BRIAN KETCHAM ENGINEERING, PC

175 Pacific Street, Brooklyn, NY 11201, 718-330-0550, btk@konheimketcham.com

Prepared by Brian T. Ketcham, P.E., March 28, 2012

I have been asked by Riverkeeper, Inc. (the Hudson Riverkeeper) to comment on the transportation component of the Draft Environmental Impact Statement (DEIS) for the proposed replacement of the Tappan Zee Bridge (TZB) along I-287 connecting Tarrytown in Westchester County with West Nyack in Rockland County. The following comments refer to the DEIS and to related documents listed at various web sites. My comments are limited because the DEIS and related documents fail to provide any detail whatsoever regarding how conclusions are reached regarding the Project's transportation impacts. The DEIS says, in effect, "Trust us: The Bridge replacement will have no long-term negative traffic impacts."

My name is Brian T. Ketcham. I am a licensed Professional Engineer, licensed in the State of New York. I am currently retired. Before retiring I worked for more than 4 decades on various transportation engineering projects. I still operate Brian Ketcham Engineering, PC, assisting low and moderate income communities in analyzing proposed projects and holding developers and government officials accountable for compliance with environmental laws and regulations. My most recent project is the Willets Point Development Plan, in which I performed detailed technical analyses and which is currently pending in court. I have participated in dozens of other similar projects, some as large as Willets Point. I also was Vice President of Konheim & Ketcham, a full service environmental engineering firm with projects for the New York State Thruway Authority, the New York State Department of Transportation and the New York City Department of Transportation, among many other agencies and private clients, for which we prepared full environmental impact statements along with detailed traffic plans and models. K&K was closed at the end of 2006. I was also Executive Director of Community Consulting Services over twenty years during which we undertook hundreds of projects supporting low income communities on a pro-bono basis, providing more than 65,000 hours of free engineering services on projects like the Atlantic Yards project in Brooklyn and Hunts Point in The Bronx. Before this I was Executive Director of Citizens for Clean Air, an organization responsible in the 1960's for New York City's clean air programs and for bringing the first law suit against the Westside Highway Project in which the federal courts denied the City, State and federal governments permits to proceed with this project in 1975. This was the first and last time such a suit was undertaken against so large a highway project and was actually won in the public's interest. And before this I was director of the Bureau of Motor Vehicle Pollution Control for the New York City Department of Air Resources. For this organization I set up a new emissions test facility which, in 1971, had more cars equipped with catalytic emissions controls than the entire world's automotive industry. Along the way I built a three-way catalyst equipped car demonstrating we could meet Clean Air Act emissions standards and improve fuel economy, showing the Congress of the United States that if two young engineers using their own funds to accomplish what the auto industry said could not be done, certainly auto makers with billions of dollars in resources could at least match what we could do. The result was that Congress did not cave in to demands by auto makers to extend or relax emissions control deadlines. Finally, I was asked by the New York State Department of Environmental Conservation and the United States Environmental Protection Agency in 1972 to prepare New York's Clean Air Plan required by the 1970 CAA. I completed this work in less than 9 months meeting the stringent federal requirements. New York's Clean Air Plan is the most comprehensive transportation plan that has ever been completed for New York City. For this work I was honored in 1993 by Mayor John Lindsay as the best manager in New York City government under the age of 35. Six months later I was fired by Mayor Abe Beame for trying to actually enforce the 1973 Clean Air Plan. A copy of my curriculum vitae is attached at Appendix A to this report.

My comments cover a number of issues: 1) demographics factors and their impact on travel; 2) traffic modeling; 3) the reported growth in traffic; 4) adding capacity to the TZB; 5) what might occur once the blockage reported at Exit 11 west of the TZB has been repaired at some future date; 6) traffic accident impacts not reported; 7) the externality costs of the resulting increase in traffic; 8) the resulting need for public transit; and 9) patterns of dishonesty.

1. Demographic factors and their impact on travel. The DEIS reports (Page 4-4) that Rockland County will grow by 50,000 residents between 2010 and 2047 (a 16% increase) and by 47,000 jobs (a 32% increase) during that same period; And that Westchester County will grow by 134,000 residents (a 14% increase) and by 160,000 jobs (a 30% increase) between 2010 and 2047. This information is important because auto travel increases approximately in proportion to jobs during peak travel periods and approximately in proportion to population during off-peak periods. Moreover, there is a huge disparity in the location of jobs (for example, 160,000 new jobs in Westchester County) and the location of potential employees (of the 134,000 new residents in Westchester County less than half would be available to fill the 160,000 new jobs). In other words, there would be a lot of additional travel into and out of Westchester County to fill these new jobs, many along I-287 and across the TZB. It is not clear how this was accounted for in the DEIS, nor whether or not the DEIS accounts for all this growth. Presumably this was done in the two models utilized but no details or data are provided for public review and analysis.

Compare these figures with those presented in Table 4-4 (Page 4-13) of the DEIS Chapter 4, Transportation. While the baseline used in Table 4-4 is 2005 not 2010 presented in Appendix B: Transportation, B-1, Traffic Volumes, which presents traffic volumes that are lower than reported in 2005 (the DEIS explains that this is, in part, a result of the 2008 economic collapse and the consequent loss of jobs), Table 4-4 does provide some insights. In particular, the growth in traffic during peak hour peak direction of travel. Despite the growth of population and jobs reported above, the DEIS reports that traffic across the TZB will increase by just 4% from 2005 to 2047 in the eastbound direction in the AM peak hour (compared to a 30% increase in jobs in Westchester) and by 15% in the westbound direction in the PM peak hour. In the off-peak direction, the DEIS reports considerably greater increases: 43% in the westbound direction (AM peak hour) and 51% in the eastbound direction (PM peak hour). Considering how many new jobs are projected for Westchester County (and further to the east in Connecticut), the peak direction peak hour projected traffic growth appears to be significantly underreported. And what about the peak hour peak direction shoulder hours? Does all this additional growth spill over into these hours and, if so, what effect does this spillover have on traffic on the TZB and the toll plaza? The DEIS is silent (See discussion of the Governor's I-287 Task Force report below). Note also that 65% of eastbound TZB person trips originate in Rockland and Orange counties and 63% of total person crossings are destined for Westchester County and Connecticut. (Reference "Origin-Destination Survey Results Summary," March 2004, DEIS appendix.) No discussion is included in the DEIS. The DEIS should account for traffic conditions for each hour of the day. The models used for this project have the capability of evaluating such impacts and, apparently, the data are available. Perhaps this has been done and is simply not reported. If so, why?

2. Modeling. The traffic analysis reports use of two models to examine and simulate traffic operations along the TZB: NYMTC's Best Practices Model (BPM) and the Paramics microsimulation model. However, except for a brief one-page summary of results (Table 4-4, and the March 2004 report, "Origin-Destination Survey Results Summary"), little detail is provided for review in a format that non-modelers (and even modelers) can understand. Indeed, except for the report "Origin-Destination Survey Results Summary," no other modeling results appear to be presented in the DEIS and what is presented is for the wrong direction (See DEIS, Table 4-4). This is a problem first because we are forced to take on faith the assertions based on unknown assumptions and input data. Failure to disclose details and compare those with earlier results asserted but nowhere available in the record except for Appendix B: Transportation, B-5, AECOM Future Capacity Memorandum, brings to mind my experience with the preparer of the EIS, Allee King Rosen and Flemming (AKRF) with the Willets Point Development Plan (WP). See Comment 9 for more details. Comparing the DEIS with earlier work for the TZB, it looks like the same thing is going on here as with Willets Point.

