

***Maine Turnpike
Southern Toll Plaza
Initial All-Electronic Tolling
Feasibility Review***

Prepared for

Maine Turnpike Authority



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February 20, 2009

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EXECUTIVE SUMMARY

The York Toll Plaza was constructed in 1969 and was expected to be removed with the defeasance of the bonds in 1981. Since its construction it has undergone two expansions and has experienced four toll collection systems. The York toll Plaza processes 15.7 million vehicle transactions per year. A total of \$33 million or 41 % of the Turnpike's revenue was collected at York in 2008. Of the 15.7 million vehicles processed at York in 2008, roughly 12% were trucks, approximately half were from out of state and over 57% used E-ZPass.

In 2006, the Maine Turnpike Authority voted and approved the concept that the replacement York Toll Plaza would be built incorporating highway speed tolling for E-ZPass customers at the new plaza. Highway speed tolling (HST) would allow E-ZPass users to pay their tolls electronically while traveling at normal highway speed (55-65 mph). Cash paying customers would exit the mainline to pay their tolls. This decision was made after consideration of the potential benefits of HST such as: improved safety, congestion relief, customer service, and capital cost savings, all weighed against some of the business costs associated with probable revenue leakage.

As part of the alternatives analysis related to the York Toll Plaza project, HNTB was commissioned to review the potential for All-Electronic Tolling (AET), also known as cashless or full open road tolling. AET would eliminate all cash toll payments potentially using two methods. First, E-ZPass users would pay their toll as they would under HST as well as any former cash customers who would convert to E-ZPass as a result of the implementation of AET. Tolls would be collected from non-E-ZPass users through video tolling.

Since 2006, a few agencies in the US have either begun implementing or have set policy that future replacement facilities will be AET. A handful of agencies have begun conversion or have set policies that future installations will incorporate AET. A few more agencies have initiated extensive formal studies to evaluate the applicability of AET. Many agencies are mainly waiting to see the results of these agencies activities before conducting extensive assessments. It should be noted that although some agencies have committed to convert to AET, at the time of this review, no existing cash based agency has completed a total conversion to AET. Furthermore, there is very little standardization of reporting of the business impacts of AET and much reluctance on the part of those agencies involved in AET to release documented and audited results of the business impacts.

While the potential benefits of AET can be documented, the significant risk associated with the uncertainty behind the business costs of AET make the option of AET for the York Toll Plaza replacement not feasible. The following points elaborate on this risk:

- The ability to recover toll revenue from as much as 26 percent of the total traffic at York due to the lack of legislation that would compel payment from out of state patrons weighs significantly in this risk. This inability has perplexed toll agencies for over 10 years and we believe that this issue will not be cured in the next 20 years.
- The traffic mix of the Maine Turnpike is such that a significant number of patrons are non E-ZPass users and from out of state. The extent to which these customers would not migrate to E-ZPass and pre-paid video products is uncertain and these factors greatly influence business costs such as operating costs and revenue losses.
- The resulting toll and fee structure for an AET system could result in actual or perceived unfair distribution of payments between Maine and out of state customers. This results when out of state violators do not pay because there is no significant enforcement capability and the structure is set up or perceived to be set up to offset these losses by paying in-state patrons further compelled to pay because of threat of registration hold.
- Difficulties attributed to the duplicate license plate numbering system and the ability of video systems to recognize the myriad of different plate types present minor operational challenges.
- The current lack of industry data for similar roadways already implementing AET limits the ability to compare potential MTA outcomes makes forecasting difficult to calibrate.
- The uncertainty relative to how customers will respond to the changes in payment methods and the uncertainty relative to revenue recovery potential for violations pose too broad a range of potential outcomes. These include potentially significant risks to net revenue required to operate the roadway.
- The MTA may be limited in its ability to allow for certain types of post payment options typical for AET systems. For example, post payments of video tolls by customers are considered an extension of credit and any restrictions on how the MTA operates under these situations would need to be considered.

Greater certainty around the potential impacts to toll operating costs and revenue impacts resulting from AET would be necessary to determine if the range of risks can potentially be mitigated to an acceptable level or if the risks are insurmountable. Based on the cost analyses conducted, the range of risk to the MTA resulting from uncertainties related to AET over 20 years could be as high as \$400 million. Therefore, given the revenue risk associated with the stated uncertainties, HNTB does not recommend AET for the York Toll Plaza at this point in time, nor do we anticipate, given the significant concerns described herein, that AET would be prudent for York Toll within the next 20 years.

INTRODUCTION

In 2006, the Maine Turnpike Authority voted and approved the concept that the replacement York Toll Plaza would incorporate highway speed tolling for E-ZPass customers at the new plaza. Highway speed tolling (HST) would allow E-ZPass users to pay their tolls electronically while traveling at normal highway speed (55-65 mph) by simply passing beneath sensors on the mainline of the highway. Cash paying customers would briefly exit the mainline of the highway to pay their tolls at a more traditional plaza. This decision was made after consideration of the potential benefits such as improved safety, congestion relief, customer service, and capital cost savings, all weighed against potential business costs associated with probable revenue leakage.

As part of the alternatives analysis related to the project, HNTB was commissioned to review the potential for All-Electronic Tolling (AET), also known as cashless or full open road tolling, as an alternative to the currently planned highway speed and cash collection plaza. An AET option would eliminate all cash toll payments at the toll plaza. Turnpike customers originally with E-ZPass would continue to pay as they would under HST as well as any former cash customers who would convert to E-ZPass as a result of the implementation of AET. Tolls would be collected from non-E-ZPass users by capturing an image of their license plate, using their license plate number to either match pre-paid license plate accounts or identify the registered owner's address to send them a bill.

Since 2006, a few agencies in the US have either begun implementing or have set policy that future replacement facilities will be AET. Some of these agencies are start-up or "greenfield" toll roads while others are existing "brownfield facilities with established toll roads and customers. A handful of agencies have begun conversion or have set policies that future installations will incorporate AET. A few more agencies have initiated extensive formal studies to evaluate the applicability of AET. Many agencies are mainly waiting to see the results of these agencies activities before conducting extensive assessments. It should be noted that although some agencies have committed to convert to AET, at the time of this review, no existing cash based agency has completed a total conversion to AET and therefore there is little to no available information to assist other agencies with forecasting the applicability of AET for their own roadways. Furthermore, there is very little standardization of reporting of the business impacts of AET and much reluctance on the part of those agencies involved in AET to release documented and audited results of the business impacts. Considering the lack of information plus the broad range of local factors and the unique characteristics of each facility, a decision regarding AET cannot be based solely on what other agencies may be doing, but must consider the individual agency case in order to appropriately determine feasibility.

TOLL TECHNOLOGY BACKGROUND

Electronic toll collection (ETC) technology has been in use on major toll roads since 1988 and has grown significantly due to its convenience for the consumer/customer. Nearly every toll agency that has implemented ETC has shown positive impacts on vehicular throughput and customer service for toll collection. The development and public acceptance of ETC technologies have allowed toll agencies to rely less on cash collection and more on non-stop electronic toll collection. Initially in the 1990's there were some predictions of an eventual national interoperability standard that would unite ETC systems across the country by the turn of the century. In practice, there are several regional groups within the United States that have adopted interoperability requirements so that a single transponder can be used on any of the facilities that are part of that group but there is no national interoperability at this stage. The Federal Highway Administration along with several other coalitions and industry groups continue to pursue the development of a national standard that would tie into an overall vehicle to vehicle and vehicle to infrastructure communication system, but this schedule continues to be uncertain. Instead, regional interoperability has grown and the result has encouraged ETC use to continue to grow steadily while cash payments have declined.

The Maine Turnpike has used electronic toll collection since 1997, when Transpass, the first system in New England, was put into operation. In 2005, the Authority converted their electronic toll collection system to *E-ZPass*, allowing Maine and any customer of the 11 state Inter-Agency Group (IAG) to pay tolls electronically on the Maine Turnpike. This system provides the Maine Turnpike with a far-reaching *E-ZPass* user base and provides interoperability and a regional transponder distribution network that extends throughout the Northeast. The IAG has issued over 17.5 million active *E-ZPass* transponders throughout the northeast.

In addition to transponder based electronic toll collection, several agencies (such as agencies in Texas, Florida and North Carolina) have or are planning to implement some form of "video tolling" as an additional payment option for patrons. Video tolling represents the option for a customer to pay for the toll based on the capture of their license plate by a roadside camera at the toll plaza rather than purchasing a transponder. Video toll accounts are typically designed for less frequent customers who cannot justify the cost of a transponder based on the frequency of their trips to benefit from the lower cost per toll for ETC.

The variety of video toll accounts types typically fall into two categories, "pre-paid" and "post-paid". In the "pre-paid" account option, the customer would sign up for an account, much like an *E-ZPass* account, but instead of a transponder assigned, the customer provides a license plate number for the account. Pre-paid accounts could include the same options as the current ETC accounts, including debit or commuter plans, but they

can also include features such as period passes that allow unlimited travel within a window of time. However the account is set up, the cost of tolls (or fees associated with the toll) for pre-paid video accounts is typically higher than ETC rates to first cover the cost to review the images and any other appropriated operational costs (such as a percentage of unreadable image costs). Second, some agencies consider pricing the video toll transaction to encourage ETC participation to improve operating efficiencies, weighing frequency of travel with operating costs. "Post-paid" accounts can take on different forms also, including those similar to the pre-paid options, only handled after the travel occurs. For example, the customer could contact the MTA post-travel to pay the toll, set up a debit and/or commuter account, or purchase a period pass covering the timeframe. The primary consideration is "when" the post payment occurs. Options for post payment within a time window (such as 72 hours or one week) after travel via a phone call or website would present one option. The next would be post-payment upon receipt of an invoice for travel. Toll rates or associated fees are typically set to cover costs for each scenario, similar to the pre-paid cost structures.

Most toll plazas designed and constructed within the last 10 years in the United States have incorporated dedicated ETC lanes as part of the toll plazas. These lanes are dedicated solely to ETC patrons and are designed as either slow speed or highway-speed dedicated electronic toll collection. A detailed description of slow speed and highway speed dedicated ETC technology is presented in the HNTB report entitled, "*Maine Turnpike Southern Toll Plaza Dedicated Electronic Toll Collection Lane Design Recommendations*" dated July 27, 2006. As noted, the MTA is currently planning to incorporate highway speed tolling at the replacement York plaza. This decision was in part based on the referenced report.

All-Electronic Tolling (AET)

It is possible that All-Electronic-Toll collection (AET) will be employed on a number of toll highways in the future. The concept of AET, also termed "Full Open Road Tolling", "Full ORT" or "cashless" tolling has been incorporated in the long range plans of a number of toll agencies. AET is a concept where 100% of all tolls are collected electronically without the need for a conventional toll plaza. While the technology to implement cashless, AET toll collection currently exists, the conversion from a cash or cash/ETC-based toll collection system to AET requires the resolution of many difficult issues, most of which are non-technical.

Since the 2006 report, the number of toll agencies studying AET and in the process of opening, planning to open or converting existing systems to AET has increased. The common characteristics among the majority of these installations remains that the facilities are:

- Primarily commuter roadways

- Primarily in-state user based
- Primarily ETC driven or ETC will be required of all users
- Heavily congested toll plazas

In addition to the above characteristics, another important factor is whether or not the project is part of an existing toll road (“brownfield” project), or part of a completely new toll road (“greenfield” project). For example, the conversion of existing toll roads in Texas and Florida to AET are all considered brownfield projects. New toll roads such as projects in North Carolina and Virginia are greenfield projects. Brownfield projects are faced with the additional challenges such as established cash payment options, driver expectations, and existing labor agreements and employees. Greenfield projects have the benefit of being designed from the beginning to incorporate AET based on understanding of the customer market, planning for operations and infrastructure, and setting local expectations early. For example, if the Maine Turnpike were considering a new roadway as part of their network and this roadway met the appropriate characteristics, this would likely represent a better candidate for AET than a brownfield portion of the existing system.

The Maine Turnpike currently does not share any of the characteristics common to agencies considering AET . By comparison, the Maine Turnpike is not a commuter roadway and approximately 50% of the vehicles entering the York Toll plaza and the Turnpike are from out of state. ETC penetration on the Maine Turnpike is only 50%. While this value is expected to grow towards the 80% range in the next 20 years full AET applications are expected to be higher still. Congestion levels are not significant with the exception of peak summer weekends in York and isolated ramp plaza locations during certain commuter hours.

The reason behind these common characteristics is risk. AET presents far greater risk in the collection of revenue. This is due to the fact that AET presents no restriction regarding who may use the roadway. As a result, the system is reliant upon video capture of sufficient information to assess the toll. The risks of this system include: correct video capture, availability of information regarding the vehicle and the legal ability to assess the toll and penalties in the instances of non payment. Three of the common characteristics listed above serve to significantly reduce this risk because of the consistent and /or known identity of the users. Even in the instance of the facility being a high commuter roadway with high ETC tag penetration the system can fail. The 407 ETR in Canada was the first full AET roadway. The 407 ETR meets the first two conditions listed with the roadway being the commuter roadway into Toronto and having in excess of 80% toll tag (ETC) utilization and 98.5% of the users being in province with no duplicate plate numbers between plate types. 407 ETR requires “heavy vehicles” (large commercial trucks) to use a transponder while passenger cars and light commercial vehicles have the option to pay by video tolling. Video represents about 20% of the transactions on 407 ETR. Currently,

there is a significant issue regarding toll collection of non toll tag users such that there is a severe revenue shortfall.

With regards to agency efforts to increase ETC percentages, a number of approaches have been tested or implemented by other agencies. In some cases, agencies (by direct action or through required construction) have limited the available cash payment lanes, resulting in delays to cash customers to encourage ETC participation. This approach must be carefully calculated as the resulting backups must be considered for potential safety conflicts with other traffic patterns, such as blocking through traffic on ramps or ramp access onto a facility. These methods of increasing ETC participation have not shown success.

The following page summarizes the toll agencies that have or will likely be utilizing AET. Note that the information available produces mainly high level characterizations of these facilities. In practice, the details behind certain types of data, such as net violations and recovery, are not readily available. Where applicable, HNTB is able to apply some experience with other agencies but only indirectly as an industry observation.

NO	Category	Location	407 ETR	Westpark Tollway	Existing Full-ORT Facilities	Creston Expressway	Central Texas Turnpike	MTA	Open Road Deployments	Proposed Full-ORT Facilities	Inter County Connector	North Carolina Turnpike Authority	ORT/Managed Lane Configuration
1	Ready/Completed	Chapel Hill, NC	407 ETR	Westpark Tollway	Creston Expressway	Central Texas Turnpike	MTA	Open Road Deployments	Proposed Full-ORT Facilities	Inter County Connector	North Carolina Turnpike Authority	ORT/Managed Lane Configuration	SR-81
2	Infrastructure	San Diego, CA	407 ETR	Westpark Tollway	Creston Expressway	Central Texas Turnpike	MTA	Open Road Deployments	Proposed Full-ORT Facilities	Inter County Connector	North Carolina Turnpike Authority	ORT/Managed Lane Configuration	SR-81
3	Infrastructure	San Diego, CA	407 ETR	Westpark Tollway	Creston Expressway	Central Texas Turnpike	MTA	Open Road Deployments	Proposed Full-ORT Facilities	Inter County Connector	North Carolina Turnpike Authority	ORT/Managed Lane Configuration	SR-81
4	Infrastructure	San Diego, CA	407 ETR	Westpark Tollway	Creston Expressway	Central Texas Turnpike	MTA	Open Road Deployments	Proposed Full-ORT Facilities	Inter County Connector	North Carolina Turnpike Authority	ORT/Managed Lane Configuration	SR-81
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7	Infrastructure	San Diego, CA	407 ETR	Westpark Tollway	Creston Expressway	Central Texas Turnpike	MTA	Open Road Deployments	Proposed Full-ORT Facilities	Inter County Connector	North Carolina Turnpike Authority	ORT/Managed Lane Configuration	SR-81

The toll lane level technology involved for AET is very similar if not the same as toll technology used for highway speed dedicated ETC lanes already approved for the replacement York Toll Plaza. The system would include overhead structures to support the placement of antennas and cameras to identify vehicles passing through the toll point. Other sensors would detect and classify vehicles to assign the appropriate toll point and these could be a combination of overhead mounted and pavement surface sensors.

While the benefits and cost considerations for AET are very similar to the decision to incorporate the option of HST, one fundamental difference exists. HST maintains an option for non-ETC customers preferring to use a stop condition form of payment, such as cash. AET is entirely electronic and eliminates the option to stop and pay by cash at the plaza. This distinction provides both benefits and costs worthy of careful consideration:

In conjunction with a decision to incorporate AET at future toll plazas, the Maine Turnpike Authority must also consider the following negative impacts:

1. AET will measurably increase operational costs for back office and the customer service center due to initial and ongoing customer education, additional post processing of transactions and increased violation image and notice processing.
2. Non-payment events at an AET plaza will likely increase due to patron confusion, technology limitations and increased scofflaws. Other toll agencies who have installed highway speed lanes or AET have typically experienced increases after conversion that lessens over time as a result of familiarization and enforcement. The issue of revenue collection has been discussed previously regarding scofflaws. The issue of collecting from patrons who infrequently use the roadway must also be considered as the cost to collect for one or two trips must be weighed against the available tolls and fees that could be charged.
3. Current limitations or lack of interstate agreements to enforce out of state toll violators limit the options for penalizing these violators. Without these agreements or laws, the Turnpike has few options to try to compel these violators to pay.
4. Improperly structured AET programs could result in a real or perceived subsidization of revenue by certain customers (for example, in-state patrons paying for out of state violators who do not pay). An AET program would need to be structured to minimize subsidization of tolls by certain groups of paying patrons at different points in the payment stream. For example, rates/fees/penalties associated with violations would need to be appropriately assigned to cover losses in that category due to lost revenue rather than having ETC or video rates set to offset a portion of losses due to violations. Global inefficiencies such as unreadable images would need to be distributed given an appropriate traffic assumptions.

5. Privacy concerns may emerge given that AET reduces the anonymous options for driver payments. Currently cash is exchanged with no record of the driver. An AET system may require anonymous account options to satisfy a portion of this concern. However, patrons who do not prepay with an account would be subject to identification via license plate lookup. The actual level of this concern is unknown and would need to be the subject of further understanding of patrons.
6. Regardless of the result of capital, operating maintenance and revenue impact costs and savings comparisons, consideration must be given for the potential equity or ethical concerns that could arise from the initial or sustained increases in non-payments expected under AET. The business case of cost savings would have to be weighed against the policy decision to accept that the potential that fewer patrons will ultimately pay the toll. More specifically, a system that allows higher revenue leakage but results in a net positive revenue over previous tolling regimes could still be viewed as inequitable or unethical since a larger portion of patrons are not actually paying the toll.
7. The capacity of local judicial processes is a potential concern if the judicial system is not set up to handle the additional cases resulting from AET. Advanced planning and coordination with the appropriate agencies would be necessary to determine costs and considerations needed as part of AET planning and implementation.
8. Unbanked customers (those without bank or credit card accounts) that prefer to pay cash at the point of tolling will find the cash option of pre or post paying with cash offsite as a burden.
9. AET may result in revenue decreases from increased diversion to local roads (some of which are already congested) as some patrons who perceive a lack of options to pay the toll that suits their preferences, seek alternate routes.
10. AET will require additional costs to increase transponder use, develop, market and implement new tolling products, as well as implement a significant public relations campaign to inform the public of the changes initially and ongoing education of future customers. The introduction of video tolling products and the removal of cash payment on the roadway will require significant public communication. Other products may include anonymous accounts to satisfy privacy concerns by some patrons.

11. Weather impacts to equipment are magnified with increasing reliance on video technologies. Significant snow or similar conditions may reduce the quality of images resulting in higher volumes of image rejections resulting in direct revenue losses.
12. AET may violate restrictions associated with existing bond covenants, trust indentures or similar agreements associated with the financing of the Maine Turnpike. For example, where bonds require toll revenues to meet certain thresholds, a higher amount of revenue loss under AET may require higher toll rates either initially or over a sustained period.
13. Consideration for labor agreements and the impact regarding AET implementation.
14. In some cases, the location for the construction of an AET plaza may not be conducive for the construction of a cash plus highway speed toll plaza given the different site requirements. If for some reason the plaza needed to be converted to add cash collection in the future, some AET plaza sites may restrict this option.
15. The conversion of only one location on the Maine Turnpike to AET while maintaining cash options at others may present confusion among patrons with regards to where payments options are available. Since cash lanes on the Maine Turnpike do not have enforcement cameras, if patrons assuming AET payment options pass through these lanes without stopping to pay, the Maine Turnpike would not realize this revenue.
16. Without fare collection staff at toll plazas, the Maine Turnpike will need to consider alternatives to handling wide load permits, which are currently a function served by fare collection staff.

With the challenges understood, the following beneficial impacts associated with AET include:

1. An AET toll plaza has the potential for greater safety due to the removal of any decisions required of the patron at the toll point. The goal of AET is a transparent roadway that reduces or eliminates any change to the driver's environment than what is typically encountered on other parts of the facility.
2. Under AET, all customers of the facility benefit from the convenience of not having to stop to pay the toll. Customers can either sign up for a transponder or opt

for other products such as pre-paid or post-paid video tolling options that could be offered by the agency.

3. AET toll plaza configurations minimize plaza construction capital cost by eliminating the need for toll booths that may require wider right of way and additional infrastructure. .
4. AET toll plazas typically require less long term maintenance, since an AET plaza includes significantly less infrastructure.
5. AET eliminates the cost of fare collection staffing and support at the toll plaza.
6. Additional environmental benefits are possible with an AET plaza. By increasing the average speed of vehicles passing through the plaza, the average fuel economy of vehicles will increase. This quantifiable reduction in the use of fuel will not only provide financial benefits to the patrons, but reduce the consumption of non-renewable resources.

An AET plaza would require patrons to either sign up for an E-ZPass account or pay via a pre-paid or post-paid video toll account. The MTA would need to consider pricing of such options would be matched to the frequency of the trip by the customer and cover administrative costs for each product. Pricing considerations can also go further to influence patrons to utilize more cost efficient products. Infrequent users who cannot justify the cost of a transponder would have the option to pay a video toll at a higher rate than the transponder rate but less than the cost of a transponder. Depending on the magnitude of the rate adjustment, larger portions of infrequent users would find the transponder option more financially practical. It may be expected that this adjustment may be as high three or more times the existing transponder rate in cases where patrons delay payment until an invoice or notice is received. While having the positive impact of driving patrons towards more cost efficient pre-payment options, this would likely have significant negative public acceptance issues.

DETAILED COST FACTOR DISCUSSION FOR ALL-ELECTRONIC TOLLING

As noted, the current direction of both industry technology and agency decision-making is to allow for the possibility of migration to AET under the right conditions. Some agencies are implementing AET on current projects or as in the case of the Maine Turnpike, considering this a future possibility in strategic planning activities. In addition to planning for the York Toll Plaza, other barrier toll plaza projects are under consideration in long range planning that will also consider HST and AET options. Each agency is faced with unique user and traffic features which will impact the consideration and viability of AET. The following discussion presents the benefits and costs in the context of the decision process for planning for AET.

Capital Cost Considerations

Plazas that incorporate staffed and/or cash collection along with considerations for ETC customers either through dedicated or highway speed lanes require greater infrastructure than those plazas that do not. The plazas require a larger right of way for pavement to support the widening for toll booths and traffic splits, as well as utilities, access and buildings to support the plaza staff. By comparison, an AET facility requires basically the same infrastructure as the highway speed tolling lanes of an HST toll plaza. At the center of the proposed HST plaza would contain a set of toll gantries over a section of roadway continuous with the mainline alignment. These gantries and equipment would be very similar to an AET toll point. The overhead structures, pavement footprint and toll equipment are basically the same. The state of the practice in the industry is to construct the highway speed lanes to match the approaching mainline configuration, allowing simpler transition to AET in the future although this may be modified dependent upon ETC utilization.

Based on the condition of the existing plaza, a capital cost estimate has also been performed to determine the amount of investment needed to refurbish the existing toll plaza. The following provides an initial estimate and comparison of the capital costs for each option. Both represent an average estimated cost for a new plaza location.

Capital Construction Cost Estimates for Plaza Options

	Existing	Highway Speed	AET
Existing Plaza Demo	n/a	\$ 2,500,000	\$ 2,500,000
New Construction	\$ 14,300,000	\$ 28,900,000	\$ 4,400,000
	\$ 14,300,000	\$ 31,400,000	\$ 6,900,000

While the toll equipment and system for transponder users is essentially the same between the AET and highway speed systems, the development of and related system upgrades in order to support any new products such as pre-paid or post-paid video tolling

would be an additional cost to the AET system for the back office. These additional costs are not captured here.

Maintenance Cost Considerations

Because the highway speed plaza involves cash collection lanes as well as the dedicated ETC lanes, the annual maintenance costs will likely be higher. The life cycle costs require significant review as over time part of the cash collection infrastructure may morph into part of the ETC system. Annual maintenance includes additional building, plaza and roadway maintenance. Building maintenance would include items such as custodial, lighting, HVAC and other regular maintenances. Roadway maintenance would include snow and ice control for the additional plaza area as well as annual routine maintenance of pavements, plaza structures and plaza grounds.

In addition to routine maintenance, the non-routine (also known as reserve maintenance or renewal and replacement costs) items such as pavement rehabilitation, plaza area concrete maintenance and booth maintenance require budgeting in the later years of the facility. By contrast, the AET plaza does not require these additional costs because it does not include the cash plaza infrastructure. Both options require maintenance of the toll equipment. The highway speed option contains a larger amount of toll equipment because of the additional cash equipment, where as the AET system would require more maintenance of the backhouse operation, potentially involving more technical staff or expansion of contracted maintenance services.

The following estimates the maintenance requirements for both options. The cost of toll equipment maintenance for AET assumes a highest cost option, which would involve a separate vendor with full time on-site support. In practice, the use of the same vendor as the rest of the system or limited on-site availability could yield lower costs.

Estimated Annual Routine Maintenance Costs for York Plaza Options

	Current Plaza	Highway Speed	AET
Cash Plaza Maintenance	\$ 345,000	\$ 345,000	\$ -
Toll Equipment Maintenance	\$ 204,000	\$ 180,000	\$ 187,000
	<hr/> \$ 549,000	<hr/> \$ 525,000	<hr/> \$ 187,000

Non-routine Maintenance Cost for Plazas with Cash Collection Infrastructure

Activity	Cost	Frequency
Concrete islands, slab and other surface sealing	\$106,000	Every 5 years
Approach pavement crack sealing	\$12,300	Every 8 years
Canopy roof sealing	\$53,000	Every 15 years
Complete approach pavement overlay	\$2.8 million	Every 15 years
Tunnel and slab rehabilitation	\$740,000	Every 20 years

Operations Cost Considerations

The cost to operate toll plazas for the purposes of this report includes the cost to staff the plaza and the cost of customer service and violations processing related to the plaza. Since the highway speed plaza sizing and staffing has not been finalized and ultimate impacts to overall MTA staff costs will be an MTA policy decision, this study starts by assuming a percentage reduction in staffing costs based on the most recent reduced number of cash lanes in the highway speed plaza compared to the current plaza. Since the AET plaza requires no on-site cash collection, the AET option is assumed have no on-site fare collection staffing costs. Depending on the capacity of current MTA back office staff, additional technical staff associated with the new toll system may be required offsite. It must be noted that the functions of toll collection are primarily transferred to the customer service and violations processing centers.

Both highway speed tolling and an AET option will increase the load on the customer service and violations processing costs to the MTA. Highway speed tolling is projected to have far less of an effect since a cash option will remain. The challenge with estimating the impact under the AET scenario is projecting the migration of the cash customers. Without any similar industry examples to compare to and without quantifiable information about the attitudes and willingness of MTA cash customers to migrate to certain products, the projection of operating costs carries the potential for significant variation and therefore risk. The risk in the case of the MTA is much higher since the characteristics of the roadways are so different. The other agencies share the benefits of high commuter usage, high ETC penetration rates and high instate constituency. The largest agency contemplating this change is the Port Authority of New York and New Jersey (PANYNJ). The risk for this agency is likely smaller than may be contemplated. The facilities of PANYNJ fit the common characteristics previously discussed with one other benefit. For example, the PANYNJ enjoys up to 80% market share (peak), and over 85% of plates are within jurisdiction. Being a dual state agency, PANYNJ has jurisdiction in both New York and New Jersey. This means they can assess fines for the largest amount of their users, all of the two states mentioned.

In order to estimate the range of this risk for the MTA given the limited information, two scenarios were considered. The first involves using limited MTA traffic pattern information (origin and destination studies or O&D) to estimate how cash patrons might migrate to certain products based on their frequency of use. This first “optimistic” scenario assumes that a significant portion of the transactions (but not patrons) will be handled as E-ZPass or video transactions under an all AET configuration. The second scenario presents a significantly more negative scenario in which all of the cash customers at the plaza migrate to the violation category. In other words, under this “pessimistic” scenario, none of the cash customers at the York plaza choose to sign up for E-ZPass or video tolling (pre-paid or post-payment before invoicing). This presents somewhat of a worst case and places a high end on the risk assessment.

The following represents the four categories of customers likely under AET:

1. E-ZPass customer (lowest risk of not collecting)
2. Registered video account (mild risk)
3. Unregistered video (more risk)
4. Violation (maximum risk)

Under the “optimistic” scenario, cash customer migration to ETC or video is based on trip frequency estimated from O&D study information. Current cash customers who use the Turnpike with greater frequency are assumed to migrate to one of these products for cost benefit reasons. The result of an evaluation of O&D data and estimates of patron trip frequency suggests that approximately 600,000-700,000 unique patrons use the Maine Turnpike. Based on trip frequencies of different patrons and based on payment type, it is estimated that approximately 225,000 unique patrons pay using E-ZPass, 350,000 pay with cash, and depending on the frequency of violations, 20,000-80,000 unique patrons violate. The cash users are further broken down in two groups, frequent and infrequent users. Based on the O&D data, it is estimated that roughly two out of three unique patrons travel less than once per week but at most six times per year. Because of their infrequent use, these individuals would represent approximately 10% of the cash transactions on the Turnpike. So for the purposes of estimating the increased volume of violation transactions to be processed by the violations processing center, this study conservatively assumes that 10% of the cash transactions at York (or 2 out of 3 current cash customers, not transactions, but unique customers of the Turnpike, based on estimated frequency of travel) will become violations. So the “optimistic” scenario assumes that 2 out of 3 unique cash customers on the Turnpike would choose to not pay the toll before receiving a violation notice. This would represent an approximate 150% increase in total non-payments at the toll plaza and an overall gross violation rate of 6.4%. This translates into additional staff required for the violations processing center to handle the additional volume of images from the system and process notices.

It is assumed that the majority of the rest of patrons (diversions are addressed later in the report), based on their estimated trip frequencies, will join E-ZPass, prepaid video tolling or post paid video tolling either via paying by phone or website within a certain window of time after traveling or by paying an invoice. These would include the one out of three unique cash patrons noted in the O&D observations above. These represent 90% of the cash transactions at York. Based on estimated trips per account, this additional volume would require additional customer service staff to manage the higher volume of E-ZPass or video accounts.

Under the “pessimistic” scenario, all cash customers (and their corresponding transactions) are assumed to migrate to the violation category. This results in a more straightforward calculation of the operating and revenue cost impacts, because the larger volume is simply applied to the current cost and recovery rates for the Maine Turnpike violations processing center. What is not assessed is the potential for increased violations due to the “their not paying why so I” scenario.

The following summarizes the additional staff estimated for each option to cover the additional costs of ETC, video tolling and violation processing followed by the additional costs for these increases in staffing.

Estimated Additional CSC/VPC Staff

	Highway Speed	AET Optimistic	AET Pessimistic
Customer Service Reps	1	12	2
Image Reviewers	1	3	25
Notice Processors	1	4	48
Clerical Staff	1	2	24
Total Additional Staff	4	21	99

The following summarizes the estimated total annual operating costs for the York plaza under each configuration. This includes the additional staff costs as well as direct costs. Direct costs include costs such as rent, utilities, postage, printing and credit card fees.

York Plaza Annual Operating Costs by Plaza Type

	Current	Highway Speed Option	AET “Optimistic”	AET “Pessimistic”
Fare Collection	\$ 3,750,000	\$ 3,150,000	\$ -	\$ -
Base CSC Cost	\$ 507,000	\$ 507,000	\$ 507,000	\$ 507,000
Additional CSC Costs	\$ -	\$ 84,000	\$ 1,210,000	\$ 165,000

Base VPC Costs	\$ 137,000	\$ 137,000	\$ 137,000	\$ 137,000
Additional VPC Costs	\$ -	\$ 255,000	\$ 762,000	\$ 8,378,000
Total Annual Costs	\$ 4,394,000	\$ 4,133,000	\$ 2,616,000	\$ 9,187,000

Revenue Impacts

In order to estimate the revenue impacts of AET at the York plaza, an analysis of the current system-wide and York plaza leakage was developed. The current estimate was then used as a baseline for estimating the revenue impacts of highway speed tolling at York and AET (optimistic and pessimistic) at York. Since the analysis is based on the system-wide observations to develop the York portion, an estimate of the total system leakage for a system-wide AET deployment also results.

With the E-ZPass system-wide conversion in 2005 and with recent augmentations to the VPC process, the MTA has a robustly capable enforcement system with revenue recovery methods for the ETC lanes at the York Toll Plaza, in addition to the rest of the ETC and coin lanes throughout the MTA system for both in-state and out of state violators. Additionally, roughly half of the images captured are used to collect revenue from E-ZPass customers who, for a variety of reasons that are mostly due to patron behavior, are not captured via valid transponder transaction. The MTA is also currently pursuing in and out of state violations that meet MTA policy and thresholds.

Revenue leakage is defined for this effort by the transactions that ultimately do not result in a collected toll. A variety of factors can be attributed to revenue leakage and this effort focuses on where the leakage is occurring in the system and what impact the new toll collection methods will have.

Potential sources of revenue leakage on the Maine Turnpike

Lane Type	Leakage	Notes
ETC lane	Unreadable image - system	Cannot pursue vehicles that cannot be identified due to equipment error
	Unreadable image - patron	Cannot pursue vehicles that cannot be identified due to patron action
	Rejected image	Some images are rejected based on non-revenue vehicles such as state police cars
	Non-pursued transactions	The MTA does not pursue certain transactions based on cost effectiveness thresholds or policies.
	In-state suspended or waived violation	In-state violators who do not pay violation notices are moved to suspension and are not

		collected from. In practice, most of this category is recaptured but due to data limitations, this category is conservative included as loss.
	Out of state suspended or waived violation	Out of state violators who do not pay violation notices are moved to suspension and are not collected from. This means the driver's right to operate in Maine is suspended however, this is not enforceable in other states and therefore provides minimal leverage.
	Select out of state and out of country violators	Due to limitations in some direct DMV access, the MTA has limited options to cost effectively pursue some violators. In some of these cases, MTA utilizes access to data via State Police for these violators. For the purposes of this analysis, these are considered losses due to the lack of data history. In practice, the MTA is actively seeking the majority of this revenue with some initial returns.
Manual Lane	Non-payments	Revenue not realized in manual lanes.

The current system leakage is estimated at the following based on MTA data and applied average toll rates. Note these are only approximate initial estimates based on average toll rates. Some variation could be expected due to higher volumes of trucks in one category or another, but this does provide an order of magnitude estimate at a minimum.

Current Estimated System-wide and York Plaza Revenue Leakage

	System-wide		York Plaza
Total net leakage as % of transactions	1.7%	\$1,500,000	\$560,000
Manual lane non-payments	1.1%	\$1,000,000	\$328,000
Non-pursued transactions	0.4%	\$330,000	\$138,000
Unreadable or reject images	0.1%	\$110,000	\$89,000
New Hampshire	<0.01%	<\$10,000	<\$5,000
Pennsylvania	<0.01%	<\$1000	<\$1000
New Brunswick	<0.01%	<\$5,000	<\$1000
In-state suspended or waived	<0.01%	<\$1000	<\$1000
Out of state suspended or waived	<0.01%	<\$1000	<\$1000

As the patrons shift as discussed in the Operations costs section, this also impacts the revenue leakage estimates. The following presents revenue leakage for the highway speed and AET options. Note that system-wide highway speed is not applicable at this stage

given not all locations would facilitate highway speed tolling and therefore the leakage factors would not apply to all locations.

Highway Speed York Plaza Revenue Leakage for York Plaza

	York Plaza
Total net leakage	\$850,000
Manual lane non-payments	\$312,000
Non-pursued transactions	\$429,000
Unreadable or reject images	\$89,000
New Hampshire	<\$10,000
Pennsylvania	<\$1000
New Brunswick	<\$5,000
In-state suspended or waived	<\$1000
Out of state suspended or waived	<\$5000

**Estimated System-wide and York Plaza Revenue Leakage
Under “Optimistic” AET Scenario**

	System-wide		York Plaza
Total net leakage as % of transactions	4.2%	\$3,300,000	\$1,500,000
Manual lane non-payments	0%	\$0	\$0
Non-pursued transactions	3.5%	\$2,700,000	\$1,000,000
Unreadable or reject images	0.6%	\$500,000	\$400,000
New Hampshire	0.04%	\$46,000	\$25,000
Pennsylvania	<0.01%	<\$5000	<\$5000
New Brunswick	<0.02%	\$18,000	\$10,000
In-state suspended or waived	<0.01%	<\$5000	<\$5000
Out of state suspended or waived	0.05%	\$55,000	\$23,000

**Estimated System-wide and York Plaza Revenue Leakage
Under “Pessimistic” AET Scenario**

	System-wide		York Plaza
Total net leakage as % of transactions	45.6%	\$36,000,000	\$17,100,000
Manual lane non-payments	0%	\$0	\$0
Non-pursued transactions	38.8%	\$30,200,000	\$13,000,000
Unreadable or reject images	5.6%	\$4,300,000	\$3,400,000
New Hampshire	0.4%	\$520,000	\$277,000
Pennsylvania	0.04%	\$43,000	\$21,000
New Brunswick	0.17%	\$202,000	\$105,000
In-state suspended or waived	0.1%	\$61,000	\$19,000
Out of state suspended or waived	0.5%	\$620,000	\$254,000

Comparison of York Plaza Total Revenue Leakage under Each Scenario

	Current	Highway Speed	AET “Optimistic”	AET “Pessimistic”
Total Leakage	\$560,000	\$850,000	\$1,500,000	\$17,100,000

In addition to the revenue impacts due to leakage, the estimates should also recognize a level of diversion from the toll plaza under the AET scenario. There were no significant estimates of diversion for this scenario, but as a point of reference, if 2.5% of the current cash customers at the York plaza choose to divert under AET, this would represent about \$400,000 in lost revenue. In addition, privacy concerns, technology aversion, and preference to pay cash are factors that must be considered as they will impact the outcome of diversion.

While leakage and diversion negatively impact revenue, the collection of tolls, fees and penalties under the violation process are also recognized. The following estimates the revenue recovery by the violations processing center.

York Plaza Total Annual VPC Revenue Recovery

	Current	Highway Speed	AET "Optimistic"	AET "Pessimistic"
Annual Recovery	\$12,000	\$38,000	\$200,000	\$2,300,000

An AET plaza would require these patrons to either sign up for an E-ZPass account or pay via a pre-paid or post-paid video toll account. From an operating cost recovery perspective, the MTA would need to consider pricing of such options would be matched to the frequency of the trip by the customer and cover operating costs for each product. Pricing considerations can also go further to influence patrons to utilize more cost efficient products. So infrequent users who cannot justify the cost of a transponder would have the option to pay a video toll at a higher rate than the transponder rate but less than the cost of a transponder based on the infrequency of use. Depending on the magnitude of the rate adjustment, larger portions of infrequent users would find the transponder option more financially practical.

Note that specific toll revenue projections or revised rate structures are not part of the scope of this report. This report does assume, as a starting point of reference, that there will be some balance of cost recovery with the increased cost to process the customer options above. In other words (and subject to further discussion), pre and post paid video billing is assumed (for initial estimates) to be structured such that the net operating cost to the MTA is the same as processing ETC customers. So for the one in three cash customers identified as "frequent" users, the net cost to handle them will require the same staffing and direct costs as handling current ETC accounts. This introduces further discussions that will be needed relative to overall pricing of toll products, how each recovers costs to operate and how the pricing structure might be set to direct customers towards more cost efficient products (namely transponder based accounts).

The following summarizes the entire cost analysis for the options at the York plaza.

Total 20-Year Cost Summary for York Plaza (\$2008)*

Current	\$ 132 million
Highway Speed	\$ 152 million
AET “Optimistic”	\$ 94 million
AET “Pessimistic”	\$ 494 million

*Capital costs assume 20-year bonds at 4.75%. O&M costs factored in on annual or scheduled as needed basis. No cost inflation, changes in traffic volume, ETC penetration, violation rates assumed as this stage.

Other Considerations

In addition to the business costs, the Authority will also need to consider the other less tangible impacts that would result from the implementation of AET:

1. Regardless of business case, consideration may be needed for the potential equity or ethical concerns that could arise from the initial or sustained increases in non-payments anticipated under AET. For example, the current toll plaza does not collect approximately \$0.6 million due to revenue leakage. Under the “optimistic” AET scenario, this would potentially increase to \$1.5 million in uncollected tolls. The Maine Turnpike would be accepting an additional loss of approximately \$1 million annually to realize the one time savings of at least \$20 million in capital costs and maintenance and operating cost savings of up to \$2.1 million annually. Under the “pessimistic” AET scenario a substantial amount of the MTA revenue would be at risk. The business case of cost savings would have to be weighed against the policy decision to accept that fewer patrons will initially and ultimately pay the toll regardless of recovery efforts.
2. Consideration for any restrictions associated with existing bond covenants, trust indentures or similar agreements associated with the financing of the Maine Turnpike.
3. Consideration for current labor agreements and the impact to the timing of an AET implementation
4. Possible environmental credits for reducing emissions at toll plazas.
5. Safety benefits due to reduce conflict potential on the roadway.

CONCLUSION AND RECOMMENDATIONS

The reality of the circumstance is that it is very unlikely that the optimistic or the pessimistic scenario will occur. It is more likely that revenue leakage will be somewhere in the middle. This value however is significant and poses a grave threat to the Maine Turnpike.

While there may be theoretical benefits of converting a cash & ETC facility to AET, the significant uncertainty behind the business costs associated with AET coupled with the unique and quantified characteristics of the Maine Turnpike make the consideration of AET for the York Toll Plaza replacement not a feasible option at this point in time or in the 20 year planning horizon. The lack of industry data for similar roadways, the uncertainty relative to how customers will respond to the changes in payment methods and the uncertainty relative to revenue recovery potential for violations pose too broad a range of potential outcomes. These include significant risks to net revenue required to operate the roadway. Greater certainty around the potential impacts to toll operating costs and revenue impacts would be necessary to reduce the range of risks to an acceptable level for the further consideration of AET. Therefore, given the lack of comparable industry information to date and the revenue risk associated with uncertainties with patron behavior, HNTB does not recommend AET for the York Toll Plaza at this time, nor do we anticipate, given the significant risk described herein, that AET would not be prudent for York Toll within the next 20 years.

Executive Summary

Maine Turnpike ORT/AET Impact Analysis

This report summarizes the results of CDM Smith's independent impact assessment for possible conversion to Open Road Tolling (ORT) or All Electronic Tolling (AET) at two toll plazas on the Maine Turnpike. The Turnpike is faced with a number of challenges in the future regarding many of its existing toll collection facilities. Perhaps most urgent among these is the need for possible reconstruction of the York Toll Plaza, the southernmost barrier on the Maine Turnpike. That facility is decades old, and was constructed in a location in which subsurface conditions may preclude reconstruction. Consideration is being given to reconstruction of the plaza at an alternative location, but at a significant additional capital cost.

The Turnpike also anticipates the need to replace its northernmost toll plaza, at the I-295 connection in Gardiner. That facility, which was constructed immediately below the roadway overpass, which is no longer in use, must be slightly relocated and reconstructed in the future.

The toll industry is moving toward automating the toll collection process, using either ORT or AET. ORT would allow for high-speed, non-stop, collection of tolls from vehicles equipped with E-ZPass transponders, while retaining a limited number of cash collection lanes in each direction. AET would feature the elimination of cash collection altogether, and require only the construction of high-speed gantries across the mainline roadway, significantly reducing capital cost but requiring new methods and costs to handle vehicles without electronic transponders. Under AET, a license plate image is taken of customers without E-ZPass; those video transactions are sent to the customer by mail. This introduces considerable collection risk due to some video transactions being unbillable and others uncollectable.

Model Overview

CDM Smith developed a model to analyze the potential net revenue impacts of both AET and ORT. The model takes into account diversion to alternative routes (due to video toll surcharges or for those not comfortable with the technological aspects of AET), unreadable video images, lack of Department of Motor Vehicle (DMV) address information, and out of date DVM information. All of these result in unbillable video transactions. The model also takes into account payment billing collection rates and assumed uncollectable transactions. Both unbillable and uncollectable transactions result in toll revenue leakage.

A key component of the analysis was to track potential toll revenue leakage under both AET and ORT. ORT operates most similarly to the existing condition in that both E-ZPass and cash are still accepted. Under this scenario there is relatively little opportunity for revenue leakage compared to how the system currently operates. Experience on other facilities that have converted to ORT has confirmed that there is very little impact on net revenue collection. Under AET, however, all non-E-ZPass transactions must be invoiced. The need to invoice video transactions is where both the increased risk of revenue leakage and the higher costs of toll collection occur.

In addition, the model also takes into account the maintenance and operating (M&O) costs associated with collecting tolls under both AET and ORT scenarios. Thus, costs associated with video image

review, DMV look up, invoice mailing, and fare collection/administration are all tracked in the model. In the end, M&O costs are subtracted from gross toll revenue impacts to develop the net toll revenue associated with AET and ORT. These are then compared to estimated existing condition net toll revenue at York and Gardiner. Annual net toll revenue impacts were developed over the forecast period from 2015 through 2030.

A final component of the analysis incorporated the capital costs of converting York and Gardiner to either AET or ORT. All capital cost estimates were provided by HNTB Corporation. A final measure of comparison was developed by taking into account both the 10-year net present value of the net toll revenue impacts and the estimated capital cost impacts associated with AET and ORT.

The following summarizes CDM Smith's net revenue impact analysis of converting the York and Gardiner toll facilities to either AET or ORT.

York Toll Plaza

E-ZPass currently accounts for about 64 percent of York transactions. Of the remaining 36 percent of cash paying customers, only about 37 percent are Maine residents. Under AET, the majority of cash customers become video customers. As a result of this cash/E-ZPass mix and the relatively low percent of in-state cash paying customers, estimates of potential toll revenue leakage amount to almost 10 percent of total toll transactions at York. This amounts to about 42 percent of the potential video transaction component. This toll revenue leakage necessitated the need for revenue enhancements in the form of video toll surcharges (even after taking into account the estimated AET impacts on M&O costs) in order to maintain net revenue neutrality with the existing condition.

A range of AET unregistered video surcharges was tested ranging from \$0.00 to \$4.00 for a passenger car. Both 5 and 10-year cumulative net revenue impacts were developed for each surcharge level tested. The model assumed that video customers could choose between two video options: registered and unregistered. Registered video customers would pre-register their plates and set up an account with a minimum balance required. Tolls would be automatically deducted from their account once successfully identified in the image review process. Due to the lower costs associated with this type of transaction, their surcharge level was assumed to be half that for unregistered video customers. Experience on other AET facilities shows that, when offered, registered video participation is very low, generally ranging between 0 and 5 percent. For purposes of this study, CDM Smith assumed 5 percent of video transactions would be registered.

The analysis indicated that an unregistered video surcharge of about \$3.00 (passenger car) would be required to maintain net revenue neutrality under AET at York over a 10-year time horizon. This is in addition to the current \$3.00 cash toll at this location. The most recent toll increase at York took place on November 1, 2012 (from \$2.00 to \$3.00) and the Authority foresees that, under the existing condition, no further increases would be needed for 15-20 years. The imposition of the \$3.00 video surcharge is also estimated to result in diversion to US Route 1 ranging from 3,400 to 5,500 per day.

Because ORT operations are very similar to current operations, no net revenue leakage is estimated to occur at the York Toll Plaza. Under this scenario, therefore, the current cash and E-ZPass rates would be maintained (i.e., no cash surcharge would be required).

A 10-year net present value comparison was conducted for both AET and ORT. HNTB estimates the capital costs to maintain the existing York Toll Plaza to be about \$22.1 million. Costs for ORT conversion amount to \$36.0 million, or about \$13.9 million greater than the existing condition costs.

AET capital costs are estimated at about \$4.8 million or about \$17.3 million less than the existing condition.

When the capital cost impacts are taken into consideration along with the 10-year net present value of the estimated AET toll revenue impacts, a net positive \$18.7 million is generated. However, it must be remembered that this is assuming a \$3.00 unregistered video surcharge and the accompanying toll diversion to US Route 1. Under ORT, the resulting combination of capital cost impacts and 10-year net present toll revenue impact is negative \$5.3 million.

Gardiner Toll Plaza

E-ZPass currently accounts for about 55 percent of Gardiner transactions. Of the remaining 45 percent of cash paying customers, about 75 percent are Maine residents. Under AET, the majority of cash customers become video customers. As a result of this cash/E-ZPass mix and the mix of in-state/out-of-state cash paying customers, estimates of potential toll revenue leakage amount to about 12 percent of total toll transactions at Gardiner. This amounts to about 36 percent of the potential video transaction component. This toll revenue leakage necessitated the need for revenue enhancements in the form of video toll surcharges (even after taking into account the estimated AET impacts on M&O costs) in order to maintain net revenue neutrality with the existing condition.

A range of AET unregistered video surcharges was tested ranging from \$0.00 to \$1.00 for a passenger car. Both 5 and 10-year cumulative net revenue impacts were developed for each surcharge level tested. Just as for the York analysis, the model assumed that video customers could choose between two video options: registered and unregistered. For purposes of this study, CDM Smith assumed 5 percent of video transactions would be registered at Gardiner.

The analysis indicated that an unregistered video surcharge of about \$0.75 would be required to maintain net revenue neutrality under AET at Gardiner over a 10-year time horizon. This is in addition to the current \$1.00 cash toll at this location. The Authority foresees that, under the existing condition, no further increases would be needed for 15-20 years. The imposition of the \$0.75 video surcharge is also estimated to result in diversion to alternative routes ranging from 800 to 1,400 per day.

As with York Toll Plaza, because ORT operations are very similar to current operations, no net revenue leakage is estimated to occur at the Gardiner Toll Plaza. Under this scenario, therefore, the current cash and E-ZPass rates would be maintained (i.e., no cash surcharge would be required).

A 10-year net present value comparison was conducted for both AET and ORT. HNTB estimates the capital costs to maintain the existing Gardiner Toll Plaza to be about \$7.0 million. Costs for ORT conversion amount to \$14.4 million, or about \$7.4 million greater than the existing condition costs. AET capital costs are estimated at about \$3.8 million or about \$3.2 million less than the existing condition.

When the capital cost impacts are taken into consideration along with the 10-year net present value of the estimated AET toll revenue impacts, a net positive \$6.7 million is generated. However, it must be remembered that this is assuming a \$0.75 unregistered video surcharge and the accompanying toll diversion to local roads. Under ORT, the resulting combination of capital cost impacts and 10-year net present toll revenue impact is negative \$4.5 million.

Summary

Various impacts and implications of implementing either ORT or AET at the York and Gardiner Toll Plazas have been presented in this report. The study compared traffic, toll rates, operating costs, net revenue over a 10-year period, and capital costs to a hypothetical continuation of the current cash collection of tolls. The analysis was conducted over a 10-year interval for each condition.

Both AET and ORT can be financially feasible options at York and Gardiner. AET offers free flow travel for all motorists with lower overall capital costs, but requires substantial video surcharges and results in traffic diversion to alternative routes. Because AET requires license plate image capture and mailed invoices for non-E-ZPass motorists, it also involves substantially more risk associated with being able to bill and collect on a substantial portion of transactions.

Conversion to ORT preserves cash collection at a lower operating cost, creates less risk to the Turnpike and requires no change to present toll rates. Cash paying motorists, however, would still be required to stop and pay their toll. And while the 10-year net toll revenue impact is positive, ORT capital costs are substantially higher than those for either the existing condition or for AET.

Technical Memorandum

Maine Turnpike ORT/AET Impact Analysis

This report summarizes the results of CDM Smith's independent impact assessment for possible conversion to Open Road Tolling (ORT) or All Electronic Tolling (AET) at one or more toll plazas on the Maine Turnpike. The Turnpike is faced with a number of challenges in the future regarding many of its existing toll collection facilities. Perhaps most urgent among these is the need for possible reconstruction of the York Toll Plaza, the southernmost barrier on the Maine Turnpike. That facility is decades old, and was constructed in a location in which subsurface conditions may preclude reconstruction. Consideration is being given to reconstruction of the plaza at an alternative location, but at a significant additional capital cost.

The Turnpike also anticipates the need to replace its northernmost toll plaza, at the I-295 connection in Gardiner. That facility, which was constructed immediately below the roadway overpass which is no longer in use, must be slightly relocated and reconstructed in the future.

The toll industry is moving toward automating the toll collection process, using either ORT or AET. While described in more detailed below, ORT would allow for high-speed, non-stop collection of tolls from vehicles equipped with E-ZPass transponders, while retaining a limited number of cash collection lanes in each direction. All electronic tolls would feature the elimination of cash collection altogether, and require only the construction of high-speed gantries across the mainline roadway, significantly reducing capital cost but requiring new methods and costs to handle vehicles without electronic transponders. In order to account for estimated toll revenue leakage resulting from AET implementation, some level of toll surcharge on non-E-ZPass transactions would also be required. With ORT, such surcharges would not be needed for current cash customers.

As the Turnpike Authority finalizes plans for replacement of these two critical plazas, it engaged the services of CDM Smith to provide an independent assessment of potential traffic, revenue and operating cost impacts associated with the ORT and/or AET options at each location. Our firm was initially contracted to perform the assessment at the York Plaza only; the Gardiner Plaza was added to the study subsequently. The Maine Turnpike Authority may ultimately consider all electronic tolling on the full system in the future, but this analysis only addressed the potential pilot implementation of AET or ORT at the York and/or Gardiner facilities.

Project Background

Preliminary estimates of capital cost to replace the York Toll Plaza range from \$26-\$45 million, for an open road tolling configuration, as compared to about \$5 million for all electronic tolling. However, the York Toll Plaza accounts for over 38 percent of Turnpike revenue; and a sizable portion of non-ETC traffic at that location is from out of state. All electronic tolling generally relies on video identification of vehicle license plates and a "pay by mail" system. Not only does this significantly increase collection complexity for previous cash-paying vehicles; it also increases collection risk, especially from out-of-state motorists.

In essence, AET offers the promise of significant capital cost savings, as compared to plaza reconstruction in an ORT configuration, but at the likely cost of increased tolls for non-E-Zpass customers. In addition, AET also presents considerable additional uncertainty regarding future operating costs and collection risk for motorists without electronic tolls. Clearly a detailed evaluation of the revenue and cost implications needs to be considered, in addition to the significant capital cost differential when making final decisions on how to proceed with a new toll collection solution at two critical toll plazas.

Open Road Tolling

Open road tolling involves the provision of high-speed, non-stop toll collection for vehicles equipped with electronic toll transponders, while retaining cash booths for collection from non-ETC traffic. An example of this is shown in Figure 1, an overhead photo depicting the relatively new ORT plaza at the Hampton tolling point on the New Hampshire Turnpike. In this case, two high-speed lanes are provided for ETC vehicles in each travel direction while six cash lanes are retained to the outside. Because electronic toll traffic continues to operate at full highway speeds, the cash and ETC express lanes are physically barrier separated, with the roadways rejoining north and south of the toll plaza.

From a collection standpoint, conversion to open road tolling is relatively low risk, and has been in successful operation for several years at dozens of mainline plazas throughout the U.S. The primary risk associated with the use of ORT express lanes is typically a small increase in violations through the ETC lanes; some intentional and some unintentional by motorists who may enter the express lanes in error. Even at high speeds, today's video imaging technology provides a reliable violation enforcement system and, in general, a relatively high percentage of revenue is retained. As importantly, motorists without ETC may continue to pay tolls by using cash as they do today, regardless of state of vehicle registration. It should be noted that no increase in violations has been observed at the New Gloucester toll plaza since ORT operation began April 1, 2013. To the contrary, implementation of violations enforcement systems (VES) on the cash lanes is bringing enforcement to "run-through" violations.

Figure 1
Typical ORT Mainline Plaza
Hampton Plaza, New Hampshire Turnpike



All Electronic Tolling

Examples of all electronic toll collection system gantries are shown in Figure 2. In this case, single (or in some cases twin) consecutive gantries are constructed across the roadway. The gantries are mounted with antennas and readers for identifying vehicles equipped with E-ZPass. Motorists not so equipped are charged a toll by high resolution cameras which capture images of license plates.

Figure 2
Typical AET Toll Zones

SH 121 Tollway (Dallas) and Melbourne Citylink (Australia)



Cash is no longer collected at AET plazas, and therefore the plaza reconstruction cost is greatly reduced. As importantly, there is essentially no additional right-of-way typically required, since the gantries are constructed across existing roadways only. AET also has the benefit of virtually eliminating accident risk at toll plaza locations; toll plazas typically represent high accident locations on toll roads across the country.

The biggest challenge, of course, with conversion to AET, is how vehicles without transponders are handled. Video tolling, while not new, contains inherent risks associated with various steps in the toll collection process. For example, it is possible that some plates may not be properly read, or vehicle owner address information with DMV records is incomplete. There are some limitations on the ability to obtain vehicle owner information from some states, and particular uncertainties regarding the ability to obtain address information from vehicles registered in Canada, who represent a notable proportion of traffic on the Maine Turnpike.

Under a pay-by-mail system, there is also an inherent collection risk itself; motorists who simply don't "pay the bill". There is a fairly complex process of multiple statements, and fees for non-payment which may be included. However, overall, the video tolling approach typically results in raw uncollectable tolls to the range of 10-20 percent or more.

Typically, agencies converting to all electronic tolling establish a "surcharge" for video users. This increase in the toll charge has three objectives:

- To encourage motorists to enroll in the ETC program which results in lower costs and higher collection to the toll agency;

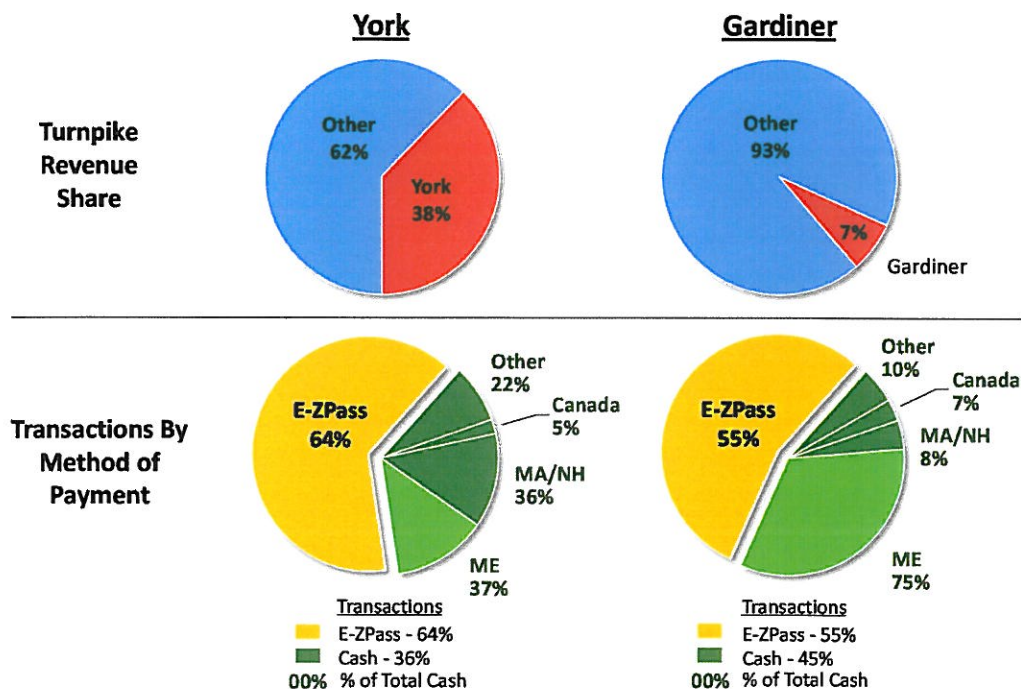
- To cover the additional operating cost associated with collection (as compared with ETC) for image recognition, mailing and follow-ups; and
- To cover the inherent “leakage” (from uncollected tolls) from the prior cash population.

Our study tested a number of alternative surcharge levels at both toll plazas evaluated. Any surcharge represents an increase in cost to the driving public, and therefore has the potential to result in traffic diversions off the Turnpike to alternative routes.

Plazas Evaluated

As noted above, this analysis was undertaken with respect to both the York Toll Plaza and the Gardiner Toll Plaza, generally at opposite ends of the Maine Turnpike. Both locations are in need of plaza replacement, but each location represents a significantly different traffic profile and level of risk. Existing conditions at the two toll plazas are summarized in Figure 3. The York Plaza accounts for 38 percent of total Turnpike revenue, while the Gardiner toll Plaza accounts for just 7 percent of Turnpike revenue, even though it covers traffic on the northern end of I-295. By contrast, the York Plaza currently has 64 percent of its traffic using one form or another of the E-ZPass electronic toll system. This component of traffic represents a very low risk under ORT or AET. E-ZPass at the Gardiner Plaza represents only 55 percent of transactions. On the other hand, at Gardiner, 75 percent of the cash traffic is typically represented by vehicles registered in the state of Maine. These represent the lowest collection risk for video tolling. At the York Plaza, which is near the New Hampshire state line, Maine-registered vehicles represent just 37 percent of current cash traffic.

Figure 3
Current York and Gardiner Characteristics



The states of Maine, New Hampshire and Massachusetts are the only three states in the U.S. to enter into reciprocity agreements for electronic toll enforcement. Under this program, subject to certain limitations, any of the states may deny registration renewal if a minimum threshold of violations (or presumably valid video toll transactions) remain unpaid in any of the three states. This is considerably important in terms of reducing collection risk. Hence, as noted later in this report, current cash vehicles with registrations in Massachusetts and New Hampshire are treated separately from all other states and Canada. Massachusetts/New Hampshire cash traffic represents 36 percent total at York but just 8 percent at Gardiner.

Study Objectives

The primary objectives of this study are to estimate the net revenue impact associated with converting to either open road tolling or all electronic tolling at the York and/or Gardiner Toll Plazas. This impact assessment was conducted in comparison to the base current system configurations at each location. The net revenue impact was determined by estimating:

- Impacts on toll revenue collections;
- Impacts on operating cost; and
- Potential revenue from administrative fees associated with possible non-payments under AET.

