Document No. 5

NEW YORK STATE BRIDGE AUTHORITY

TRAFFIC CONSULTANT TRAFFIC AND REVENUE FORECAST

2019-2024

Stantec has prepared a Traffic and Revenue Forecast for New York State Bridge Authority Bridges, dated December 20. 2019, which provides a forecast of revenue and expenses for the period 2019-2024. The report includes:

1. Information on future authority operations, debt service and capital construction, together with estimated receipts and expenditures for the next five fiscal years without reference to the proposed toll increase.

2. Projections and estimates as to the effect which the proposed toll increase will have on the future use of the facilities, and an estimate of the revenues which will accrue to the Authority during the next five fiscal years as a result of the proposed toll increase.

The report projects the need for another toll increase in 2024. Projections in the Stantec report beyond five years are for the Authority's planning purposes only.

New York State Bridge Authority Toll Traffic & Revenue Forecasts

Stantec

Prepared for:
New York State Bridge Authority

Prepared by:
Stantec Consulting Services, Inc.

December 20, 2019

NEW YORK STATE BRIDGE AUTHORITY TOLL TRAFFIC & REVENUE FORECASTS

Table of Contents

NEW YORK STATE BRIDGE AUTHORITY TOLL TRAFFIC & REVENUE FORECASTS

List of Tables

NEW YORK STATE BRIDGE AUTHORITY TOLL TRAFFIC & REVENUE FORECASTS

List of Figures

Executive Summary

The purpose of this report is to present forecasts of the New York State Bridge Authority (the "Authority") traffic and toll revenues, annually for the period 2019 through 2035, under the current toll schedule and the proposed toll schedule(s) required to support the Authority's capital and operating needs under several scenarios in accordance with Stantec Consulting Services Inc.'s (Stantec) agreement with the Authority. Stantec was supported by three sub-consultants in the development of this report content: Spock Solutions, Fagan Consulting, and Alta Vista Solutions.

This report present a discussion of Hudson Valley transportation infrastructure, including the Authority's five bridges; national trends affecting traffic growth; population and employment growth in the Mid-Hudson Valley; historical and projected traffic, revenue and expenses for the bridges; the current toll schedule and its impacts on bridge traffic and revenues; the Authority's Capital Improvement Program; and a proposed toll increase scenario.

The five bridges of the Authority are among thirteen vehicular crossings of the Hudson River and its estuaries between Albany and the Atlantic Ocean, including three bridges between Staten Island and New Jersey. Two of these crossings are operated by the New York State Thruway Authority (the "Thruway Authority"), and six are operated by the Port Authority of New York and New Jersey (the "Port Authority"). Between the Thruway bridge at Castleton-on-Hudson and the Outerbridge Crossing of the Arthur Kill between Staten Island and New Jersey, the thirteen crossings all charge tolls. There is no toll-free vehicular crossing of the Hudson River south of Albany.

The law creating the Authority is found in the Bridge Authority Act, currently Sections 525 to 542 of the New York Public Authorities Law and defines the Authority's mission as ***"to maintain and operate the safe vehicle crossings over the Hudson River entrusted to its jurisdiction for the economic and social benefit of the people of the State of New York."*** To fulfill this mission, the Authority's Capital Improvement Program has and will continue to maintain the five bridges in good structural and functional condition.

There are five vehicular bridges across the Hudson River operated by the Authority and serving local, recreational and long-distance trips. From north to south, the five bridges are:

- **Rip Van Winkle Bridge** connects Columbia and Greene counties and the communities of Hudson and Catskill;
- **Kingston-Rhinecliff Bridge** connects Dutchess and Ulster counties and the communities of Kingston and Rhinebeck/Red Hook;
- **Mid-Hudson Bridge** connects Poughkeepsie in Dutchess County and Highland in Ulster County. It carries the second highest volume of traffic and the greatest number of commuters;
- **Newburgh-Beacon Bridge** is designated as Route I-84 and has two spans connecting Newburgh in Orange County and Beacon in Dutchess County. The bridge carries the

highest volume of traffic of the five vehicular bridges and it serves both long-distance and local trips;

- **Bear Mountain Bridge** connects Orange and Putnam counties (and touches the far northern corners of Westchester and Rockland counties) connecting the communities of Highland Falls/Fort Montgomery and Cold Spring/Garrison.

In 2010, the Governor and state legislature charged the Authority with the responsibility of maintaining the structure of the Walkway Over the Hudson Bridge. The Authority acquired ownership of the bridge for maintenance purposes on December 21, 2010 and entered into a 99 year lease with the NYS Office of Parks Recreation and Historical Preservation to operate and maintain the deck. The bridge carries a 1.3-mile pedestrian walkway via a former railroad bridge between the City of Poughkeepsie in Dutchess County and Highland in Ulster County. It has been designated as the Walkway Over the Hudson State Historic Park. The Authority has undertaken several maintenance projects with over $3.0 million in budgeted capital expenditures from 2020 through 2024.

In consultation with the Authority, it was determined that future revenue derived from tolls in effect since January 30, 2012 would not be sufficient to meet the Authority's prime directive of maintaining the bridges in a state of good repair. To provide the revenues necessary to fund the Authority's capital program, the Authority is proposing a toll rate increase to be phased in over a four year period, commencing May 1st of 2020 and continuing in May 2021, 2022 and 2023.

The tolls in effect since January 30, 2012 for the Authority's bridges are shown in Table 23. Also shown are the proposed tolls beginning May 1, 2020 through May 1, 2023.

Current and Proposed Toll Schedules

Vehicle Class		Payment Method	Current Toll Rate	Proposed Toll Rate				% Change	
				May 2020	May 2021	May 2022	May 2023	Current - May 2020	Current - May 2023
Passenger Cars - Commuter									
Class 11	Commuter	E-Z Pass	$ 1.00	$ 1.10	$ 1.20	$ 1.30	$ 1.40	10.0%	40.0%
Passenger Cars - Non-Commuter									
Class 1	Passenger	Video	$ 1.50	$ 1.75	$ 1.75	$ 2.00	$ 2.15	16.7%	43.3%
Class 1	Passenger	E-Z Pass	$ 1.25	$ 1.35	$ 1.45	$ 1.55	$ 1.65	8.0%	32.0%
Class 7	Psgr Extra Axle	Video	$ 1.00	$ 1.25	$ 1.25	$ 1.50	$ 1.70	25.0%	70.0%
Class 7	Psgr Extra Axle	E-Z Pass	$ 0.90	$ 1.00	$ 1.10	$ 1.20	$ 1.30	11.1%	44.4%
Commercial Vehicles									
Class 2	Truck 2 Axle	Video	$ 5.00	$ 6.00	$ 6.00	$ 7.00	$ 8.00	20.0%	60.0%
Class 2	Truck 2 Axle	E-Z Pass	$ 4.50	$ 4.90	$ 5.30	$ 5.70	$ 6.10	8.9%	35.6%
Classes 3 - 6	Trucks per Axle	Video	$ 2.50	$ 3.00	$ 3.00	$ 3.50	$ 4.00	20.0%	60.0%
Classes 3 - 6	Trucks per Axle	E-Z Pass	$ 2.25	$ 2.45	$ 2.65	$ 2.85	$ 3.05	8.9%	35.6%
Class 8	Trucks Extra Axle	Video	$ 2.50	$ 3.00	$ 3.00	$ 3.50	$ 4.00	20.0%	60.0%
Class 8	Trucks Extra Axle	E-Z Pass	$ 2.25	$ 2.45	$ 2.65	$ 2.85	$ 3.05	8.9%	35.6%

The impact of the proposed toll action on the Authority's revenues and long-term financial plan is described in more detail herein.

Abbreviations

AET	All-electronic tolling
ATPM	Automatic toll payment machines
BEA	Bureau of Economic Analysis
BMB	Bear Mountain Bridge
DMV	Department of Motor Vehicles
FHWA	Federal Highway Administration
GDP	Gross Domestic Product
IBTTA	International Bridge, Tunnel & Turnpike Association
IPI	Industrial Production Index
KRB	Kingston-Rhinecliff Bridge
MHB	Mid-Hudson Bridge
MPO	Metropolitan Planning Organization
NBB	Newburgh-Beacon Bridge
NYCSC	New York Customer Service Center
NYSBA	New York State Bridge Authority
NYSTA	New York State Thruway Authority
PANYNJ	The Port Authority of New York and New Jersey
RVW	Rip Van Winkle Bridge
VMT	Vehicle miles travelled

1.0 Background and Physical Description

The purpose of this report is to present forecasts of the New York State Bridge Authority (the "Authority") traffic and toll revenues, annually for the period 2019 through 2035, under the current toll schedule and the proposed toll schedule(s) required to support the Authority's capital and operating needs under several scenarios in accordance with Stantec Consulting Services Inc.'s (Stantec) agreement with the Authority. Stantec was supported by three sub-consultants in the development of this report content: Spock Solutions, Fagan Consulting, and Alta Vista Solutions.

The following sections of this report present a discussion of Hudson Valley transportation infrastructure, including the Authority's five bridges; national trends affecting traffic growth; population and employment growth in the Mid-Hudson Valley; historical and projected traffic, revenue and expenses for the bridges; the current toll schedule and its impacts on bridge traffic and revenues; the Authority's Capital Improvement Program; and several toll increase scenarios.

1.1 Hudson Valley Transportation Infrastructure

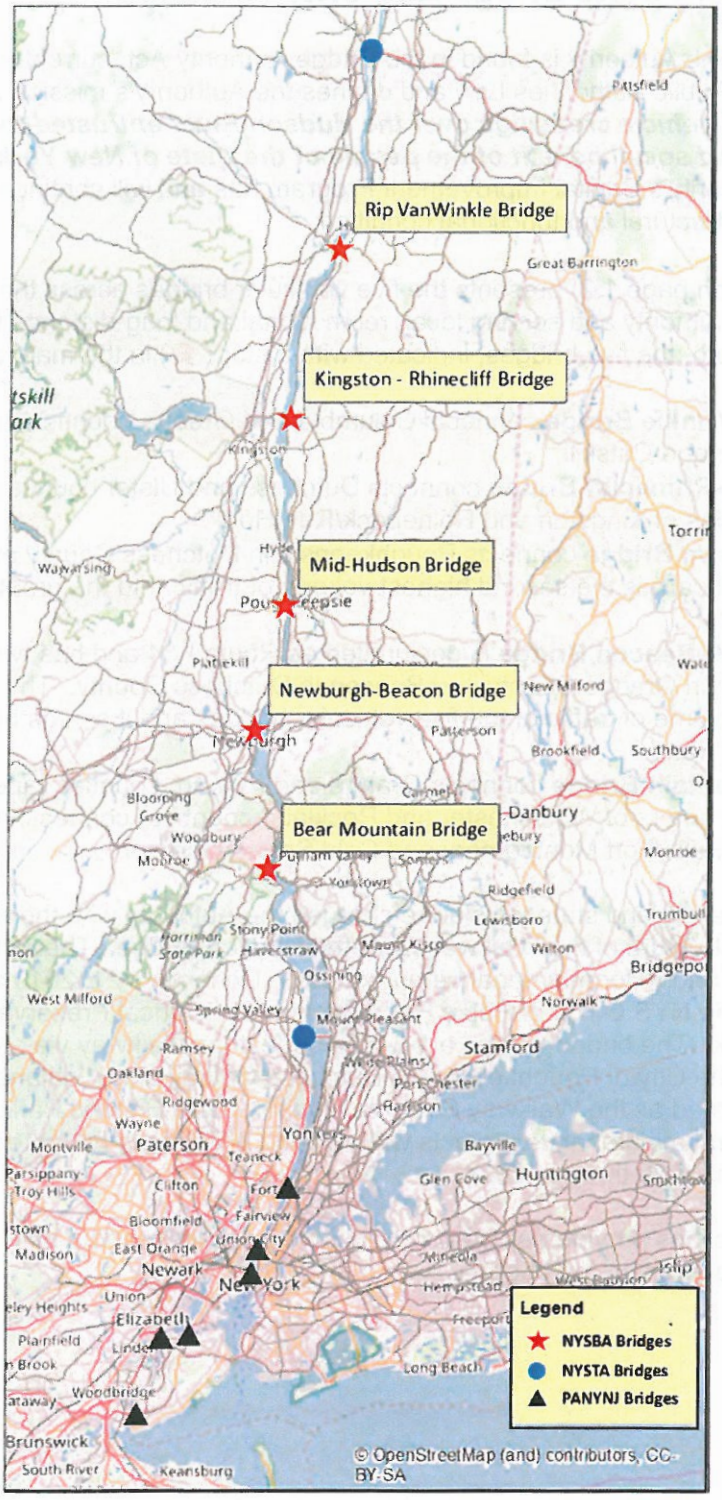
Figure 1 presents the southern part of the state of New York where the Hudson Valley is located.