The DEIS at Page 4-5 reports on the estimated capacity for the proposed 10-lane toll plaza serving eastbound travel. Based on figures provided, toll plaza capacity is limited to about 5,400 passenger cars an hour based on the configuration described (this is for passenger cars alone; it would be less once trucks are factored into the equation). The DEIS describes severe backups eastbound during weekends because reportedly less than 60% of weekend motorists use E-ZPass (DEIS, Page 4-5). However, if the toll plaza is limited to processing just 5,400 vehicles per hour it is likely that backup will occur for much of the day in 2047 even with the low-balled estimates reported in the DEIS for travel in 2047. But the DEIS is again silent on the matter. Where are the toll plaza modeling results for this project? There are plenty of approved models that could be used if the project's consultants have not already completed such modeling. The DEIS must be augmented with modeling results including various scenarios to establish whether or not sufficient capacity is available in 2047 to accommodate all future traffic or if the toll plaza must be expanded.

3. The reported growth in traffic. There is some confusion about how the replacement Bridge would affect traffic. The DEIS claims it would not generate new trips and I agree with that statement; the Bridge itself is not a "traffic generator" since it does not, by itself, cause additional trips to be created.[1] However, as explained in the DEIS, the new Bridge is asserted have the capacity to accommodate more traffic were it not for reported blockages along I-287 near Exit 11 in Rockland County where steep grades and the reduction in travel lanes west of this interchange impede traffic flow (DEIS, Page 4-13).

Appendix B: Transportation, B-5, AECOM Future Capacity Memorandum, provides some help. Figure 1 reports a 29% increase in volume in the AM Westbound direction from 2010 to 2047. Figure 2 reports a 44% increase in the PM Eastbound direction. Both figures report reasonably good travel speeds along the Bridge with this increase in traffic. This analysis was apparently done to demonstrate whether or not three lanes would be adequate to accommodate traffic growth in the non-peak direction. What is not discussed are conditions for the peak hour peak

[1] For example, a project like the Willets Point Development Plan mentioned herein, a new multi-use development that would add millions of square feet of new activity to Queens, would produce 8,000 to 10,000 vehicle trips an hour and 80,000 vehicle trips over 24-hours is, itself, a "traffic generator."

direction of traffic flow: the eastbound direction AM peak period and westbound in the PM peak period.

Baseline traffic data are provided in Appendix B: Transportation, B-1 Traffic Volumes. They show 2010 baseline volumes in the range of 5,400 to 5,700 westbound for the PM peak period (3 to 6 PM) and in the range of 5,400 to 5,900 in the AM peak period (6 to 9 AM). A similar increase in the PM peak hour (44%) would result in approximately 8,000 vehicles per hour westbound in 2047 and in the AM peak hour (a 29% increase) in approximately 7,300 vehicles per hour eastbound in 2047. If this growth in traffic were applicable, these volumes would effectively exceed the capacity of 4 travel lanes and would definitely exceed the capacity of the toll plaza in the eastbound direction.

It is useful to compare these results with those provided to the Governor's I-287 Task Force in April 2000, "Long Term Needs Assessment and Alternative Analysis, I-287/Tappan Zee Bridge Corridor," prepared by Vollmer Associates, regarding "Key Aspects of Corridor Transportation Conditions" (Exec Sum – 2):

- "**Congestion is Growing.** Eastbound available capacity in the current AM peak is limited, causing congestion and long travel times. Westbound PM peak conditions are generally less severe but reverse commuting is growing rapidly. Growth in traffic has been greater during the shoulder hours (before and after the peak hour) than during the peak hours, resulting in a "spreading" of the peak period and shrinking of available capacity in the shoulder hours of travel." *(Ignored in the DEIS)*

- "**Future Traffic Forecasts Show Worsening Conditions.** Under either a low growth (20 percent more growth overall) or a high growth (30 percent more growth overall) forecast, future traffic levels will result in I-287 carrying volume in excess of capacity in the peak periods *(i.e., with 4 lanes of travel as proposed in the DEIS)*, resulting in lower speeds than at present and substantially greater travel times. New bottlenecks causing downstream congestion will exacerbate travel conditions. Even in the reverse commuting direction (westbound in the AM; eastbound in the PM), volumes are projected to equal or exceed capacity along the entire corridor. These forecast traffic conditions suggest that dedicated existing lanes for priority treatment of high occupancy vehicles will not solve future congestion. Lanes from the non-peak direction cannot be utilized for peak direction travel because reverse commuting is already too high and growing too rapidly. Similarly, there will be no available capacity in the peak direction that could be dedicated to buses or carpools without exacerbating congestion. Peak period congestion will spread over more hours in 2020 and the corridor will experience four rush hours rather than the current two *(i.e., in both directions in both the AM and PM peak periods)*. This renders long-term solutions that rely on shifting commuters to the shoulder periods (the hours directly before and after the rush hours) ineffectual." *(My emphasis and clarifications)*

While this was written before the financial crashes in 2002, and again in 2008, it should not be dismissed as irrelevant. As Figure 4-1 shows (following Page 4-4 of the DEIS Chapter 4, Transportation), while travel across the Tappan Zee Bridge leveled off over the decade of the 2000's, the conditions described above were for the period just prior to this leveling off when traffic volumes were apparently no different from today, and simply reinforce the expected severity of conditions in the future. Indeed, the Governor's I-287 Task Force report reports assumptions that are more severe than described in the DEIS. For example, lane capacities were assumed to be 1,800, not 2,000, vehicles per hour as reported in the DEIS; with Moderately High Growth assumptions of 30% to 40% in traffic levels from 1999 to 2020 for both peak and off peak conditions, or 1.5% to 2% per year compared to the DEIS which assumes annual growth rates of just 0.3% per year from 2017 to 2047. As described above, this assumption is flawed because it does not match the projected growth patterns in population and jobs for counties in immediate proximity to the TZB that would be the source of most Hudson River crossings. The DEIS has to justify these enormous changes in the DEIS from earlier studies that, if wrong, will eventually reveal the fatal flaws in this current analysis. If the earlier work is ultimately proven to be correct, it also powerfully reinforces the need to include public transit in the current TZB design.

4. Effect of adding lanes including break down lanes on TZB capacity. The claim is made throughout the Scoping Report Response to Comments and the DEIS that the addition of a lane of traffic in the non-peak direction, and widening lanes and adding shoulders to the Bridge when none currently exist, will in no way increase Bridge capacity. This is simply not true. As described above, there is a need for additional capacity to accommodate the growth in existing peak period traffic and to accommodate the growth in reverse commute traffic. According to the DEIS the addition of a lane will add capacity for up to 2,000 passenger cars an hour (as also noted above, the Governor's I-287 Task Force report reports capacity limited to 1,800 passenger cars an hour). But it is not just the addition of a single lane to the TZB that adds capacity. Widening all lanes to the standard 12-foot width increases capacity as well, especially when heavy trucks are accounted for; reducing the roadway grade below 3% at the Bridge will likewise effectively increase capacity, especially for heavy trucks; the addition of breakdown lanes on the right side and shoulders on the left side permit increased travel speeds effectively increasing capacity thereby improving traffic flow and increasing traffic speeds compared to travel without these improvements. This is particularly true for accidents or vehicular breakdown when vehicles can be pulled out of the moving lane. And even with 14-foot wide right side breakdown lanes traffic delays will be significant because of "gawker effect" that frequently causes traffic to slow to half or less of designed speeds (and as reported in the DEIS—Page 4-5—accident rates along the approaches to and along the Bridge are very high). Adding shoulders and breakdown lanes clearly increases capacity compared to the existing Bridge configuration with no shoulders whatsoever. All of these issues are addressed in the Institute of Transportation Engineers Highway Capacity Manual section on freeways[2] and I am sure the consultant's simulation model is programmed to demonstrate these effects. The DEIS must be augmented to demonstrate these effects on traffic flow (analyses of before and after TZB replacement incorporating ITE HCM adjustment factors). It is simply wrong to assert that the proposed expansion of the TZB will not affect the traffic capacity of this project.