The net revenue impacts were evaluated at each location, under various scenarios, over a 10-year forecast period, generally extending from 2015-2024. The net present value of the 10-year net revenue potential for each scenario was then related to the hypothetical continuation of current toll operations. The discounted net impacts could then be related to alternative capital costs associated with the ORT vs. AET options at each location by the Authority.

Finally, recognizing the inherent uncertainties associated with the video tolling portion of the AET option, a risk analysis was undertaken. This involved testing a range of assumptions regarding customer payments, image recognition and various other factors, with a goal of establishing a net revenue forecast at 90 and 95 percent confidence levels. While this is most critical with respect to AET, a nominal risk assessment was also undertaken for ORT.

Overview of Study Approach

A detailed assessment of existing conditions at each toll plaza was made at the outset of the study. Historical data regarding the traffic mix at each location was obtained, and seasonal observations were made of the state distribution of cash traffic at each location for various times of year. CDM Smith also evaluated historical trends, such as the increasing share of E-ZPass traffic over time. It was also important to identify the distribution of ETC traffic itself; since a differential mechanism and rates are used for motorists who enroll in E-ZPass through the Maine Turnpike as opposed to other interoperable states.

The CDM Smith team also identified alternative routes for vehicles that might choose to divert off the Turnpike in the event of video surcharges (primarily under the AET option). In addition, data from

the Turnpike and HNTB was used to estimate the proportion of traffic at the York Plaza which entered/exited at each of the next several ramp locations; critical in the traffic diversion assessment.

The potential behavioral options for drivers under each alternative were then established. For example, under ORT, motorists can choose to remain in their current mode of collection, using either E-ZPass or cash. However, the implementation of high-speed, non-stop collection for E-ZPass provides an appealing incentive for some cash motorists to switch to ETC. It was ultimately determined that no ORT cash surcharge would be needed between cash and non-Maine issued E-ZPass vehicles; hence, there was little or no motivation for traffic to leave the Turnpike for alternative routes under the ORT option.

The options under AET were considerably more numerous. The elimination of the ability to pay cash would encourage some current customers to shift to ETC. However, it may also cause a small proportion to simply leave the Turnpike due to a technology aversion or privacy concerns. More importantly, since AET would inevitably require establishment of a video toll surcharge to overcome leakage and increased operating cost, a portion of cash traffic would be expected to shift to alternative routes. This diversion to US Route 1 could be significant if sufficiently high surcharges were required; and is an important factor to be taken into consideration.

Those motorists choosing to continue to use the Turnpike without a transponder would ultimately be billed for their trip. This would trigger a complex set of possibilities regarding the ultimate collection of the toll, as described in more detail below.

While estimates of traffic diversions under AET were calculated using well tested diversion techniques, the proportions of traffic that would actually be billable and collectable were based on reasonable assumptions based on experience at other AET facilities across the nation. While several facilities have converted to AET, there are still limitations on detailed performance information at several of these agencies; agencies are often reluctant to provide detailed data due to security considerations. However, reasonable expectations for collection rates and other factors were used. Since these assumptions are critical to the analysis, the risk analysis tested a wide range of “percentages” to help identify minimum levels of net revenue potential at strategic confidence intervals.

Finally, the study provides a “bottom line” cost-effectiveness assessment for each plaza, comparing performance for ORT and AET, under various scenarios, with the current base condition. The net impacts, over a 10-year horizon, are then related to the net differences in capital investment costs, as provided by HNTB.

ORT Analytical Methodology

The ORT impact assessments were relatively straightforward. No changes were assumed for current E-ZPass traffic, be they Maine-issued E-ZPass or accounts issued in other states. Toll rates were assumed to be the same.

The analysis estimated a small proportion of cash vehicles which would choose to shift to E-ZPass based on the more convenient, uncongested toll collection opportunities provided by the new express lanes. The study also looked at actual experience on other ORT facilities, and estimated an increase in

the violation portion for vehicles passing through the express lanes without transponders. As previously discussed, no increase in violations has been observed at the New Gloucester toll plaza since ORT operation began April 1, 2013. While this provides some indication that the increase in violations may not occur at the York and Gardiner toll plazas under ORT operation, the potential risk remains and the experience at New Gloucester was not factored into the estimated slight increase in ORT lane violations at York and Gardiner. No diversions to alternative routes were estimated under the ORT configuration.

Operating cost impacts were estimated for ORT, based on the reduced number of cash collection facilities which will be required. Increased violation enforcement costs, as well as violation enforcement fees, were also prepared. Ten-year net revenue estimates were developed for each plaza under the ORT configuration, and ultimately formatted for direct comparison of capital cost.

A detailed spreadsheet model was developed for estimating traffic, revenue and operating cost impacts. A simplified version of this was used in the ORT analysis itself. A much more complex version, referred to as the CDM Smith Waterfall model, was used for the AET analysis, as described below.

AET Analytical Methodology

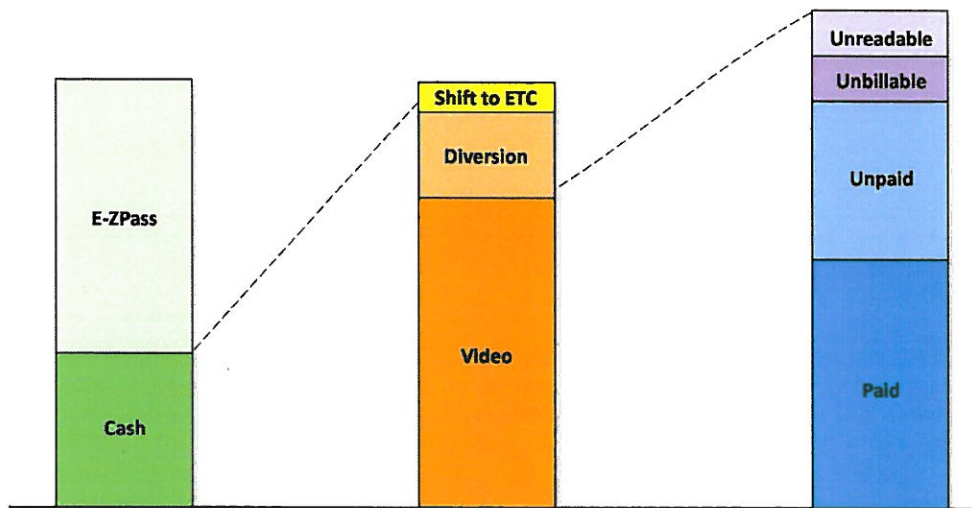
The AET impact assessments were much more complex. This involved assessing the redistribution of current cash traffic, assessing payment cost implications and bringing these together in development of ten-year net revenue estimates. A range of scenarios were tested at each location, including a range of surcharge levels to offset possible revenue leakage and higher cost of collection.

Assessing Redistribution of Current Cash Traffic

Figure 4 graphically summarizes the analysis used in assessing the redistribution of current cash traffic, and potential collection risks. At each location, traffic is currently made up of E-ZPass and cash. The E-ZPass traffic represents 55 percent of the total at Gardiner and 64 percent at York.

Since cash would no longer be available under the AET option, the first step in the process was to estimate the redistribution of current cash vehicles into ETC, video or “off the road”. A relatively small proportion was assumed to shift to ETC, based in part on the magnitude of surcharge applied to video cost transactions. The portion of the traffic estimated to divert to alternative routes is also directly related to the surcharge level, and involves a review of the best alternative routes for most typical movements, travel time differential and distance differences and the net increase in toll associated with the surcharge. Former cash traffic diverted off the Turnpike was no longer available to pay tolls and was all treated as lost revenue. The remaining portion of former cash vehicles, shown in orange in the center bar of Figure 4, was assumed to remain on the Turnpike. Their tolls, under AET, would be collected by means of captured license plate information. This data would then be subjected to a DMV lookup for owner name and address.

Figure 4
Redistribution of Former Cash Traffic Under AET



Of the total vehicles without transponders passing under the toll gantry (the “video” traffic), a certain portion was assumed to be unreadable based upon weather, license plate physical limitations, trailer hitch blockages and more. Another portion of the traffic was assumed to be “unbillable”; primarily cases where information on vehicle owner address could not be obtained or proved to be faulty. Both of these conditions exist under current AET operations throughout the U.S. and Canada. The light blue and dark blue portions of the right bar represent motorists who are actually billed for the trip(s) made within a billing period. A percentage of those are assumed to be paid, while another percentage remains unpaid, sometimes after multiple invoices.

Assessing Payment and Cost Implications

The distribution of video transactions into unreadable, unbillable and billable transactions was handled in this step using the Waterfall model described below. In addition, the proportion of invoices paid on the first invoice, second invoice or later was also an important input into the modeling process. This is somewhat uncertain and was heavily tested in the risk analysis.

Cost implications were also estimated in the detailed model, based on unit costs provided primarily by Maine Turnpike operations staff based, in turn, on the Agency’s historical experience with violation processing. In practice, this resulted in a fairly conservative estimate of back office operating costs associated with video collection; since under AET there would be a significant increase in the number of billings and amount of collections, it is not unlikely that certain cost efficiencies could be introduced into the process. However, for purposes of this analysis, the same conservative unit costs for each step of the process was coded into the study model.

The CDM Smith AET Waterfall Model is a spreadsheet-based series of calculations that closely mimics the processes through which AET transactions would be handled. In the absence of a formal MTA AET business rules document, assumptions regarding AET business rules for use in the model were

developed in close cooperation with the MTA. Figure 5 depicts how transactions and revenues flow through the system and end up as either lost revenue or collected toll revenue.

This model begins with existing condition gross transactions and toll revenue and applies a series of parameters and decision points that collectively determine whether revenue is collected for each transaction, the method under which that revenue is collected, and at what rate. The model processes transactions and revenue for passenger vehicles separately from commercial vehicles. The model also distinguishes between vehicles registered in Maine, Massachusetts/New Hampshire, all other states and Canada.

Additionally, a simplified version of the AET Waterfall Model was developed to simulate ORT operation. While ORT utilizes similar toll collection procedures as currently seen on the Maine Turnpike, the Waterfall Model is needed to estimate the traffic and revenue impacts of the implementation of high-speed E-ZPass lanes, a cash toll collection surcharge, and improved violations enforcement within cash lanes.

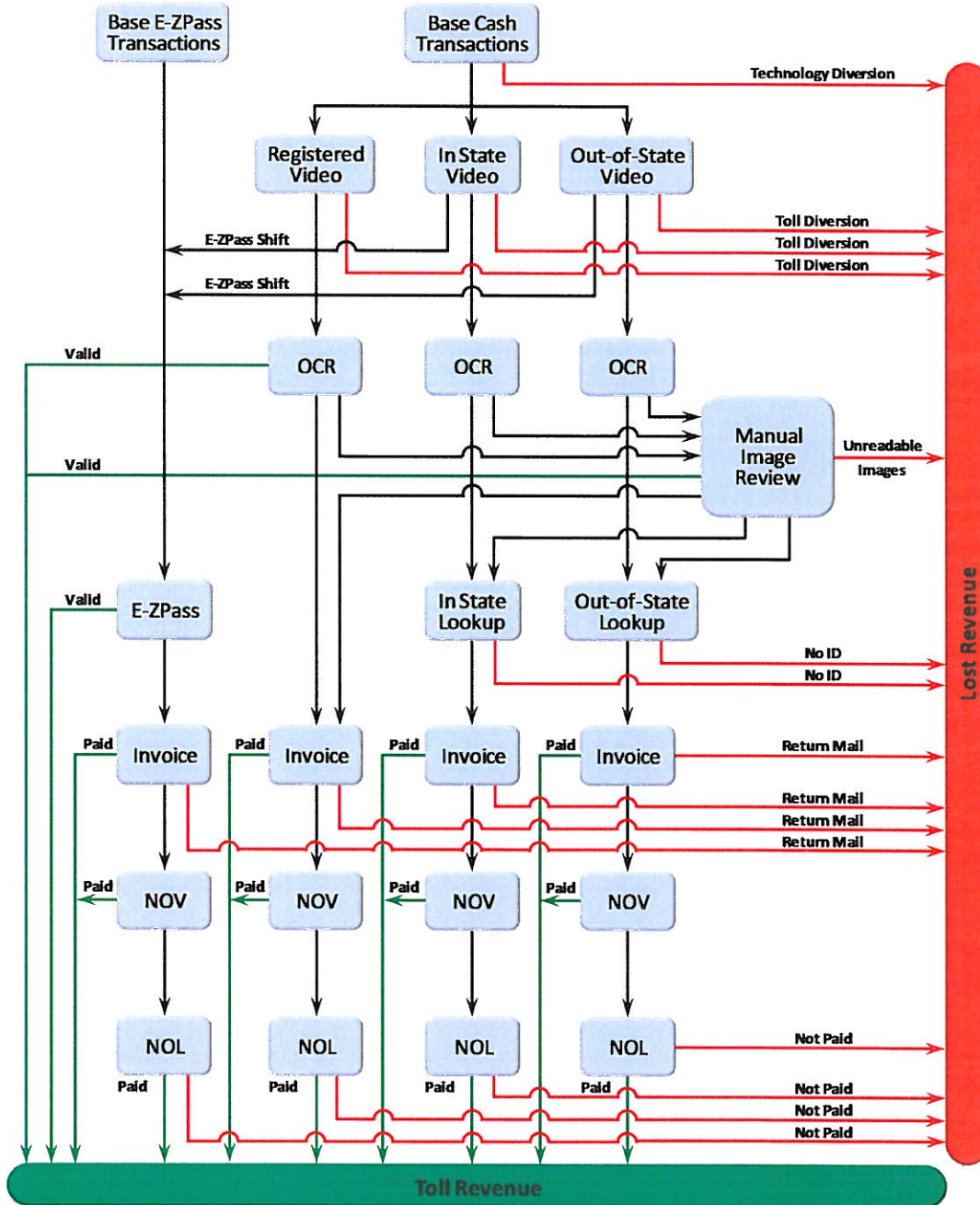
AET Waterfall Model Overview

The following list provides descriptions for key elements and decision points presented in Figure 5:

1. Existing condition transactions are composed of two groups: E-ZPass and cash transactions.
2. E-ZPass users with valid accounts pass through the AET model with no further consideration. Revenue is added directly to the final revenue calculations.
3. E-ZPass users with an invalid account (e.g. expired or declined credit card associated with the account) go through an invoicing/violations process... An assumed payment rate is applied to the initial invoice. Additional payment rates are then applied to the portion of each subsequent attempt at collecting the toll and associated fees assumed to remain unpaid. This process includes a Notice of Violation (NOV) and Notice of Liability (NOL). The portion of violations remaining unpaid after the entire process is considered lost revenue.
4. A technology diversion percent is applied to those existing cash customers unwilling to either join E-ZPass or become a video customer. They choose to not use the facility under AET for various reasons, including the desire not to be tracked, the belief that this technology will be used to catch speeders, they simply do not understand how it works, etc.
5. Following the application of technology diversion, a calculation is applied to account for the portion of current cash customers that will obtain an E-ZPass account due to implementation of AET. These new E-ZPass account holders are then added to the total E-ZPass population.
6. The remaining cash customers (i.e., after toll technology shift and shift to E-Z Pass), become potential video customers. Some small proportion (5 percent in the base case AET model) are assumed to become registered video customers. The remaining become potential unregistered video customers and the model is set up to deal with in-state and out-of-state motorists separately.
7. Once the registered and unregistered video customer mix has been identified, toll diversion is estimated based on the amount of the video surcharge amounts. These are effectively toll increases for these customers. For purposes of this analysis, it was assumed that registered

video toll surcharges would be 50 percent of the unregistered surcharge amount. As shown in Figure 5, all toll diversion revenue flows to the right side of the figure as lost revenue.

Figure 5
AET Waterfall Model Flow



8. The same first steps of OCR and manual image review take place for unregistered video transactions as they do for registered video transactions. As shown in Figure 5, unreadable images represent lost revenue, while readable images then go through the in-state and out-of-state department of motor vehicle look-up process.
9. Registered video transactions would be identified upon being successfully read by an optical character reader (OCR). Their license plate would match that set up by the account holder and the appropriate toll would be deducted from their account. In the event the plate is not successfully read, it would go through a manual image review process. If successfully identified there, the appropriate amount would be deducted from their account. If readable after the manual review process, the toll amount would be considered lost revenue. In the event that license is identified, but the account is found to be invalid (e.g. expired or declined credit card associated with the account), the same invoice/violation process would be followed as for E-ZPass accounts. All DMV lookup success rates are then applied to in-state and out-of-state video transactions. Invoices are then mailed to the addresses returned from the DMV lookup process. Some of these will be undeliverable, resulting in return mail. These are considered lost revenue. Historically, MTA has not been able to obtain plate data from the eastern provinces of Canada. Although recent overtures to Quebec and New Brunswick may yield some plate data recovery, for present purposes no recovery is assumed.
10. Payment rates are then applied to the video toll invoices successfully mailed to patrons. Additional payment rates are then applied to the portion of each subsequent attempt at collecting the toll and associated fees assumed to remain unpaid. Any remaining unpaid notices are considered losses.
11. Any remaining unpaid notices for in-state video transactions are subject to suspension of vehicle registration (notice of suspension or NOS). Only the remaining unpaid notices for out-of-state video transactions are subject to the NOS action, as the model assumes MTA will lack the authority to suspend out-of-state registrations. For purposes of this model, the mailing costs associated with NOS is assumed, but due to the very low assumed collection level at this stage, no toll revenue collection is assumed.

Key Model Variables

The following section presents descriptions of those variables that have the greatest influence on the AET modeling process. The values used for these variables in the Waterfall Model were developed in close cooperation with the MTA. Wherever possible, the values used in the Waterfall Model are based on data provided by MTA based on current Turnpike experience. Where existing MTA data did not provide sufficient basis for model inputs, values were developed based on data collected through interviews with toll agencies that have implemented AET. Facility characteristics such as location, user profile, tolling policy, and enforcement measures were taken into account when considering whether agency interview data was applicable to the Turnpike for the purposes of this study. This section includes only those variables that CDM Smith believes to be critical to the understanding of the AET model and not all variables are presented here.

Technology Diversion

Upon implementation of AET, a certain percentage of Turnpike patrons who currently pay cash will neither enroll in E-ZPass, nor will they participate in video tolling. The only remaining option for these

patrons is to leave the facility entirely. Based on the experience of CDM Smith, having observed several US facilities that have converted to AET, it is expected that only a small percentage of customers would actually divert from the road for this reason. CDM Smith estimates technology diversion at 3.0 percent for both passenger vehicles and commercial vehicles. Technology diversion is not applicable to ORT as customers continue to have the option to pay tolls using cash.

Video/Cash Surcharge

In addition to the technology diversion, diversion will occur due to the de-facto rate increase for video toll users under AET and for cash users under ORT. Under AET or ORT operation customers without an E-ZPass account may pay more than E-ZPass users for the same trip. Surcharge rates being evaluated in this study will cause some current Turnpike cash customers to divert to an alternate route. Surcharges ranging from \$0.00 to \$5.00 were tested for the York toll Plaza. Surcharges ranging from \$0.00 to \$2.00 were tested for the Gardiner toll Plaza.

Shift from Cash to E-ZPass

This input represents the assumed percentage of cash customers—remaining following Technology Diversion—that would shift to E-ZPass as a result of AET or ORT implementation. The volume of this potential shift is largely based on the perceived and actual benefits of obtaining an E-ZPass account. The primary benefit of E-ZPass under AET is the cost savings related to not being subject to the video surcharge. As the surcharge increases in relation to the existing toll, the number of patrons willing to obtain an E-ZPass account is also expected to increase. Within the AET and ORT models, the percentage of cash customers estimated to shift to E-ZPass ranged from 3 percent to 23 percent. The standard discount afforded to motorists using a Maine issued E-ZPass was accounted for in the toll differential when calculating the percentage of cash customers who are expected to shift to E-ZPass. Because cash customers are predominantly infrequent users, the Maine E-ZPass frequent-user discount program was assumed to have a minimal impact and was not factored into the toll differential when estimating shift.

Under ORT, it is expected that a smaller percentage of Turnpike customers will shift to E-ZPass based solely on the convenience and perceived time savings of the high-speed E-ZPass lanes.

Registered Video Accounts

Registered video accounts represent an additional option for current Turnpike cash customers to avoid the full AET video surcharge. A Registered Video user is someone who has contacted the Turnpike and has guaranteed payment of the toll, in some manner such as a credit card, pre-paid cash balance, or post-pay agreement. This agreement minimizes the risk of leakage due to non-payment. It has the added benefits of minimizing costs associated with identification and mailing. Increased payment rates and decreased costs associated with registered video accounts allow agencies to reduce video surcharges for registered video users. In turn, the lower video surcharge incentivizes video customers to register. Where offered, participation in registered video discount programs on existing AET facilities has been demonstrated to be low. Thus, in the AET model, 5 percent of potential video transactions are assumed to shift into registered video accounts.

Normal E-ZPass Growth

This is the growth in E-ZPass penetration that would occur independently of AET conversion. It is based on historical growth and has been incorporated into this analysis. The “shift from cash to E-

ZPass” discussed above, would reflect the impact of AET and would be added to the normal E-ZPass growth that would occur over time.

Identifiable License Plate Images

This input represents the assumed percentage of successful license plate images identification, either through the OCR or manual identification process. This is an important metric for AET as unidentifiable images result in unbillable toll transactions. Image review success rates can be influenced by tolling equipment, inclement weather, obscured plates, and vehicle mix among others. For the purposes of this study, successful image identification rates used in the model were assumed to be the same as current MTA violation enforcement experience. Values used in the model for this variable can be seen in Tables 1 and 2.

Successful DMV Lookup

As previously discussed, once the license plate of a non-E-ZPass patron is recorded, it must be matched to a name and address for billing purposes. The rate at which MTA is able to obtain matching billing information is a critically important variable. For every plate that goes unmatched, MTA loses a would-be source of revenue.

The figures used in the model for this input were based on current MTA successful DMV look-up rates for in-state and out-of-state vehicles. DMV look-ups are currently conducted through the Maine DMV for in-state vehicles, the New Hampshire DMV for New Hampshire Vehicles, and through Duncan Solutions for all other out-of-state vehicles. Values used in the model for this variable can be seen in Tables 1 and 2. Since it is currently difficult for MTA to obtain Canadian DMV plate data, all unregistered Canadian video transactions are considered losses from a toll revenue standpoint.

Returned Mail

A portion of invoices mailed to MTA video toll patrons are expected to be returned as invalid addresses. In these cases, MTA has little recourse to correct this, as methods of obtaining a correct address would not be cost effective. The figures used in the model for this input were based on current MTA return mail rates. Values used in the model for this variable can be seen in Tables 1 and 2.

Payment on Video Invoice and Notices

One of the most critical variables in the AET analysis is the proportion of patrons who will pay at the various levels of invoicing. When customers fail to pay the 1st invoice, the cost to mail subsequent notices increases and offsets portions of the toll revenue being collected. It is expected that payment rates decrease with each successive mailing resulting in a percentage of video toll transactions that go unpaid. This results in a negative impact on net revenue as a high collection cost is incurred in conjunction with no toll revenue being collected.

AET Model assumptions relating to video tolling at the York and Gardiner toll plazas are presented in Tables 1 (York) and 2 (Gardiner). Included are percentages for unsuccessful image capture, invalid DMV data, return mail and video billing payments for ME, MA/NH and other out-of-state cash customers. The percentages are applied to each group of cash customers in succession to estimate the percentage of potential video transactions that go unpaid. At the York plaza, cash customers are split fairly evenly between Maine, Massachusetts and New Hampshire, and other out of state roadway users. As shown, the “Other” category, which represents 27.4 percent of all video transactions, has the

highest uncollected rate (64.2 percent). This is largely due to the very low assumed invoice payment rates for these motorists. Under the current assumptions for identification and payment rates, this results in approximately 42 percent of total video transactions being uncollected. This represents about 9.6 percent of total transactions (E-ZPass and video) at York.

Table 1
York Toll Plaza AET Video Toll Payment Assumptions

Item	Maine	MA/NH	Other	Weighted Average
Percent Cash Distribution	37.0%	35.6%	27.4%	100.0%
Percent No Image Capture	1.5%	15.0%	15.0%	10.0%
Percent No DMV Record/Returned Mail	17.2%	5.1%	8.5%	10.9%
Billable Video Transactions				
% Pay 1st Invoice	55.0%	50.0%	25.0%	45.0%
% Pay NOV	55.0%	40.0%	20.0%	40.1%
% Pay NOL	35.0%	20.0%	10.0%	22.8%
Total % Pay Invoice	86.8%	76.0%	46.0%	72.1%
Total % Unpaid Invoice	13.2%	24.0%	54.0%	27.9%
Total Percent Video Uncollected	29.2%	38.7%	64.2%	42.2%
Total Percent Uncollected (ETC + Video)				9.6%

Table 2 shows the same information for Gardiner. In this case, because Maine registered vehicles make up a very large (75 percent) proportion of video transactions, the overall amount of uncollected video transactions amounts to 35.9 percent. But, because video transactions make up a larger share of total transactions at Gardiner, the number of uncollected video transactions represents about 12 percent of total transactions (E-ZPass and video).

Table 2
Gardiner Toll Plaza AET Video Toll Payment Assumptions

Item	Maine	MA/NH	Other	Weighted Average
Percent Cash Distribution	75.0%	8.2%	16.8%	100.0%
Percent No Image Capture	1.5%	15.0%	15.0%	4.9%
Percent No DMV Record/Returned Mail	17.2%	5.1%	8.5%	15.0%
Billable Video Transactions				
% Pay 1st Invoice	55.0%	50.0%	25.0%	49.6%
% Pay NOV	55.0%	40.0%	20.0%	47.9%
% Pay NOL	35.0%	20.0%	10.0%	29.6%
Total % Pay Invoice	86.8%	76.0%	46.0%	79.3%
Total % Unpaid Invoice	13.2%	24.0%	54.0%	20.7%
Total Percent Video Uncollected	29.2%	38.7%	64.2%	35.9%
Total Percent Uncollected (ETC + Video)				12.0%

Cost Assumptions

Operations and maintenance costs are very important to the AET analysis. It is known that a certain percentage of present toll transactions will be lost under AET. As described above, this will be due to technology and surcharge diversion, unreadable license plate images, unsuccessful DMV lookups, returned mail and uncollectable tolls. Generally, the costs of operations and maintenance of an AET system are expected to be less than the costs associated with a conventional cash and ETC system. There will be fewer personnel needed. This will result in a reduction in cost for labor, benefits, insurance and administration. The costs of operating and maintaining the toll plazas will be eliminated. There will be no costs for handling and securing large amounts of cash. On the other side, under AET, there will be increased back office costs, mailing costs, maintenance of expensive camera equipment, costs for image reviews and DMV lookups. Reduced costs of operations and maintenance under AET may offset some of the loss of toll revenue associated with traffic diversion and uncollectable tolls.

The AET model utilizes a series of cost-related components to determine the costs associated with AET operations. These were developed in close cooperation with MTA. The assumptions developed were based upon current toll collection cost data provided by MTA, when available. Assumptions were also influenced by CDM Smith experience in previous projects and staff participation in industry surveys supporting other AET conversions. Table 3 presents some of the key per-unit costs used in the AET and ORT models.

Table 3
Per Unit Cost Summary
2013-2030

Cost Component	2013 AET/ORT Model Value	Annual Rate of Inflation				
		2014	2015	2016	2017	2018-2030
Per Unit Cost						
Base CSC Per Transaction Cost	\$0.04	3.5%	2.5%	2.5%	2.5%	2.5%
Cost Per Manual Image Review	\$0.16	3.5%	2.5%	2.5%	2.5%	2.5%
Notices Stuffed & Mailed	\$0.54	3.5%	2.5%	2.5%	2.5%	2.5%
1st Notice (30 days)	\$1.71	3.5%	2.5%	2.5%	2.5%	2.5%
Mailing NOV	\$1.71	3.5%	2.5%	2.5%	2.5%	2.5%
Mailing NOL	\$2.00	3.5%	2.5%	2.5%	2.5%	2.5%
Mailing NOS	\$1.94	3.5%	2.5%	2.5%	2.5%	2.5%
In-State Lookup	\$0.13	3.5%	2.5%	2.5%	2.5%	2.5%
Out-of-State DMV lookup	\$1.87	3.5%	2.5%	2.5%	2.5%	2.5%

Findings

This section summarizes the study team's use of the AET and ORT models to estimate AET traffic, toll revenue, and M&O costs for a range of surcharge levels over the forecast period from 2015 to 2030. With this information, total net AET and ORT toll revenue is developed and compared to the estimated net revenue values for the existing condition. The result of this comparison is then used to identify the optimum AET video toll and ORT cash toll surcharge levels. The optimal surcharge level is identified

as the lowest surcharge at which a given scenario becomes net revenue neutral. This is the point at which surcharge revenue is sufficient to offset changes in toll collection costs and revenue leakage due to the implementation of AET or ORT. Once the selected surcharge value is determined and the net revenue values estimated, a further analysis is conducted taking into account the estimated capital costs associated with both AET and ORT. As will be discussed in more detail below, toll surcharges were only deemed necessary under AET; ORT implementation was financially feasible without an additional cash toll surcharge.

As described in the AET model description, the existing condition traffic and revenue estimates form the starting point for the AET analysis. All of the assumed AET shifts and diversions shown in Figure 5 are applied to existing condition traffic and revenue estimates.

As it relates to the current study, the most important analysis is the estimated net revenue impact of converting to AET or ORT (compared to the existing condition) and not overall net revenue figures. Thus, if a certain AET or ORT scenario has a net positive impact compared to the existing condition, it will continue to have a similar net positive impact in the event new existing condition forecasts are developed.

Please note that CDM Smith has chosen to report toll revenue and fee revenue separately. The fee revenues should not necessarily be considered in whole as this revenue is not always collected. Very often agencies will wave outstanding fees if the base toll debt is paid or will engage in other programs designed to incentivize patrons to pay past-due balances. Thus, for purposes of this study, it was decided that only 30 percent of total potential fee revenue would be collected.

York Toll Plaza

The following section presents estimated traffic and revenue for the York Toll Plaza under AET and ORT conditions. The results of surcharge sensitivity tests are discussed, including the estimated annual net revenue forecasts associated with various surcharge levels. Estimated annual traffic and toll revenue impacts are presented assuming the optimal surcharge level.

York Toll Plaza Assuming AET

The results of the AET surcharge sensitivity tests are presented in Table 4. These were conducted at estimated 2015 levels, the assumed opening year. Surcharge rates were tested at \$0.00, \$1.00, \$2.00, \$3.00 and \$4.00. These are the assumed passenger-car video toll surcharges that would be assessed to unregistered video transactions in addition to the \$3.00 cash toll. Registered video transaction surcharges were assessed at 50 percent of the unregistered video surcharge. Data shown in Table 4 includes estimated toll transactions, no contact/uncollectable transactions, gross toll and fee revenue, M&O costs, and net revenue impacts associated with each surcharge levels.

Estimated annual transactions are provided for the existing condition for both cash and E-ZPass (including violations). These existing condition transactions do not change across the various surcharge levels since this assumes no AET. In total, an estimated 13,965,000 transactions are anticipated to occur in 2015 under existing conditions. If AET is implemented, total toll transactions are expected to decrease compared to the existing condition. At \$0.00 surcharge, a reduction of 1,756,000 transactions is anticipated, an approximately 12.6 percent reduction compared to the existing condition. The "lost" 1,756,000 transactions are identified in the table under the header No

Table 4
Estimated 2015 York Toll Plaza AET Surcharge Sensitivity Summary (1)
All Values in Thousands

Toll Transactions	Unregistered Video Surcharge (2)				
	\$0.00	\$1.00	\$2.00	\$3.00	\$4.00
Existing Condition Toll Transactions: Cash	4,213	4,213	4,213	4,213	4,213
Existing Condition Toll Transactions: E-ZPass	9,752	9,752	9,752	9,752	9,752
Total Existing Condition Toll Transactions+Violations	13,965	13,965	13,965	13,965	13,965
AET Toll Transactions: Video	2,359	2,096	1,785	1,414	995
AET Toll Transactions: E-ZPass	9,850	10,013	10,176	10,341	10,507
Total AET Toll Transactions	12,209	12,109	11,961	11,755	11,501
AET Transaction Impacts	-1,756	-1,856	-2,003	-2,209	-2,463
No Contact/Uncollectable Transactions					
Toll and Technology Diversion	119	410	783	1,259	1,818
Unreadable Plates and DMV No Hits	374	331	279	217	147
Unsuccessful Collection	1,344	1,196	1,022	815	580
Total AET No Contact/Uncollectable	1,837	1,937	2,084	2,290	2,545
Existing Condition Violations	81	81	81	81	81
AET Transaction Loss Impact	1,756	1,856	2,003	2,209	2,463
Gross Toll and Fee Revenue					
Existing Condition Gross Toll Revenue: Cash	\$14,776	\$14,776	\$14,776	\$14,776	\$14,776
Existing Condition Gross Toll Revenue: E-ZPass	40,710	40,710	40,710	40,710	40,710
Existing Condition Fee Revenue	189	189	189	189	189
Total Existing Condition Gross Toll+Fee Revenue	\$55,675	\$55,675	\$55,675	\$55,675	\$55,675
AET Gross Toll Revenue: Video	\$8,359	\$10,074	\$10,965	\$10,792	\$9,413
AET Gross Toll Revenue: E-ZPass	40,970	41,455	41,942	42,432	42,926
AET Collected Fee Revenue (30% of Maximum)	1,794	1,589	1,344	1,051	718
Total AET Gross Toll+Discounted Fee Revenue	\$51,123	\$53,118	\$54,251	\$54,275	\$53,057
Total AET Gross Toll Revenue Impact	-\$4,552	-\$2,557	-\$1,424	-\$1,400	-\$2,619
Summary of Existing Condition M&O Costs					
Image Review	\$159	\$159	\$159	\$159	\$159
DMV Lookup	16	16	16	16	16
Mailing	59	59	59	59	59
Fare Collection/Administration	5,832	5,832	5,832	5,832	5,832
Total Annual Existing Condition M&O Costs	\$6,067	\$6,067	\$6,067	\$6,067	\$6,067
Summary of AET M&O Costs					
Image Review	\$682	\$607	\$518	\$411	\$290
DMV Lookup	1,652	1,461	1,233	959	647
Mailing	3,303	2,923	2,472	1,929	1,313
Fare Collection/Administration	2,415	2,428	2,431	2,419	2,394
Total Annual AET M&O Cost	\$8,052	\$7,420	\$6,653	\$5,719	\$4,644
AET Cost Savings	-\$1,985	-\$1,352	-\$586	\$348	\$1,423
Net Revenue Impacts (3)					
Total Net Existing Condition Toll+Fee Revenue	\$49,608	\$49,608	\$49,608	\$49,608	\$49,608
Total Net AET Toll Revenue	43,071	45,698	47,598	48,556	48,412
Total Net AET Toll Revenue Impact	-\$6,537	-\$3,910	-\$2,010	-\$1,052	-\$1,196
5-yr Cumulative AET Net Revenue Impact	-\$27,350	-\$15,312	-\$6,609	-\$2,150	-\$2,591
10-yr Cumulative AET Net Revenue Impact	-\$42,993	-\$21,109	-\$5,305	\$2,910	\$2,521

(1) Per MTA, it is assumed that no billing information can be obtained for vehicles with Canadian license plates.

(2) These are the assumed passenger car video toll surcharge amounts that would be assessed to unregistered video transactions in addition to the \$3.00 cash toll. Registered video transaction surcharges were assessed at 50 percent of the unregistered video surcharge.

(3) Net revenue is calculated by subtracting maintenance and operations costs from gross toll+fee revenue.

Contact/Uncollectable Transactions. At the \$0.00 level surcharge, it is estimated that a total of 1,837,000 transactions would be lost in 2015 due to:

- 119,000 transactions lost due to diversion (both toll diversion and technology diversion);
- 374,000 transactions lost due to unreadable plates or no DMV match; and
- 1,344,000 transactions lost due to unsuccessful collection.

The estimated leakage of toll transactions increases as the unregistered video surcharge increases from \$0.00 to \$4.00 (again, registered video rates are increasing at 50 percent of these rates). The increase is primarily due to increasing levels of diversion associated with the increased video toll rate. Negative impacts on the other two categories actually decrease since the pool of video customers decreases (due to diversion and greater assumed shifts to E-ZPass) at increasingly higher video surcharge levels. But, the overall net impact is increasing losses as surcharge levels increase.

Estimates of toll and fee revenue are provided for the existing condition and for the various surcharge levels under AET. The total estimated AET gross toll revenue impact is negative in 2015 at all tested surcharge levels. The impact is smallest at the \$3.00 surcharge, totaling a negative impact of \$1,400,000 compared to the existing condition. The toll revenue impact includes the video and E-ZPass gross toll revenue and the anticipated fee revenue. Beyond that, the video surcharge levels are so great that the negative effects of toll diversion outweigh the positive impacts of the toll increase.

Maintenance and operation costs, both existing and under AET are shown for the surcharge levels. The existing M&O does not change, and the estimated annual AET M&O costs decrease continuously from the \$0.00 to the \$4.00 surcharge. The decreasing AET M&O costs are largely due to the diminishing number of video toll transactions thus reducing transaction related processing costs such as image review, DMV lookup and mailings. The total AET cost savings turns positive at the \$3.00 surcharge level. At lower surcharge levels, the combination of high license plate look-up costs (especially for out-of-state motorists) and mailing costs more than offset the other personnel and administrative savings afforded by AET.

Total AET M&O costs are greater at the \$0.00 through \$2.00 surcharge levels compared to those for the existing condition. Beginning at the \$3.00 rate, total AET M&O costs are estimated to be lower than those for the existing condition. It is interesting to note, however, that at all surcharge levels, the Fare Collection/Administration cost component under AET is always less than half those for the existing condition. This is largely due to the elimination of toll collector costs. What drives the total AET M&O costs up are the additional costs incurred by the other three cost components: Image Review, DMV Lookup, and Mailing. These three components increase dramatically over the existing condition as cash customers become video customers, each of whom needs to be identified and sent an invoice (or multiple invoices).

The net revenue impacts (gross toll and fee revenue minus M&O costs) are shown for AET compared to the existing condition. In 2015, the net toll revenue impact is always negative for all surcharge levels, although it is minimized at the \$3.00 surcharge. At the \$4.00 surcharge, gross toll revenue starts to decrease due to the levels of toll diversion and conversion to E-ZPass. In 2015 it is estimated that the net toll revenue impact of AET is negative \$1,052,000 at the \$3.00 surcharge level. The five-

year cumulative AET net revenue impact with a \$3.00 surcharge totals a negative \$2,150,000. The ten-year cumulative impact at the \$3.00 level turns positive, totaling an estimated \$2,910,000 in 2015.

A graphical summary of the estimated annual net toll revenue from 2015 through 2030 at the various unregistered video surcharge levels and for the existing condition (Base Case) is shown in Figure 6. The net revenue curve for the \$3.00 and \$4.00 curve are so similar at this scale that they appear as one line. All the AET estimated net toll revenues fall short of the Base Case in 2015. The estimated AET toll revenue streams associated with the \$2.00, \$3.00 and \$4.00 video surcharges exceed the Base Case toll revenue in future years while the estimated annual toll revenue associated with the \$0.00 and \$1.00 surcharge never equals or exceeds the Base Case forecast. The \$3.00 and \$4.00 surcharges result in annual gross toll revenues that exceed the Base Condition by about 2019. The annual gross toll revenue at the \$2.00 surcharge exceeds the Base Condition toll revenue in about 2021.

Figure 6
Estimated York Toll Plaza AET Annual Net Revenue Forecasts

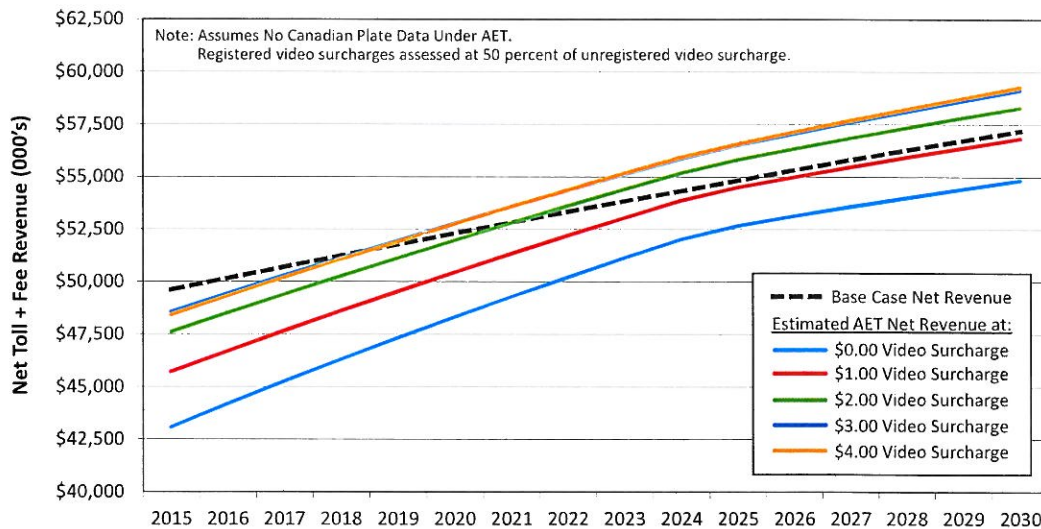


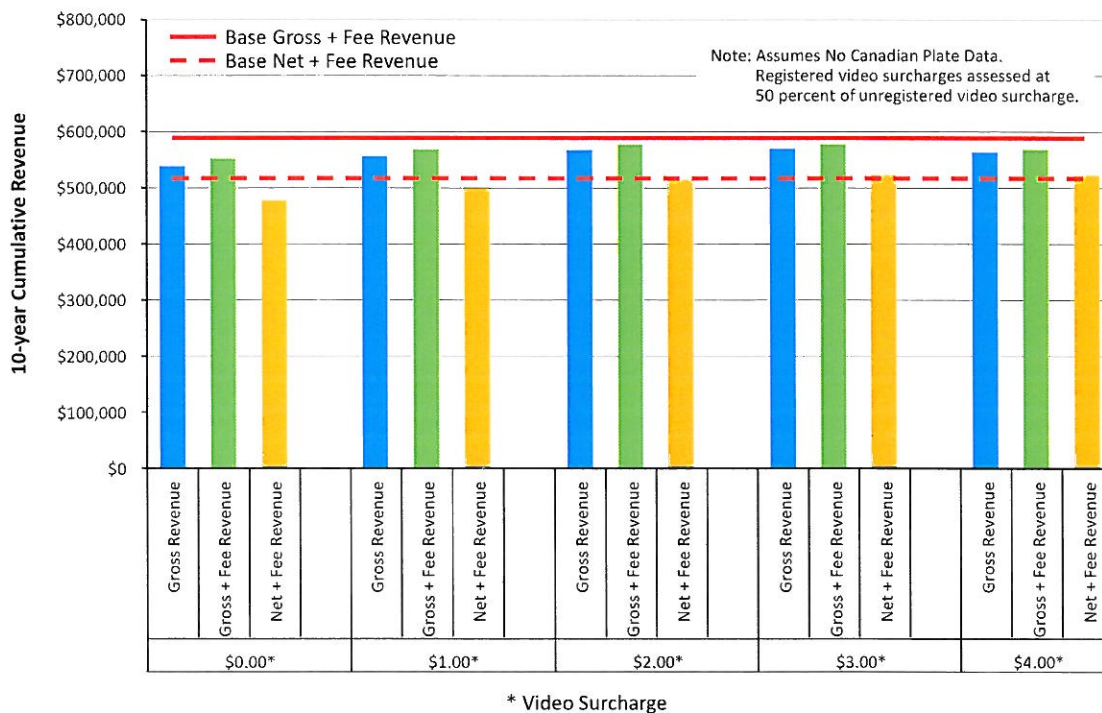
Figure 7 shows the estimated ten-year cumulative toll revenue comparison assuming AET at York Plaza for the tested video surcharge levels. The revenue for each surcharge level is shown for the gross toll revenue, the gross toll revenue plus the fee revenue, and the net toll revenue plus the fee revenue. The gross toll revenue plus fee revenue and the net toll revenue plus fee revenue for the existing condition are shown as horizontal lines. The estimated, cumulative 10-year net toll revenue plus fee revenue meets or exceeds the existing condition net plus fee revenue only at the \$3.00 and \$4.00 surcharge level.

Detailed traffic and toll revenue estimated impacts are shown in Table 5 for the York Toll Plaza at a \$3.00 video surcharge from 2015 through 2030. This table shows the estimated trends over time in toll transactions, leakage (uncollectible transactions), gross toll and fee revenue, and M&O costs for

both the existing condition and the AET condition. Also shown are the impacts between the existing and AET conditions for each year and cumulatively through the forecast period.

The leakage due to implementation of AET decreases from 2015 through 2025 primarily due to an increasing market share of E-ZPass vehicles, decreasing the number of video transactions. The leakage gradually increases from 2026 through 2030. The increase is caused by the saturation of the E-ZPass market and normal growth slowly increases the number of video transactions.

Figure 7
Estimated York Toll Plaza AET Ten Year Cumulative Revenue Comparison



The AET gross toll revenue impact is negative throughout the forecast period, but the size of the decrease in gross toll revenue diminishes over the years. The impact ranges from negative \$1,400,000 in 2015 to negative \$970,000 in 2030. This decrease is associated with the increasing E-ZPass market share and the decrease in video transaction toll revenue leakage.

Savings in M&O costs are estimated to be positive from 2015 through 2030, ranging from \$348,000 to \$2,912,000, respectively. While it is anticipated that the existing condition M&O costs continually increase through the forecast period, the M&O costs for the AET scenario are forecast to decrease through 2024 due to the decreasing video transaction market share. As video transaction market share decreases over time, fewer image reviews, DMV lookups and mailings will be required. As a result, fewer staff will be required to perform these processes. Additionally, this will lead to proportionate decreases in direct costs related to out-of-state DMV lookups and mailings. Total AET M&O costs are forecast to start increasing around 2025 due to the saturation of the E-ZPass market. When that saturation point is reached, the number of video transactions and related costs are

Table 5
Estimated Total York Toll Plaza AET Traffic and Toll Revenue Impacts Assuming a \$3.00 Video Surcharge (1)(2)
All Values in Thousands

	Year															
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Toll Transactions																
Existing Condition Toll Transactions: Cash	4,213	3,935	3,676	3,435	3,212	3,004	2,810	2,631	2,463	2,308	2,256	2,281	2,305	2,330	2,353	2,377
Existing Condition Toll Transactions: E-ZPass	9,752	10,227	10,682	11,117	11,535	11,935	12,318	12,686	13,038	13,376	13,696	13,755	13,903	14,049	14,192	14,334
Total Existing Condition Toll Transactions+Violations	13,965	14,162	14,358	14,553	14,746	14,938	15,129	15,317	15,502	15,684	15,862	16,036	16,208	16,378	16,546	16,711
AET Toll Transactions: Video	1,414	1,308	1,209	1,117	1,031	952	878	809	745	686	666	676	686	695	705	714
AET Toll Transactions: E-ZPass	10,341	10,815	11,269	11,703	12,119	12,518	12,901	13,268	13,619	13,956	14,185	14,334	14,482	14,627	14,770	14,912
Total AET Toll Transactions	11,755	12,123	12,478	12,820	13,150	13,470	13,779	14,077	14,364	14,642	14,851	15,010	15,167	15,322	15,475	15,626
AET Transaction Impacts	-2,209	-2,039	-1,881	-1,733	-1,596	-1,468	-1,350	-1,240	-1,138	-1,042	-1,011	-1,026	-1,041	-1,056	-1,070	-1,085
No Contact/Uncollectable Transactions																
Toll and Technology Diversion	1,259	1,164	1,076	994	918	847	782	721	664	611	594	603	611	620	628	637
Unreadable Plates and DMV No Hits	217	203	190	178	167	157	147	139	130	123	120	122	124	125	127	129
Unsuccessful Collection	815	754	697	645	596	551	509	469	433	399	388	394	400	405	411	416
Total AET No Contact/Uncollectable	2,290	2,121	1,964	1,817	1,681	1,555	1,438	1,329	1,227	1,133	1,102	1,119	1,135	1,151	1,166	1,182
Existing Condition Violations	81	82	83	84	85	87	88	89	90	91	92	93	94	95	96	97
AET Transaction Loss Impact	2,209	2,039	1,881	1,733	1,596	1,468	1,350	1,240	1,138	1,042	1,011	1,026	1,041	1,056	1,070	1,085
Gross Toll and Fee Revenue																
Existing Condition Gross Toll Revenue: Cash	\$14,776	\$13,967	\$13,216	\$12,519	\$11,872	\$11,273	\$10,719	\$10,204	\$9,728	\$9,287	\$9,156	\$9,257	\$9,356	\$9,454	\$9,551	\$9,646
Existing Condition Gross Toll Revenue: E-ZPass	40,710	42,242	43,714	45,130	46,483	47,807	49,073	50,290	51,462	52,589	53,407	53,994	54,573	55,145	55,710	56,267
Existing Condition Fee Revenue	189	191	193	196	198	201	203	206	208	210	213	215	217	220	222	224
Total Existing Condition Gross Toll+Fee Revenue	\$55,675	\$56,400	\$57,124	\$57,845	\$58,564	\$59,281	\$59,994	\$60,700	\$61,397	\$62,086	\$62,776	\$63,466	\$64,147	\$64,819	\$65,483	\$66,138
AET Gross Toll Revenue: Video	\$10,792	\$10,127	\$9,511	\$8,939	\$8,409	\$7,918	\$7,464	\$7,043	\$6,653	\$6,293	\$6,189	\$6,277	\$6,364	\$6,449	\$6,533	\$6,617
AET Gross Toll Revenue: E-ZPass	42,432	43,960	45,428	46,841	48,200	49,510	50,773	51,987	53,156	54,280	55,096	55,682	56,260	56,830	57,393	57,949
AET Collected Fee Revenue (30% of Maximum)	1,051	981	916	856	800	748	700	655	614	575	563	571	579	587	595	602
Total AET Gross Toll+Discounted Fee Revenue	\$54,275	\$55,068	\$55,855	\$56,635	\$57,409	\$58,176	\$58,936	\$59,685	\$60,422	\$61,148	\$61,849	\$62,530	\$63,202	\$63,866	\$64,521	\$65,168
Total AET Gross Toll Revenue Impact	-\$1,400	-\$1,332	-\$1,269	-\$1,210	-\$1,155	-\$1,105	-\$1,058	-\$1,015	-\$975	-\$938	-\$927	-\$936	-\$944	-\$953	-\$961	-\$970
Summary of Existing Condition M&O Costs																
Image Review	\$159	\$165	\$172	\$178	\$185	\$192	\$199	\$207	\$215	\$223	\$231	\$239	\$247	\$256	\$265	\$275
DMV Lookup	16	17	18	18	19	20	21	21	22	23	24	25	26	27	27	28
Mailing	59	62	64	66	69	72	74	77	80	83	86	89	92	95	99	102
Fare Collection/Administration	5,832	6,002	6,173	6,346	6,521	6,698	6,878	7,060	7,244	7,431	7,613	7,792	7,976	8,163	8,355	8,551
Total Annual Existing Condition M&O Costs	\$6,067	\$6,246	\$6,427	\$6,610	\$6,795	\$6,982	\$7,172	\$7,365	\$7,561	\$7,759	\$7,953	\$8,145	\$8,341	\$8,541	\$8,746	\$8,956
Summary of AET M&O Costs																
Image Review	\$411	\$394	\$377	\$361	\$346	\$332	\$319	\$306	\$294	\$283	\$284	\$295	\$307	\$318	\$331	\$343
DMV Lookup	959	920	883	848	815	784	755	727	702	677	681	708	736	764	793	823
Mailing	1,929	1,849	1,773	1,701	1,632	1,568	1,507	1,450	1,396	1,345	1,352	1,405	1,459	1,516	1,574	1,633
Fare Collection/Administration	2,419	2,484	2,547	2,609	2,671	2,731	2,791	2,850	2,908	2,966	3,016	3,061	3,106	3,152	3,198	3,244
Total Annual AET M&O Cost	\$5,719	\$5,646	\$5,580	\$5,519	\$5,464	\$5,415	\$5,372	\$5,333	\$5,299	\$5,270	\$5,333	\$5,469	\$5,608	\$5,750	\$5,895	\$6,044
AET Cost Savings	\$348	\$600	\$847	\$1,090	\$1,330	\$1,567	\$1,801	\$2,032	\$2,262	\$2,489	\$2,621	\$2,676	\$2,733	\$2,791	\$2,851	\$2,912
Net Revenue Impacts (3)																
Total Net Existing Condition Toll+Fee Revenue	\$49,608	\$50,154	\$50,697	\$51,235	\$51,770	\$52,299	\$52,822	\$53,335	\$53,836	\$54,326	\$54,823	\$55,321	\$55,806	\$56,278	\$56,737	\$57,182
Total Net AET Toll Revenue	48,556	49,422	50,275	51,116	51,944	52,761	53,565	54,352	55,123	55,878	56,516	57,061	57,595	58,116	58,626	59,124
Total Net AET Toll Revenue Impact	-\$1,052	-\$732	-\$422	-\$243	-\$119	-\$175	-\$462	-\$743	-\$1,017	-\$1,287	-\$1,552	-\$1,694	-\$1,789	-\$1,838	-\$1,890	-\$1,943
Cumulative AET Net Revenue Impact	-\$1,052	-\$1,784	-\$2,205	-\$2,325	-\$2,150	-\$1,688	-\$945	\$72	\$1,359	\$2,910	\$4,604	\$6,345	\$8,133	\$9,972	\$11,861	\$13,804

(1) Per MTA, it is assumed that no billing information can be obtained for vehicles with Canadian license plates.

(2) These are the assumed passenger car video toll surcharge amounts that would be assessed to unregistered video transactions in addition to the \$3.00 cash toll.

Registered video transaction surcharges were assessed at 50 percent of the unregistered video surcharge.

(3) Net revenue is calculated by subtracting maintenance and operations costs from gross toll+fee revenue.

estimated to increase at a nominal annual growth rate without any further shift to E-ZPass. AET is expected to have a net positive impact on total M&O costs compared to the existing condition throughout the forecast period at the \$3.00 surcharge level.

The total impact on net toll revenue at the \$3.00 surcharge level is negative from 2015 (-\$1,052,000) through 2018 (-\$119,000). The net toll revenue impact goes positive in 2019, totaling about \$175,000. The net revenue impact reaches \$1,943,000 in 2030. Cumulatively, the net toll revenue impact becomes positive in year 2022.

York Toll Plaza ORT

While it is the current MTA policy not to implement a cash surcharge for cash transactions under ORT, CDM Smith initially thought it best to test various surcharge levels (including no surcharge) to see what impact they had on net toll revenue. This decision stemmed from the potential risk to net revenue posed by an anticipated increase in violations in the ORT lanes. Because the \$0.00 surcharge had a substantial positive impact on net toll revenue, the forecasts for the greater than \$0.00 surcharges were not included in this report.

Detailed traffic and toll revenue impacts are shown in Table 6 for the York Toll Plaza with no cash surcharge from 2015 through 2030. This table shows trends over time in estimated toll transactions, gross toll and fee revenue, and M&O costs for both the existing condition and the ORT condition. Also shown are the net impacts between the existing and ORT conditions for each year and cumulatively through the forecast period.

If ORT is implemented, total toll transactions are estimated to increase by 19,000 compared to the existing condition. The increase in toll transactions is primarily based on the assumption that video enforcement of cash toll violations (run-throughs) will be introduced to the cash lanes upon construction of an ORT plaza (they do not currently exist). By 2030, total annual ORT transactions are expected to exceed existing condition projections by 57,000. Under ORT, no technology diversion is assumed since the cash option still remains.

In 2015 ORT has an estimated positive gross revenue impact of \$177,000, representing a 0.3% increase over the existing condition forecast. This positive impact increases proportionately with forecast existing condition gross toll revenue throughout the forecast period.

York Toll Plaza 2015 ORT M&O costs are estimated to be \$775,000, or 12.8%, lower than those projected for existing condition. By 2030 ORT M&O cost savings are estimated to increase to \$1,472,000. As a percent of total annual existing condition M&O costs, this represents a savings of 16.4%. This savings is due primarily to the replacement of legacy system toll equipment that is costly to maintain, with some parts requiring frequent replacement.

Unlike under the AET alternative, existing condition and ORT costs are relatively similar across all cost categories. The differences that do occur are in the Fare Collection/Administration category. As mentioned above, ORT costs are slightly lower due to the replacement of the legacy toll equipment. All other cost categories are very similar between the existing condition and the ORT alternative.

Net revenue impacts are also shown for ORT compared to the existing condition. In 2015 it is estimated that ORT has a positive net toll revenue impact of \$952,000 without a cash surcharge. The

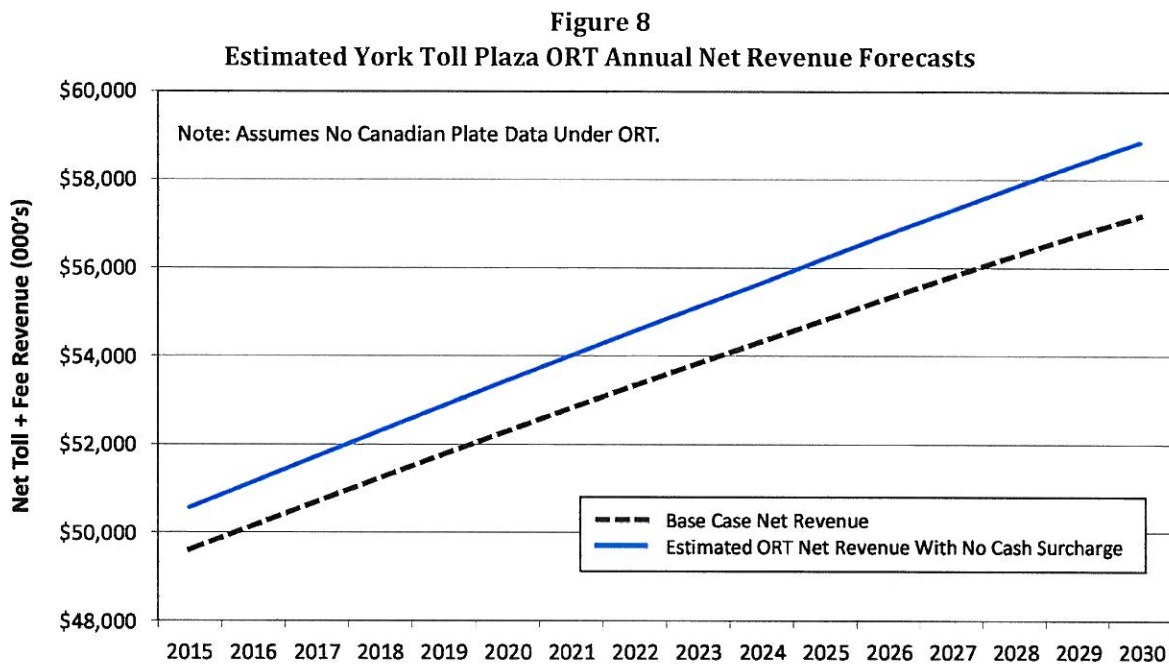
Table 6
Estimated Total York Toll Plaza ORT Traffic and Toll Revenue Impacts Assuming No Cash Surcharge
All Values in Thousands

	Year															
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Toll Transactions																
Existing Condition Toll Transactions: Cash	4,213	3,935	3,676	3,435	3,212	3,004	2,810	2,631	2,463	2,308	2,256	2,281	2,305	2,330	2,353	2,377
Existing Condition Toll Transactions: E-ZPass	9,752	10,227	10,682	11,117	11,535	11,935	12,318	12,686	13,038	13,376	13,606	13,755	13,903	14,049	14,192	14,334
Total Existing Condition Toll Transactions	13,965	14,162	14,358	14,553	14,746	14,938	15,129	15,317	15,502	15,684	15,862	16,036	16,208	16,378	16,546	16,711
ORT Toll Transactions: Cash	4,149	3,876	3,622	3,386	3,166	2,962	2,773	2,597	2,433	2,281	2,230	2,256	2,281	2,306	2,330	2,354
ORT Toll Transactions: E-ZPass	9,834	10,309	10,764	11,199	11,616	12,015	12,399	12,767	13,119	13,456	13,686	13,835	13,983	14,128	14,272	14,414
Total ORT Toll Transactions	13,983	14,185	14,386	14,585	14,782	14,978	15,172	15,363	15,551	15,737	15,916	16,091	16,264	16,434	16,603	16,769
ORT Transaction Impacts	19	23	28	32	36	40	43	47	50	53	54	55	55	56	57	57
Gross Toll and Fee Revenue																
Existing Condition Gross Toll Revenue: Cash	\$14,776	\$13,967	\$13,216	\$12,519	\$11,872	\$11,273	\$10,719	\$10,204	\$9,728	\$9,287	\$9,156	\$9,257	\$9,356	\$9,454	\$9,551	\$9,646
Existing Condition Gross Toll Revenue: E-ZPass	40,710	42,242	43,714	45,130	46,493	47,807	49,073	50,290	51,462	52,589	53,407	53,994	54,573	55,145	55,710	56,267
Existing Condition Fee Revenue	189	191	193	196	198	201	203	206	208	210	213	215	217	220	222	224
Total Existing Condition Gross Toll+Fee Revenue	\$55,675	\$56,400	\$57,124	\$57,845	\$58,564	\$59,281	\$59,994	\$60,700	\$61,397	\$62,086	\$62,776	\$63,466	\$64,147	\$64,819	\$65,483	\$66,138
Gross Toll and Fee Revenue																
ORT Gross Toll Revenue: Cash	\$14,589	\$13,806	\$13,069	\$12,386	\$11,753	\$11,167	\$10,624	\$10,121	\$9,655	\$9,224	\$9,100	\$9,203	\$9,305	\$9,406	\$9,505	\$9,603
ORT Gross Toll Revenue: E-ZPass	40,948	42,479	43,950	45,366	46,728	48,041	49,306	50,523	51,694	52,821	53,638	54,225	54,804	55,376	55,940	56,497
ORT Collected Fee Revenue (30% of Maximum)	305	292	281	270	260	251	243	235	228	222	221	223	226	228	230	233
Total ORT Gross Toll+Discounted Fee Revenue	\$55,852	\$56,577	\$57,301	\$58,022	\$58,742	\$59,459	\$60,175	\$60,880	\$61,578	\$62,267	\$62,959	\$63,651	\$64,335	\$65,010	\$65,676	\$66,333
Total ORT Gross Toll Revenue Impact	\$177	\$177	\$177	\$177	\$178	\$178	\$179	\$179	\$180	\$181	\$183	\$186	\$188	\$191	\$193	\$195
Summary of Existing Condition M&O Costs																
Image Review	\$159	\$165	\$172	\$178	\$185	\$192	\$199	\$207	\$215	\$223	\$231	\$239	\$247	\$256	\$265	\$275
DWV Lookup	16	17	18	18	19	20	21	21	22	23	24	25	26	27	27	28
Mailing	59	62	64	66	69	72	74	77	80	83	86	89	92	95	99	102
Fare Collection/Administration	5,832	6,002	6,173	6,346	6,521	6,698	6,878	7,060	7,244	7,431	7,613	7,792	7,976	8,163	8,355	8,551
Total Annual Existing Condition M&O Costs	\$6,067	\$6,246	\$6,427	\$6,610	\$6,795	\$6,982	\$7,172	\$7,365	\$7,561	\$7,759	\$7,953	\$8,145	\$8,341	\$8,541	\$8,746	\$8,956
Summary of ORT M&O Costs																
Image Review	\$173	\$180	\$187	\$194	\$202	\$209	\$217	\$225	\$234	\$243	\$251	\$259	\$267	\$276	\$285	\$295
DWV Lookup	24	24	25	26	27	28	30	31	32	33	34	35	37	38	39	41
Mailing	85	88	91	95	99	102	106	110	114	118	123	127	132	136	141	146
Fare Collection/Administration	5,011	5,143	5,276	5,409	5,542	5,676	5,812	5,948	6,085	6,224	6,356	6,484	6,615	6,749	6,884	7,023
Total Annual ORT M&O Cost	\$5,292	\$5,436	\$5,579	\$5,724	\$5,870	\$6,017	\$6,165	\$6,314	\$6,465	\$6,618	\$6,743	\$6,886	\$7,031	\$7,179	\$7,330	\$7,484
ORT Cost Savings	\$775	\$810	\$847	\$886	\$925	\$966	\$1,008	\$1,051	\$1,096	\$1,142	\$1,210	\$1,259	\$1,310	\$1,362	\$1,416	\$1,472
Net Revenue Impacts (1)																
Total Net Existing Condition Toll+Fee Revenue	\$49,608	\$50,154	\$50,697	\$51,235	\$51,770	\$52,299	\$52,822	\$53,335	\$53,836	\$54,326	\$54,823	\$55,321	\$55,806	\$56,278	\$56,737	\$57,182
Total Net ORT Toll Revenue	50,560	51,342	51,721	52,298	52,872	53,442	54,008	54,565	55,112	55,649	56,215	56,765	57,304	57,850	58,346	58,849
Total Net ORT Toll Revenue Impact	\$952	\$987	\$1,024	\$1,063	\$1,103	\$1,144	\$1,186	\$1,230	\$1,276	\$1,323	\$1,393	\$1,444	\$1,498	\$1,553	\$1,609	\$1,667
Cumulative ORT Net Revenue Impact	\$952	\$1,939	\$2,964	\$4,027	\$5,129	\$6,273	\$7,459	\$8,689	\$9,965	\$11,288	\$12,681	\$14,126	\$15,623	\$17,176	\$18,785	\$20,452

(1) Net revenue is calculated by subtracting maintenance and operations costs from gross toll+fee revenue.

five-year cumulative ORT net revenue impact at the \$0.00 surcharge totals a \$5,129,000. The ten-year cumulative impact totals an estimated \$11,288,000.