The five bridges of the Authority are among thirteen vehicular crossings of the Hudson River and its estuaries between Albany and the Atlantic Ocean, including three bridges between Staten Island and New Jersey. Two of these crossings are operated by the New York State Thruway Authority (the "Thruway Authority"), and six are operated by the Port Authority of New York and New Jersey (the "Port Authority"). Between the Thruway bridge at Castleton-on-Hudson and the Outerbridge Crossing of the Arthur Kill between Staten Island and New Jersey, the thirteen crossings all charge tolls. There is no toll-free vehicular crossing of the Hudson River south of Albany.

NEW YORK STATE BRIDGE AUTHORITY TOLL TRAFFIC & REVENUE FORECASTS

Background and Physical Description
December 20, 2019

Figure 1: Southern New York State



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1.1.1 New York State Bridge Authority Facilities

The law creating the Authority is found in the Bridge Authority Act, currently Sections 525 to 542 of the New York Public Authorities Law and defines the Authority's mission as ***"to maintain and operate the safe vehicle crossings over the Hudson River entrusted to its jurisdiction for the economic and social benefit of the people of the State of New York."*** To fulfill this mission, the Authority's Capital Improvement Program has and will continue to maintain the five bridges in good structural and functional condition.

Figure 1 (shown on page 1.2) presents the five vehicular bridges across the Hudson River operated by the Authority and serving local, recreational and long-distance trips. From north to south, the five bridges, indicated with a star (★) in the map, are:

- **Rip Van Winkle Bridge** connects Columbia and Greene counties and the communities of Hudson and Catskill;
- **Kingston-Rhinecliff Bridge** connects Dutchess and Ulster counties and the communities of Kingston and Rhinebeck/Red Hook;
- **Mid-Hudson Bridge** connects Poughkeepsie in Dutchess County and Highland in Ulster County. It carries the second highest volume of traffic and the greatest number of commuters;
- **Newburgh-Beacon Bridge** is designated as Route I-84 and has two spans connecting Newburgh in Orange County and Beacon in Dutchess County. The bridge carries the highest volume of traffic of the five vehicular bridges and it serves both long-distance and local trips;
- **Bear Mountain Bridge** connects Orange and Putnam counties (and touches the far northern corners of Westchester and Rockland counties) connecting the communities of Highland Falls/Fort Montgomery and Cold Spring/Garrison.

In 2010, the Governor and state legislature charged the Authority with the responsibility of maintaining the structure of the Walkway Over the Hudson Bridge. The Authority acquired ownership of the bridge for maintenance purposes on December 21, 2010 and entered into a 99 year lease with the NYS Office of Parks Recreation and Historical Preservation to operate and maintain the deck. The bridge carries a 1.3-mile pedestrian walkway via a former railroad bridge between the City of Poughkeepsie in Dutchess County and Highland in Ulster County. It has been designated as the Walkway Over the Hudson State Historic Park. The Authority has undertaken several maintenance projects with over $3.0 million in budgeted capital expenditures from 2020 through 2024.

The following sections provide descriptions, observed condition and a brief summary of planned projects at or near each of the bridges.

1.1.1.1 Bear Mountain Bridge (BMB)

Bridge Description

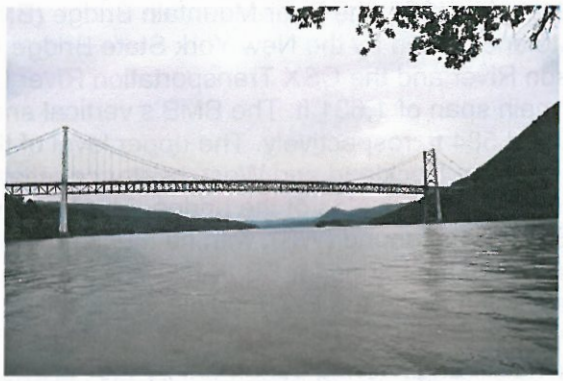
Built in 1924 and rehabilitated in 1977, the Bear Mountain Bridge (BMB) is a suspension bridge located in New York State and owned by the New York State Bridge Authority (NYSBA). The bridge crosses the Hudson River and the CSX Transportation River Line Railroad, and is 2,255 feet (ft.) in length with a main span of 1,631 ft. The BMB's vertical and horizontal clearances over the river are 155 ft. and 584 ft. respectively. The upper level of the bridge deck supports Route 6 and Route 202 between Rockland and Westchester counties. The bridge also supports two pedestrian walkways; one on each side of the bridge. The BMB has one lane in each direction, eastbound (EB) and westbound (WB), with no median barrier. Tolls are collected at the toll plaza on the west end of the bridge for EB traffic. WB traffic is not tolled. Tolls can be paid manually or automatically through the E-ZPass electronic tolling system. The BMB was listed on the National Register of Historic Places in 1982. It was also formally declared a Metropolitan Area Historic Civil Engineering Landmark by the American Society of Civil Engineers and the New York State Bridge Authority in 1986 (see photo in Figure 2).

Planned Future Projects

According to the New York Metropolitan Transportation Council (NYMTC) 2018-2045 Vision Plan and Transportation Improvement Plan (TIP 2017-2021), multiple improvement projects are under execution and study around the BMB area:

- The New York State Department of Transportation (NYSDOT) and the Federal Railroad Administration are evaluating potential improvements to intercity passenger rail service on the Empire Corridor from New York City to Buffalo via Albany, for a distance of 463 miles. The 2045 study includes Penn Station Access-Empire Corridor via the Hudson Line and Empire Corridor planning tier II environmental impact statement (EIS). A portion of the rail improvement project will be executed near the EB side of the BMB.
- NYSDOT is studying the development of the second railway line of the CSX River Subdivision which will pass by the west end of the bridge.
- NYSDOT is evaluating a possible Route 9A/Truck Route Upgrade for safety and geometry. Route 9A passes by the east end of the bridge.
- The BMB's main cable will be evaluated and investigated in a 10-year cycle to maintain a state of good condition.
- NYSDOT is working on biennial roadside vegetation management by removing overgrown and undesirable vegetation along state highways, including exit/entrance ramps and rest areas in Columbia, Dutchess, Ulster, Rockland, Orange, Putnam and Westchester counties.

Figure 2: Bear Mountain Bridge



1.1.1.2 "Hamilton Fish" Newburgh-Beacon Bridge (NBB)

Bridge Description

The Newburgh-Beacon Bridge (NBB) comprises two spans. The north span was built in 1963 and rehabilitated in 1984. The south span was built in 1980. The NBB is a truss-type bridge situated in New York State and owned by the New York State Bridge Authority (NYSBA). The bridge's north span is 7,855 feet (ft.) in length, while the south span is 7,789 ft. The bridge's maximum span between piers is 1,000 ft., with vertical and horizontal clearances over the Hudson River of 148 ft. and 760 ft., respectively. The NBB supports Interstate 84 (I-84) and New York State Route 52 (NY-52) over the river between Newburgh and Beacon. Tolls are collected at the toll plaza on the east end of the bridge for eastbound (EB) traffic. Traffic in the westbound (WB) direction is not tolled. Tolls can be paid manually or automatically through the E-ZPass electronic tolling system. The bridge is not listed on the National Register of Historic Places. It is classified as part of the urban principal arterial interstate (see photos in Figure 3).

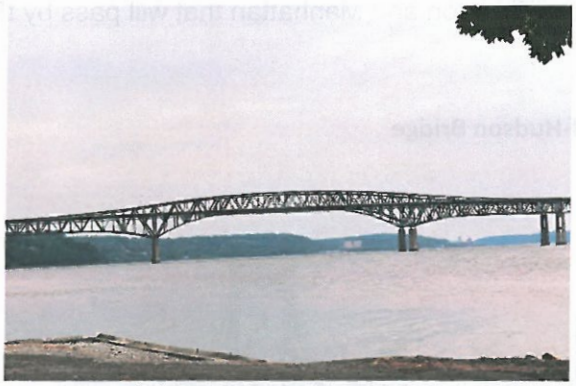
Planned Future Projects

According to the New York Metropolitan Transportation Council (NYMTC) 2018-2045 Vision Plan and Transportation Improvement Plan (TIP 2017-2021), multiple improvement projects are under execution and study around the NBB area:

- The New York State Department of Transportation (NYSDOT) and the Federal Railroad Administration are evaluating potential improvements to intercity passenger rail service on the Empire Corridor from New York City to Buffalo via Albany, for a distance of 463 miles. The study includes Penn Station Access-Empire Corridor via the Hudson Line and Empire Corridor planning tier II EIS. A portion of the rail improvement project will be executed near the EB side of the NBB.

- NYSDOT is developing trailways between Kingston and Manhattan that will pass by the WB side of the bridge.
- NYSDOT is working on installing intelligent transportation system (ITS) equipment along I-84 from the Pennsylvania state line to the Connecticut state line in Dutchess, Orange and Putnam counties.
- NYSDOT is working on developing and expanding guide signs over I-84 from the Pennsylvania state line to the Connecticut state line in Dutchess, Orange and Putnam counties. This project will bring signs on I-84 into compliance with the National Manual of Uniform Traffic Control Devices.
- NYSDOT is working on biennial roadside vegetation management by removing overgrown and undesirable vegetation along state highways, including exit/entrance ramps and rest areas in Columbia, Dutchess, Ulster, Rockland, Orange, Putnam, and Westchester counties.