5. Effect of removing the I-287 blockage reported near Exit 11 in Rockland County. The DEIS cites blockages west of the TZB as the reason that proposed Bridge capacity will not be exceeded. Few details are provided. However, the DEIS does suggest that these blockages will divert traffic onto local roads connecting with I-287 parallel bypass roads that would impact local communities. How these diversions will reduce travel over the TZB is not clear since, as the DEIS emphasizes, there are no other River crossings either north or south of the TZB for 20 to 25 miles. Clearly if local (and regional) traffic needs to cross the Hudson River (especially heavy interstate trucks) they will find a way to the Bridge or they will shift to shoulder hours during which measured traffic volumes across the Bridge (Reference) are nearly as great as for

[2] Reference HCM2000, Chapter 23, pages 23-3 to 23-12.

peak hours, perhaps spreading the peak period from 3 to 4 hours to 5 to 7 hours. None of this is reported in the DEIS but, as described above, it was considered in the Governor's I-287 Task Force report (see discussion above). The State has ignored these diversions because it has abandoned road improvements recommended in earlier I-287 corridor studies. That action does not mean that these problems do not exist and that they will not get more severe in the future as population and jobs increase in the region demanding greater use of the TZB to cross the Hudson River. The DEIS must be amended to examine these problems in detail, providing affected communities with measures that can be adopted to mitigate these impacts.

6. Traffic accidents impacts not reported.[3] Increased traffic accidents will be significant in number. The DEIS follows the boilerplate methodology required by NYSDOT. However, it fails to account for the increase in the number of traffic accidents due to the significant growth in population and jobs in the region serviced by the TZB, generating nearly 44,000 new daily car and truck trips by 2047 and clogging I-287 and the surrounding local access roads. This error is revealed by how the DEIS reports traffic accidents—in accidents per million vehicle miles of travel. Clearly, as the phrase "accidents per million vehicle miles of travel" suggests, any increase in travel will result in additional traffic accidents. This impact is entirely ignored in the DEIS. It is done intentionally to mask the real impact of population and job growth and to sweep under the rug the real cost to a community for this increase in traffic accidents. By ignoring those effects, the DEIS also ignores yet another justification for including public transit in the proposed Bridge design.

By itself the growth in traffic along the I-287 corridor, generating 16 million more vehicle trips annually will increase annual vehicular travel by 155 million miles of travel and, because of this, produce an additional 470 traffic accidents each year. This impact is entirely ignored in the TZB DEIS. Table 1 (Tables 1 and 2 are in Appendix B) summarizes the traffic accidents estimated specifically for the growth of traffic along the I-287 corridor along with the related externality costs (more than $23 million in damages annually for traffic accidents alone). On this basis, the growth in traffic along the I-287 corridor crossing the TZB can be expected to generate 470 additional traffic accidents each year in 2047 including approximately 2 additional road deaths and nearly 160 personal injuries each year due to population and job growth and the resulting increase in vehicular travel. Table 1 provides the details on how these figures were derived. Table 1 also includes the societal costs of these added traffic accidents not covered by insurance in 2047: more than $23 million annually in costs to motorists and accident victims. This growth in the number of traffic accidents is acknowledged in the DEIS (Page 4-13): "…traffic volumes would grow and are likely to result in an increase in the number of accidents… on the bridge." This increase in accidents is simply not quantified, nor are motorist's vehicle breakdowns (e.g.,

[3] Average annual trips added to the TZB were estimated from data provided in the DEIS and referenced materials. Because the DEIS contains little information on traffic impacts it was necessary to extract from what is available. We started by digitizing traffic data provided in Appendix B: Transportation, B-1 Traffic Volumes, using that data to develop temporal, seasonal and weekday variations in travel. Using the limited data provided in Table 4-4 of the DEIS Transportation chapter, we were able to approximate future eastbound and westbound temporal characteristics for average weekday travel. These numbers were summed and adjusted for weekday and seasonal characteristics to approximate annual average travel. Annual average traffic impacts from the expected growth in travel were adjusted accordingly. The result was that the TZB can be expected to accommodate another 17 million annual trips by 2047. This annual addition to traffic moving along the TZB was used to estimate the growth in traffic accidents reported in this analysis. The tables used in this process are included as Appendix C to this Report.

mechanical failures, empty gas tanks) that total 3 to 4 times as many delays as caused by traffic accidents themselves. At 4 times the number of additional traffic accidents reported new to the TZB corridor by 2047, the Bridge would suffer 6 to 7 additional disruptions each day with obvious consequences for delay.

7. The externality costs of the resulting increase in traffic. Adding 16 million more cars and trucks to the TZB/I-287 corridor each year will generate approximate 155 million more miles of vehicular travel within about three to four miles of the TZB (from the Palisades Interstate Parkway to the interchange with the New York State Thruway). Air pollution and traffic noise will certainly be impacted, especially by the increase in diesel trucks crossing the Hudson River via the TZB that emit cancer causing particulates and other unhealthy pollutants.

Growth in traffic along the I-287 corridor will increase overall daily project traffic by about 40% on weekdays by 2047. For this reason alone the dollar cost of the environmental impacts of the replacement TZB must be evaluated in the DEIS.

In addition, the addition of 16 million more car and truck trips annually, approximately 155 million added vehicle miles of travel, to the already congested I-287 corridor, will clearly result in more congestion with increased travel times for all current and future motorists along with lost productivity to nearby businesses (as quantified below) (see also the Governor's I-287 Task Force report). This increase in travel will result in a significant increase in traffic accidents and personal injuries. The external costs borne by residents and workers along the I-287 corridor are not trivial. Accident costs, increased health care costs, pain and suffering resulting from the impacts of more traffic, are all very real totaling approximately $23 million each year for the project as reported, borne both by motorists and accident victims as well as by businesses and property owners along the I-287 corridor.

The addition of 16 million more vehicle trips generating 155 million added miles of travel comes with a financial cost to travelers along I-287 crossing the Hudson River. Table 2 summarizes the types of externalities this increase in traffic would generate. Congestion, an increase in traffic accidents and environmental damages are just the most obvious externalities.[4]

Table 2 summarizes these costs in terms of their dollar value to the community. These are costs that would be borne by existing motorists, residents and businesses alike. These costs total about $166 million dollars a year and represent a real loss to motorists and to the community in terms of lost productivity, increased health care costs, and losses associated with traffic accidents not covered by auto insurance. Congestion and lost productivity from the growth in traffic moving

---

[4] There are many more costs that have not been fully quantified in dollar terms that are borne by all communities from imposing new vehicular travel: storm water runoff of road salts and toxic organics that are a major source of water pollution, the damage and clean up costs of oil spills from the extraction of oil from off-shore drilling (as we so recently observed), greenhouse effects of vehicular emissions, the value of land devoted to highways and removed from our tax roles, the value of unpaid parking of cars and trucks which amount to untaxed subsidies to motorists, the cost nationwide of disposing of ten million car and truck chassis and a quarter billion tires each year, the social costs to those deprived of auto access, the foreign policy and defense costs of protecting our supplies of imported oil (the current Iraq war and other serious problems in the Middle East), and a similar array of hidden costs due to the manufacture of vehicles and the storage and refinement of petroleum products. All are part of the externalities associated with car and truck use.

across the TZB comes to approximately $38 million a year in losses; increased health care costs from air pollution, $20 million a year; traffic accident costs not covered by insurance, $23 million a year; plus all the other externalities listed in Table 2 and summarized in the footnote below, more than $85 million a year. All costs reported herein are in 2012 dollars.

