Review of
New Jersey Turnpike Authority
Interchange 6-9 Widening Program
Environmental Impact Statement

Prepared for:

Tri-State Transportation Campaign

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Summary

The Environmental Impact Statement (EIS) for the New Jersey Turnpike Authority Interchange 6-9 Widening Program (January 2007) fails to consider a congestion pricing alternative to widening. The Turnpike charges higher E-Z pass tolls during peak hours than in off-peak hours. However, the current price differentials are small compared to other roadways in the U.S. that use variable tolling such as SR 91 in Orange County, California. The EIS did not consider more effective congestion pricing as an alternative, even though congestion pricing is becoming increasingly widely used in the U.S. In addition to many jurisdictions operating or planning express toll lanes parallel to free freeway lanes, toll authorities in Illinois and Florida are planning express toll lanes with higher tolls than the general toll lanes. In the Chicago region, these "Green Lanes" are planned to be implemented on 80 miles of toll road between 2010 and 2015. The Miami Dade Expressway Authority states that they are implementing express toll lanes rather than simply widening that toll road because: **"Building more lanes will only spread congestion and will not alleviate traffic in the long run."**[1] As compared to the proposed widening project, more effective congestion pricing on the New Jersey Turnpike would achieve congestion relief without the negative secondary impacts of widening.

Increasing freeway and toll road capacity always leads to increased travel. The modeling done in the EIS fails to properly account for these increases. Modeling methods that do account for these increases are readily available. In fact, the required feedback procedures are routinely employed in the region for air quality analyses as required by Federal regulations. Without this model feedback, the EIS fails to disclose indirect impacts of the projects including land use shifts, increased congestion on other roadways and also increased travel, energy use, greenhouse gas emissions. When these modeling deficiencies are corrected, the apparent capacity problem in 2032 is much reduced.

Even this corrected modeled overstates the future traffic problem because the EIS overestimates traffic growth for at least six reasons:

1) EIS fails to include the impacts of recent toll increases or programmed future toll increases
2) EIS relies on unrealistic levels of future jobs in the study area
3) EIS likely overestimates suburban growth
4) EIS ignores impacts of widening on future land use
5) EIS fails to account for reduced driving by senior citizens
6) EIS may overestimate growth in external and freight traffic

If all of these issues are addressed, congestion pricing alone would likely be sufficient to deal with 2032 congestion or could be combined with a minimal widening program, e.g. one additional lane in each direction.

[1] Miami Dade Expressway Authority. "MDX Introduces Managed Lanes." http://mdxtest.myflorida.com/improvements/managed_lanes_faq.htm

Congestion Pricing as Alternative to Widening Not Considered

Economists have long argued that congestion should be managed through pricing. A preeminent transportation economist, Kenneth Small, writes:

> The U.S. highway system, largely constructed with public funds from the fuel tax, could be characterized as a public good if it were rarely congested. But like many public goods that are available at little or no charge, its quality has deteriorated with the intensity of use. Today, the nation's road system has turned into a "tragedy of the commons" as road users experience nearly 4 billion hours of annual delay (Schrank and Lomax, 2005). Of course, even an efficient road system would force motorists to incur some delays, but the current level is regarded by most observers as excessive.[2]

To transportation economists, congestion pricing is a win-win policy, almost a "free lunch." The collective value of the tolls paid is much less than the collective value of the time savings achieved through tolling. There are concerns about equity, but these concerns can generally be addressed through using some of the toll revenue to support transit and other transportation choices that benefit lower-income people.

Therefore, toll values are not just an important model input; they are an important policy tool. The Turnpike expansion is proposed to deal with peak period congestion including Friday afternoon and Sunday afternoon congestion. Instead of assuming tolls are constant in the model (and incorrectly assuming tolls that are lower than actual tolls today), traffic can be managed, in part, through variable toll rates. Higher peak period tolls would encourage travel during off-peak periods when excess roadway capacity is available, and other travel shifts including carpooling, choosing a closer destination, and using transit.

Although there generally are concerns that higher tolls will divert traffic to free roadways, this effect is often more than offset by an opposing effects that are often ignored. With higher peak period tolls, peak period vehicle miles traveled (VMT) will be lower and this will mean lower traffic volumes on many roadways. These reductions are likely to be especially large at important bottlenecks like Princeton Hightstown Road (discussed below). Congestion pricing also encourages commuters to carpool and to use transit.

There are two alternative approaches to congestion pricing on the Turnpike: 1) tolling all lanes at higher rates during peak periods (i.e. increasing the current differentials), or 2) tolling some lanes at a higher rate than other lanes. Both approaches have advantages and disadvantages.

<u>Tolling all lanes at the same rate</u>

407 ETR (Express Toll Route) in the Toronto area is a publicly-built highway that was later sold to a private firm. It is 108 kilometers in length (67 miles). It requires a transponder and is completely barrier

[2] Small, Kenneth A., Clifford Winston and Jia Yau. "Differentiated Road Pricing, Express Lane, and Carpools: Exploiting Heterogeneous Preferences in Policy Design. Brookings Institution, 2006.

free. Off-peak tolls are relatively high compared to most U.S. toll roads, $.18 per km or $.29 per mile plus $.25 (Canadian) for passenger cars + monthly transponder fees. Higher tolls are charged during peak periods. The differential between off-peak and peak tolls is higher in more heavily traveled sections. The peak surcharge is moderate today (7-10 percent), but with the peak pricing structure in place, the differential could increase over time as needed to maintain desired travel speeds.

Tolling some lanes at a higher rate than other lanes

In most cases, a single toll charge for all users is probably most economically efficient, in part because this avoids the high costs required to construct dual facilities and the interconnections between the dual facilities. However, it has been difficult politically to introduce tolls on free roadways or to increase tolls on existing toll roads to the levels needed to manage congestion. Therefore, most congestion pricing projects in the U.S. have involved dual facilities. The dual facility/dual price model got started with SR 91 in Orange County, California. There, toll lanes were added to the median of a very congested freeway, opening in 1995. These toll lanes started as a private franchise but were purchased by the by the Orange County Transportation Authority (OCTA) in 2003 which now is the operator.

OCTA's policy goals in setting tolls are:

- Provide customers a safe, reliable, predictable commute.
- Optimize throughput at free-flow speeds.
- Increase average vehicle occupancy.
- Balance capacity and demand, thereby serving both full-pay customers and carpoolers with three or more people who are offered discounted tolls.
- Generate sufficient revenue to sustain the financial viability of the 91 Express Lanes.[3]

OCTA has a target flow of 1360 - 1600 vehicles per lane per hour. If traffic volumes exceed the target, tolls are increased; if traffic volumes are lower than the target, the tolls are decreased. Tolls on SR 91 vary by day of week, time period and direction of travel. In the January 1, 2009 schedule tolls for the 10-mile express toll lanes section range from $1.25 for off-peak periods to $9.55.[4] Carpools with 3 or more passengers are exempt from the tolls. These policies work together to achieve OCTA's policy goals including maintaining throughput on the managed lanes at free-flow speeds and increasing vehicle occupancy.

Since SR-91 opened, other managed lane projects have opened in Texas, Minnesota, California, Colorado and Utah.[5] Other projects are under construction, including adding express toll lanes to the Capital Beltway around Washington D.C. in Virginia.