Figure 3: Newburgh-Beacon Bridge



(a) Overview of the bridge

(b) Overview of the bridge's south span

1.1.1.3 "Franklin D. Roosevelt" Mid-Hudson Bridge (MHB)

Bridge Description

Built in 1930 and rehabilitated in 1989, the Mid-Hudson Bridge (MHB) is a suspension bridge in New York State owned by the New York State Bridge Authority (NYSBA). The bridge is 3000 feet in length and crosses the Hudson River. The MHB vertical and horizontal clearances over the river are 137 ft. and 485 ft., respectively. The upper level of the bridge deck supports a pedestrian walkway and Route 44 over AMTRAK, Gerald Drive, and Rhode Island (RI) between Poughkeepsie and Highland. The MHB includes three lanes. One lane is eastbound (EB) and one westbound (WB) with no median barrier. The third (middle) lane is generally closed at all times except during rush hour traffic (6:00 am to 9:00 am in the EB direction, and 3:00 pm to 6:00 pm in the WB direction). The third lane is also occasionally opened when work is being done on either side of the bridge. Tolls are collected at the toll plaza on the west end of the bridge for EB traffic. WB traffic is not tolled. Tolls can be paid manually or automatically through the E-ZPass electronic tolling system. The MHB is not listed on the National Register of Historic

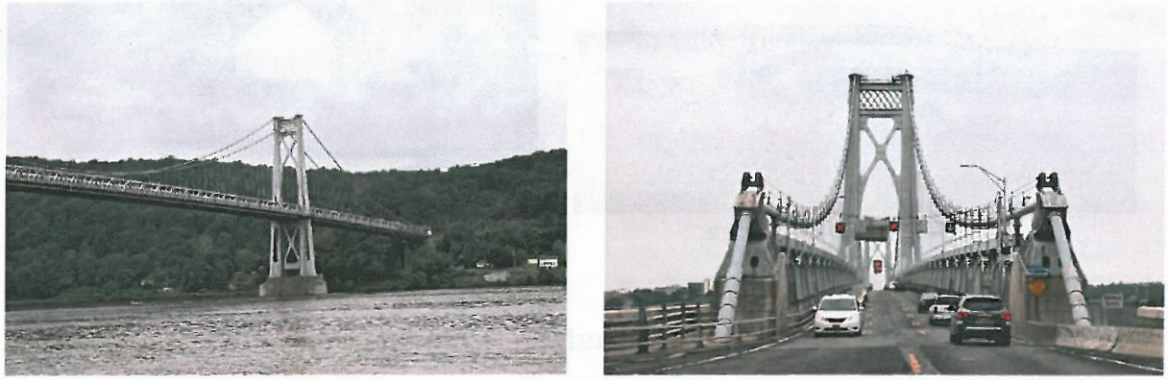
Places, and the route is classified as an urban principal arterial freeway (see photos in Figure 4).

Planned Future Projects

According to the New York Metropolitan Transportation Council (NYMTC) 2018-2045 Vision Plan and Transportation Improvement Plan (TIP 2017-2021), several improvement projects are under execution and study around the MHB area:

- The New York State Department of Transportation (NYSDOT) and the Federal Railroad Administration are evaluating potential improvements to intercity passenger rail service on the Empire Corridor from New York City to Buffalo via Albany, for a distance of 463 miles. The 2045 study includes Penn Station Access-Empire Corridor via the Hudson Line and Empire Corridor planning tier II EIS. A portion of the rail improvement project will be executed adjacent to the EB side of the MHB. Additionally, Route 9W near the MHB's WB end will be resurfaced and replaced.
- NYSDOT is developing trailways between Kingston and Manhattan that will pass by the WB end of the bridge.

Figure 4: Mid-Hudson Bridge



(a) View of the bridge (b) Bridge entrance in the EB direction

1.1.1.4 "George Clinton" Kingston-Rhinecliff Bridge (KRB)

Bridge Description

Built in 1957 and rehabilitated in 2002, the Kingston-Rhinecliff Bridge (KRB) is a continuous truss deck bridge in New York State owned by the New York State Bridge Authority (NYSBA). The KRB measures 7,793 feet (ft.) in length across the Hudson River. Its longest span between piers measures 800 ft., with vertical and horizontal clearances of 152 ft. and 776 ft. over the river, respectively. The KRB carries Route 199 across the river north of the City of Kingston and the hamlet of Rhinecliff. The KRB has one lane in each direction, eastbound (EB) and westbound (WB), with no median barrier. Tolls are collected at the toll plaza on the west end of

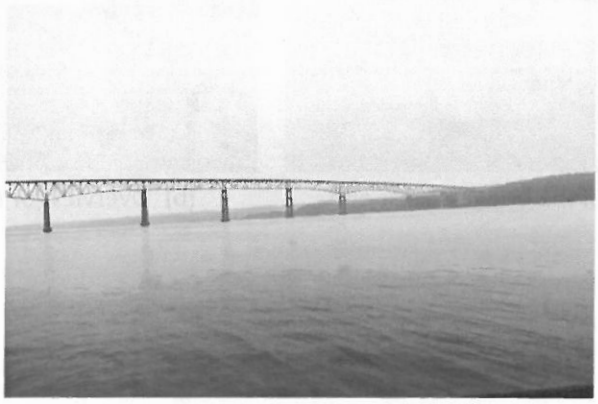
the bridge for EB traffic. WB traffic is not tolled. Tolls can be paid manually or automatically through the E-ZPass electronic tolling system.

The bridge is not listed on the National Register of Historic Places and is classified as a rural principal arterial (see Figure 5).

Planned Future Projects

According to the New York Metropolitan Transportation Council (NYMTC), 2018-2045 Vision Plan and Transportation Improvement Plan (TIP 2017-2021), there are currently no potential improvement projects under execution or study around the bridge area.

Figure 5: Kingston-Rhinecliff Bridge



(a) Overview of the bridge's east end from the south

1.1.1.5 Rip Van Winkle Bridge (RVWB)

Bridge Description

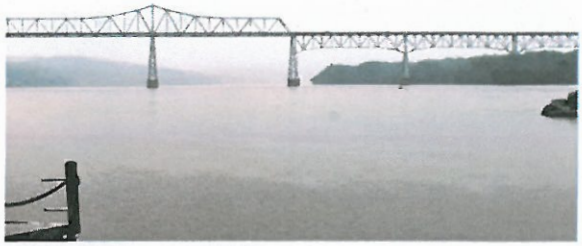
Built in 1935 and rehabilitated in 1993, the Rip Van Winkle Bridge (RVWB) is a continuous truss-thru deck bridge in New York State owned by the New York State Bridge Authority (NYSBA). The bridge's total structure length is 5,036 feet (ft.) across the Hudson River. It has a maximum span of 800 ft. with vertical and horizontal clearances of 142 ft. and 760 ft. over the river, respectively. The RVWB supports a pedestrian walkway and Route 23 between Hudson and Catskill in the state of New York. The RVWB has one lane in each direction, eastbound (EB) and westbound (WB), with no median barrier. Tolls are collected at the toll plaza on the west end of the bridge for EB traffic. WB traffic is not tolled. Tolls can be paid manually or automatically through the E-ZPass electronic tolling system. The bridge is not listed on the National Register of Historic Places, and the route is classified as a rural principal arterial. (see photos in Figure 6).

Planned Future Projects

According to the New York Metropolitan Transportation Council (NYMTC) 2018-2045 Vision Plan and Transportation Improvement Plan (TIP 2017-2021), no potential improvement projects are currently under execution or study around the bridge area.

Figure 6: Rip Van Winkle Bridge

(a) Overview of the bridge's west end



(b) Overview of the mid-span of the bridge

1.1.2 Toll Rates

Tolls are collected on the five vehicular bridges in the eastbound direction only, as they are on all non-Authority bridges to the south of the Authority's jurisdiction. The current toll schedule implemented on January 30, 2012 is presented in Table 1.

Table 1: New York State Bridge Authority Current Toll Schedule (implemented January 30, 2012)

Vehicle Description	E-ZPass	Cash
Passenger Cars		
Class 1 2 axles, up to 4 tires	$1.25	$1.50
Class 2 2 axles, more than 4 tires	$4.50	$5.00
Commuter Plan [(A)] Passenger vehicles only, minimum of 17 trips each month	$1.00	N/A
Commercial Vehicles		
3 axles	$6.75	$7.50
4 axles	$9.00	$10.00
5 axles	$11.25	$12.50
6 axles	$13.50	$15.00
Other		
Extra axle (w/class 1)	$0.90	$1.00
Extra axle (w/classes 2-6)	$2.25	$2.50

Note: (A) NYSBA Commuter Discount Plan: Customer must be a NY Customer Service Center E-ZPass account holder in good standing and be enrolled in the NYS Bridge Authority Discount Plan to receive discounts. A minimum of $17.00 (17 trips) will be charged each month at $1.00 for each Class 1 tag assigned the NYSBA Discount Plan. Each additional trip will be charged at the $1.00 discount rate.

Current tolls on the Authority's bridges are the lowest of all Hudson River crossings. Current toll rates for passenger cars (full fare and commuter rates) and for 5-axle trucks for the Authority bridges, the George Washington Bridge, the Mario M. Cuomo Bridge and the Castleton-on-Hudson Bridge are shown in Table 2.

Tolls on the Authority bridges, the George Washington Bridge and the Mario M. Cuomo Bridge are collected one-way in the eastbound direction only; whereas the tolls on the Castleton-on-Hudson Bridge are collected, within the New York State Thruway's ticket system, in both directions. The Authority's tolls generally are considerably lower than the other Hudson River bridge tolls. The Authority's commuter toll to full-fare toll ratio (at 66 percent) and the Mario M. Cuomo Bridge fare ratio (at 60 percent), are the lowest in the group; and, in terms of sheer magnitude, the Authority's commuter toll (at $1.00) is at only 62 percent of the next lowest rate, Castleton-on-Hudson at $1.59.

Table 2 shows the respective tolls for the Authority bridges, the George Washington Bridge, the Mario M. Cuomo Bridge and the Castleton-on-Hudson Bridge in both one-way and round-trip terms to place them on an equivalent basis.

Table 2: Current Tolls on Hudson River Bridges (One-Way / Round Trip)

Authority / Facility	One-Way/ Round-Trip Tolls				Ratio: Passenger Car Commuter to Full Fare
	Passenger Car			5-Axle Trucks	
	Cash	E-ZPass	Commuter[A]		
NYSBA	**$1.50 / $1.50**	**$1.25 / $1.25**	**$1.00 / $1.00**	**$12.50 / $12.50**	**66%**
PANYNJ / George Washington	$15.00 / $15.00	$10.50 / $10.50[B]	$9.50 / $9.50	$105.00 / $105.00[C]	70%
NYSTA / Mario M. Cuomo	$5.00 / $5.00	$4.75 / $4.75	$3.00 / $3.00	$32.75 / $32.75[C]	60%
NYSTA / Castleton-on-Hudson	$1.05 / $2.10[D]	$1.00 / $2.00[D]	$0.80 / $1.59[E]	$4.60 / $9.20	76%

Notes: (A) Commuter requires E-ZPass
(B) Reduced E-ZPass Off Peak rates available
(C) Maximum toll - may be reduced during certain hours
(D) Ticket system - US 9 exit (B1) to/from Selkirk exit (22)
(E) Annual permit - assume 500 ticket system trips/year <30mi - $88 plus $0.62/trip bridge-surcharge

1.1.2.1 Past Changes in Toll Collection

Table 3 lists the history of system wide toll modifications for the Authority, along with seven other toll authorities throughout the state (going back to 1982).