Basis of Cost Estimates.[5] Costs are reported for 2010 as a baseline for the potential effects of expanding the TZB. The travel cost estimates are based on well-documented national calculations of travel costs by respected authorities [6, 7, 8] extrapolated to the New York metropolitan area, which were corrected for the region's higher density, employment, auto ownership and vehicle miles of travel. For comparison of the external costs reported herein, externality costs for car and truck operation for the 31–county New York Metropolitan Area totaled more than $108 *billion* in 2010.

8. The resulting need for public transit. The replacement Bridge would be designed to last more than 100 years. During the next 100 years travel behavior will change significantly, especially as the cost of travel skyrockets. Over the next 100 years it is reasonable to expect that gasoline will top $5, $6 even $7 per gallon in real inflation-adjusted dollars. The world has exceeded peak oil and from now on the extraction of oil will become increasingly difficult as we further deplete the world's dwindling supply of fossil fuels. Travel will become much more costly not just to own and operate cars and trucks, but to cross the TZB as toll rates are hiked to pay for this project. As Charles Komanoff has reported in StreetsBlog[9] in February 2011, this project could demand that tolls be doubled or tripled or more. The DEIS provides no means by which the Bridge would be paid for. Federal funds are currently limited especially since Congress will not increase gasoline taxes to cover very real national infrastructure needs. Travel behavior could change as more people seek lower cost public transport to get to the abundance of jobs in Westchester County and points beyond to the east yet remained domiciled in Rockland County of points to the west where housing is cheaper. The DEIS reports that the State has abandoned for now the public transit component of the TZB project and pushed it further into the future. The DEIS claims it would double the cost of the TZB to add transit at this stage of the project. It is really hard to accept that the addition of a transit lane to each bridge would cost so much. Indeed, to incorporate such a change now, widening each bridge by 12 to 15 feet (requiring some reinforcement of the foundation supports) could be done with relative ease without increasing the cost of the Bridge by more than 10% to 15%. The DEIS must be expanded to include a detailed analysis of the demand for transit along with an assessment of the effects of increasing costs for vehicular travel, along with the I-287 corridor and the resulting need to include transit in the Bridge design and implementation.

---

[5] "Congestion Fee that Cuts Costly Car Use is a Bargain for All," Community Consulting Services, Inc., June 2007.

[6] "Transportation in America: A Statistical Analysis of Transportation in the United States," 20th Edition, May 2007. www.enotrans.com.

[7] "Transportation Costs and Benefit Analysis Techniques, Estimates and Implications," regularly updated on www.vtpi.org.

[8] "Final Report on the Federal Highway Cost Allocation Study," May 1982.

[9] Charles Komanoff, "Cost of Tappan Zee Bridge Mega-Bridge Could Cause Tolls to Triple.

I understand that just 2% of person trips crossing the TZB today are via public transit. However, given the certainty not even hinted at in the DEIS or related materials—that cost of travel will increase substantially forcing people to abandon long commuter trips by auto and seek alternatives for their trips to work (including relocating closer to work if affordable). The provision of dedicated transit across the TZB will prove to be a visionary strategy to assist the 99%.

9. Use of the EIS as a means of securing project approvals—patterns of dishonesty. Over the last three years I have been assisting Willets Point United to assess the 11 million square foot mixed use development for Queens near Flushing and across from the Nets CitiField Stadium—the Willets Point Development Plan (WP). The problem with the WP analyses is that they were vastly inconsistent and flawed. AKRF prepared the Draft Generic Environmental Impact Statement, the Final Generic Environmental Impact Statement, the Draft Access Modification Statement (AMR), the Phase I EIS, and the Draft EIS for the Van Wyck Ramps. Throughout their traffic analyses they used the same analytic models as reported for the TZB analyses. The problem is that each report assumed different travel characteristics for targeted audiences. Specifically, AKRF first assumed for the FGEIS 50% of WP generated trips would be diverted to the Van Wyck Expressway (VW) via the new ramps thereby minimizing local traffic impacts (the audience here was the NYC Council); AKRF then assumed just 16% of WP traffic would utilize the VW in the AMR; AKRF followed this by assuming 33% of WP traffic would utilize the VW in the EIS for the ramps. The problem with both the AMR EIS and the VW Ramp EIS is that the diversion of traffic from the VW to local access roads was ignored, thereby permitting AKRF to under report local project impacts. All the reports referenced here were prepared by AKRF and all were filled with errors and omissions. Much of this failure to report consistently and honestly was buried in the computer models used to evaluate project impacts. It took 1,000 hours of my engineering time to sort out these errors, upon which the project was stopped dead for two years beginning February 2010. Unable to respond to these disclosures, NYC EDC then attempted an end run with their Phase I segmentation proposal, itself filled with very significant errors—a report attempting to demonstrate that just 1.3 million square feet of the 11 million square foot project could be built without the need for the new Van Wyck ramps. I demonstrated that their analysis was flawed and that even 1.3 million square feet of new development at the WP site could not be done without huge traffic problems. This brief history of the Willets Point United work is provided because I see the same behavior with the latest attempt to "fast-track" a replacement for the Tappan Zee Bridge with little supporting data along with numerous errors and omissions that need correction.

10. Conclusions. Chapter 4 of the DEIS, Transportation, is limited and not convincing. It essentially asks the tax paying public and motorists to "trust" the agencies sponsoring this project. To build the Bridge without public transit in the face of growing constraints on fossil fuels and the anticipated increase in the cost of vehicular travel simply ignores vital facts to the severe detriment of the public interest. Moreover, the DEIS fails to fully document the transportation impacts of the proposed Bridge replacement, fails to present any details on modeling results assumed as backup for assertions, fails to fully consider the potential relatively near-term growth in traffic based on demographic data and especially once the bottleneck near Exit 11 on I-287 in Rockland County is cleared up, fails to account for the growth in traffic accidents and related societal costs of this increase in accident volume, fails to make a convincing case that transit should not be incorporated into the current proposed Bridge design and completely ignores the results of earlier engineering analyses that predict far more severe traffic conditions over the next two decades than are now reported in the subject DEIS.

The sponsoring agencies must be more forthcoming about traffic impacts including providing details of their modeling efforts and reporting a peak direction modeling of the entire peak periods, not just peak hours which, while worst case, do not deal with spill over traffic onto shoulder periods due to capacity constraints when traffic volumes are sure to exceed roadway and/or toll plaza capacity.

Brian T. Ketcham, P.E.

APPENDIX A

Brian T. Ketcham, P.E.
President, Brian Ketcham Engineering, P.C.