[3]Orange County Transportation Authority http://www.octa.net/toll_policy.aspx

[4] Orange County Transportation Authority http://www.octa.net/schedule_effective.aspx

[5] Texas Transportation Institute http://managed-lanes.tamu.edu/related_work/TRB/Inventory/Comprehensive_Listing_of_US_MLs-19Feb07.pdf

While the majority of these projects to date have paired express toll lanes with free lanes, Illinois and Florida are both planning to pair express toll lanes with general toll lanes. In Illinois, this initiative is called "Green Lanes" and is planned for 80 miles of toll roads in the Chicago region and will be implemented between 2010 and 2015.[6] The green lanes will serve carpools and vanpools at the regular toll price plus single occupant vehicles paying variable tolls. The Illinois State Tollway Authority states that the benefits will include:

- Reliable travel times - By using Green Lanes, daily commute times will be more consistent. Reduces congestion during peak periods, which helps reduce travel times for those who must travel then.
- Save money - According to the Alliance to Save Energy, using the average U.S. work commute of 12.1 miles, commuters could save about $300 a year by carpooling twice a week with two other people in a vehicle that gets 20.1 miles per gallon – assuming the three passengers share the cost of gas.
- Commute Options - Green Lanes will be shared with transit, such as PACE Buses, providing an opportunity to utilize a more efficient transportation system.[7]

In Florida, the Miami Dade Expressway Authority is also planning to add managed lanes with higher tolls than for general purpose toll lanes. In their Frequently Asked Questions webpage, one of the questions is: "Why not just build more general toll lanes?" The Miami Dade Expressway Authority answers: **"Building more lanes will only spread congestion and will not alleviate traffic in the long run."**[8]

Tolls Assumed in the EIS are too Low

The EIS never discusses alternative toll rates, and neither the recent 50% increase in toll rates nor the future toll increases that are already programmed were included in any of the published EIS analyses. It is well known that toll increases depress toll road volumes. When reporting on the current round of New

[6] *Chicago Tribune*. "Green Lanes are a go: Illinois tollway OKs $400 million congestion-relief project", November 21, 2008. http://archives.chicagotribune.com/2008/nov/21/local/chi-tollway-hotlanes-21-nov21

[7] Illinois State Tollway Authority, http://www.illinoistollway.com/pls/portal/docs/PAGE/TW_CONTENT_REPOSITORY/TW_CR_TRAFFIC_CONST/P2BROCHURE_FINAL_V3_10232008.PDF

[8] Miami Dade Expressway Authority. "MDX Introduces Managed Lanes." http://mdxtest.myflorida.com/improvements/managed_lanes_faq.htm

Jersey Turnpike toll increases, *Toll Roads News* suggests that the toll increases through 2012 might reduce Turnpike traffic by 10%.[9]

The actual decreases could be even greater. The modeling files we received include some modeling runs that were done with an 80% increase in tolls over the old, pre-increase tolls, i.e. about 20% higher than current tolls. We don't have documentation concerning these runs, but they appear to show reductions in traffic volumes of 17% to 35% for 24-hour periods for the Turnpike sections proposed for widening as shown in the table below.

Effects of 80% Toll Increase on 2005 Daily Traffic Volumes in Model

24-hour	Base	Increased Tolls	% change
Turnpike Northbound			
6 to 7	46,065	29,847	-35%
7 to 7A	49,080	32,857	-33%
7A to 8	60,980	49,149	-19%
8 to 8A	65,820	53,811	-18%
Turnpike Southbound			
6 to 7	44,547	30,308	-32%
7 to 7A	50,236	34,761	-31%
7A to 8	62,351	49,863	-20%
8 to 8A	64,485	53,694	-17%

The EIS failed to factor in either the toll increases that are already in effect or the further increases that are already programmed. Therefore, the EIS overestimates Turnpike traffic volumes, which causes it to overestimate the benefits of widening.

Congestion Pricing Options for the New Jersey Turnpike

Following either congestion pricing model (congestion pricing for all users or higher tolls for express lanes) is a better option for the New Jersey Turnpike that the proposed widening project. Even if limited roadway capacity were added as part of a congestion pricing implementation (e.g. one additional lane in each direction), congestion pricing would achieve congestion relief with much less induced travel, less secondary land use impacts, and smaller increases in traffic volumes on intersecting roadways. (These problems that result from highway widening are discussed in the sections below.)

[9] *Toll Road News*. New Jersey Turnpike toll increases trimmed slightly, new discounts for greenies, oldies, trucks off-peak. October 7, 2008.

The EIS Fails to Disclose Secondary Impacts of Widening

Bad Science in Roadway Expansion Studies

Over the past twenty years, transportation planners have learned a great deal about how transportation infrastructure and land use interact as inseparable parts of a complex system. Roadway expansion intended to relieve congestion always has unintended consequences. These include increased traffic levels on other roadways and changes in land use that increases traffic. These traffic increases generally lead to additional rounds of roadway expansion, resulting in a vicious cycle. The New Jersey Turnpike evaluation studies are predicated on this type of bad science. When these errors are corrected, the negative impacts are disclosed and apparent benefits are reduced.

These unintended consequences often are not disclosed in planning studies. For example, the best known recent freeway expansion project is the U.S. Big Dig in Boston. The *Boston Globe* recently reported how economic studies that evaluated the Big Dig failed to disclose impacts on other roadways that the Globe has now documented from post-construction traffic data.

> The upshot is that Massachusetts, for the $15 billion invested by the state and federal taxpayers, got a gleaming new highway system that has made zipping beneath Boston and Boston Harbor much easier. It increased overall mobility by allowing more people to travel at peak times. But most travelers who use the tunnels are still spending time in traffic jams – just not in the heart of the city, where bumper-to-bumper was a way of life on the old elevated artery.[10]

The *Globe* documents a number of trips where travel times have increased, including one case where peak period travel time has doubled from 12 minutes to 25 minutes.

In the project environmental review process, these traffic increases are a type of "secondary impact" that are required to be disclosed but generally are not. The *Globe* reports:

> The Globe findings provide a fuller picture of the traffic situation than a state-commissioned study done two years ago, in which the Big Dig was credited with helping to save at least $167 million a year by increasing economic productivity and decreasing motor vehicle operating costs. That study did not look at highways outside the Big Dig construction area and did not take into account new congestion elsewhere.

The negative impacts of highway expansion are not always obvious because they can occur over a wide area that often extends well beyond the boundaries of the roadway project. However, transportation planners have developed computer models that do account for these effects. The problem is not that that planners lack the tools to evaluate these impacts, but that they too often fail to employ the tools or use them improperly.

[10] *Boston Globe*. Big Dig pushes bottlenecks outward: Artery has cleared, but commutes longer on several major routes. November 16, 2008.

When secondary traffic impacts are not disclosed, project benefits are overstated and project impacts, including increased energy consumption and greenhouse gas emissions, are ignored. This is bad science that leads to overinvesting in increased freeway expansion.

EIS Ignores Impacts of Widening on Future Land Use

The EIS describes shifts towards auto-oriented suburban land uses as a cause of the need for roadway widening but fails to note that past roadway widening has been a primary cause of shifts towards auto-oriented suburban land uses.

> The primary factors which have contributed to traffic growth on the central New Jersey portion of the Turnpike over this period include: 1) increases in the state's population and employment; 2) a redistribution of the state's population and employment from its cities and older suburbs to newly suburbanized areas; and 3) changing household demographic patterns. These factors have contributed to an increased number of vehicles in the state, an increased number of trips made per vehicle, and an increased amount of mileage per trip. The major redistribution of northeastern and central New Jersey's population and employment which has occurred simultaneously with the absolute increases in those demographics has produced an increase in the number of trip origins and destinations, that is, more dispersed travel, and resultant increases in the number and length of automobile trips. The increasingly dispersed and suburbanized employment locations lead to increases in the number and length of automobile trips since these locations are generally accessible only by car. (EIS, p. 2-2)

This is a great statement of the land use/transportation problem, but fails to give sufficient weight to increased roadway capacity as a primary cause of the problem. Our reliance on large freeways and toll roads has caused great shifts in the locations of population and employment. Boarnet and Houghwout write:

> New highways that link the outlying residential areas to the CBD lower the cost of commuting into the employment concentration in the center of the city. This increases land values in the suburban fringe while reducing the "accessibility premium" that central locations had previously enjoyed. The urban area will grow geographically as commuters can live farther from work without increasing their travel budgets. Densities will fall as the premium for the densely developed locations near the CBD is reduced.[11] (p. 4)

The proposed widening of I-93 in New Hampshire provides an estimate of the magnitude of this effect. The Final Environmental Impact Statement (FEIS) included estimates from an expert panel that the widening would bring 40,000 additional residents into the study area.[12] When the additional population that would result from the I-93 widening is accounted for, the secondary impacts on traffic are

[11] Boarnet, Marlon and Andrew Houghwout. *Do Highways Matter? Evidence and Policy Implications of Highways Influence on Metropolitan Development*, p. 4. The Brookings Institution Center on Urban and Metropolitan Policy, 2000.