Table 3: Toll Increase Frequencies, 1982 - Present

Agency	Frequency
New York State Bridge Authority	**1989, 2000, 2012**
Port Authority of New York / New Jersey[1]	1987, 1991, 2001, 2008, 2011, 2012, 2013, 2014, 2015
New York State Thruway Authority	1988, 2005, 2008, 2009, 2010
MTA Bridges and Tunnels	1989, 1993, 1996, 2003, 2005, 2008, 2009, 2011, 2013, 2015, 2017, 2019[2]
Niagara Falls Bridge Commission	1982, 1991, 1995, 1998, 2007, 2016-2020 (trucks)
Buffalo-Fort Erie Bridge Authority	1984, 1993, 1996, 1997, 2000, 2002, 2007, 2018
Thousand Islands Bridge Authority	1984, 2007, 2013, 2019
Ogdensburg Bridge and Port Authority	1985, 2006, 2019

[1] Source: Toll table 2012-2015 as accessed March 21, 2019 at http://www.panynj.gov/bridges-tunnels/pdf/toll-table-2001-2015.pdf
[2] 2019 Toll Increase at MTA B&T crossings effective March 31, 2019

The Authority has increased its tolls only three times since it started operations in the 1930s. Until the 2012 toll increase, the Authority was the only authority that had not increased tolls since 2000. In conjunction with the Thruway Authority and the Port Authority, tolls on all the Hudson River crossings from the Rip Van Winkle Bridge southward were converted to one-way

toll collection in the 1970s by doubling the eastbound toll; thus no change occurred in the toll charged for a round-trip.

1.2 Other Transportation and Related Developments

In order to accurately forecast future demand on the Authority's bridges, it is necessary to review improvements and/or changes on competing and feeder routes. This review will be input into the forecasting model, including both during construction (constraints on the system) and operation (assumed traffic relief on the corridors).

Projects in development or slated for future development having an impact on the Authority bridges include:

- **Route 9W: I-84 - Carter Avenue Interim Work:** This project involves reconstruction of intersections and raising the bridge on I-84 over Route 9W to provide better clearance for trucks and to meet current interstate standards. Construction on this project began in the Spring of 2018 and will wrap up in summer of 2019. Efforts were made to conduct work outside of peak traffic hours, and it is not estimated that this project will impact toll transactions and revenue.
- **I-90: Castleton-on-Hudson Bridge Rehabilitation:** New York State Thruway Authority will undertake a $30 million rehabilitation of the Castleton-on-Hudson Bridge, with contract letting planned for 2020. The Castleton-on-Hudson Bridge is near the Authority's Rip Van Winkle Bridge. It is not anticipated that this project will have a negative impact on the Authority's toll traffic and may in fact be positive during the construction period. To be conservative, we did not consider any positive impact in our forecast.
- **Rail Improvements**:
    - The New York State Department of Transportation (NYSDOT) and the Federal Railroad Administration are evaluating potential improvements to intercity passenger rail service on the Empire Corridor from New York City to Buffalo via Albany, for a distance of 463 miles. The 2045 study includes Penn Station Access-Empire Corridor via the Hudson Line and Empire Corridor planning tier II environmental impact statement (EIS).
    - NYSDOT is studying the development of the second railway line of the CSX River Subdivision which will pass by the west end of the bridge.
    - As these potential improvements are currently undefined and unfunded, we have not included them in our forecasts.

The three-mile long Governor Mario M. Cuomo Bridge, located 13 miles north of New York City, carries the Thruway (I-87 and I-287) over the Hudson River between Nyack in Rockland County and Tarrytown in Westchester County. This bridge, the nearest southern competitor to the five vehicular bridges operated by the Authority, is the recently completed replacement of the Tappan Zee Bridge operated by the Thruway Authority. The project was built by a design-build consortium under the Governor's expedited plan of construction and opened in several phases. Construction on the bridge project began in 2013. The north span of the Governor Mario M. Cuomo Bridge was opened to northbound (westbound) traffic on August 26, 2017 and to

southbound (eastbound) traffic on October 6, 2017. Southbound traffic was shifted to the south span when it was completed in September 2018. Although the capacity of the new Governor Mario M. Cuomo bridge is greater than the old Tappan Zee Bridge that it replaced, the new bridge is not expected to divert any future traffic from the NYSBA bridges due to the higher toll rates. It should be noted, however, that there was an initial decrease in NYSBA traffic around the time that the Governor Mario M. Cuomo Bridge opened, though a monthly analysis showed that traffic volumes began to decrease prior to the opening of the new bridge. Both the Newburgh-Beacon and the Tappan Zee Bridges saw traffic grow strongly prior to the opening of the new Governor Mario M. Cuomo Bridge.

For toll facilities in general, the method of toll collection has evolved over time, generationally starting from patrons paying with cash, tokens and tickets. Beginning in the 1990's this was followed with systems with patrons still paying with cash, but tokens and tickets became customers using E-ZPass with gated lanes. The current generation has many facilities now only offering customers high speed fully electronic toll collection lanes with video enforcement.

The Authority began offering E-ZPass toll collection in 1998 with gated enforcement, and in 2013 and 2014 NYSBA began utilizing automatic toll payment machines (ATPM) in some lanes at Bear Mountain, Kingston-Rhinecliff and Rip Van Winkle bridges to cater to non-E-ZPass customers as well as to recognize some of the safety and staffing advantages of the technology.

Paralleling national trends in the tolling industry, a major recent development in the downstate transportation network has been introduction of all-electronic tolling (AET), including at all barrier tolls operated by NYSTA, all bridges and tunnels operated by MTA B&T, and on the Bayonne Bridge and Outerbridge Crossing operated by the PANYNJ. NYSTA plans to convert its ticketed system to AET by the end of 2020 and PANYNJ will complete conversion of its three Staten Island crossings when the Goethals Bridge transitions to AET by the end of 2019. The Port Authority recently announced plans to convert its remaining Hudson River Crossings (the Holland and Lincoln Tunnels and the George Washington Bridge) to AET by the end of 2021. The growth of AET in the United States can be seen in the fact that over 125 toll facilities now operate with AET, based on the 330 US Tolling facilities participating in IBTTA's Toll Miner database.

A review of these facilities suggests a wide range of implementation approaches, rate modifications, enforcement policies and other factors unique to each facility and to meet each agency's specific goals.

Table 4 presents a timeline of the numerous conversions to all-electronic tolling in the region in recent years.

Table 4: Toll Facilities in the Region that have converted to All Electronic Tolling

Facility (Agency)	Year Converted to All-Electronic Tolling
Henry Hudson Bridge (MTA)	2012
Tappan Zee Bridge / Governor Mario M. Cuomo Bridge (NYSTA)	2016
Massachusetts Turnpike (MassDOT)	2016
Hugh L. Carey Tunnel (MTA)	2017
Queens Midtown Tunnel (MTA)	2017
Marine Parkway Bridge (MTA)	2017
Cross Bay Bridge (MTA)	2017
Verrazano-Narrows Bridge (MTA)	2017
Robert F. Kennedy Bridge (MTA)	2017
Throgs Neck Bridge (MTA)	2017
Bronx-Whitestone Bridge (MTA)	2017
Bayonne Bridge (PANYNJ)	2017
Grand Island Bridges (NYSTA)	2018
Harriman Toll Barrier (NYSTA)	2018
Yonkers Toll Barrier (NYSTA)	2018
Spring Valley Toll Barrier (NYSTA)	2018
New Rochelle Toll Barrier (NYSTA)	2018
Outerbridge Crossing (PANYNJ)	2019

2.0 Historical Bridge Traffic and Revenue

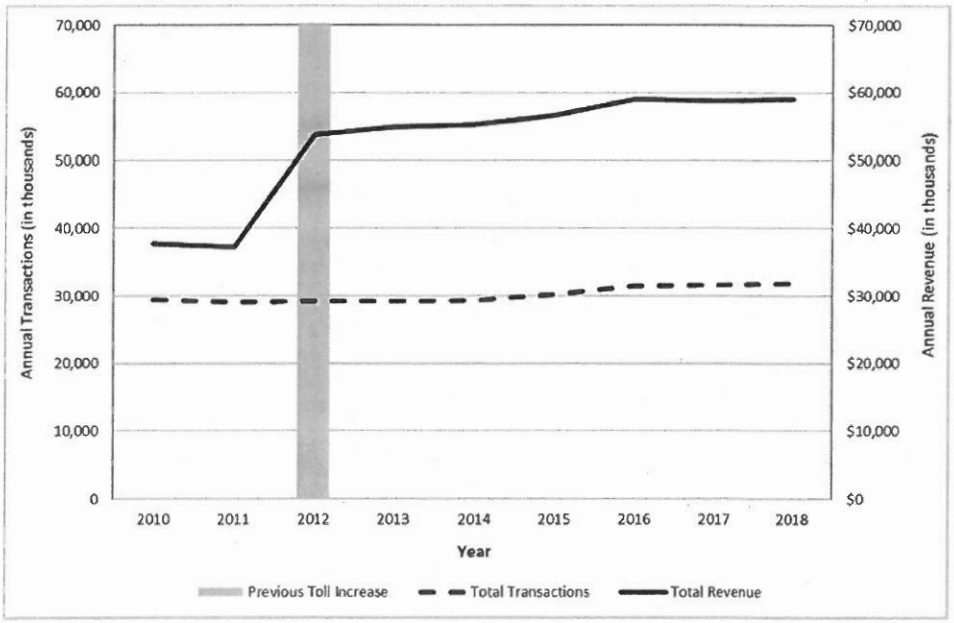
A variety of historical traffic and revenue data was analyzed to prepare the traffic and revenue forecast for the five NYSBA-operated bridges. The data was obtained from the Authority and included the observed traffic and revenue for each bridge between 2010 and early 2019, hourly traffic data by vehicle and payment type on each bridge, transponder usage frequency data, and hourly license plate counts collected on Newburgh-Beacon Bridge. This section summarizes the observed trends from these data.

2.1 Historical Traffic and Revenue 2010-2019

Stantec analyzed toll transactions and revenues for the years 2010 through late 2019 with the intent of identifying trends in transaction growth and revenue growth by bridge and payment category. The historical growth in toll transactions and revenue for the full system is shown in Figure 7.

Overall, the volume of system transactions has remained relatively constant since 2010, with a moderate average annual growth rate of 0.9 percent between 2010 and 2018. The annual transactions decreased by approximately 1.3 percent between 2010 and 2011 due to inclement weather conditions in the early part of the year followed by weak economic conditions and high gasoline prices over the later months of 2011. In 2012, the tolls on all Authority bridges were increased for all vehicle types effective January 30, but background growth outweighed driver reactions to the toll increase and traffic continued to show a positive increase in 2012 over the prior year, although minimally, with 0.5 percent over 2011. This positive traffic growth in spite of the toll increase could be the result of recovery from the decreased traffic levels in 2011 which may have offset any loss in traffic due to the toll increase. Toll revenue increased approximately 45 percent from 2011 to 2012. Both annual transactions and toll revenue on NYSBA bridges increased gradually following the toll increase. Notably, the annual transactions increased significantly during 2015 and 2016, as it did elsewhere in the region. In 2017, overall transaction volumes resumed slow growth, while toll revenue dropped slightly in 2017 due to a decrease in truck traffic. In 2018 both transaction volumes and toll revenue grew slightly, reaching their highest levels since the 2012 toll increase.

Figure 7: Historical Traffic and Revenue on Authority Bridges



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NEW YORK STATE BRIDGE AUTHORITY TOLL TRAFFIC & REVENUE FORECASTS

Historical Bridge Traffic and Revenue

December 20, 2019

For 2018, toll paying traffic was 31.8 million compared to 31.6 million in 2017, 0.5 percent growth. Toll revenue was $59,020,000 compared to $58,824,000 in 2017, a 0.3 percent growth. Month-by-month data shown in Figure 8 indicates that though traffic increased in the first half of 2018, the later months showed a decrease in bridge transactions. The loss of traffic roughly coincides with the opening of the new Governor Mario M. Cuomo Bridge in September 2018.