Professional Background
Brian Ketcham is an innovative transportation engineer with expertise in all transportation-related fields: traffic, transit, air quality and noise impact analyses; truck routing, parking plans, pedestrian flow, and associated socio-economic analyses. With more than 40 years of professional experience, he has performed dozens of complex traffic and mobile source air quality studies, managed environmental assessments of large-scale transportation projects (highways, shopping centers, residential developments, hospitals) and prepared several extensive truck route plans. Most have been prepared for New York City and State agencies. As a New York City official in the early 70s, he authored the nation's first transportation control plan to meet federal air quality standards, pioneering strategies that have come to be known as transportation systems management programs. Brian Ketcham is also a nationally recognized researcher on full cost accounting of transportation systems.

Relevant Experience

Directed large scale traffic analyses:
- Traffic simulation and modeling of traffic plans for the reconstruction of the Triborough Bridge (MTA), the Kosciuszko Bridge (NYSDOT), and the Queens Boulevard Bridge (NYCDOT).
- Regional Intelligent Transportation Systems (ITS) strategy study; modeled entire New York metropolitan area to identify sites for application of intelligent transportation systems strategies (NYS Thruway Authority).
- Impact and mitigation for the Manhattan West 1,100 residential dwelling unit development on upper West Side including 140 block traffic network (Private Developer).
- Impact and mitigation of the College Point Corporate Park, Queens, NY including 30 industrial and commercial trip generators (NYCEDC).
- Modeling and mitigation, and development of three alternative diversion route for more than 100 intersections in a 4 square mile area of Long Island City, Queens, NY (NYCDOT).
- Countywide impacts of 16 potential sites in Middlesex County, NJ for resource recovery facility, transfer station analysis, truck route study, traffic analysis of selected site, redesign of complex traffic circle (Middlesex County).

Performed air quality, noise impact analyses of traffic generated by large-scale developments:
- Route 347 expansion in Suffolk County, NY (NYSDOT)
- Grand Central Parkway safety improvements (2 studies), Queens (NYSDOT)
- Van Wyck Expressway safety improvements project, Queens (NYSDOT)
- Bronx River Parkway safety improvements project, Bronx (NYSDOT)
- FDR Drive at 116th Street safety improvement project, Manhattan (NYSDOT)
- La Guardia Airport expansion, Queens, NY (PANYNJ).
- Expansion of Long Island Expressway at the Sagtikos Parkway, Suffolk County, NY (NYSDOT).
- Route 25 widening, CR 83-Cr 21, Suffolk County, NY (NYSDOT).
- I-495, Exits 63-67, service improvements, Suffolk County, NY (NYSDOT).
- Route 112 widening, Route 25-I-495, Suffolk County, NY (NYSDOT).
- Route 25A widening, Suffolk County, NY (NYSDOT).
- Route 211 widening, Orange County, NY (NYSDOT).
- Route 9/I-84 reconstruction, Dutchess County, NY (NYSDOT).
- Route 240/Harlem Road widening, Buffalo, NY (NYSDOT).
- Merck World Headquarters, Reddington, NJ.
- Middlesex County, NJ resource recovery facility.
- Passaic County, NJ resource recovery facility.

Developed procedures for evaluating transit and pedestrian impacts of major land use changes:
- Developed methods to analyze impact of large-scale residential development on line haul subway capacity, bus service levels, pedestrian levels of service on subway entrances and platforms.
- Initiated study of large transportation node at portal to Manhattan for large-scale commercial project in Long Island City.
- Developed strategies for transit and pedestrian improvements on Lexington Ave. and on 34th Street.
- Developed pedestrian analytical techniques for NYC Department of City Planning; calibrated the pedestrian chapter of the Highway Capacity Manual (NYDCP).
- Developed white paper for Secretary of USDOT on transportation strategies for 1980s related to alternative land use scenarios.

Developed enforceable refuse truck routes:
- Passaic County, NJ resource recovery facility.
- Middlesex County, NJ resource recovery facility.
- Somerset County, NJ resource recovery facility.
- City of Newark, NJ for Essex County resource recovery facility.

Developed transportation management studies:
- Studied existing and future patterns of export of waste from New York City (NYCDOS).
- Directed study of avoided trucking and emissions due to Brooklyn containerport and barging (PANYNJ).
- Author of 1973 New York State Implementation Plan-Transportation Controls (NYSDEC).
- Advisor to USDOT/USEPA on Public Participation Guidelines on Transportation Planning Process.
- Managed study for NYCDOT, Reducing Taxi VMT in Manhattan CBD.
- Prepared report on congestion in Manhattan for Borough President.

Participated in regional and national transportation planning efforts:
- Principal U.S. investigator, The Four World Cities Transport Study, comparing New York, Paris, London and Tokyo.
- Using extensive database compiled for World Cities Study to develop master transit plan for Brooklyn, NY, extensively utilizing geographic information systems format (Community Consulting Services).
- Member of advisory committees on Long Range Transportation and Congestion Management Systems Plans, Congestion Management and Air Quality projects.
- Member, NYS Department of Environmental Conservation, Air Management Advisory Committee.
- Founding member and former Member of Board of Directors, Tri-State Transportation Campaign.
- Founding member and former Member of Board of Directors, Transportation Alternatives.

Developed innovative ways of characterizing the full cost of transportation:
- Wrote "Win-Win Transportation: A No-Losers Approach to Financing Transport in NYC and the Region" with C. Komanoff, presented at the AAAS Annual Meeting, Boston, February 1993.
- Presented "Making Transportation Choices Based on Real Costs" at the Transportation 2000 Conference on "Making Transportation a National Priority," Snowmass, CO, October 1991.
- Prepared "The Societal Costs of Congestion in New York City" for USEPA, December 1979.
- Developed an innovative model, which is being refined, for estimating the hidden costs of motor transport by vehicle and roadway type (Tri-State Transportation Committee).
- Organized a report to Congress on the hidden costs of motor transport nationwide for use in the debate over the 1991 Surface Transportation Assistance Act.
- Organized first-ever all day conference on the full-cost of roadway travel at the Annual Meeting of the Society of Automotive Engineers, Detroit, MI, 1973.

Education

Case Institute of Technology, B.S.M.E., 1962
Massachusetts Institute of Technology, all course work for Masters Degree in mechanical engineering, 1966

Professional Registration
Licensed Professional Engineer, 1969, New York State #045144

Societies
Institute of Transportation Engineers

Selected Professional Publications

“The Four World Cities Transport Study,” The London Reseach Centre, November 1998.

"Win-Win Transportation: A No-Losers Approach to Financing Transport in NYC and the Region," with C. Komanoff, presented at the AAAS93 Annual Meeting, Boston, February 12, 1993.

"Making Transportation Choices Based on Real Costs," presented at the Transportation 2000 Conference on "Making Transportation a National Priority," Snowmass, Colorado, October 6, 1991.

"A Validation of the Time-Space Corner and Crosswalk Analysis Method," co-authored by J. Fruin and P. Hecht, Paper No. 870389, Transportation Research Board, January 1988.

"Beyond Autocracy: The Public's Role in Regulating the Auto," co-authored with S. Pinkwas, Government, Technology and the Future of the Automobile, edited by D.H. Ginsburg and W.J. Abernathy, 1980.

"Diesel and Man", co-authored with S. Pinkwas, New Engineer Magazine, April 1978. (This article won the 1978 Business Journalism Award.)

"Environmental Impact of Goods Movement Activity in NYC," co-authored with M. Arrow and J. Coyle, Transportation Research Record No. 496, Urban Goods Movement, Transportation Research Board, National Research Council, Washington, D.C., 1974.