[12] New Hampshire I-93 Final Environmental Impact Statement, Section 4-12, p. 4-185 – 4-216, 2004.

enormous. The widened roadway would operate as level-of-service F in the year 2020, so that the project would fail its intended purpose of eliminating congestion on I-93.[13] However, that is only the tip of the iceberg of the problems caused by the widening. The more serious negative consequences are all of the impacts on other roadways in the region. No trip begins or ends on a freeway. The additional 40,000 people cause significant congestion throughout the study area. Mitigation for all of this additional congestion of local roadways would take large sums of money that is not included in the project's budget.

Increasing roadway capacity has been a primary cause of suburban housing growth in New Jersey. Further increases in roadway capacity would perpetuate this trend. Housing decentralizes first in response to increased freeway or toll road capacity, but job decentralization follows as jobs move out to be closer to the population. The greater Princeton/New Brunswick area is a national example of this pattern. Robert Lang writes:

> Northern New Jersey in particular houses a vast supply of edgeless city space. Consider, for example, Princeton, New Jersey, which often is mentioned in books on the new suburbs, including Garreau's *Edge City*. In this book, Princeton is listed as an edge city, represented by a small dot about where the town stands. But if readers open up Black's Guide and try to locate the Princeton edge city, as they would Tysons Corner, they will find that it simply does not exist – as a center, at least. Instead they will be confronted with about a dozen maps that together represent more than 100 square miles of central New Jersey between Princeton and New Brunswick. In those maps they can find just over 11 million square feet of space, but they will not find anything even closely resembling a Tysons Corner or a Post Oak.[14]

Decentralization of jobs leads to further decentralization of housing which leads to further decentralization of jobs, and on and on. Suburban land use growth is the major cause of traffic congestion in the study area, and increasing roadway capacity would cause further growth in suburban housing and jobs. This land use pattern consumes enormous amounts of land, and relies on private cars driving long distances – resulting in tremendous costs, increased energy use, and increased greenhouse gas emissions.

The New Jersey Turnpike EIS fails to account for land use shifts that would result from the proposed widening project.

EIS Fails to Properly Account for Travel Changes from Widening

Even if the widening did not affect future land use, it would affect future travel. This is common sense, but this phenomenon; called "induced travel" also has been a major research topic. DeCorla-Souza (of the Federal Highway Administration) and Cohen define induced demand as an: "increase in daily VMT

[13] I-93 Traffic Sensitivity Analysis. New Hampshire Department of Transportation, June 2005.

[14] Lang, Robert E. *Edgeless Cities: Exploring the Elusive Metropolis*, p. 70-71. Washington, DC: Brookings Institution, 2003.

[vehicle miles traveled], with reference to a specific geographic context, resulting from expansion of highway capacity. This definition includes several components, including both short-term effects and long-term effects. The short-term effects include 1) more trips, 2) longer trips, 3) shifts from other travel modes to auto, and 4) auto trips with lower occupancies. The long-term effects result from land development brought on by 5) increased roadway capacity.

All of these factors can be modeled, but the New Jersey Turnpike EIS models none of the factors completely – only modeling a small portion of factor #2 – longer trips. The four-step modeling process is used in most regions in the United States, and is applied incompletely in this project. The four steps include:

1) trip generation – calculating the numbers of originals and destinations for each small geographic area,

2) trip distribution – linking the origins and destinations to form complete one-way trips,

3) mode choice – determining whether the trips are made by walking, biking, using transit, or in autos and if in autos, the number of people in the vehicle, and

4) assignment – assigning the autos to particular roadways.

The four step modeling process splits people's unified travel planning processes into four steps to facilitate computing. Good modeling practice requires feedback between the modeling steps until an equilibrium between the four steps is reached. If the sequence is computed only once, significant errors result. Both the trip distribution and mode choice stages depend on information on travel times. In the first model sequence, the roadway network appears to be uncongested, and longer trips will be chosen in the model. When these trips are assigned to the network, there appears to be severe congestion. The congested travel times are fed back into the trip distribution and mode choice steps, and resulting trip lengths are much shorter – too short in fact, and another feedback step is required. After several feedback stages, equilibrium values are achieved that properly replicate behavior. Modeling feedback is required by Federal regulations in air quality nonattainment areas (for more information, see Appendix 1).

When modeling is done with feedback, three of the four components of induced travel are accounted for. These are: longer routes in the assignment stage, changes in destination in the distribution stage, and mode changes in mode choice. Therefore, it is good modeling practice to do modeling with feedback for each separate alternative.

Instead of proper modeling, the New Jersey Turnpike EIS simply takes the output of the third stage of the four step modeling process, auto trip tables, and applies them to all alternatives without feedback. Therefore, the modeling does not account for either destination changes or mode choice changes. It can account only for routing changes.

Induced travel from land use changes cannot be accounted for in a four step model unless the model is coupled with a land use allocation model that results in different future land use projections for different transportation alternatives.

The state of the practice in transportation modeling is to include model feedback. Carolyn Rodier of the University of California has researched how well land use models and transportation models with feedback account for induced travel. She concludes:

> The body of literature on the ability of existing travel and land use models to represent induced travel indicates that when travel times are fed back to a land use model and/or the trip distribution step, then (1) models can represent induced travel within the range documented in the empirical literature and (2) the effect of new highway capacity on land use and trip distribution significantly contributes to the models' representation of induced travel. If induced travel is not represented in travel and land use models, then the need for, and the benefit of, the project will be overstated (e.g., 16% to 236% of VHT [vehicle hours of travel]), and negative environmental effects will be understated (e.g., 72% to 192% of NOx emissions).[15]

Rodier also reports on the share of induced travel caused by each of the four components of induced travel. Changes in destination produced the largest share of the total induced travel. The land use component produced the second highest amount of induced travel. Changes in routing, the only one of the four components modeled in the EIS was the third highest factor. The relative proportions of the components varied depending on the study. However, Rodier's research results suggest that routing changes alone represent probably represent only about 1/5 to 1/3 of total induced travel.

We did not receive any model files to do destination choice. In the absence of such model files, we did our own destination choice modeling in order to correct the deficiencies in the EIS modeling. We assumed that the single auto trip table used in the EIS represents a Build condition, i.e. with the project, as that is general practice when only a single trip table is used. Therefore, we developed a No Build auto trip table.[16] Technical notes on how this was done are provided in Appendix 2.

We focused this analysis on the morning peak commuting period because of the two primary time periods studied, the morning and afternoon peak commuting periods, the morning period is the more congested period (EIS Table 2.10, p. 2-17 and 2.11, p. 2-18). In the EIS representation of the 2032 No Build alternative in the morning peak period, 6 of the 8 roadway Turnpike segments are shown as having traffic volumes over capacity (column A in table below). The numbers shown are volume-to-capacity (V/C) ratios, so that numbers greater than or equal to 1.0 show traffic volumes exceeding capacity.

The EIS reported V/C ratios for the peak hour within a modeled 2 ½ hour period, based on the current fraction of peak period traffic in the peak hour. As we would expect increased peak spreading with the

[15] Rodier, Carolyn J. A Review of the Representation of Induced Highway Travel in Current Travel and Land Use Models, p. 8.

[16] The No Build trip table developed is based on one feedback iteration. Therefore, differences between the No Build and Build trip tables may be greater than if multiple feedback iterations were applied. Nevertheless, the large differences calculated support our primary point – that model feedback should have been used and that the No Build and Build trip tables should be different.

severe congestion anticipated in the FEIS, we recalculated an average V/C ratio over the full 2 ½ hour period. Then, 4 of the 8 segments are shown as overcapacity (column B).

2032 AM Weekday Peak Period Volume to Capacity Ratio

	A: EIS reported	B: over 2 1/2 hr. AM peak period	C: corrected No Build over AM peak period
Turnpike Northbound			
6 to 7	0.94	0.87	0.79
7 to 7A	1.08	1.00	0.88
7A to 8	1.25	1.16	0.91
8 to 8A	1.37	1.27	1.11
Turnpike Southbound			
6 to 7	1.00	0.93	0.50
7 to 7A	0.93	0.86	0.53
7A to 8	1.06	0.99	0.48
8 to 8A	1.07	1.00	0.61

Column B assumes that the morning peak period traffic pattern would be the same in2032 whether the Turnpike was widened or not. As discussed below, this is wrong. With corrected modeling (including destination feedback), the calculated volume-to-capacity ratios decline further so that only 1 of the 8 segments is over capacity. And this still assumes the overall level of growth assumed in the EIS. As discussed elsewhere in this report, there are at least 6 factors why future growth in the study area may be overestimated:

1) EIS uses toll values that are too low

2) EIS relies on unrealistic levels of future jobs in the study area

3) EIS likely overestimates suburban growth

4) EIS ignores impacts of widening on future land use

5) EIS fails to account for reduced driving by senior citizens

6) EIS may overestimate growth in external and freight traffic

As is discussed above, the EIS also fails to consider the impacts of alternative tolling strategies that go beyond the existing variable tolling program. Combinations of these factors would cause future traffic volumes during the morning peak commuting period on the Turnpike in 2032 to be below capacity without widening.