Figure 9 shows the month-by-month revenue for the year 2017 through the latest 2019 data available. The year-over-year change revenue was largely consistent with the change in traffic for each month, showing minor losses around the time of the Governor Mario M. Cuomo Bridge completion that may have contributed to this slight decline.

Figure 8: Total Toll Paying Traffic on NYSBA Bridges, 2017-2019

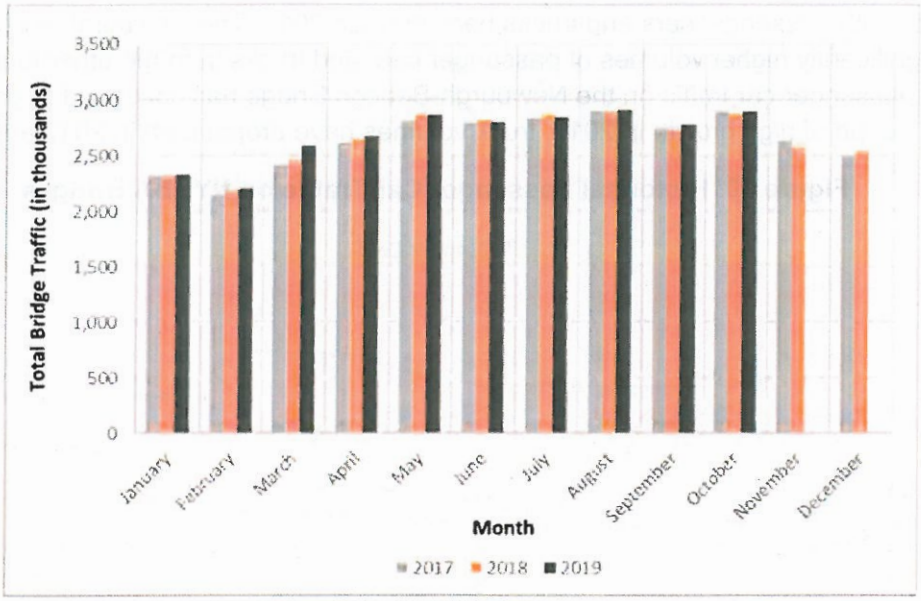

Figure 9: Total Revenue from NYSBA Bridges, 2017-2019

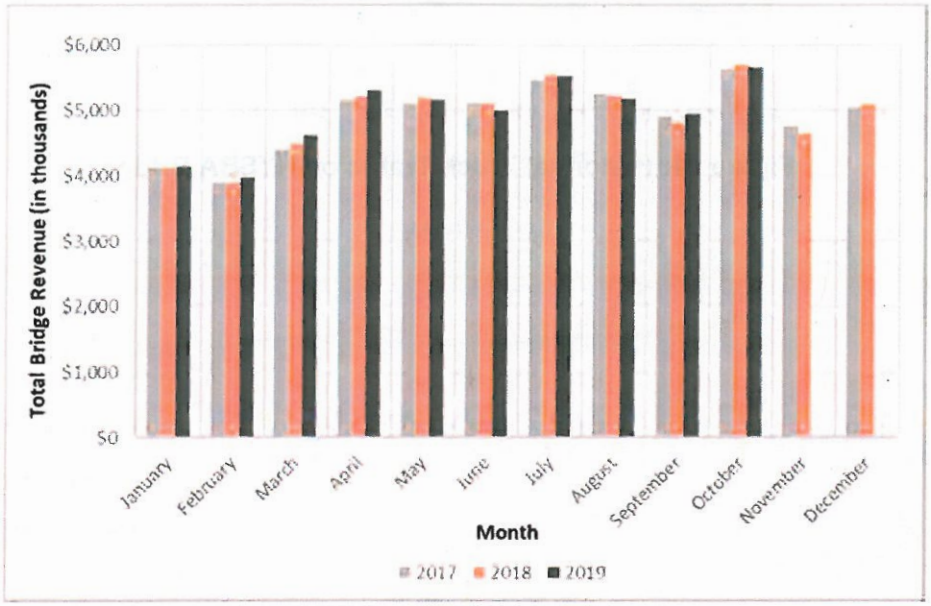

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Figure 10 and Figure 11 present comparisons of the annual toll traffic on each of the Authority's bridges for both passenger cars and trucks back through 2010. The Newburgh-Beacon bridge carries significantly higher volumes of passenger cars and trucks than the other four bridges. Although passenger car traffic on the Newburgh-Beacon Bridge has continued to grow slowly since the period of high growth in 2016, truck volumes have dropped off in 2017 and 2018.

Figure 10: Historical Passenger Car Traffic on NYSBA Bridges

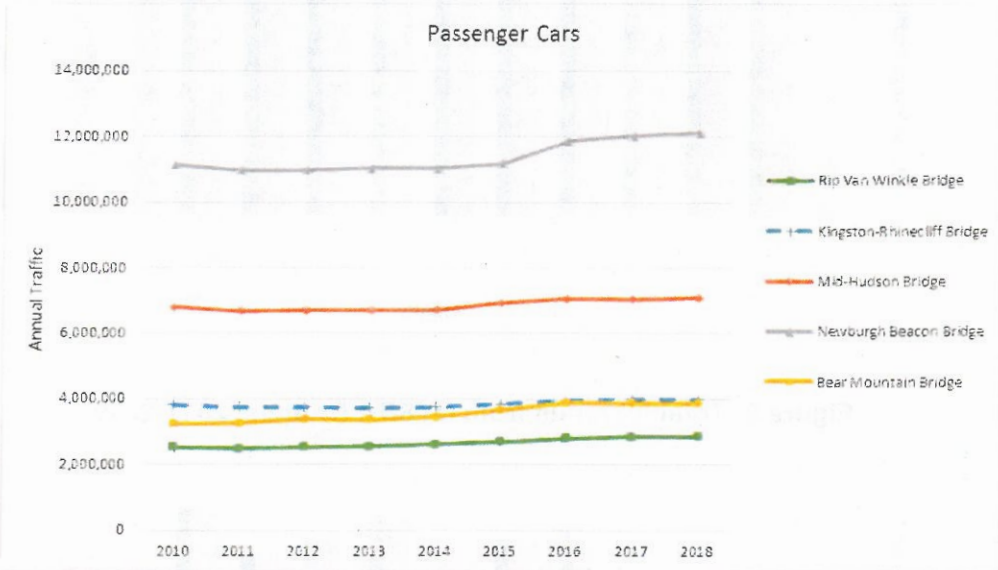


Figure 11: Historical Truck Traffic on NYSBA Bridges

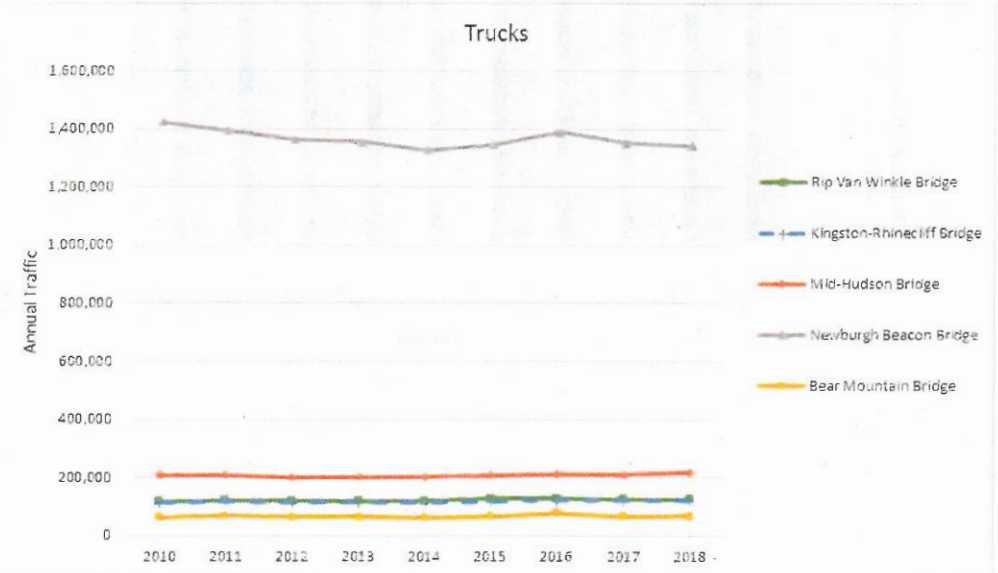
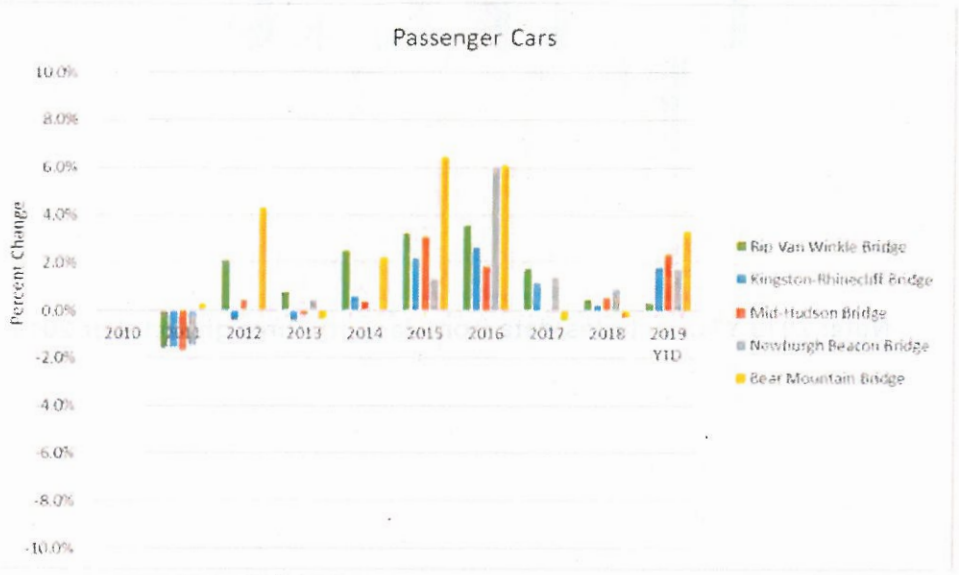


Figure 12 and Figure 13 show the percent change for both passenger cars and trucks by bridge back through 2010. It should be noted that the Bear Mountain Bridge (BMB) is the closest of the Authority's bridges to the Governor Mario M. Cuomo Bridge, at roughly 20 miles upstream while the Newburgh-Beacon Bridge is the next closest at roughly 30 miles upstream. These bridges may have experienced some impact from the new bridge completion. The total traffic on Bear Mountain Bridge decreased by approximately 0.3 percent in 2018, while the traffic on all other Authority bridges increased slightly. Growth for the period January through October 2019 is positive for all facilities versus the same period in 2018, for both car and truck traffic.