"The Implications of Present Trends for Air Quality," Proceedings of the International Conference on Transportation Research, Bruges, Belgium, Transportation Research Forum, Chicago, IL, 1974.

"Automotive Pollution Control: An Alternative Approach," International Conference on Transportation Research, Bruges, Belgium, June 18, 1973.

"Urban Transportation," co-authored with J.P. Romauldi, C. Stark and W. Sprietzer, Public Affairs Report No. 2, Society of Automotive Engineers, Inc., New York City, January 1973.

"Problems Associated with Air Quality Control Region Implementation Plans," co-authored with J.C. Fensterstock and M.P. Walsh, Conference Proceedings: The Relationship of Land Use and Transportation Planning to Air Quality Management, Center for Urban Policy Research and Conferences, Department, Rutgers University, May 1972.

"Urban Goods Movement and Environmental Quality," Proceedings: Metropolitan Goods Movement Symposium, United Engineering Center, New York City, March 27, 1972

"The Restructuring of Cities Through Transportation Planning," co-authored with J.C. Fensterstock, Proceedings Urban Technology Conference, American Institute for Aeronautics and Astronautics, Paper No. 71-517, May 1971.

APPENDIX B

TABLE 1

ESTIMATION OF THE NUMBER OF TRAFFIC ACCIDENTS ANNUALLY GENERATED BY 16 MILLION NEW VEHICLE TRIPS CROSSING THE TAPPAN ZEE BRIDGE IN 2047

EASTBOUND

ACCIDENT TYPE	RATE/100 MIL VMT (1)	NUMBER OF ACCIDENTS	EXTERNAL COSTS (2)
Fatal Accidents	**1.2**	**1**	**$3,929,118**
Incapacitating Injury Accidents	**23**	**16**	**$5,170,921**
Serious Injury Accidents	**46**	**32**	**$2,062,780**
Minor Injury Accidents	**85**	**59**	**$2,024,772**
Property-Damage-Only Accidents	**305**	**212**	**$771,682**
TOTAL NUMBER OF ACCIDENTS EACH YEAR		**320**	**$13,959,273**

WESTBOUND

ACCIDENT TYPE	RATE/100 MIL VMT (1)	NUMBER OF ACCIDENTS	EXTERNAL COSTS (2)
Fatal Accidents	**1.2**	**1**	**$4,828,010**
Incapacitating Injury Accidents	**9**	**8**	**$2,486,312**
Serious Injury Accidents	**17**	**15**	**$936,736**
Minor Injury Accidents	**32**	**27**	**$936,656**
Property-Damage-Only Accidents	**116**	**99**	**$360,637**
TOTAL NUMBER OF ACCIDENTS EACH YEAR		**150**	**$9,548,350**

WESTBOUND

ACCIDENT TYPE	RATE/100 MIL VMT (1)	NUMBER OF ACCIDENTS	EXTERNAL COSTS (2)
Fatal Accidents		**2**	**$8,757,128**
Incapacitating Injury Accidents		**24**	**$7,657,232**
Serious Injury Accidents		**46**	**$2,999,515**
Minor Injury Accidents		**86**	**$2,961,428**
Property-Damage-Only Accidents		**311**	**$1,132,319**
TOTAL NUMBER OF ACCIDENTS EACH YEAR		**469**	**$23,507,623**

(1) Rates based on accident data provided by NYMTC in their 2006 Transportation Safety Statistical Report adjusted for national figures presented in the NHTSA's Traffic Safety Facts 2006.

(2) Based on costs reported in "SafetyAnalyst: Software Tools for Safety Management of Specific Highway Sites, While Paper for Model 3-Economic Appraisal and Priority Ranking," prepared for FHWA by Midwest Research Institute, 2002, adjusted to 2012 dollars.

Brian Ketcham Engineering, PC, March 2012

TABLE 2

ANNUAL EXTERNALITY COSTS OF TRAFFIC GROWTH CROSSING THE TAPPAN ZEE BRIDE IN 2047

SUMMARY OF RESULTS

	Externality Costs (1)
Added Travel Time Costs (Congestion)	**$38,160,213**
Air Pollution (Health Costs)	**$20,164,204**
Noise Impacts (Health Costs)	**$3,469,110**
Accident Costs, Internal	**$15,122,738**
Accident Costs, External	**$8,384,885**
Pavement Wear & Tear	**$4,553,207**
Vehicular Wear & Tear Costs	**$4,336,388**
Other Externality Costs (2)	**$72,200,858**
TOTALS	**$166,391,604**

(1) Externality costs presented in 2012 dollars.
(2) Includes environmental degradation such as the control of water pollution, oil spills, the lost value of highway land removed from tax rolls, and, most apparent today, the foreign policy and military costs of ensuring an abundant supply of imported oil. Greenhouse gas emissions and their destabilizing effect on climate are another important environmental externality from motor vehicle use. Traffic growth crossing the Tappan Zee Bridge in 2047 will generate generate about 45,000 tons of CO2 emissions annually (assuming an average fuel economy of 35 MPG).

Brian Ketcham Engineering, PC, March 16, 2012

APPENDIX C

SUMMARY OF SEASONAL AND WEEKDAY TOTAL VOLUMES CROSSING THE TZB, 2010
WESTBOUND

	SUN	MON	TUES	WED	THUR	FRI	SAT	ANNUAL AVERAGE TOTAL
WINTER								
PC	42,672	53,044	53,919	53,394	55,590	58,334	50,411	
TRUCKS	531	2,186	3,495	2,499	2,371	2,250	934	
TOTALS	43,203	55,230	57,414	55,893	57,961	60,584	51,345	54,519
PERCENT SUMMER	73%	88%	91%	87%	85%	84%	78%	84%
SPRING								
PC	53,031	55,461	57,050	58,685	61,673	66,408	57,627	
TRUCKS	610	2,370	2,960	2,976	3,009	2,844	1,157	
TOTALS	53,641	57,831	60,010	61,661	64,682	69,252	58,784	60,837
PERCENT SUMMER	90%	92%	95%	95%	95%	96%	90%	93%
SUMMER								
PC	58,818	60,160	60,231	61,547	65,225	69,008	64,255	
TRUCKS	726	2,570	3,038	3,062	3,111	2,877	1,334	
TOTALS	59,544	62,730	63,269	64,609	68,336	71,885	65,589	65,137
PERCENT SUMMER								
FALL								
PC	54,174	57,326	57,758	58,923	60,607	66,179	59,111	
TRUCKS	674	2,587	2,986	2,988	2,739	2,673	1,204	
TOTALS	54,848	59,913	60,744	61,911	63,346	68,852	60,315	61,418
PERCENT SUMMER	92%	96%	96%	96%	93%	96%	92%	94%
ANNUAL WB TOTAL	19,275,285	21,507,990	22,031,126	22,271,753	23,207,156	24,689,786	21,538,011	22,074,444