Inclusion of the destination choice feedback does not just change the picture on the Turnpike, but also allows consideration of indirect impacts on other roadways. First, there is a large increase in vehicle miles traveled (VMT). In the 2 ½ hour morning peak weekday period, the Build modeling results in

250,000 more VMT per day during this time period alone. The increase in daily traffic would be at least 4 times as much – 1 million VMT per day. At an average of 20 miles per gallon, this requires an additional 50,000 gallons of fuel per day. At the 2009 IRS auto reimbursement rate of $.55 per mile, it is equal to $550,000 per day in increased driving costs. It would cause a large increase in greenhouse gas emissions.

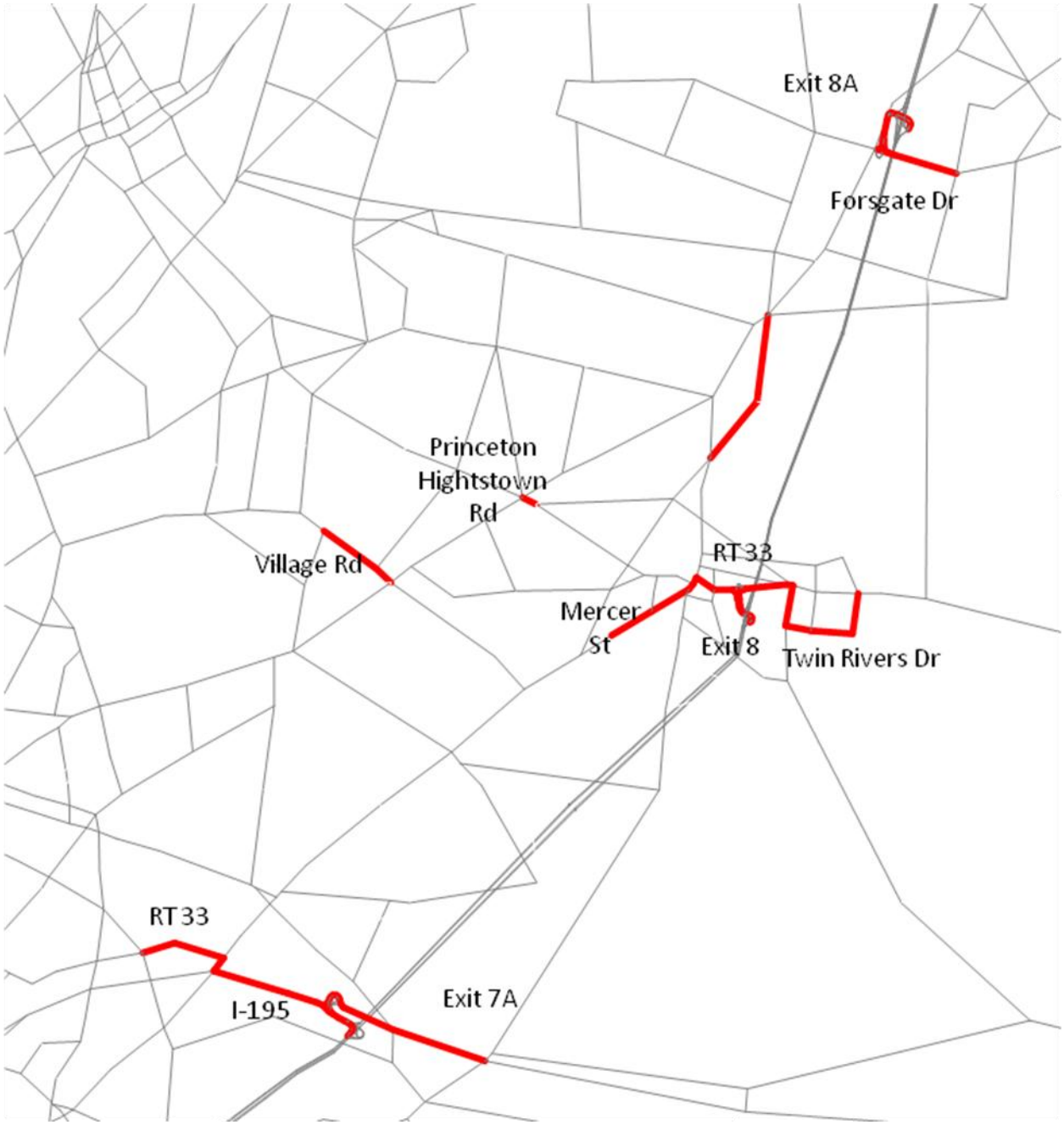
Impacts of the Widening on Traffic on Other Roadways is Ignored

As with the Big Dig discussion earlier in this report, a major failing of the EIS is that it does not examine or disclose impacts on other roadways. It simply assumes that there are no such impacts:

> Because no adverse impacts are anticipated, no mitigation measures for the Proposed Project are required. (EIS, p. 4-227)

While the EIS focuses on traffic reductions on some parallel roadways with the widening, it fails to consider increased traffic volumes on roadways connecting to the Turnpike. No trip begins or ends on a limited access highway. Therefore, increasing the traffic volumes on limited access highways requires traffic increases on connecting roadways. The graphic below shows roadways in the study are that the model indicates will have significant traffic increases with the widening.

Significant Traffic Increases in Morning Peak Period with Widening



A particularly severe increase in congestion is shown in the model for Princeton Hightstown Road between the Route 133 Bypass and Old Trenton Road. At this location, the EIS modeling shows an eastbound travel time for a ¼ mile section of 23 minutes in the 2032 morning peak period with the Turnpike Widening as compared to 16 minutes without widening. This is an extreme case, but illustrates that there are secondary impacts on other roadways. These secondary impacts are not analyzed or disclosed in the EIS.

Safety Benefits At Least Partially Offset by Increased Travel

Reducing accidents is another purpose of the project. There are two reasons why the widening project could reduce accident numbers. First, limited access highways have lower accident rates per million vehicle miles than other roadways. Second, the EIS notes that there higher than average accident rates on the Turnpike at the point where the number of lanes is reduced, and that accidents at this point could be reduced.

These points are valid, but fail to tell the entire story because increased travel will at least partially offset the accident reductions. Reduced driving this year due to high gas prices has illustrated how important the amount of driving is to the number of accidents. As of December 1, 2008, New Jersey had only 541 fatalities in 2008, as compared to 667 during the same period in 2007, and this followed a decline in total fatalities between 2006 and 2007.[17] The State attributes these reductions to safety initiatives. However, it is clear from national trends, that reduced driving is likely the primary reason.

In August of this year, Insurance Journal published *Traffic Fatalities Go Down as Gasoline Prices Go Up*. The reductions in fatalities in the U.S. this year are unprecedented:

> Roll back the clock to 1961: John F. Kennedy was inaugurated president. The Peace Corps was founded. The Dow Jones industrials hit 734. Gasoline reached 31 cents a gallon.
>
> And the number of people killed in U.S. traffic accidents that year topped 36,200.
>
> This year, gasoline climbed over $4 a gallon, and the traffic death toll -- according to one study -- appears headed to the lowest levels since Kennedy moved into the White House.
>
> The number is being pulled down by a change in Americans' driving habits, which is fueled largely by record high gasoline prices, according to the Transportation Research Institute at the University of Michigan.
>
> The institute's study -- which covers 12 months ending in April -- found that as gas prices rose, driving and fatalities declined. The surprise, said professor Michael Sivak, author of the study, was the huge decline in fatalities in March and April as gasoline prices surged above $3.20 a gallon.
>
> Over the previous 10 months, monthly fatalities declined an average of 4.2 percent compared to the previous year. Then, Sivak's data shows, fatalities dropped 22.1 percent in March and 17.9 percent in April of this year -- numbers that did not show up in a recent federal report that tracked a drop in traffic deaths through the end of 2007.[18]

Safety analyses that fail to include increased driving are incomplete and biased.