A graphical summary of the estimated annual net toll revenue from 2015 through 2030 is shown for \$0.00 cash surcharge and for the existing condition in Figure 8.



Gardiner Toll Plaza

The following section presents estimated traffic and revenue for the Gardiner Toll Plaza under AET and ORT conditions. The results of surcharge sensitivity tests include the estimated annual net revenue forecasts associated with various surcharge levels. Estimated annual traffic and toll revenue impacts are presented assuming the optimal surcharge level.

Gardiner Toll Plaza AET

The results of the Gardiner AET surcharge sensitivity tests are presented in Table 7. These were also conducted at 2015 levels, the assumed opening year. Passenger-car unregistered video surcharge rates were tested at \$0.00, \$0.25, \$0.50, \$0.75 and \$1.00. These would be in addition to the existing \$1.00 cash toll. Registered video transaction surcharges were assessed at 50 percent of the unregistered video surcharge. Table 7 includes estimated toll transactions, no contact/uncollectable transactions, gross toll and fee revenue, M&O costs, and net revenue impacts associated with each of the video surcharge levels.

Estimated annual transactions are provided for the existing condition for both cash and E-ZPass (including violations). The number of uncollectible transactions due to AET is estimated to total

Table 7
Estimated 2015 Gardiner Toll Plaza AET Surcharge Sensitivity Summary (1)
All Values in Thousands

Toll Transactions	Unregistered Video Surcharge (2)				
	\$0.00	\$0.25	\$0.50	\$0.75	\$1.00
Existing Condition Toll Transactions: Cash	3,294	3,294	3,294	3,294	3,294
Existing Condition Toll Transactions: E-ZPass	5,152	5,152	5,152	5,152	5,152
Total Existing Condition Toll Transactions+Violations	8,446	8,446	8,446	8,446	8,446
AET Toll Transactions: Video	2,002	1,897	1,837	1,758	1,680
AET Toll Transactions: E-ZPass	5,249	5,354	5,389	5,424	5,460
Total AET Toll Transactions	7,251	7,251	7,226	7,182	7,140
AET Transaction Impacts	-1,195	-1,195	-1,220	-1,264	-1,306
No Contact/Uncollectable Transactions					
Toll and Technology Diversion	92	151	210	297	383
Unreadable Plates and DMV No Hits	117	110	106	101	95
Unsuccessful Collection	1,034	981	952	913	876
Total AET No Contact/Uncollectable	1,243	1,243	1,268	1,312	1,354
Existing Condition Violations	48	48	48	48	48
AET Transaction Loss Impact	1,195	1,195	1,220	1,264	1,306
Gross Toll and Fee Revenue					
Existing Condition Gross Toll Revenue: Cash	\$3,677	\$3,677	\$3,677	\$3,677	\$3,677
Existing Condition Gross Toll Revenue: E-ZPass	4,683	4,683	4,683	4,683	4,683
Existing Condition Fee Revenue	135	135	135	135	135
Total Existing Condition Gross Toll+Fee Revenue	\$8,495	\$8,495	\$8,495	\$8,495	\$8,495
AET Gross Toll Revenue: Video	\$2,311	\$2,764	\$3,232	\$3,655	\$4,034
AET Gross Toll Revenue: E-ZPass	4,733	4,792	4,812	4,832	4,852
AET Collected Fee Revenue (30% of Maximum)	1,381	1,308	1,265	1,208	1,151
Total AET Gross Toll+Discounted Fee Revenue	\$8,425	\$8,865	\$9,309	\$9,694	\$10,036
Total AET Gross Toll Revenue Impact	-\$69	\$370	\$814	\$1,199	\$1,542
Summary of Existing Condition M&O Costs					
Image Review	\$76	\$76	\$76	\$76	\$76
DMV Lookup	11	11	11	11	11
Mailing	41	41	41	41	41
Fare Collection/Administration	2,552	2,552	2,552	2,552	2,552
Total Annual Existing Condition M&O Costs	\$2,680	\$2,680	\$2,680	\$2,680	\$2,680
Summary of AET M&O Costs					
Image Review	\$522	\$496	\$480	\$460	\$439
DMV Lookup	481	453	436	413	390
Mailing	2,258	2,139	2,067	1,972	1,878
Fare Collection/Administration	866	868	870	870	869
Total Annual AET M&O Cost	\$4,127	\$3,956	\$3,853	\$3,714	\$3,577
AET Cost Savings	-\$1,447	-\$1,276	-\$1,173	-\$1,034	-\$897
Net Revenue Impacts (3)					
Total Net Existing Condition Toll+Fee Revenue	\$5,815	\$5,815	\$5,815	\$5,815	\$5,815
Total Net AET Toll Revenue	4,299	4,908	5,456	5,980	6,459
Total Net AET Toll Revenue Impact	-\$1,516	-\$907	-\$359	\$165	\$644
5-yr Cumulative AET Net Revenue Impact	-\$6,507	-\$3,607	-\$1,028	\$1,441	\$3,698
10-yr Cumulative AET Net Revenue Impact	-\$9,808	-\$4,405	\$329	\$4,863	\$8,998

(1) Per MTA, it is assumed that no billing information can be obtained for vehicles with Canadian license plates.

(2) These are the assumed passenger car video toll surcharge amounts that would be assessed to unregistered video transactions in addition to the \$1.00 cash toll. Registered video transaction surcharges were assessed at 50 percent of the unregistered video surcharge.

(3) Net revenue is calculated by subtracting maintenance and operations costs from gross toll+fee revenue.

1,195,000 in 2015 for the \$0.00 surcharge level. Uncollectible transactions increase as the unregistered video surcharge increases, totaling 1,306,000 at the \$1.00 surcharge in 2015.

The estimated AET gross toll revenue impact is negative \$69,000 at the \$0.00 surcharge and positive \$370,000 at the \$0.25 surcharge. At the \$1.00 surcharge, the estimated toll revenue impact of AET is a positive \$1,542,000. This toll revenue impact takes into account both the gross toll revenue and the discounted fee revenue. Similar to the York Toll Plaza analysis, it is assumed that only 30 percent of the eligible fee revenue is actually collected. This is because fee revenue is often discounted or entirely forgiven.

Maintenance and operation costs decrease under AET as the surcharge level increases. This is largely due to the decreasing numbers of video transactions. There are no AET M&O cost savings at any of the tested surcharge levels compared to the existing condition. The impacts on M&O range from a negative \$1,447,000 at \$0.00 surcharge to negative \$897,000 at the \$1.00 surcharge. The reason there are no positive AET M&O cost savings is twofold. First, the license plate lookup and mailing costs associated with invoicing, NOV, NOL, etc. are much larger compared to the existing \$1.00 cash toll at Gardiner. At York, these costs were expended in order to collect a \$3.00 cash toll. And second, there is a higher proportion of cash (and therefore video) transactions at Gardiner compared to York. This means that there are relatively higher costs associated with collecting a higher number of transactions at Gardiner compared to York.

The same general pattern between existing condition and the AET alternative M&O costs exists at Gardiner as it did at York. Under AET, the Fare Collection/Administration costs fall dramatically and only represent a fraction of those under the existing condition due to the elimination of manual toll collectors. However, as at York, back office costs associated with processing video transactions (Image Review, DMV Lookup, and Mailings) are significantly higher under AET.

The total net revenue impacts are negative in 2015 for the \$0.00, \$0.25, and \$0.50 surcharges. At the \$0.75 surcharge the net toll revenue impact becomes positive, totaling \$165,000. At the \$1.00 surcharge, the net toll revenue impact totals \$644,000. The five-year cumulative AET net revenue impact totals an estimated \$1,441,000 at the \$0.75 surcharge, while the ten-year cumulative impact is estimated to total \$4,863,000 at the same surcharge.

A graphical summary of the estimated annual net toll revenue from 2015 through 2030 at the various video surcharge levels and for the existing condition is shown in Figure 9. The net revenue forecasts at the \$0.75 and \$1.00 surcharges are always above the net toll revenue forecast for the existing condition.

Figure 10 shows the estimated ten-year cumulative toll revenue comparison assuming AET at Gardiner Toll Plaza for each tested video surcharge level. For each surcharge, the forecast cumulative gross toll revenue, gross toll revenue plus fee revenue, and net toll revenue plus the fee revenue are shown. The gross toll revenue plus fee revenue and the net toll revenue plus fee revenue for the existing condition are shown as horizontal lines. The estimated cumulative 10-year net toll revenue plus fee revenue meets or exceeds the existing condition net plus fee revenue at the \$0.50, \$0.75 and \$1.00 surcharge levels.

Figure 9
Estimated Gardiner Toll Plaza AET Annual Net Revenue Forecasts

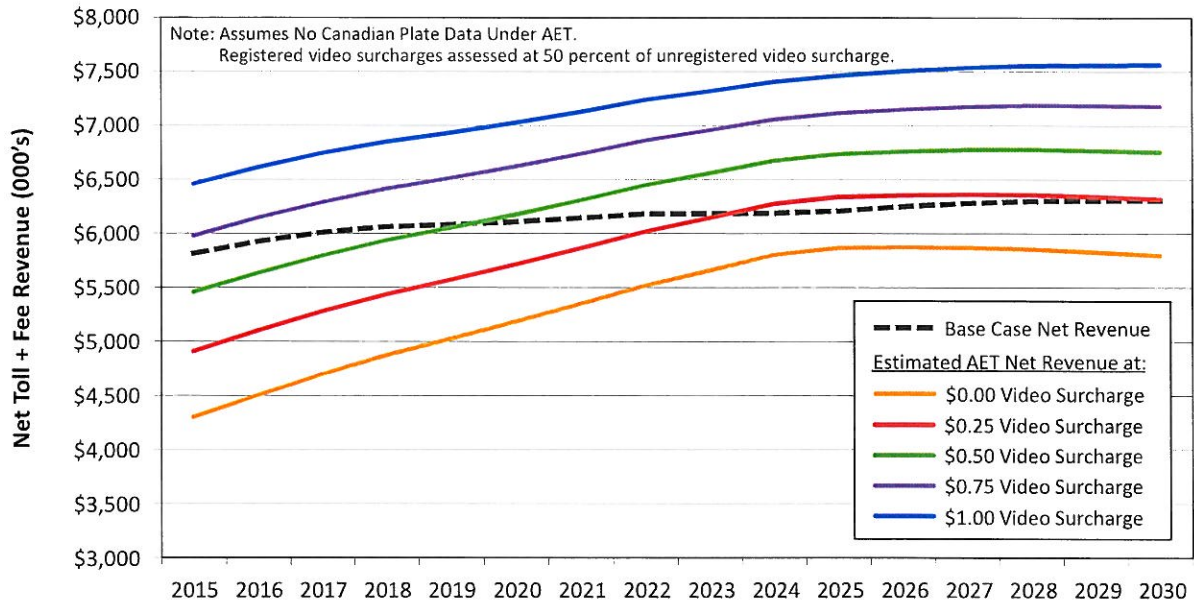
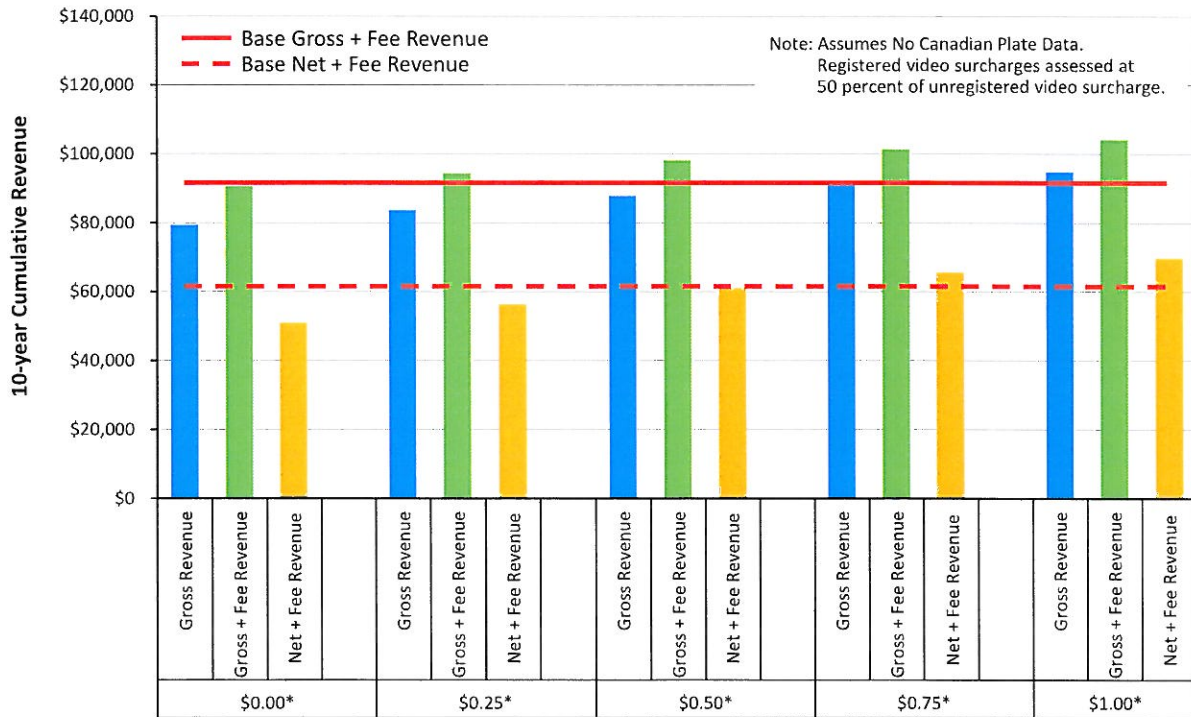


Figure 10
Estimated Gardiner Toll Plaza AET Ten Year Cumulative Revenue Comparison



* Video Surcharge

Detailed estimated traffic and toll revenue impacts are shown in Table 8 for the Gardiner Toll Plaza at a \$0.75 video surcharge from 2015 through 2030. This rate was selected for presentation here because it generates positive net toll revenue over both the five and ten year cumulative periods. This table shows the estimated trends over time in toll transactions, leakage (uncollectible transactions), gross toll and fee revenue, and M&O costs for both the existing condition and the AET condition. Also shown are the impacts between the existing and AET conditions for each year and cumulatively through the forecast period.

Leakage due to implementation of AET decreases from 2015 through 2025 primarily due to an increasing market share of E-ZPass vehicles, thus decreasing the number of video transactions. The leakage gradually increases from 2026 through 2030, caused by the saturation of the E-ZPass market and the normal growth of video transactions.

The AET gross toll revenue impact is positive throughout the forecast period. The size of the positive impact decreases slightly from 2015 through 2030, but ranges from positive \$1,199,000 in 2015 to positive \$741,000 in 2030.

Savings in M&O costs are estimated to be positive from about 2023 through 2030, ranging from \$24,000 to \$130,000, respectively. While it is anticipated that the existing condition M&O costs continually increase through the forecast period, the M&O costs for the AET scenario are forecast to decrease through 2024 due to the decreasing market share of video transactions. As discussed previously in relation to AET M&O costs at York, decreases in video toll transactions will result in fewer image reviews, DMV lookups and mailings. As a result, fewer staff will be required to perform these processes. Additionally, this will lead to proportionate decreases in direct costs related to out-of-state DMV lookups and mailings. Total AET M&O costs are forecast to start increasing around 2025 due to the saturation of the E-ZPass market. Again, when that saturation point is reached, the number of video transactions and related costs are estimated to increase at a nominal annual growth rate without any further shift to E-ZPass. AET is expected to have a net positive impact on total M&O costs compared to the existing condition throughout the forecast period.

The total impact on net toll revenue at the \$0.75 surcharge level is positive from 2015 (\$165,000) through 2030 (\$870,000). Cumulatively, the net toll revenue impact ranges from \$165,000 in 2015 to \$10,195,000 in 2030.

Gardiner Toll Plaza ORT

As was mentioned earlier, we understand that ORT cash surcharges are not in the current business rules for MTA operations. They were tested here, however, in order to see if they were needed, and if so, at what level to achieve toll revenue neutrality. Similar to York, \$0.00 surcharge had a substantial positive impact on net toll revenue, so the forecasts for the greater than \$0.00 surcharges were not included in this report.

Detailed traffic and toll revenue estimated impacts are shown in Table 9 for the Gardiner Toll Plaza at a \$0.00 cash surcharge from 2015 through 2030. This table shows the estimated trends over time in toll transactions, gross toll and fee revenue, and M&O costs for both the existing condition and the ORT condition.

Table 8
Estimated Total Gardiner Toll Plaza AET Traffic and Toll Revenue Impacts
Assuming a \$0.75 Video Surcharge (1)(2)
All Values in Thousands

	Year															
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Toll Transactions																
Existing Condition Toll Transactions: Cash	3,294	3,164	3,025	2,878	2,725	2,582	2,446	2,318	2,187	2,064	1,943	1,831	1,728	1,633	1,545	1,464
Existing Condition Toll Transactions: E-ZPass	5,152	5,552	5,932	6,287	6,611	6,934	7,256	7,577	7,898	8,214	8,531	8,848	9,165	9,482	9,799	10,116
Total Existing Condition Toll Transactions+Violat	8,446	8,717	8,957	9,165	9,336	9,515	9,702	9,895	10,044	10,199	10,338	10,483	10,617	10,739	10,849	10,957
AET Toll Transactions: Video																
AET Toll Transactions: Video	1,758	1,685	1,606	1,522	1,436	1,354	1,277	1,205	1,130	1,060	1,008	965	921	877	833	789
AET Toll Transactions: E-ZPass	5,424	5,824	6,204	6,558	6,881	7,204	7,525	7,846	8,166	8,484	8,801	9,117	9,432	9,747	10,061	10,375
Total AET Toll Transactions	7,182	7,509	7,810	8,080	8,317	8,558	8,802	9,050	9,296	9,544	9,799	10,054	10,309	10,564	10,819	11,074
AET Transaction Impacts	-1,264	-1,208	-1,148	-1,085	-1,019	-958	-899	-844	-788	-735	-678	-624	-571	-519	-467	-415
No Contact/Uncollectable Transactions																
Toll and Technology Diversion	297	285	272	258	243	229	216	204	191	179	176	178	181	183	186	188
Unreadable Plates and DMV No Hits	101	97	93	89	85	81	77	73	70	66	65	66	67	68	69	70
Unsuccessful Collection	913	875	835	792	747	704	665	627	588	552	541	550	558	565	572	578
Total AET No Contact/Uncollectable	1,312	1,258	1,200	1,138	1,074	1,014	958	904	849	798	782	794	806	817	826	836
Existing Condition Violations	48	50	52	54	55	57	58	60	61	63	64	64	65	66	67	67
AET Transaction Loss Impact	1,264	1,208	1,148	1,085	1,019	958	899	844	788	735	718	730	741	751	759	768
Gross Toll and Fee Revenue																
Existing Condition Gross Toll Revenue: Cash	\$3,677	\$3,564	\$3,441	\$3,308	\$3,169	\$3,038	\$2,915	\$2,800	\$2,680	\$2,568	\$2,473	\$2,406	\$2,366	\$2,366	\$2,463	\$2,689
Existing Condition Gross Toll Revenue: E-ZPass	4,683	5,001	5,302	5,580	5,831	6,083	6,336	6,588	6,807	7,024	7,168	7,268	7,361	7,445	7,522	7,597
Existing Condition Fee Revenue	135	139	142	144	146	148	150	152	154	155	157	159	161	163	165	167
Total Existing Condition Gross Toll+Fee Revenue	\$8,495	\$8,704	\$8,884	\$9,032	\$9,146	\$9,269	\$9,401	\$9,541	\$9,641	\$9,747	\$9,862	\$10,000	\$10,128	\$10,244	\$10,349	\$10,453
AET Gross Toll Revenue: Video	\$3,655	\$3,540	\$3,413	\$3,276	\$3,131	\$2,995	\$2,868	\$2,750	\$2,625	\$2,509	\$2,478	\$2,517	\$2,554	\$2,587	\$2,617	\$2,646
AET Gross Toll Revenue: E-ZPass	4,832	5,149	5,449	5,727	5,978	6,230	6,481	6,733	6,952	7,168	7,312	7,412	7,505	7,589	7,665	7,740
AET Collected Fee Revenue (30% of Maximum)	1,208	1,162	1,113	1,060	1,005	954	905	860	813	769	755	768	779	789	798	807
Total AET Gross Toll+Discounted Fee Revenue	\$9,694	\$9,851	\$9,975	\$10,063	\$10,114	\$10,178	\$10,255	\$10,348	\$10,389	\$10,445	\$10,557	\$10,697	\$10,837	\$10,965	\$11,080	\$11,193
Total AET Gross Toll Revenue Impact	\$1,199	\$1,147	\$1,091	\$1,031	\$969	\$910	\$854	\$802	\$749	\$698	\$683	\$697	\$709	\$720	\$731	\$741
Summary of Existing Condition M&O Costs																
Image Review	\$76	\$80	\$84	\$88	\$92	\$96	\$101	\$105	\$109	\$114	\$118	\$123	\$127	\$132	\$137	\$141
DMV Lookup	11	12	13	13	14	14	15	16	16	17	18	18	19	20	21	21
Mailing	41	43	45	48	50	52	54	57	59	61	64	66	69	71	74	76
Fare Collection/Administration	2,552	2,642	2,732	2,820	2,907	2,995	3,087	3,180	3,271	3,364	3,453	3,541	3,631	3,721	3,812	3,905
Total Annual Existing Condition M&O Costs	\$2,680	\$2,777	\$2,874	\$2,969	\$3,062	\$3,158	\$3,257	\$3,358	\$3,456	\$3,557	\$3,653	\$3,749	\$3,846	\$3,944	\$4,043	\$4,144
Summary of AET M&O Costs																
Image Review	\$460	\$453	\$445	\$435	\$422	\$411	\$400	\$389	\$377	\$365	\$368	\$383	\$398	\$414	\$429	\$445
DMV Lookup	413	409	402	394	384	375	366	358	349	340	343	357	371	385	400	414
Mailing	1,972	1,948	1,915	1,873	1,824	1,777	1,732	1,690	1,641	1,595	1,608	1,675	1,742	1,808	1,875	1,943
Fare Collection/Administration	870	898	924	949	971	995	1,019	1,044	1,066	1,089	1,110	1,131	1,152	1,172	1,192	1,212
Total Annual AET M&O Cost	\$3,714	\$3,707	\$3,686	\$3,650	\$3,602	\$3,558	\$3,517	\$3,481	\$3,442	\$3,388	\$3,429	\$3,546	\$3,663	\$3,779	\$3,896	\$4,015
AET Cost Savings	-\$1,034	-\$930	-\$812	-\$681	-\$540	-\$399	-\$261	-\$123	\$24	\$168	\$224	\$203	\$183	\$164	\$147	\$130
Net Revenue Impacts (3)																
Total Net Existing Condition Toll+Fee Revenue	\$5,815	\$5,927	\$6,010	\$6,063	\$6,083	\$6,111	\$6,144	\$6,185	\$6,190	\$6,209	\$6,251	\$6,282	\$6,300	\$6,300	\$6,306	\$6,308
Total Net AET Toll Revenue	5,980	6,144	6,289	6,413	6,512	6,621	6,738	6,862	6,957	7,057	7,116	7,151	7,174	7,185	7,184	7,179
Total Net AET Toll Revenue Impact	\$165	\$218	\$279	\$350	\$429	\$510	\$594	\$677	\$772	\$867	\$907	\$899	\$892	\$885	\$878	\$870
Cumulative AET Net Revenue Impact	\$165	\$383	\$662	\$1,012	\$1,441	\$1,952	\$2,545	\$3,225	\$3,997	\$4,863	\$5,770	\$6,670	\$7,562	\$8,447	\$9,325	\$10,195

(1) Per MTA, it is assumed that no billing information can be obtained for vehicles with Canadian license plates.
 (2) These are the assumed passenger car video toll surcharge amounts that would be assessed to unregistered video transactions in addition to the \$3.00 cash toll.
 Registered video transaction surcharges were assessed at 50 percent of the unregistered video surcharge.
 (3) Net revenue is calculated by subtracting maintenance and operations costs from gross toll+fee revenue.

Table 9
Estimated Total Gardiner Toll Plaza ORT Traffic and Toll Revenue Impacts Assuming No Cash Surcharge
 All Values in Thousands

	Year															
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Toll Transactions																
Existing Condition Toll Transactions: Cash	3,294	3,164	3,025	2,878	2,725	2,582	2,446	2,318	2,187	2,064	2,024	2,053	2,079	2,103	2,124	2,146
Existing Condition Toll Transactions: E-ZPass	5,152	5,552	5,952	6,287	6,611	6,934	7,256	7,577	7,858	8,135	8,314	8,430	8,538	8,636	8,724	8,812
Total Existing Condition Toll Transactions	8,446	8,717	8,957	9,165	9,336	9,515	9,702	9,895	10,044	10,199	10,338	10,483	10,617	10,739	10,849	10,957
ORT Toll Transactions: Cash																
ORT Toll Transactions: Cash	3,250	3,123	2,986	2,842	2,692	2,550	2,417	2,291	2,162	2,041	2,003	2,032	2,059	2,083	2,105	2,127
ORT Toll Transactions: E-ZPass	5,241	5,643	6,024	6,380	6,704	7,028	7,351	7,673	7,955	8,233	8,412	8,529	8,637	8,735	8,824	8,911
Total ORT Toll Transactions	8,492	8,766	9,010	9,222	9,396	9,578	9,768	9,964	10,117	10,274	10,415	10,561	10,695	10,818	10,929	11,038
ORT Transaction Impacts	45	49	53	57	60	63	66	69	72	75	77	78	79	80	80	81
Gross Toll and Fee Revenue																
Existing Condition Gross Toll Revenue: Cash	\$3,677	\$3,564	\$3,441	\$3,308	\$3,169	\$3,038	\$2,915	\$2,800	\$2,680	\$2,568	\$2,537	\$2,573	\$2,606	\$2,636	\$2,663	\$2,689
Existing Condition Gross Toll Revenue: E-ZPass	4,683	5,001	5,302	5,580	5,831	6,083	6,336	6,588	6,807	7,024	7,168	7,268	7,361	7,445	7,522	7,597
Existing Condition Fee Revenue	135	139	142	144	146	148	150	152	154	155	157	159	161	163	165	167
Total Existing Condition Gross Toll+Fee Revenue	\$8,495	\$8,704	\$8,884	\$9,032	\$9,146	\$9,269	\$9,401	\$9,541	\$9,641	\$9,747	\$9,862	\$10,000	\$10,128	\$10,244	\$10,349	\$10,453
Gross Toll and Fee Revenue																
ORT Gross Toll Revenue: Cash	\$3,632	\$3,523	\$3,403	\$3,273	\$3,136	\$3,007	\$2,887	\$2,775	\$2,657	\$2,547	\$2,518	\$2,554	\$2,588	\$2,619	\$2,646	\$2,674
ORT Gross Toll Revenue: E-ZPass	4,746	5,066	5,367	5,647	5,900	6,153	6,406	6,660	6,879	7,097	7,242	7,343	7,436	7,521	7,597	7,673
ORT Collected Fee Revenue (30% of Maximum)	245	240	233	226	219	212	206	200	193	187	186	189	191	193	195	197
Total ORT Gross Toll+Discounted Fee Revenue	\$8,623	\$8,828	\$9,003	\$9,146	\$9,254	\$9,372	\$9,499	\$9,634	\$9,730	\$9,831	\$9,946	\$10,086	\$10,215	\$10,333	\$10,439	\$10,544
Total ORT Gross Toll Revenue Impact	\$128	\$124	\$119	\$114	\$108	\$103	\$98	\$94	\$89	\$85	\$84	\$85	\$87	\$88	\$90	\$91
Summary of Existing Condition M&O Costs																
Image Review	\$76	\$80	\$84	\$88	\$92	\$96	\$101	\$105	\$109	\$114	\$118	\$123	\$127	\$132	\$137	\$141
DMV Lookup	11	12	13	13	14	14	15	16	16	17	18	18	19	20	21	21
Mailing	41	43	45	48	50	52	54	57	59	61	64	66	69	71	74	76
Fare Collection/Administration	2,552	2,642	2,732	2,820	2,907	2,995	3,087	3,180	3,271	3,364	3,453	3,541	3,631	3,721	3,812	3,905
Total Annual Existing Condition M&O Costs	\$2,680	\$2,777	\$2,874	\$2,969	\$3,062	\$3,158	\$3,257	\$3,358	\$3,456	\$3,557	\$3,653	\$3,749	\$3,846	\$3,944	\$4,043	\$4,144
Summary of ORT M&O Costs																
Image Review	\$84	\$89	\$94	\$98	\$103	\$107	\$112	\$118	\$122	\$128	\$132	\$137	\$141	\$146	\$151	\$156
DMV Lookup	16	17	18	19	20	21	22	23	24	24	25	26	27	28	29	30
Mailing	58	62	65	68	71	74	78	81	84	88	91	95	98	102	106	109
Fare Collection/Administration	2,342	2,408	2,474	2,538	2,602	2,667	2,733	2,802	2,868	2,936	3,004	3,071	3,140	3,209	3,279	3,350
Total Annual ORT M&O Cost	\$2,501	\$2,576	\$2,651	\$2,724	\$2,796	\$2,869	\$2,945	\$3,023	\$3,099	\$3,176	\$3,238	\$3,315	\$3,393	\$3,471	\$3,550	\$3,631
ORT Cost Savings	\$179	\$201	\$223	\$245	\$267	\$289	\$312	\$335	\$357	\$380	\$415	\$434	\$453	\$473	\$493	\$513
Net Revenue Impacts (1)																
Total Net Existing Condition Toll+Fee Revenue	\$5,815	\$5,927	\$6,010	\$6,063	\$6,083	\$6,111	\$6,144	\$6,183	\$6,185	\$6,190	\$6,209	\$6,251	\$6,282	\$6,300	\$6,306	\$6,308
Total Net ORT Toll Revenue	6,122	6,252	6,353	6,422	6,459	6,503	6,554	6,612	6,631	6,655	6,707	6,771	6,822	6,862	6,889	6,913
Total Net ORT Toll Revenue Impact	\$307	\$325	\$343	\$359	\$375	\$392	\$410	\$429	\$446	\$465	\$498	\$519	\$540	\$561	\$583	\$604
Cumulative ORT Net Revenue Impact	\$307	\$633	\$975	\$1,335	\$1,710	\$2,102	\$2,512	\$2,941	\$3,387	\$3,852	\$4,350	\$4,869	\$5,410	\$5,971	\$6,553	\$7,158

(1) Net revenue is calculated by subtracting maintenance and operations costs from gross toll+fee revenue.

Under ORT, total toll transactions are expected to increase compared to the existing condition at the \$0.00 surcharge level. In 2015, an increase of 45,000 toll transactions is anticipated compared to the existing condition. The increase is due to the assumption that video enforcement of cash toll violations (run-throughs) will be introduced to the cash lanes upon construction of an ORT plaza. Since ORT maintains a cash payment option for MTA customers, the model does not assume any technology diversion.

ORT gross toll and fee revenue is estimated to be \$128,000 higher than the existing condition in 2015. Estimated future year gross plus fee revenue impacts remain positive throughout the forecasts period. By 2030 the ORT impact is estimated to be about \$91,000 greater than the existing condition. Variations in the impact occur due to the varying mix of cash and E-ZPass transactions and due to the particular mix of in-state versus out-of-state cash users over time.

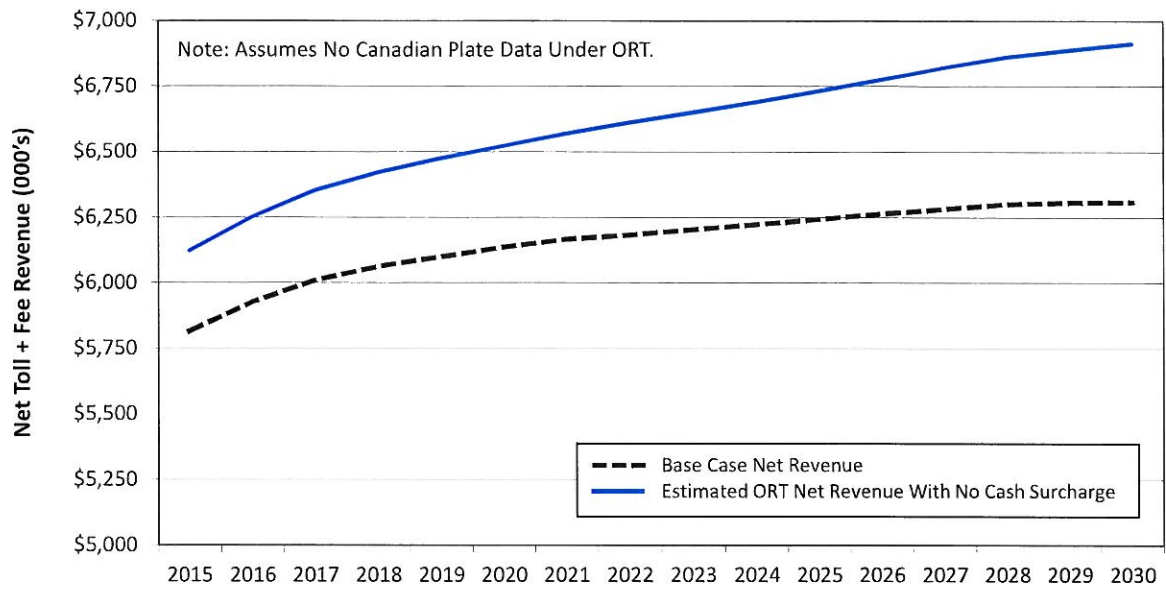
Gardiner Toll Plaza 2015 ORT M&O costs are estimated to be \$179,000 lower than those projected under the existing condition; reflecting about a 6.7 percent decrease. By 2030 ORT M&O cost savings are estimated to increase to \$513,000. As a percent of total annual existing condition M&O costs, this represents a savings of 12.4%. As described previously, this savings is due primarily to the replacement of legacy system toll equipment that is costly to maintain, with some parts requiring frequent replacement.

Just as was shown at York, under the AET alternative, existing condition and ORT costs are relatively similar across all cost categories. The differences that do occur are in the Fare Collection/Administration category. As mentioned above, ORT costs are slightly lower due to the replacement of the legacy toll equipment. All other cost categories are very similar between the existing condition and the ORT alternative.

Also shown are the impacts between the existing and ORT conditions for each year and cumulatively through the forecast period. As shown, the total estimated net revenue impact increases from \$307,000 in 2015 and increases to \$604,000 by 2030. The cumulative net revenue impact over that period amounts to \$7,158,000.

A graphical summary of the estimated annual net toll revenue from 2015 through 2030 is shown for the \$0.00 cash surcharge and for the existing condition in Figure 11. Due to the degree to which the \$0.00 surcharge scenario had a positive net revenue impact, net revenue forecast for surcharges greater than \$0.00 were not included in this figure.

Figure 11
Estimated Gardiner Toll Plaza ORT Annual Net Revenue Forecasts



Risk Analysis

Methodology

The risk analysis was performed in order to test the sensitivity of the AET and ORT waterfall models by applying a Monte Carlo Simulation directly to the model. This process involved generating random variables in order to test a large number of combinations of possible variable values, ultimately generating a distribution of possible revenue generation in the model. The process itself consisted of four major steps:

- Variable and range selection;
- Distribution fitting;
- Random variable generation; and
- Multivariate risk simulation within the waterfall model.

Variable and Range Selection

Tables 10 through 12 list variables that were selected for sensitivity testing within the risk analysis framework. Variables were selected based on their significance in affecting the outcome of the model results as well as the relative unpredictability of the variable in future years. Each selected variable was given a range based on reasonable upper and lower extreme values that were reasonable in practical application.

Distribution Fitting

Figure 12 provides a sample of a variable with a fitted distribution. Once models and ranges were selected, distributions were fitted to each variable, applying a symmetrical bell curve to the assumed data range. Variables were fit so that roughly 95 percent of the data would be between the upper and lower bounds, and that the base model input would be the 50th percentile value for the distribution.

Random Variable Generation

Random variable generation was performed using the random generation procedures within the R Statistical Software package, and supplemented with the random generation feature within Excel, where applicable. Three thousand randomly generated values were obtained for each of the variables in order to ensure adequate sampling of every distribution. Figure 13 shows examples of these randomly-generated variables plotted against their underlying distributions.

Table 10
York AET Risk Analysis Variable Ranges

Variable	Low	Expected	High
%Tech Diversion	0%	3%	10%
%In State ID'd in Initial Process	77%	96%	100%
%in state ID'd in second manual process	80%	85%	90%
%Fees Waived	48%	70%	88%
% IN-State Shift to E-ZPass from Cash, \$2 Surcharge	4%	11%	20%
% IN-State Shift to E-ZPass from Cash, \$2.50 Surcharge	5%	13%	23%
% IN-State Shift to E-ZPass from Cash, \$3 Surcharge	6%	15%	26%
% IN-State Shift to E-ZPass from Cash, \$3.50 Surcharge	8%	17%	30%
% IN-State Shift to E-ZPass from Cash, \$4 Surcharge	9%	19%	31%
% IN-State Shift to E-ZPass from Cash, \$4.50 Surcharge	11%	21%	33%
% IN-State Shift to E-ZPass from Cash, \$2 Surcharge	69%	80%	89%
RVA %Paid 1st invoice	64%	75%	84%
RVA %Paid NOL	30%	50%	70%
Maine UVA %Paid 1st invoice	19%	55%	75%
Maine UVA %Paid NOV	19%	55%	75%
Maine UVA %paid NOL	10%	35%	45%
Massachusetts/New Hampshire UVA %paid 1st Invoice	20%	50%	60%
Massachusetts/New Hampshire UVA %Paid NOV	15%	40%	51%
Massachusetts/New Hampshire UVA %paid NOL	10%	20%	25%
Other UVA %paid 1st Invoice	10%	25%	41%
Other UVA %Paid NOV	5%	20%	31%
Other UVA %paid NOL	4%	9%	17%
Toll Diversion Multiplier	0.5	1	1.5
Additional PC Shift Rate (E-ZPass to Cash)	0.95	1	1.05
Additional CV Shift Rate (E-ZPass to Cash)	0.95	1	1.05

Table 11
Gardiner AET Risk Analysis Variable Ranges

Variable	Low	Expected	High
%Tech Diversion	1%	3%	5%
%In State ID'd in Initial Process	77%	96%	100%
%in state ID'd in second manual process	80%	85%	90%
%Fees Waived	48%	70%	88%
% IN-State Shift to E-ZPass from Cash, \$0 Surcharge	2%	6%	12%
% IN-State Shift to E-ZPass from Cash, \$0.25 Surcharge	2%	7%	14%
% IN-State Shift to E-ZPass from Cash, \$0.5 Surcharge	3%	8%	16%
% IN-State Shift to E-ZPass from Cash, \$0.75 Surcharge	3%	9%	17%
RVA %paid 1st reminder	69%	80%	89%
RVA %paid NOV	64%	75%	84%
RVA %Paid NOL	30%	50%	70%
Maine UVA %Paid 1st invoice	19%	55%	75%
Maine UVA %Paid NOV	19%	55%	75%
Maine UVA %paid NOL	10%	35%	45%
Massachusetts/New Hampshire UVA %paid 1st Invoice	20%	50%	60%
Massachusetts/New Hampshire UVA %Paid NOV	15%	40%	51%
Massachusetts/New Hampshire UVA %paid NOL	10%	20%	25%
Other UVA %paid 1st Invoice	10%	25%	41%
Other UVA %Paid NOV	5%	20%	31%
Other UVA %paid NOL	4%	9%	17%
Toll Diversion Multiplier	0.5	1	1.5
Additional PC Shift Rate (E-ZPass to Cash)	0.96	1	1.04
Additional CV Shift Rate (E-ZPass to Cash)	0.96	1	1.04

Table 12
York & Gardiner ORT Risk Analysis Variable Ranges

Variable	Low	Expected	High
% In-State Shift to E-ZPass from Cash	1%	2%	5%
%Fees Waived	48%	70%	88%
%In-state Violators	1%	2%	5%
%Out of State Violators	1%	3%	5%
%Canadian Violators	2%	4%	7%
% In-state ID'd in initial process	77%	96%	100%
% In-state ID'd in second manual process	80%	85%	90%
%Pay 1st notice In-state	21%	40%	61%
%pay 1st notice out of state	11%	20%	31%
%pay NOV in-state	21%	40%	61%
%pay NOV out of state	11%	20%	31%
%pay NOL in-state	30%	50%	70%
%pay NOL out of state	6%	15%	26%
Toll Diversion Multiplier	0.5	1	1.5
Additional PC Shift Rate (E-ZPass to Cash)	0.95	1	1.05
Additional CV Shift Rate (E-ZPass to Cash)	0.95	1	1.05

Figure 12
 Sample Variable Range with Fitted Distribution

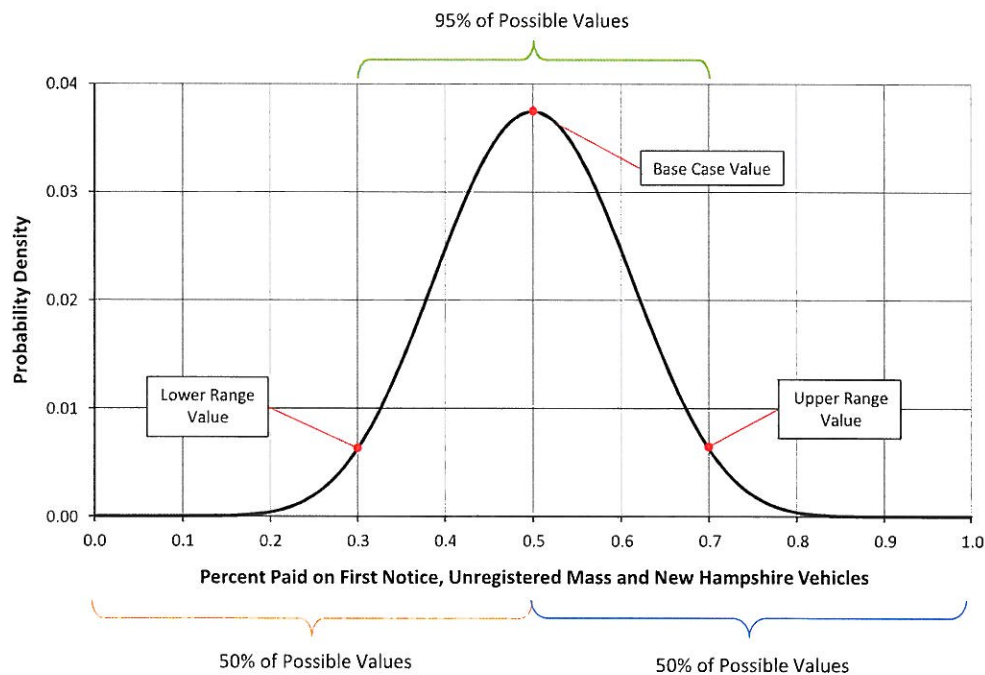
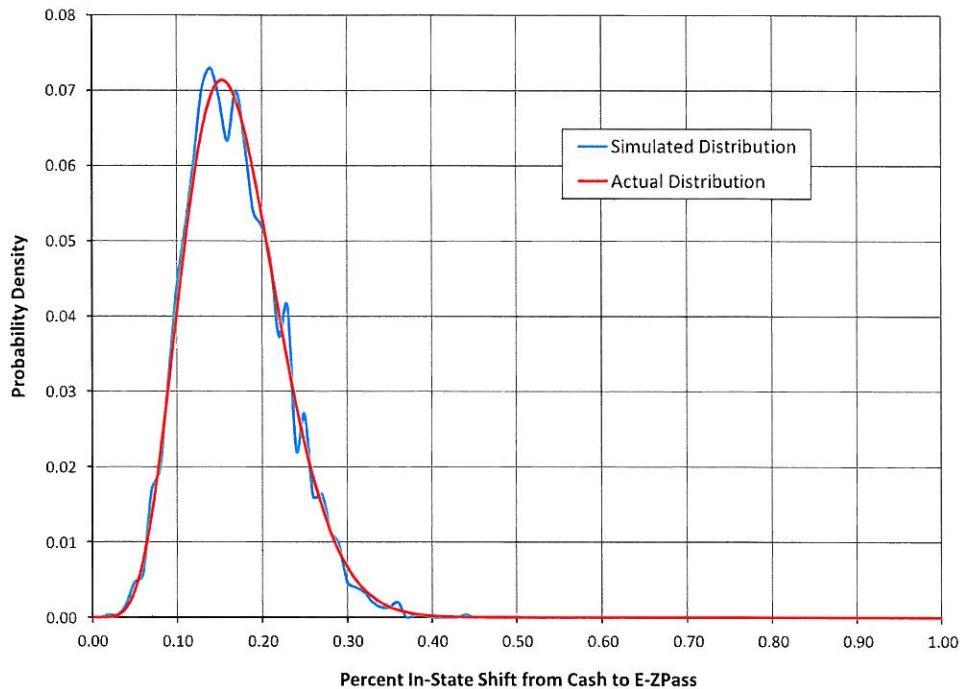


Figure 13
Sample Distribution with Randomly Generated Data



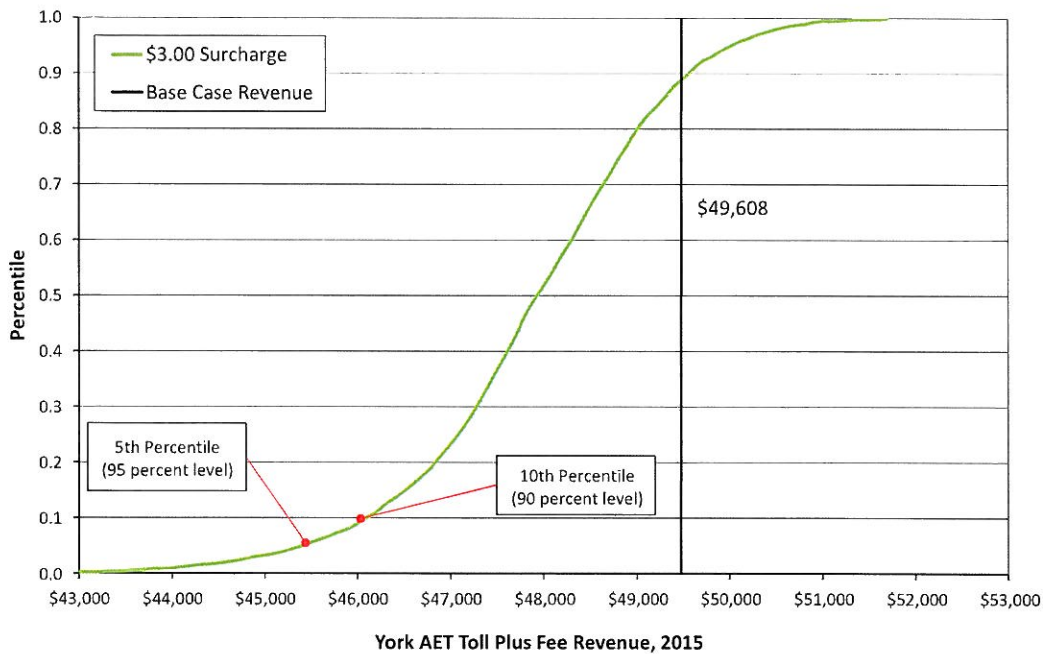
Multivariate Risk Simulation

The Monte Carlo simulation itself was performed by using each of the 3,000 randomly generated sets of variables as model inputs. Typically, simulation will employ a general process or mathematically-derived relationship between input and output variables. In this case, the model itself was used due to relatively low run times. From the distribution of the output values, we can determine an expected range of revenue generation, an example of which is shown in Figure 14. The values for the 10th and 5th percentiles of the data were selected as benchmark values for risk sensitivity. At the 10th percentile, for example, 300 of the 3,000 output values are less than this value, with 2,700 output values generating a greater level of revenue, translating into a 90 percent level of confidence that actual revenue values will meet or exceed this amount.

Risk Analysis Output

Risk models were run for the AET and ORT models for both the York and Gardiner plazas. Optimal surcharge levels were selected for each scenario and results were tabulated for the net toll plus fee revenue for future years between 2015 and 2030.

Figure 14
Sample Monte Carlo Output Distribution



Figures 15 through 18 show yearly net plus fee revenue for the York and Gardiner AET and ORT models for the selected surcharge level, expected model output, and the 90 and 95 percent confidence levels from the risk analysis. In general, the AET risk analysis shows a much greater variation between expected value and lower risk bound than its ORT counterpart. This would be the expected outcome, given the higher level of certainty associated with ORT (given its similarities with current operations) compared to AET.

Figure 15
Estimated York Toll Plaza AET Risk Analysis Annual Net Revenue Forecasts

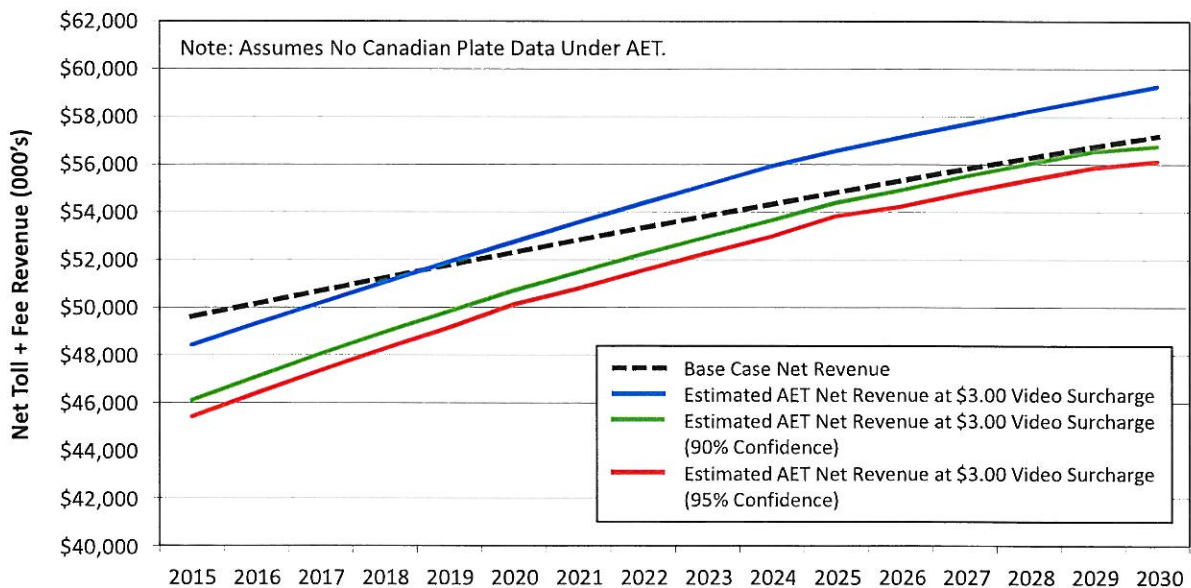


Figure 16
Estimated York Toll Plaza ORT Risk Analysis
Annual Net Revenue Forecasts

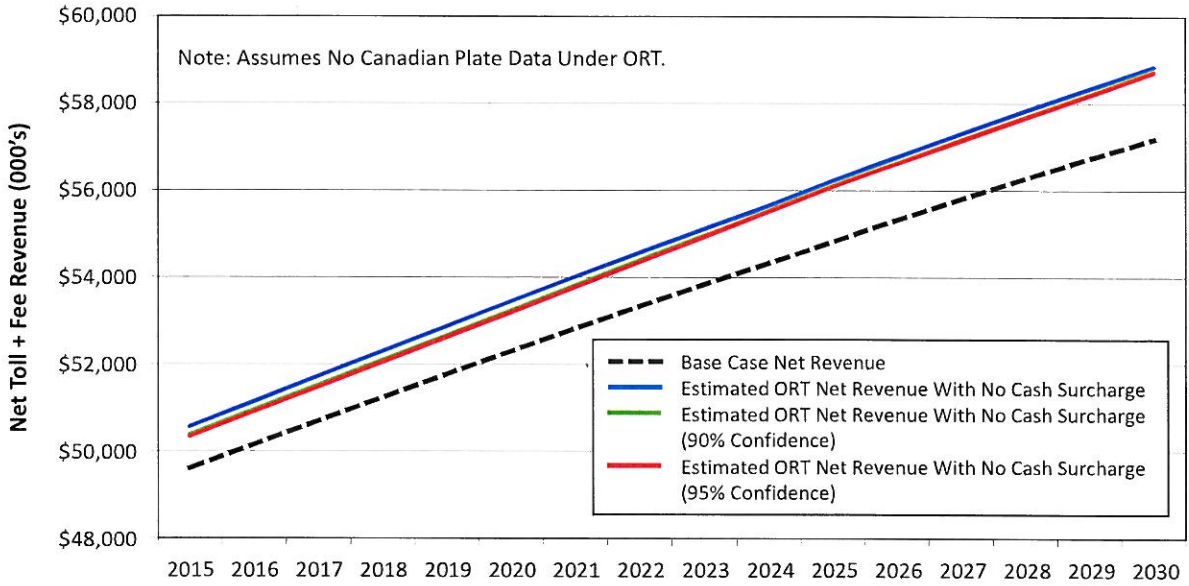


Figure 17
Estimated Gardiner Toll Plaza AET Risk Analysis
Annual Net Revenue Forecasts

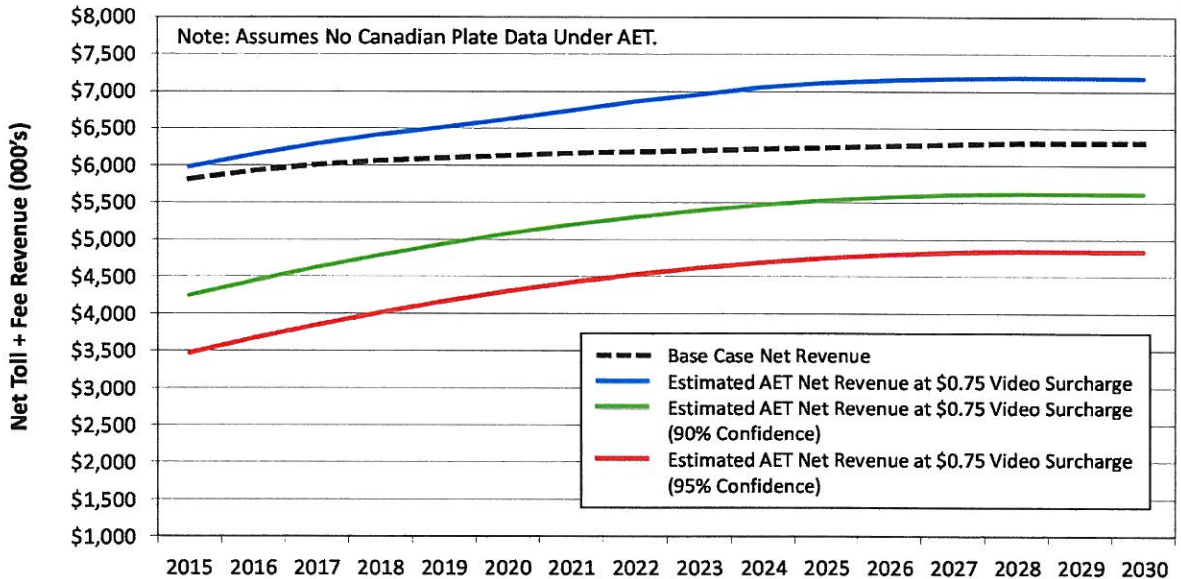
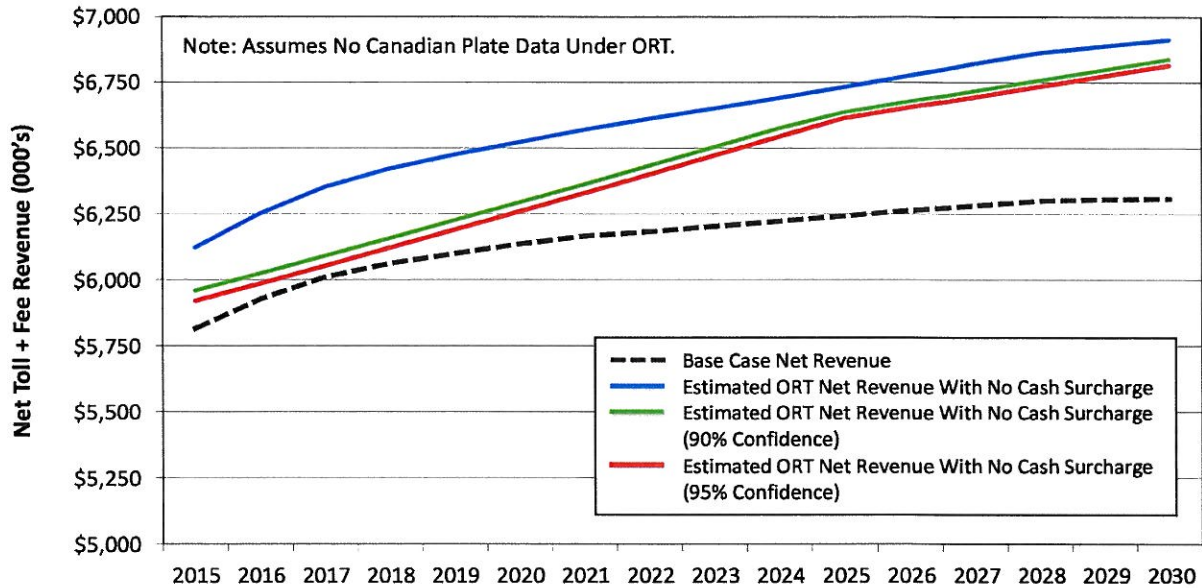


Figure 18
Estimated Gardiner Toll Plaza ORT Risk Analysis
Annual Net Revenue Forecasts



York Plaza

The York AET model (Figure 15) shows approximately a 5 percent drop in revenue between the expected scenario and the 90 percent confidence level, with approximately a 6 percent drop between the expected and the 95 percent level at 2015. The percent differences between expected and risk-generated revenue decrease slightly in the outer model years, to about 4 percent and 5 percent for the 90 and 95 percent levels, respectively. While the expected revenue generated for this model exceeds the annual revenue of the base case after 2019, the 90 and 95 percent confidence levels for revenue generation do not exceed the base case for any model year.

The risk results for the York ORT model (Figure 16) show very minimal difference between the expected revenue and the 90 and 95 percent confidence levels. Annual revenue for both expected revenue and 90 and 95 percent levels exceed base case revenue for all model years.

Gardiner Plaza

Gardiner AET (Figure 17) shows a significant difference between the expected values and the 90 and 95 percent confidence levels, with a 29 percent decrease between the expected value and 90 percent level for 2015 and a 42 percent decrease between the expected revenue and the 95 percent level. The expected annual revenue for Gardiner AET remains above the base case revenue for every year. The bigger divergence between expected and the 90 and 95 percent confidence level at Gardiner is attributable to the higher video market share at Gardiner (compared to York) and the bigger impact of relatively high collection costs at Gardiner (i.e., the cost of collecting a \$1.00 toll at Gardiner versus the cost of collecting a \$3.00 toll at York).

The ORT results for Gardiner (Figure 18) show relatively modest reductions between the expected revenue and the 90 and 95 percent levels, with a reduction between 4 and 1 percent for the 90

percent level and a reduction between 5 and 1 percent for the 95 percent level. In this case, both the 90 and 95 percent confidence levels for annual net toll plus fee revenue are higher than annual base case revenue throughout the entire forecast period.