Figure 12: Annual Passenger Car Traffic Change by Bridge, 2010-2019 YTD



Note: 2019 YTD includes data from January through October 2019

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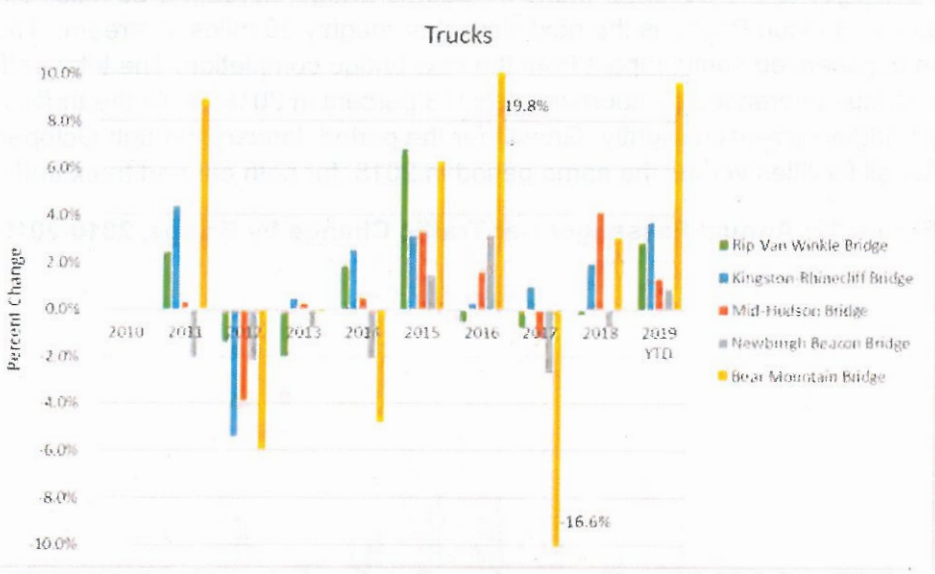
Figure 13: Annual Truck Traffic Change by Bridge, 2010-2019 YTD



Note: 2019 YTD includes data from January through October 2019

Table 5 shows the monthly distribution of the traffic on all NYSBA bridges for the years 2017 and 2018. The percent share of traffic of each month is almost identical between the two years, with a slightly higher share during the spring and summer months. The uniform seasonal distribution of the traffic is consistent with the fact that the majority of the trips on the Authority bridges continue to be made by commuters, which makes them less sensitive/subject to seasonal variations.

Table 5: Monthly Share of Toll Paying Traffic

Month	Toll Paying Traffic (000)			
	2017		2018	
	Traffic	Monthly Share	Traffic	Monthly Share
January	2,317	7.3%	2,318	7.3%
February	2,147	6.8%	2,184	6.9%
March	2,417	7.6%	2,452	7.7%
April	2,617	8.3%	2,646	8.3%
May	2,810	8.9%	2,861	9.0%
June	2,800	8.9%	2,821	8.9%
July	2,833	9.0%	2,862	9.0%
August	2,904	9.2%	2,894	9.1%
September	2,740	8.7%	2,735	8.6%
October	2,893	9.2%	2,875	9.1%
November	2,635	8.3%	2,577	8.1%
December	2,488	7.9%	2,539	8.0%
Annual	31,601	100.0%	31,764	100.0%

As shown in Table 6, total annual traffic increased slightly in 2018 by 0.5 percent, even though some vehicle groups saw decreased travel. It should be noted that some of the negative growth in cash payment groups does not represent decreased travel, but instead illustrates a trend toward E-ZPass payment. The commuter traffic was down 6.6 percent while passenger cars paying with cash were down by 9.0 percent. On the other hand, the non-commuter traffic paying with E-ZPass increased by 6.2 percent. In the truck category, a similar trend was seen, with cash-paying trucks decreasing by approximately 30,000 vehicles while those paying with E-ZPass increased by approximately the same number.

Table 6: Toll Paying Traffic by Vehicle Type (in Thousands), 2017 and 2018

Vehicle Group	2017	2018	Change	Percent Change
Passenger Cars				
Non-commuter Cash	8,035	7,314	-720	-9.0%
Non-commuter E-ZPass	18,029	19,152	1,123	6.2%
Commuters	3,669	3,426	-243	-6.6%
Total	29,732	29,892	160	0.5%
Trucks and Buses				
E-ZPass	1,538	1,573	35	2.3%
Cash	331	299	-32	-9.6%
Total	1,868	1,872	3	0.2%
Total Traffic				
E-ZPass	23,235	24,150	915	3.9%
Cash	8,365	7,614	-752	-9.0%
Total	31,601	31,764	163	0.5%

2.2 2018 Traffic and Revenue by Bridge and Vehicle Group

In 2018, there were approximately 31.7 million toll transactions (eastbound traffic only) on the bridges as shown in Table 7. Total bidirectional traffic on the Authority's five bridges, if we assume each direction is roughly equal, was approximately 63.4 million vehicles.

Table 7: 2018 Traffic by Bridge and Vehicle Group

Bridge	2018 Annual Toll Paying Traffic (000)							
	Passenger Cars				Trucks & Buses			Grand Total
	Commuter	Non-commuter E-ZPass	Non-commuter Cash	Total	E-ZPass	Cash	Total	
Rip Van Winkle Bridge	283	1,782	795	2,860	106	18	125	2,984
Kingston- Rhinecliff Bridge	470	2,621	898	3,989	100	22	122	4,111
Mid-Hudson bridge	1,160	4,098	1,818	7,077	184	32	217	7,293
Newburgh-Beacon Bridge	1,187	7,899	3,034	12,119	1,126	216	1,342	13,461
Bear Mountain Bridge	326	2,752	770	3,848	56	11	66	3,914
Total	**3,426**	**19,152**	**7,314**	**29,892**	**1,573**	**299**	**1,872**	**31,764**

Of the 31.7 million toll-paying vehicles using the five bridges, 26.5 million, or 83 percent, were passenger cars paying the full toll, either by cash or by E--ZPass. The second largest class of vehicles was commuters, accounting for 3.4 million trips or 11 percent of total traffic. There were 1.8 million trucks, representing 6.0 percent of total traffic. Table 8 shows the 2018 annual toll-paying traffic and revenue on each bridge.

Table 8: 2018 Traffic and Revenue by Bridge

Bridge	2018 Annual Toll-Paying Traffic		2018 Annual Toll Revenue		Average Toll
	Volume (000)	Percent Share	Amount (000)	Percent Share	
Rip Van Winkle Bridge	2,984	9.4%	$4,905	8.4%	$1.64
Kingston- Rhinecliff Bridge	4,111	12.9%	$6,247	10.7%	$1.52
Mid-Hudson bridge	7,293	23.0%	$11,067	18.9%	$1.52
Newburgh-Beacon Bridge	13,461	42.4%	$30,531	52.3%	$2.27
Bear Mountain Bridge	3,914	12.3%	$5,657	9.7%	$1.45
Total	**31,764**	**100.0%**	**$58,407**	**100.0%**	**$1.84**

Source: New York State Bridge Authority

Historical Bridge Traffic and Revenue

December 20, 2019

As can be seen in Table 7 and Table 8:

- The highest volume was carried on the Newburgh-Beacon Bridge, with almost 13.5 million vehicles, or 42.4 percent of total traffic. The Newburgh-Beacon Bridge also carried the highest number of trucks - 1.3 million, or 72 percent of all trucks using the five bridges. As a result of the high percentage of trucks, paying relatively higher tolls, the Newburgh-Beacon Bridge accounted for 52 percent of total revenues.
- Toll-paying traffic on the Mid-Hudson Bridge was 7.3 million vehicles, the second highest volume of the bridges. The Mid-Hudson Bridge is a commuter facility and commuters participating in the commuter discount plan accounted for 1.2 million (16 percent) of total toll-paying passenger car traffic on this bridge. This bridge represented 23 percent of total traffic, but revenue was only19 percent of total Authority toll revenue, due to the lower commuter tolls.
- The Rip Van Winkle, Kingston-Rhinecliff and Bear Mountain bridges carried 9.4 percent, 12.9 percent and 12.3 percent, respectively, of total traffic and accounted for 28.8 percent of toll revenues.

Figure 14 shows the historical trend of the E-ZPass payment method as a percentage of total transactions on the Authority bridges, as well as by vehicle category. The market share of E-ZPass for passenger cars increased from approximately 67 percent in 2013 to 75 percent in 2018. For trucks, the E-ZPass market share increased from 76 percent in 2013 to approximately 84 percent in 2018. Overall, the total market share of electronic payments increased from approximately 67 percent to 76 percent between 2013 and 2018. Available data from early 2019 indicate that this increasing market share trend is continuing, with roughly 78 percent overall E-ZPass market share in April 2019 versus 76 percent in April 2018. These are sizable increases in E-ZPass participation in the recent past that coincide with the introduction of all-electronic toll collection in the region.

Figure 14 : Historical E-ZPass Share on Authority Bridges, 2013-2018

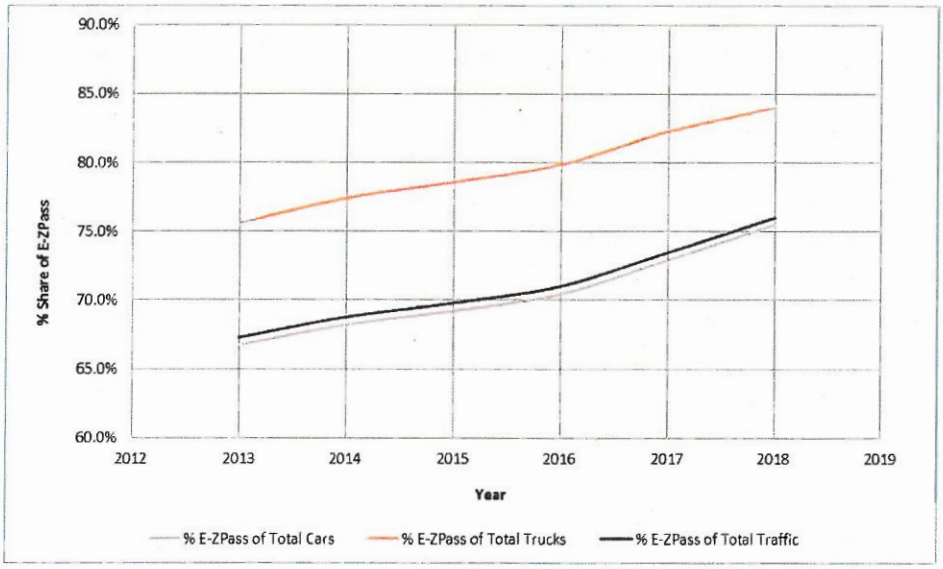


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Figure 15 shows the E-ZPass market share overall for each bridge as well as for all five bridges combined, as seen in 2018.

Figure 15: E-ZPass Market Share of Total Bridge Traffic – 2018

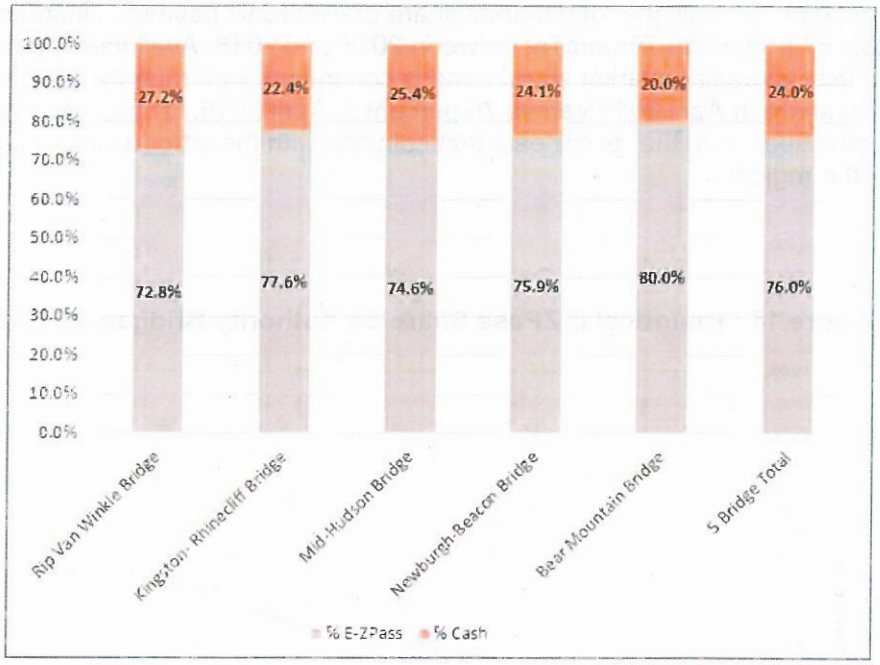


Figure 16 and Figure 17 show the E-ZPass market share by vehicle type for each bridge as well as for all five bridges combined, as seen in 2018.