[17] New Jersey Division of Traffic Safety. *Annual Report to the Legislature*, p. 1. December 2008. http://www.nj.gov/oag/hts/downloads/DHTS_Leg_Report_08.pdf

[18] Lowry, Joan. Traffic Fatalities Go Down as Gasoline Prices Go Up. *Insurance Journal*, August 26, 2008. http://www.insurancejournal.com/news/national/2008/08/26/93081.htm

The EIS Overestimates Future Traffic Volumes

EIS May Overestimate Growth in Through Traffic and Truck Traffic

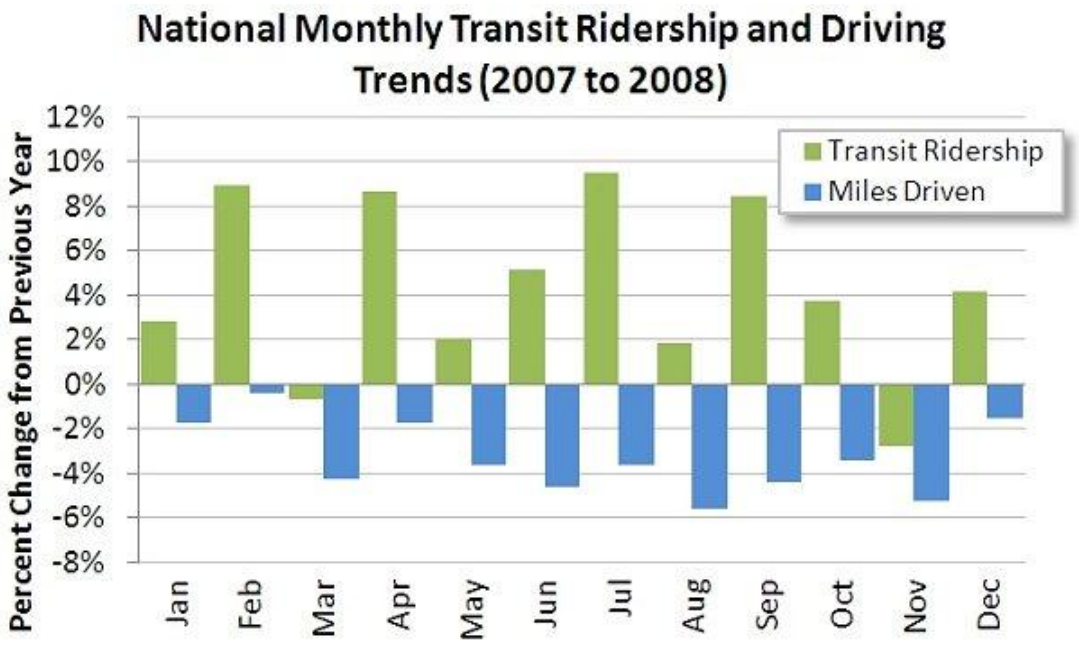
The FEIS states:

> The travel model also projected a 2.5 percent per year growth in long-distance auto traffic and 2 percent per year growth in long-distance truck traffic that feed into the modeled region. (EIS 4-144)

The travel model did not "project" these increases in long distance (through) traffic or truck traffic. These increases are inputs to the model; they reflect assumptions, not outputs. While these growth rates are based on long range trends, there is some evidence of shifts. For example, a recent Brookings Institution report on the growth in vehicle miles traveled (VMT) found:

> Driving, as measured by national VMT, began to plateau as far back as 2004 and dropped in 2007 for the first time since 1980. Per capita driving followed a similar pattern, with flat-lining growth after 2000 and falling rates since 2005. These recent declines in driving predated the steady hikes in gas prices during 2007 and 2008. Moreover, the recent drops in VMT (90 billion miles) and VMT per capita (388 miles) are the largest annualized drops since World War II.[19]

While VMT has been flat or declining, transit use is growing rapidly.[20]



[19] Puentes, Robert and Adie Tomer. The Road … Less Traveled: An analysis of Vehicle Miles Traveled Trends in the U.S., p. 1. Brookings Institution, December 2008.

[20] Tri-State Transportation Campaign. "Back to the Future: U.S. Transit Use Hit 50 Year High in 2008." *Mobilizing the Region.* http://blog.tstc.org/2009/03/13/back-to-the-future-us-transit-use-hit-50-year-high-in-2008/

There is no reason to assume that traffic will grow over the next 20 years at rates experienced in the 1990s.

EIS Based on Unrealistic Future Socioeconomic Assumptions

The EIS argues that the expansion project is needed to meet traffic conditions in the year 2032, as forecast by the region's travel demand model. People travel between land uses. The first step in transportation modeling is identifying the locations of residences and commercial land uses. The rest of the modeling work rests on this foundation. Any errors made at this step carry through the analysis process.

The 2032 EIS analyses are based on assumptions about the number and location of future jobs and housing. Although the assumptions relied on in the EIS are consistent with official planning documents, the official numbers clearly overestimate future jobs regionally, and therefore probably also greatly overestimate future job growth in the study area.

EIS Table 2.7, p. 2-9 shows an increase in total regional households of 16.1% between 2005 and 2032. Table 2.8, p. 2.11 shows an increase of 25.0% in total employment, with the implication that the number of jobs per household would increase from 1.31 jobs per household to 1.42 jobs per household over the period.

These increases are based on historical trends that could not possibly be sustained and now have reversed. They fail to properly account for the demographic factors underlying the trends. Job growth generally was greater than housing growth from 1970 through the year 2000 primarily because of the increase in female labor force participation. This trend has run its course, and now labor force participation is declining due to an aging population.

> For much of the past four decades, the participation rate has trended up, rising from less than 60 percent in the early 1960s to more than 67 percent by the late 1990s. However, after having peaked at 67.3 percent in the first quarter of 2000, the labor force participation rate fell steadily to under 66 percent by early 2005 and has edged up only to just above 66 percent since then. . . .
>
> On balance, the results suggest that most of the decline in the participation rate during and immediately following the 2001 recession was a response to business cycle developments. However, the continued decline in participation in subsequent years and the absence of a significant rebound in 2005 appears to reflect other more structural factors.[21]

[21] Aaronson, Sephanie, Bruce Fallick, Andrew Figura, Jonathan Pingle and William Wascher. The Recent Decline in Labor Force Participation and its Implications for Potential Labor Supply, p. 1. Division of research and Statistics, board of Governors of the Federal Reserve System, March 2006.

Without increases in the labor force participation rate, especially for older people, the labor force participation rate, measured as the percent of those aged 16 and over working, is expected to drop by about 10% between now and 2032.[22]

This all suggests that the average number of workers per household will decline rather than increase (as assumed in the EIS) between 2005 and 2032. However, even if we assume that the number of workers per household stays constant between 2005 and 2032, the EIS overestimates job growth in the region by 518,000. Assuming that the overestimates are proportional across all counties in the region, job growth in the NJ Turnpike widening 4-county study area is overestimated by 113,000. In the model, 113,000 jobs generate a huge amount of traffic, so this is a major source of error.

The Tri-State Transportation Campaign has published an analysis of New Jersey transportation statistics that indicates that some trends are shifting. For example, the report shows increasing transportation efficiency as measured in economic output for the amount of travel.[23]

In the latter parts of the 20th century, the hot land development areas were freeway-oriented – shopping centers, suburban office parks, and large residential subdivisions. In recent years, the hottest markets have been 24-hour, walkable, mixed-use urban centers. As they have reported in each of the past several years, the authoritative Urban Land Institute/PricewaterhouseCoopers annual *Emerging Trends in Real Estate 2008* report concludes:

> The top markets to watch, according to the report, are those that have positioned themselves as 24-hour cities with a global pathway to international markets. They all have a major international airport and/or shipping port, export-import hubs, an educated workforce and walkable residential neighborhoods. They have made a concerted effort to revitalize downtown areas or nearby "urban burbs" that have made them magnets for corporate headquarters, business elites, the best and the brightest of the workforce as well as the largest share of investor dollars.
>
> "The most successful investment opportunities are markets on the coast, reinforcing the real estate truism that it's all about location, location, location," the report says. "But as many interior cities such as Denver have demonstrated, it is possible to transform a city into a 24-hour global pathway city with master planning around infrastructure, transportation and economic development."[24]

Similar shifts are underway in the housing market. This issue is addressed in the current issue of the *Journal of the American Planning Association* in an article by Myers and Ryu. They write:

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[22] Szafran, Robert F. Age-adjusted labor force participation rates, 1960-2045. Chart 4, p. 30. *Monthly Labor Review*, September 2002.