Sensitivity Tests

The risk analysis described above was intended to demonstrate the range of outcomes in net revenue under a change in a variety of assumptions over which MTA may have little control. The potential impacts with respect to three other discrete conditions were also tested, in the forms of sensitivity tests, outside the risk analysis above. To an extent, MTA might be able to influence these uncertainty factors, either through strategic marketing initiatives or decisions regarding the enforcement of fee collection. Three issues were subjected to sensitivity testing:

- The proportion of “pre-registered” video transactions;
- The potential availability of Canadian plate data; and
- Fee revenue realization rate.

Pre-Registered Video Transactions

Many agencies now shifting to AET offer the option of one-time vehicle plate registration. This can be incentivized by allowing for significant reductions in the video surcharge and by providing convenient mechanisms for plate pre-registration, such as kiosks in former cash collection lanes and service areas, on line or telephone registration systems, etc. The concept of pre-registration typically involves the motorist registering their own license plate, without even the need to provide any vehicle ownership or other identification information. Pre-paid accounts can then be established for that particular license plate, regardless of state or province of registration. Lists are maintained of pre-registered plates and tolls due when that particular plate is encountered are simply deducted from the pre-paid account.

The pre-registration of accounts has very significant positive benefits for agencies operating AET facilities. There is no need to look up vehicle owner information, no need to send a bill, and no collection risks associated with post payment. In essence, for each vehicle with a pre-registered license plate, the video transaction functions essentially the same as an E-ZPass transaction, except that the vehicle is identified by video imaging of the plate rather than reading an electronic toll transponder.

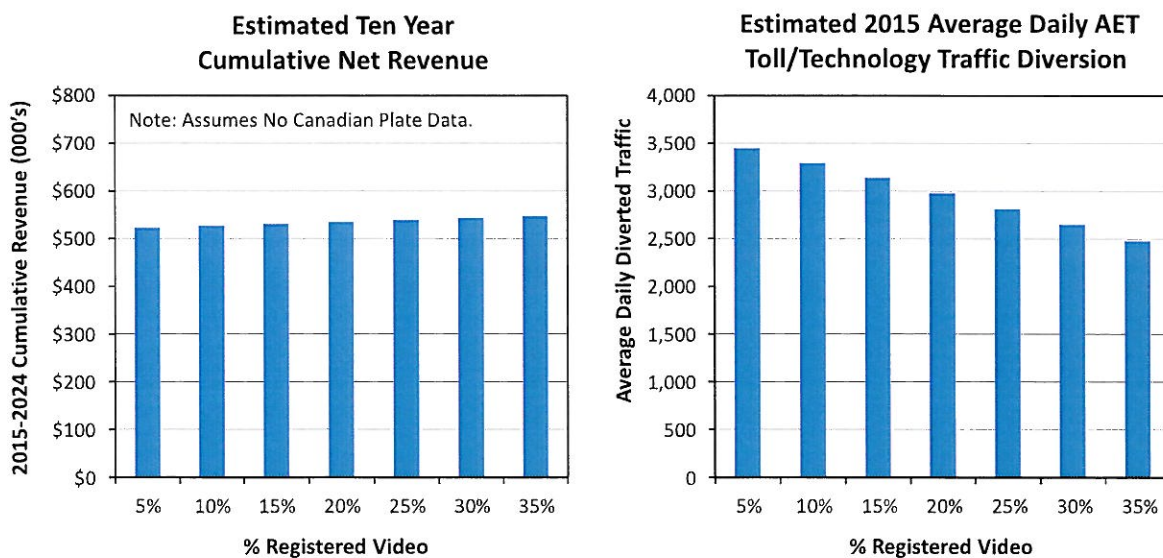
In the base analysis, CDM Smith assumed that the surcharge applied to pre-registered plates would be 50 percent of that applied to unregistered plates. The base analysis assumed just 5 percent of video transactions would be made by vehicles with pre-registered plates, based on actual experience in other toll facilities.

This sensitivity analysis tested the potential net revenue implications of a progressively higher share of video users choosing to pre-register their plates. As shown in Figure 19, 10-year net revenue at the York Plaza would actually increase slightly as the proportion of pre-registered video users increased, notwithstanding the lower toll surcharge being applied as compared to unregistered vehicles. As shown in the right half of Figure 19, since the surcharge applied to those pre-registered video users was half as high, the lower the traffic diversion to the alternative route, primarily US 1. Specifically, in the base forecast, with a \$3.00 unregistered surcharge and assuming a \$1.50 surcharge for registered vehicles, if only 5 percent of non-E-ZPass traffic pre-registered their plates, approximately 3,500 vehicles per day would shift to US 1. If 25 percent of non-ETC traffic pre-registered their plates, the diversions would be lowered to an estimated 2,800 and less than 2,500 if about one-third of all non-ETC traffic registered their plates.

Similar results are shown for the Gardiner Toll Plaza in Figure 20. Net revenue would be higher, and traffic diversions off the Turnpike would be lower, the higher the percentage of pre-registered plates.

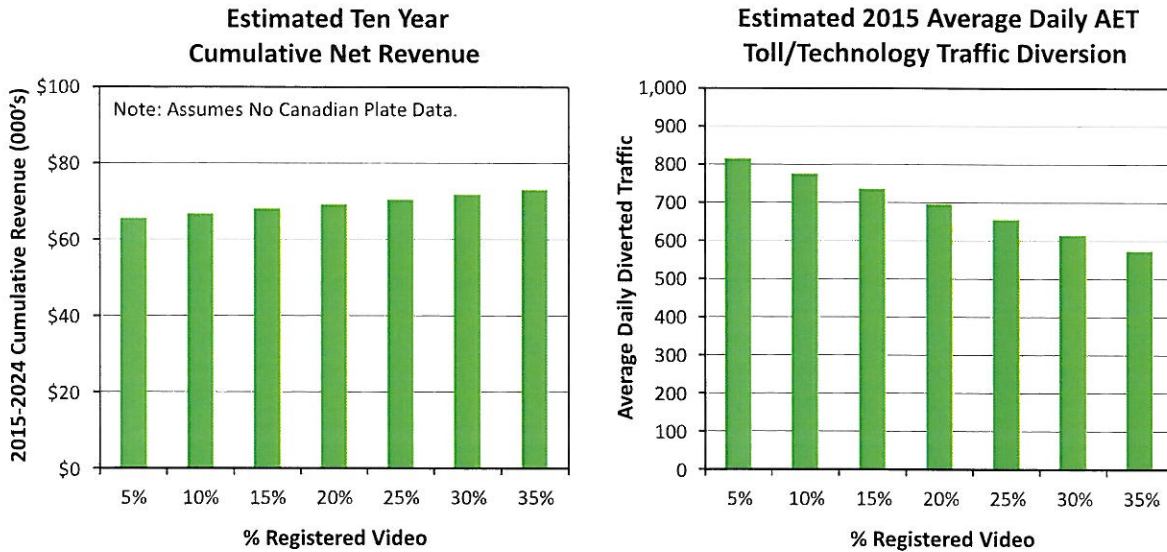
This is an important finding of the study, and suggests that if AET was ultimately implemented across the Maine Turnpike, maximum incentive should be provided for motorists to pre-register plates. This might include providing automated kiosks in some of the former cash collection lanes, and at Turnpike service areas, where motorists can simply register their plate, one time, and qualify for the lower surcharge rate as long as a balance is maintained in the account. Since many agencies across the U.S. are faced with the same situation, it is not unlikely that third party national plate registry providers may emerge in the future to operate pre-registration kiosks and maintain pre-paid balances which may be usable at AET toll facilities nationwide.

Figure 19
Registered Video Account Participation Sensitivity
York Toll Plaza



Note: Assumes unregistered video surcharge is \$3.00 and registered video surcharge is \$1.50.

Figure 20
Registered Video Account Participation Sensitivity
Gardiner Toll Plaza



Canadian Vehicle Owner Data Availability

As previously discussed, there is considerable uncertainty as to the ability to obtain vehicle owner information for Canadian registered vehicles. Just before the conclusion of our study, CDM Smith was advised that data may become available in the near future for some provinces. As such, we tested the potential implications of Canadian plate data becoming available.

Table 13 shows the relatively small impact that Canadian plate data would have on net revenues over the 10-year analysis period, at the range of video surcharges tested. In general, the net revenue impact of recovering all Canadian plates would be less than 1 percent, at the levels of surcharge being considered in this study.

The ability to obtain Canadian registrations is a significant policy consideration, but not one which would have very heavy impacts on net revenue. This is largely due to the fact that Canadian traffic generally represents 4 to 7 percent of cash vehicles, and cash traffic itself accounts for a minority of revenue collected. Further, the collection of revenue from video customers from “other states” has a relatively low yield, since high levels of repeat billings are assumed and a much higher level of collection risk is included in the analysis.

Table 13
Estimated 10-Year Net Revenue Impacts of Canadian Plate Data Availability

York Toll Plaza					
Scenario	Unregistered Video Surcharge				
	\$1.00	\$1.50	\$2.00	\$2.50	\$3.00
No Canadian Data Available	\$511,987	\$519,954	\$525,960	\$529,848	\$531,461
Canadian Plate Data Available	514,241	522,556	528,887	533,077	534,969
Percent Revenue Change	0.4%	0.5%	0.6%	0.6%	0.7%
Gardiner Toll Plaza					
Scenario	Unregistered Video Surcharge				
	\$0.25	\$0.50	\$0.75	\$1.00	\$1.25
No Canadian Data Available	\$57,125	\$61,834	\$66,318	\$70,390	\$73,936
Canadian Plate Data Available	57,064	61,999	66,702	70,987	74,728
Percent Revenue Change	-0.1%	0.3%	0.6%	0.8%	1.1%
Note: all revenue values in 000s					

Fee Revenue Realization Rate

As previously discussed, for the purposes of this study only 30 percent of potential fee revenue was assumed to be collected. The actual percent of fee revenue realized by MTA under AET toll operations could vary significantly from this assumption. Table 14 presents estimated AET fee revenue at the York toll plaza for fee collection rates ranging from 10 percent to 100 percent for years 2015 and 2020. Estimates are also shown as a percent of annual net AET toll + fee revenue. At the assumed fee collection rate of 30 percent, fee revenue constitutes 2.8 percent of estimated annual net AET toll + fee revenue in 2015. Since fee revenue stems primarily from unpaid video toll invoices, projected increases in E-ZPass participation rates result in that share decreasing to 1.9 percent by 2020.

Table 15 presents estimated AET fee revenue at the Gardiner toll plaza for fee collection rates ranging from 10 percent to 100 percent for years 2015 and 2020. At the assumed fee collection rate of 30 percent, fee revenue constitutes 21.2 percent of estimated annual net AET toll + fee revenue in 2015. Projected increases in E-ZPass participation rates result in that share decreasing to 14.4 percent by 2020.

Table 14
Estimated Annual AET Fee Revenue by Collection Rate

Fee Collection Rate	2015		2020	
	Estimated Fee Revenue	Fees as a Percent of Net AET Toll + Fee Revenue	Estimated Fee Revenue	Fees as a Percent of Net AET Toll + Fee Revenue
10%	\$460	1.0%	\$330	0.6%
20%	\$920	1.9%	\$660	1.3%
30%	\$1,380	2.8%	\$990	1.9%
40%	\$1,840	3.7%	\$1,320	2.5%
50%	\$2,300	4.6%	\$1,650	3.1%
75%	\$3,450	6.8%	\$2,480	4.5%
100%	\$4,600	8.9%	\$3,300	6.0%

Table 15
Estimated Annual AET Fee Revenue by Collection Rate
Gardiner Toll Plaza
All Revenues in Thousands

Fee Collection Rate	2015		2020	
	Estimated Fee Revenue	Fees as a Percent of Net AET Toll + Fee Revenue	Estimated Fee Revenue	Fees as a Percent of Net AET Toll + Fee Revenue
10%	\$410	8.3%	\$320	5.2%
20%	\$810	15.1%	\$650	10.1%
30%	\$1,220	21.2%	\$970	14.4%
40%	\$1,630	26.4%	\$1,290	18.3%
50%	\$2,040	31.0%	\$1,620	21.9%
75%	\$3,050	40.2%	\$2,420	29.5%
100%	\$4,070	47.3%	\$3,230	35.9%

Summary and Conclusions

Various impacts and implications of implementing either ORT or AET at the York and/or Gardiner Toll Plazas have been presented in this report. The study compared traffic, toll rates, operating costs and net revenue over a 10-year forecast period to a hypothetical continuation of the current cash collection of tolls. The analysis was conducted over a 10-year interval for each condition. This section provides a useful “bottom line” summary of the ORT and AET scenarios for each plaza studied, to aid in informed decision making by the Authority.

York Toll Plaza

Table 16 provides the bottom line summary for both AET and ORT at the York Toll Plaza. For each operational alternative, the base estimates as well as estimates at the 90 percent confidence interval are provided. These are all compared to current conditions, assuming cash collection would continue, without assuming any change in toll rates.

If (hypothetically) cash collection could continue at a reconstructed York Toll Plaza, the average toll rate for Maine-issued E-ZPass accounts would be \$2.41, consistent with current levels. Other E-ZPass cars would pay a toll of \$3.00, as would passenger car motorists using cash. Average daily traffic at this plaza is 38,500 (at estimated 2015 levels), although it increases significantly during peak summer weekends and holiday conditions.

Over the 10-year analysis period, cumulative net revenue is estimated at \$520,083,000. On a net present value basis, with a nominal discount rate of 5 percent, this is equivalent to \$399,965,000.

HNTB estimates that a total capital investment of about \$22.1 million would be required to restore and maintain cash operations at York. When related to the 10-year NPV under the base case, this provides a 10-year net total, for comparison purposes, of \$377,865,000. This is the estimated amount of total revenue, less all operating cost and the capital investment cost to restore the current plaza, between 2015 and 2024.

Similar information is provided for the ORT case, under both the base forecast and 90 percent confidence interval. The same toll rates are assumed and no traffic diversions are anticipated. The 10-year net revenue NPV is slightly higher under ORT, largely due to reductions in operating cost. However, a capital cost of \$36 million is estimated to replace the current plaza with an ORT facility, resulting in a 10-year net total NPV of \$372.5 million, or about \$5.3 million lower than continuation of the current base. At the 90 percent confidence interval, the 10-year total is only slightly different.

Under AET, toll rates for E-ZPass users are also assumed to remain the same. However, to overcome the potential revenue leakage and the higher cost of back office collection, a significant surcharge is required for video users. Non-E-ZPass traffic which chooses to pre-register the plate would be charged a \$1.50 surcharge, for a total toll of \$4.50. Unregistered video users, which would make up the majority of non-E-ZPass traffic, would be charged a surcharge of \$3.00 for a total toll of \$6.00.

Table 16
York Toll Plaza AET& ORT Bottom Line

Item	"Current"	ORT Scenario		AET Scenario (1)	
	Base Case	Base Estimate	90% Conf. Estimate	Base Estimate	90% Conf. Estimate
Toll Rate (cars)					
Maine E-Zpass	\$2.41	\$2.41	\$2.41	\$2.41	\$2.41
Other E-ZPass	\$3.00	\$3.00	\$3.00	\$3.00	\$3.00
Cash	\$3.00	\$3.00	\$3.00	-	-
Registered Video	-	-	-	\$4.50	\$4.50
Unregistered Video	-	-	-	\$6.00	\$6.00
Average Daily Traffic (2015)					
Net Traffic Diversion	38,500	38,500	38,500	35,100	33,000
	-	-	-	(3,400)	(5,500)
10-Year Net Revenue (000)					
Cumulative Estimate	\$520,083	\$531,370	\$529,759	\$522,993	\$500,962
Cum Estimate NPV (5%)	\$399,965	\$408,554	\$407,315	\$401,317	\$384,222
Net NPV Impact	-	\$8,589	\$7,350	\$1,352	(\$15,743)
Capital Cost (HNTB) (000)					
Cost Impact vs Current	\$22,100	\$36,000	\$36,000	\$4,800	\$4,800
	-	\$13,900	\$13,900	(\$17,300)	(\$17,300)
10 Year Net Total (000) (2)					
Net Difference from Base	\$377,865	\$372,554	\$371,315	\$396,517	\$379,422
		(\$5,311)	(\$6,550)	\$18,652	\$1,557

(1) Assumes unregistered passenger car video surcharge is \$3.00 and the registered video surcharge is \$1.50.
(2) 10 year net total equals NPV of 10 year net revenue less capital cost.

Because of the significantly higher toll, CDM Smith estimates a shift of approximately 3,400 vehicles off the Turnpike. While less than 10 percent of the total traffic, it is a much higher proportion of the cash traffic, recognizing that E-ZPass vehicles are not subjected to an increase and would not divert. Under the 90 percent confidence estimate, where higher diversion percentages were tested, the estimated shift to US 1 would be 5,500 vehicles per day.

Under the base estimate, the 10-year cumulative net revenue is estimated at just under \$523 million, slightly higher than the continuation of the current system, but lower than under an ORT case. The cumulative 10-year NPV is estimated at \$401.3 million, or about \$1.4 million above the hypothetical continuation of current operations. With the 90 percent confidence level, a somewhat lower \$384.2 million NPV of cumulative net revenue, more than \$15.7 less than a continuation of cash.

The HNTB estimate for capital costs associated with implementing AET at York is \$4.8 million; some \$17.3 million less than the current cost to keep the plaza running and than \$31.2 million less than building an ORT facility. When the capital cost is subtracted from the 10-year net present value, AET with a \$3.00 unregistered video surcharge is shown to produce a 10-year net total of \$396.5 million, some \$18.7 million greater than the 10-year total of maintaining the current plaza and about \$24

million greater than implementing ORT. Even at the 90 percent confidence level, the net AET revenue impact remains positive.

The above AET scenario is net revenue positive, however, only by imposing a \$3.00 video surcharge on unregistered customers. Toll diversion levels of between 3,400 and 5,500 per day would also result under this AET scenario as a result of the video surcharges.

In considering the optimum solution at York, several factors should be taken into consideration:

- The best 10-year net total revenue, after recognizing both operating and capital investment cost, would come from AET (assuming a significant video surcharge);
- However, this would be achieved through a significant increase in charges assessed to both registered and unregistered video vehicles, with a surcharge of as much as \$3.00; and
- As a result of the surcharge, there would be significant diversions of traffic to US 1 estimated to range from 3,400 to 5,500 per day (with higher amounts under peak weekend conditions).

Gardiner Toll Plaza

A similar bottom line analysis is presented in Table 17 for the Gardiner Toll Plaza. In this case, both toll rates and 10-year net revenue implications are much lower. As a result, there is considerably less overall risk associated with testing AET at the Gardiner location.

As shown in Table 17, the 10-year cumulative net revenue estimate if operations were to continue in their current mode is \$60.7 million. After adjusting for net present value, this is reduced to \$46.8 million; again representing a cumulative 10-year total. According to HNTB, the capital cost of restoring and preserving current operations (not recommended) is estimated at \$7 million. After subtracting this, a 10-year net total of \$39.8 million is shown for the Gardiner Plaza under current operations.

In the case of ORT, cumulative net revenue would be slightly increased, primarily due to the increased share of E-ZPass users and a reduction in the cost associated with cash collection. However, rebuilding the plaza as a full ORT facility is estimated at \$14.4 million, some \$7.4 million higher than simply maintaining it in its current location. After subtracting the additional capital cost, the 10-year bottom line total for ORT is estimated between \$34.0 and \$35.3 million, or generally around \$5-6 million less than continuing current operations.

Under the AET condition, HNTB estimates that the entire plaza could be replaced for \$3.8 million, about \$3.2 million less than simply trying to restore the plaza at its current location. However, motorists without E-ZPass would be required to pay a higher toll; unregistered plate vehicles would be assessed a surcharge of \$0.75, bringing the per transaction toll for cars to \$1.75. This would be expected to divert between 800 and 1,400 vehicles per day, spread over several routes.

Table 17
Gardiner Toll Plaza AET& ORT Bottom Line

Item	"Current"	ORT Scenario		AET Scenario (1)	
	Base Case	Base Estimate	90% Conf. Estimate	Base Estimate	90% Conf. Estimate
Toll Rate (cars)					
Maine E-Zpass	\$0.50	\$0.50	\$0.50	\$0.50	\$0.50
Other E-ZPass	\$1.00	\$1.00	\$1.00	\$1.00	\$1.00
Cash	\$1.00	\$1.00	\$1.00	-	-
Registered Video	-	-	-	\$1.38	\$1.38
Unregistered Video	-	-	-	\$1.75	\$1.75
Average Daily Traffic (2015)	23,300	23,300	23,300	22,500	21,900
Net Traffic Diversion	-	-	-	(800)	(1,400)
10-Year Net Revenue (000)					
Cumulative Estimate	\$60,710	\$64,562	\$62,922	\$65,573	\$49,514
Cum Estimate NPV (5%)	\$46,757	\$49,678	\$48,417	\$50,270	\$37,807
Net NPV Impact	-	\$2,921	\$1,660	\$3,513	(\$8,950)
Capital Cost (HNTB) (000)					
Cost Impact vs Current	\$7,000	\$14,400	\$14,400	\$3,800	\$3,800
	-	\$7,400	\$7,400	(\$3,200)	(\$3,200)
10 Year Net Total (000) (2)					
Net Difference from Base	\$39,757	\$35,278	\$34,017	\$46,470	\$34,007
		(\$4,479)	(\$5,740)	\$6,713	(\$5,750)

(1) Assumes unregistered passenger car video surcharge is \$0.75 and the registered video surcharge is \$0.38.
(2) 10 year net total equals NPV of 10 year net revenue less capital cost.

The NPV of the cumulative net revenue under the AET base case (assuming a \$0.75 unregistered video surcharge) is estimated at \$50.3 million or about \$3.5 million greater than if the current operations were retained. However, at the 90 percent confidence level, the NPV of net revenue drops to just \$37.8 million (there is a greater range of risk at the Gardiner Toll Plaza since E-ZPass represents a lower share of transactions). When compared with the lower capital cost of AET, the 10-year net total under the AET base case forecast is \$46.5 million (about \$6.7 million better than the "do nothing" scenario). However, at the 90 percent confidence level, the 10-year total NPV is estimated at \$34.0 million, almost \$6 million less than if current operations are retained.

A review of the bottom line assessment for the Gardiner Toll Plaza suggests:

- AET would generate about \$6.7 million more in 10-year NPV revenue, after recognizing capital cost, compared to the continuation of current operations and assuming a \$0.75 unregistered video surcharge;
- There is considerably higher risk associated with AET at the Gardiner Plaza (in percentage terms). But in dollar terms, the net risk is smaller. Even at the 90 percent confidence interval,

where AET would generate \$5.7 million less than the simple continuation of current operations, this is only slightly less than the 10-year net total for ORT;

- In essence, AET has the potential to improve net revenue, after capital costs, while shifting to ORT would likely reduce the 10-year net total, based on the \$14.4 million capital costs. Though it must be recognized that no cash surcharge is assumed for ORT while a \$0.75 unregistered video surcharge is assumed for AET; and
- Higher toll rates would have to be charged to video users at the Gardiner Plaza, but the surcharge would be considerably lower than that required at York.

In reviewing these bottom line conclusions, it should be recognized that the AET condition assumed only a very small percentage (5 percent) of former cash traffic would choose to register plates. If MTA considers implementation of AET in the future, it should more thoroughly investigate opportunities to encourage pre-registration of plates, as this would likely reduce traffic diversions and slightly improve net revenue performance. The Maine traveler market may be well adapted to this, since there are a large number of seasonal visitors which may not find it worthwhile to invest in electronic toll transponders, but who may make a sufficient number of trips (over a typical one to two week vacation period) to take advantage of the one-time registration of license plates.

Staff Report on the Present Status of Tolling on the Maine Turnpike

Early History

For its first 50 years, the Maine Turnpike collected tolls by issuing a ticket to each motorist at the beginning of a trip and charging a cash toll at departure based on distance traveled. At midnight on September 16, 1997, this ticket system was replaced by charging tolls only at plazas on the mainline or at entrance ramps.

At the same time, the Turnpike introduced the option either to pay cash or to pay electronically using Transpass, a system that required a participating motorist to lease a transponder that sent and received signals to and from an overhead antenna and allowed for tolls to be calculated. The account holder was required to maintain funds on deposit from which tolls were withdrawn.

In the ensuing years, a competitor called "E-ZPass" became the dominant electronic toll system in the northeast after adoption by authorities in New York, New Jersey, and Pennsylvania. As Transpass became obsolete, the Maine Turnpike responded in 2005 by switching from Transpass to E-ZPass and joining the E-ZPass Interagency Group (IAG) as a voting member.

The IAG presently includes 25 tolling authorities in 15 states, from Maine west to Illinois and south to North Carolina. It is the largest interoperable toll network in the world, has 25 million transponders in use, and processes 2.4 billion transactions per year. All 25 members reciprocate in promptly crediting tolls for one another each day. The system accounts for 70% of all tolls collected in the United States.

Toll System Obsolescence

Electronic components installed in 2005 to support Maine's E-ZPass toll plazas are now obsolete. The computer and software systems are no longer supported and the vehicle sensors are expensive to maintain. New electronics are needed to improve operations in cash as well as E-ZPass lanes.

In 2011, the Turnpike began replacing its outmoded components with a system called "Infinity" made by UTS/Transcore. The New Gloucester barrier toll was converted to the new system on April 1, 2013. Seven side ramps are presently being converted; and several more are in design.

The Infinity system produces many tangible improvements for both cash and E-ZPass collections:

- The system offers full violation and video audit capability in all lanes. When fully installed, it will enable the Turnpike to reduce uncollectible tolls by about 500,000 transactions per year equal in value to \$2.4 million.
- For vehicle classification, the old system uses pressure sensitive treadles and in-lane laser light curtains that are vulnerable to physical damage. Repairs to them cost the Turnpike approximately \$390,000 in 2012. The new system replaces them with components that are less susceptible to damage and cheaper to repair.
- The new system employs video auditing that will greatly enhance toll collector audit functions and eliminate external contracts for services that currently cost approximately \$90,000 per year.
- The annual cost of contracts to maintain the new system will be reduced by about \$124,000.

Annual savings and enhanced revenue from the new components recently installed are already offsetting the amortized capital costs of their purchase.

At most of the Turnpike's 19 toll sites, it is possible to install the new system as a retrofit to an existing plaza without changing locations. However, at three of the barrier tolls --York, Exit 44/I-295, and West Gardiner/I-295 -- there is need to consider new plazas at different or modified sites. Any alternative site must be chosen in a permitting process guided by federal and state agencies.

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The new vehicle sensory systems function to a degree of reliability approaching 100% -- even at highway speeds -- as has recently been proven in New Gloucester where electronic tolls are collected at 65 mph. New Gloucester employs Open Road Tolling (ORT) in which motorists with transponders travel at highway speed under an overhead gantry of antennas that record the toll electronically. Motorists who need to pay cash, move right to a separated lane to stop and pay an attendant.

Conditions at York

Among the sites in need of upgrade is the 17-lane toll plaza at York, where the Turnpike collects 38% of its revenue. York was constructed in 1969 near mile 7, the first point on the Maine Interstate where tolling is permitted. Because federal funds were used to build or widen the highway south of mile 7, federal law prohibits tolls on this part even though the state requires the Turnpike to maintain it.

The York plaza was designed to last until 1982, when bonds were to be repaid, tolls were to cease, and the Turnpike was to be turned over to Maine DOT for perpetual maintenance. However, the oil shocks of 1973 and 1978 caused such a significant decline in gas tax revenue that the Legislature had inadequate funds in 1982 with which to support the general highway budget -- let alone the Turnpike. The Legislature directed the Turnpike to continue collecting tolls not only to maintain itself but also to contribute substantial sums to Maine DOT, a practice that continues to this day in reduced form under different statutory directives.

The York toll plaza, now 45 years old, is beyond its useful life and suffers from numerous operational and structural deficiencies. The highway in this location is built on deep compressible clays. The plaza itself rests on piles, but the approach and departure pads have been sinking by nearly 1 inch per year.

A sensitive component of the new Infinity system is an antenna loop that is carefully set in concrete within the approach to each lane. These loops are necessary to classify vehicles. They help to distinguish between cars that owe a \$3 toll from trucks that may owe as much as \$13.50 at York, depending on vehicle size and the number of axles. To work effectively over time, the loops must be set within a rigid pad on stable ground, a condition difficult to maintain at the present York plaza

In addition, the curves, elevation changes, and close proximity of ramps at mile 7 make it highly undesirable for Open Road Tolling, which, for safety reasons, requires straight lines of sight along clear approach and departure zones.

York's Procedural History

Cognizant of the need to replace the deteriorating York plaza and to provide the public with high speed tolling, the Maine Turnpike Authority voted eight years ago (2006) to install Open Road Tolling in York at a location to be selected north of the existing plaza. It was then anticipated that the project would be complete by 2010, ahead of a similar facility being planned for Hampton, New Hampshire.

After a lengthy evaluation, the Turnpike filed a Phase I Report in November of 2009 with the Army Corps of Engineers (ACOE) to initiate a process for obtaining environmental and wetland permits for a new toll plaza location.

Many citizens of York who opposed a new physical facility raised the following question:

Is it feasible to collect tolls at the York plaza by means of All Electronic Tolling (AET) and avoid the need to build or maintain any physical facilities for the collection of cash?

Under AET, cash collection is abandoned and all motorists proceed down the highway under the antenna that registers tolls for electronic customers. For a customer without a transponder, collection is

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attempted by taking high resolution photos of the license plate, looking up the registered owner's address through a back office inquiry, and mailing a bill to the owner's residence.

Although AET had been ruled out in the Phase I report, the ACOE replied to the report on May 5, 2010, by seeking clarification on a number of further points about the AET option.

As answers to these questions were being prepared, new Turnpike management took over in March of 2011. With support from the Board, three measures relevant to the York toll issue were initiated:

1. Expansion of E-ZPass. The first initiative was to embark on an aggressive program to expand electronic toll collection (ETC) on the Maine Turnpike. AET is generally implemented only on those toll roads where ETC has reached high percentages of traffic penetration. Conditions for AET are most favorable on toll roads where daily commuters are the dominant revenue source. The Maine Turnpike has fewer commuters than most toll roads, especially at York. Nevertheless, expansion of E-ZPass in Maine would help to improve the Turnpike's financial condition regardless of future choices. And if the decision were made to continue cash collection capacity at York, it might be done with a smaller plaza if more vehicles paid by E-ZPass.

2. Cash lane survey. In 2012, the Turnpike initiated a license plate survey to document where vehicles in the cash lanes come from. To collect tolls by mail under AET depends on the feasibility and cost of obtaining addresses from jurisdictions in which vehicles are registered. This information is important for modeling AET losses and costs and for pursuing violators under any system.

3. Another Opinion on AET. The Turnpike decided to obtain a fresh opinion on the feasibility of AET at York. The study was later expanded to include West Gardiner/I-295 as well. After a request for proposals was issued to five prominent toll consultants, the Turnpike chose Wilbur Smith (now CDM Smith) to perform a financial risk analysis based on conditions specific to Maine.

E-ZPass Expansion

As part of a legislative reform bill in the spring of 2011, the Turnpike obtained authority to form reciprocity contracts with other jurisdictions to collect tolls. By August of 2011, Maine, New Hampshire, and Massachusetts became the first three states in the union to enforce collection against each other's citizens by suspending or holding vehicle registrations. While collections under the program have been modest, it is assumed that many motorists from the tri-state area who once avoided tolls are now paying. 23% of traffic in Maine's cash lanes comes from these two neighboring states.

In 2012, the IAG switched to a new E-ZPass transponder that costs only \$10 rather than \$25. The Maine Turnpike, which sells its transponders at cost, dropped its prices accordingly on February 1, 2012, and used the price drop to promote the opening of many new electronic accounts.

Later in the spring of 2012, the Legislature gave the Turnpike permission to eliminate a cumbersome commuter discount program that had been mandated by law since 1982. It was designed for the paper ticket system. So long as the Turnpike was required to administer this outmoded program, it was nearly impossible to sell E-ZPass over the Internet. On November 1, 2012, the Turnpike did away with the old program, adopted a new volume discount, and began selling transponders on-line. The effort was extraordinarily successful. The Internet now accounts for more than half of all E-ZPass sales.

Also in 2012, state law was changed to permit the Turnpike to send notices of liability by ordinary mail rather than by certified mail, which cost \$5.79 more. This has saved the Turnpike over \$50,000 per year within its present violation enforcement system. The added cost of certified mail might alone have been fatal to any high volume toll-by-mail system like AET.

On November 1, 2012, the Turnpike passed a 20% toll increase that greatly favors Maine E-ZPass account holders in two respects: (1) Rates for cash were generally raised higher than rates for E-ZPass,

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and (2) a new volume discount program was offered to Maine E-ZPass customers. Under the new discount, the Turnpike is returning \$6.5 million per year to Maine motorists in contrast to \$2 million per year under the former commuter program.

As the Turnpike created these incentives to adopt E-ZPass, it launched a series of successful sales campaigns, with a focus on drive-time radio, to promote electronic tolling.

In addition to efforts here in Maine, both New Hampshire and Massachusetts have promoted E-ZPass. New Hampshire, for example, offers a 30% toll discount for its version of E-ZPass, and Massachusetts gives away its transponders. Because these two states are the most prominent contributors to out of state traffic on Maine highways, their efforts have helped to raise the percentage of E-ZPass revenue in Maine; and Maine's efforts have helped them as well.

In 2006, the electronic toll percentage on the Maine Turnpike was 40%. By 2010, it was 59%. As a product of recent initiatives, it has risen to 66% and will likely continue rising, but more slowly as the level reaches or exceeds 70%. For a state like Maine with fewer commuters, it is difficult to raise the electronic penetration rate into ranges much beyond 75% or 80%. This is partly because so many travelers, even from Maine, use the Turnpike infrequently, for only one or two round trips per month.

Cash Survey

From August of 2012 through June of 2013, the Turnpike sampled license plate data from 407,332 motorists who passed through cash lanes at five locations: York, Exit 44, New Gloucester, West Gardiner/I-295, and the southbound on-ramp in Gray. The survey revealed that license plates came from states and provinces in the following percentages at the plazas listed:

	Maine	Massachusetts	New Hampshire	Canada	All other states
All five toll plazas	55.4%	15.5%	7.5%	5.2%	16.4%
York	37.0%	24.7%	10.5%	4.8%	22.7%
W. Gardiner/I-295	75.0%	5.7%	2.6%	6.9%	10.1%

This information helped to determine where to focus further E-ZPass sales efforts and it formed an important component of the model prepared by CDM Smith for the AET evaluation.

The CDM Smith Risk Analysis of AET

A principal purpose of the CDM Smith study is to assist the Turnpike in determining whether to install either Open Road Tolling (ORT) or All Electronic Tolling (AET) at the York plaza. Because the Turnpike is concerned about the future of its tolling system, not just for York but for the entire road, CDM Smith was also asked to evaluate AET for the I-295 plaza in West Gardiner, which has a \$1 toll that is more representative of other plazas on the road.

Under ORT, the capacity to collect cash at each plaza is preserved. Under AET, collection from a former cash customer is attempted by finding the owner's address and sending a bill by mail. Experience with AET from other states reveals that at least 40% of former cash tolls are likely to be lost for a variety of reasons including: traffic diversion, plates obscured by snow or dirt, unwillingness of states or provinces to supply an address, invalid addresses, customers' failure to respond to small invoices, and lack of enforcement reciprocity with other jurisdictions.

Conversion to ORT preserves cash collection at a lower operating cost, creates less risk to the Turnpike, and requires no change to present toll rates. AET presents a greater risk, requires a substantial surcharge

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to preserve revenue, and imposes heavy traffic diversion on other roads. Bondholder approval for AET would require a revenue certificate based on conservative financial assumptions.

On November 1, 2012, the Turnpike raised tolls by 20% after eight months of intense public hearings, studies, and deliberations. The cash toll at York was raised from \$2 to \$3. The Turnpike foresees that no further increase will be necessary for many years if the present toll regime is kept.

A transition to ORT may be accomplished without changing current toll rates because ORT preserves cash collection in its present form. In fact, with new electronics, maintenance costs are reduced by replacing old and inefficient equipment, and revenue in the cash lanes is enhanced by installing detection equipment to capture "run through" violators.

The primary financial impediment to ORT at York or West Gardiner is the cost of building a new plaza. In other toll plazas where existing cash lanes are kept in use, ORT can be installed at relatively modest expense. For example, the mainline toll in New Gloucester, the Turnpike's second largest revenue source, was converted to ORT for \$8.5 million. Seven side tolls are presently being converted to the same electronic system for an aggregate cost of \$4.4 million.

At York, however, an ORT plaza will likely need nine new cash lanes in a different location. While the estimate for a new ORT plaza is \$36 million, an AET facility may be built for as little as \$4.8 million. AET also eliminates the cost of toll collectors and field cash management. However, AET leaves at least 40% of the former cash tolls uncollected and adds to operating costs for back office support, license plate lookup fees, postage, mail preparation, accounting follow through, and penalty administration.

In terms of financial risk, introducing AET at York without a toll surcharge would reduce revenue by \$4.55 million in the first year and increase maintenance and operation costs by \$2 million for a net loss of \$6.55 million. Because ORT would produce a net revenue gain of \$.95 million, the first year's difference in net impact between AET and ORT would be \$7.5 million. If the difference in capital cost is about \$31 million, the added investment for ORT could be recovered in just over four years.

To recover losses under AET, it is necessary to increase existing tolls with a surcharge. Doubling the toll to \$6 for unregistered passenger vehicles (or to \$24 for 5-axle trucks) and increasing it by 50% for those willing to register their plates with the Turnpike would raise first year's net revenue to just above the break even point when compared with present conditions. However, it would still fall \$.6 million behind an ORT system with no surcharge.

A chief consequence of adding a \$3 surcharge to the AET toll is to divert between 3,400 and 5,500 vehicles per day onto adjoining roads like Route 1, with higher levels at peak times. These diversions amount to between 30% and almost 50% of current cash traffic. Summer traffic on Route 1 in York already averages 14,000 cars per day. At Ogunquit, it averages 21,000.

Because of conflicts in business protocols between AET and cash collection, it would likely be necessary to adopt AET for the entire Turnpike rather than to use it in only one location and attempt to run two parallel systems with different collection and violation rules.

Therefore, to better understand the consequences of adopting AET for the entire road, the Turnpike engaged CDM Smith to perform an additional risk analysis for the plaza at West Gardiner/I-295. Of all locations on the highway, this toll appears at first blush to be the most favorable place to implement AET as a pilot. The West Gardiner plaza is on a separate spur of the Turnpike. It can be isolated financially from the rest of the toll system and accounts for only 7% of total Turnpike revenue. An AET toll system could be tried there with only modest risk.

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75% of cash toll payers at West Gardiner/I-295 are from Maine -- twice what the percentage is for York. Addresses of Maine vehicle owners can be freely obtained from InforME, the state's data repository. For Maine motorists who don't pay, the Turnpike can suspend vehicle registrations. Administration of a pay-by-mail system would seem easier for West Gardiner/I-295 than for York.

However, the cash toll at West Gardiner is only \$1, hardly worth the cost of mailing a letter. Even when several tolls can be aggregated into a single statement, the back office cost of producing a bill, applying postage, and following up for collection and enforcement exceeds the value of what may be recovered.

6.9% of the traffic through West Gardiner is from Canada. Tolls based on plates from New Brunswick and Nova Scotia would be written off immediately for lack of an address to mail a bill to.

The aggregate value of all cash tolls presently collected at West Gardiner/I-295 is \$3.677 million per year. Under AET without a surcharge, gross toll revenue becomes \$3.692 million (\$2.311 million in reduced tolls plus \$1.381 million in collected late fees). However, the cost to capture that revenue would grow from \$2.68 million in the present system to \$4.127 million under AET, resulting in a significant net loss.

With a surcharge of 75¢, net revenue would turn positive, but at that level an estimated 9% of present cash traffic would divert to other roads.

Policy Considerations

Studies of the York and West Gardiner plazas raise the following policy issues:

Fairness and equity. Under AET, substantial leakage is inevitable. Because many trips will not be paid for, a key issue is how to make up for the lost tolls. A common solution is to impose a surcharge on the basic toll so that the burden of paying the loss falls on those who formerly paid cash. Unfortunately, a surcharge at York would cause substantial diversion of traffic onto other roads and further aggravate the revenue loss.

Alternatively, if the loss is allocated to those who pay by E-ZPass, it will discourage people from using E-ZPass and motorists will question why it is fair to charge the Turnpike's best customers to subsidize those who pay nothing. At hearings prior to the 2012 toll increase, many members of the public, including the Legislature's Transportation Committee, insisted that equity in tolling be a primary policy goal. Equity is not achieved when many ride free at the expense of those who dutifully pay.

Diversion onto state roads. ORT creates no diversion and may even attract motorists back onto the toll road because of improved convenience. Under AET, diversion depends on the level of surcharge. If a surcharge is imposed at York sufficient to balance losses, it would create a 30% diversion of former cash traffic onto adjacent roads, where capacity is already strained. In the absence of a surcharge, the resulting revenue losses would need to be absorbed inequitably by those who pay by E-ZPass.

Customer service. Customers using the Hampton Toll in New Hampshire and the New Gloucester Toll in Maine have come to appreciate the value of high speed electronic tolling. In addition to convenience, it saves on fuel and cuts emissions. One company that uses the New Gloucester toll many times a day estimates that it saves a quarter of a gallon of diesel fuel (worth a dollar) every time one of its trucks passes through the toll at 65 miles per hour rather than slowing and accelerating again.

While this convenience is available to E-ZPass customers under either ORT or AET, there is a difference in other aspects of service. For those who pay cash, there is the difference between paying on site at the moment of use or paying later by mail, phone, or credit card. From a customer service perspective, the opportunity to pay on site seems preferable even if it requires the patron to stop.

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Safety. AET is clearly the safest solution and is a reason often given by other agencies for considering AET. Because ORT separates cash traffic to lanes behind a protective barrier, it is far safer than conventional slow speed tolling but less safe than AET because ORT divides traffic into two streams and then integrates them again after the toll is paid similar to an interchange.

Landowner impacts. An AET gantry makes use of no land outside of the existing right of way except to bring power and communications to the site. While most of an ORT facility at York can be constructed within the right of way, it also requires a support building with associated utilities and parking for staff. A small strip of adjacent land would be necessary at York, but there would be no need to take homes or structures.

Environmental impact. An AET gantry can be erected with negligible environmental impacts. A new ORT plaza in York would require widening of the highway in the vicinity of the plaza, some changes in road elevation and the filling of any small areas of wetland that are immediately adjacent to the road. Impacts to streams and other environmental features would depend on the site chosen.

Consistency with existing toll plazas. If York were converted to AET but the remaining plazas up the road retained their capacity to collect cash, it would set up two conflicting business protocols for non-E-ZPass tolls. When a vehicle passes through a conventional toll point without paying, the motorist becomes a violator. If the vehicle owner is identified, a notice goes out and enforcement starts.

If the same vehicle passes under an AET gantry, on the other hand, then the motorist is a presumptive customer. If the owner can be identified, then a bill is mailed with a surcharge. Remedies for violation and enforcement are deferred until time has passed without payment or response.

It is possible under this scenario to be both a customer and a violator in the same trip. For example, if only the York plaza were configured for AET, the northbound motorist would be a customer at York but a violator at New Gloucester and West Gardiner. A southbound motorist who pays cash to enter in South Portland would incur a bill by mail when passing through York -- without knowing it and with no apparent choice in the matter.

While these conflicting protocols do not rule out the possibility for using both systems on one road, they do create an ambiguous context in which to provide acceptable customer service. Confusion and frustration are likely.

Privacy. A significant number of motorists refuse to set up an E-ZPass account because of privacy concerns or because they have no relationship to a banking institution and do not want to deposit cash in an E-ZPass account. So long as participation in electronic tolling is voluntary, E-ZPass will never be universal. There will continue to be an upper limit on the extent to which E-ZPass is accepted and used by travelers, even in a region like ours with only one dominant toll regime. Retaining cash lanes deals with the issue without the privacy concerns generated by either electronic or video tolling under AET.

Staffing and employment. Adoption of AET at York would permit the Turnpike to reduce fare collection staff by about 23 full time equivalent employees (FTEs) but would require about 32 new employees with slightly higher salaries to support back office operations.

At West Gardiner/I-295 the reduction in fare collection FTEs would be about 9. The required increase in back office staff would be almost as large as for York because the percentage of motorists without E-ZPass is much higher at West Gardiner and diversion would be less than at York.

If AET were adopted for the whole road, the entire fare collection team of 117 full time employees and 145 part timers would be let go or transferred. On the basis of present data, it is difficult to project how many back office employees would be needed to manage AET for the entire road.

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Credit. Under the Turnpike's bond resolutions, a change to the toll structure requires an investment grade study by an independent consultant to certify that a new schedule will produce the revenue needed to keep promises to bond holders. The bond resolutions also require that "no free vehicular passage will be permitted over the turnpike, or any portion thereof, . . ." with narrow exceptions.

A proposal to convert to AET would not be approved by the bond trustee without certification that tolls are sufficient to overcome leakage losses, pay for added collection costs, and compensate for the uncertainties of an AET toll environment. A conversion to ORT, on the other hand, introduces few changes or uncertainties except for the capital cost of construction that can be amortized over the facility's service life.

Flexibility. The center of an ORT plaza is the functional equivalent of AET. The essential difference between the two systems is that ORT preserves the opportunity to collect cash on side lanes at the moment of passage. It also imposes immediate liability on those who fail to pay. If advances in technology or changes in federal law bring us closer to universal collection by electronic means, then an ORT plaza can be converted to AET by closing the cash lanes.

Summary of Pros & Cons. The pros and cons of AET may be outlined as follows:

Pros: Low capital cost	Cons: Higher operating cost
Little environmental impact	Uncollectible tolls -- leakage
Enhanced safety	Toll surcharge & fairness issues
	Traffic diversion caused by surcharges
	Unsuitability to Maine's traffic mix

AET is more viable for toll roads where high volumes of daily commuters pay electronically, where the motorists are predominantly from within the same state for ease of enforcement, where the toll is high enough to justify the cost of postage and back office processing, where land constraints make it difficult to build cash facilities next to the road, or where the capital expense of building new cash plazas outweighs future leakage and collection costs.

Conclusion

Because critical electronic components within its 19 toll plazas are becoming obsolete, the Maine Turnpike must move swiftly to complete necessary upgrades in cash and E-ZPass lanes.

In the past two years, the Turnpike has converted several side tolls to the new system and has installed the system as an ORT plaza for the mainline toll in New Gloucester. These conversions have yielded improved levels of service in a fashion that is both cost effective and free of substantial risk.

The York plaza presents a special challenge because it is difficult to retrofit modern electronics and vehicle sensor systems into a deteriorating structure at a poor site unsuitable for high speed tolling.

Over several years, the Turnpike has made substantial strides in expanding E-ZPass. One purpose for this effort was to enhance the possibility of considering AET for York or West Gardiner/I-295.

After careful study of the relative costs, financial risks, toll equities, and traffic impacts, Turnpike staff do not regard it as presently feasible to abandon cash collection for AET at either location.

Public Hearing

The board of the Turnpike Authority has yet to decide how to proceed at York or West Gardiner/I-295. The board will hold a public hearing on the AET issue at Turnpike Headquarters (Exit 46) on Thursday, June 19, 2014, at 6:00 PM. Turnpike staff and authors of the CDM Smith study will be present.

Minutes of a Meeting of the Board of the Maine Turnpike Authority July 24, 2014

5. Executive Director Peter Mills recounted the board's current posture in regard to a decision on the MTA's southern toll plaza. The first phase had been to determine if AET were feasible on the Maine Turnpike. If AET were determined not to be feasible, phase two would be to look at what could be done in the current location either with a conversion to Open Road Tolling (ORT) or through simply maintaining the current structure for a period of time. The third phase would be to look at a possible Open Road Tolling facility in other locations.

There was a lengthy discussion among the board members regarding AET.

- James Cloutier stated that he believed the MTA was an organization that embraced new technology but that AET, at the moment, was not such a huge priority for Mainers as a whole that it justified taking the risks to revenue or future bond ratings that a conversion to AET at this time would entail.
- Chairman Wathen stated that he had been impressed by the data that came out of the CDM Smith Study on surcharge rates and diversion.
- Robert Stone noted that during the last toll increase the focus from the public and legislators had been on toll equity which was not a concept which was consistent with the way AET worked. Mr. Stone stated that when technological innovations were implemented they should further, and not frustrate, the MTA's previously stated goal of creating greater equity in rates.
- Rick Goodrich stated that he believed that the projected surcharge and diversion rates were the key issues, and that these issues were particularly resonant in York County, where Route One was already exceedingly congested.
- John Dority echoed the importance of the diversion issue, stating as an analogy that MaineDOT probably would not allow, or would require very heavy mitigation for, a development that diverted traffic onto Route One in the levels projected for an AET Plaza. He stated that while the MTA would probably not be subject to the same requirements, the fact illustrated that for policy reasons diversion of this magnitude should be avoided.
- Deputy Commissioner Bruce Van Note stated that in his opinion a \$3 surcharge and diversion of 3,500 vehicles per day onto Route One simply would not work. Beyond this, he believed that preserving the integrity of the system was also vitally important. In his view people simply did not believe it was fair for cheaters to get free rides at the expense of others, and this was a consideration the board had to take into account.

7. On motion of James Cloutier, seconded by Robert Stone, and with unanimous approval of the members present it was resolved by the board as follows:

“After consideration of a report commissioned by the Authority from CDM Smith, recommendations of MTA staff and comments received from members of the public the board has determined that All Electronic Tolling (AET) is not feasible on the Maine Turnpike or in the best interest of the Maine Turnpike or Turnpike users at this time or for the foreseeable future. MTA staff is directed to continue to analyze other options for modernization of the Maine Turnpike Authority's toll collection system.”

Maine Turnpike Authority--Tolls and Discounts

The Turnpike enabling act contains these provisions in 23 MRSA §1973:

"4. Rates. The rate of toll at each toll facility may be revised from time to time.

A-1. The authority is prohibited from imposing variable surcharges based on the time of day.

B. A reduction in the rates of fees, fares and tolls may be given to any class of vehicle based upon volume of use."

(Paragraph A-1 prohibiting time of day surcharges is imposed by the tourism and hotel industries.)

Our rates and discounts are set and amended by order of the Maine Turnpike Board. Current rates and discounts took effect on November 1, 2012, and are not expected to change in the near future.

Family Volume Discount

At the same time as the toll increase, we adopted a family volume discount for automobile use that cuts the customer's bill in half if 40 trips are taken in one month or by 25% if 30 to 39 trips are taken in one month. The month of the trip is determined by the posting date. The discount applies to the family entire account which may have up to 4 transponders on it. It is the combined number of trips by the family that qualifies them for the discount. The discount is only available for personal E-ZPass accounts with transponders bought from the Maine Turnpike and it applies only to automobiles or automobiles towing trailers (our classes 1, 7 and 8).

Business Discount

Maine is one of the few authorities in the U.S. still offering a discount to its E-ZPass business customers. It has been in effect for decades and applies only to travel on the Maine Turnpike:

Under \$50 in tolls: no discount

\$50 to \$100: 10% of the amount over \$50

\$100 to \$300: \$5 plus 15% of the amount over \$100.

Over \$300: \$35 plus 20% of the amount over \$300.

General toll information

We charge \$10 plus 5.5% tax for each transponder. The transponder costs us \$7.40 plus \$2.74 for mailing. To open a personal account, we require a \$20 deposit against tolls. For business accounts, we require a deposit of \$20 for each axle. We charge nothing to keep a customer's account open. If the account has been dormant for a year, we close it out and return any funds on deposit.

E-ZPass customers with out-of-state transponders are charged the cash rate. Maine E-ZPass customers are charged by the length of trip at the rate of 7.7 cents per mile, subject to a minimum toll of 50 cents. The rate is never more than the cash rate and is usually less. For example, many of the shorter trips around Portland cost \$1 for cash but the E-ZPass rate is 50 cents whenever the trip is less than 6.5 miles long. If the family makes 40 trips or more on the same account, the E-ZPass rate then drops to 25 cents.

For cash customers, we have six barrier sites where tolls are charged in each direction, and 13 side tolls where a motorist is charged only upon entrance to the Turnpike. For personal automobiles, 12 of the side tolls and two of the barriers charge \$1; side tolls at Gray and Wells charge \$1.50; the barrier at West Gardiner/mainline charges \$1.75; New Gloucester mainline charges \$2.25; and York charges \$3.

If a Maine E-ZPass transponder isn't read under the antenna, the customer is charged the cash rate, but the trip still counts toward the discount. In fact the traveler might even get two trips toward the discount if the car went through two tolling sites that would otherwise have been matched to create one trip for a functioning transponder.

Other states

New Hampshire offers an across-the-board 30% discount for in-state personal E-ZPass accounts. Massachusetts has a three-tier system with its lowest rate for in-state E-ZPass, an intermediate rate for out-of-state E-ZPass, and its highest rate for toll-by-plate customers (30 cents higher than the out-of-state rate at each gantry). Rhode Island residents who buy an in-state E-ZPass are able to cross the Newport/Pell Bridge for 83 cents as opposed to \$4 for cash or for an out-of-state transponder. Every state with an E-ZPass discount allows motorists from out of state to open an in-state account and carry a separate transponder for that purpose.

Excerpts from the General Turnpike Revenue Bond Resolution of the
Maine Turnpike Authority

SECTION 101. Definitions.

* * * * *

"Traffic Consultant" shall mean an independent traffic consultant of nationally recognized standing or a firm or corporation of independent traffic consultants of nationally recognized standing selected by the Authority and appointed pursuant to a resolution of the Authority and having a favorable reputation for skill and experience in traffic engineering or consulting matters relating to facilities comparable in scope and character to the Turnpike.

* * * * *

SECTION 501. The Pledges Effected by this Resolution. (a) There are hereby pledged for the payment of the Bonds, in accordance with their terms and the provisions of this Resolution, subject only to the provisions of this Resolution permitting the application thereof for or to the purposes and on the terms and conditions herein and therein set forth including, without limitation, this Article V, Section 905 and Section 1005 hereof: (i) all Revenues; (ii) all moneys and securities in any of the Funds, Accounts and Subaccounts (except the Rebate Fund, the Subordinated Debt Service Fund and the Subordinated Debt Service Reserve Fund) together with the investment income therefrom except to the extent such income is required to be deposited in the Rebate Fund pursuant to a Supplemental Resolution; and (iii) all other moneys and securities to be received, held or set aside by the Authority or by any Fiduciary pursuant to this Resolution (except Subordinated Bond proceeds). It is the intention of the Authority that, to the fullest extent permitted by law, this pledge shall be valid and binding from the time when it is made, that the Revenues, moneys, securities and other funds so pledged and then or thereafter received by the Authority shall immediately be subject to the lien of such pledge and shall be valid and binding as against all parties having claims of any kind in tort, contract or otherwise against the Authority, irrespective of whether such parties have notice thereof. The Authority hereby confirms its pledge to the Surety Bond Provider of the Pledged Collateral, which pledge shall be subordinated to the pledge granted to the Bonds.

* * * * *

SECTION 706. No Impairment of Bondholders' Rights under Resolution. The Authority covenants and agrees that none of the Revenues will be used for any purpose other than as provided in this Resolution and no contract or contracts will be entered into or any other action taken by which the rights of the Trustee or of the Bondholders might be impaired or diminished. The Authority further covenants that it will, from time to time, execute and deliver such further instruments and take such further action as may be required to carry out the purposes of this Resolution.

* * * * *

SECTION 802. Toll Schedules and Revisions. (a) The Authority covenants that tolls will be classified in a reasonable way to cover all traffic, so that the tolls may be uniform in application to all traffic falling within any reasonable class regardless of the status or character of any Person included in the traffic, that no reduced rate of toll will be allowed within any such class except through the use of commuter passes or other privileges based upon frequency or volume, and that, except as provided in (b) below or as may be required from time to time on a temporary basis for the safe and efficient operation of the Turnpike, no free vehicular passage will be permitted over the Turnpike, or any portion thereof, except to members, officers and employees of the Authority and of the Department of Transportation and the state police of the State while in the discharge of their official duties and except to employees of independent contractors while in the performance of their duties for which the Authority has contracted and to emergency vehicles authorized by the Authority while performing emergency services on the Turnpike; provided, however, that the Turnpike may be used at any and all times by the armed forces of the United States, the State and any of their allies for defense purposes or

preparations therefor free of all tolls and charges, but any structural damage to the Turnpike created by such free use, ordinary deterioration or depreciation excepted, shall be compensated for at cost of repair or replacement.

(b) The Authority covenants that it will continue in effect the present schedule of tolls for traffic over the Turnpike until such schedule shall be revised as hereinafter provided and that, except as hereinafter provided in this Section, it will not authorize or permit a reduction or reclassification in toll rates or any modification (except for the conversion of the north end of the Turnpike to a closed barrier system) to the toll collection system in effect as of the effective date of this Resolution unless the Authorized Official furnishes the Trustee with a Certificate, based upon a Consultant's Report, stating that it is reasonably expected that the Net Revenue Requirement will be satisfied in the current Fiscal Year and in each of the five Fiscal Years following the rate reduction or reclassification or modification of the toll collection system. Subject to the foregoing provisions of this Section, from time to time and as often as it shall appear necessary the Authority will request the Consulting Engineers and the Traffic Consultants to furnish a Consultant's Report for the purpose of making recommendations as to a revised schedule of tolls and will inform the Trustee of such request. The Authority covenants that it will revise such schedule and such tolls as may be necessary or proper, in order that the Revenues will at all times be sufficient:

- (i) to provide funds for the payment of Operating Expenses; and
- (ii) to provide Net Revenues that are equal to or greater than the Net Revenue Requirement in any Fiscal Year;

provided, however, that nothing herein shall be deemed to limit the Authority's right in its discretion to revise such schedule and such tolls in a reasonable manner in order to provide additional Revenues for making deposits to the General Reserve Fund.

The deposit to the credit of the Debt Service Fund in any Fiscal Year of an amount in excess of the amounts provided for above for such Fiscal Year shall not be taken into account in adjusting the schedule of tolls for any subsequent Fiscal Year or Fiscal Years. Any deficiency in the Required Debt Service Deposit or the Required Reserve Maintenance Deposit, or the amount of any Required Debt Service Reserve Deposit, in any Fiscal Year shall, as promptly as may be practicable, be added to the amounts provided for above for the remaining Fiscal Years in adjusting such schedule of tolls, provided that the amount so to be added to meet the requirements of clauses (i) and (ii) above in each of such subsequent Fiscal Years may be based upon recommendations of the Consulting Engineers and the Traffic Consultant.

* * * * *

SECTION 805. Consulting Engineers and Traffic Consultant.

(a) The Authority covenants that it will, for the purpose of performing and carrying out the duties imposed on the Consulting Engineers by this Resolution, employ an independent engineer or engineering firm or corporation having a nationwide and favorable reputation for skill and experience in such work. Any Consulting Engineer employed by the Authority may be replaced by the Authority upon giving notice to the Trustee of thirty days, provided that the new engineer or firm or corporation shall be approved by a resolution adopted by the Authority and certified in writing by two Authorized Officials, including either the Chairman or Vice Chairman, to the Trustee that such engineer or firm or corporation qualifies under the criteria set forth under this Section 805.

(b) The Authority shall employ a Traffic Consultant, or cause the Consulting Engineers to employ a Traffic Consultant approved by the Authority, to perform any of the duties of the Consulting Engineers under this Resolution which would ordinarily be performed by a Traffic Consultant.



195 Church Street, Suite 7A
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tel: 203 865-2191
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January 12, 2017

Mr. Peter Mills
Executive Director
Maine Turnpike Authority
2360 Congress Street
Portland, ME 04102

Subject: AET Versus ORT Conversion Variables Considered at the York Mainline

Dear Peter:

You contacted our firm (CDM Smith) to conduct an objective evaluation of the gross and net revenue impacts of converting the York mainline plaza to either All Electronic Tolling (AET) or Open Road Tolling (ORT). CDM Smith has conducted studies for numerous clients throughout the United States (in Florida, North Carolina, Pennsylvania, Colorado, and Texas, among others) where those studies have led to the successful implementation of AET. In fact, most studies in recent years have resulted in conversion to AET and not ORT.

Quite frankly, at the outset of this study, I assumed that AET would also provide a viable toll collection solution to the problems that currently exist at the York mainline plaza. It is also not surprising that others would have come to the same conclusion. MassPike recently converted to AET, New York City's MTA bridges and tunnels are converting to AET, the Pennsylvania Turnpike is studying conversion to AET. It would only seem logical that AET would also be a viable alternative at the York mainline.

However, after having conducted our analysis at the York plaza, using the same approach we've used on other conversion studies, we estimated that a \$3.00 passenger car video surcharge would be required to offset projected net revenue losses at this location. The \$3.00 surcharge amounts to a doubling of the current passenger car cash toll rate. Based upon the impacts of these measures, previous professional tolling recommendations, and an MTA staff recommendation, the MTA Board of Directors selected ORT over AET at the York mainline.

Various groups and individuals have questioned the Board's decision given the many benefits of AET (no stopping by any motorist, lower capital costs, etc.) and in light of the fact that AET is being implemented on numerous facilities throughout the United States. Upon analysis, it turns out that the York mainline operating characteristics are rather unique and set it apart from other toll facilities that have been converted to AET. In fact, these same unique factors have led the New Hampshire Department of Transportation to convert its Hampton mainline toll plaza (a 15-minute drive south of the York mainline) to ORT and not AET. In May of 2013, New





Mr. Peter Mills
January 16, 2017

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Hampshire opened its second ORT plaza at Hooksett. Each facility must be evaluated in the context of its particular mix of patrons, operating characteristics, and the larger transportation system it operates in.

The following factors were taken into account as part of the CDM Smith analysis and all contribute to the ultimate decision for conversion to ORT and not AET at the York toll plaza:

1. **High current cash market share.** Almost 30 percent of current transactions at York do not pay via E-ZPass. Under AET, all non-E-ZPass transactions will become video transactions. Nearly 100 percent of toll revenue leakage with AET comes from the video component. For this reason, the majority of toll facilities that have converted only do so when they have reduced cash toll transactions to 20 percent, or less, of total transactions. Video transactions on the recently converted MassPike, for example, account for only 15 percent of total toll transactions. Minimizing cash transactions at the time of conversion reduces the financial risk of revenue loss.
2. **High proportion of out-of-state cash motorists.** Compounding the negative impact of a high cash market share at the York mainline is the fact that the majority of them are out-of-state motorists. Only about 37 percent of cash paying motorists at York are Maine residents. In fact, about 5 percent of York cash customers are from out-of-country (i.e., from Canada). Out-of-state motorists' license plate images are less likely to be correctly identified, they have a lower invoice payment rate, and they are much more difficult to successfully collect on through second party collection efforts. I am not aware of any other toll facility that has converted to AET where only 37 percent of cash customers are in-state.
3. **High proportion of low frequency users.** Just over 61 percent of passenger car cash motorists use the York mainline only a few times a year. Very low frequency (and most likely, out-of-state) users are more difficult to collect from. Even Maine's existing reciprocity agreements recognize that interstate enforcement may not be invoked until a violator has accumulated a threshold number of violations sufficient to make enforcement worthwhile. Between New Hampshire and Maine the threshold is ten violations. Between Massachusetts and Maine, the threshold is a minimum of \$25 in unpaid tolls.
4. **Accessible parallel alternative route.** Route 1 provides a parallel alternative route to the Turnpike. Those wishing to avoid a doubling of the toll rate could divert to it for



Mr. Peter Mills
January 16, 2017

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many of their trips. Relatively low diversion would be expected during the peak summer tourist months. But, significant additional capacity exists for diversion during off-peak time periods and at all times during the off-peak winter months. Many, if not most, AET facilities have been implemented on tunnels or bridges (where alternative routes are also tolled) or are in more congested urban settings with less attractive alternative diversion routes.