Figure 16: E-ZPass Market Share of Passenger Car Traffic – 2018

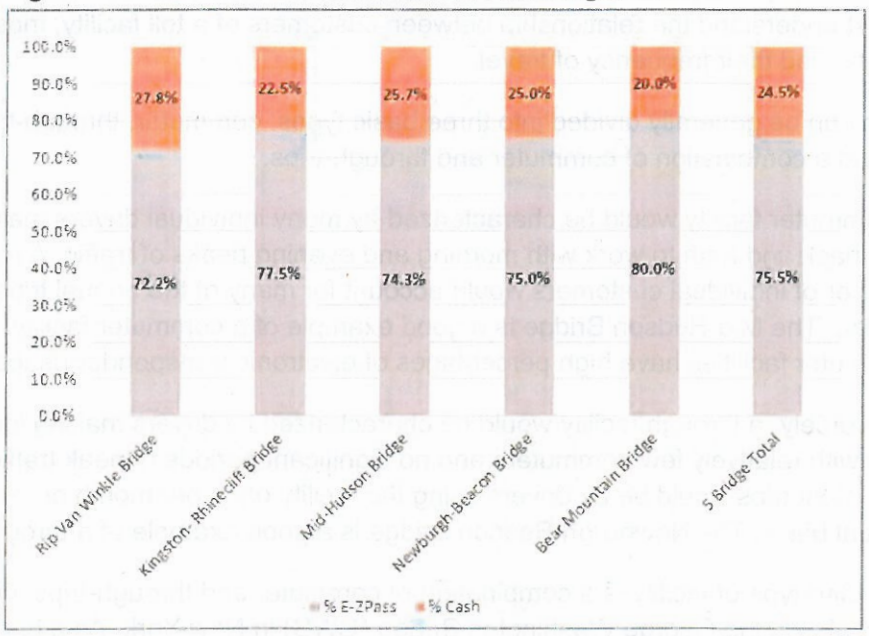
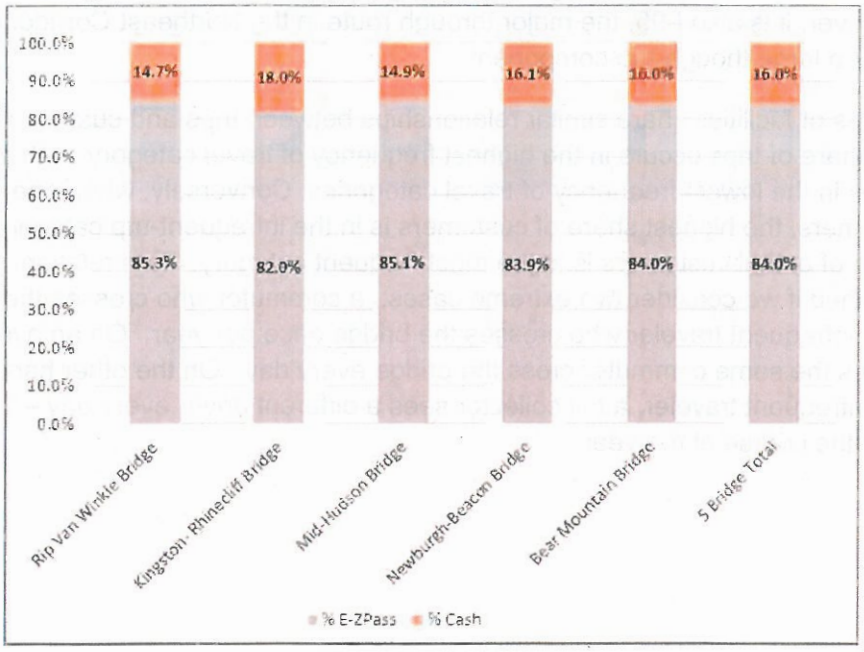


Figure 17: E-ZPass Market Share of Truck Traffic – 2018



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2.3 Transponder Usage Frequency Data

To fully benefit from a discussion of travel characteristics for traffic on the Authority's crossings one must first understand the relationship between customers of a toll facility, trips they make on that facility, and their frequency of travel.

Toll facilities can be generally divided into three basic types: commuter, through-trips (longer distance), and a combination of commuter and through-trips.

- A commuter facility would be characterized by many individual drivers making frequent trips back and forth to work with morning and evening peaks of traffic. A relatively small number of individual customers would account for many of the annual trips on that facility. The Mid-Hudson Bridge is a good example of a commuter facility. Generally, commuter facilities have high percentages of electronic transponder usage.

- Conversely, a through facility would be characterized by drivers making long-distance trips with relatively few commuters and no significant periods of peak traffic during the day. Most trips would be by drivers using the facility once per month or less on an annual basis. The Newburgh-Beacon Bridge is a good example of a through facility.

- The third type of facility is a combination of commuter and through-trips. One of the best examples is the George Washington Bridge (GWB) in New York. As a bridge to Manhattan, there are morning and evening peak periods typical of commuter facilities. However, it is also I-95, the major through route in the Northeast Corridor, giving the GWB a large though-trip component.

All three types of facilities share similar relationships between trips and customers. Generally, the largest share of trips occurs in the highest frequency of travel category, with the lowest share of trips in the lowest frequency of travel categories. Conversely, when one discusses actual customers, the highest share of customers is in the infrequent-trip category, and the lowest share of actual customers is in the most-frequent category. This relationship can be better explained if we consider two extreme cases: a commuter who crosses the bridge every day, and an infrequent traveler who crosses the bridge once per year. On an average day, a toll collector sees the same commuter cross the bridge every day. On the other hand, in the case of the very infrequent traveler, a toll collector sees a different driver every day – 365 different drivers over the course of the year.

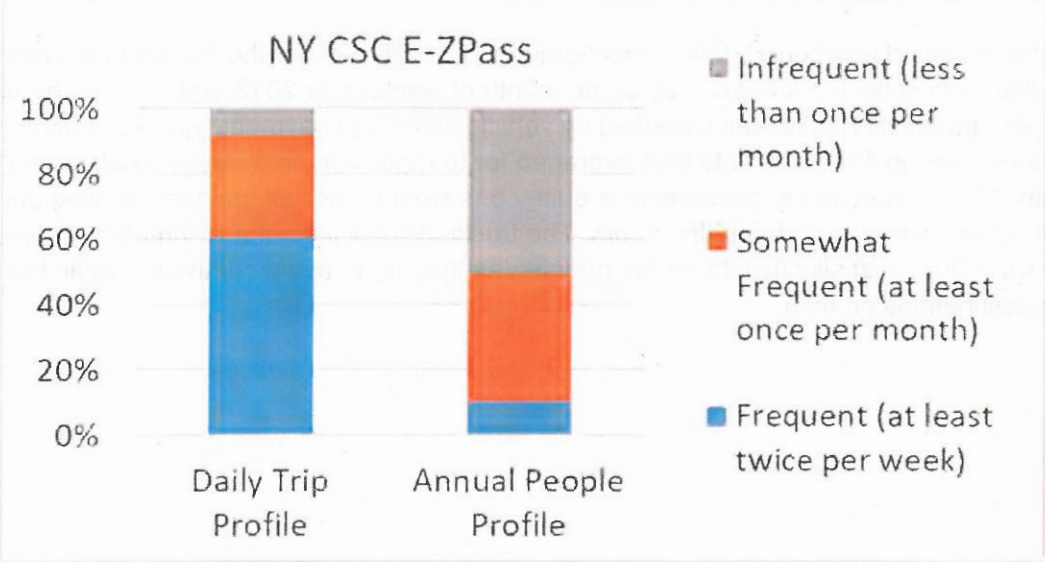
As shown in Table 9, the share of annual trips is very different than the share of annual people in this example – with a very large number of infrequent annual people contributing to infrequent trips.

Table 9: Sample Trips to People

On an Average Day	Over the course of a year		Share of Annual Trips	Share of Annual People
1 very frequent commuter	365 trips	1 person	50%	0.3%
1 extremely infrequent traveler	365 trips	365 people	50%	99.7%
TOTAL: 2 trips	730 trips	366 people	100%	100%

Statistics for E-ZPass usage for the month of September 2018 were obtained and analyzed with the purpose of assessing travel frequency on the Authority's bridges. The data was analyzed from the perspective of trips on NSYBA facilities on an average day, versus individual customers who drive on NYSBA facilities over the course of a year. Figure 18 presents a side by side comparison of the two perspectives.

Figure 18: Frequency of NY CSC E-ZPass on NYSBA Facilities



On an average day, it is estimated that the majority of the E-ZPass customers on NYSBA bridges are frequent customers who travel twice or more each week (shown in blue on Figure 18). However, this same group of customers represents only a small portion of individual E-ZPass customers that drive on the NYSBA facilities over the course of a year.

If we instead focus on infrequent customers, we can see that on an average day, less than 10 percent of trips are made by someone who is making his or her only NYSBA crossing that month. However, since this is an average day, there is a customer like this every day – in fact, different customers every day, to account for this portion of the average day trip profile. Since these are unique individuals each day of the month, they represent a vastly greater number of people and E-ZPass accounts than the commuter base. Over the course of the year, that same 10 percent of trips is estimated to make up more than half of all E-ZPass customers, with 55 percent of the annual people profile.

Although the graphs presented here are specifically NY CSC E-ZPass account holders, the same relationship between trip frequency on an average day versus unique customers holds true for non-account holders. In general, non-account holders travel less frequently than account holders, so that this relationship has significant implications when considering alternative types of toll collection, such as all-electronic tolling (AET), that require the toll collection process to identify each individual customer.

2.4 Hourly Traffic Data

Stantec obtained eastbound (tolled direction) hourly traffic data for the five bridges from NYSBA. The data was collected for each day of the month of September 2018 and for each hour of the day. The transaction data was classified by vehicle class and payment type. For each bridge, Tuesday through Thursday data was averaged for to represent an average weekday for the month. The passenger car distribution is quite consistent across all bridges, peaking during the morning and afternoon commuting hours. The trucks display less of a commuter pattern, with their travel heaviest slightly later in the morning as they try to avoid commuter traffic but arrive at their destinations on time.

Figure 19 and Figure 20 show the hourly distribution of traffic on each bridge on an average weekday by passenger cars and trucks, respectively.