[23] Tri-State Transportation Campaign. *The State of Transportation 2006: Benchmarks for Sustainable Transportation in New Jersey*, December 2006. http://www.tstc.org/press/2006/StateofNJ.pdf

[24] Press release, October 17, 2007. http://www.uli.org/AM/Template.cfm?Section=Home&CONTENTID=112985&TEMPLATE=/CM/ContentDisplay.cfm

> The giant baby boom generation born between 1946 and 1964 has been a dominant force in the housing market for decades. This group has always provided the largest age cohorts, and has created a surge in demand as it passed through each stage of the life cycle. As its members entered into home buying in the 1970s, gentrification in cities and construction of starter homes in suburbs increased. Their subsequent march into middle age was accompanied by rising earnings and larger expenditures for move-up.[25]

In contrast, the authors found that those 65 and over are net sellers of housing as shown in the figure below.

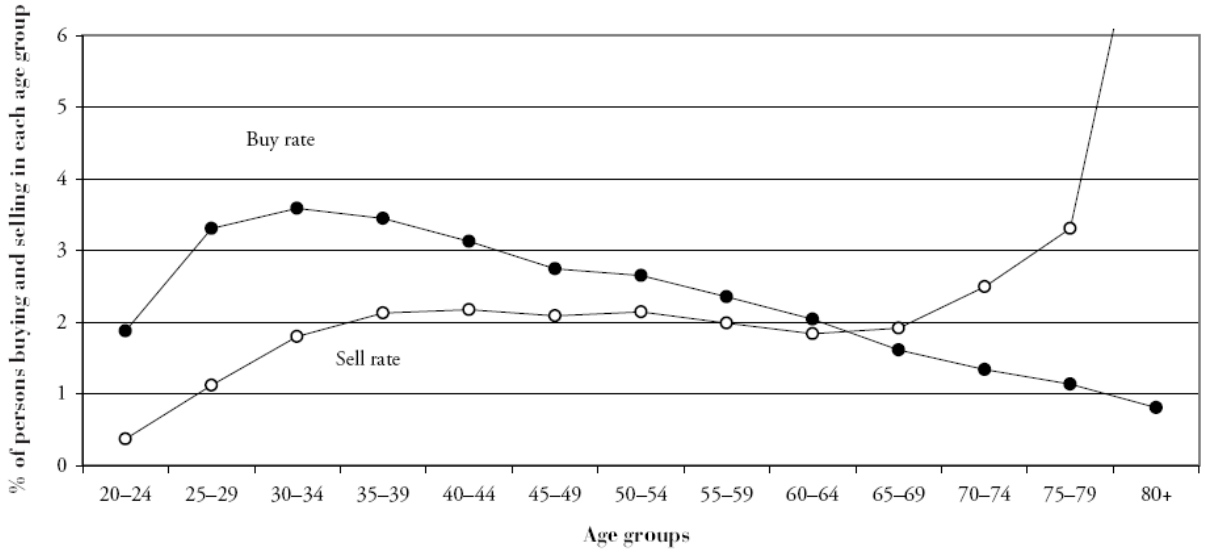


Figure 3. Average annual percent of persons buying and selling homes in each age group, for the United States, 1995 to 2000.

Source: Myers, Dowell and SungHo Ryu, 2008.

These senior citizens will need to live somewhere, but they will likely be downsizing and choosing housing that is different from the large lot, single-family housing that has dominated housing construction in recent years. In 2006, before the housing bubble burst, Nelson wrote:

> With changing demographics, homeownership at a historically high rate, and rising energy and construction prices, maintaining the 2003 distribution of housing units by type may be unlikely. The preference survey results also suggest that the market is currently significantly oversupplied with detached single family homes on large lots relative to demand in 2025.[26]

[25] Myers, Dowell and SungHo Ryu. "Aging Baby Boomers and the Generational Housing Bubble: Foresight and Mitigation of an Epic Transition." Journal of the American Planning Association, 74(1), Winter 2008.

[26] Nelson, Arthur. "Leadership in a New Era", Journal of the American Planning Association, 72(4), Autumn 2006, p. 393-407.

The State of New Jersey is encouraging development to in urban areas rather than in suburban ones.

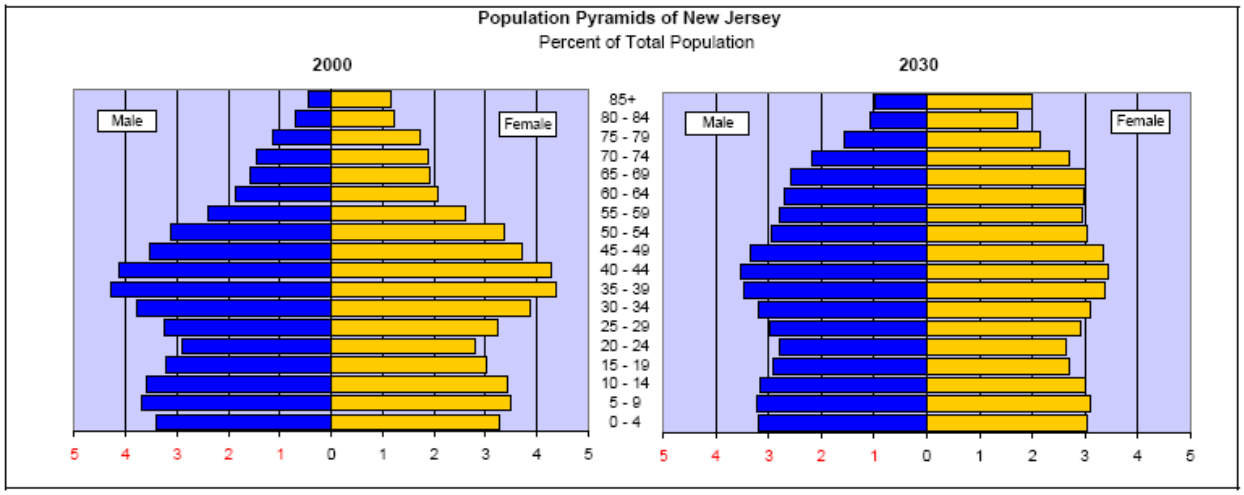
> This year, Governor Jon Corzine signed into law the Urban Hub Tax Credit Program to encourage major capital investment around transit facilities in nine urban centers in the state. "The governor wants to promote urban development around transit," says Franzini. "If we have fewer cars on the road, that will lead to less CO2 emissions." This program is designed to spur developments in designated transit hubs within one-half mile of New Jersey Transit, PATH, or PATCO stations in the nine urban municipalities of Camden, East Orange, Elizabeth, Hoboken, Jersey City, Newark, New Brunswick, Paterson, and Trenton.[27]

In addition to these incentives for private developers, New Jersey offers financial incentives to municipalities for redevelopment around transit stations in its Transit Village Initiative.

Therefore, it is likely that both housing and job growth in the study area are overestimated in the EIS, with the jobs being overestimated by even more than the 113,000 discussed in the previous section.

The share of the region's population over age 65 will be much higher in 2032 than today. The U.S. Census Bureau projects that New Jersey's population will age dramatically between now and 2030 (see Figure below).