5. **Partial AET conversion.** In the event the York mainline were converted to AET, it would be the only AET facility on the Maine Turnpike System. All other locations on the Maine Turnpike would require motorists without E-ZPass to stop and pay a cash toll. Given the very high percent of out-of-state (and low frequency) cash users, this would undoubtedly cause much confusion at subsequent tolling locations north of the York plaza. Violations would likely increase as cash motorists incorrectly assume they use the E-ZPass lanes at all toll plazas. I am not aware of any other similar situation where a single tolling point has been converted to AET, with the remainder of the system continuing to operate as a traditional (or ORT) toll facility.
6. **Obsolete Maine Department of Motor Vehicle (DMV) Records.** Actual experience by Maine Turnpike Authority staff to identify current toll violators shows that just over 17 percent of requests to the DMV do not produce valid/current mailing addresses. This is extremely high compared to other states. In our experience, most states are unable to match a license plate to an address in only 5 to 10 percent of the time.

Our role in this analysis was to assess the likely impact these variables would have on net revenue collections at York assuming both AET and ORT conversion. None of the above factors negatively effects toll revenue collection under ORT (at least not compared to current toll collection at York). Cash customers under ORT would continue to be treated as they currently are at York. Under AET, however, the combined effect of each of the above factors leads to revenue losses that require the substantial video toll surcharges recommended in our report.

If you have any questions or comments, please do not hesitate to contact me at your convenience.

Very truly yours,

A handwritten signature in black ink, appearing to read "Gary T. Quinlin".

Gary T. Quinlin
Project Manager
CDM Smith, Inc.



Town of York

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York, Maine 03909-1314

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Tax Collector
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Finance/
Treasurer
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Code Enforcement
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Planning
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Assessor
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Police Department
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Dispatch
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York Beach Fire
Department
(207)363-1014

York Village Fire
Department
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Public Works
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www.yorkmaine.org

Maine Turnpike Authority
Board of Directors:
2360 Congress Street
Portland, ME 04120

May 20, 2014

Dear Board of Directors:

The citizens of York, organized under the aegis of Think Again, are once again preparing to engage the MTA on the siting of new toll facilities.

The York Board of Selectmen thereby reaffirms their policy position on the toll collection system at the York Toll Plaza as follows:

1) The York BOS recognizes that all electronic tolling (AET) is and should be the ultimate policy goal for an integrated interstate toll collection system. However, we recognize that certain technical and political impediments make adoption of this AET system unfeasible at present.

2) The York BOS recognizes that 34% of MTA toll revenues consist of cash payments, indicating that Open Road Tolling is the next most desirable collection format.

3) The York BOS remains steadfast in its belief that the current toll booth location is suitable for the location of an ORT system.

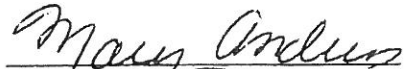
A) The current toll booth location is dimensionally capable of accommodating an ORT system.


B) The issue of land subsidence at the current toll booth location is susceptible to technical analysis and remediation and should not be considered an impediment to a retrofit. In fact, a technical resolution of this subsidence issue will be mandatory for the continuing viability of the roadway itself regardless of the toll booth siting.

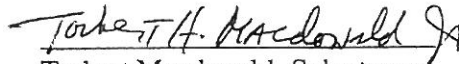
C) The benefits of constructing an ORT system at the current toll booth location are myriad: the avoided cost of new land acquisition; the avoidance of new environmental impacts in the invaluable Mt. Agamenticus region of Town; and the avoided impact of quality of life diminishment and the impact of land taking in a community unified in opposition to such action.

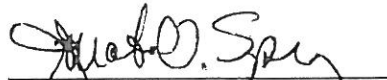
Therefore, the York BOS encourages the MTA Board of Directors to pursue the engineering studies necessary to prove the viability of an ORT plaza at the current location of the York Toll Plaza. All other options will be strenuously opposed by the Town of York.

Respectfully,
Town of York, Board of Selectmen


Mary Andrews, Chair


Robert E. Palmer Jr., Vice Chair


Torbert Macdonald, Selectmen


Jonathan O. Speers, Selectmen


Ronald Nowell, Selectmen

Cc: Robert G. Yandow, Town of York Town Manager
Peter Mills, MTA Executive Director
MTA Board of Directors:
Chair Daniel E. Wathen
Vice-Chair James F. Cloutier
Freeman R. Goodrich
Gerard P. Conley Sr.
Robert D. Stone
John E. Dority
Bruce Van Note
Mary E. Costigan, Town of York – Town Attorney



**YORK TOLL PLAZA REPLACEMENT PROJECT
EVALUATION MATRIX
SUBJECT TO DESIGN REFINEMENTS**
October 13, 2015

Approximate Location \ Evaluation Parameter	ENGINEERING / SAFETY								ENVIRONMENTAL										
	Horizontal Alignment ⁽¹⁾		Vertical Alignment ⁽¹⁾		Sight Distance ⁽²⁾	Separation from Interchange (>1 mile) ⁽¹⁾	Historic Crash Data ⁽³⁾	Geotechnical ⁽⁴⁾	Wetland Impacts (Total) ⁽⁵⁾	Impacts to Maine DEP Wetlands of Special Significance ⁽⁵⁾	Wetlands Relative Function and Value ⁽⁶⁾	Stream Impacts ⁽⁷⁾	Vernal Pool Impact (Total) ⁽⁸⁾		Impacts to Maine DEP Vernal Pool of Special Significance		FEMA Floodplain ⁽⁹⁾	Cultural / Historical Resources ⁽¹⁰⁾	Potential Threatened / Endangered Species Habitat (State Listed) ⁽¹¹⁾
	Cash Plaza on Crest	Cash Plaza - Approach Grades between +1% and +2%	ORT Lanes on Existing or New	No.									(SF)	No.	(SF)	(Acres)			
Mile 7.3	On Curve	Average	Poor	New	Average	No	43	Clay	5.5	1.9	High	360	1	1,750	0	0	3.0	No Impact	1
<i>Other Sites Analyzed</i>																			
Mile 8.1	Curve on approach	Average	Poor	Existing	Average	Marginal	23	Ledge	1.0	0.1	Average	50	0	0	0	0	0.5	No Impact	3
Mile 8.8*	On straight	Good	Average	Existing	Good	Yes	13	Ledge	1.0	0.8	Average	80	2	7,230	1	950	0.3	No Impact	3
Mile 10.0	Curve on approach	Average	Average	Existing	Average	Yes	21	Ledge	1.0	1.0	High	160	4	32,480	4	32,480	0.0	No Impact	2
Mile 13.2	On straight	Good	Poor	Existing	Good	Yes	18	Ledge	0.7	0.2	Low	140	2	7,430	0	0	0.0	No Impact	1
Low-Range of Impacts	On straight	Good	Good	Existing	Good	Yes	Low-range	Good	< 0.34	No Impact	Low	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact
Mid-Range of Impacts	Curve on approach	Average	Average	New	Average	Marginal	Mid-range	Marginal	≥ 0.34 – 3.0	Resource Impacted	Average	Resource Impacted	Resource Impacted	Resource Impacted	Resource Impacted	Resource Impacted	Resource Impacted	Resource Impacted	Resource Impacted
High-Range of Impacts	On Curve	Poor	Poor		Poor	No	High-range	Poor	> 3.0		High								

Approximate Location \ Evaluation Parameter	ABUTTER IMPACTS			LOGISTICS DURING CONSTRUCTION			COSTS / FINANCIALS		
	Potential Right-of-Way Impacts ⁽¹²⁾	House Displacement within 75 feet of direct impact line ⁽¹³⁾	Houses within 1000 feet of direct impact line ⁽¹⁴⁾	Constructability ⁽¹⁵⁾	Safety of Toll Collectors ⁽¹⁶⁾	Traveler Impacts ⁽¹⁷⁾	Initial Capital Costs ⁽¹⁸⁾	Revenue Loss during Construction ⁽¹⁹⁾	Life-Cycle / Operations Costs ⁽²⁰⁾
	Acres						\$Millions		
Mile 7.3	0.1	0	47	Difficult	Extra Precaution	Intermediate	\$60.4	Significant	Not Typical
<i>Other Sites Analyzed</i>									
Mile 8.1	2.0	0	6	Conventional	No Impacts	Intermediate	\$39.7	Minimal	Typical
Mile 8.8*	0.3	0	4	Conventional	No Impacts	Minor	\$40.8	Minimal	Typical
Mile 10.0	3.5	0	46	Conventional	No Impacts	Minor	\$42.6	Minimal	Typical
Mile 13.2	2.5	1	41	Conventional	No Impacts	Minor	\$46.6	Minimal	Typical
Low-Range of Impacts	0 – 0.9	0	0 – 10	Conventional	No Impacts	Minor		Minimal	Typical
Mid-Range of Impacts	1.0 – 3.0	NA	11 – 30	Difficult	Extra Precaution	Intermediate		Significant	Not Typical
High-Range of Impacts	>3.01	>0	>31			Major			

* Recommended for 10% design and further analysis.

Footnotes:

- Horizontal Alignment, Vertical Alignment and Separation from Interchange (>1 mile) values are based on criteria and design policies from the guidelines in the Federal Highway Administration report "State of the Practice and Recommendation on Traffic Control Strategies at Toll Plaza" 2006 and American Association of State Highway and Transportation Officials (AASHTO) "A Policy on Geometric Design of Highways and Streets", 2011.
- Sight Distance value is based on the criteria and design policies from the guidelines in the American Association of State Highway and Transportation Officials (AASHTO) "A Policy on Geometric Design of Highways and Streets", 2011.
- Information is based on MaineDOT's historical crash data and MaineDOT Office of Safety guidelines. Sites with 30 or more crashes were identified as high-range. Sites with 20-30 crashes were identified as mid-range. Sites with less than 20 crashes are low-range.
- Geotechnical. Green represents mostly stable granular soils, no apparent groundwater impact, and no apparent bedrock excavation (ledge). Yellow represents ledge excavation, possible unstable soils, and minor groundwater impacts. Red represents soft and compressible soils, impacts due to high groundwater elevation.
- Wetland Impacts are based on anticipated direct impacts on field delineated wetlands. Severity of impact based on level of USACE permitting required. Category 1 is non-reporting to the Corps. Category 2 requires notification to Corps but meets General Permit requirements. If not Category 1 or 2, a USACE Individual Permit must be obtained.
- Wetland Relative Function and Value is based on a preliminary comparative assessment of each proposed location in accordance with U.S. Army Corps of Engineers methodology.
- Stream Impacts are based on anticipated direct impacts to potentially jurisdictional waterways, which could be modified based upon regulatory agency determinations.
- Vernal Pool Impacts are based on anticipated direct impacts within Significant and Non-Significant Pools.
- Floodplains are based on anticipated direct impacts.
- Cultural / Historic Resources are based on anticipated direct impacts.
- Potential Threatened / Endangered Species Habitat (State Listed) are based on anticipated direct impacts within a State or Federally designated habitat area.
- Potential Right-of-Way Impacts is land that would need to be acquired and used as a right-of-way for the new toll facility. Right-of-way impacts may include construction of a new administration building, parking lot, highway widening or retaining wall. Right-of-impacts do not include new access road to the new administration building.
- House Displacement is quantified for houses within 75 feet of direct impact line. The direct impact line is the cut or fill limit shown on the conceptual plans.
- Houses within 1000 feet from direct impact line.
- Constructability is measured by construction constraints that may include poor soils conditions, environmental impacts, tolling equipment / installation, traffic management, and/or construction phasing.
- Safety of Toll Collectors. Identifying the safety of the toll collectors and maintenance staff who may have to walk through a construction zone.
- Traveler Impacts may include traffic delays or construction of the new plaza being within proximity of the existing toll plaza.
- Initial Capital Costs. Costs to construct the new toll facility, access road, utilities, utilities removed from existing toll facility, demo of the existing toll facility and reconfigure to a highway, wetland mitigation, toll equipment and systems, ROW acquisition, design/construction engineering and 10% contingency.
- Revenue Loss during Construction. It is anticipated there will be revenue lost if traffic is diverted during construction.
- Life-Cycle / Operations Costs. The life-cycle costs are associated maintenance issues. Example, paving operations may be on a 6-year cycle rather than a 10-year cycle.

Memorandum

To: Maine Turnpike Authority: Daniel Wathen, Chair, James Cloutier, Vice Chair, Gerard Conley, John Dority, Robert Stone, Freeman Goodrich, Karen Doyle, MaineDOT

From: MTA Staff: Peter Mills, Executive Director, Doug Davidson, Chief Financial Officer, Peter Merfeld, P.E., Chief Operating Officer, Bruce Van Note, PLS, Esq., Dir, Policy and Planning, Ralph Norwood, P.E., Project Manager, Sara Zografos, Planning and Permitting

Re: Staff Recommendation for the Preferred Site for the New Toll Plaza in York

Date: November 16, 2015

Before the Board is the question of choosing a preferred alternative for permitting and final design of a replacement toll plaza at York. Jacobs Engineering has recommended the site near Mile 8.8, a recommendation that is consistent with the previous analysis by HNTB, the MTA's General Engineering Consultant.

MTA staff recommends that the Board select the Mile 8.8 site as its preferred alternative. It is one of the safest sites; it meets all applicable design standards and guidelines; it has low environmental impacts. It has limited effect on very few abutters, except for those who will benefit from closing the existing plaza at Mile 7.3. It will be straightforward to construct and will impose few challenges for travelers or toll collectors. It will cost less to build and will minimize revenue losses during construction.

Background

The York Toll Plaza, the gateway to Maine, is one of the most important elements of transportation infrastructure in the State. It generates about \$56 million in tolls per year (about 45% of all MTA revenue) and is a central reason why two-thirds of all MTA tolls are paid by out-of-staters.

The existing plaza is old and must be replaced. Originally designed in the 1960's as a temporary barrier plaza for all vehicles to stop, take tickets and pay tolls, its approaches are sinking into clay soils. It has a leaking tunnel full of electrical components. Its present suite of outdated toll equipment is held together with used parts. The plaza is located on a curve at the bottom of a hill near an interchange and an overpass. This raises safety concerns and contributes to an environment of unnecessary noise. It is located on poor soils, surrounded by wetlands. It does not provide highway speed electronic tolling that travelers and freight haulers now expect and deserve. The MTA has been seeking to deliver this project for over ten years.

In the early phase of MTA's studies, extensive expert analysis by HNTB supported replacing the current barrier plaza with a new open road toll at any of several locations north of the current plaza, including one at Mile 8.7.

In 2011, MTA decided to take a fresh look at critical project issues such as toll collection systems (ORT vs. AET), plaza sizing, and plaza locations. MTA retained CDM Smith, a nationally known toll consultant, to analyze the impact and consequences of implementing AET.

On July 24, 2014, after three years of study, the Board accepted the recommendation of staff that AET is not feasible on the Maine Turnpike. Nor would it be in the best interests of Turnpike users. Among other things, it would require non E-ZPass toll rates at York initially to double from \$3 to \$6 to compensate for lost revenue from toll violations and from diversion, estimated at 3,400 to 5,500 vehicles per day. This would further snarl already congested roads like Route 1.

In August 2014, MTA retained Jacobs, another experienced engineering consultant, to obtain more detailed environmental information, reconsider ORT plaza sizing, take a fresh look at options near the current plaza at Mile 7.3, and analyze other plaza locations. In June 2015, after a detailed look at the current plaza site, Jacobs recommended focusing on Mile 8.8 for further evaluation.

Throughout the years, MTA staff has fully engaged the Town of York and its residents. Since the project was first proposed over 10 years ago, MTA staff has met with York officials and residents dozens of times, including about 14 times since Jacobs was retained. On September 3, 2015, 21 York residents expressed concerns at the Board's regular meeting. In a separate Memorandum to the MTA Board, MTA staff has responded to each comment. MTA will continue to listen to concerns arising in York, including those who will benefit from closure of the old plaza at Mile 7.3.

Although local opinions are important, MTA's legal and fiduciary obligations extend to all 1.3 million residents of Maine and to Turnpike customers who make 62 million Turnpike trips each year. It is the Turnpike's obligation to seek a site that is safe, affordable, and least disruptive to travelers, abutters, toll collectors, and the environment.

Mile 8.8 is that site. MTA staff concur with previous expert analyses and recommendations by Jacobs and HNTB, and recommend that the Board do so as well.

Reasons for Recommending the Mile 8.8 Site

Voluminous technical memos, reports, maps, and charts support the selection of the Mile 8.8 site as a preferred alternative. Perhaps the most useful document is the final Evaluation Matrix and its supporting Technical Memorandum dated October 13, 2015, prepared by Jacobs.

MTA staff recommends the Mile 8.8 site because it will be safe and will have low environmental impact with negligible effect on abutters. It will be more straightforward to construct, will reduce impacts on travelers and toll collectors, and will cost less than other sites.

1. Overview of All Sites. The Evaluation Matrix and supporting Technical Memorandum describe commonly accepted criteria for such an alternatives analysis. The matrix identifies 25 evaluation criteria grouped in five categories: (a) Engineering/Safety, (b) Environmental, (c) Abutter Impacts, (d) Logistics During Construction, and (e) Cost/Financial. Each factor is defined. To provide a convenient comparison, relative ratings are color coded. Although not

determinative, a summary of these site suitability rankings for each of the five sites analyzed by Jacobs is illustrative.

York Toll Plaza Replacement Project Summary of Site Suitability Rankings				
Approximate Location	# Green Ratings	# Yellow Ratings	# Red Ratings	Comment
MM 7.3	4	13	8	Near existing plaza
MM 8.1	11	13	1	
MM 8.8	15	10	0	Recommended for further evaluation
MM 10.0	11	11	3	
MM 13.2	15	7	3	

Two observations are apparent from this chart. First, the Mile 8.8 site has the highest number of green ratings (tied with one other site) and has no red ratings. Second, the Mile 7.3 site – with 4 green and 8 red ratings – is inferior to any of the other four.

2. Engineering/Safety. Mile 8.8 is one of the safest sites for a new ORT plaza. It meets national engineering standards and guidelines and is consistent with the Turnpike's obligations under environmental rules. There will be less braking, weaving, and confusion at Mile 8.8, and thus fewer accidents and less noise. All lanes will be used more fully, thus easing congestion. Regarding engineering and safety considerations as a whole, the bottom line is this: Professional Civil Engineers having substantial experience with such facilities would all agree that an ORT plaza located on a straight section of highway at the crest of a hill away from interchanges and overpasses will be safer than an ORT plaza located on a curve, at the bottom of a hill, near an interchange and overpass, if all other factors are equal. Other sites also have favorable engineering or safety ratings, but they have other less desirable impacts - such as the displacement of a home.
3. Environmental. The Mile 8.8 site has low environmental impact. Applying the conceptual plaza design to field mapping of wetlands and other environmental features yields anticipated impacts to only one acre of wetland, two vernal pools, and 80 feet of stream. These are low for a project of this significance, and will likely be less after mitigation during final design. Environmental rules require regulators to select the least environmentally damaging practicable alternative (LEDPA). MTA staff firmly believe that Mile 8.8 is that site.
4. Abutter Impacts. Although questions from people who live near any site are to be expected, the reality is that impacts to abutters and nearby residents at the Mile 8.8 site are the lowest of

all the five sites examined. The site will not displace any homes. There are only four houses within 1,000 feet of the project limit lines and two of these are at the outer edge of this perimeter. There is one house to the east in the Whippoorwill subdivision and three houses to the west on the Chase's Pond side.

Although questions from nearby residents are expected, it is important to consider net local impacts. Moving the plaza to Mile 8.8 will lead to demolition of the existing plaza at Mile 7.3. Vehicles will no longer need to brake for a plaza there, nor accelerate as they depart. An ORT plaza, by design, produces less noise and fewer emissions. The result will be fewer impacts overall and fewer residents affected.

5. Logistics During Construction. The project at Mile 8.8 will be straightforward to build and take less time. Like most of the sites considered – other than Mile 7.3 and possibly Mile 8.1 – construction phasing is easier and disruption to travelers and toll collectors will be less because the existing 3 lanes of highway will essentially become the ORT lanes. Soils are more favorable. Traffic from the existing toll booth will not interfere with construction.
6. Costs / Financial. Jacobs's current estimate of the capital cost for Mile 8.8 is \$40.8 million, the second lowest of the five sites considered. That estimate includes the cost of demolishing the existing plaza and of narrowing the highway near Mile 7.3. But it does not include the cost of property acquisition to allow "apples-to-apples" comparisons among all sites. (The cost of acquiring the Morrison property was \$925,000.) Although the Turnpike must develop all capital projects with a sensitivity to cost, cost alone is not a primary consideration in recommending the site at Mile 8.8. Even if the cost were significantly higher, its safety, environmental, logistical, and other benefits make it far superior to other choices.

Mile 8.8 and all sites considered – other than Mile 7.3 - will cause minimal loss of toll revenue during construction. Mile 8.8 and all the alternative sites considered – other than Mile 7.3 – are estimated to have similar life cycle and operational costs going forward.

7. Mile 8.8 vs. Mile 7.3 Comparison. Despite the weight and depth of the information outlined above, certain York citizens continue to advocate for building at Mile 7.3 and argue that the MTA Board must evaluate how the two sites compare with each other. By any objective comparison Mile 7.3 is inferior to the Mile 8.8 site and to any of the other sites. More study will not alter that conclusion.

York Toll Plaza Replacement Project Comparison of MM 8.8 and MM 7.3 Sites				
Evaluation Factor	Jacobs Matrix Col. #	MM 8.8*	MM 7.3	Comments
Engineering / Safety				
Horizontal Alignment	1	On-straight	On curve	MM 8.8 is superior to MM 7.3 from an engineering/safety perspective.
Vertical Align. - Cash Plaza on Crest	2	Good	Average	
Vertical Align. - Approach Grades	2	Average	Poor	
Sight Distance	3	Good	Average	
Separation from Interchange (> 1 mile)	4	Yes	No	
Historical Crash Data	5	Non HCL	HCL	
Geotechnical (soils)	6	Ledge	Clay	
Environmental				
Total Wetland Impact (acres)	7	1.0	5.5	MM 7.3 would impact over 5 times more wetlands.
Wetland Relative Function and Value	9	Average	High	Wetlands at MM 7.3 are higher value.
Stream Impacts (feet)	10	80	360	
Vernal Pool Impact - #	11	2	1	
Vernal Pools of DEP Significance - #	12	1	0	
FEMA Floodplain Impacts (acres)	13	0.3	3.0	
# Potential E/T Species Habitat Impacts	15	3	1	Long-eared bat potentially at all sites.
Abutter Impacts				
Potential R/W Impacts (acres)	16	0.3	0.1	Either option requires minimal land acquisition.
Houses Within 1000 ft	18	4	47	No houses displaced by either option.
Logistics During Construction				
Constructability	19	Conventional	Difficult	MM 8.8 would take significantly less time to build.
Safety of Toll Collectors	20	No Impacts	Caution	Extra precautions required to assure safety.
Traveler Impacts	21	Minor	Intermediate	Substantial disruption to travelers at MM 7.3.
Cost / Financial				
Initial Capital Cost	22	\$40.8	\$60.4	MM 8.8 would cost almost \$20M less.
Revenue Loss During Construction	23	Minimal	Significant	Diversion due to traveler disruption.
Life Cycle Cost / Operations	24	Typical	Not Typical	Settlement not eliminated, more frequent paving.

*Recommended for further design and analysis.

The Mile 7.3 site is inferior in every category.

- a) Engineering/Safety. Mile 7.3 is located at the bottom of a hill, on a curve, near an interchange and an overpass on poor soils surrounded by wetland. It was built in the 1960's as a temporary barrier plaza at which all vehicles stopped to take tickets and pay tolls in cash. At that time, high speed tolling, current design standards, and today's environmental rules did not exist. If they had, it would not have been built where it is today.

The new site selected should meet today's national engineering standards and guidelines, consistent with MTA's obligations under environmental rules. The Mile 7.3 site does not do so. The Mile 8.8 site will.

- b) Environmental. Mile 7.3 would impact about 5 times more wetlands and streams. The wetlands at Mile 7.3 have higher function and value than those at Mile 8.8. Environmental rules require the selection of the least environmentally damaging practicable alternative (LEDPA).
- c) Abutter Impacts. There are 47 houses within 1,000 feet of the project limit of the plaza at Mile 7.3. There are far fewer houses near other sites. There are only four houses within 1000' of the Mile 8.8 project limits and two of these are at the outer fringe of that perimeter.

- d) Logistics During Construction. Construction phasing, maintaining toll collection, and shoring of potentially unstable soils at the Mile 7.3 site would make construction significantly more complicated there. It will take longer and cause more disruption of traffic and the surrounding terrain.
 - e) Costs/Financial. The estimated capital cost of construction at Mile 7.3 is \$60.4 million, as much as 50% more than other alternatives. Mile 7.3 is projected to cause toll revenue losses due to diversion estimated at one to two million dollars per year. The long term cost of maintaining an ORT plaza at Mile 7.3 will be higher than other sites because some continued settlement is anticipated despite soil stabilization. This would likely require more frequent re-paving cycles.
8. All Factors Point Toward Mile 8.8. The site alternatives analysis does not present a significant conflict among the factor categories as sometimes happens with other projects. Mile 8.8 is one of the safest alternatives and has relatively low environmental impact. It is estimated to cost less and it compares well on other factors.

For these reasons, MTA staff recommends that the Board select the Mile 8.8 site for the replacement ORT plaza in York for the purpose of applying for permits and moving to final design.

Turnpike staff remain committed to working with all interested parties, including York officials and nearby residents, in a fair, open and respectful manner toward the goal of replacing the current deteriorating and outdated barrier toll with a modern ORT plaza that is safer, affordable, and less disruptive to travelers, abutters, toll collectors, and the environment.

Extracts from the minutes of a meeting of the Maine Turnpike Authority on November 19, 2015:

5. Chairman Daniel Wathen introduced a memorandum to the board from MTA staff dated November 16, 2015, recommending the selection of Mile 8.8 as the preferred alternative for permitting and final design of a replacement toll plaza in York, a copy of which memorandum is attached to these minutes and incorporated herein.

6. John Dority stated that he had been involved with the York Toll Plaza since 1968 and that he believed that the Mile 8.8 Site, unlike the current site, met all engineering standards for toll plazas.

7. James Cloutier stated that he believed there were three factors to be considered in a decision like this: (1) environmental considerations, (2) engineering and safety, and (3) local opinion. He said he believed there was a very strong technical case to be made for the mile 8.8 site, both as compared to the current site and other locations studied. Mr. Cloutier said that he believed that the the concerns that had been expressed by Think Again and others could not outweigh the fact that the first two factors were so overwhelmingly in favor of mile 8.8. Mr. Cloutier stated that the comparable costs of the site were not as important a factor to him as the environmental and engineering factors.

8. Chairman Wathen stated that Mr. Cloutier had summarized his own opinion well. He said that if there had been a "close call" here between mile 8.8 and the existing site as far as engineering considerations went, then the difference in cost would not be a deciding factor with him. He stated that he agreed with Mr. Cloutier that mile 8.8 was clearly a far superior location.

9. On motion of Rick Goodrich, seconded by Gerard P. Conley, Sr., and with unanimous approval of the members present, it was voted to designate mile 8.8 as the MTA's preferred alternative for replacement of the York Toll Plaza currently located at mile 7.3.

EXECUTIVE SUMMARY

ES Executive Summary

The Massachusetts Department of Transportation (MassDOT) is studying the feasibility of implementing a statewide tolling strategy to improve the safety and efficiency of highway operations. An important element of this study involves developing and comparing alternative tolling methods for the Massachusetts Turnpike system. The system is comprised of the 124-mile Western Turnpike (Interstate Highway I-90) between the New York state line and Exits 14/15/55 in Weston, and the Metropolitan Highway System (MHS) which includes the urbanized part of I-90 as well as the Sumner/Callahan Tunnels, the Ted Williams Tunnel, and the Tobin Bridge. This study focuses on the Western Turnpike (WT).

Toll collection operations between all seventeen toll locations on the WT are closely linked, and improvements made to individual toll locations or interchanges in isolation could have negligible benefits if not negative impacts throughout the system. For this reason, the existing and future baseline conditions of the Western Turnpike were reviewed system-wide, as were the alternatives developed and compared during the course of the study.

The purpose of this study was to consider the potential benefits and costs of replacing today's interchange-based toll system with a new system of mainline-based toll points relying to varying degrees on electronic toll collection. The broad categories of alternatives considered were all electronic tolling (AET) and open road tolling (ORT).

AET is a tolling approach first implemented on the 407 Express Toll Route (ETR) in Toronto, Canada in 1997 and has since been successfully implemented in the United States by various toll agencies. AET eliminates delays associated with tolling, thereby providing convenience and time savings to all customers who are offered two payment options, Electronic Toll Collection (ETC) and video tolling. With AET, there are no parallel service roadways and no cash toll plaza lanes. Vehicles in an AET environment, from which a transponder was not detected, are not immediately treated as violators. Rather, they are invoiced based on the license plate number and address associated with it.

ORT is a tolling approach that has been successfully implemented by many toll agencies. It is a tolling strategy intended to provide maximum convenience and time savings to ETC customers, the payment method exposing an agency to the lowest processing cost, highest accuracy and lowest payment risk to the operating agency. This is accomplished by installing gantry structures above all travel lanes to support toll equipment to identify vehicles by both a transponder and license plate number. ORT lanes have been implemented as ETC-only and combined ETC and video tolling. The "ORT Toll Plaza" design concept has emerged as the best way to accommodate E-ZPass and cash toll collection at a given location. Drivers with E-ZPass are provided high-speed, multi-lane free-flow ORT lanes, and cash-paying drivers are provided adjacent cash toll plaza lanes.

Options were developed for each of the basic ORT and AET concepts to test the effectiveness of varying the number and location of plazas in the case of ORT, and gantries in the case of AET. These "build" alternatives were compared to each other and to the "no-build" alternative, which represented continuation of the existing ticket and interchange based toll system.

In summary, the study found that "No-Build" is the worst alternative. Either ORT or AET would be a clear improvement over doing nothing.

- When comparing the "Build" alternatives the study found that ORT works well, but with important caveats and issues to address.

EXECUTIVE SUMMARY

- AET also works well, and further improves over time with:
 - Higher E-ZPass participation
 - Improved video technology
 - Higher rates of video compliance

AET is the recommended alternative with gantries in all major segments (the "AET MSM Alternative"). It is recommended because it would provide:

- Lowest up-front capital cost
- Highest traffic and environmental benefits
- Least disruptive to implement /shortest schedule
- Reasonable Year 1 performance
- Best long-term net present value
- Other benefits:
 - Rate adjustments based on time-of-day, congestion or other factors possible with AET
 - AET is simple for drivers to navigate.

ES.1 Owner Facilities and Operational Review

1.1 Prior Studies Review

MassDOT and its predecessor agencies have conducted several studies over the past several years on specific issues relevant to tolling on the Western Turnpike, and other states have recently completed similar studies. Together, these studies provided useful background data and information for the new analysis.

1.2 Western Turnpike Overview

The Massachusetts Turnpike, like most toll facilities of its vintage such as the Pennsylvania Turnpike, New Jersey Turnpike, New York Thruway and others from the 1940s and 1950s, was built as a "ticket system" toll road. The toll was set based on the length of the trip and the size of the vehicle. Trip length was determined by issuing the driver a ticket at entry to the toll road which declared the entry point, and then collecting that ticket plus the toll due when the driver would exit.

1.2.1 Traffic Challenges

To economize construction on these early expressways, the limited-access interchanges were designed to funnel all movements, entry and exit, east-bound and west-bound, into a single toll collection point where staffed toll collection operations were conducted. These "trumpet" type interchanges – named for their resemblance to the bell and tubing of a trumpet – are functionally obsolete by today's engineering standards and no longer employed in modern construction. In order to focus all traffic onto a single point, the trumpet interchange ramps are configured with tight-radius curves and short approaches into the toll plaza. Traffic movements are very circuitous and slow.

Added to this disruptive traffic flow is the fact that ticket system tolling is the slowest of all the cash collection methods: issuance of tickets can be fairly quick – up to 600 vehicles per hour in cars-only lanes – but is painfully slow on the exit side because toll rates vary depending on entry plaza. Toll collectors cannot have change ready, and drivers often do not have exact change. Whereas automatic coin machines often process 600 or more vehicles per hour, and even cash collection in manned barrier system lanes with cars and trucks can process 300 to 350 vehicles per hour, manned ticket system exit lanes often process vehicles at a rate of 180 vehicles per hour or less.

EXECUTIVE SUMMARY

As traffic grows, ticket system interchanges cannot be expanded enough to accommodate the increased volume without major ramp modifications, and these interchanges never process traffic as quickly as they could with some directional supplemental ramps or complete reconfigurations.

1.2.2 Obstacles to Improvement

As electronic toll collection was introduced in 1989 and grew in the following few years, it became possible to move traffic through conventional toll plaza lanes without toll collectors, called "dedicated lanes," at over 1,000 vehicles per hour. This number could be even higher for toll plazas with clear approaches and departures. Unfortunately, this is not possible with the old 1950s interchanges and tight ramp curves on most Western Turnpike plazas.

Since initial construction, lanes have been added, electronic toll collection (initially the "FastLane" program, which is part of the E-ZPass network and was rebranded as E-ZPass in 2012) was introduced, and where possible, some higher-speed electronic toll lanes have been added to toll plazas. The improvements have increased capacity, but inadequately for some of the major system interchanges such as Interchange 10 (I-290/I-395) and Interchange 11A (I-495), where traffic congestion and backups onto the mainline are common. These areas then become high-potential locations for accidents.

In addition to processing traffic poorly, ticket system plazas are also very expensive to operate, and old toll plazas require expensive repair and upkeep.

1.3 Existing Facilities Review

The Western Turnpike toll plazas employ lanes with manual, dedicated ETC, automatic ticket issuing machine, or dual mode manual/ETC toll collection. The dual mode lanes provide operational flexibility to handle different payment types and staffing levels. Also, at each plaza one or more of the physical lanes toward the middle of the plaza are reversible to better match transaction processing capacity to the directionality of the traffic flow.

1.3.1 Plaza Facilities Assessment

As part of a 1997 Series A bond refunding the Massachusetts Turnpike Authority¹ retained an independent engineering firm to inspect all Western Turnpike facilities from April through September, 2009. Their report concluded capital construction had not kept pace with the needs of the Western Turnpike, spending approximately \$10 to \$15 million annually versus their estimated annual need of approximately \$47 million for proper repair, rehabilitation and replacement projects. This capital expenditure was deemed to be the minimum needed to fund necessary improvements and significantly reduce the rate of facility decline. The information listed below summarizes the findings of their inspection.

The Western Turnpike roadways were found to be in generally good condition. However, significant lengths of pavement were found to be in marginal condition. Programmed pavement resurfacing contracts were cited as the reason the pavement condition was rated good. It was emphasized this program needs to resurface a minimum of 10 to 12 miles per year to retain the current rating.

The report found the condition of 170 bridge structures on the Western Turnpike varied based upon when the bridge deck was last rehabilitated or reconstructed. Overall it was found most bridge elements have been adequately maintained and only a few require attention.

¹ Before the 2009 creation of MassDOT, the Massachusetts Turnpike Authority was the independent agency responsible for the construction, maintenance and operation of the Massachusetts Turnpike.

EXECUTIVE SUMMARY

Interchanges including roadways, drainage systems and appurtenances along with the toll plazas were found to be in good condition overall. The report attributed this condition to ongoing maintenance and rehabilitation efforts by MassDOT's maintenance staff. In particular, a toll booth and canopy rehabilitation program lasting from 1996 to 2001 was cited as a reason for the favorable assessment, although plaza tunnel conditions at some locations must be watched for further water damage and deterioration. Long-term, if plazas were to be kept in operation after 2015, a next cycle of major building and tunnel and plaza rehabilitation would be warranted roughly 20 years after the last cycle.

Western Turnpike support facilities include motorist service areas, maintenance depots, communications and computer equipment, and police barracks. The maintenance depots were found to be in generally good condition overall, although a few of these facilities were rated to be in a range of marginal to fair. The State Police facilities located in Westfield, Charlton and Weston were found to be in generally good condition overall.

The Western Turnpike has at least some fixed facilities with data and power service between most interchanges, which could be used to support new mainline toll infrastructure.

1.3.2 Existing Traffic Conditions

Weekday daily volumes along the Western Turnpike mainline range from over 23,000 at the New York Stateline (Interchange 1) to over 130,000 between Natick and Weston (Interchange 13 & 14). The volumes show a consistent pattern of increasing traffic volumes from west to east.

Weekday AM and PM peak hour volumes by direction along the study corridor shows that in AM peak hour the predominant directions are westbound west of Interchange 9 in Sturbridge and eastbound east of Interchange 9. During the PM peak hour, eastbound and westbound traffic is balanced west of Interchange 9 and the predominant direction is westbound east of Interchange 9.

Weekday AM and PM peak hour toll plaza ramp traffic volumes were reviewed at each of the 17 interchanges. The highest hourly traffic volumes overall (over 3,000 vehicles) occur at Interchange 11A (I-495 in Westborough) for both entering and exiting vehicles in both peak hours. Other interchanges with high commuter hourly volumes include Interchanges 13 (AM exit) and 14 (PM enter). The lowest peak hour traffic volumes generally occur at Interchange 2 in Lee with volumes under 1,000 vehicles for both directions and peak hours.

Vehicle classification data from MassDOT was reviewed for years 2009 through 2011. The vehicle classification data shows that passenger vehicles (including 2-axle trailers) comprise approximately 91 percent of the total toll transactions for 2009, 2010, and 2011 through September 2011.²

Traffic operating conditions at the toll plazas were evaluated using existing toll plaza geometrics and volumes to calculate volume-to-capacity ratios for weekday peak hours. In addition, a micro-simulation model was developed for Interchanges 14, 15, and 55 in Weston including ramps to Route 128 and local roadways.

Most of the toll plazas have some level of queuing in at least one of the four peak periods analyzed (AM, PM, Off-Peak, and High Season). Only toll plazas 1 (West Stockbridge), 2 (Lee), 7 (Ludlow), and 11 (Millbury) were identified as not having vehicle queues in any of the study periods.

² *Electronic & Manual Toll Collection Reports, Class Comparison – Western Turnpike, January-December 2009 VS January-December 2010, MassDOT Highway Division; Electronic & Manual Toll Collection Reports, Class Comparison – Western Turnpike, January-September 2010 VS January-September 2011, MassDOT Highway Division.*

EXECUTIVE SUMMARY

Vehicle queues of 0.5 miles or more would occur during one or more peak periods at the following 10 Western Turnpike toll plazas:

- #4 (West Springfield)
- #5 (Chicopee)
- #6 (Chicopee)
- #10 (Auburn)
- #10A (Millbury)
- #11A (Westborough)
- #12 (Framingham)
- #13 (Natick)
- #14 (Weston)
- #15 (Weston)

It is noted that at many toll plazas vehicle throughput capacity is not the primary problem. Usually, the issue is that approach and departure geometry has ramp weaves, diverges and merges (often on curves) which are too close to the plaza aprons. This situation results in vehicle congestion and queuing which can be exacerbated by limited toll plaza throughput capacity. For example, at Weston the vehicle queues from Route 128 extend upstream, impacting operations at the Interchange 14 toll plaza. Vehicle queues also extend upstream from Interchange 16 in Newton to the Interchange 15 toll plaza.

1.3.3 Safety

To further examine the issue of safety, vehicle crash data at Interchanges 14 and 15 in Weston and the mainline segment of I-90 between Interchanges 13 and 14 were obtained and evaluated. Crash data between years 2007 and 2009 from MassDOT were obtained, reviewed and summarized.

The results show that while the Weston toll plaza area experienced fewer crashes than the adjacent longer mainline segment, the crash rate for the Weston toll plaza is about 60 percent higher than the adjacent mainline section. The higher number of crashes is due to a combination of higher traffic volumes in the toll plaza area combined with a shorter roadway length. Potential causes of the higher crash rates are the ramp weaving and merge areas at the approaches and departures to the toll plazas and speed differential between cash and FAST LANE vehicles.

1.4 Existing Operations Review

The owner's current cash handling and plaza staffing were reviewed. Toll collection staffing and costs over the past five years were also reviewed for developing a trend analysis of the existing system and an understanding of existing costs. The current customer service center operations were reviewed during the site visit of tolling operations. The review focused on:

- call center and account management.
- image processing,
- license plate lookups,
- mail processing,
- banking and credit card arrangements, and
- other major cost and activity centers.

1.4.1 Lane - Plaza Level, Host, and Back Office Operations

The tolling equipment at the plaza lanes is networked to, and supported by, hardware, software, and equipment installed in each toll plaza building and the MassDOT host computer. Each plaza building

Massachusetts moves ahead on all-electronic, releases details of AET deployment

TollRoadsNews 2013 August 19

Seventeen mixed cash and E-ZPass toll plazas on the Mass Pike's ticket system are being replaced by ten mainline toll points, under the plan for going cashless with all-electronic tolling (AET.) The schedule provides for a Go-Live date for AET systemwide early 2017.

Details of the planning are laid out in a 53-page report [EIS] submitted to the state's environmental permitting agency. The barrier system will also be simplified by ending some ramp plazas and putting all toll equipment on the mainline. Five separate plaza operations in the Allston/Weston area will be replaced by a gantry on the mainline. A total of 24 mixed mode (ET+cash) toll points will be replaced by 18 all-electronic (ET+pay-by-plate) toll points. The plan assumes tolling will be continued throughout beyond 2017 - the year sometimes mentioned as a date for ending tolls on the western ticket system based on the notion it is "paid for."

Tobin Bridge "pilot"

AET will be deployed first on the Tobin Bridge, a toll operation that is on a route of its own to the northeast of the city. In the nature of a "pilot" AET, the report says that will go cashless some time in 2014.

"This pilot will test new AETS (AET System) technologies and business concepts, and provide MassDOT time to gain experience before the systemwide conversion. Through this early implementation of AETS on a smaller scale, MassDOT is better preparing and positioning itself to meet the demands of a system-wide conversion, thereby reduce exposure to potential operational risks." In the design phase a back office and customer service center will be procured, while concurrently design/build RFPs will be issued for toll gantries and system equipment. Factory testing will be followed by construction of the toll zones along the mainline. The plan provides for the AET system to be tested in 'shadow mode' for several months alongside the current ET+cash system to test its performance before the switchover. After the 'Go-Live' day for AET they will take down the old system and demolish the toll booths, canopies and associated structures. Capital cost of the conversion to AET is estimated to cost about \$120m. 400 toll collector jobs will end. A number may be redeployed to customer service and image review for the Pay-by-Plate imaging of those motorists without transponders.

Current state

The AET permitting document summarizes the current situation on the Turnpike and tolled bridges and tunnels as difficult to improve further without going cashless. Eight barrier plazas on the metropolitan portion of the Turnpike and at the tunnels and Tobin bridge were a huge source of congestion before electronic tolling. Although dedicated E-ZPass lanes alleviated the worst of the congestion roadway curves and limited space cause traffic to continue to be delayed. Presently 80% of tolls are collected by transponder at the Turnpike's metropolitan mainline plazas, while on the harbor tunnels and in the ticket system heading out west the percentage is only 70%. The system west of MA128 has 17 ticket system toll points which, except at the ends, are side plazas. The report says: "due to the nature of ticket system interchanges and plazas, it is not possible to improve plaza operations adequately via E-ZPass expansion. There often isn't enough space for more E-ZPass lanes, the curves are too tight for extra lanes to help, and cash-paying traffic is too slow to allow efficient operations." Peak hours and holiday periods produce traffic volumes the existing plazas cannot handle without long backups: "Since its introduction, E-ZPass (formerly known as "FAST LANE") non-stop lanes have been implemented where possible. The improvements have increased capacity, but have not helped enough to handle major surges of traffic at many major system interchanges such as Interchange 10 (I-290/I-395) and Interchange 11A (I-495), where traffic congestion and backups onto the mainline are common. These areas then become high-potential

locations for accidents.

Higher crash record with mixed ET, cash

The report cites an ITE presentation on toll plaza accident potential: "As traffic flow diverges into the toll lanes then merges back into the roadway system, conflict points are created . . . As speed differentials within the traffic stream increase, it contributes to increased turbulence in the traffic flow and creates the potential for additional conflict points to occur along a motorist's chosen path." The Mass Pike's Interchanges 14 and 15 in Weston and Allston have an especially bad crash record - some 60% higher than elsewhere: "The higher rate of crashes is due to a combination of higher traffic volumes in the toll plaza area combined with a shorter roadway length. Potential causes of the higher crash rates are the ramp weaving and merge areas at the approaches and departures to the toll plazas and speed differential between cash and E-ZPass vehicles. The easy improvements in safety and smoothing traffic flow have been made over the past ten years and further improvements are very difficult so long as cash and electronic tolling are mixed, the report says. Modernization of mixed mode tolling was examined - including five with open road tolling. This was found to be very expensive in capital and system costs, and probably not feasible because of the extra real estate needed, and the likely cost and community resistance. It was therefore rejected in favor of going the whole way to AET/cashless operations.

Goals of AET conversion

Goals of the AET conversion are set out as: - improving traffic flow and reducing congestion caused by toll collection - improving safety through simplifying interchanges - reducing operations costs through eliminating cash collection - avoiding the alternative of having to acquire right of way and gain permits for the expanded facilities needed to improve mixed toll collection The benefits of AET will be specially large at the Weston and Allston interchanges where traffic operations can be greatly simplified and safety improved, the report says. The project says roadside equipment to support the gantries, and service road access can be provided to avoid environmentally sensitive areas. The end of cash toll plazas will allow impervious pavement and runoff to be reduced. AECOM was the lead toll consultant on the feasibility study. TTI is the lead toll consultant on the RFP with AECOM supporting.

AECOM is the lead civil engineering consultant on the RFP with TTI supporting.

TOLLROADSnews 2013-08-19

http://www.tollroadsnews.com/node/6699?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+tollroadsnews+%28TOLLROADSnews%29

Mass Gov Patrick highlights AET conversion and Turnpike project in Allston to exploit change

October 24, 2013 By Peter Samuel TOLLROADSNews

2013-10-23: Governor Deval Patrick this week highlighted all-electronic tolling conversion on the Massachusetts Turnpike and announced a new \$260 million project in Allston to take advantage of the closure of the several toll plazas there. He was making a major speech on his transportation policy initiatives at the Greater Boston Chamber of Commerce. This follows quickly on the reinstatement of toll collection for cars on the western end of the Turnpike, and improved revenues.

The Governor highlighted the Tobin Bridge as the first stop-to-pay plaza to go - with testing of AET systems to begin in January to go live in March next year. The Tobin will be the pilot project for the complete conversion of the Massachusetts toll network which will be implemented progressively through 2016. Conversion will move westward starting with the point tolls at Boston Harbor's three tunnels going into the Extension and its mainline or point tolls, with the trip/ticket tolling system west of Boston being last.

It's an approximate \$100m project. Just over 400 toll collector jobs will end.

Allston interchange rebuild and mainline straightening

Also Patrick announced an immediate start on planning and permitting for a straightening of the Turnpike for about half a mile through Allston just west of downtown Boston. The Turnpike presently jogs north at this point to a mainline stop/roll-through toll plaza and two ancillary plazas on major ramps. There is a bunch of ramps including several loops, and the whole IC/toll plaza complex takes up a lot of valuable real estate.

The project called the Allston Interchange or Allston Straightening is a rebuild of an elevated half a mile of the Turnpike that sits on about 30 structurally deficient spans that go back to original construction in the 1960s. The alternatives analysis is looking at different ramp arrangements to maintain local connections to major roads including Cambridge Road which bridges the Charles River nearby leading to the main Harvard campus (see nearby.)

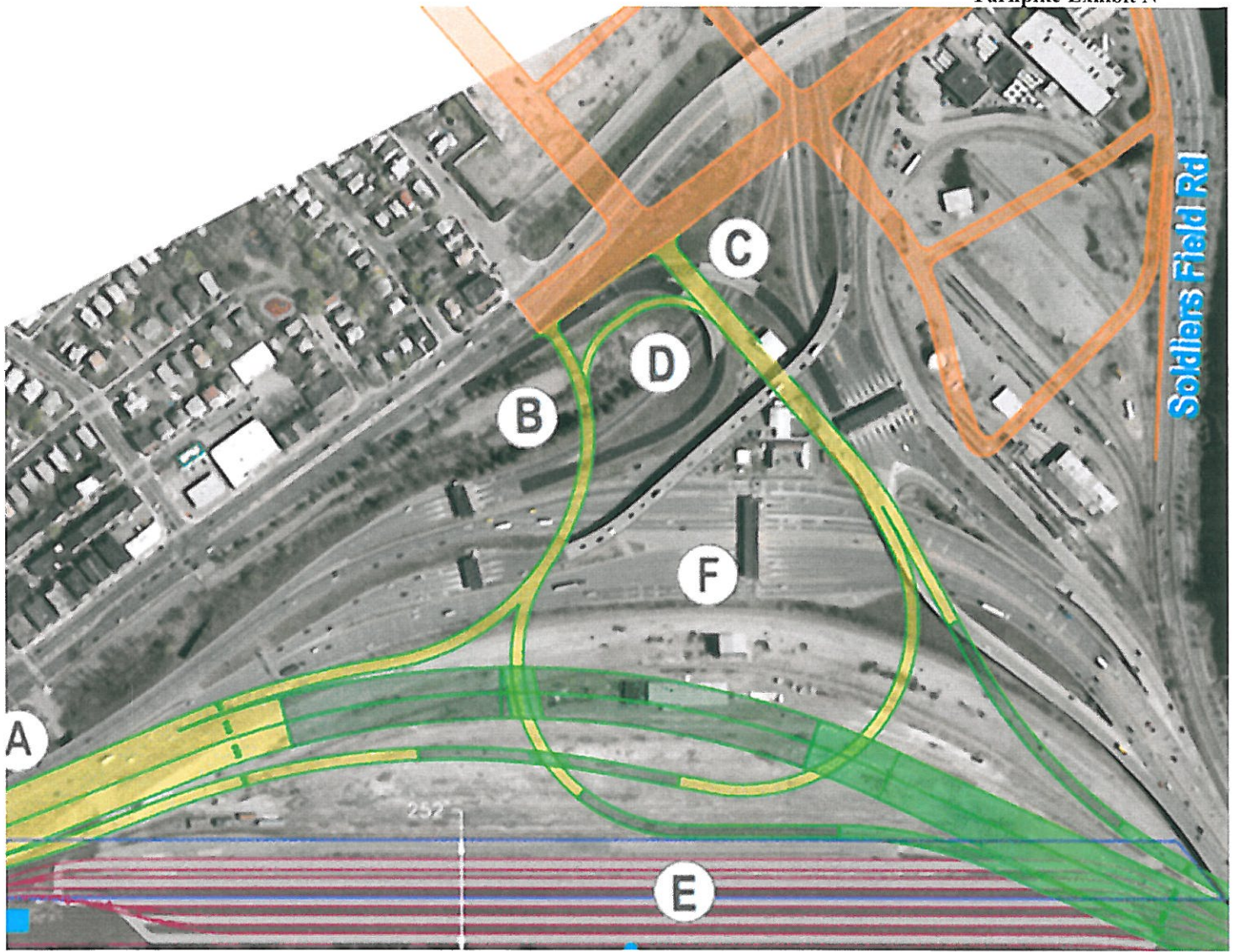
The straightening of the mainline and elimination of the three toll plazas and complex ramps will free up some 60 acres of land for urban development, both housing and commercial. A small new roadway grid will be built to service the new development.

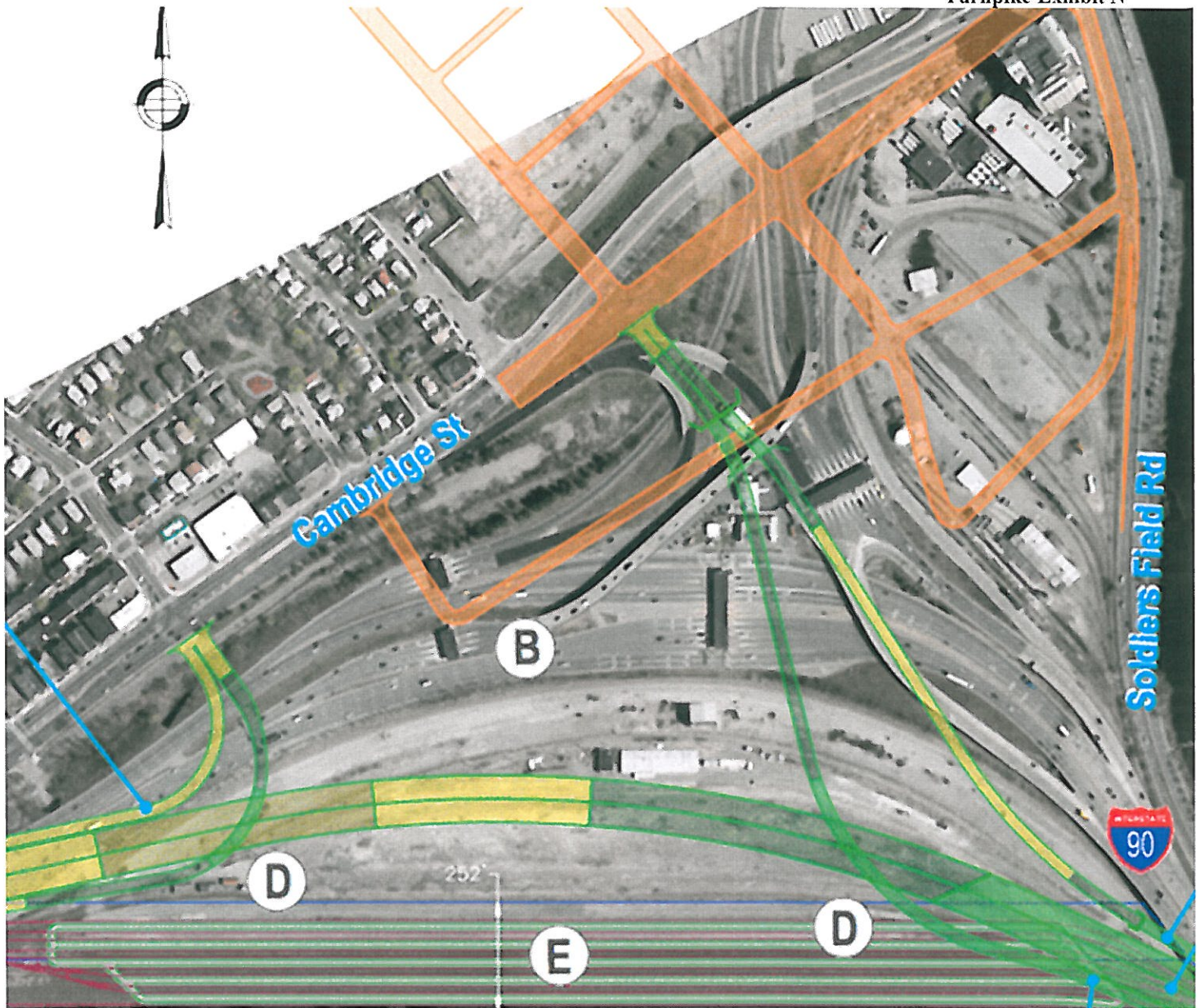
Target date for construction is the fall of 2016, allowing three years for alternatives analysis, public consultation, permitting, detailed design and contracts.

The highways division of MassDOT has an ongoing study for modernizing and relocating ramps at other points in this inner urban segment of the Turnpike - the Boston Ramps study.

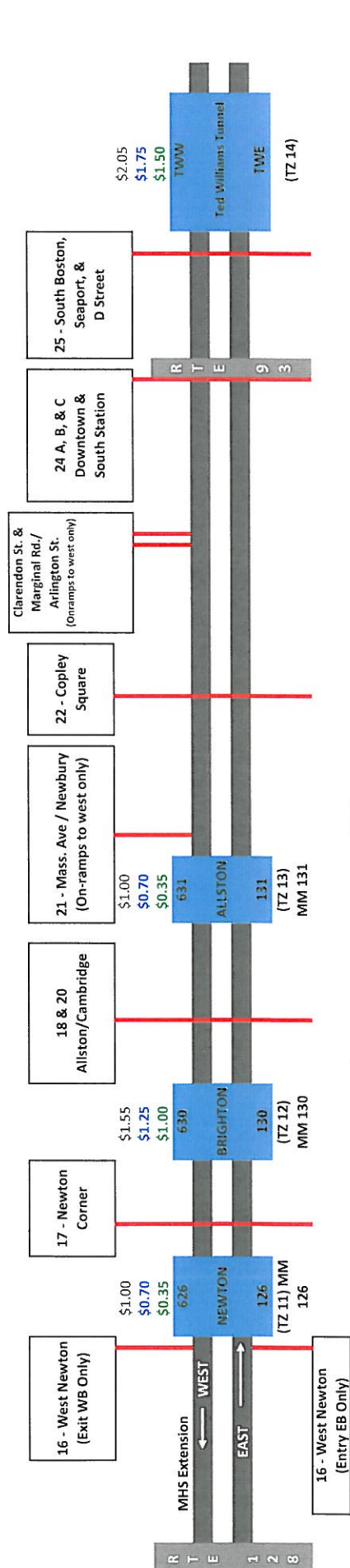
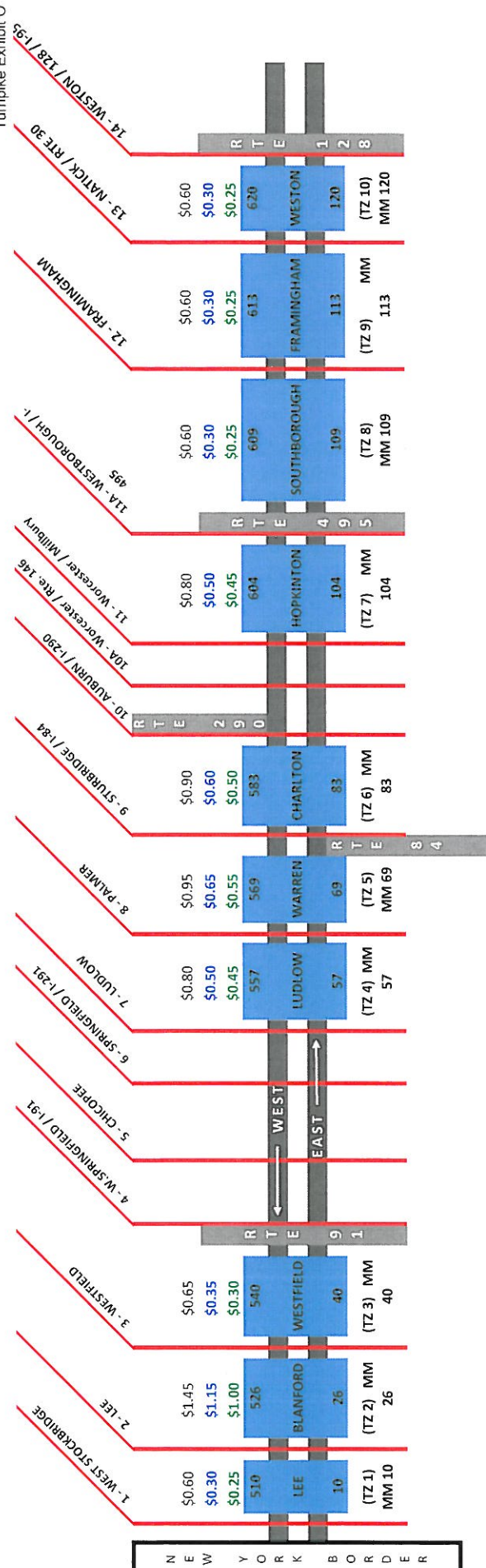
Two alternative concepts for the rebuild at Allston are shown nearby.

<http://www.massdot.state.ma.us/bostonramps/Home.aspx>





TOLLROADSnews 2013-10-23



2-Axle PASSENGER RATES:
 Pay by Plate
 E-ZPass Other
 E-ZPass MA

TZ = New AET Toll Zone Number
 Blue Box = AET TZ Town w/ IAG Plaza Codes
 Red Line = Entry/Exit Points
 MM = Mile Marker

STW - Summer Tunnel
 CTE - Callahan Tunnel
 (TZ 16)

TLN - Tobin Local North
 TCN - Tobin Central North
 TLS - Tobin Local South
 TCS - Tobin Central South
 (TZ 15)

March 5, 2017

From MassDOT's website

Page One

Transponder Fees

Transponders provided at initial sign-up – No charge
 Request for additional transponders - No charge
 Lost, stolen, damaged or defaced transponders - Customer will be charged the cost of a replacement at the time of account closure.

E-ZPass MA Statements

Online - No charge
 Mailed - \$0.60 per statement

Annual Tax Deduction Statement

Online - No Charge
 Mailed or Faxed - Private Individual Account - \$2.00

Other Fees

Returned unpaid check - \$25.00
 Excessive Image Toll – \$1.00 per image trip, after 3 image trips for a license plate in a calendar month per account starting with the third image trip for a license plate in a calendar month per account. (An image trip occurs when a transponder is not identified in the vehicle)
 V-Toll - A V-Toll posted by license plate indicates that your transponder did not read as you passed under an EZDriveMA toll zone. You will be charged a V-Toll fee of a \$1.00 for every V-Toll after 2 per calendar month. You should be sure that your transponder is properly attached to your windshield at all times. If you think that your transponder is defective, you should bring it to the nearest Customer Service Center to be tested. Should the transponder be defective, it will be exchanged at no charge, providing the transponder is not damaged or defaced.
 Retail Cash Payment Location: A convenience fee of \$1.95 will be charge for each E-ZPass MA Replenishment.

Note: Fee amounts are subject to change at any time.

