- Prefer not to answer

Q802. What is the highest level of formal education you have completed? (Select one)

- Primary/secondary school
- High school graduate
- Some college
- 2 year college/technical school
- 4 year college

- Postgraduate college

Q810. Which of these best describes your employment? (Select One)

- Employed full-time
- Employed part-time
- Retired
- Not working outside the home
- Full-time student
- Other (specify)

Ask if Q810 = "Employed" or "Retired". Q811. Which of the following best describes your occupation, or your previous occupation if you are retired? (Select one)

- Managerial/Professional/Executive
- Technical/Sales/Administrative Support
- Service
- Farming/Forestry/Fishing
- Craftsman/Repairman
- Operator/Laborer
- Other

Ask if Q810 = "Employed" or "Student". Q820. Where do you normally work / study? (Select One from list of 72 NJ locations, NY New York City, NY Yonkers, PA Philadelphia, PA Pittsburgh, Other)

Ask if Q810 = "Employed". Q830. Does your job allow you to work from home? (Select One)

- Yes, I could work from home all the time if I wanted to
- Yes, I could work from home regularly if I wanted to
- Yes, I could work form home occasionally if I wanted to
- Only in special circumstance
- No

Ask if Q810 = "Employed". Q840. On about how many days did you work from home in the last year? (Select One)

- None
- 1
- 2-3
- 4-6
- 7-11
- 12-25

- 26-50
- 51+

Including yourself, how many people, in total, currently live in your household? (Type in a whole number for Adults and Children) - *must sum to at least 1*

How many vehicles do you have in your household? Please include all cars, trucks, motorcycles, etc. (Type in a whole number for each) - *must sum to at least 1*

Loop Q843 – 844 through until asked for each vehicle from Q842 – up to 10. Please answer these questions in regards to your first (or next) vehicle

Q843. Which of the following describes your vehicle? (Select all that apply)

- Compact/subcompact car
- Large car
- Luxury car
- Midsize car
- Minivan
- Motorcycle
- Pickup Truck
- Sports car
- Standard passenger / cargo van
- SUV
- Other (specify)
- Don't know

Q844. What year is your vehicle? (Select one year or Older than 1990)

Q900. Do you have any comments about this survey? (Please be as specific as possible. If nothing comes to mind, please type NA.)