U.S. Census Bureau population projection for New Jersey 2000-2030[28]

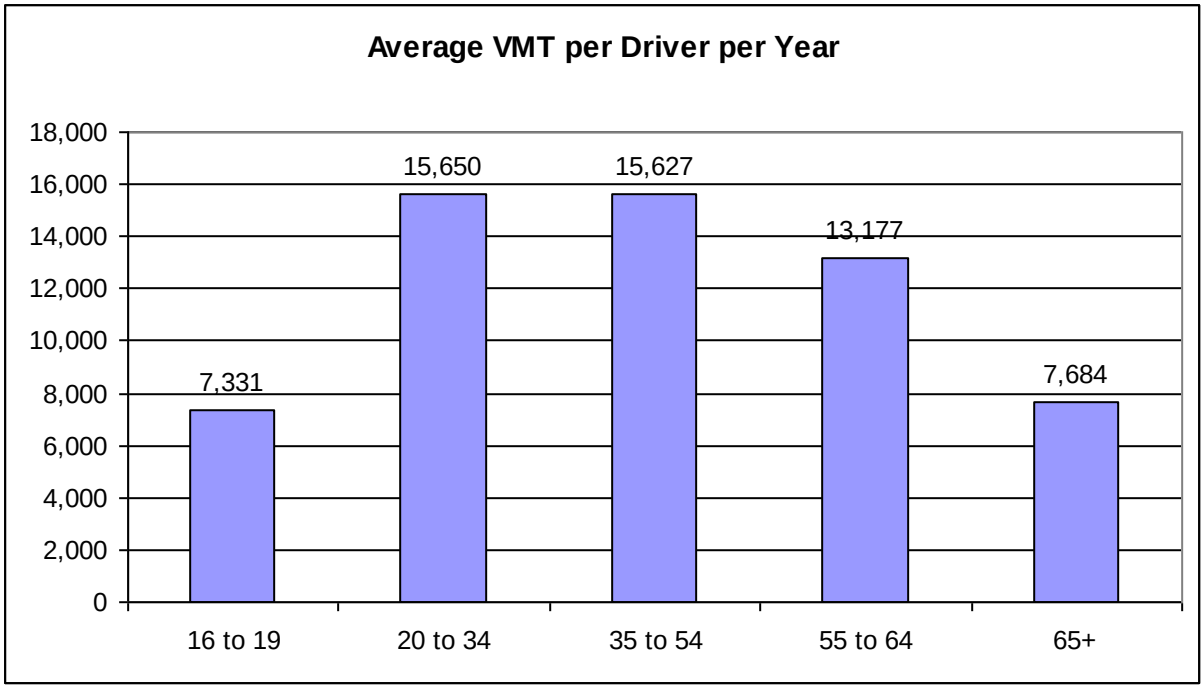


[27] Schantz-Feld, Mali R. "New Jersey Encourages Urban Investment in Financial Services, Biotech, and Logistics". In *Area Development Online*, Oct/Nov 2008. http://www.areadevelopment.com/stateResources/newJersey/new_jersey_financial_services.shtml

[28] U.S. Census Bureau 2005, http://www.census.gov/population/projections/31PyrmdNJ3.pdf.

New Jersey's population is projected to increase by 1.4 million between 2000 and 2030 but only 6 percent of the increase will be in population under age 45. A third of the increase will be persons aged 45-64, some of whom will be reaching age 65 by the Turnpike analysis year of 2032. Most of the increase, 846,000, will be aged 65 and over. (This is primarily due to current New Jersey residents aging and maintaining residency in the state.)

The EIS traffic modeling assumes that the per capita rate of driving will remain constant. However, as shown in the figure below, drivers aged 65 and over drive only half as much as those aged 20-55, on average. Furthermore, this data is on a per-driver basis, and a significant proportion of those aged over 65 do not drive at all.



Source: 2001 National Household Travel Survey

Furthermore, the driving that is done is less likely to be the longer distance or peak commuting period driving that is the focus of the widening project. The EIS modeling fails to account for the different driving characteristics of an aging population.

Myopic Focus on Turnpike Prevents Good Transportation and Land Use Planning

The New Jersey Turnpike Authority should not be doing this sort of planning at all, because it necessarily takes too narrow a view.

> The *purpose* of the Proposed Project is to service existing and projected future traffic demand on the New Jersey Turnpike mainline and interchanges between Interchanges 6 and 9, and thereby to support the economic role of the Turnpike in moving goods and people within and through New Jersey in the most efficient manner possible. The purpose of the Proposed Project is also to address the operational, maintenance and safety needs of the Authority in its management of the Turnpike. (EIS, p. 2-1)

The purpose of any regional transportation project should include the transportation system as a whole, including other modes, and the interconnections with land use. Simply trying to increase capacity on the Turnpike will not achieve regional objectives.

Appendix 1 – Modeling Standards

There are no formal modeling requirements for roadway Environmental Impact Statements. Nevertheless, there is modeling guidance in other areas than can and should be applied in the development of Environmental Impact Statements. There are three sources of relevant modeling standards:

1) air quality conformity regulations,
2) FHWA-sponsored peer reviews, and
3) Transportation Research Board Special Report 288.

Severe and extreme ozone nonattainment areas and serious CO nonattainment areas have detailed modeling requirements.

40 CFR §93.122

b. *Regional emissions analysis in serious, severe, and extreme ozone nonattainment areas and serious CO nonattainment areas must meet the requirements of paragraphs (b)(1) through (3) of this section if their metropolitan planning area contains an urbanized area population over 200,000.*
    1. *By January 1, 1997, estimates of regional transportation-related emissions used to support conformity determinations must be made at a minimum using network-based travel models according to procedures and methods that are available and in practice and supported by current and available documentation. These procedures, methods, and practices are available from DOT and will be updated periodically. Agencies must discuss these modeling procedures and practices through the interagency consultation process, as required by §93.105(c)(1)(i). Network-based travel models must at a minimum satisfy the following requirements:*
        i. *Network-based travel models must be validated against observed counts (peak- and off-peak, if possible) for a base year that is not more than 10 years prior to the date of the conformity determination. Model forecasts must be analyzed for reasonableness and compared to historical trends and other factors, and the results must be documented;*
        ii. *Land use, population, employment, and other network-based travel model assumptions must be documented and based on the best available information;*
        iii. *Scenarios of land development and use must be consistent with the future transportation system alternatives for which emissions are being estimated. The distribution of employment and residences for different transportation options must be reasonable;*
        iv. *A capacity-sensitive assignment methodology must be used, and emissions estimates must be based on a methodology which differentiates between peak- and off-peak link volumes and speeds and uses speeds based on final assigned volumes;*
        v. *Zone-to-zone travel impedances used to distribute trips between origin and destination pairs must be in reasonable agreement with the travel times that are estimated from final assigned traffic volumes. Where use of transit currently is anticipated to be a significant factor in satisfying transportation demand, these times should also be used for modeling mode splits; and*
        vi. *Network-based travel models must be reasonably sensitive to changes in the time(s), cost(s), and other factors affecting travel choices.*
    2. *Reasonable methods in accordance with good practice must be used to estimate traffic speeds and delays in a manner that is sensitive to the estimated volume of travel on each roadway segment represented in the network-based travel model.*

3. *Highway Performance Monitoring System (HPMS) estimates of vehicle miles traveled (VMT) shall be considered the primary measure of VMT within the portion of the nonattainment or maintenance area and for the functional classes of roadways included in HPMS, for urban areas which are sampled on a separate urban area basis. For areas with network-based travel models, a factor (or factors) may be developed to reconcile and calibrate the network-based travel model estimates of VMT in the base year of its validation to the HPMS estimates for the same period. These factors may then be applied to model estimates of future VMT. In this factoring process, consideration will be given to differences between HPMS and network-based travel models, such as differences in the facility coverage of the HPMS and the modeled network description. Locally developed count-based programs and other departures from these procedures are permitted subject to the interagency consultation procedures of §93.105(c)(1)(i).*

In addition to the conformity modeling requirements, FHWA's Travel Model Improvement Program (TMIP) has been working to improve regional modeling practice. One of TMIP's activities has been sponsoring peer reviews of regional models. The TMIP website[29] has reports from reviews completed since 2004 for models from 18 agencies. These reports are a good resource for understanding the current state of the practice, modeling priorities and modeling directions.

In 2007, the Transportation Research Board, a branch of the National Academy of Sciences published *Special Report 288: Metropolitan Travel Forecasting: Current Practice and Future Direction*.[30] This report includes a survey of current practice and some recommendations for future model improvements.

[29] http://tmip.fhwa.dot.gov/services/peer_review_program/status.stm

[30] http://www.trb.org/news/blurb_detail.asp?id=7821

Appendix 2 – Technical Notes on Correcting Model

As discussed in the main body of this report, the EIS modeling used the same vehicle trip table for analyzing both No Build and Build alternatives instead of properly using model feedback to account for travel changes that would result from increased roadway capacity.