Page Two

In 2012, MassDOT decided to transition to an all-electronic tolling system for the Massachusetts Turnpike (I-90) as well as all of the Boston tunnels and the Tobin Memorial Bridge. This program is now known as EZDriveMA. The primary purpose of EZDriveMA is to increase safety and convenience for the traveling public by eliminating the sometimes dramatic speed reductions and congestion that occur at toll plazas. Studies have shown this to be a significant source of crashes. The program will improve safety since crashes occur more frequently both in the approaches to toll booths and as vehicles exit the toll booths and move into travel lanes. Additionally, EZDriveMA will improve air quality by reducing emissions from vehicles idling in toll lanes and by eliminating the stop and go traffic in manual collection toll lanes as well as in existing E-ZPass lanes, where drivers must now reduce their speed to 15 miles per hour. The program will save the motoring public more than 800 hours of time every day, or 280,000 hours per year. The system will also save drivers up to 875,000 gallons of gasoline per year.

Tolling Locations

An EZDriveMA tolling location consists of a gantry, mounted over the roadway, which holds equipment to read the E-ZPass transponders as they pass under the gantry, as well as cameras to capture images of the vehicle's license plate.

As you travel under a tolling location:

If you have an E-ZPass account in good standing, your transponder is read and the toll is automatically charged to your E-ZPass account.

If you have a Registered Pay By Plate account in good standing, an image of your license plate is taken and the toll is automatically charged to your account.

If you do not have an E-ZPass or Registered Pay By Plate account in good standing, an image of your license plate is taken and the registered owner of the vehicle or responsible party is mailed a Pay By Plate MA invoice.

The toll amount for your trip is calculated by the EZDriveMA system based on the gantries you traveled under.

Tolling Rates

The goal in setting the new rates at each tolling location is to remain revenue neutral, maintaining existing revenue collection to be substantially equal to prior revenue. The toll amount charged for individual trips may decrease, stay the same or increase since tolling locations may change. Rates will be set so that E-ZPass MA account holders traveling from the New York border to Boston will pay a lower toll under the new toll rates. Under EZDriveMA the Tobin Bridge, the Sumner, Callahan, and Ted Williams Tunnels will be tolled in both directions. The current toll will be split equally so that E-ZPass MA customers will pay the same amount roundtrip as today.

Toll Plaza Demolition Project

The Toll Plaza Demolition and Roadway Reconstruction project, to demolish the existing toll plazas on the Massachusetts Turnpike (I-90), begins on October 28, 2016. The project will proceed in two stages and all work is anticipated to be completed by the end of 2017. Visit the [Toll Plaza Demolition Project webpage](#) to learn more.

Page Three

Pay By Plate MA is the toll payment option where photographic or video images of vehicles and license plates are used to either post toll transactions to a valid Registered Pay By Plate MA account or to obtain the name and address of the registered vehicle owner in order to issue an invoice to collect tolls and related fees. Pay By Plate MA is only valid on MassDOT roadways.

Due to the additional processing cost related to Pay By Plate MA, customers will pay a [higher toll rate](#).

Pay By Plate MA Accounts/Payment Options

Pay By Plate Invoice Account

This is the default account type (no customer action is required for this account type) which is created automatically by the system if your license plate is not listed on any other valid toll payment account, such as E-ZPass or Registered Pay By Plate MA. Vehicle information is obtained through a license plate look-up and an invoice is mailed to the registered owner of the vehicle. An invoice fee will be charged.

To avoid invoice fees, please sign up for E-ZPass MA or any of the Registered Pay By Plate accounts options listed below.

Invoice payments can be made online, by mailing a check to the Commonwealth of Massachusetts, EZDriveMA Payment Processing Center, P.O. Box 847840, Boston, MA 02284-7840 or paying by cash or credit/debit card at any of our [Customer Service Centers](#).

Customers paying by cash can also pay their Registered Pay By Plate MA invoice at [Retail Cash Payment locations](#). A convenience fee of \$2.95 for each invoice payment will be charged at these locations.

Registered Pay By Plate MA Account – Automatic Prepaid Replenishment

Assign a credit/debit card or checking account number to your account. The assigned account will be charged the initial payment. As tolls are incurred, they are automatically deducted from the initial payment. When your account balance becomes low, your account will be automatically replenished through your assigned account.

Registered Pay By Plate MA Account – Manual Prepaid Account Replenishment

Open your account with an initial payment. As tolls are incurred they are automatically deducted from the initial payment. It is your responsibility to maintain a sufficient account balance to cover your toll usage. You can track your account balance online, by calling customer service or by signing up for text/email alerts.

Replenishment payments can be made online, by mailing a check to the EZDriveMA Customer Service Center, P.O. Box 8007, Auburn, Massachusetts 01501-8007 or paying by cash or credit/debit card at any of our [Customer Service Centers](#).

Customers paying by cash can replenish their Registered Pay By Plate MA accounts at [Retail Cash Payment locations](#). A convenience fee of \$1.95 for each replenishment will be charged.

Registered Pay By Plate MA Account – Automatic Postpaid Payment

Assign a credit/debit card or checking account number to your account. Your assigned account will be charged for your toll usage at the end of your 30-day invoice cycle.

Registered Pay By Plate MA Account – Manual Postpaid

Your invoice will be mailed to you on a 30-day invoice cycle. Please be sure to pay before the due date to avoid additional fees.

Review and Comment on AECOM Report: Feasibility of Implementing Statewide Tolling Strategy - Western Turnpike (July 2012)

In the course of evaluating the practicability of AET and at the York Plaza on the Maine Turnpike, the following question has arisen: Why is AET the preferred alternative for the Massachusetts Turnpike but not practicable at the York Plaza?

In an effort to address that question CDM Smith conducted a review of the July 2012 AECOM report titled "Feasibility of Implementing Statewide Tolling Strategy - Western Turnpike" produced for MassDOT. The AECOM report evaluated several AET and ORT alternatives in comparison with a No-build alternative. It was determined that AET was the recommended alternative. The following presents the key factors and assumptions used to support that determination, including system configuration, leakage assumptions, and cost assumptions.

Existing Toll System Challenges

The MassPike's Western Turnpike is a ticket system toll road. Ticket system toll collection is the slowest of all cash toll collection methods limiting plaza throughput and contributing to congestion at tolling points. Adding to this operational challenge are "trumpet" type interchanges. Each Interchange funnels all movements, entry and exit, east-bound and west-bound, into a single toll collection point. Tight-radius curves, short approaches and weaving common to trumpet interchanges also contribute to operational difficulty at tolled interchanges. The AECOM report identified 10 interchanges where queues of 0.5 miles or more occur during at least one of the peak periods. These challenges incentivized conversion to some form of mainline tolling. For this and other reasons, doing nothing was identified as the worst alternative. AET, in particular, was viewed as the best alternative to alleviate these operational limitation of the current system. No such operational issues exist at the York toll plaza.

Relatedly, the relatively slow cash collection that results from the MassPike's ticket system of operation (a separate rate is calculated for each movement), relatively high toll collection staff needs are required to maintain minimum levels of throughput. Because of this, conversion to AET on the MassPike would result in much greater savings in toll collection costs than is the case for the Maine Turnpike at the York toll plaza.

Negative Impact of a Mixed Tolling System

The AECOM report points out that "Toll collection operations between all seventeen toll locations on the Western Turnpike are closely linked, and improvements made to individual toll locations or interchanges in isolation could have negligible benefits, if not negative impacts, throughout the system". In other words, implementation of AET in isolation could be detrimental. This is exactly what would happen on the Maine Turnpike if York is converted to AET while the rest of the system maintains the current cash/ETC collection options.

Leakage Assumptions

The portion of toll revenue most at risk under AET operations is the video (current cash customers) component. The higher the proportion of toll revenue attributable to video, the higher the proportion of revenue that will be lost to leakage. Leakage occurs through unbillable transactions (bad license plate images, no DMV records) or uncollectible invoices (wrong DMV

address, refusal to pay invoice). On the MassPike only about 28 percent of transactions are cash transactions. At the York toll plaza, that number amounts to 36 percent. So, even assuming equal leakage rates, total revenue leakage at York would be greater than on the MassPike.

The AECOM report also assumes lower video revenue leakage rates compared to those assumed at the York toll plaza. The AECOM report assumed that only about 30 percent of video revenue would be lost. The CDM Smith analysis estimated that approximately 42 percent of video revenue would be lost. The combination of a higher percent of revenue coming from video transactions and higher revenue leakage rates results in significantly higher revenue leakage assumptions at the York toll plaza. To put this into perspective, actual operating experience at the Tobin Bridge shows that roughly 50 percent of video invoices remain unpaid. Based on this, and the experience at other AET facilities in the U.S., it would appear that rather conservative revenue leakage assumptions were used in the AECOM report for video revenue leakage.

Surcharge and Toll Diversion Assumptions

It is interesting that no toll diversion was assumed in the AECOM report. This was because it was deemed that the current toll rate structure was sufficient under AET. No video surcharges (i.e., toll increases on current cash customers) were deemed necessary to make up for AET revenue leakage. This was in spite of the fact that in reviewing the state of the practice, the AECOM report recognizes a video-toll surcharge is in place on all currently operating facilities that employ video toll collection. The AECOM report cites the Tobin Bridge AET feasibility study in which it was estimated that a \$2.00 video toll surcharge would be necessary to offset video toll leakage. The current actual Tobin video surcharge is \$0.50 (or 20 percent) higher than the ETC rate. As noted above, however, current data shows that about 50 percent of Tobin video toll revenue goes uncollected.

Despite these acknowledgements, the AECOM analysis projected that no video surcharges would be required for AET to be financially feasible. This conclusion appears to be based primarily on optimistic video toll leakage and diversion assumptions that are not supported by the experience of currently operating AET facilities, including on the Tobin Bridge.

Estimated revenue leakage levels at the York toll plaza resulted in the need for rather substantial video toll surcharges to make up for that lost revenue. Those higher video rates, in turn, resulted in additional revenue loss due to toll diversion. Financial feasibility at the York toll plaza is only realized once the significant video surcharge is assumed.

Gary Quinlan
CDM Smith

July 22, 2016
From Gary Quinlan

I also thought you, and your staff, would be interested in the recent North Texas Tollway Authority (NTTA) document in the link below. This is essentially an update of a similar report they did in 2011. It covers many aspects of their system, but I was particularly interested in their discussion of the need to increase their video (which they call ZipCash) toll rates to cover the revenue leakage they incur. They provide a very detailed breakdown of non-pursuable video transactions and paid versus unpaid video invoices. It is very uncommon among toll facility to provide this level of transparency. See the figure on page 16 for the flow chart which identifies video leakage rates. It is interesting in that it compares current values with those from their 2011 report. The two last rows in the figure (Out of State and In State) refer to un-pursuable transactions due to lack of DMV records.

https://www.ntta.org/whoweare/boardofdirectors/Documents/2016/NTTA_2016_County_Review_Full_Report_07.2016.pdf

The complete video revenue leakage picture and justification for a higher video surcharge is shown in the table on page 23. Here they show that ultimately, they collect about 55 percent of the theoretical toll from each video transaction. In other words, total video revenue leakage amounts to about 45 percent. In the end, they show the need to increase the video surcharge from about 57 percent to about 90 percent in order to achieve revenue neutrality with ETC (or TollTag, as they call it) rates.

In the end, our analysis of the revenue leakage at York and the recommended video surcharge is very similar to that for NTTA. We estimated that a total of 42.2 percent of York video tolls would be uncollected (versus 45 percent for NTTA facilities) and we recommended a 100 percent video toll surcharge to make up for revenue leakage (versus a 90 percent recommended video surcharge for NTTA facilities). Perhaps this is just a coincidence, but it does support the fact that the level of revenue leakage and associated video surcharge we are recommending are not outside the limits of what other facilities experience. There certainly are many AET facilities with less than 100 percent video surcharges, but I suspect that in many of those cases, the ETC rates are subsidizing losses incurred by the video transactions or they simply accept that there will be a net loss of revenue (in the case of facilities that are converting to AET).

Date January 26, 2017	To Maine Turnpike Authority
Technical Memorandum	From HNTB
	Subject Southern Toll Plaza: Existing Site Conceptual Replacement Options



At the request of the Maine Turnpike, HNTB re-evaluated conceptual costs estimates associated with replacing the existing York Toll Plaza located at MM7.3. Three options were re-evaluated and are summarized below.

- 1) Option 1A – Renewal and Replacement with Geotechnically Supported Toll Islands/Bumpers/Slabs: Retain existing toll booths and canopy, with new concrete island, bumpers and concrete slabs (structural and roadway). New concrete elements are assumed to be pile supported consistent with concepts applied at Exit 63 – Gray Interchange and to be applied at Exit 44 – Scarborough (I-295). Additionally, this option applies the renewal and replacement cost delta between existing and new plaza at existing locations (as developed in 2008/2009) inflated to 2017 dollars.
- 2) Option 1B – Replace in Kind: All existing infrastructure to be replaced with new in exact same location with same horizontal highway geometry (i.e. no highway widening). Minor vertical improvement assumed included to adjust highway approaches to new concrete slabs. Vertical adjustments assumed to be constructed with “lightweight fill/advanced soil construction.” New concrete islands, bumpers, slabs, toll booth, canopy, tunnel assumed to be pile supported consistent with concepts applied at Exit 63 – Gray Interchange and to be applied at Exit 44 – Scarborough (I-295). Cost estimate increased due to shear complexity of constructing a new toll plaza in same location as existing while maintaining toll operations.
- 3) Option 2 – Replace 200’ north with marginally improved highway geometry: New toll plaza located 200’ north with improvements to horizontal geometry requiring ROW and Environmental impacts. Vertical adjustments assumed to be constructed with “lightweight fill/advanced soil construction.” New concrete islands, bumpers, slabs, toll booth, canopy, tunnel assumed to be pile supported consistent with concepts applied at Exit 63 – Gray Interchange and to be applied at Exit 44 – Scarborough (I-295).

Table 1 - Conceptual Cost Estimates

<u>Option</u>	<u>Conceptual Cost (2017 \$\$)</u>
Option 1A	\$26.0M
Option 1B	\$34.5M
Option 2	\$38.2M

*Unit costs for Tolling Infrastructure (toll island, bumpers, slabs, toll booths, canopy) developed based on Exit 52, Exit 53, and Exit 63

*Unit costs for Geotechnical Infrastructure and New Tunnel developed from Exit 44 Engineer's Estimate

*Conceptual Costs noted above include Construction Engineering (24%).

York Meetings 2006 - 2016

2014-10-14	Workshop on wetland mapping	MTA	Dean Lessard, Dick Bilden, MTA Staff
2014-10-16	MTA Board Meeting-wetland mapping presentation	MTA	MTA Board and Staff, Think Again
2014-10-20	Think Again Meeting	Norma's	Erin Courtney, Sara Zografos, Think Again
2014-12-18	MTA Board Meeting- plaza sizing presentation	MTA	MTA Board and Staff, Think Again
2014-12-18	Workshop on plaza sizing	MTA	Dean Lessard, Dick Bilden, David Linney, MTA Staff & Jacobs
2015-03-23	Pre Board Meeting Workshop on existing plaza location	MTA	Dean Lessard, Dick Bilden, MTA Staff
2015-03-26	MTA Board Meeting-existing site presentation	MTA	MTA Board and Staff, Think Again
2015-05-28	MTA Board Meeting	MTA	MTA Board and Staff
2015-06-25	MTA Board Meeting- alternative site matrix	MTA	MTA Staff, Think Again
2015-06-25	Workshop on alternative site matrix	MTA	Dean Lessard, Dick Bilden, David Loane, MTA Staff
2015-07-23	MTA Board Meeting	MTA	MTA Board and Staff
2015-07-27	York Selectemen's Meeting	York	Peter Mills, Bruce Van Note, York
2015-08-03	Workshop-answer questions on the evaluation matrix	MTA	MTA Staff, Think Again, York
2015-09-03	MTA Board Meeting-public comment on the alternative sites matrix	MTA	MTA Staff and Board, Think Again, York

York Meetings 2006 - 2016

Date	Reason for meeting	Where	Attendees
2006-09-26	Town Mangers meeting	York Maintenance	Towns of York, Ogunquit, Wells, MTA Staff
2006-10-25	Joint Select Board Meeting	Ogunquit Town Hall	Towns of York, Ogunquit, Wells, MTA Staff
2007-03-21	Presentation to York County Delegation		York County Legislators, MTA Staff
2007-08-09	Legislative Tour and Briefing	York Toll Plaza	Legislators, MTA Staff
2007-08-10	Legislative Tour and Briefing	York Toll Plaza	Legislators, MTA Staff
2007-09-21	Legislative Tour and Briefing	York Toll Plaza	Legislators, MTA Staff
2007-11-29	Town Mangers meeting	Tour of York Toll	Towns of York, Ogunquit, Wells, MTA Staff
2007-12-10	Legislative Tour and Briefing	York Toll Plaza	Legislators, MTA Staff
2008-01-22	Town Mangers meeting		Towns of York, Ogunquit, Wells, MTA Staff
2008-01-23	Joint Select Board Presentation	Ogunquit Town Hall	Towns of York, Ogunquit, Wells, MTA Staff
2008-02-15	Town Mangers meeting		Towns of York, Ogunquit, Wells, MTA Staff
2008-02-27	Public Meeting	York Middle School	Members of the public (about 40 signed in) MTA and HNTB Staff
2008-04-03	Public Meeting	York Middle School	Members of the public (over 350 signed in), Think Again, Town of York, MTA and HNTB Staff

York Meetings 2006 - 2016

2008-04-29	MTA/York Meeting	MTA	MTA Staff, MTA Board, York Selectmen
2008-05-15	Authority and York Selectmen meeting	York Beach Fire Station	MTA Staff, Think Again, HNTB, York Selectmen, Town of York
2009-06-19	Feasibility Study	MTA	MTA Board members and Staff, York selectmen
2009-09-03	Existing Site Evaluation		
2009-09-09	Letter to Joan Jarvis from Conrad Welzel with answers to questions they submitted on the Resolution to accept the Recommendations from HNTB		
2009-10-26	Second set of answers sent to Think Again		
2009-11-05	Authority and York Selectmen meeting	MTA	Members of the public (about 50 signed in) Think Again, MTA Board and Staff
2009-12-16	Abutters meeting	York Middle School	Abutters, MTA and HNTB Staff
2010-01-21	Public Meeting	York Middle School	Members of the public, Think Again, Dawn Hill, Town of York, MTA and HNTB Staff
2010-02-10	York Water District meeting		YWD, HNTB, MTA Staff
2012-03-08	York Water District meeting	YWD	YWD, HNTB, MTA Staff
2014-05-14	Think Again Meeting	Norma's	Sara Zografos, Peter Mills, Think Again
2014-09-15	Think Again Meeting	Norma's	Erin Courtney, Sara Zografos, Think Again

York Meetings 2006 - 2016

2015-11-19	MTA Board Meeting	MTA	MTA Staff and Board
2016-05-26	MTA Board Meeting Executive Session	MTA	MTA Staff and Board
2016-06-23	MTA Board Meeting Executive Session	MTA	MTA Staff and Board
2016-10-05	Public Meeting	York Maintenance	MTA Staff and Board, Think Again, York

Maine Turnpike Authority

2360 Congress Street
Portland, Maine 04102

Daniel E. Wathen, Augusta, Chairman
Robert D. Stone, Auburn, Vice Chairman
Bryan P. Cutchen, West Gardiner
John E. Dority, Augusta
Michael J. Cianchette, Cumberland
Karen S. Doyle, Chief Financial Officer MaineDOT, Ex-Officio

Peter Mills, Executive Director
Douglas Davidson, Chief Financial Officer & Treasurer
Peter S. Merfeld, P.E., Chief Operations Officer
Jonathan Aray, Secretary & General Counsel

January 28, 2017

Jay L. Clement, Senior Project Manager, Maine Project Office
Department of the Army, New England District, Corps of Engineers
675 Western Avenue #3
Manchester, Maine 04351

Re: Southern Toll Plaza for Maine Turnpike Authority USACE No: NAE-2007-01211

Dear Mr. Clement:

Owens McCullough has responded separately to Questions 1 through 3 on stormwater issues. This letter responds to Questions 4 and 5, the tolling questions, posed in your email of December 5, 2016.

The Alternatives Analysis

Primary opposition to this application is from York residents who argue that the Turnpike should abandon cash tolls at York and attempt instead to collect 4.4 million annual transactions by photographing license plates, searching for addresses and billing by mail.

If the abandonment of cash collection is not practicable, it seems undisputed that the best location for a new ORT plaza is at Mile 8.8. There is clear evidence that this is the Least Environmentally Damaging Practicable Alternative (LEDPA) for continuing to offer patrons the opportunity to pay cash.

The nature and extent of environmental impact to wetlands, vernal pools, streams, and habitat have not been raised as an issue. Indeed, the relatively small proposed impacts at Mile 8.8 are fully mitigated by proposals in the application.

The remaining issue, as framed by intervenors, is whether the Turnpike should be required to adopt All Electronic Tolling (AET), a system that is not "electronic" but is intensely manual. The Turnpike has studied and rejected AET in a well considered decision reached after a lengthy period of deliberation and public engagement. In exercise of its statutory and fiduciary duties, the MTA board cannot responsibly abandon cash collection at the York toll at any time within the foreseeable future.

The question, then, is whether tolls, both cash and electronic, will be collected in a new ORT plaza at Mile 8.8 or at the existing slow speed barrier toll that fails to meet the purpose of this project or the needs of the fifteen million motorists who pass through the York toll each year.

The means and methods of electronic tolling are complex. The purpose of this letter is to answer some good open questions that continue to be asked and to add to the store of information contained in our application.

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General Issues to Place the York Tolling Decision in Context

Questions 4 and 5 raise broad issues about tolling that deserve discussion with supplemental materials that we have attached. These issues include:

1. What factors in the tolling climate at York (or more generally in Maine and New Hampshire) make it necessary to continue collecting cash?
2. What conditions in Massachusetts led to a different decision?
3. Are the decisions made by Maine based on data that is consistent with national experience?
4. How does the York toll conversion fit within the Turnpike's system?

1. What is Different about Maine?

Attachment A is a letter from Gary Quinlin of January 12, 2017, summarizing what distinguishes Maine's tolling environment based on his national perspective. His points include:

1. Maine's high cash market share;
2. the high proportion of out-of-state motorists;
3. the prevalence of low frequency users;
4. nearby routes that offer alternatives to turnpike travel;
5. conflicting customer protocols arising from adopting AET at only one plaza; and
6. the absence of reliable data from DMV records.

Additional points are made in our answers below, but one thing should be said about Mr. Quinlin's comment number 6 on Maine DMV data. The fact that 17% of Maine motorists fail to keep their addresses on file with the Secretary of State is not a function of state system obsolescence. It is a product of general neglect or reluctance by motorists to keep their addresses current. The problem is universal. In Maine, it is compounded by the fact that vehicle registrations are purchased and renewed at town offices with attendant delays in getting data into the DMV.

Regardless of the cause, the point is well made that the absence of current DMV data, not only in Maine but in other jurisdictions, is a significant reason for widespread losses in AET toll collections. The Maine Turnpike Authority encounters this problem every day as we attempt to reach violators whose plates we have photographed. Our diurnal bundles of returned mail are voluminous. Yet the scale of our current violation enforcement system is tiny compared to what AET would require.

2. Massachusetts in Contrast to Maine

Interchanges built on the Massachusetts Turnpike are functionally obsolete and not capable of hosting cash toll collections. As AECOM, their consultant, explained in 2012 at the beginning of a voluminous analysis:

To economize construction on these early expressways, the limited-access interchanges were designed to funnel all movements, entry and exit, east-bound and west-bound, into a single toll collection point where staffed toll collection operations were conducted. These "trumpet" type interchanges – named for their resemblance to the bell and tubing of a trumpet – are functionally obsolete by today's engineering standards and no longer employed in modern construction. In order to focus all traffic onto a single point, the trumpet interchange ramps are configured with tight-radius curves and short approaches into the toll plaza. Traffic movements are very circuitous and slow.

See page ES-2 of Enclosure B.

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Highway and interchange constraints made it almost impossible for Massachusetts to continue collecting cash within their legacy system. An October 2013 article from TollRoadsNews (Enclosure D) explains that Massachusetts was also motivated by development opportunities arising from abandoning cash tolls in places like Allston:

The project called the Allston Interchange or Allston Straightening is a rebuild of an elevated half a mile of the Turnpike that sits on about 30 structurally deficient spans that go back to original construction in the 1960s. . . . The straightening of the mainline and elimination of the three toll plazas and complex ramps will free up some 60 acres of land for urban development, both housing and commercial.

Deficiencies and opportunities at the Allston interchange exemplify -- to an extreme -- conditions that are found throughout the Massachusetts system.

There was also the matter of their cash collection system which continued to depend on tickets until recent times. The amount collected at each toll varied based on the class of the vehicle and on the motorist's point of origin. The toll collector had to examine each ticket and make change in an amount that differed from car to car. The process was time consuming and it backed up traffic. One of the reasons Massachusetts converted to AET was to try to replicate the ticket system by continuing to charge former cash customers from point-to-point based on matching plate photos at every stage of the journey.

By contrast, Maine did away with tickets 20 years ago. All cash tolls in Maine are paid in the same amount within each class at each location, regardless of where the trip originated. The cash toll at York and those north of Gray are mainline barrier tolls with simple collection systems. Even Maine's side tolls are essentially barrier tolls except that they are generally paid in only one direction -- on entering the turnpike and not departure.

The simplicity of Maine's cash system means that a collector can handle upward of 325 transactions per hour. In fact, their shifts are scheduled on that basis.

Most of Maine's interchanges have either been built or rebuilt since barrier tolls were adopted, thus eliminating traffic limitations of the sort that have plagued Massachusetts.

AECOM presented Massachusetts with the choice of moving to AET to preserve their historic collection protocol or adopting a new barrier toll system with Open Road Tolling (ORT). Although AET was the preferred choice for Massachusetts, AECOM had the following to say about ORT on the first page of their report:

ORT is a tolling approach that has been successfully implemented by many toll agencies. It is a tolling strategy intended to provide maximum convenience and time savings to ETC [electronic] customers, the payment method exposing an agency to the lowest processing cost, highest accuracy and lowest payment risk to the operating agency. . . . The 'ORT Plaza' design concept has emerged as the best way to accommodate E-ZPass and cash toll collection at a given location. Drivers with E-ZPass are provided high-speed, multi-lane free-flow ORT lanes, and cash-paying drivers are provided adjacent cash toll plaza lanes.

Other points in the AECOM report are included in Enclosures B through F to this letter.

3. Data on AET is Elusive, for Understandable Reasons.

There is little public information about how much money is lost when agencies convert to AET. To reveal such data can be detrimental to the agency's efforts to persuade motorists to open electronic accounts. If word gets out that nearly half the pay-by-plate motorists will not have to pay, or that the

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agency can't read plates during a snow storm or heavy rain, or that motorists can't be pursued if registered in other jurisdictions, then motorists may refuse or neglect to open an electronic account.

At a recent national conference, a toll executive from another state described the experience of converting a toll road to AET by announcing that the losses were only 5%. When asked afterward whether it was 5% of the former cash traffic or 5% of gross revenue, the reply was 5% of gross, which turned out to be 50% of cash. They had adopted AET for a commuter highway where the electronic penetration rate was at 90%. The authority actually lost half of its cash receipts, an experience similar to that of other agencies whose data is disclosed.

Last year, the North Texas Tollway Authority did release its AET revenue losses in an unusual display of candor. Gary Quinlin of CDM Smith reviewed the data and provided the following analysis:

In the end, our analysis of the revenue leakage at York and the recommended video surcharge is very similar to that for NTTA. We estimated that a total of 42.2 percent of York video tolls would be uncollected (versus 45 percent for NTTA facilities) and we recommended a 100 percent video toll surcharge to make up for revenue leakage (versus a 90 percent recommended video surcharge for NTTA facilities).

Perhaps this is just a coincidence, but it does support the fact that the level of revenue leakage and associated video surcharge we are recommending are not outside the limits of what other facilities experience. There certainly are many AET facilities with less than 100 percent video surcharges, but I suspect that in many of those cases, the ETC rates are subsidizing losses incurred by the video transactions or they simply accept that there will be a net loss of revenue (in the case of facilities that are converting to AET).

Many toll agencies operate on accrual accounting. They include as current revenue the toll that is owed by every motorist who uses the road. In a later accounting period, after all efforts to collect have been exhausted, they prepare an entry to write off all the tolls that are then deemed uncollectible, but this occurs years after the trips that generated the write off. Thus, the losses and the costs are spread out and no longer associated with the period in which they occurred.

It is difficult to obtain figures for lost revenue and collection costs from public records of AET agencies when it is counter to their interests to reveal them.

The best way to obtain good information is to hire a consultant like CDM Smith who is retained by agencies throughout the industry to track revenue and costs from internal data so that agencies and bond holders can make rational decisions tailored to the circumstances of each road.

We hired CDM Smith because of their lack of bias and their access to data. They have assisted many agencies in converting to AET and have helped others decide when it is best to continue collecting cash on the highway. At the outset of working for Maine Turnpike, they were asked specifically to tell us how to implement AET at York and at West Gardiner/I-295 and to provide our staff, our board, and our bondholders their best judgment on what the consequences would be.

Whether to incur those consequences raises significant issues of financial risk, traffic management, fairness, and public policy that we know are also appreciated by environmental regulators.

CDM Smith's recent letters of July 22, 2016, and January 19, 2017, appended to these answers as Enclosures A and F describe the consultant's role and the current challenges being faced by agencies across the nation in making these complex decisions tailored to the special conditions of each road.

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4. York Plaza's Relationship to the Rest of the Turnpike

The building of a new toll plaza at York is only one component of a complete overhaul of the 19 Maine locations where tolls are collected. 13 of them are side tolls where all tolls, both electronic and cash, are collected at reduced speeds. The remaining six have been built or planned as highway speed ORT plazas.

Two of the mainline ORT plazas are in full operation, one at New Gloucester since 2013 and the other at West Gardiner since 2016. Two others are under construction at the Falmouth Spur and at Exit 44 in Scarborough. The design for York is essentially complete and an ORT plaza at West Gardiner/I-295 is planned. New Hampshire is operating two ORT facilities, one at Hampton since 2010 and the other at Hooksett since 2013. An ORT for Bedford is in design and a fourth site is being considered.

Opponents argue that the Turnpike should abandon collection of cash tolls altogether and toll by mail. We do not believe that they are arguing for a split system in which former cash customers are charged by mail at York but continue to pay cash elsewhere on the same system. That would mean that a non-E-ZPass motorist coming into Maine at York would be treated first as a customer tolled by mail but later as a violator if the vehicle passed through E-ZPass gantries in other locations.

Being a violator quickly leads to being fined and losing one's registration. For an AET customer who can be found and is being billed by mail, there is an iterative and lengthy process before converting the debt to violation status.

Such a conflict in business and collection protocols would be problematic, bordering on impossible to explain and administer, and is not employed anywhere else to our knowledge.

When Massachusetts made the transition to AET, they started first with the Tobin Bridge which was a free-standing barrier toll, independent of the turnpike. When they expanded AET to the turnpike, they converted every segment of the road to AET on the same day.

Answers to Specific Tolling Questions Posed

What follows below are more specific responses to questions 4 and 5. The questions are in bold.

4. Recognizing that a key argument that the Authority is using against the AET alternative is cost, please address the following for further support and clarification of that argument:

Because the answer to question 4f serves as a predicate to other answers, we address that question first. We have also combined answers to question 4b and question 5 because they both deal with conditions at the existing site.

4f. Throughout the multitude of studies and reports that have been developed throughout the planning process, there is a confusing mix of percentages and dollar values attributable to the potential revenue loss from AET. In very simple terms, what percent of the Authority's total annual revenue comes from the York Toll Plaza and what does that equate to in dollars; what percent of that revenue is non-EZ Pass and what does that equate to in dollars; and what is the annual total dollar value of tolls projected to be lost with AET? And finally, for that total projected loss, have all available and practicable measures for mitigating that loss been pursued such that in spite of those measures, AET remains economically impracticable?

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Answer to Question 4f:

The Latest Revenue Data: York in Context

In 2016, the total net toll revenue for the Turnpike was \$134.16 million. The portion from York was \$57.08 million, or 42.55%.

26.67% of the York revenue, \$15.22 million, came from cash. The value of cash collected at York is significant in that it represents 39.81% of all cash collected on the Turnpike.

Losses from AET

Decisions about changing toll structures on the Turnpike can be made only by performing a responsible actuarial analysis. This is required as a matter of public policy, responsible business planning, and more specifically by Section 802 of the Turnpike's standing bond resolution.

CDM Smith performed an analysis of AET at York and at Gardiner/I-295 resulting in a report of April 14, 2014, included as Appendix 2F to the Turnpike's permit application. The firm estimated that York cash receipts for 2015 would be \$14.776 million for the year. This became their starting point for projecting risks, losses and costs associated with converting from cash to AET.

Because traffic rebounded in 2015 and 2016, the York toll collected \$.5 million more in cash during 2016 than had been estimated for 2015. Thus, the losses from converting to AET are likely to be greater than those projected by the CDM Smith report.

On page 17 of their report, CDM Smith projected that AET at York without a toll surcharge would lose \$4.55 million in revenue in the first year and increase operational costs by \$2 million for a net difference of \$6.55 million compared with present operations.

To complete the contrast between ORT and AET, we must account for how ORT would improve the toll collection system by capturing more revenue and reducing operational costs. On page 28 of the report, CDM Smith projected that ORT at York will generate new revenue and save costs at the combined rate of \$.95 million per year over present conditions. This is consistent with the Authority's experience at many other plazas where the new electronic suite is already up and running, including two ORT plazas on the main line at New Gloucester and West Gardiner.

Adding the operating gains from ORT (\$.95 million) to the losses and costs of AET (\$6.55 million) yields \$7.5 million as the first year's difference in net impact between AET and ORT. This number demonstrates why substantial surcharges are necessary for AET to break even. It also demonstrates why it is worthwhile to make the capital investments to preserve the efficiencies and reliability of cash collection.

The difference in up front capital cost between AET and ORT at York is about \$31 million. Without a surcharge to support AET, \$7.5 million is a conservative projection of ORT's operating gain over AET in just the first year. It is reasonable to conclude that nearly a quarter of the capital outlay for ORT will be recovered in one year and the remainder within a few years thereafter.

The changeover to the new electronic system has already taken place in most of the Authority's other plazas, including two that are operating as highway speed ORT facilities where it was possible to convert relatively new existing barrier tolls quickly and at modest cost.

Mitigation of AET Losses

There is only one good way to mitigate for AET losses: Convert cash payers to E-ZPass customers. Otherwise the loss must be recovered through a surcharge or unfair impositions on other drivers.

When present management took over the Turnpike in April of 2011, we persuaded the Maine

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Legislature to change state law to make it easier to promote E-ZPass aggressively. We did so because it makes the system better no matter how tolls are collected, whether by the present system, by ORT, or by AET.

The Authority has since promoted E-ZPass by:

1. adopting reciprocal toll enforcement with Massachusetts and New Hampshire,
2. lowering the transponder price from \$25 to \$10,
3. increasing transponder sales to more than 3000 per month for the past 50 months;
4. selling more than half of its transponders over the Internet,
5. creating a family discount for E-ZPass subscribers that returns \$8.5 million per year,
6. continuing one of the few discounts in the nation for E-ZPass business customers,
7. raising tolls by applying higher rates on non-E-ZPass customers,
8. conducting E-ZPass promotions on radio and social media,
9. installing modern electronic lane equipment to replace outmoded systems, and
10. reaping the collateral benefit of E-ZPass promotions in New Hampshire and Massachusetts.

Since October of 2012, the number of open and active E-ZPass accounts, both business and personal, has grown by 53% from 146,717 to 224,653. The number of active transponders has grown by 60% from 238,301 to 380,501.

When E-ZPass was relatively new in 2006, the electronic toll percentage on the Maine Turnpike was 40%. By 2010, it was 59%. Initiatives in recent years have raised it to 71.5% and this growth will likely continue, but ever more slowly. For a state like Maine with fewer commuters, many visitors from diverse jurisdictions, a toll road of limited length with free road alternatives, and a large portion of its population outside the toll road's service area, it will be difficult to raise electronic penetration into higher ranges.

Given the success of transponder sales, the growth in electronic revenue is much less than one might expect. The difference can be explained by the fact that so few new account holders use the turnpike with great frequency, an issue discussed in our answer to the next question 4a.

4a. What if transponders were given away for free, would there be greater penetration into that tolling stream that would mitigate identified losses from AET? This question was apparently raised by opponents in the past and I did not see it closed out in the application materials.

Answer to question 4a:

Free transponders will not make AET practicable. There are costs and inefficiencies for opening accounts and issuing transponders to customers who seldom need them. Giving away transponders to infrequent users and carrying their open accounts would cost more than the tolls collected.

When other states have given away transponders or charged a refundable deposit, we are told that these efforts have not materially increased electronic usage and were not worth the investment. Once an agency starts giving away transponders, there is no going back. Agencies recently entering the E-ZPass system are doing what Maine has always done: selling transponders at cost.

When we convert a frequent cash customer to E-ZPass, it usually reduces future collection costs. But that is not true for a customer who uses the turnpike only a few times a year. There are costs, either to the customer or to the turnpike, for opening and maintaining an account.

Many agencies charge a monthly fee for open accounts. Maine does not. To encourage the use of E-ZPass, Maine carries all accounts at no charge, even those with little or no activity.

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At the end of 2016, Maine had 216,414 open personal accounts. 76,180 of them had no activity in December. 33,634 of them had no transactions for more than 120 days.

Associated with these accounts, Maine had 327,568 outstanding auto transponders, of which 96,818 had no activity during December. 40,072 of the valid transponders had not been used for at least four months.

Most public agencies contract out their account maintenance functions to private companies like Xerox or TransCore. These companies charge a service fee for each open account. Because the Maine Turnpike administers its own E-ZPass accounts, we internalize these costs. They are not passed on to customers, as is the practice in many other agencies.

When an E-ZPass agency in another state has received adverse publicity for imposing fees on open accounts, the local press has sometimes pointed out that Maine charges nothing. For weeks after such publicity, the Maine Turnpike Authority would receive many new accounts from out of state motorists because they only had to pay for the transponder. If transponders were also free, we would be flooded with having to manage accounts for people throughout the northeast.

The Turnpike's wholesale cost for transponders is \$7.40. 80% of the new transponders are shipped by mail. It costs \$2.74 to mail out one or \$3.14 to mail two. For each transponder, we charge a flat fee of \$10 plus tax which covers the wholesale cost plus mailing, but nothing for activating the transponder and for setting up and maintaining the account.

Maine has been selling 3000 to 5000 transponders per month since November of 2012 when we were first able to promote on line sales with a family discount. Although the Authority's recent revenue growth comes from electronic tolls, our cash receipts persist as a substantial portion of our revenue.

To open an E-ZPass account for a personal automobile, the patron pays \$20 as an advance against tolls and \$10.55 for the transponder (\$10 plus 5.5% tax) for a total of \$30.55. If an automobile owner is unwilling to pay for the transponder, the owner is not likely to open an account. It's the account that is important and Maine charges nothing to service them.

Question 4b. is answered in conjunction with Question 5.

4c. Information in the application indicates that NH has reportedly come to the same conclusion on the AET alternative that the Authority has, that it is not economically practicable at this time. But the MA decision to go AET at the Tobin Bridge, Newton, and other locations is repeatedly brought up by those opposed to the relocation, implying that if MA has determined that the conversion is economically practicable, why can't MTA? MTA notes that MA is prepared to accept probable revenue loss and doesn't have to concern itself with bond rating impacts. Is there any greater insight to the MA determination that hasn't already been noted?

Answer to Question 4c:

This question is addressed in Section 2 of our general discussion at the head of this letter and in Enclosures B through F. Cash tolls in Massachusetts caused severe traffic congestion. Obsolete interchanges and highway constraints left insufficient room to continue or expand cash collection. The Tobin Bridge is an obvious and familiar example; but the tunnels and the interchanges at Allston, Weston-128, Auburn-290, Westborough-495, and other sites were also unsuitable.

Experience from other agencies across the U.S. and Canada has taught the industry that AET is most appropriate for toll roads where:

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- high volumes of daily commuters can be induced to pay electronically;
- a predominance of in-state traffic makes enforcement easier;
- tolls are high enough to justify the cost of postage and back office processing;
- lack of available real estate makes it cost prohibitive to build cash booths near the road;
- there is no room on bridges, tunnels or constrained highways for cars to stop;
- license-obscuring snow storms are less frequent;
- the capital cost for new cash plazas significantly outweighs the losses and costs for AET;
- motorists on the toll road have few alternative routes; and
- the agency's credit is not dependent on revenue bonding.

Most of these criteria apply to Massachusetts. None of them to York, and none of them to Hampton, Hooksett, New Gloucester, or West Gardiner where ORT is already up and running, or to the Falmouth Spur, Maine Mall Exit 44, or Bedford where ORT is in construction or design.

4d. According to your consultants, AET would require a surcharge be placed on non-EZ Pass holders to make up for predicted revenue loss/leakage. Presumably the Authority and its consultants considered a lower, unilateral toll increase for ALL drivers in order to mitigate the cost increase to non-EZ Pass holders (and associated deviation onto secondary roads to avoid tolls)? Undoubtedly 'fairness' enters in to this discussion but perhaps there were other reasons why this wasn't available or practicable? And if I understand the Authority's use of 'fairness' as it relates to our 404(b)(1) Guidelines, it essentially relates to an alternative being found contrary to the public interest (in this case the driving public)?

Answer to Question 4d.

Leveling the toll is not only unfair, it is poor business practice. If the toll were the same for those who pay (or fail to pay) by mail as for those who pay electronically, it would remove one of the chief incentives for opening an electronic account. Those who argue for an AET plaza assert that the surcharge will soon convert everyone to electronic accounts. Analysis and data from CDM Smith proves that this isn't true. But surely it would be less true if the surcharge were eliminated and all the electronic customers were commensurately overcharged.

Opponents argue that risking up to \$15 million in annual cash at York is both trivial and temporary. It is neither. While the loss may attenuate over time, it remains substantial over a period that is many times greater than the time to amortize the capital cost of preserving cash revenue. Table 4 on page 17 of the CDM Smith report of April 14, 2014, deserves special scrutiny on this point.

The seven member board of the Maine Turnpike Authority has determined that spreading the losses of AET to other travelers would be against public interest and contrary to good business practice.

4e. It has been presented by opponents that AET may result in a net increase in revenue over the design life of the project, despite initial losses. The application doesn't appear to thoroughly dismiss this allegation.

Answer to Question 4e:

The opponents simply borrowed this conclusion from pages 47 and 48 of CDM Smith's report of April 14, 2014, but failed to include the following paragraph:

The above AET scenario is net revenue positive, however, only by imposing a \$3.00 video surcharge on unregistered customers. Toll diversion levels of between 3400 and

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5500 per day would also result under this AET scenario as a result of the video surcharges.

Table 5 on page 21 of the report shows that an AET system can, indeed, produce a positive return after a number of years but only by imposing a \$3 surcharge on non-E-ZPass motorists. Almost any inefficient system can make money so long as the price is raised high enough on those who are left to pay.

Two pages later, the consultant produced a similar chart (Table 6 on page 23) to show that ORT makes an operating profit of nearly a million dollars in the first year and continues to produce an ever increasing positive return for the indefinite future without raising the toll. That is because ORT captures more revenue than the present system and operates at lesser cost.

Doubling the charge for cash customers under AET will cause a chaos of diverted traffic onto nearby roads. It is environmentally detrimental and contrary to the public interest for many reasons.

Not the least of these is the fact that motorists from many jurisdictions as well as Maine will use the turnpike for free because we have no way to identify them even with perfect photos. These include, for example, motorists from Vermont, Connecticut and the Maritimes.

Many others will use the highway for free because we cannot enforce collections from them even when they are identified or because it is not economical to pursue them. In our arrangement with Massachusetts, neither agency seeks enforcement from the other until the unpaid tolls on a single plate exceed \$25. With New Hampshire, we each take action only when the number of violations is ten or more.

And it snows in Maine. When it snows, any toll-by-plate system loses thousands of images. In our violations enforcement system, we presently examine between six and nine thousand plates a day. While some are violators, a majority are E-ZPass customers whose tags are not in the car or can't be read. During snow storms, our ability to read plate numbers often drops by 30% or more.

Converting York from cash to AET would add four million new transactions per year to be billed exclusively through photographs and mail. Converting the entire road to AET would add 22.7 million.

Getting every digit of the plate number correct and identifying the state are not sufficient to begin a search for the owner. One must also interpret the associated ideograph, e.g., a lobster, black bear or Purple Heart, to establish the type of plate. Maine has 54 types. There are said to be over a thousand types within the United States. Many plates have exactly the same letters and numbers but differ only as to type.

Our Customer Service Center spends untold hours tracing down and removing toll charges made to Maine E-ZPass motorists by mistakes from out-of-state agencies tolling by plate.

By investing the capital to preserve cash collection on the road, the turnpike's primary remaining cost is to pay the toll collectors, whose staffing levels are adjusted to maintain efficient collection at all times of day during all seasons of the year. Lanes are staffed based on our experience that a single toll attendant can make up to 325 collections per hour. Staffing, our major variable collection cost, is tuned to meet the anticipated traffic.

At rush hour, we hire collectors to work for four hour shifts so that we have just enough people during the busy times and can reduce staffing during lulls. At night in York, there is only one person to cover traffic in each direction. Yet even then, each collector will bring in \$800 to \$1200 during seven hours of nighttime duty. On busy summer Sunday afternoons, each of the five workers in the southbound cash lanes at York will easily collect \$3000 per shift. A single attendant in the truck

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lane may collect as much as \$12,000.

The certainty of cash collection is as close to 100% as any system can provide. Its efficiency, its reliability, and its low operating cost cannot be matched by trying to bill by mail.

4b. Another element that may not be thoroughly discussed, although it has been brought up in the past, is the high revenue loss from taking the existing toll plaza off line (and demolishing it) while an AET facility is built at that same location. Some opponents have taken the position that an AET facility can simply be erected at the present toll plaza's location, perhaps even using some of the same infrastructure, and have virtually no environmental or socio-economic impact. Perhaps this alternative is even more costly than the application describes?

5. The no build alternative is addressed in the application but not specifically the rehabilitation alternative. Rehabilitation in this case would be upgrading or replacing existing facilities with as much 'mitigation' for the facility's short comings as possible, including ORT. Is it the Authority's position that the discussion of alternative 7.3 equates to the 'rehabilitation alternative'?

Answer to questions 4b and 5:

Pictures of AET and ORT sites may lead one to believe that electronic tolling is a simple system of overhead antennas hanging from a gantry. However, completely out of sight is one of the most important and sensitive components of a modern toll system: an array of underground loops carefully set within the road surface of each lane. The loops are buried a quarter inch below the surface usually in concrete reinforced by fiberglass rebar to reduce electro-magnetic interference.

A lane controller sends electrical currents through the loops to produce continuous electro-magnetic fields just above ground. The loops are tuned to measure even slight inductance variations caused by vehicles passing over top. These tuned loops are sensitive to the point where they can discriminate among many types of vehicles and even detect trailer hitches linking a vehicle to its trailer. The system works reliably even when vehicles pass through at 100 mph (when tested by State Troopers).

Electronic loops are essential for classifying vehicles. Without them, if a 100,000 pound, six-axle truck used a car transponder at York, it would be charged only \$3 rather than \$13.50 because the E-ZPass antenna receives information only from the transponder. It cannot classify the vehicle carrying it. Even if the toll is charged by mail after a license plate photo, it is the in-ground classification system--and not the plate photo--that determines how much to charge.

Loop systems have no moving parts subject to failure and are being installed throughout the industry to replace 40-year-old electro-mechanical treadle systems that are unreliable, expensive to maintain, and useable only for low speed traffic.

Massachusetts has installed loops in every lane under every E-ZPass gantry. Maine has installed them in most of its tolling locations, but York is still using mechanical treadles.

To work effectively over time, the loops must be set within a rigid pad on stable ground, a condition that cannot be maintained at mile 7.3 without piling support.

The highway near mile 7.3 is built on deep compressible clays. The plaza itself rests on piles, but the approach and departure paving has been sinking by nearly 1 inch per year. Physical stability is essential to the functioning of the loops. To install loops in each of York's 17 present lanes requires excavating each of the approach and departure zones and driving piles down to bedrock 60 or 65 feet below the surface to support a slab to house the loops in a stable environment. And even when done,

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the plaza itself would continue to limit speeds to 10 mph.

There is nothing salvageable at the present plaza if we intend to meet the project purpose. The toll lanes are only 10 feet wide; the tunnel leaks; and there is little space for sheltering computers. The electricity supply is inadequate. Pilings under the tunnel create a huge hump across the road that must be eliminated for highway speed traffic. The site is too close to adjoining ramps. It's at the bottom of a hill and around a bend in the road. Even by 1969 standards, the toll should never have been built at this location.

Whether the existing site could be rehabilitated in exactly the same location was addressed by HNTB in Section 7 of Part 2 of the Draft-Phase One Report filed with ACOE in 2009 and incorporated by reference in our application. That information is up-dated by a Tech Memo attached to this letter as Enclosure G. To rehabilitate the old site with modern electronics can only be accomplished by driving piles and adding tunnel capacity. The final 10 mph toll would not meet the purposes of the project.

Because the York Town Council favored building a new plaza near the old, we tasked Jacobs Engineering to examine with care the possibility of building a new ORT plaza a short distance north of the existing plaza. This became, in essence, the rebuild alternative. It would require elaborate preparation of the underlying soils. When compared with other choices, it was more costly by half and environmentally more invasive than any other site evaluated. These factors are charted and reviewed in the alternatives analysis in our application.

The York project has these primary goals:

- (1) to replace obsolete electronics;
- (2) to convert to high speed tolling for E-ZPass traffic;
- (3) to preserve revenue and reduce operating costs;
- (4) to remedy safety deficiencies; and
- (5) to minimize impacts to the state transportation system, abutters and the environment.

A modern ORT plaza at Mile 8.8 achieves these goals. AET does not. Neither is it feasible to achieve them by trying to repair the present site. To retrofit the site by installing modern electronics a few lanes at a time can only be done at great expense; and it would not provide high speed tolling. It would still be the same 10 mph E-ZPass plaza that it is today.

In Closing

The Turnpike has no plan to abandon the collection of cash at York, nor any prudent basis for proposing to our bondholders that we do so.

Over a ten year span of time, the Authority has carefully considered its options in an orderly process with the help of the best engineering, environmental and financial advice available. Board proceedings have been open and the public has been fully engaged at every turn, first in deciding whether cashless tolling was feasible and then in determining where best to locate a plaza to meet the Turnpike's purpose and need.

The building of a new ORT plaza and closing of the old will reduce noise and air emissions, increase fuel efficiency, and enhance the productivity of Maine citizens while preserving Turnpike revenue. By attracting more traffic onto the Turnpike, it will reduce congestion on neighboring roadways.

We have chosen a site that best minimizes environmental impacts. It is also further from residential property than the present plaza at mile 7.3.

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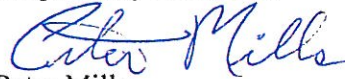
We have more than honored mitigation concerns of the various permitting agencies, including agreed payments to compensate for wetland losses and to enhance protection for wildlife, both at the site and in other areas of special concern to Maine IF&W.

Wetland around the old site will be reclaimed and the highway moved away from existing homes. Stormwater management for the York Water District will be greatly improved.

We bought land near mile 8.8 from owners who had it permitted for an eight lot subdivision. By taking it out of development, this project will protect its wetlands, vernal pools and wildlife habitat and preserve a welcome forested buffer for established residential neighbors.

The Maine Turnpike has approached this project with every intention to fulfill our mission by balancing the impacts in ways that will leave the land, our neighbors, and the natural environment in a better state than we found it.

Respectfully submitted,



Peter Mills

Executive Director, Maine Turnpike Authority

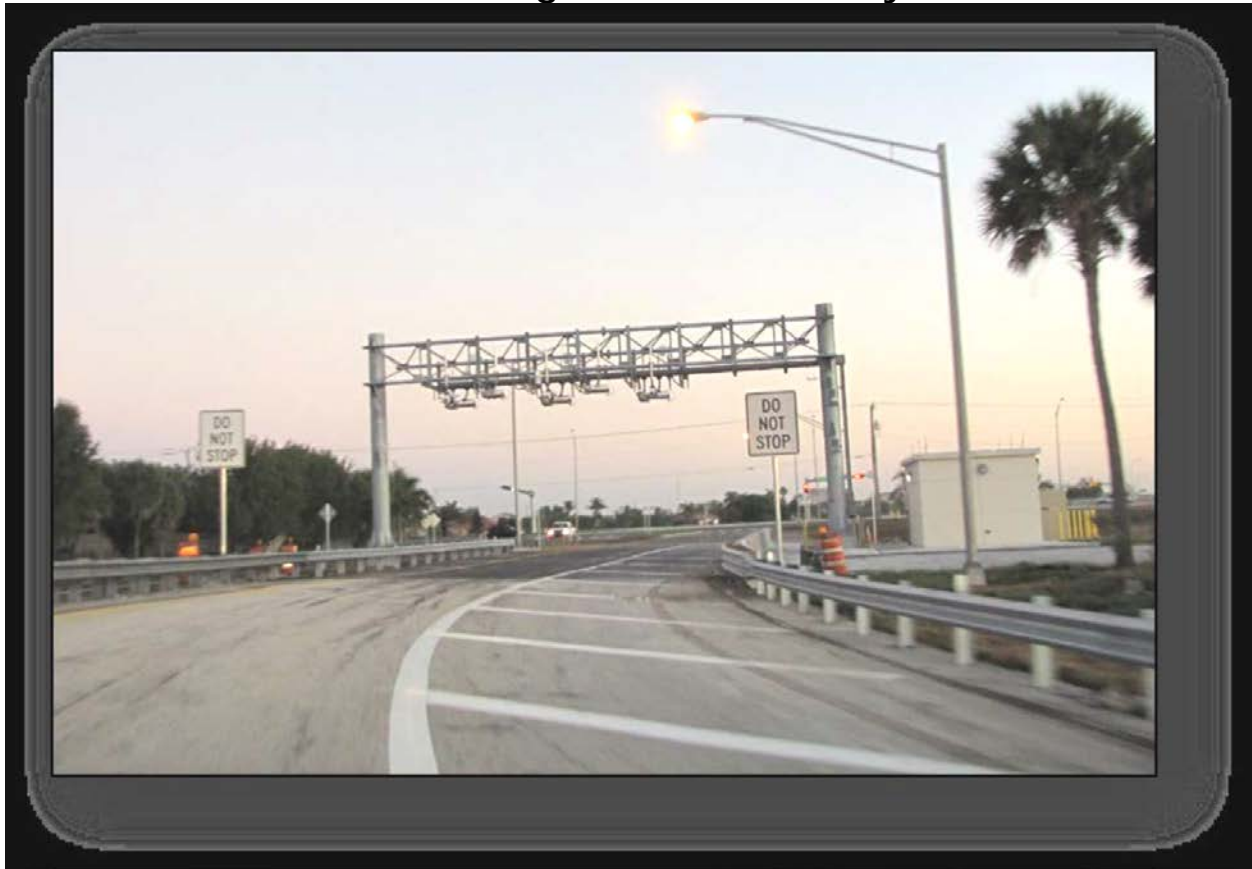
Enclosures:

- A. Letter from Gary Quinlin of CDM Smith dated January 12, 2017
- B. The first five pages of the Executive Summary of the 2012 AECOM report entitled "Feasibility of Implementing a Statewide Tolling Strategy--Western Turnpike."
- C. TollRoadsNews article dated August 19, 2013
- D. TollRoadsNews article dated October 24, 2013
- E. Review & Comments on AECOM's Report by Gary Quinlin dated September 9, 2015
- F. Pages 5 through 7 of Gary Quinlin's letter of July 22, 2016
- G. HNTB Tech Memo of January 26, 2017, on York Toll replacement options

cc: Robert Green, Maine DEP (with enclosures)

Shortfalls in MTA's Response to the Army Corp of Engineers

All-Electronic Tolling - The 21st Century Solution



Source: Central Florida Expressway Authority

**Prepared
by
The eTrans Group, Inc.
for
The Town of York, Maine**

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1.0 Executive Summary

The Maine Turnpike Authority's (MTA) recent recommendation for replacing the existing York Toll Plaza with a new, hybrid toll plaza at Milepost 8.8 that offers cash and open road toll (ORT) options is inconsistent with its own findings.

On March 17, 2010, after studying options for the York Toll Plaza for several years, the Maine Turnpike Authority (MTA) submitted a Draft Phase I reportⁱ for the environmental review process by the U.S. Army Corps of Engineers (ACOE). In its May 5, 2010 responseⁱⁱ to the MTA's initial submittal, the ACOE noted that the MTA:

- did not properly consider safety issues associated with conventional (cash) toll collection; ⁱⁱⁱ and,
- dismissed one-way^{iv} and all electronic tolling (AET)^v options inconsistent with Federal Highway Administration Guidelines for environmental review per Section 404 (b)(1) of the Clean Water Act (hereafter referred to as Guidelines).

~~Therefore,~~ the MTA commissioned CDM Smith to conduct *"an impact assessment for possible conversion to Open Road Tolling (ORT) or All Electronic Tolling (AET) at two toll plazas on the Maine Turnpike."* ^{vi} ~~However,~~ the CDM Smith study (Final Draft released on March 18, 2014) does not adequately respond to several ACOE requests ~~and~~ it is also fraught with significant structural and other issues that bias its results against AET. (e.g. The CDM Smith study only considered an AET pilot program at these two plazas).^{vii} Nevertheless, even with significant bias in their results, *after "considering traffic, toll rates, operating costs, net revenue over a 10-year period, and capital costs to a hypothetical continuation of the current cash collection of tolls"* ^{viii}:

**The CDM Smith study found AET to be a
"financially feasible option" at the York Toll Plaza**^{ix}.

The CDM Smith study also noted that: *"AET offers free flow travel for all motorists with lower overall capital costs."*^x

~~However, due to the bias in their results,~~ ~~the~~ CDM Smith study estimated that a \$3.00 (passenger car) surcharge ^{xi} would be required for those customers not actively enrolled in the ETC program (up to 20% of all customers eventually). ~~However,~~ ~~the~~ author is ~~not~~ unaware of any MTA policy this would violate. In fact, ~~a significant surcharge~~ (though \$3.00 is rarely required, ~~a significant surcharge~~) is normally charged AET customers who use the license plate toll option and do not pre-enroll in the AET program. This is done to avoid those actively enrolling in the AET program from cross-subsidizing the costs of those that do not actively enroll. This is the fair and equitable approach.

~~the~~ CDM Smith study also estimated that: "*The imposition of a \$3.00 video surcharge is also estimated to result in diversion of traffic to US Route 1 from 3,400 to 5,500 per day.*" ^{xii} ~~Therefore,~~ ~~in addition~~ to the bias against AET in their results leading to an overestimate of ~~ing~~ the video surcharge that will be necessary, the exaggerated estimate of the video surcharge was used to predict trip diversions to Route 1 upon implementation of AET. ~~Suggesting that long-term traffic diversions from 3,400 to 5,800 would be realized over the long term is not defensible~~ ~~at this level are unrealistic.~~ At these levels, the traffic assumed to divert onto Route 1 ~~ed~~ would be a major portion of that assumed will not be actively enrolled in the AET program. ~~to be video tolled; and,~~ And, even if traffic diversions at these levels of this significance ~~did occur initially,~~ the level of service ~~on US Route 1~~ the diverted traffic would encounter on US Route 1 would be so poor that few motorists would leave the MTA mainline a second time and the challenges associated with the alternative route would be quickly spread amongst the motoring public. i.e. ~~the~~ problem would, to a great extent, be self-regulating.

Therefore, the CDM Smith study found the AET option at the York Toll Plaza financially feasible in spite of the fact that this study suffers from several major shortfalls, which bias the results of this work against the AET option at the York Toll Plaza. The CDM Smith study also noted that

"the plaza reconstruction cost <of AET> is greatly reduced. As importantly, there is essentially no additional right-of-way typically required, since the gantries are constructed across existing roadways only. AET also has the benefit of virtually eliminating accident risk at toll plaza locations; toll plazas typically represent high accident locations on toll roads across the country." ^{xiii}

Nevertheless, on July 23, 2015 the MTA released the results of a Jacob's Engineering study that reviewed the safety and environmental impacts of five alternative solutions for the York Toll Plaza.^{xiv} However, even though the CDM Smith study found AET financially feasible, an AET

alternative was not considered for the York Toll Plaza in these analyses. Therefore, the significant environmental and safety benefits of the AET option were not considered.

In summary, the MTA has eliminated the AET option from the York Toll Plaza analyses even though its own advisors have found it to be economically feasible.

Further, this report will demonstrate that the CDM Smith analysis is fraught with several structural and other issues that bias the results against AET, making the AET option an even better solution from a financial perspective than the results of the CDM Smith study would suggest. Since the AET option is, by far, the most environmentally friendly option, and it eliminates all of the safety issues associated with collection of tolls at the roadside, elimination of the AET option from the York Toll Plaza analysis is highly irregular and indefensible.

2.0 U.S. Army Corps of Engineers (ACOE) Observations/Requests

2.1 Major Oversights in the MTA Submittal

In its May 5, 2010 response^{xv} to the MTA's initial submittal, the ACOE noted that the MTA's analyses:

- did not properly consider safety issues associated with conventional (cash) toll collection; ^{xvi} and,
- dismissed one-way^{xvii} and all electronic tolling (AET)^{xviii} options inconsistent with Federal Highway Administration Guidelines for environmental review per Section 404 (b)(1) of the Clean Water Act (hereafter referred to as Guidelines).

The MTA has yet to appropriately respond to these concerns.

2.2 Other Issues the ACOE Investigation Requesteds the MTA Investigate

The ACOE asked the MTA to investigate:

- 1) *"available and practicable strategies <that> exist to address out of state/country toll collection";* ^{xix} and,
- 2) *"the percent loss in revenue with high speed electronic toll collection within the context of a mixed tolling arrangement" <including> other state's experiences with this option".* ^{xx}

However, **the MTA has yet to** appropriately **respond to these** requests.

A number of commercial options are available to increase the effectiveness of collecting tolls from out of state vehicles, including:

<http://bestpass.com> and <https://platepass.com>

There have also been several mobile apps introduced to help resolve this issue, including:

<https://www.banypass.com/ptoll/> and <http://www.paytollo.com/>

There is also at least one company currently offering to provide toll payment services through cell phones. Other commercial solutions will also likely be introduced. Collectively, these will have a significant impact on the ability of the MTA and others to collect out of state tolls.