Source: TZB DEIS, Appendix B: Transportation, B-1 Traffic Volumes

SUMMARY OF SEASONAL AND WEEKDAY TOTAL VOLUMES CROSSING THE TZB, 2010
EASTBOUND

	SUN	MON	TUES	WED	THUR	FRI	SAT	ANNUAL AVERAGE TOTAL
WINTER								
PC	35,575	43,673	43,704	41,344	42,798	41,903	36,906	
TRUCKS	646	1,497	1,532	1,471	1,515	1,235	532	
TOTALS	36,221	45,170	45,236	42,815	44,313	43,138	37,438	42,047
PERCENT SUMMER	56%	68%	72%	67%	67%	63%	61%	65%
SPRING								
PC	41,080	36,379	37,987	39,429	43,515	42,500	39,206	
TRUCKS	583	1,068	1,215	1,257	1,278	1,048	459	
TOTALS	41,663	37,447	39,202	40,686	44,793	43,548	39,665	41,001
PERCENT SUMMER	64%	56%	62%	64%	67%	64%	64%	63%
SUMMER								
PC	63,787	64,451	60,653	61,453	63,875	65,881	60,640	
TRUCKS	1,154	2,409	2,385	2,495	2,508	2,152	960	
TOTALS	64,941	66,860	63,038	63,948	66,383	68,033	61,600	64,972
PERCENT SUMMER								
FALL								
PC	46,854	44,942	44,049	48,219	49,742	51,679	44,996	
TRUCKS	837	1,754	1,674	2,059	1,783	1,598	705	
TOTALS	47,691	46,696	45,723	50,278	51,525	53,277	45,701	48,699
PERCENT SUMMER	73%	70%	73%	79%	78%	78%	74%	75%
ANNUAL EB TOTAL	17,384,585	17,900,786	17,629,409	18,042,589	18,890,028	18,979,635	16,826,865	17,950,557

Source: TZB DEIS, Appendix B: Transportation, B-1 Traffic Volumes

SUMMARY OF SEASONAL AND WEEKDAY TOTAL VOLUMES CROSSING THE TZB, 2010
TOTAL, BOTH DIRECTIONS

	SUN	MON	TUES	WED	THUR	FRI	SAT	ANNUAL AVERAGE TOTAL
WINTER								
PC	78,247	96,717	97,623	94,738	98,388	100,237	87,317	
TRUCKS	1,177	3,683	5,027	3,970	3,886	3,485	1,466	
TOTALS	79,424	100,400	102,650	98,708	102,274	103,722	88,783	96,566
PERCENT SUMMER	64%	77%	81%	77%	76%	74%	70%	74%
SPRING								
PC	94,111	91,840	95,037	98,114	105,188	108,908	96,833	
TRUCKS	1,193	3,438	4,175	4,233	4,287	3,892	1,616	
TOTALS	95,304	95,278	99,212	102,347	109,475	112,800	98,449	101,838
PERCENT SUMMER	77%	74%	79%	80%	81%	81%	77%	78%
SUMMER								
PC	122,605	124,611	120,884	123,000	129,100	134,889	124,895	
TRUCKS	1,880	4,979	5,423	5,557	5,619	5,029	2,294	
TOTALS	124,485	129,590	126,307	128,557	134,719	139,918	127,189	130,109
PERCENT SUMMER								
FALL								
PC	101,028	102,268	101,807	107,142	110,349	117,858	104,107	
TRUCKS	1,511	4,341	4,660	5,047	4,522	4,271	1,909	
TOTALS	102,539	106,609	106,467	112,189	114,871	122,129	106,016	110,117
PERCENT SUMMER	82%	82%	84%	87%	85%	87%	83%	85%
ANNUAL EB TOTAL	36,659,870	39,408,776	39,660,535	40,314,341	42,097,184	43,669,421	38,364,876	40,025,001

Source: TZB DEIS, Appendix B: Transportation, B-1 Traffic Volumes

SUMMARY OF TRAFFIC VOLUME DATA FOR SUMMER, 2010, USED TO ESTIMATE ANNUAL GROWTH IN TRAFFIC VOLUME USED IN ESTIMATING INCREASE IN TRAFFIC ACCIDENTS

SUMMER PASSENGER CARS WESTBOUND

	MON	TUES	WED	THURS	FRI
12 - 1 AM	729	609	690	728	850
1 - 2	365	349	372	386	484
2 - 3	237	240	266	275	339
3 - 4	192	210	224	234	288
4 - 5	273	292	304	312	373
5 - 6	644	636	640	675	742
6 - 7	1,810	1,829	1,811	1,855	1,855
7 - 8	3,118	3,240	3,243	3,252	3,150
8 - 9	3,372	3,453	3,508	3,532	3,501
9 - 10	2,882	2,828	2,881	2,960	3,186
10 - 11	3,118	2,850	2,860	3,119	3,492
11 - 12	3,340	3,006	3,097	3,351	3,890
12 - 1 PM	3,393	3,144	3,182	3,539	4,364
1 - 2	3,430	3,269	3,321	3,693	4,567
2 - 3	3,857	3,819	3,922	4,294	4,995
3 - 4	4,831	4,924	4,967	5,113	4,918
4 - 5	5,240	5,442	5,374	5,238	4,686
5 - 6	5,208	5,279	5,266	5,135	4,673
6 - 7	4,569	4,692	4,946	5,131	4,672
7 - 8	3,219	3,381	3,545	4,022	4,207
8 - 9	2,254	2,313	2,499	2,997	3,399
9 - 10	1,776	1,872	2,013	2,300	2,542
10 - 11	1,320	1,442	1,487	1,811	2,158
11 - 12	984	1,111	1,130	1,275	1,674
TOTALS	60,161	60,230	61,548	65,227	69,005

SUMMER PASSENGER CARS EASTBOUND

	MON	TUES	WED	THURS	FRI
12 - 1 AM	813	459	435	465	555
1 - 2	440	326	319	319	420
2 - 3	312	268	270	292	342
3 - 4	333	304	304	319	354
4 - 5	699	643	632	634	654
5 - 6	2,156	2,078	2,019	2,020	1,890
6 - 7	5,307	5,500	5,289	5,249	4,796
7 - 8	5,711	5,869	5,589	5,665	5,239
8 - 9	5,375	5,473	5,272	5,389	4,798
9 - 10	4,256	4,194	4,267	4,263	3,862
10 - 11	3,452	3,166	3,314	3,486	3,485
11 - 12	3,140	2,775	3,031	3,312	3,429
12 - 1 PM	3,110	2,669	2,860	3,084	3,550
1 - 2	3,100	2,693	2,911	3,074	3,542
2 - 3	3,280	2,942	3,107	3,310	3,670
3 - 4	3,341	3,121	3,201	3,319	3,680
4 - 5	3,659	3,446	3,499	3,628	3,729
5 - 6	3,915	3,722	3,721	3,659	3,722
6 - 7	3,483	3,244	3,316	3,389	3,494
7 - 8	2,562	2,284	2,363	2,665	2,999
8 - 9	2,076	1,839	1,899	2,091	2,452
9 - 10	1,783	1,646	1,715	1,890	2,187
10 - 11	1,347	1,250	1,324	1,458	1,789
11 - 12	798	741	797	895	1,244
TOTALS	64,448	60,652	61,454	63,875	65,882

SUMMER HEAVY TRUCKS WESTBOUND

	MON	TUES	WED	THURS	FRI
12 - 1 AM	27	68	75	76	79
1 - 2	27	62	65	64	73
2 - 3	28	57	64	61	68
3 - 4	36	68	71	73	77
4 - 5	49	84	86	85	90
5 - 6	64	97	104	102	107
6 - 7	83	114	118	117	117
7 - 8	99	122	130	130	132
8 - 9	117	137	140	144	147
9 - 10	146	167	173	174	176
10 - 11	170	189	196	201	202
11 - 12	187	211	217	225	211
12 - 1 PM	196	216	226	235	219
1 - 2	194	225	219	230	206
2 - 3	182	210	212	222	177
3 - 4	183	194	187	186	112
4 - 5	145	154	146	125	81
5 - 6	114	110	101	89	81
6 - 7	112	115	108	105	97
7 - 8	104	108	107	110	100
8 - 9	85	87	91	100	91
9 - 10	73	80	75	83	75
10 - 11	73	78	73	87	84
11 - 12	78	84	78	86	76
TOTALS	2,572	3,037	3,062	3,110	2,878