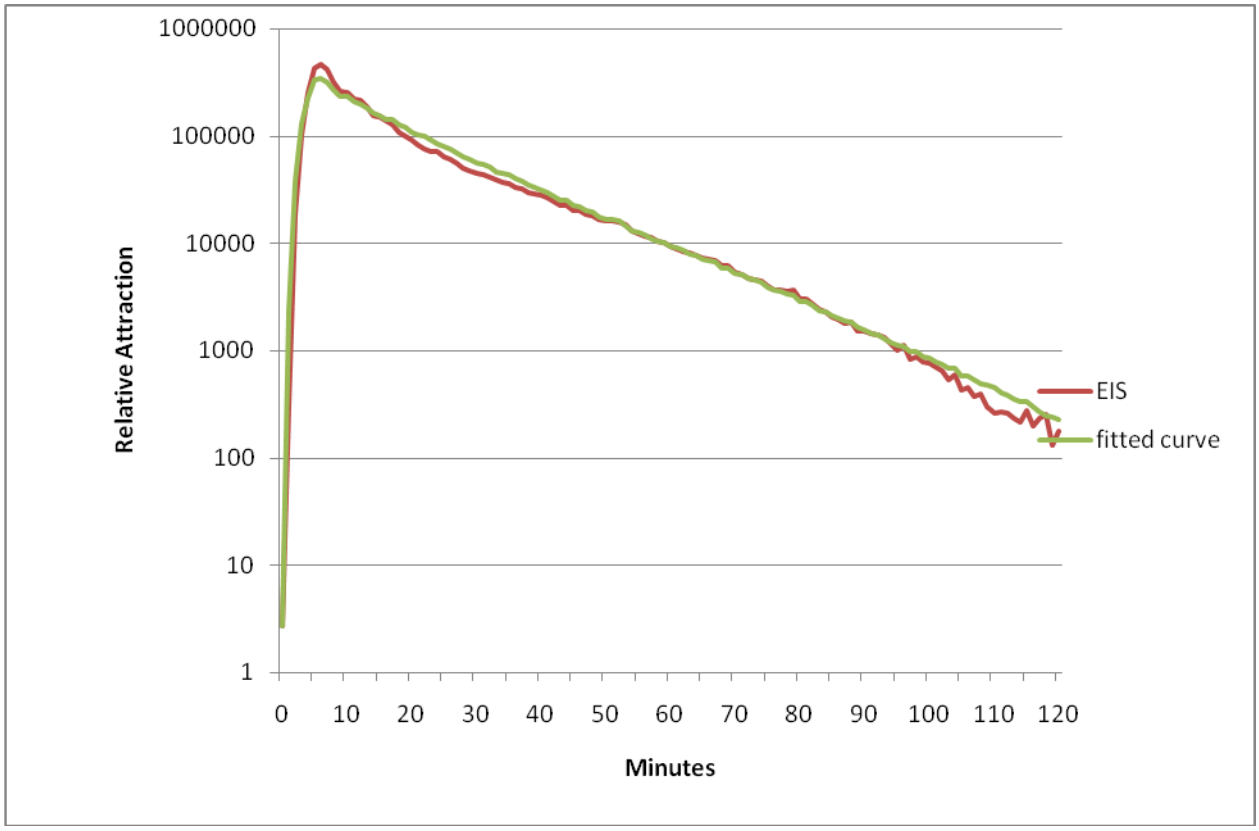
Air quality conformity regulations require model feedback in the region, so there must be model versions that include feedback. However, the model files we received did not. Therefore, to create separate No Build and Build trip tables, we had to do additional modeling. With limited resources, we did only one feedback iteration instead of developing a model with complete feedback, and did this work only for the weekday morning peak period.

The single 2032 weekday morning peak period trip table was considered to represent a Build condition. Generally when one a single trip table is presented; it was developed using a Build network because the modeler is assuming that the project will be built.

Travel demand models calculate trip tables in the trip distribution stage of the four step modeling process. The most common trip distribution model is the "gravity model", named because the basic idea is that travelers have stronger attractions to closer destinations than destinations that are farther away (i.e. take less time to get to).

We didn't have any trip distribution parameters, so we needed to estimate them. We extracted the internal-to-internal trips from the EIS trip table, and skimmed the congested zone-to-zone travel times from the EIS model outputs. Then, we applied TransCAD's Origin Destination Matrix Estimation routine to fit an exponential distribution to the EIS trip table. A parameter of 0.1454 was calculated. The resulting fit is shown in the figure below.

Relative Attractiveness of Destinations by Distance on Logarithmic Scale



As shown, the fit is very close for travel times below 100 minutes. Above 100 minutes, there is quite a bit more model "noise" because of the small number of trips that exceed 100 minutes in duration. The graphic is on a logarithm scale indicating that in both the EIS model and in the fitted model, a destination that is 5 minutes away is about 1000 times as attractive as a destination that is 110 minutes away.

The model was implemented in TransCAD using the Method of Successive Averages (MSA), which is the generally recommended approach to implementing model feedback. Six MSA iterations of trip distribution and vehicle assignment were done for both the Build and No Build alternatives for the weekday morning peak period in 2032.

The TransCAD implementation is a multi-class assignment to take into account the different auto and truck tolls as was also done in the EIS modeling.

The model volumes from the corrected modeling are not identical with those in the EIS modeling. This is partly because of the feedback included in the modeling which produces a different vehicle trip table, but also because many more assignment iterations were done. Our modeling included 20 assignment iterations in MSA iterations and 50 assignment iterations in the final MSA iteration, as compared to 5 iterations in the EIS modeling.

Historically, model iterations were limited due to slow computing. With modern computers, the number of iterations should be increased. This problem has been identified as a concern in the Federal Travel Model Improvement Program (TMIP) peer review processes in both the Baltimore and Washington D.C. regions.

> Growth will result in more congestion, and the model will likely require more iterations to achieve convergence. BMC [Baltimore Regional Council] should consider full convergence on a future baseline alternative (at a minimum) before evaluating capital improvement projects. If the future alternative analyses include alternative development patterns, full convergence on each must be conducted. The consequence of inadequately converged equilibrium assignments is that link volumes are unstable from one iteration to the next. This means that the impacts of projects that produce relatively small changes in traffic volumes (e.g., operational improvements or even a new transit line) cannot be measured with any confidence.[31]
>
> The committee notes that TPB [Transportation Policy Board/Metropolitan Washington Council of Governments] completes a relatively small number of iterations of the equilibrium highway-assignment algorithm and does not indicate a criterion for determining how many iterations may be appropriate. The committee believes that improvements in base year highway link volume validation through additional iterations may be possible.[32]
>
> . . What led to the focus on convergence were the difficulties FTA faced when trying to include highway user benefits in Summit and not getting logically explicable results. That exercise was considering network specific measures between two scenarios. Other performance measures such as vehicle-miles of travel (VMT) consistently stabilize after about 20 user equilibrium (UE) iterations. Volumes on a specific link may shift a lot during early iterations, so design forecasts need the precision and specificity of tight convergence, but such precision is not necessary for measures such as regional mode split. Mr. Milone suggested that running a larger number of iterations for project planning studies and fewer for regional plans might be a good solution.[33]

The quote above suggests 20 iterations is a reasonable target for regional performance measures and more iterations are suggested for project planning studies. In the EIS modeling, only 5 iterations were done. This is poor modeling and makes no sense given modern computers. The

[31] Report on Findings of the Second Peer Review Panel of the Baltimore Metropolitan Council Travel Demand Model, p. 9, July 2005.

[32] Washington MPO model peer review, Report #2, p. 7, 2004.

[33] Highlights of the Transportation Policy Board (TPB) Travel Forecasting Subcommittee Meeting held November 16, 2007, p. 4. [TPB is the Washington DC MPO.]

more complicated modeling with feedback and additional iterations takes only 5 minutes per alternative on a typical laptop computer.

In order to develop No Build traffic volumes that are comparable to the EIS Build model traffic volumes, the traffic volume differences between the No Build and Build TransCAD MSA models were calculated for each roadway link, and this difference was added to the EIS Build model results. This is a standard traffic analysis technique which is sometimes called “pivot point analysis.”