The CDM Smith Study also assumed a slight increase in Open Road Toll (ORT) violations at the York Toll Plaza - citing no observed increase in violations at the New Gloucester Toll Plaza since introduction of ORT as justification for this. However, several toll authorities have been wrestling with escalating ORT violations - and E-ZPass lane violations are not limited to just ORT. For example, the E-ZPass lanes on the Pennsylvania Turnpike (gate-free lanes in the toll plazas) have been subject to such fraud and abuse that:

"When the Pennsylvania Turnpike's fiscal year ended in May, there were \$33.3 million still outstanding in unpaid tolls."^{xxi}

Therefore, the CDM Smith study assuming only modest violations in ORT lanes at the York Toll Plaza is overly optimistic for ORT operations and biases their results against AET.

In response to the MTA's initial submittal, ~~At that time~~ the ACOE also asked the MTA to:

3) provide a technical response to York's recommendation to carry the AET option forward into Phase II of the Highway Methodology process that addresses: ^{xxii}

- a) how losses in toll revenue under the AET toll option might be mitigated
- b) how revenue risks can be reduced to a practicable level, and
- c) the availability and practicability of "innovative enforcement programs" ~~and, to~~

The MTA has yet to appropriately respond to these requests.

The ACOE also asked the MTA to

4) provide a technical response to the Whipoorwill Home Owners~~hip~~ Association's (WHOA): ^{xxiii}

"compelling arguments that AET is in fact, economically practicable, particularly if the high costs of new toll plaza construction, long-term maintenance costs of a new toll plaza, and employee salaries are eliminated. Equally compelling is their position that the AET would meet the majority of project goals."

The MTA has yet to appropriately respond to this request.

The ACOE also asked the MTA to:

5) *"consider an AET option but with a design that enabled conversion/expansion in the event that "leakage" could not be addressed or exceeded acceptable thresholds."* ^{xxiv}

The MTA has yet to appropriately respond to this request.

2.3 MTA's Response to ACOE Requests - A Quick Summary

~~Also, of~~ the ACOE requests above:

#1 and #2 were given only cursory review; ^{xxv}

#3 a, b and c do not appear to have been addressed;

#4 was dismissed based on ~~the~~ biased results of the CDM Smith study; ^{xxvi} and,

#5 was dismissed though no defensive reason was presented. ^{xxvii}

~~Also, the CDM Smith study only evaluated the benefits of an AET pilot program at these two toll plazas.~~ ^{xxviii}

On March 18, 2014 the MTA released the results of a CDM Smith study to conduct an independent assessment of conversion to ORT or AET operations at the York and the Gardiner toll plazas on the Maine Turnpike. CDM Smith developed a detailed model to analyze the potential net revenue impacts of both AET and ORT at each toll plaza. That effort included a waterfall algorithm to estimate revenue recovery rates at different stages in the process and a detailed sensitivity analyses of the impacts of variations in their major assumptions (e.g. the potential impacts of speculative AET pricing surcharges). However, the CDM Smith study ^{xxix} is subject to many of the same limitations as the MTA's previous alternative evaluation efforts that were equally biased against AET. ^{xxx}

These anomalies and several ~~other~~ major assumptions in CDM Smith's analysis resulted in the retention of significant bias against AET in the MTA's recent evaluation of alternative solutions for the York Toll Plaza. For example, the MTA never considered full deployment of AET:

"The Maine Turnpike Authority may ultimately consider all electronic tolling on the full system in the future, but this analysis only addressed the potential pilot implementation of AET or ORT at the York and/or Gardiner facilities." ^{xxxi}

Therefore, on the direction of the MTA, the CDM Smith study only evaluated the benefits of an AET pilot program at two of the 18 (eighteen) toll plazas operated by the MTA. The impacts of how this assumption biased the MTA's analyses are explained in further detail in the (Refer to-summary of Safety and Financial Analyses below.)

Further, on~~On~~ July 23, 2015 the MTA released the results of a Jacob's Engineering study to review the safety and environmental impacts of five alternative solutions for the York Toll Plaza.^{xxxii} However, as a result of the ~~biased results from the CDM Smith~~ limited safety reviews inappropriately focused and structured financial analysis biasing the results of the CDM Smith study, an AET alternative was not considered for the York Toll Plaza in these analyses. Therefore, the significant environmental and safety benefits of the AET option were not considered; and, as a result, all electronic tolling (AET), a technology successfully introduced on the Highway 407 ETR in Toronto, Ontario, in 1997, has been overlooked in the final options to be reviewed in detail.

2.4 The MTA Dismissed AET - the Most Viable Option for the York Toll Plaza

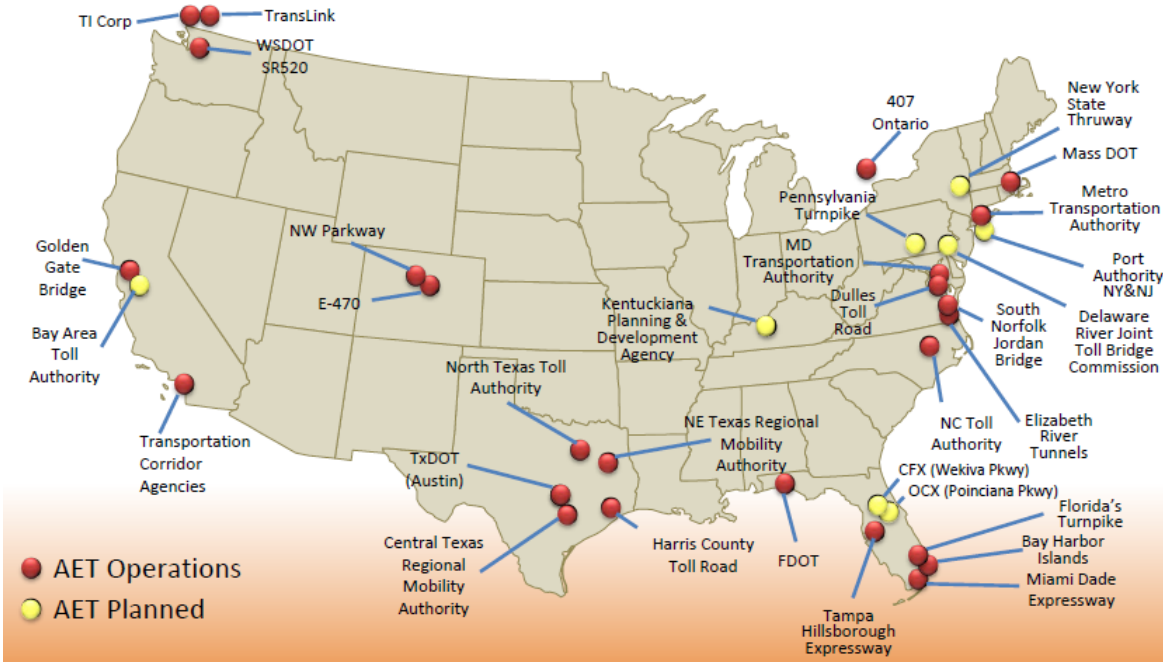
—Twenty five toll authorities are currently operating AET successfully in the U.S. and Canada, and several more authorities are planning for the implementation of AET in the near future. There are also several AET operations in South America (Chile, Brazil), Europe, Scandinavia, Japan and Australia, and AET has been recently deployed AET operations in the Caribbean and South Africa. Many of these operations have been successfully operating for over a decade. These ~~successful~~ AET operations also span a wide variety of operating conditions, from deploying AET on green-field facilities where the transponder penetration was in the low teens when toll collection started (e.g. H407 ETR in Toronto), to successfully collecting tolls from large percentages of vehicles from outside of the country (e.g. several operations in Europe). For example, the Central Florida Expressway Authority, which serves large volumes of out of state travelers. recently studied AET deployments throughout the U.S. and Canada and elected to move forward with AET deployment because AET:

- a) greatly reduces the environmental impacts of toll collection
- b) reduces capital, operations and maintenance costs
- c) requires less right-of-way
- d) offers increased traffic throughput,
- e) eliminates the safety issues with toll plazas, and
- f) leads to less driver confusion.

»»» All Electronic Tolling (AET) Locations 2010



»»» All Electronic Tolling (AET) Locations 2015



Source: Central Florida Expressway Authority

Nevertheless, the MTA has dismissed AET again— even though the AET option for the York Toll Plaza:

- a) has essentially no environmental impacts ~~(and even~~ provides the opportunity to reclaim several acres of wetlands through removal of the existing toll plaza (a net environmental gain),
- b) eliminates the safety risks (and costs of crashes) of collecting cash tolls at the roadside,
- c) is the better option financially (once all capital and operating costs are considered),
- d) avoids the congestion (and its commensurate environmental impacts) associated with collecting cash tolls at the roadside, and
- e) provides those using the Turnpike with a level of service significantly better than other options.

According to the ACOE:

"An alternative can only be dismissed if it is not available, not practicable (after considering cost, logistics, and available technology), or more environmentally damaging." xxxiii

Since AET is clearly available, the MTA has not demonstrated that AET is not practicable, considering costs, logistics and available technology, and the AET option offers a net positive environmental impact, the AET option should not have been dismissed.

3.0 Environmental, Safety and Financial Issues Not Properly Addressed in MTA's Analyses

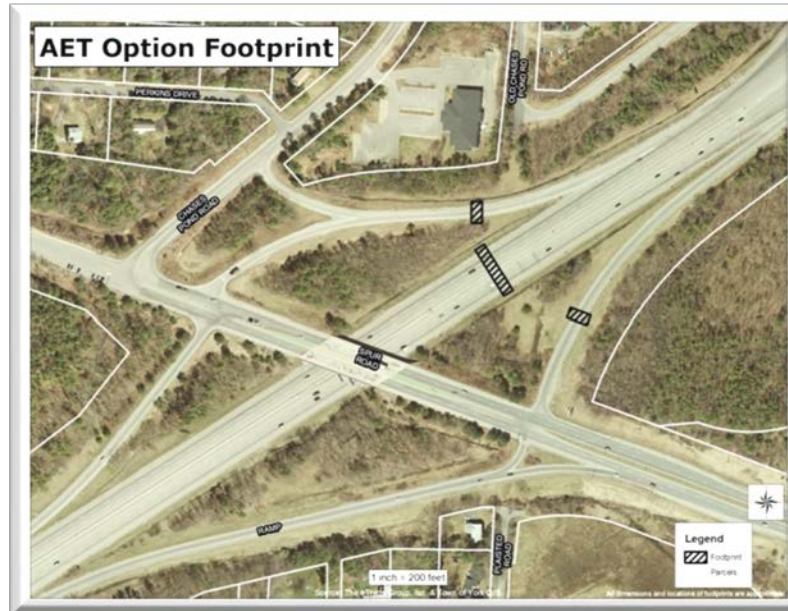
Several environmental impacts have been identified with the hybrid toll plaza proposed for Mile Marker 8.8 (refer to summary above), not the least of which is possible intrusion on nearby homes (noise, light and groundwater impacts). Additional details on the summary of additional environmental and safety benefits of the AET option are presented below, and additional biases against AET from both the structure, inappropriate focus and assumptions of MTA's financial analyses are provided below.



Source: INSERT SOURCE

3.1A) Environmental Benefits of an AET Solution for the York Toll Plaza

An AET toll gateway ~~can be easily installed~~ immediately North of the Connector at Mile Marker 6.7 is the best solution identified from an environmental perspective. At this location vehicles would be tolled on both the ramps and the mainline.



All Electronic Tolling Footprint at Mile Marker 6.7 xxxiv

The net aquatic and wetlands environmental impacts of an AET toll gateway at MM 6.7 are positive.

An AET toll gateway at this location allows the reclamation of several acres of wetlands once the existing toll plaza footprint outside of the mainline R/W can be abandoned - without transferring the environmental problems at the existing toll plaza to a new location such as the pristine environment that currently exists at MM 8.8. For example, the AET option eliminates the need to spread additional salt on the roadway at the toll gateway during inclement cold weather to improve the safety of both vehicles and pedestrians at a barrier toll plaza. The impacts of oil, brake, radiator fluid and other contaminants that, like salt, can leach into the groundwater are also minimized by the AET option since vehicles are not required to stop to pay a toll. Since many of the homes along the MTA corridor in this area are served by groundwater wells, this is a significant environmental benefit of the AET option.

An installing AET toll gateway at MM 6.7 also avoids other negative impacts to housing.

Though no home displacements are expected at the recommended location for the new York Toll Plaza at MM 8.8, new homes in the area could be significantly impacted by other environmental impacts such as noise, vehicle emissions and light intrusion should a new hybrid toll plaza be built at that location. The AET option avoids the need to stop and queue vehicles

on the corridor and the resultant heavy vehicle braking and acceleration noise and increased vehicle missions associated with imposing a stop and go environment on through traffic. The AET option also offers a commensurate reduction in fuel consumption for roadway users. Also, unlike the recommended hybrid toll plaza at MM 8.8, the AET solution at MM 6.7 would~~does~~ not impose visual blight on the corridor, or introduce additional impacts from~~negatively impact~~ vehicular noise and emissions. ~~;~~~~and,~~ ~~Further,~~ although nighttime lighting would be required at the AET toll gateway, the impacts of this lighting on housing along the MTA corridor ~~at an AET gateway at~~ MM 6.7 would be ~~likely~~ significantly less than the impact of lighting these for an ORT and cash toll plaza at MM 8.8 since the interchange immediately south of the proposed AET toll gateway at MM 6.7 is already artificially lit.

3.2 Safety Benefits of an AET Solution for the York Toll Plaza

An AET toll gateway immediately North of the Connector at Mile Marker 6.7 is the best solution from a safety perspective.

The MTA and its advisors repeatedly identify safety as a primary concern in their alternative evaluations for the York Toll Plaza, including providing comparative safety issues between options being investigated. However, since the AET option was inappropriately dismissed early in the original analysis (July 2006), ^{xxxv} and eliminated from the list of~~screened out of~~ viable options by the MTA using similarly the biased results from the CDM Smith study of March 18, 2014, the significant safety benefits of the AET option have been overlooked.

The York Toll Plaza is currently identified as a High Crash Location (HCL) by the Maine DOT.^{xxxvi} A summary of Jacob's efforts to review crash data on the Turnpike in this area in an attempt to identify possible roadway alignment or other geometric issues that could be problematic for location of a toll plaza is presented on pp. 5 and 6 of this Technical Memorandum. Though this is appropriate, no estimates appear to have been made regarding the possible increase in crashes that will occur from introducing a toll plaza at the alternative locations investigated. Cash toll collection at the roadside requires placement of a physical barrier across the roadway to stop vehicles paying the toll. This introduces several~~ing~~ major conflicts into the traffic flow. In addition to the physical barriers - the toll booths and safety appurtenances around them, this also requires vehicles to merge from traffic, slow, get in queue with other vehicles, stop to pay the toll, then accelerate and safely merge back into traffic as they approach mainline speeds. ~~Also,~~ ~~though~~ a tunnel can help reduce pedestrian safety issues, pedestrian traffic within the immediate confines of the toll plaza will invariably occur and introduce additional conflict. This creates an inherently dangerous situation ~~even~~ where one may not have existed - a phenomenon that is well documented in the literature.

Relocating the York Toll Plaza to "safer" location only relocates the inherent problems associated with the toll plaza environment at the new toll plaza. A hybrid solution like that being proposed (ORT and cash toll collection) reduces the safety issues somewhat. However, the fact that a barrier toll plaza is proposed where a significant portion of mainline traffic will be required to merge from traffic, successfully navigate through the toll plaza, pay the toll, then merge back with mainline traffic, must not be overlooked. The AET option for the York Toll Plaza reintroduces free-flow traffic operations on the MTA corridor and avoids all of the safety issues associated with a toll plaza in their entirety.

A recent study funded by SAFER-SIM and the Florida Department of Transportation (FDOT) evaluated the safety effectiveness of converting from traditional mainline toll plazas (TMTP) and Hybrid Mainline Toll Plazas (HMTP) to All-Electronic Toll (AET) collection. (Refer to Attachment X.) Before and after data were collected from one hundred mainline toll plazas on more than 750 miles of toll roads in Florida. The data indicated that converting from a TMTP to an AET operation resulted in an average reductions of 77, 76, and 67 percent for total, fatal-and-injury and Property Damage Only (PDO) crashes, respectively. The safety benefits of converting from a HMTP to an AET operation resulted in reductions of 23, 29 and 19 percent for total, fatal-and-injury, and PDO crashes respectively. xxxvii The results of this work proved that converting to an AET operation significantly improved traffic safety for all crash categories, especially, fatalities. Such conversions also changed tolling points from amongst the highest risk locations on expressways to posing safety risks similar to routine expressway segments.



Highway 407 ETR®, Toronto, Ontario

The significance of the risk of fatalities at conventional barrier toll plazas ~~this safety issue~~ is exemplified by the fact that there have been at least ~~five~~^{three} fatal crashes at toll plazas in the region since ~~May~~^{August} of 2015.

Recent Fatal Crashes at Toll Plazas in the North East Region

Atlantic City Expressway	Egg Harbor Toll Plaza	November 2015
Garden State Parkway	Paramus Toll Plaza	October 2015
New Hampshire Turnpike	Merrimack Toll Plaza	August 2015
<u>Massachusetts Turnpike</u>	<u>Auburn Toll Plaza</u>	<u>July 2015</u>
<u>I-95 (New Hampshire)</u>	<u>Hampton Toll Plaza</u>	<u>May 2015</u>

Crashes involving personal injury are far more frequent and can be catastrophic. Though not a fatal crash, the following URL of a tractor trailer ~~also collided with a car and~~ crashing through ~~at the~~ Dover Toll Booth on the Spaulding Turnpike in May 2015 demonstrates the major physical risks of collecting cash at the roadside.

https://www.youtube.com/watch?v=pE_83KbHp7g

Catastrophic and fatal accidents are difficult to predict. However, treacherous winter driving conditions that frequently occur in this region greatly increase the risk of a serious incident at this location. The fact that a significant share of the motorists using the York Toll Plaza are from out of State, many which are unfamiliar with the area or the Toll Plaza itself, further increases the likelihood of a major incident at this location. ~~Th~~As long as a barrier toll plaza is used to collect tolls at the York Toll Plazas the possibility of a major vehicular crash ~~at the York toll Plaza~~ (at its current location or a new location) is not a matter of IF this will happen, but WHEN it will happen.

Estimates of the costs of all such crashes should be included in the life-cycle cost analyses conducted for the alternatives analyses reviewing options for the York Toll Plaza. As with other costs of AET conversion, these costs should be estimated on a systems-wide basis.

An additional safety issue of collecting tolls at the roadside that appears to have been overlooked by the MTA is dangers to MTA personnel and the public - exemplified by a robbery on Sunday afternoon, January 10, 2016, at an East Orange tollbooth on the Parkway. The perpetrator

"leaned into the tollbooth, pushed the attendant out of the way and took money from the drawer before he drove away," xxxviii

Though revenue loss from this incident was likely limited by cash drawer limitation policies established by the authority, collecting cash at the roadside poses a significant risk to life and

limb for both MTA personnel and the public at large during such robberies - a risk that can be avoided entirely through the implementation of AET.

3.3 Inherent Biases in the MTA's Financial Analyses

Good industry practice suggests that a financial analyses of alternative options for a project of this magnitude (refurbishing or relocating the York Toll Plaza) consist of a review of the life-cycle costs of the most-likely operating scenario for each option being considered, as well as a sensitivity analysis of the possible impact on the results of variations in major assumptions. However, the MTA's financial analysis falls significantly short of expectations. Structurally, there are three significant errors with the financial analyses of the AET option. The financial analyses by CDM Smith consider only:

a) Estimates of retained revenue (vs. life-cycle costs). The CDM Smith study focuses on a worst case scenario and appears to assume that estimated worst case conditions, including revenue losses and diverted traffic, would be sustained throughout the 10 year study period instead of the most likely scenario. This suggests that MTA management would be unwilling or incapable to manage toll operations to improve revenue collections, reduce violation activity and minimize diversion over time. One has to assume that this would not be the case, but this is what was analyzed.

b) A pilot study of AET toll operations at the York and Gardner toll plazas. The remainder of the MTA operation was assumed to operate "as is", which is mostly in conventional (cash) toll collection mode. Therefore, cost savings from AET operations at the 16 (sixteen) remaining toll plazas on the Turnpike - locations not plagued by the extent of out-of-state traffic and the challenges associated with collecting these tolls as the York Toll Plaza location - were not considered.

c) A 10 year study period. Since this analysis was comparing the AET option with a hybrid toll plaza offering ORT and conventional cash toll collection, ^{xxxix} limiting the study to only 10 years enabled avoiding consideration of the significant costs of maintaining the conventional toll operation facilities in the out-years, as well as the salaries of the staff required to man the conventional toll operation at the roadside on a 24/7 basis.

All three of these structural anomalies are significant and bias the results of the CDM Smith work against AET. A number of oversights and major assumptions also bias the results of these analyses against AET. The more significant of these include:

a) Estimates of the more significant benefits of converting to and AET operation (including significant enhancements in both environmental and safety conditions) are not considered in the financial analyses.

b) AET toll surcharges and fees assumed are inconsistent (significantly higher) than those typically encountered on AET operations, and the reasons for establishing these surcharges are inconsistent with Good Industry Practice for AET operations. ^{xi} (Refer to "AET Business Model" , a summary of appropriate AET pricing policies provided as Attachment Y.)

c) Toll plaza relocation cost data used were inconsistent with current estimates. HNTB estimates for the capital costs to maintain the existing York Toll Plaza (about \$22.1 million), costs for ORT conversion at \$36.0 million, and AET capital costs of about \$4.8 million were used. ^{xli} or about \$17.3 million less than the existing condition." However, Jacobs recent report (16 Nov 2015) assumes relocation costs to Milepost 8.8 at \$40.8 MM. ^{xlii} Therefore, the cost analyses should be updated to include all costs associated with providing ORT at the York Toll Plaza location, including those above.

e)d) Traffic diversion estimates are based on surcharges significantly greater than those likely necessary - and it appears that these traffic diversions are assumed to occur through the entire ten year financial analysis.

e)e) Toll revenue shrinkage in cash toll operations do not appear to have been considered in the financial analyses. Revenue leakage in cash toll operations is typically significant and admittedly a problem at the MTA based on observed reduced "run-through violation rates" at the New Gloucester Toll Plaza after violation enforcement systems were installed in the conventional lanes. ^{xliii} (It should be noted that run-through violation rates are just one of many sources of "leakage" in cash toll lanes - all which appear to not have been addressed in the MTA's alternatives analyses.)

e)f) The business rules for ORT operations (including license plate tolling and violations enforcement) were assumed to be significantly different than those assumed for AET operations. However, -when, in reality, the business rules for both operations need to be similar to sustain viability of toll operations in each mode over the long-haul.

4.0 Summary

The proper review and evaluation of options for the York Toll Plaza requires an investigative effort that responds to observations and requests of the ACOE, and includes anthe unbiased review and consideration of all options, issues and risks so that a prudent and responsible decision canhas been made. This measure of care and responsibility, commonly referred to as due diligence, is especially critical when public expenditures and safety risks as significant as those encountered at conventional mainline barrier toll plazas are being considered.

Conducting such a review requires a thorough assessment of all aspects of the project, technical, financial and socio-political, to ensure that the best decision is made. From an environmental perspective, an unbiased review clearly denotes the benefits of AET when compared to the MTA's preferred option.

Anticipated Environmental and Other Impacts of AET vs. Recommended Practicable Options

Estimated Impacts \ Option	ORT/Cash@ MM 8.8	AET @MM 6.7
NRCS Wetland (Ac)	1.0 ¹	0
Stream (ft)	80 ¹	0
Vernal Pools	2 ¹	0
FEMA Flood Plain (Ac)	0.3 ¹	0
Threatened/Endangered Species Habitat	3 ¹	0
Right-of-Way	0.3 ¹	0
Net Environmental Gain	No	Yes
Meets Engineering Requirements	Some ¹	Yes
Safety (Toll collectors and public)	Poor	Best
Satisfies Purpose & Need	Marginally	Yes
Customer Service	Poor	Yes
Estimated Construction \$	\$ 40.8 m ²	\$ 3.8 m ²
Life-cycle Costs/Retained Revenue	Poor	Best

Acceptability: **Best** **Marginal** **Worst**

1) "Southern Toll Plaza, Technical Memorandum on Alternatives Analysis (draft)", Jacobs Engineering, Evaluation Matrix, July 23, 2015.

2) "Maine Turnpike ORT/AET Analysis (Final Draft)", CDM Smith, March 18, 2014, pg. ES-3

For example, the AET solution offers NO additional environment damage, recovery of areas that were damaged, NO vehicles stopping and creating pollution, and less heavy salting. The footprint of the Maine Turnpike also becomes smaller throughout the entire system when AET is implemented.

The MTA's analysis of options for this project does not adequately consider some critical issues, while giving inappropriate credence to others. This has resulted in the MTA offering a short-list of options for public review and recommendation that do not pass the scrutiny of an independent assessment. Individually, these oversights suggest that the MTA's review of alternatives for the York Toll Plaza is based on faulty logic. Collectively, they demand a more thorough and current review of the facts to ensure that an appropriate decisions is made on the best way to resolve the York Toll Plaza relocation issue.

End of File

References

- i "Maine Turnpike Southern Toll Plaza Replacement Study, Draft – Phase I Report", for submittal to the U.S. Army Corps of Engineers, HNTB Corporation, November 5, 2009.
- ii Additional Information Required, Application # NAE-2007-01211, Maine Turnpike Authority, Attachment to letter from Jay Clement (ACOE) to Conrad Welzel (MTA), May 5, 2010.
- iii IBID, Part 1, Existing Conditions, Section b.
- iv IBID, Part 2, Existing Site Evaluation, Section 2.c.
- v IBID, Part 2, Existing Site Evaluation, Section 2.d. (1)
- vi "Maine Turnpike ORT/AET Impact Analysis (Final Draft)", CDM Smith, March 18, 2014, pg. ES-1.
- vii IBID, pg. 1.
- viii IBID, pg. ES-4.
- ix IBID., pg. ES-4.
- x IBID, pg. ES-4.
- xi IBID., pg. ES-2.
- xii IBID. pg. ES-2.
- xiii IBID. pg. 3.
- xiv "Southern Toll Plaza, Technical Memorandum on Alternatives Analysis (draft)", Jacobs Engineering Group, July 23, 2015
- xv Additional Information Required, Application # NAE-2007-01211, Maine Turnpike Authority, Attachment to letter from Jay Clement (ACOE) to Conrad Welzel (MTA), May 5, 2010.
- xvi IBID, Part 1, Existing Conditions, Section b.
- xvii IBID, Part 2, Existing Site Evaluation, Section 2.c.
- xviii IBID, Part 2, Existing Site Evaluation, Section 2.d. (1)
- xix IBID, Part 2, Existing Site Evaluation, Section 2.d. (3)
- xx IBID, Part 2, Existing Site Evaluation, Section 2.e.
- xxi "[Investigation: Hundreds Don't Pay Turnpike Tolls Each Day](#)", CBS Pittsburgh, November 2, 2015.
- xxii IBID, Town of York Submittal.
- xxiii IBID. WHOA Submittal.
- xxiv IBID, Part 2, Existing Site Evaluation, Section 2.p.
- xxv "[Practicability of All-Electronic Tolling at the York Toll Plaza](#)", Attachment 1, Final ACOE Response, MTA [latest submittal to ACOE, September 1, 2015](#), pgs. 3-5.
- xxvi IBID, pgs. 7-8.
- xxvii IBID, pg. 5.

- xxix "Maine Turnpike ORT/AET Impact Analysis (Final Draft)", CDM Smith, March 18, 2014.
- xxx "[York Toll Plaza Upgrade Options, A Realistic Approach](#)", The eTrans Group, Inc., April 23, 2010.
- xxxi IBID, pg. <xx> [reference to just an AET pilot program evaluated]
- xxxii "Southern Toll Plaza, Technical Memorandum on Alternatives Analysis (draft)", Jacobs Engineering Group, July 23, 2015
- xxxiii "Additional Information Required, Application # NAE-2007-01211", Maine Turnpike Authority, Attachment to letter from Jay Clement (ACOE) to Conrad Welzel (MTA), Part 2, Existing Site Evaluation, Section 2.b, May 5, 2010.
- xxxiv "[York Toll Plaza Upgrade Options, A Realistic Approach](#)", The eTrans Group, Inc. April 23, 2010.
- xxxv IBID., pg. 9.
- xxxvi "[Southern Toll Plaza, Technical Memorandum on Alternatives Analysis \(draft\)](#)", Jacobs Engineering Group, July 23, 2015, pg. 6.
- xxxvii "[Safety Evaluation of All-Electronic Toll Collection System \(TRB 15-2700\)](#)", Muamer Abuzwidah and Mohamed Abdel-Aty, University of Central Florida, Orlando, Florida, 2015.
- xxxviii [NJ.com, January 15, 2016.](#)
- xxxix "[Maine Turnpike ORT/AET Impact Analysis](#)", CDM Smith, March 18, 2014, pgs. ES 2-3.
- xl "[Dispelling the Myths: Toll and Fuel Tax Collection Costs in the 21st Century](#)", Fleming, etal, Policy Study No. 409, the Reason Foundation, November 2012, pgs 24 to 28.

^{xli} *"Maine Turnpike ORT/AET Impact Analysis"*, CDM Smith, March 18, 2014, pgs. ES 2-3.

^{xlii} *"Southern Toll Plaza, Technical Memorandum on Alternatives Analysis (draft)"*, Jacobs Engineering Group, July 23, 2015, Southern Toll Plaza, Technical Memorandum on Alternatives Analysis (draft), Jacobs Engineering Group, July 23, 2015, pg. 15.

^{xliii} *"Maine Turnpike ORT/AET Impact Analysis"*, CDM Smith, March 18, 2014, pg. 2.

CONTROL SHEET

PROJECT: York Toll Plaza Upgrade (Phase 2)

DOCUMENT TITLE: Shortfalls in MTA's Response to the Army Corp of Engineers

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Release: 1.0

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Date: February 7, 2016

**Preliminary Comments on the Report by Daryl Fleming entitled
“Shortfalls in MTA’s Response to the Army Corps of Engineers”**

The word “bias“ is repeated 21 times in the report. That allegation is unfounded.

CDM Smith was retained specifically to instruct the Turnpike in how to implement All Electronic Tolling (AET) and to explain the consequences. CDM Smith has a wealth of experience in assisting toll roads to adopt AET and other advanced toll systems. They have no bias against a system that they themselves have implemented in many appropriate settings. For the Maine Turnpike, they were asked to compare AET with Open Road Tolling (ORT) and to develop data on the relative differences in cost and traffic diversion.

In their Executive Summary, CDM Smith concluded:

“Both AET and ORT can be financially feasible options at York and Gardiner. AET offers free flow travel for all motorists with lower overall capital costs, but requires substantial video surcharges and results in traffic diversion to alternative routes. Because AET requires plate image capture and mailed invoices for non-E-ZPass motorists, it also involves substantially more risk associated with being able to bill and collect on a substantial portion of transactions.

“Conversion to ORT preserves cash collection at a lower operating cost, creates less risk to the Turnpike and requires no change to present toll rates. Cash paying motorists, however, would still be required to stop and pay their toll. And while the 10-year net toll impact is positive, ORT capital costs are substantially higher than those for either the existing condition or for AET.”

Where is the bias? These balanced conclusions are based entirely on evidence contained in a very readable report published on our website almost two years ago.

No one, not even Fleming, questions whether a substantial toll surcharge would be required for AET. No one questions that a steep \$3 surcharge on the York toll would drive traffic off the Turnpike onto other local roads like Routes 1 and 236.

To collect tolls from former cash customers would require opening a massive “boiler room” office with scores of clerks to mail out bills all over North America to owners of the thousands of cars and trucks that pass through York in the course of a year without E-ZPass and expecting to pay cash. Collection by mail is unbelievably cumbersome, costly and ineffective. Financial losses from AET are substantial and inevitable. They are objectively calculated by CDM Smith based on their experience with dozens of other toll agencies.

Fleming’s report contains no data to disprove the financial analysis performed by CDM Smith.

Fleming alleges that certain questions posed by the Army Corps of Engineers remain unanswered, specifically on safety and the feasibility of one-way tolling. These questions were, indeed, answered. They are included within the hundreds of pages of technical reports that were published on the Turnpike’s website many months ago.

The state of New Hampshire has also studied these issues and has elected to retain cash collection, not only at Hampton but at Dover, Rochester and Bedford as well.

The Maine Turnpike has spent ten years and \$4.5 million analyzing these questions and has engaged several of the world’s leading experts. The decisions of the Turnpike’s seven-member board have been based on evidence, public input and careful deliberation. Fleming’s intemperate bias in favor of AET is well known and remains unchanged from what it was years ago. The points he makes were carefully considered by the Board before they decided unanimously 20 months ago to continue collecting cash at the tolls.

Consultant calls MTA report "biased"

Town moves into gear to opposed toll plaza

By Deborah McDermott □ dmcdermott@seacoastonline.com Posted Feb. 11, 2016 at 6:08 PM

YORK, Maine — A transportation consultant hired by the town of York has concluded that the Maine Turnpike Authority erred in eliminating all-electronic tolling as an alternative to a more traditional toll plaza, calling the MTA action “highly irregular and indefensible.”

Daryl Fleming, a principal at The eTrans Group in Atlanta, Ga., said an MTA report on the viability of all-electronic tolling – tolling without any cash toll booths – was “biased” against AET. This point is key as the town builds its case against the MTA’s plans to build a new plaza, and prepares to file its own briefs with permitting agencies the Army Corps of Engineers and the Maine Department of Environmental Protection.

“When you cut to the core, the turnpike doesn’t include AET. They ignore it,” said Town Manager Steve Burns. “But once you include it, it becomes the least damaging alternative – and that’s going to matter to the Army Corps of Engineers.”

MTA Executive Director Peter Mills rejects the idea that the MTA did not consider AET. In fact, he said, it was thoroughly considered by the MTA staff and board. He said the Fleming report contains “numerous innuendos that are unjustified and imbalanced.”

The town hired Fleming to review a report by engineering firm CDM Smith, hired by the MTA several years ago to report on the feasibility of AET at the York toll plaza. That report concluded that the MTA could implement AET in York, but that the costs associated with “leakage” from vehicles that don’t have E-ZPass outweigh other factors.

CDM Smith indicated it would be necessary for the MTA to institute a \$3 surcharge for non-E-ZPass motorists, and that as a result, many motorists would leave the turnpike at the York exit and further add to an already congested Route 1. The costs for building an AET gantry is considerably less than the Hampton-style plaza the MTA wants to build - \$4.8 million versus \$34 million – but the cost of collecting lost tolls and the surcharge outweighs that, the report states.

Fleming said even CDM Smith concluded that the MTA, over a 10-year period, would collect more toll revenue with an AET system than with the MTA’s blend of cash lane and open-road tolling.

He also said that diversion studies prove that while a motorist may initially leave the turnpike at the York exit to avoid the surcharge, the next time, the motorist will find the surcharge more palatable than being stuck in traffic on Route 1. In addition, an AET gantry is the least damaging environmental option, and because all traffic would pass under it at highway speeds, there are great safety benefits as well.

He argues that all of this information should be presented to the Army Corps and MDEP as they consider permitting the project. And that’s exactly what the town intends to do.

“The Corps of Engineers gets to decide. They’re the key. If they decide to redefine the problem, we win. If we let the MTA’s definition of the problem stand, we lose,” said Burns.

Mills said he takes exception to any attempt to discredit CDM Smith, saying the firm “is the leading and highly respected engineering firm in the industry. CDM has consulted on AET projects, so they had every incentive to promote AET. I asked them how we could do it and I told them to be honest about it. So the idea that they were biased is beyond my ken.”

Further, said Mills, the MTA board did consider AET after the CDM Smith report was released and made a conscious decision not to pursue it. “To imply we ignored that in making a decision is completely false.”

Shortfalls in MTA's Response to the Army Corp of Engineers

Anticipated Environmental and Other Impacts
at York Toll Plaza for
MTA Recommended Option vs. All Electronic Tolling (AET)

Estimated Impacts \ Option	ORT/Cash@ MM 8.8	AET @MM 6.7
NRCS Wetland (Ac)	1.0 ¹	0
Stream (ft)	80 ¹	0
Vernal Pools	2 ¹	0
FEMA Flood Plain (Ac)	0.3 ¹	0
Threatened/Endangered Species Habitat	3 ¹	0
Right-of-Way	0.3 ^{1,3}	0
Net Environmental Gain	No	Yes
Meets Engineering Requirements	Some ¹	Yes
Safety (Toll collectors and public)	Poor	Best
Satisfies Purpose & Need	Marginally	Best
Customer Service	Poor	Best
Estimated Construction \$	\$ 40.8 M ²	\$ 3.8 M ²
Life-cycle Costs/Retained Revenue	Poor	Best

Acceptability: **Best** **Marginal** **Worst**

Prepared
by
The eTrans Group, Inc.

for

The Town of York, Maine

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1.0 Executive Summary

The Maine Turnpike Authority's (MTA) recent recommendation for replacing the existing York Toll Plaza with a new, hybrid toll plaza at Milepost 8.8 that offers cash and open road toll (ORT) options is inconsistent with its own findings.

On March 17, 2010, after studying options for the York Toll Plaza for several years, the Maine Turnpike Authority (MTA) submitted a Draft Phase I reportⁱ for the environmental review process by the U.S. Army Corps of Engineers (ACOE). In its May 5, 2010 responseⁱⁱ to the MTA's initial submittal, the ACOE noted that the MTA:

- did not properly consider safety issues associated with conventional (cash) toll collection;ⁱⁱⁱ and,
- dismissed one-way^{iv} and all electronic tolling (AET)^v options inconsistent with Federal Highway Administration Guidelines for environmental review per Section 404 (b)(1) of the Clean Water Act (hereafter referred to as Guidelines).

The MTA commissioned CDM Smith to conduct *"an impact assessment for possible conversion to Open Road Tolling (ORT) or All Electronic Tolling (AET) at two toll plazas on the Maine Turnpike."*^{vi} However, this study (Final Draft released on March 18, 2014) does not respond to several ACOE requests. It is also fraught with significant structural and other issues that bias its results against AET. (e.g. Under the direction of the MTA, the CDM Smith study only considered an AET pilot program at these two plazas).^{vii} Nevertheless, even with significant bias in their results, *after "considering traffic, toll rates, operating costs, net revenue over a 10-year period, and capital costs to a hypothetical continuation of the current cash collection of tolls"*^{viii}:

**The CDM Smith study found AET to be a
"financially feasible option" at the York Toll Plaza.^{ix}**

CDM Smith also noted that: *"AET offers free flow travel for all motorists with lower overall capital costs."*^x

However, limitations of scope of this study result in biases in the results, including an estimated \$3.00 (passenger car) surcharge^{xi} would be required for those customers not actively enrolled in the ETC program (up to 20% of ALL customers). The author is unaware of any MTA policy this would violate, though a \$3.00 surcharge is rarely required. A significant surcharge is normally charged AET customers who use the license plate toll option and do not pre-enroll in the AET program. This is done to avoid those actively enrolling in the AET program from cross-subsidizing the costs of those that do not actively enroll. This is the fair and equitable approach.

This study also stated that: *"The imposition of a \$3.00 video surcharge is also estimated to result in diversion of traffic to US Route 1 from 3,400 to 5,500 per day."*^{xii} Further, it appears that traffic diversions from 3,400 to 5,800 per day were assumed to be realized over the long term. This is not likely as these levels of traffic diversion would be a major portion of that traffic assumed not actively enrolled in the AET program. And, even if traffic diversions at these levels did occur initially, the congestion the diverted traffic would encounter on US Route 1 would be so bad that few motorists would leave the MTA mainline a second time and word about the anticipated congestion on the alternative route would be quickly spread amongst the motoring public. i.e. The problem would be self-regulating and not occur over the long term. Further, traffic diversions at these levels have not been experienced elsewhere.

The Mystic River Bridge (60 miles south of the York Toll Plaza) converted to all AET in July, 2014. While highway engineers argued that there would be significant traffic diversion, there was no drop in traffic after AET was installed. In fact, traffic increased by over 7%. (See data below.)

**Total Transactions - Mystic River Bridge
AET Implemented in July 2014**

Month / Year	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Year Total</u>
2014	1,029,823	996,819	1,022,968	931,389	959,549	10,677,868
2015	1,122,826	1,056,865	1,102,529	1,003,845	1,022,756	11,023,092
Change	93,003	60,046	79,561	72,456	63,207	345,224
Increase	9.03%	6.02%	7.78%	7.78%	6.59%	7.44%

Source: Massachusetts Turnpike Authority

This is particularly significant because drivers using this facility have three options to avoid AET: US Route 93 (no tolls), the Ted Williams Tunnel (ORT), or the Callahan Tunnel (ORT).

Even though an abnormally high level of traffic diversion was assumed upon the conversion to AET, CDM Smith found the AET option at the York Toll Plaza financially feasible in spite of the fact that this study suffers from several major shortfalls which bias the results of this work against the AET option at the York Toll Plaza.

CDM Smith study also noted that

"the plaza reconstruction cost <of AET> is greatly reduced. As importantly, there is essentially no additional right-of-way typically required, since the gantries are constructed across existing roadways only. AET also has the benefit of virtually eliminating accident risk at toll plaza locations; toll plazas typically represent high accident locations on toll roads across the country." ^{xiii}

On July 23, 2015 the MTA released the results of a Jacob's Engineering study that reviewed the safety and environmental impacts of five alternative solutions for the York Toll Plaza.^{xiv} However, even though CDM Smith found AET financially feasible, an AET alternative was not considered for the York Toll Plaza in these analyses. Therefore, the significant environmental and safety benefits of the AET option were not considered. In summary,

The MTA eliminated the AET option from the York Toll Plaza analyses even though its own advisors found it to be economically feasible.

This report provides a summary of the information requested by the ACOE and the MTA's response to these requests. Environmental, safety and financial issues not properly addressed by the MTA in its alternatives analyses are also presented.

This report demonstrates that the AET option is, by far, the most environmentally friendly option. It also demonstrates that the AET option eliminates all of the safety issues associated with collection of tolls at the roadside, as well as the costs and risks associated with this type of toll operation. Consideration of all such costs, as well as realistic estimates of net retained revenue, in a life-cycle cost analysis should also demonstrate that AET is the most financially feasible alternative for the York Toll Plaza.

2.0 U.S. Army Corps of Engineers (ACOE) Observations/Requests and the MTA's Response

2.1 Major Oversights in the MTA Submittal

In its May 5, 2010 response^{xv} to the MTA's initial submittal, the ACOE noted that the MTA's analyses:

- did not properly consider safety issues associated with conventional (cash) toll collection;^{xvi} and,
- dismissed one-way^{xvii} and all electronic tolling (AET)^{xviii} options inconsistent with Federal Highway Administration Guidelines for environmental review per Section 404 (b)(1) of the Clean Water Act (hereafter referred to as Guidelines).

The MTA has yet to appropriately respond to these concerns.

2.2 Other Issues the ACOE Requested the MTA Investigate

The ACOE asked the MTA to investigate:

- 1) *"available and practicable strategies <that> exist to address out of state/country toll collection";*^{xix} and,
- 2) *"the percent loss in revenue with high speed electronic toll collection within the context of a mixed tolling arrangement" <including> other state's experiences with this option".*^{xx}

However, the MTA has yet to appropriately respond to these requests.

A number of commercial options are available to increase the effectiveness of collecting tolls from out of state vehicles, including:

<http://bestpass.com> and <https://platepass.com>

There have also been several mobile apps introduced to help resolve this issue, including:

<https://www.bancpass.com/ptoll/> and <http://www.paytollo.com/>

There is also at least one company currently offering to provide toll payment services through cell phones. Other commercial solutions will also likely be introduced. Collectively, these and other commercial solutions will likely have a significant impact on the ability of the MTA and others to collect out of state tolls.

The CDM Smith Study commissioned and managed by the MTA also assumed a slight increase in Open Road Toll (ORT) violations at the York Toll Plaza - citing no observed increase in violations at the New Gloucester Toll Plaza since introduction of ORT as justification for this. However, though not routinely reported for several reasons, toll authorities throughout North America have been wrestling with escalating ORT violations. In addition, E-ZPass lane violations are not limited to just open road lanes in ORT operations. For example, the E-ZPass lanes on the Pennsylvania Turnpike (gate-free lanes in the toll plazas) have been subject to such fraud and abuse that:

"When the Pennsylvania Turnpike's fiscal year ended in May <2015>, there were \$33.3 million still outstanding in unpaid tolls."^{xxi}

Therefore, for this study to assume only modest violations in ORT lanes at the York Toll Plaza is overly optimistic and biases the results against AET.

In response to the MTA's initial submittal, the ACOE also asked the MTA to:

3) provide a technical response to York's recommendation to carry the AET option forward into Phase II of the Highway Methodology process that addresses:^{xxii}

- a) how losses in toll revenue under the AET toll option might be mitigated
- b) how revenue risks can be reduced to a practicable level, and
- c) the availability and practicability of "innovative enforcement programs".

The MTA has yet to appropriately respond to these requests.

The ACOE also asked the MTA to

4) provide a technical response to the Whippoorwill Home Owners Association's (WHOA):^{xxiii}

"compelling arguments that AET is in fact, economically practicable, particularly if the high costs of new toll plaza construction, long-term maintenance costs of a new toll plaza, and employee salaries are eliminated. Equally compelling is their position that the AET would meet the majority of project goals."

The MTA has yet to appropriately respond to this request.

The ACOE also asked the MTA to:

5) *"consider an AET option but with a design that enabled conversion/expansion in the event that "leakage" could not be addressed or exceeded acceptable thresholds."* ^{xxiv}

The MTA has yet to appropriately respond to this request.

2.3 MTA's Response to ACOE Requests - A Quick Summary

Of the ACOE requests (above) in response to MTA's initial submittal:

- #1) and #2) were given only cursory review; ^{xxv}
- #3 a), b) and c) do not appear to have been addressed;
- #4) was not given adequate consideration in the study commissioned by the MTA; ^{xxvi} and,
- #5) was dismissed though no defensive reason was presented. ^{xxvii}

On March 18, 2014 the MTA released the results of a CDM Smith study^{xxviii} it had commissioned to conduct an independent assessment of conversion to ORT versus pilot AET operations at the York and the Gardiner toll plazas on the Maine Turnpike. CDM Smith developed a detailed model to analyze the potential net revenue impacts of both AET and ORT at each toll plaza. That effort included a waterfall algorithm to estimate revenue recovery rates at different stages in the process and a detailed sensitivity analyses of the impacts of variations in their major assumptions (e.g. the potential impacts of speculative AET pricing surcharges).

Primary objectives of this study commissioned by the MTA and major assumptions in the analyses resulted in the retention of significant bias against AET in the MTA's recent evaluation of alternative solutions for the York Toll Plaza. For example, the MTA study never considered full deployment of AET:

"The Maine Turnpike Authority may ultimately consider all electronic tolling on the full system in the future, but this analysis only addressed the potential pilot implementation of AET or ORT at the York and/or Gardiner facilities." ^{xxxix}

Therefore, under the direction of the MTA, the CDM Smith study only evaluated the benefits of an AET pilot program at two of the 18 (eighteen) toll plazas operated by the MTA. This resulted in many of the costs associated with the ORT option and benefits of the AET option being overlooked. (The impacts of how this assumption biased the MTA's analyses are explained in further detail in the summary of Safety and Financial Analyses below.) Therefore, the results of this study^{xxx} are subject to many of the same limitations as the MTA's previous alternative evaluation efforts that were biased against AET.^{xxxi}

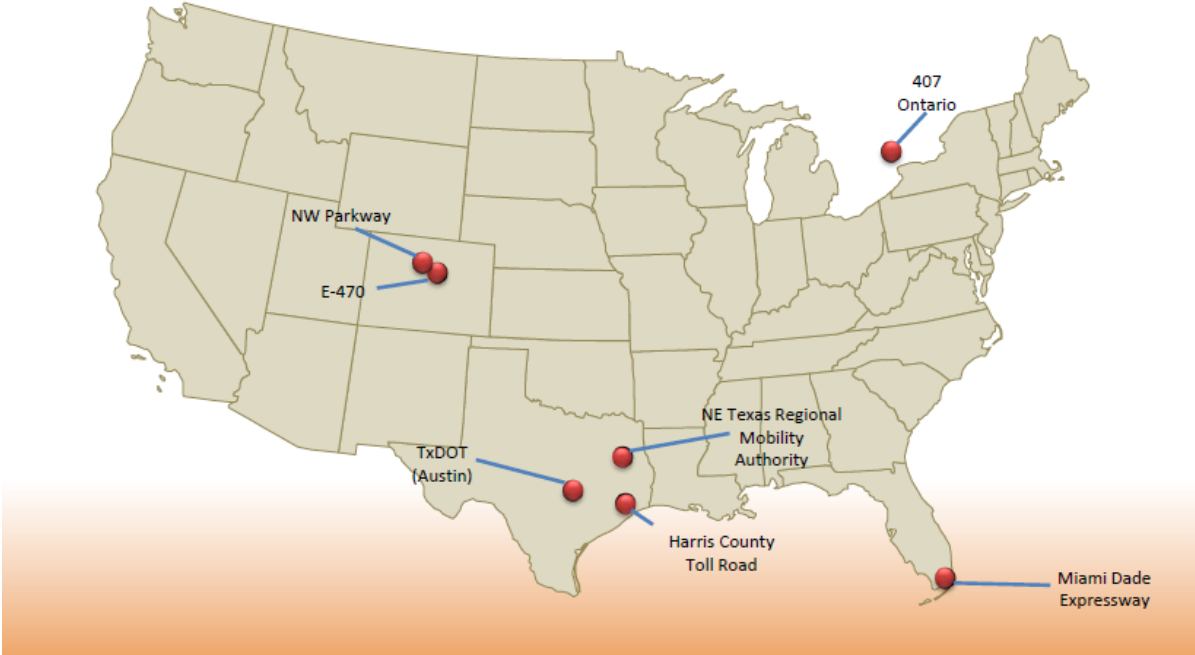
Further, on July 23, 2015 the MTA released the results of a Jacob's Engineering study to review the safety and environmental impacts of five alternative solutions for the York Toll Plaza.^{xxxii} However, under the direction of the MTA, an AET option was not considered for the York Toll Plaza in these analyses. Therefore, the significant environmental and safety benefits of AET were not considered; and, as a result, all electronic tolling (AET), a technology successfully introduced on the *Highway 407 ETR* in Toronto, Ontario, in 1997, and successfully implemented at dozens of toll facilities throughout the world since then, has been overlooked in the final options for the York Toll Plaza to be reviewed in detail.

2.4 The MTA Dismissed AET - the Most Viable Option for the York Toll Plaza

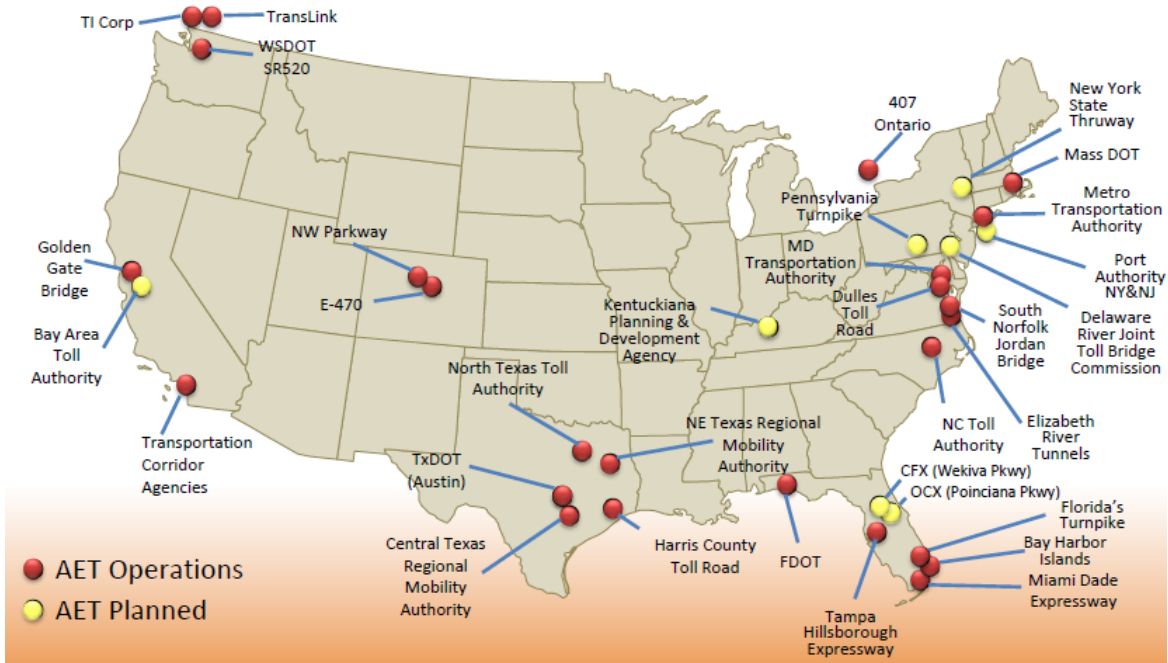
Twenty five toll authorities are currently operating AET successfully in the U.S. and Canada, and several more authorities are planning for the implementation of AET in the near future. There are also several AET operations in South America (Chile, Brazil), Europe, Scandinavia, Japan and Australia, and AET has been recently deployed in the Caribbean and South Africa. Many of these operations have been operating AET successfully for over a decade. These AET operations also span a wide variety of operating conditions, from deploying AET on green-field facilities where the initial transponder penetration was in the low teens when toll collection started (e.g. H407 ETR in Toronto), to successfully collecting tolls from large percentages of vehicles from outside of the country including several operations in Europe.



All Electronic Tolling (AET) Locations 2010



All Electronic Tolling (AET) Locations 2015



Source: Central Florida Expressway Authority, February 2016

The Central Florida Expressway Authority, which serves large volumes of out of state travelers, recently studied AET deployments throughout the U.S. and Canada and elected to move forward with AET deployment because AET.^{xxxiii}

- a) greatly reduces the environmental impacts of toll collection
- b) reduces capital, operations and maintenance costs
- c) requires less right-of-way
- d) offers increased traffic throughput,
- e) eliminates the safety issues with toll plazas, and
- f) leads to less driver confusion.

Nevertheless, the MTA has dismissed AET again even though the AET option for the York Toll Plaza:

- a) has essentially no environmental impacts (AET actually enables reclamation of several acres of wetlands resulting in a net environmental gain),
- b) eliminates the safety risks (and costs of crashes) of collecting cash tolls at the roadside,
- c) is the better option financially (once all anticipated capital and operating costs and net revenue are considered in a life-cycle cost analysis),
- d) avoids the congestion (and its commensurate environmental impacts) associated with collecting cash tolls at the roadside, and
- e) provides those using the Turnpike with a level of service significantly better than other options.

According to the ACOE:

"An alternative can only be dismissed if it is not available, not practicable (after considering cost, logistics, and available technology), or more environmentally damaging." xxxiv

Since AET is clearly available, the MTA has not demonstrated that AET is not practicable, considering costs, logistics and available technology, and the AET option offers a net positive environmental impact, the AET option should not have been dismissed.

3.0 Environmental, Safety and Financial Issues Not Properly Addressed in MTA's Analyses

Several environmental impacts have been identified with the hybrid toll plaza proposed for Mile Marker 8.8 (refer to summary above), not the least of which is possible intrusion on nearby homes (noise, light and groundwater impacts). The AET solution for upgrade of the York Toll Plaza imposes none of these impacts on the community. Additional details on the environmental and safety benefits of the AET option are presented below.

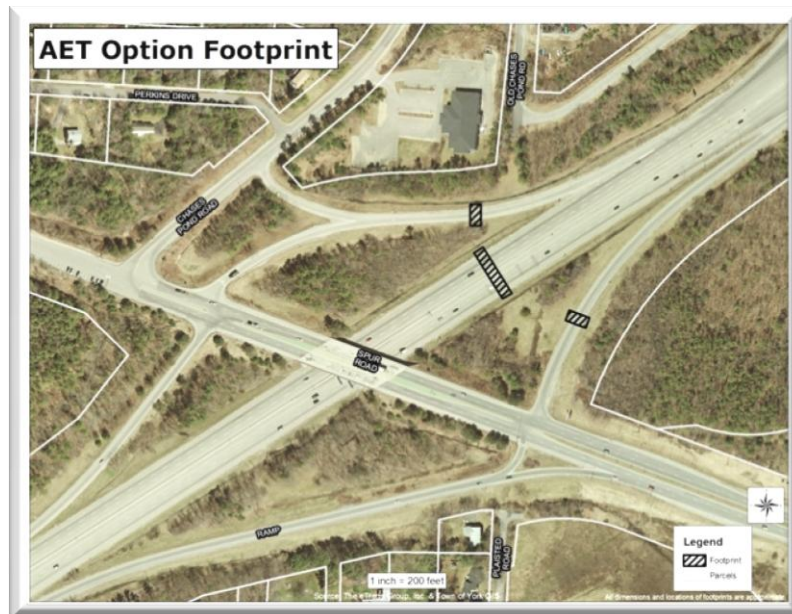
Residences Near Proposed Location of Relocated York Toll Plaza



Source: Town of York Maine

3.1 Environmental Benefits of an AET Solution for the York Toll Plaza

An AET toll gateway has been proposed immediately North of the Connector at MM 6.7.



All Electronic Tolling Footprint at Mile Marker 6.7 is the Best Solution from an Environmental Perspective ^{xxxv}

The net aquatic and wetlands environmental impacts of an AET toll gateway at this location are positive.

An AET toll gateway at this location allows the reclamation of several acres of wetlands once the existing toll plaza footprint outside of the mainline R/W can be abandoned - without transferring the environmental problems at the existing toll plaza to a new location such as the pristine environment that currently exists at MM 8.8.

An AET toll gateway at MM 6.7 avoids negative impacts to housing.

The AET option eliminates the need to spread additional salt on the roadway at the toll gateway during inclement cold weather to improve the safety of both vehicles and pedestrians at a barrier toll plaza. The impacts of oil, brake, radiator fluid and other contaminants that, like salt, can leach into the groundwater are also minimized by the AET option because vehicles are not required to stop to pay a toll. Since many of the homes along the MTA corridor in this area are served by groundwater wells, this is a significant environmental benefit of the AET option. Though the recommended location for the new York Toll Plaza at MM 8.8 is not expected to displace existing residences, homes in the area could be significantly impacted by other

environmental impacts such as noise, vehicle emissions and light intrusion should a new hybrid toll plaza be built at that location.

By negating the need to stop and queue vehicles on the corridor, the AET option avoids the heavy vehicle braking and acceleration noise and increased vehicle emissions associated with imposing a stop and go environment on through traffic. The AET option also offers a commensurate reduction in fuel consumption for roadway users. Also, unlike the recommended hybrid toll plaza at MM 8.8, the AET solution at MM 6.7 would not impose visual blight on the corridor, or introduce additional impacts from vehicular noise and emissions. Further, although nighttime lighting would be required at the AET toll gateway, the impacts of this lighting on housing along the MTA corridor at MM 6.7 would be significantly less than the impact of lighting for an ORT and cash toll plaza at MM 8.8 since the interchange immediately south of the proposed AET toll gateway at MM 6.7 is already artificially lit.

3.2 Safety Benefits of an AET Solution for the York Toll Plaza

An AET toll gateway immediately North of the Connector at Mile Marker 6.7 is the best solution from a safety perspective.

The MTA and its advisors repeatedly identify safety as a primary concern in their alternative evaluations for the York Toll Plaza, including providing comparative safety issues between options being investigated. However, the AET option was inappropriately dismissed early in the original analysis (July 2006),^{xxxvi} and eliminated from the list of viable options by the MTA during its recent review. Therefore, the significant safety benefits of the AET option have not been given adequate consideration.

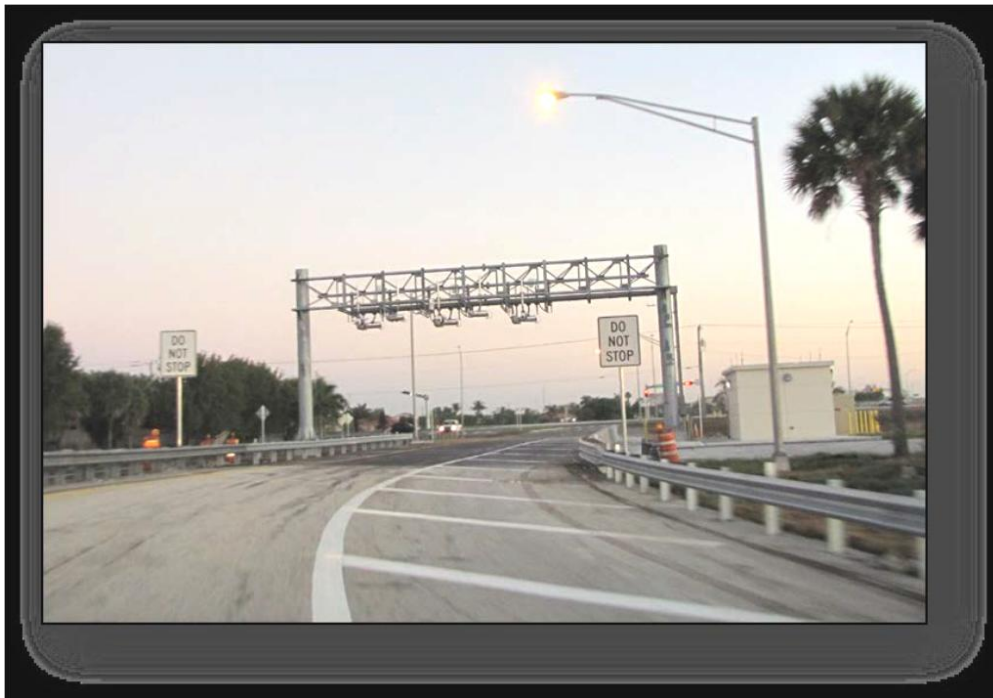
The York Toll Plaza is currently identified as a High Crash Location (HCL) by the Maine DOT.^{xxxvii} A summary of Jacob's efforts to review crash data on the Turnpike identifies possible roadway alignment or other geometric issues that could be problematic for location of a toll plaza.^{xxxviii} However, no estimates appear to have been made regarding the possible increase in crashes that will occur from introducing a toll plaza at the alternative locations investigated. Cash toll collection at the roadside requires placement of a physical barrier across the roadway to stop vehicles paying the toll. Therefore, the ORT solution proposed by the MTA introduces several major conflicts into the traffic flow. In addition to the physical barriers - the toll booths and safety appurtenances around them, the ORT solution requires vehicles to merge from traffic, slow, get in queue with other vehicles, stop to pay the toll, then accelerate and safely merge back into traffic as they approach mainline speeds. In addition, though a tunnel under the toll plaza can help reduce pedestrian safety issues, pedestrian traffic within the immediate confines of the toll plaza will invariably occur and introduce additional conflict.