SUMMER HEAVY TRUCKS EASTBOUND

	MON	TUES	WED	THURS	FRI
12 - 1 AM	83	64	66	65	74
1 - 2	73	66	67	63	78
2 - 3	76	68	71	77	81
3 - 4	92	76	78	78	86
4 - 5	110	96	97	100	104
5 - 6	151	157	169	174	170
6 - 7	142	161	166	163	169
7 - 8	101	115	115	122	125
8 - 9	114	115	115	120	123
9 - 10	133	136	143	138	140
10 - 11	131	128	146	150	129
11 - 12	119	126	147	146	118
12 - 1 PM	127	125	146	140	120
1 - 2	120	115	132	121	98
2 - 3	110	105	113	107	79
3 - 4	93	91	96	91	68
4 - 5	92	90	88	89	57
5 - 6	83	86	81	78	53
6 - 7	87	86	86	83	54
7 - 8	89	90	92	93	55
8 - 9	81	82	82	90	56
9 - 10	71	72	67	78	42
10 - 11	66	67	66	72	38
11 - 12	64	67	66	69	36
TOTALS	2,408	2,384	2,495	2,507	2,153

SUMMER PASSENGER CARS AND HEAVY TRUCKS WESTBOUND

	MON	TUES	WED	THURS	FRI	AVERAGE	% TOTAL		INCR. 2047	
12 - 1 AM	756	677	765	804	929	786	1.2%	1,081	295	
1 - 2	392	411	437	450	557	449	0.7%	618	169	
2 - 3	265	297	330	336	407	327	0.5%	450	123	
3 - 4	228	278	295	307	365	295	0.4%	405	111	
4 - 5	322	376	390	397	463	390	0.6%	536	146	
5 - 6	708	733	744	777	849	762	1.2%	1,048	286	
6 - 7	1,893	1,943	1,929	1,972	1,972	1,942	2.9%	2,671	729	
7 - 8	3,217	3,362	3,373	3,382	3,282	3,323	5.0%	4,570	1,247	
8 - 9	3,489	3,590	3,648	3,676	3,648	3,610	5.5%	4,965	1,355	
9 - 10	3,028	2,995	3,054	3,134	3,362	3,115	4.7%	4,284	1,169	
10 - 11	3,288	3,039	3,056	3,320	3,694	3,279	5.0%	4,510	1,231	
11 - 12	3,527	3,217	3,314	3,576	4,101	3,547	5.4%	4,878	1,331	
12 - 1 PM	3,589	3,360	3,408	3,774	4,583	3,743	5.7%	5,148	1,405	
1 - 2	3,624	3,494	3,540	3,923	4,773	3,871	5.9%	5,324	1,453	
2 - 3	4,039	4,029	4,134	4,516	5,172	4,378	6.6%	6,021	1,643	
3 - 4	5,014	5,118	5,154	5,299	5,030	5,123	7.7%	7,046	1,923	
4 - 5	5,385	5,596	5,520	5,363	4,767	5,326	8.0%	7,325	1,999	
5 - 6	5,322	5,389	5,367	5,224	4,754	5,211	7.9%	7,167	1,956	
6 - 7	4,681	4,807	5,054	5,236	4,769	4,909	7.4%	6,752	1,843	
7 - 8	3,323	3,489	3,652	4,132	4,307	3,781	5.7%	5,200	1,419	
8 - 9	2,339	2,400	2,590	3,097	3,490	2,783	4.2%	3,828	1,045	
9 - 10	1,849	1,952	2,088	2,383	2,617	2,178	3.3%	2,995	817	
10 - 11	1,393	1,520	1,560	1,898	2,242	1,723	2.6%	2,369	647	
11 - 12	1,062	1,195	1,208	1,361	1,750	1,315	2.0%	1,809	494	
TOTALS	62,733	63,267	64,610	68,337	71,883	66,166		91,000	24,834	38%

SUMMER PASSENGER CARS AND HEAVY TRUCKS EASTBOUND

	MON	TUES	WED	THURS	FRI	AVERAGI	% TOTAL		INCR. 2047	
12 - 1 AM	896	523	501	530	629	616	0.9%	876	260	
1 - 2	513	392	386	382	498	434	0.7%	618	184	
2 - 3	388	336	341	369	423	371	0.6%	528	157	
3 - 4	425	380	382	397	440	405	0.6%	576	171	
4 - 5	809	739	729	734	758	754	1.1%	1,072	319	
5 - 6	2,307	2,235	2,188	2,194	2,060	2,197	3.3%	3,125	929	
6 - 7	5,449	5,661	5,455	5,412	4,965	5,388	8.2%	7,666	2,277	
7 - 8	5,812	5,984	5,704	5,787	5,364	5,730	8.7%	8,152	2,422	
8 - 9	5,489	5,588	5,387	5,509	4,921	5,379	8.2%	7,652	2,273	
9 - 10	4,389	4,330	4,410	4,401	4,002	4,306	6.6%	6,127	1,820	
10 - 11	3,583	3,294	3,460	3,636	3,614	3,517	5.4%	5,004	1,487	
11 - 12	3,259	2,901	3,178	3,458	3,547	3,269	5.0%	4,650	1,382	
12 - 1 PM	3,237	2,794	3,006	3,224	3,670	3,186	4.9%	4,533	1,347	
1 - 2	3,220	2,808	3,043	3,195	3,640	3,181	4.8%	4,526	1,345	
2 - 3	3,390	3,047	3,220	3,417	3,749	3,365	5.1%	4,787	1,422	
3 - 4	3,434	3,212	3,297	3,410	3,748	3,420	5.2%	4,866	1,446	
4 - 5	3,751	3,536	3,587	3,717	3,786	3,675	5.6%	5,229	1,553	
5 - 6	3,998	3,808	3,802	3,737	3,775	3,824	5.8%	5,440	1,616	
6 - 7	3,570	3,330	3,402	3,472	3,548	3,464	5.3%	4,929	1,464	
7 - 8	2,651	2,374	2,455	2,758	3,054	2,658	4.0%	3,782	1,124	
8 - 9	2,157	1,921	1,981	2,181	2,508	2,150	3.3%	3,058	909	
9 - 10	1,854	1,718	1,782	1,968	2,229	1,910	2.9%	2,718	807	
10 - 11	1,413	1,317	1,390	1,530	1,827	1,495	2.3%	2,127	632	
11 - 12	862	808	863	964	1,280	955	1.5%	1,359	404	
TOTALS	66,856	63,036	63,949	66,382	68,035	65,652		93,400	27,748	42%

Source: TZB DEIS, Chapter 4, Transportation and Appendix B: Transportation, B-1 Traffic Volumes

		ADJ. FACTOR	SEASONAL AND WEEKDAY ANNUAL ADJUSTED VOLUMES
ANNUAL TOTAL 2010 = (66,166 + 65,652) * 365 =	48,113,424	0.831888	40,025,001
ANNUAL TOTAL 2047 = (91,000 + 93,400) * 365 =	67,306,000	0.831888	55,991,083
ANNUAL GROWTH ESTIMATE - (24,834 + 27,748)* 365 =	19,192,576	0.831888	15,966,082
	PERCENT INCREASE 2010 TO 2047		40%