Introducing a toll plaza to a mainline corridor creates an inherently dangerous situation where one may not have existed - a phenomenon that is well documented in the literature.

Relocating an ORT solution for the York Toll Plaza to a "safer" location only relocates the inherent problems associated with the toll plaza environment to the new location.

A hybrid solution like that being proposed (ORT and cash toll collection) reduces the safety issues somewhat. However, the fact that a barrier toll plaza is proposed where a significant portion of mainline traffic will be required to merge from traffic, successfully navigate through the toll plaza, pay the toll, then merge back with mainline traffic, will cause accidents.

The AET option for the York Toll Plaza reintroduces free-flow traffic operations on the Maine Turnpike at this location and avoids all of the safety issues associated with a toll plaza in their entirety.



Source: Central Florida Expressway Authority, February 2016

A recent study funded by SAFER-SIM and the Florida Department of Transportation (FDOT) evaluated the safety effectiveness of converting from traditional mainline toll plazas (TMTP) and Hybrid Mainline Toll Plazas (HMTP) to All-Electronic Toll (AET) collection.^{xxxix} (Attached) Before and after data were collected from one hundred mainline toll plazas on more than 750 miles of toll roads in Florida. The data indicate that converting from a TMTP to an AET operation resulted in an average reductions of 77, 76, and 67 percent for total, fatal-and-injury

and Property Damage Only (PDO) crashes, respectively. The safety benefits of converting from a HMTP to an AET operation resulted in reductions of 23, 29 and 19 percent for total, fatal-and-injury, and PDO crashes respectively.^{xl} The results of this work demonstrate that converting to an AET operation significantly improves traffic safety for all crash categories, especially, fatalities. Such conversions also change tolling points from amongst the highest risk locations on expressways to posing safety risks associated with routine expressway segments.

The significance of the risk of fatalities at conventional barrier toll plazas is exemplified by the fact that there have been several fatal crashes at toll plazas in the region in recent years. These include two fatal crashes at the Hampton Toll Plaza on I-95 in New Hampshire, which is essentially an extension of the Maine Turnpike. Two fatal crashes have also occurred at toll plazas in Massachusetts and New Jersey.

I-95 (New Hampshire)	Hampton Toll Plaza	October 2010
I-95 (New Hampshire)	Hampton Toll Plaza	May 2015
New Hampshire Turnpike	Merrimack Toll Plaza	August 2015
Massachusetts Turnpike	Auburn Toll Plaza	July 2015
Garden State Parkway	Paramus Toll Plaza	October 2015
Atlantic City Expressway	Egg Harbor Toll Plaza	November 2015

Note that five of these fatal crashes were within the last year!

Further, although there were no fatalities, in March 2016 six people were injured when a vehicle struck two toll booths at the Newark Toll Plaza on I-95 in Delaware, and four people were injured when a car failed to stop at the Delaware Toll Plaza just outside of Newark.

Crashes involving personal injury are far more frequent and can be catastrophic. Though not a fatal crash, the following video of a tractor trailer crashing through a Dover Toll Booth on the Spaulding Turnpike in May 2015 demonstrates the major risks of collecting cash at the roadside.

https://www.youtube.com/watch?v=pE_83KbHp7g

Treacherous winter driving conditions that frequent this region greatly increase the risk of a serious incident at this location. The fact that a significant share of the motorists using the York Toll Plaza are from out of State, many of whom are unfamiliar with the area and the Toll Plaza, further increases the likelihood of a major incident at this location.

**As long as a physical barrier is used to collect tolls at the York Toll Plaza,
a major vehicular crash (whether it is at its current location or a new location)
is not a matter of IF, but WHEN.**

Estimates of the costs of all such crashes should be included in the life-cycle cost analyses conducted for the alternatives analyses reviewing options for the York Toll Plaza. As with other costs of AET conversion, these costs should be estimated on a systems-wide basis.

Thefts at roadside toll collection points are a safety issue that also appear to have been overlooked by the MTA.

Theft at roadside toll collection points pose significant risk to MTA personnel and the public - exemplified by two recent robberies at toll plazas in the North East. On Sunday afternoon, January 10, 2016, at an East Orange tollbooth on the Parkway. The perpetrator

"leaned into the tollbooth, pushed the attendant out of the way and took money from the drawer before he drove away,"^{xli}

Though revenue loss from this incident was likely limited by cash drawer management policies established by the authority, collecting cash at the roadside poses a significant risk to life and limb for both MTA personnel and the public at large during such robberies. These events exemplify the risks of armed robbery where cash is collected at the roadside - a risk that can be more effectively managed in a customer service center environment through the implementation of AET.

3.3 Shortfalls in the MTA's Financial Analyses

Good industry practice suggests that a financial analyses of alternative options for a project of this magnitude (refurbishing or relocating the York Toll Plaza) consist of a review of the life-cycle costs of the most-likely operating scenario for each option being considered, as well as a sensitivity analysis of the possible impact on the results of variations in major assumptions. However, the MTA's financial analysis falls significantly short of expectations.

Structurally, there are three significant oversights in the financial analyses of the AET option:

- a) Estimates were developed of retained revenue (vs. life-cycle costs that consider net revenue). The MTA commissioned study also appeared to focus on a worst case (assuming estimated worst case conditions) instead of estimating the results of the most likely scenario. This appears to have included assuming that significant revenue losses and diverted traffic would be sustained throughout the 10 year study period instead of the most likely scenario. This suggests that MTA management would do nothing to manage toll operations to improve revenue collections, reduce violation activity and minimize diversion over time. One has to assume that this would not be the case.

b) The study commissioned by the MTA only considered deployment of a pilot AET toll operation at the York and Gardner toll plazas. The remainder of the MTA operation was assumed to operate "as is", which is mostly in conventional (cash) toll collection mode. Therefore, cost savings from AET operations at the 16 (sixteen) remaining toll plazas on the Turnpike - locations not affected by out-of-state traffic and the challenges associated with collecting these tolls as the York Toll Plaza location - were not considered.

When analyzing AET, economies of scale must also be considered. Amortizing the fixed costs of back office operations of AET over all 18 locations is a key component of the total cost savings. As part of their AET conversion plan, the Massachusetts Department of Transportation will be computerizing the reading and, upon conversion, invoicing all cash users throughout their system. Each license plate becomes an account that can be invoiced on a scheduled basis. Because the single largest group of cash payers on the Maine Turnpike are Mainers, it is easier to enforce the collection of non-cash tolls on these customers.

c) The study commissioned by the MTA only considered a 10 year study period. Since the analysis compared the AET option with a hybrid toll plaza offering ORT and conventional cash toll collection,^{xiii} limiting the study to only 10 years did not require consideration of the significant costs of maintaining the conventional toll operation facilities in the out-years, as well as the salaries of the staff required to sustain conventional toll operations at the roadside on a 24/7 basis - nor did it consider the significant cost savings that would be realized by AET during this period. Some of the greatest savings in labor expenses can be achieved by converting to AET at the less traveled toll plazas because all 18 locations are currently manned 24 hours per day, 7 days a week in both directions.

These structural anomalies are significant and bias the results of this evaluation effort against AET. A number of other anomalies also bias the results of these analyses against AET. The more significant of these include:

- a) Estimates of the more significant benefits of converting to an AET operation (including significant enhancements in both environmental and safety conditions) are not considered in the financial analyses.
- b) AET toll surcharges and fees assumed are inconsistent (higher) than those typically encountered on AET operations, and the reasons for establishing these surcharges are inconsistent with Good Industry Practice for pricing AET operations.^{xiii}

- c) HNTB's estimate for the capital costs of ORT conversion at the existing toll plaza (\$36.0 million) was used.^{xiv} However, Jacobs' recent report (16 Nov 2015) estimates relocation costs to MM 8.8 at \$40.8 million.^{xiv} The cost analyses should be updated to include current estimates of costs associated with providing ORT at the recommended York Toll Plaza relocation site.
- d) Traffic diversion estimates are based on surcharges significantly greater than those likely to occur - and it appears that these traffic diversion estimates are assumed to occur through the entire ten year financial analysis. Should such levels of traffic diversions occur, especially over an extended period of time, action would certainly be taken to effectively reduce these diversions.
- e) Toll revenue shrinkage in cash toll operations do not appear to have been adequately considered in the financial analyses. Revenue leakage in cash toll operations is typically significant and admittedly a problem at the MTA based on observed reduced "*run-through violation rates*" at the New Gloucester Toll Plaza after violation enforcement systems were installed in the conventional lanes.^{xvi} Run-through violation rates are just one of many sources of "leakage" (revenue losses) in cash toll lanes - all which should have been addressed in the MTA's alternatives analyses.
- f) The business rules for ORT operations associated with license plate tolling and violations enforcement were assumed to be significantly different than those assumed for AET operations. However, the business rules for managing these issues in both operations need to be similar to sustain viability of toll operations in each mode over the long-term.

4.0 Summary

The proper review and evaluation of options for the York Toll Plaza requires an investigative effort that responds to observations and requests of the ACOE, and includes an unbiased review and consideration of all options, issues and risks so that a prudent and responsible decision can be made. This measure of care and responsibility, commonly referred to as due diligence, is especially critical when public expenditures and safety risks as significant as those encountered at conventional mainline barrier toll plazas are being considered. Conducting such a review requires a thorough assessment of all aspects of the project, environmental, technical, financial and socio-political, to ensure that the best decision is made.

From an environmental perspective, an unbiased review clearly denotes the benefits of AET when compared to the MTA's preferred option. (A summary of anticipated environmental and other impacts for both options is provided below.) Of particular note is the fact that the AET option (even if implemented system-wide) requires no additional right-of-way beyond the existing footprint of the Maine Turnpike - versus projected right-of-way impacts of relocating just the existing York Toll Plaza at MM 8.8 of 0.3 acres (an estimate that is misleading because it does not include land already purchased by the MTA, or land that may be required to build an access road to the new administration building).

In fact, in addition to offering NO additional environment damage, NO vehicles stopping and creating pollution, and less heavy salting, the AET solution enables reclamation of several acres of wetlands that have been damaged. The environmental footprint of the Maine Turnpike also becomes significantly smaller when AET is implemented throughout the entire system.

The MTA's analysis of options for this project does not adequately consider some critical issues, while giving inappropriate credence to others. This has resulted in the MTA offering a short-list of options for public review and comment that do not pass the scrutiny of an independent assessment. The MTA's review of alternatives for the York Toll Plaza is based on faulty logic and reasoning. A more thorough and current review of the facts is necessary to ensure that an appropriate decision is made on the best way to resolve the York Toll Plaza relocation issue.

**Anticipated Environmental and Other Impacts
at York Toll Plaza for
MTA Recommended Option vs. All Electronic Tolling (AET)**

Estimated Impacts \ Option	ORT/Cash@ MM 8.8	AET @ MM 6.7
NRCS Wetland (Ac)	1.0 ¹	0
Stream (ft)	80 ¹	0
Vernal Pools	2 ¹	0
FEMA Flood Plain (Ac)	0.3 ¹	0
Threatened/Endangered Species Habitat	3 ¹	0
Right-of-Way	0.3 ^{1,3}	0
Net Environmental Gain	No	Yes
Meets Engineering Requirements	Some ¹	Yes
Safety (Toll collectors and public)	Poor	Best
Satisfies Purpose & Need	Marginally	Best
Customer Service	Poor	Best
Estimated Construction \$	\$ 40.8 M ²	\$ 3.8 M ²
Life-cycle Costs/Retained Revenue	Poor	Best

Acceptability: Best Marginal Worst

1) "Southern Toll Plaza, Technical Memorandum on Alternatives Analysis (draft)", Jacobs Engineering, Evaluation Matrix, July 23, 2015.

2) "Maine Turnpike ORT/AET Analysis (Final Draft)", CDM Smith, March 18, 2014, pg. ES-3.

3) Potential Right-of-Way Impacts includes only land that would need to be acquired and used as a right-of-way for the new toll facility. Land already purchased by the MTA and land that may be required to build an access road to the new administration building is not included in this estimate.

References

- ⁱ "Maine Turnpike Southern Toll Plaza Replacement Study, Draft – Phase I Report", for submittal to the U.S. Army Corps of Engineers, HNTB Corporation, November 5, 2009.
- ⁱⁱ Additional Information Required, Application # NAE-2007-01211, Maine Turnpike Authority, Attachment to letter from Jay Clement (ACOE) to Conrad Welzel (MTA), May 5, 2010.
- ⁱⁱⁱ IBID, Part 1, Existing Conditions, Section b.
- ^{iv} IBID, Part 2, Existing Site Evaluation, Section 2.c.
- ^v IBID, Part 2, Existing Site Evaluation, Section 2.d. (1)
- ^{vi} "Maine Turnpike ORT/AET Impact Analysis (Final Draft)", CDM Smith, March 18, 2014, pg. ES-1.
- ^{vii} IBID, pg. 1.
- ^{viii} IBID, pg. ES-4.
- ^{ix} IBID., pg. ES-4.
- ^x IBID, pg. ES-4.
- ^{xi} IBID., pg. ES-2.
- ^{xii} IBID. pg. ES-2.
- ^{xiii} IBID. pg. 3.
- ^{xiv} "Southern Toll Plaza, Technical Memorandum on Alternatives Analysis (draft)", Jacobs Engineering Group, July 23, 2015
- ^{xv} Additional Information Required, Application # NAE-2007-01211, Maine Turnpike Authority, Attachment to letter from Jay Clement (ACOE) to Conrad Welzel (MTA), May 5, 2010.
- ^{xvi} IBID, Part 1, Existing Conditions, Section b.
- ^{xvii} IBID, Part 2, Existing Site Evaluation, Section 2.c.
- ^{xviii} IBID, Part 2, Existing Site Evaluation, Section 2.d. (1)
- ^{xix} IBID, Part 2, Existing Site Evaluation, Section 2.d. (3)
- ^{xx} IBID, Part 2, Existing Site Evaluation, Section 2.e.
- ^{xxi} "Investigation: Hundreds Don't Pay Turnpike Tolls Each Day", CBS Pittsburgh, November 2, 2015.
- ^{xxix}^{xxii} IBID, Town of York Submittal.
- ^{xxiii} IBID. WHOA Submittal.
- ^{xxiv} IBID, Part 2, Existing Site Evaluation, Section 2.p.
- ^{xxv} "Practicability of All-Electronic Tolling at the York Toll Plaza", Attachment 1, Final ACOE Response, MTA latest submittal to ACOE, September 1, 2015, pgs. 3-5.
- ^{xxvi} IBID, pgs. 7-8.
- ^{xxvii} IBID, pg. 5.
- ^{xxviii} "Maine Turnpike ORT/AET Impact Analysis (Final Draft)", CDM Smith, March 18, 2014.
- ^{xxix} IBID, pg 1..
- ^{xxx} Op cit.
- ^{xxxi} "York Toll Plaza Upgrade Options, A Realistic Approach", The eTrans Group, Inc., April 23, 2010.
- ^{xxxii} "Southern Toll Plaza, Technical Memorandum on Alternatives Analysis (draft)", Jacobs Engineering Group, July 23, 2015
- ^{xxxiii} Central Florida Expressway, February 2016.
- ^{xxxiv} "Additional Information Required, Application # NAE-2007-01211", Maine Turnpike Authority, Attachment to letter from Jay Clement (ACOE) to Conrad Welzel (MTA), Part 2, Existing Site Evaluation, Section 2.b, May 5, 2010.
- ^{xxxv} "York Toll Plaza Upgrade Options, A Realistic Approach", The eTrans Group, Inc. April 23, 2010.
- ^{xxxvi} IBID., pg. 9.
- ^{xxxvii} "Southern Toll Plaza, Technical Memorandum on Alternatives Analysis (draft)", Jacobs Engineering Group, July 23, 2015, pg. 6.
- ^{xxxviii} "Southern Toll Plaza, Technical Memorandum on Alternatives Analysis (draft)", Jacobs Engineering Group, July 23, 2015, , pgs. 5-6.
- ^{xxxix} "Safety Evaluation of All-Electronic Toll Collection System (TRB 15-2700)", Muamer Abuzwidah and Mohamed Abdel-Aty, University of Central Florida, Orlando, Florida, 2015.
- ^{xl} "IBID.

^{xli} NJ.com, January 15, 2016.

^{xlii} *"Maine Turnpike ORT/AET Impact Analysis"*, CDM Smith, March 18, 2014, pgs. ES 2-3.

^{xliii} *"Dispelling the Myths: Toll and Fuel Tax Collection Costs in the 21st Century"*, Fleming, etal, Policy Study No. 409, the Reason Foundation, November 2012, pgs 24 to 28.

^{xliv} *"Maine Turnpike ORT/AET Impact Analysis"*, CDM Smith, March 18, 2014, pgs. ES 2-3.

^{xlv} *"Southern Toll Plaza, Technical Memorandum on Alternatives Analysis (draft)"*, Jacobs Engineering Group, July 23, 2015, , pg. 15.

^{xlvi} *"Maine Turnpike ORT/AET Impact Analysis"*, CDM Smith, March 18, 2014, pg. 2.

CONTROL SHEET

PROJECT: York Toll Plaza Upgrade (Phase 2)

DOCUMENT TITLE: Shortfalls in MTA's Response to the Army Corp of Engineers

CLIENT CONTACT: Mr. Dean Lessard
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Town of York
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ETRANS PROJECT #: P00141

Release: 1.1

AUTHOR: Daryl S. Fleming

SIGNATURE: *Daryl S. Fleming*

Date: March 30, 2016

Beginning chart of relative advantages. See Page 19 where it is repeated.

Fleming now says that we should convert the entire highway to AET to make it work. ORT and its allied electronic systems are already functioning perfectly well in many other areas of the Turnpike. To convert the whole road to AET would require abandoning millions of dollars of infrastructure that is already built and working well. It would require creating a back office boiler room with hundreds of people looking up plates and sending out mail to people all over North America. The economic loss would be unacceptable to bond holders and the surcharges would be anathema to motorists.

Page 5: Fleming claims violations at ORT are rampant elsewhere even though we have had no increase at New Gloucester. They would obviously be far worse under AET where cash payment is not an option.

Page 7: Claims that AET should have been looked at for the whole road to give it a fair chance. We included Gardiner/I-295 because it was feasible at that location to implement AET in isolation from the rest of the system. But analysis showed it would not work there. The required surcharges were unacceptable and the diversion rates were bad for traffic.

Page 7 Accuses Jacobs of "overlooking" AET. It was not their task to examine it.

Page 7 Hold up greenfield sites as the most adverse. Quite the contrary, that's where one may take the risks of using AET.

Page 8. Map of AET sites. Where's the map of ORT and conventional tolling sites and relative traffic volumes.

Page 9. Florida is not adopting AET statewide.
AET was never "dismissed". It is simply not practicable in Maine or NH.

Page 10. Creates a map to includes houses up to a half mile away claiming they are "near" the new toll site.

Page 14. Blends in crash data from conventional toll booths with data from ORT. ORT is much safer.

Page 15. Theft and other issues. These are operational policy matters that have nothing to do with filling less than an acre of wetland.

Page 18. Claims for AET the benefit of reclaiming several acres of wetlands at mile 7.3, a benefit under ORT as well.

Page 19. Repeats the chart used at the beginning with faulty comparisons:
Safety is not "poor" at ORT. ORT is much safer than conventional tolling.
Purpose and need can only be satisfied by ORT. AET doesn't do it.
Customer service: Collecting \$3 in cash is far superior to billing people \$6 by mail.
Estimated costs are distorted by including the \$7M cost for reclamation in the ORT estimate but not for AET and failing to include the cost of a building and other supports for the AET staff.

Peter Mills

Comments on the Daryl Fleming Report

No one at the Turnpike has claimed that AET “can’t” be done. We hired highly qualified consultants not to tell us what to do but to explain “how” it might be done and to describe the consequences.

The question of whether to incur those consequences is a policy, financial, and business matter that was transparently deliberated by the Turnpike’s public board 21 months ago. They decided this issue on the basis of what lies in the best interests of all the people who use the Turnpike including commuters, freight haulers, tourists, bond holders, people impacted by diversion, and others.

In general terms the consequences for adopting AET are universally acknowledged:

1. Loss of toll revenue;
2. Back office expenses for labor and postage to bill by mail;
3. A significant toll surcharge to pay AET’s extra costs; and
4. Diversion of traffic caused by the surcharge.

Fleming doesn’t dispute these consequences but now takes the position they are nothing to worry about.

Nearly every point that Fleming makes in favor of AET is drawn from studies that the Turnpike long ago published on its website and were considered by the Turnpike’s board.

An earlier draft of his report assailed the Turnpike’s independent experts as hopelessly biased and incompetent. In his present draft, he decided to adopt their findings and argue instead that they are not relevant.

Fleming must have attended the Donald Trump school of Engineering and Rhetoric as if to say “This AET thing is Yuuge. You’re going to love it. Anyone who doesn’t is an idiot.”

The issue was not resolved by the board in any such facile way.

CDM Smith was retained specifically to instruct the Turnpike in how to implement AET and to explain the consequences. CDM Smith has a wealth of experience in assisting toll roads to adopt AET and other advanced toll systems. They have no bias against a system that they themselves have implemented in many appropriate settings. For the Maine Turnpike, they were asked to compare AET with Open Road Tolling (ORT) and to develop data on the relative differences in cost and traffic diversion.

In their Executive Summary, CDM Smith concluded:

“Both AET and ORT can be financially feasible options at York and Gardiner. AET offers free flow travel for all motorists with lower overall capital costs, but requires substantial video surcharges and results in traffic diversion to alternative routes. Because AET requires plate image capture and mailed invoices for non-E-ZPass motorists, it also involves substantially more risk associated with being able to bill and collect on a substantial portion of transactions.

“Conversion to ORT preserves cash collection at a lower operating cost, creates less risk to the Turnpike and requires no change to present toll rates. Cash paying motorists, however,

would still be required to stop and pay their toll. And while the 10-year net toll impact is positive, ORT capital costs are substantially higher than those for either the existing condition or for AET.”

These balanced conclusions are based entirely on evidence contained in a very readable report published on our website almost two years ago.

No one, not even Fleming, questions whether a substantial toll surcharge would be required for AET. No one can seriously question that a steep \$3 surcharge on the York toll would drive traffic off the Turnpike onto other local roads like Routes 1 and 236.

To collect tolls from former cash customers would require opening a massive “boiler room” office with scores of clerks to mail out bills all over North America to owners of the millions of cars and trucks that pass through York each year without E-ZPass and expecting to pay cash. Collection by mail is cumbersome, costly and ineffective. Financial losses from AET are substantial and inevitable. They are objectively calculated by CDM Smith based on their experience with dozens of other toll agencies.

Fleming alleges that certain questions posed by the Army Corps of Engineers remain unanswered, specifically on safety and the feasibility of one-way tolling. These questions were, indeed, answered. They are included within the hundreds of pages of technical reports that were published on the Turnpike’s website many months ago.

The state of New Hampshire having studied these issues has elected to retain cash collection, not only at Hampton but at Dover, Rochester and Bedford. Maine has operated an ORT plaza at New Gloucester for three years with favorable experience and is opening another at West Gardiner. Fleming’s advice is to abandon these plans and investments in order to emulate Boston’s Tobin Bridge, a tolling environment that bears no resemblance to that of northern New England.

The Maine Turnpike has spent ten years and \$4.5 million analyzing these questions and engaged several of the world’s leading experts. The decisions of the Turnpike’s seven-member board are based on evidence, public input and careful deliberation. Fleming’s intemperate bias for AET is well known and remains unchanged from what it was years ago. The points he makes were carefully considered by the Board before they decided unanimously 21 months ago to continue collecting cash at the tolls.

AET technology is not new, advanced or novel. It uses the same technology as ORT but relies on an army of back office clerks to view pictures of license plates, find addresses, and mail out bills. It is labor intensive, unreliable, and costly. It may be useful and sometimes necessary in metro settings like Dallas or the Tobin Bridge where there is no room to collect cash on the highway or where the road has a high volume of daily in-state commuters who can be compelled to convert to E-ZPass under sanction of high fines and surcharges.

NH & Maine have studied AET extensively and have both concluded that collecting cash on site is the best solution for established tolls in northern New England with their heavy reliance on out-of-state tourists and interstate trucking.

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July 22, 2016

Mr. Peter Mills
Executive Director
Maine Turnpike Authority
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Subject: **Comments on Final eTrans Report “Shortfalls in MTA’s Response to the Army Corp of Engineers (March 30, 2016)”**

Dear Peter:

As requested, CDM Smith has reviewed the final eTrans Report “Shortfalls in MTA’s Response to the Army Corp of Engineers (March 30, 2016)”. This report summarizes our findings in light of the specific work we did regarding the York Mainline conversion to either AET or ORT and in light of our experience on other similar work throughout the United States.

Introduction

CDM Smith was (and still is in most cases) the traffic engineering consultant to a number of the agencies mentioned in the eTrans report where AET has been implemented, including for the Pennsylvania Turnpike Commission, the Central Florida Expressway Authority, and for Highway 407 in Toronto (the first AET facility in North America). In addition, the Florida Turnpike, the Maryland Transportation Authority, the E-470 Public Highway Authority (Colorado), the Harris County Toll Road Authority (Texas), and many more have deployed AET based on CDM Smith traffic and revenue studies. The same approach and considerations for those studies were taken into account as part of our analysis of AET and ORT impacts at the York Toll Plaza.

The CDM Smith Study for the Maine Turnpike Authority (MTA) was conducted without bias for either AET or ORT, but rather on the mix of variables specific to the York (and Gardiner) toll plaza. These variables are unique for each and every toll facility. The mix of in-state versus out-of-state cash customers, overall cash market share, license plate successful read rate, valid department of motor vehicle address records, toll diversion, and more, are all location specific. They determine the potential levels of revenue leakage under AET and ORT, as well as the level of video or cash surcharges required to make up any toll revenue shortfalls.

In the end, we did not recommend either AET or ORT, but rather only the measures required to ensure net revenue neutrality for both. Based upon the impacts of these measures, previous professional tolling recommendations, and an MTA staff recommendation, the MTA Board of





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Directors selected ORT. Based on our national experience and a number of technical project-specific risk factors including the percentage of MTA income at risk at York, the mix of out-of-state and Canadian traffic, the cash market share, the toll surcharge, and traffic diversion, it is our professional opinion that the MTA decision was prudent and consistent with good tolling practice nationally.

Following are responses to each section of the eTrans report, as they apply to the work conducted by CDM Smith and summarized in our "Maine Turnpike ORT/AET Impact Analysis (March 18, 2014)".

Response to eTrans Report: Cover Page

The cover page of the eTrans report provides a table which contrasts ORT versus AET on several key elements. All ORT characteristics are labeled as "marginal" or "poor", while those for AET are all labeled as "best". It is odd that a "toll cost to customer" category has not been included since this is the aspect of any toll road that most directly affects all users. If "toll cost to customer" were to be considered, ORT would be labeled as "best" since no changes would be required for cash or E-ZPass customers (compared to existing rates). AET would likely merit a "worst" label since a substantial \$3.00 surcharge would be required for video (current cash) customers in order to maintain net toll revenue neutrality.

It is also misleading for the author to show the "Life-cycle Costs/Retained Revenue" to be "best" under AET and "poor" for ORT. The only reason for the net positive result under AET is due to the \$3.00 video surcharge needed to recover lost revenue. Later in the eTrans report (see Section 3.3.d, page 17) the author says the \$3.00 video surcharge is "significantly greater than those likely to occur". Without that level of video surcharge, net toll revenue losses would be significant under AET (based on our analysis).

While the CDM Smith study did not analyze the other components this table ranks, I would take exception to the "poor" ranking under ORT for "Safety" and "Customer Service". Numerous studies (including experience at MTA's converted ORT facilities, as well as those in neighboring New Hampshire) have shown that ORT dramatically reduces accidents compared to traditional mixed use (cash and E-ZPass) toll plazas. Regarding "Customer Service", some of the top focus group responses we have had for those opposing AET is the loss of customer service via the toll attendants. Those motorists indicated that they liked the option to pay cash and ask toll attendants for directions or for help in case of emergencies. These are certainly not reasons to maintain toll collectors, but it does provide ORT with a heightened customer service option not available with AET.



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Response to eTrans Report: Section 1.0 (Executive Summary)

In Section 1.0, the author takes issue with the level of traffic diversion CDM Smith estimated under AET. He makes two arguments. First, the CDM Smith estimates of 3,400 to 5,500 daily trips diverting to alternative routes is far too high. And, second, that these levels of diversion are “assumed to be realized over the long term.”

The 3,400 daily diversion value is CDM Smith’s base case estimate for diversion assuming AET was implemented in 2015. The 5,500 daily diversion level is based on CDM Smith’s financial risk analysis assuming a 90 percent confidence level. Risk analyses are often performed in order to provide the financial community (rating agencies, bond insurers, and investors) with some level of assurance that a toll authority’s financial obligations can be met. A detailed description of CDM Smith’s risk analysis is provided in our Study Report.

The eTrans author seems to imply that there is no alternative road way capacity to absorb this level of diversion. Travel in the southern coastline area of Maine is highly seasonal. As shown in the table below, July and August traffic levels greatly exceed those in other months. Traffic volumes and congestion can be severe during these two peak summer months. Relatively little diversion would occur during these two months (though not necessarily during off peak night time periods). However, for half the year, traffic volumes are about half those during the two peak summer months. During these periods the alternative routes would have ample capacity to absorb significant levels of diversion to avoid a doubling of the video toll at York.

Month	Monthly Variation
January	64.3 %
February	63.9
March	75.1
April	85.1
May	102.2
June	114.2
July	147.9
August	152.3
September	116.8
October	103.7
November	88.9
December	82.3
Average	100.0



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The eTrans author's second comment regarding diversion, that these levels of diversion are "assumed to be realized over the long term," is simply untrue. Table 5 (page 21) of the CDM Smith report provides the information summarized in the table below. As shown, CDM Smith base case diversion levels decrease from 3,449 per day in 2015 to less than half that level by 2025 (at 1,627 per day). These decreases in diversion are largely the result of the assumed continued shift from video transactions to E-ZPass (which has no AET toll surcharge) over time.

Year	Estimated Annual Diversion	Estimated Daily Diversion
2015	1,259,000	3,449
2016	1,164,000	3,189
2017	1,076,000	2,948
2018	994,000	2,723
2019	918,000	2,515
2020	847,000	2,321
2021	782,000	2,142
2022	721,000	1,975
2023	664,000	1,819
2024	611,000	1,674
2025	594,000	1,627

In an attempt to support his statements regarding CDM Smith's high diversion levels, the author then uses experience on the Tobin Bridge (formally known as the Mystic River Bridge), which recently converted to AET.

In an attempt to demonstrate that the diversion rates we estimated at the York Toll Plaza are too high when AET is assumed, the eTrans report cites the fact that traffic volumes on the Tobin Bridge actually increased for the five month period including August through December 2015 compared to the same five month period in 2014. Over this period, traffic increased by 7.4 percent. His conclusion, therefore, is that AET does not result in toll diversion.

This example does not make any sense for three reasons. First, conversion to AET at the Tobin Bridge took place in July 2014. Thus, AET was operational during both of the time periods they analyzed. So, the growth rate they show really only reflects normal background growth or growth



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from other non-AET related sources. For this comparison to be meaningful, they would need to have compared August through December 2013, when there was no AET, versus August through December 2014, when there was AET.

Secondly, the toll diversion rates developed in the CDM Smith report are based on the \$3.00 (passenger car) toll increase that would be incurred by video customers under AET. This would be double the current cash toll rates. Toll rates on the Tobin Bridge were \$3.00 for cash and \$2.50 for E-ZPass (car rates) prior to conversion to AET. Upon conversion to AET, the rates remained unchanged at \$3.00 for video (also referred to as toll-by-plate) and \$2.50 for E-ZPass. So, even if the author had chosen the correct time periods to compare, we would not have expected any toll diversion to occur at the Tobin Bridge because there was no additional video toll surcharge.

Thirdly, even if the author had selected the correct time periods to compare and a similar toll increase had occurred at the Tobin Bridge, it is impossible to know, without careful analysis, what level of toll diversion would be expected at this highly urban location. Simply using this as an example because it converted to AET is not sufficient to say that diversion rates should also be similar those in the York corridor.

What is most important regarding the AET conversion at the Tobin Bridge is the actual impact it has had on toll revenue collection. The eTrans report does not mention the fact that video payment violations rates have been very high at this location. An April 1, 2015 article in the New Salem News (http://www.salemnews.com/news/local_news/motorists-racking-up-hefty-fines-for-unpaid-cashless-tolls/article_23bb90f3-ed93-5940-ae1b-7ff8aeae1ed1.html) wrote the following:

“Figures from the state Department of Transportation reveal that from mid-July to Dec. 31 the state collected less than half of the \$2.7 million in pay-by-plate tolls billed to motorists crossing the Tobin during that time.

[M]otorists who didn't pay up after getting bills in the mail have been hit with more than \$3.2 million in late fees and other charges, with MassDOT collecting only \$600,000 of that by the end of the year.”

As a result of such high violation rates, MassDOT felt it necessary to forgive tolls through an amnesty program. Specifically, MassDOT issued the following notice on this subject: (<https://www.paybyplatema.com/pbp/Desktop/Default.aspx>):



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“Important Notice: Effective June 1st, 2015 all current delinquent customers will be offered an amnesty settlement. All Pay By Plate fees will be waived and all Registry of Motor Vehicles (RMV) holds will be removed. Only outstanding tolls will need to be paid in full. This amnesty program is for Tobin Bridge outstanding fees only.”

Violation fees are meant to both deter motorists from not paying the toll and to help make up for lost toll revenue from those who do violate and never pay. So, while this amnesty program may help in collecting some lost toll revenue, the loss of fee revenue will result in continued net revenue losses.

For comparative purposes, the total video uncollectible rate assumed by CDM Smith for the York Toll Plaza is 42.2 percent (Table 1, page 14). This includes losses from both unbillable transactions and uncollectible transactions. In spite of the slightly lower video collection assumptions CDM Smith developed for the York Toll Plaza, the revenue risk is much higher compared to that for the Tobin Bridge.

In the case of the Tobin Bridge, video transactions account for only about 15 percent of total transactions. This means that a 50 percent video loss rate results in revenue leakage of only about 7.5 percent. In addition, the Tobin Bridge only accounts for about 7.7 percent of total MassDOT Turnpike System toll revenue. The situation at York, however, is quite different. At York, about 30 percent of current transactions are cash (versus 15 percent at Tobin Bridge), thus putting twice the revenue at this location at risk. In addition, the York Toll Plaza is the single highest revenue generating location on the Maine Turnpike accounting for just over 40 percent of total system revenue in 2015 (versus 7.7 percent for Tobin Bridge).

It is also almost comical that the eTrans report uses an example 60 miles south of the York Toll Plaza (on an entirely different road and in a different type of area) when the closest example of a successful toll conversion can be found just a 15 minute drive south of the York Toll Plaza on I-95 in Hampton, New Hampshire. The New Hampshire DOT converted the traditional mixed use (cash and E-ZPass) barrier toll plaza in Hampton to ORT in 2010. Following its success, they converted the Hooksett Mainline Toll Plaza in 2013. Current plans are for the conversion of the Dover and Rochester plazas by the 2021-2022 time period.

In 2011 Hampton Toll Plaza on Interstate 95 was selected as one of the top ten transportation projects in the country in that year's competition based upon judging in three categories: "on time", "under budget", and "innovative management". The competition was sponsored by the American Association of State Highway and Transportation Officials (AASHTO), AAA, and the U.S. Chamber of Commerce (<https://www.nh.gov/dot/media/nr2011/nr09011195.htm>).



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And upon conversion of the Hooksett Toll Plaza, NHDOT Turnpikes Administrator Chris Waszczuk noted that the benefits of implementing ORT at the Hooksett Tolls include (<https://www.nh.gov/dot/media/nr2013/20130522-open-road-tolling.htm>):

- Improved customer convenience
- Reduced travel time – 270,000 hours annually
- No lines or stopping to pay tolls
- Reduced fuel consumption – 465,000 gallons annually
- Improved air quality – less vehicle idling and delays
- Safer – no lane changing or slowing down
- 30% discount for E-ZPass "passenger type" vehicles

The author of the eTrans report seems to be so focused on promoting AET at all costs, that he neglects to see (or look for) any benefits afforded by ORT. The New Hampshire example is but one of many successful ORT conversions throughout the country. Other examples include the New Jersey Turnpike and Garden State Parkway (NJ), Pennsylvania Turnpike, Central Florida Expressway, and many more.

Response to eTrans Report: Section 2.0 (U.S. Army Corps of Engineers Observations/Requests and MTA's Response)

In Section 2.2 of the eTrans report the author states that toll revenue leakage under ORT has been underestimated, thus making it look more favorable versus AET. It is true, that intentional toll cheats would be able to use the E-ZPass lanes under ORT. But, the same is true with conventional toll plazas with dedicated E-ZPass lanes (which there are at the York Toll Plaza). Thus, conversion to ORT would not result in any (or only minimally more for those who mistakenly get in the express E-ZPass ORT lanes) additional revenue leakage compared to conventional toll plazas. Under AET, revenue leakage occurs when cameras do not take a clear image of the plate, when the department of motor vehicles has incorrect address information, or when motorists do not pay invoices.

Regardless of what the author says on this point, actual experience of ORT revenue collection on the Maine Turnpike at the converted New Gloucester Toll Plaza has shown that there is negligible revenue loss. CDM Smith is the traffic engineering consultant to the Pennsylvania Turnpike, the New Jersey Turnpike, and the Garden State Parkway (NJ). Toll revenue leakage at locations where ORT has been implemented has not been an issue. The same can be said for experience at the Hampton and Hooksett Toll Plazas in New Hampshire.



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For some reason, the eTrans report notes the following, which is totally irrelevant to their argument regarding increased ORT revenue leakage (page 5):

“In addition, E-ZPass lane violations are not limited to just open road lanes in ORT operations. For example, the E-ZPass lanes on the Pennsylvania Turnpike (gate-free lanes in the toll plazas) have been subject to such fraud and abuse that:

“When the Pennsylvania Turnpike’s fiscal year ended in May (2015), there were \$33.3 million still outstanding in unpaid tolls.”^{xxi}

Therefore, for this study to assume only modest violations in ORT lanes at the York Toll Plaza is overly optimistic and biases the results against AET.”

Citing this experience in Pennsylvania is irrelevant and misleading for several reasons. First, if, as the author asserts, this \$33.3 million in revenue loss is not attributable to ORT, but rather to gate free E-ZPass only lanes (referred to as “slip ramps” by the Pennsylvania Turnpike Commission), then it is plainly clear this has nothing to do with ORT. Secondly, had the author correctly understood what the \$33.3 million outstanding tolls referred to, he would not have made this argument at all. In fact, the \$33.3 million referred to represents unpaid tolls for the entire system, including ORT plazas, slip ramps, and conventional toll plazas (which form the vast majority of the Pennsylvania Turnpike toll system). They also represent the cumulative two-year total in unpaid tolls. It should also be noted that while \$33.3 million sounds like a substantial amount, given the total two-year revenue collection on the Pennsylvania Turnpike, this amounts to only a little more than 1.5 percent of systemwide toll revenue. But, again, the bigger point here is that the \$33.3 million dollar unpaid tolls referenced has nothing to do with ORT revenue loss (either on the Pennsylvania Turnpike or on the Maine Turnpike).

Further, if eTrans had read down a little farther in the Pennsylvania Turnpike article from which it quoted, it would have seen that Turnpike Commission Chair Sean Logan said his *“concern is the level of unpaid and uncollected tolls will increase dramatically if the turnpike continues down the road to all electronic tolling without the authority to go after violators with an enforcement mechanism that gets drivers attention”*.

In Section 2.4 the eTrans report again uses incomplete and misleading information from another real world example of AET conversion to argue that AET is good and ORT is bad. Unfortunately, this fails as well. They cite the Central Florida Expressway (CFX) Authority as having “recently



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studied AET deployment throughout the U.S. and Canada and elected to move forward with AET deployment..." CDM Smith is the traffic engineering consultant to the CFX Authority and conducted the traffic and revenue studies leading to their recent decision to implement AET.

Based on the eTrans report, one would be forgiven for interpreting this statement to mean that the CFX Authority decided to convert its entire system to AET. In fact, that is not the case. AET, in this case, will be implemented on a new expansion project as part of a western beltway around Orlando, FL. Total toll revenue on the new AET segment is estimated to amount to \$1.2 million after one year of operation. Total CFX toll revenue in that same year is estimated to amount to \$451.5 million; thus, AET revenue will account for 0.3 percent of total system toll revenue (revenue forecasts for the AET segment and total system are from the Central Florida Expressway Authority FY 2015 General Traffic and Earnings Consultant's Annual Report, CDM Smith, February 2016).

This proposed toll segment is, in many ways, a good candidate for AET. It will serve a highly commuter oriented market and is expected to have more than 80 percent SunPass (Florida's equivalent to E-ZPass) participation. In addition, it will serve as an ideal pilot program for any further expansion projects since any losses at this location would not present a revenue risk to the CFX Authority. None of these conditions are true of the York Toll Plaza. Finally, the eTrans author does not mention that all of the current CFX Authority toll system was converted from traditional toll collection to ORT several years ago; they have no plans to convert any of the existing ORT plazas to AET.

Response to eTrans Report: Section 3.0 (Environmental, Safety and Financial Issues Not Properly Addressed in MTA's Analysis)

Section 3.3 specifically deals with "Shortfalls in the MTA's Financial Analyses". The eTrans assertions here fall into the following categories:

1. The CDM Smith report should have considered a life-cycle cost analysis instead of a net revenue analysis.
2. The CDM Smith report limited its analysis to a 10-year time frame.
3. The CDM Smith report focused on a worst case scenario instead of a most likely scenario.
4. The AET video surcharge amounts are higher than those for other AET facilities and inconsistent with "Good Industry Practices".
5. CDM Smith estimates of toll diversion are too high.
6. CDM Smith underestimated cash revenue leakage rates under ORT.
7. CDM Smith assumed different business rules for AET than they did for ORT.



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Items #1 and #2 – These two are related. We provided net AET and ORT traffic and revenue impacts over a 16-year period from 2015 through 2030 (see CDM Smith report Tables 5 and 6). We also conducted a net present value analysis of the revenue impacts along with estimated capital costs for both AET and ORT over a ten-year period. CDM Smith did not recommend either AET or ORT based on this analysis, but rather provided technical analysis and a professional measurement of impacts, and left that decision up to the MTA.

The structure of the analysis, however, is consistent with studies CDM Smith has conducted for numerous other toll authorities. Furthermore, this is the type of information that is requested by the financial industry (rating agencies, bond insurers, and investors). Maximum focus, from their point of view, is on the risk to toll revenue and the ability of a toll agency to maintain minimum debt service coverage ratios. In this case, AET introduces more revenue risk than does ORT, thus the need for the \$3.00 video surcharge. Capital costs related to construction of a new toll plaza (be it AET or ORT) is substantially less risky. Cost incurred in construction are well established and represent a one-time expenditure. Revenue losses, on the other hand, can occur on an annual basis. Consistent with other tolling agency practices nationally, I would think that the MTA would be much more concerned with preservation of its long term revenue stream, when compared to the one time capital cost to construct a new toll facility.

Item #3 – This is simply not the case. CDM Smith’s base case (see Tables 5 and 6 of the CDM Smith report) reflects “a most likely scenario”. We incorporated actual experience at MTA regarding nearly every variable considered in the analysis. Table 1 of CDM Smith’s report highlights several of the key assumptions in the model that MTA staff provided based on actual experience. The same is true on the cost side of the equation (image review costs, mailing costs, etc.). The author of the eTrans report may think these variables are too high or that they will change in the future. In order to maintain a strong bond rating, we must base our analysis on current operations. Rating agencies are not interested in “up-side” forecasts and do not rate toll agencies on what might happen in the future. If anything, they are much more interested in the “down-side”. Thus, the CDM Smith report also conducted a risk analysis at both a 90 percent and 95 percent confidence level in order to provide the MTA (as well as rating agencies and others, if needed) some measure of confidence that debt service coverage levels could be maintained with either 90 percent or 95 percent confidence.

Item #4 – This is an odd statement. No toll rates (whether cash, E-ZPass, or video) are set based on “Industry Standards”. Rates are set to meet operating, capital, and debt service needs. The video surcharges estimated for the York Toll Plaza are based on factors unique to this location, including a majority of out-of-state travelers (including a significant number of Canadian



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customers), high cash paying market share (which would be video under AET), a high number of invalid department of motor vehicle addresses, current violation payment experience, etc.

Item #5 – Diversion levels developed in the CDM Smith study were discussed above in detail.

Item #6 – The eTrans author again questions CDM Smith leakage rates for ORT, arguing they should be much higher. This, too, was discussed above in detail.

Item #7 – The CDM Smith analysis assumed the same business rules for both AET and ORT. The eTrans report does not give any examples of where different business rules were used, so it is difficult to respond beyond this. Perhaps they are conflating assumed cash leakage rate assumptions under ORT versus those assumed under AET as being based on business rules. Those types of assumptions are not business rules, but rather actual operating characteristics based on MTA's own experience and on the experience of other ORT facilities such as those in New Hampshire, New Jersey, Pennsylvania, and elsewhere.

Response to eTrans Report: Section 4.0 (Summary)

CDM Smith has no comments on this section.

To repeat what was said in the Introduction, CDM Smith entered into this assignment without a bias toward AET or ORT. We have conducted many studies where the preferred outcome was for conversion to, or the introduction of, AET. As clearly stated in our report, AET is not infeasible, but rather must be accompanied by a substantial video surcharge in order to maintain net toll revenue neutrality. ORT at York, on the other hand, would not require any additional toll surcharges to maintain revenue neutrality on MTA's system. The MTA selected ORT. Based on our national experience and a number of technical project-specific risk factors including the toll surcharge, the percentage of MTA income at risk at York, the mix of out-of-state and Canadian traffic, the cash market share, and traffic diversion, it is our professional opinion that the MTA decision was and remains prudent.

If you have any questions or comments, please do not hesitate to contact me at your convenience.

Very truly yours,

A handwritten signature in black ink, appearing to read "Gary T. Quinlin".

Gary T. Quinlin
Project Manager
CDM Smith, Inc.

Peter Mills

Education/Background:

Born in Farmington, ME 1943
Gorham High School, Gorham, ME Graduated 1961
Harvard College BA. Graduated cum laude in English 1965 with courses qualifying to become a naval officer.
U.S. Navy 1965-70
Univ of Maine School of Law; Law Review. Graduated 1973.
Attorney in Portland 1973-82; owner of the law firm Mills, Shay, Lexier and Talbot in Skowhegan since 1982.
Married to Nancy Mills, Superior Court Justice. Three adult daughters. 6 Grandchildren.
State Senate 1994-2002; Maine House of Representatives 2002-04; State Senate 2004-10.
Executive Director, Maine Turnpike Authority since March 17, 2011.

Military Experience (1965-70): Five years as a destroyer line officer with sea duty billets in communications, operations and intelligence. Deployed to Vietnam, the Central Pacific and the Mediterranean. Was awarded the Navy Commendation Medal for gun line duty in Vietnam and the Navy Achievement Medal for intelligence work on Soviet missile testing.

Maine Turnpike Experience: During my tenure as Executive Director, I have overseen:

- Submission of six Turnpike budgets for approval by the Turnpike Board and the Maine Legislature
- Capital construction of between \$40 and \$60 million per year
- Labor force reductions and efficiencies to reflect greater reliance on technology
- Drafting and passage of a number of changes to state law to improve Turnpike operations
- The public process by which tolls were increased by 20% in 2012
- Two bond issues to substantially reduce interest on outstanding debt
- An increase in the S&P rating for Turnpike bonds
- Two long range (3 year) labor contracts each containing material reforms
- Significant improvements to the administration of E-ZPass
- Resolution of conflicts making use of prior experience in construction and design litigation

Public Service:

In the 117th Legislature (1995-96), chaired Judiciary and served on Labor Committee. In 1995, chaired the Property Rights Task Force.

In the summer of 1996, chaired the Critical Review Committee to rewrite Learning Results for the Dept of Education. In 1996 and 1997, served on the Assessment Design Team to implement Learning Results.

In 1997, served on the Children's Health Task Force (to implement S-Chip coverage for children) and on a committee to reform pensions for teachers and public employees.

In the 118th and 119th Legislatures (1997-2000), served on Labor and Taxation Committees

In 1998 served on:

- The Learning Results Steering Committee to implement education standards and
- The Task Force to Increase Primary and Secondary Forest Product Manufacturing.

In 1999 served on a Committee on Sawmill Biomass and an Economic Development Incentives Commission.

In the 120th Legislature (2001-02), served as the Senate Republican lead on Appropriations.

In 2001, served on the Education Funding Reform Task Force.

In 2002-04, was Senate chair and then a House member of the Community Preservation Advisory Commission.

In the 121st Legislature (2003-04), was a House member on Appropriations; also served on the Task Force on Retirement Benefits for Law Enforcement Officers & Firefighters. Became a member of the Health Insurance Public Purchasers' Steering Group.

In the 122nd Legislature (2005-06), served on the Select Committee on Tax Reform and the Insurance & Financial Services Committee.

In the spring of 2005, initiated and led the "Don't Mortgage ME" petition drive that stopped the Legislature from borrowing \$447 million dollars without voter approval.

From August 2005 to June of 2006, conducted an unsuccessful campaign for governor in the GOP primary; spoke to over 200 gatherings about the state's current challenges.

In the 123rd Legislature (2007-08), served as Republican Senate lead on the Education Committee.

In 2007, served on the Alternative Education Task Force.

In the 124th Legislature (2009-10), served on the Health & Human Services Committee, the Labor Committee, the Maine Children's Growth Council, LURC's Comprehensive Land Use Plan Working Group Forum, the Advisory Council on Health Systems Development, and the Energy Corridor Commission.

From August 2009 to June of 2010, campaigned a second time unsuccessfully for governor in the GOP primary.

From November 2010 to January 2011, served on Governor LePage's transition committee.

From 2011 to 2013, Governor's Advisory Committee on Development of Broadband Infrastructure

Civic engagements:

President of the Maine Trial Lawyers Association (1992-94).

Inducted into the American College of Trial Lawyers in 1991.

On the Board of Pine Tree Legal Assistance Corporation 1994-1999

On the Board of HealthReach Community Health Centers 1997-2003

On the Board of HealthReach Network, a provider of health services, 2000-2006

On the board of the Maine Math & Science Alliance 1998-2005

Organized transportation summits for Somerset County in 2000 and 2004

On the Advisory Committee on Health Systems Development (2009-10)

On the Steering Committee of the Reforming States Group (1996-2010) (An international group of policymakers sponsored by the Milbank Foundation to develop state & provincial health policy. I was co-chair 2009-10.)

The Maine Coalition for Excellence in Education (2000-09)

The Somerset County Economic Development Corporation (Clerk & founding member 2000-2011)

The Maine Children's Growth Council (2008-10)

Currently serving on the following:

Chair of the Advisory Board of the Margaret Chase Smith Policy Center (since 2009).

The Muskie School Board of Visitors (since 2002)

The Kennebec Regional Development Corp. -- FirstPark (Secretary & founding member. Since 1998)

The Maine Children's Trust (since 2009)

The Board of Health InfoNet (since 2009)

Board of Maine Community Foundation (since 2012)

Founding member & Secretary of the Maine Virtual Academy, an online school (since 2012)

Publications: Numerous Op-Eds and longer writings on education, health, tax and public policy. Many are available at petermills.info. They include:

"A Critical Exegesis of Maine's Creaky Tax Code" in the MCS Maine Policy Review in 1997

"Maine's Dubious Odyssey into the Funding of Local Government" in the MCS Maine Policy Review in 1998

"Maine Tax Policy: Lessons from the Domesday Book" in Changing Maine edited by R. Barringer in 2004

"Megawatts from Mountain Tops: What's in it for Maine?" Vol IX, Numbers 8 & 9 concerning wind power development in the series "Choices" published by the Maine Center for Economic Policy in October 2008.

"Bite Size Democracy -- The Virtues of Incremental Change," in the MCS Maine Policy Review in 2011

"Maine as a Bulwark of Democracy" an essay for the MCS Maine Policy Review in 2014

"Climate Policy 2015: Reports from the Congressional Trenches" published in MCS Policy Review in 2016

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Hallowell, Maine 04347

FAMILY: Children – Michael, Karen, Daniel and Steven

EDUCATION:

Waterville High School, Class of 1950
University of Maine – Bachelor of Science in Civil Engineering
University of Mississippi – Certificate in Management
Various courses in City and Regional Planning – Urban
Transportation Planning – Real Estate Appraisal – Management, etc.

WORK EXPERIENCE:

Military – U.S. Army – Georgia, Germany 1954-1956
Various – Maine Department of Transportation, June 1956 to December 1973. Engineering, planning, managing and public liaison responsibilities.
Commissioner – Maine Department of Transportation, December 1973 to December 1979. Responsible for the overall administration of a Department of approximately 3,000 employees and a budget of nearly \$150,000,000 annually.
Vice President – Operations, the Dunlap Agency, July 1983 to August 1987. Management responsibility for several Northern New England branch office goals, operations and profitability, corporate strategic planning and organizational development.
President – Mallar Associates, August 1987 to December 1999 and Mallar Development Services, January 1980 to July 1983. Specializing in management services, transportation, economic development, governmental relations, governmental operations and public policy.
Retiree – Volunteer work 2000 to present.

FORMER AFFILIATED POSITIONS:

Chairman, Maine-New Hampshire Interstate Bridge Authority
Member, Maine Turnpike Authority
President, American Association of State Highway and Transportation Officials.
Member – Maine Historic Preservation Commission
Chairman, Maine Reapportionment Commission
Co-Chairman, Select Committee on Workers' Compensation
Vice President, Maine Development Foundation
Chairman, Governor's Economic Development Strategy Task Force
Chairman, Board of Directors, Maine Chamber of Commerce and Industry
Chairman, Northern New England Rail Passenger Authority
Board Member and Treasurer, Friends of Scarborough Marsh
Co-Coordinator, Southern Maine Community College Pier Project

OTHER RELATED AFFILIATIONS:

Registered Professional Engineer, Retired
Registered Land Surveyor, Retired
Long-term Member, Maine State Employees Association (MSEA)
Member, Maine Better Transportation Association

TOWN ACTIVITIES:

Former President, Hallowell-Farmingdale Little League
Former Treasurer, Hallowell-Farmingdale Cub Scouts
Member, Former Chairman, Farmingdale Highway Advisory Committee
Member, Former Chairman, Farmingdale Capital Needs Committee
Former Member, Chairman, Farmingdale Board of Selectmen
Former Farmingdale Road Commissioner

GARY T. QUINLIN

TOLL STUDIES AND FINANCE

Experience

Mr. Quinlin is a senior project manager at CDM Smith with more than 27 years of experience in transportation, finance, and toll technology projects. He has vast experience in virtually all types of traffic, revenue, and toll studies includes traffic and toll revenue forecasting, investment grade studies, toll sensitivity, managed lane/high occupancy toll (HOT) lane studies, and all electronic toll (AET) studies. He has been a senior project manager for more than 20 years and has been involved in work for many toll agencies such as Florida's Turnpike Enterprise, the New Jersey Turnpike, the Pennsylvania Turnpike, the Maine Turnpike, the Miami-Dade Expressway Authority, and many more.

Much of Mr. Quinlin's recent efforts have revolved around conducting investment grade traffic and revenue studies for use in bond issues, such as those for the New Jersey Turnpike Authority (NJTA) and the Pennsylvania Turnpike Commission (PTC) as well as AET conversion studies for the Miami-Dade Expressway Authority, the PTC, NJTA, and the Maine Turnpike Authority.

Education

M.S. - Urban and Regional Planning, University of Iowa, 1989

B.S. - Sociology, University of Iowa, 1987

CDM Smith

Project Director, Miami-Dade Expressway Authority (MDX) Systemwide Traffic and Revenue (T&R) Update Study, Miami-Dade County, FL. - Mr. Quinlin acted as the project director for this investment grade T&R study. He coordinated all aspects of this work, including the review of economic data collected by an independent subconsultant. Mr. Quinlin developed all final traffic and revenue estimates and developed the study report.

Project Director, Miami-Dade Expressway Open Road Tolling (ORT) Master Plan, Miami-Dade County, FL. - As the project director, Mr. Quinlin worked closely with MDX staff in developing the traffic and revenue forecasts for the master plan. Estimates of converting the existing system to ORT were developed for traffic and revenue, as well as capital and operations and maintenance (O&M) costs. A key element of the study was to "close" the system so that current toll-free movements were eliminated from the system.

Project Manager, General Traffic Engineering Consultant Services, New Jersey - Mr. Quinlin is the nominated project manager for CDM Smith's current general traffic engineering consultant services contract for the New Jersey Turnpike. He is the point person for all work conducted by the firm over the period of this three-year contract. Major elements of this contract include the development of periodic investment grade traffic and revenue studies and participation in financing team/rating agency meetings. Additional tasks include the creation of monthly traffic and revenue reports and annual business interruption insurance certificates.

Project Manager, Maine Turnpike Authority: Independent Financial Risk Analysis for Toll Collection Alternatives at the York Toll Plaza, Maine - Mr. Quinlin is currently managing a study to determine the financial feasibility of relocating the York toll plaza and converting its toll collection system to either ORT or to AET. A specialized model was developed specifically for the York Plaza to test the impact of alternative business rule assumptions and operating characteristics under both ORT and AET operations. Forecasts of annual gross and net (excluding O&M costs) toll revenue are being developed and compared to the existing condition.

Project Director, Pennsylvania Turnpike Commission I-95 Interchange T&R Study, Pennsylvania - The Pennsylvania Turnpike Commission retained CDM Smith to update the prior study from 2006 that estimated traffic and toll revenue impacts associated with a new interchange between I-276 (PA Turnpike) and I-95. Mr. Quinlin acted as project director for this study. He was responsible for overseeing all aspects of work, including client contact, data collection and review, and the development of estimated traffic and revenue impacts.

Project Director, Alabama US 280 Elevate Test Level (TL) Feasibility Traffic and Revenue, Birmingham, AL - Mr. Quinlin served as project director on this study. He coordinated an extensive travel pattern survey and traffic count program, supervised all traffic modeling efforts, developed estimated traffic and toll revenue forecasts, and developed the report document.

Project Director, Pennsylvania Turnpike and I-80 Traffic and Revenue Study, Pennsylvania - CDM Smith conducted a study for the Turnpike Commission to support its proposal to the Federal Highway Authority (FHWA) to take over maintenance of the I-80 corridor in Pennsylvania and make annual payments to PennDOT for improving

other transportation infrastructure in the state. As the project director of this study, Mr. Quinlin was responsible for all aspects of work, including data collection, origin-destination (OD) surveys, and traffic counts, as well as the development of traffic and toll revenue forecasts.

Project Director, Eastbound I-580 High Occupancy Vehicle (HOV) to HOT Conversion, Alameda County, CA

- The client proposed converting the existing HOV lane on I-580, the second most congested freeway in the Bay Area, to a high occupancy toll lane to reduce traffic congestion and delay, encourage the use of high occupancy vehicles and transit, support air quality attainment goals, and improve motorist safety. Mr. Quinlin served as the project director for the HOT study. He coordinated all work efforts, including data collection (traffic counts and travel time studies); supervised and reviewed all modeling efforts; developed final traffic and revenue findings; led weekly progress meetings; and developed the final study document.

Project Manager, Pennsylvania Turnpike 2011, 2012, 2013, 2014, 2015, 2016 and 2017 T&R Studies, Pennsylvania

- Mr. Quinlin served as the project director for these traffic and revenue studies for the Pennsylvania Turnpike Commission (PTC). The 2011, 2013, 2014, 2016, and 2017 studies were Bring Down Letters and keyed off of prior investment grade studies. The 2012 and 2015 studies were comprehensive investment grade studies. Each of these T&R studies incorporated annual rate adjustments into the forecasts. Part of CDM Smith's role is to identify the impacts of alternative rate increases, as well as the differential application of the rate increases to cash and E-ZPass customers. These studies are used in support of the issuance of all toll revenue bonds by the PTC.

Project Director, 2012 New Jersey Turnpike Investment Grade T&R Study, New Jersey - As project director for this work, Mr. Quinlin oversaw the development of formal updated investment grade traffic and revenue forecasts for both the New Jersey Turnpike and the Garden State Parkway. A detailed socioeconomic review was conducted as part of this study, including meetings with planners and economists in both project corridors, in order to develop updated estimates of growth throughout the ten-year forecast period. Mr. Quinlin participated in rating agency meetings and investor "road shows" as part of his duties for this work.

Project Manager, Pennsylvania Turnpike Barrier Conversion AET Studies, Pennsylvania - CDM Smith was asked to estimate the traffic, gross revenue, and net revenue impacts of converting individual segments of the Pennsylvania Turnpike System to AET. The first portion studied was the easternmost tolling location at the Delaware River Bridge. This location was successfully converted to AET operations, the first for the Turnpike, in January 2016. Operations at this location have been under study to apply to current potential AET conversion locations on the Beaver Valley Expressway, the Findlay Connector, and the northern portion of the Northeastern Extension.

Project Manager, Pennsylvania Turnpike Preliminary Systemwide AET Study, Pennsylvania - CDM Smith was a subconsultant on this project and was responsible for the development of all traffic, toll, and fee revenue impacts of converting the entire Pennsylvania Turnpike to AET. CDM Smith was also responsible for all efforts related to the development of toll system capital and O&M costs. Public outreach and survey efforts were used to collect user characteristics and attitudes toward AET. CDM Smith developed a specialized AET model to estimate the traffic, revenue, and O&M cost impacts of converting to AET. A key element of the model is the ability to test numerous business rules assumptions and their impact on traffic, revenue, and O&M costs. CDM Smith also worked with the prime consultant in reviewing legislative/legal issues related to AET and ways to minimize AET revenue leakage.

Project Manager, Pennsylvania Turnpike Final Systemwide AET Study, Pennsylvania - CDM Smith is responsible for all final traffic and revenue studies to be completed in advance of AET implementation on the Pennsylvania Turnpike. In addition to refining the work conducted in the preliminary phase of work, this study will include the development of pilot programs to test the impact of AET. In addition, CDM Smith is tasked with reviewing capital and O&M costs developed by others for this work. The AET model developed as part of the preliminary study will be used to test and refine the final operational assumptions that will be used in the pilot programs, as well as for full system implementation.

Project Director, Delaware River and Bay Authority (DRBA) Investment Grade Traffic and Toll Revenue Study, Delaware - Mr. Quinlin is overseeing the development of a formal investment grade traffic and toll revenue study for the DRBA, which includes forecasts for both the Delaware Memorial Bridge and the Cape May-Lewes Ferry. A detailed socioeconomic review of the region is being undertaken in the development of five-year updated forecasts. The study report will be included in an upcoming Official Statement, and CDM Smith will attend rating agency meetings in support of the issuance of additional revenue bonds.