Figure 19: Hourly Distribution of Passenger Cars on Average Weekday

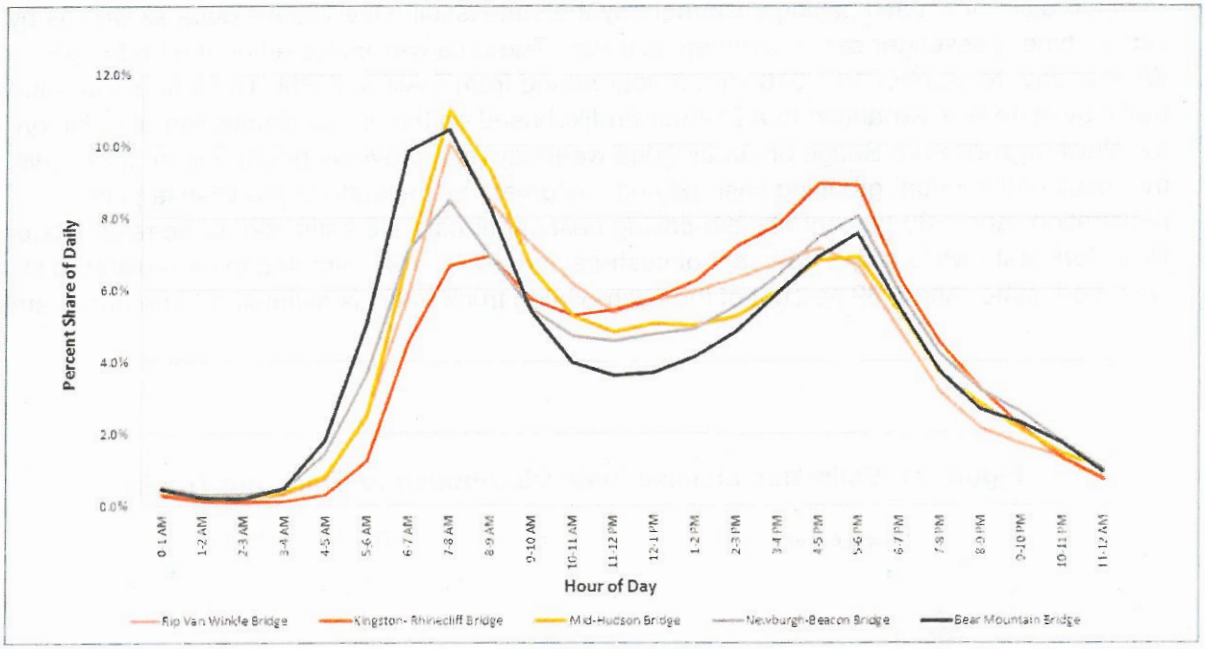
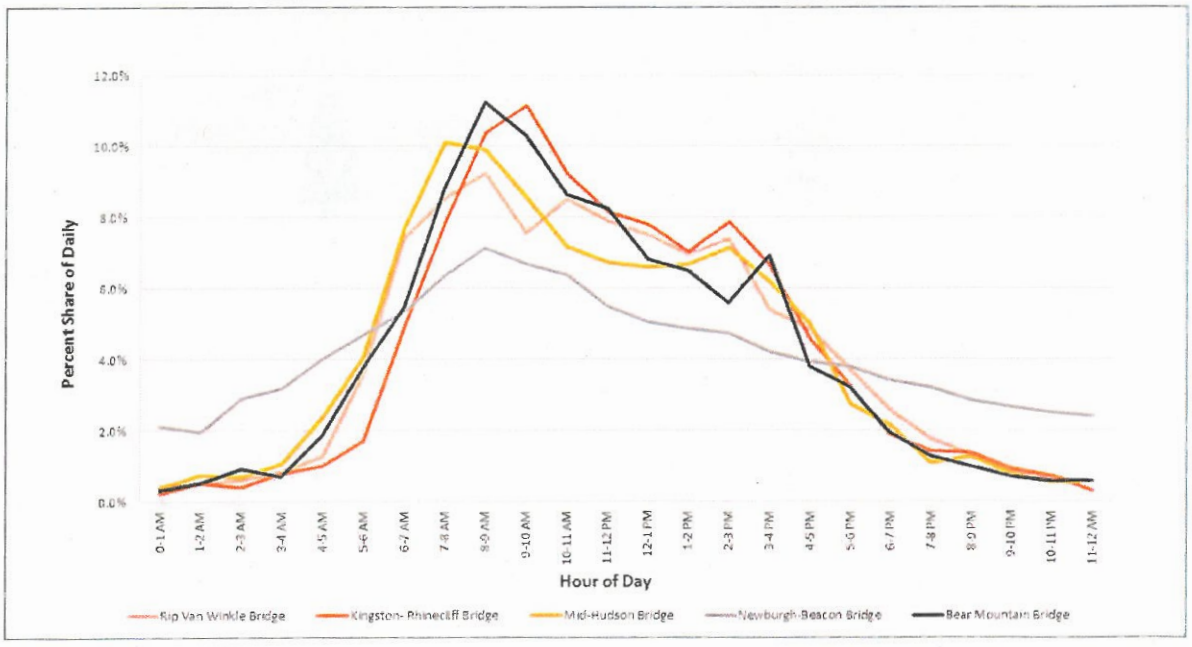


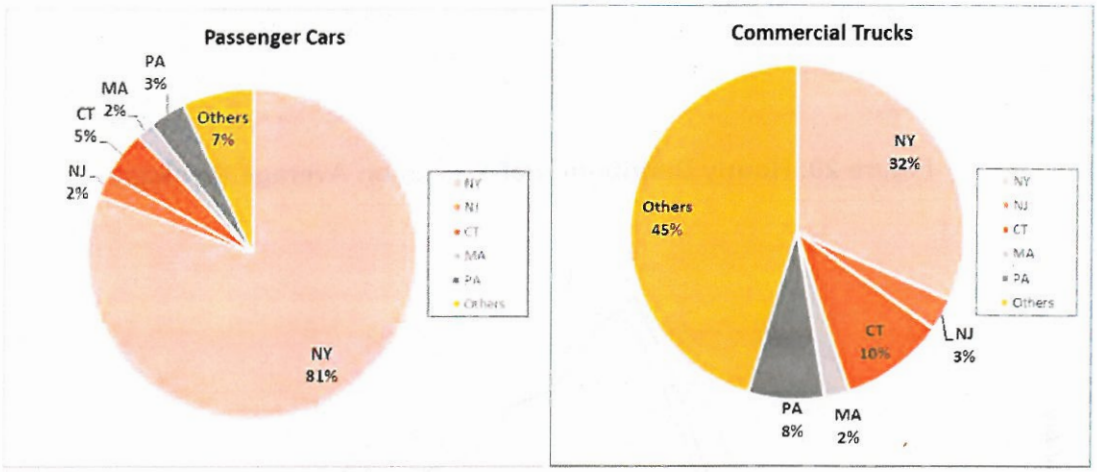
Figure 20: Hourly Distribution of Trucks on Average Weekday



2.5 License Plate Data

Stantec obtained license plate counts on the Newburgh-Beacon Bridge from NYSBA. The data included a count of cash-paying customers by the state issuing the license plate as well as by vehicle type (passenger car or commercial truck). The data was collected on the bridge on Wednesday, November 16, 2016 for a 9-hour period from 8 AM to 5 PM. The 9 hours of hourly traffic by state was expanded to a 24-hour profile based on the hourly distribution of traffic on the Newburgh-Beacon Bridge on an average weekday (see previous page). Figure 21 shows the result of this effort, grouping cash-paying customers by the state of the license plate registration. About 80 percent of cash-paying passenger cars are estimated to be residents of New York state while only 31 percent of cash-paying trucks are estimated to be registered in New York state. About 69 percent of the cash-paying truck traffic is estimated to be out-of-state.

Figure 21: Estimated License Plate Distribution for Cars and Trucks



3.0 Socioeconomic Conditions

Expanding upon background information pertaining to the operation of NYSBA bridges, an assessment of national and regional trends and socioeconomic conditions provides context for the interpretation of traffic and revenue patterns on the NYSBA bridges. The following sections discuss trends in national and regional travel, as well as regional population and employment.

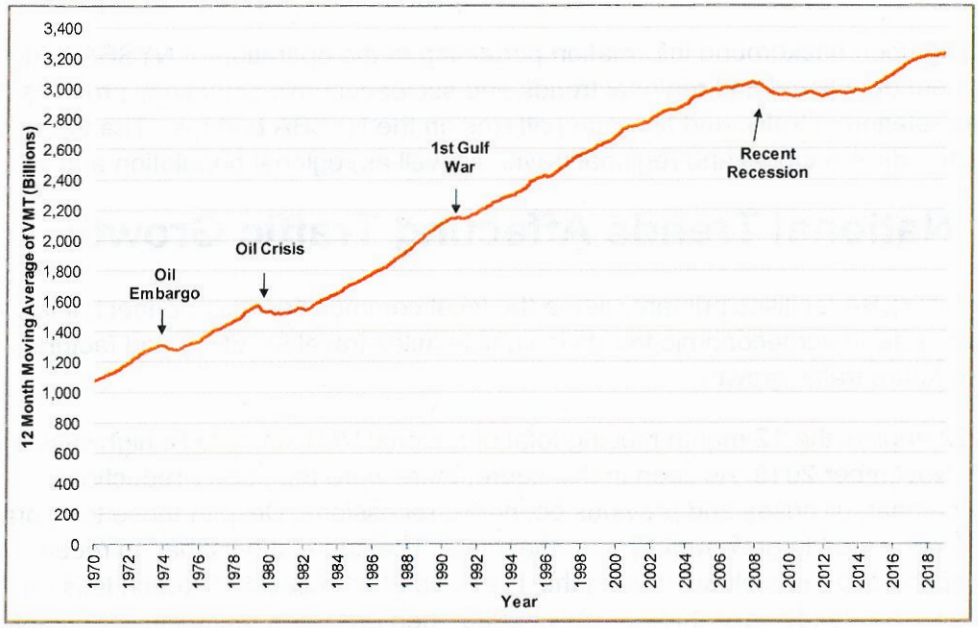
3.1 National Trends Affecting Traffic Growth

Although NYSBA facilities primarily serve the local communities they connect, it is useful to briefly consider macroeconomic trends in vehicle miles traveled (VMT) and factors potentially affecting future traffic growth.

Figure 22 depicts the 12-month moving total of national VMT on all U.S. highways, from 1971 through November 2018. As seen in this figure, there were temporary reductions in VMT during military combat, oil crises and previous economic recessions. Despite these temporary "dips", the VMT continued to grow rapidly over the years. The figure shows that, in recent years, with the exception of short plateaus during the 1991 and 2001 recessions (each less than one year), VMT grew at a steady pace through about 2005, then grew at a much slower pace through 2008. The increase in gas prices and the downturn in economic activity that took hold in late 2008 resulted in a significant reduction in total national travel mileage after the December 2007 peak. VMT declined throughout 2008 and early 2009. From the official end of the recession in mid-2009 through 2013, VMT generally remained flat. Then, in 2014 through 2017, VMT increased at a strong rate not seen since the late 1990s. The year 2016 experienced the largest annual increase in VMT since tracking began in 1971[1]. This upward trend in VMT was likely due to an improved economy, employment and population growth, and a reduction in fuel prices. It is important to note that even with the recent overall growth in VMT, per capita VMT fell for nine straight years between 2005 and 2013. The State Smart Transport Initiative (SSTI) concluded in a 2014 report that this decline reflected "changing demographics, saturated highways, and a rising preference for compact, mixed-use neighborhoods, which reduce the need for driving." [2] These factors may have come into play in the past year; in late 2017 through late 2018, nationwide VMT has experienced little to no growth.

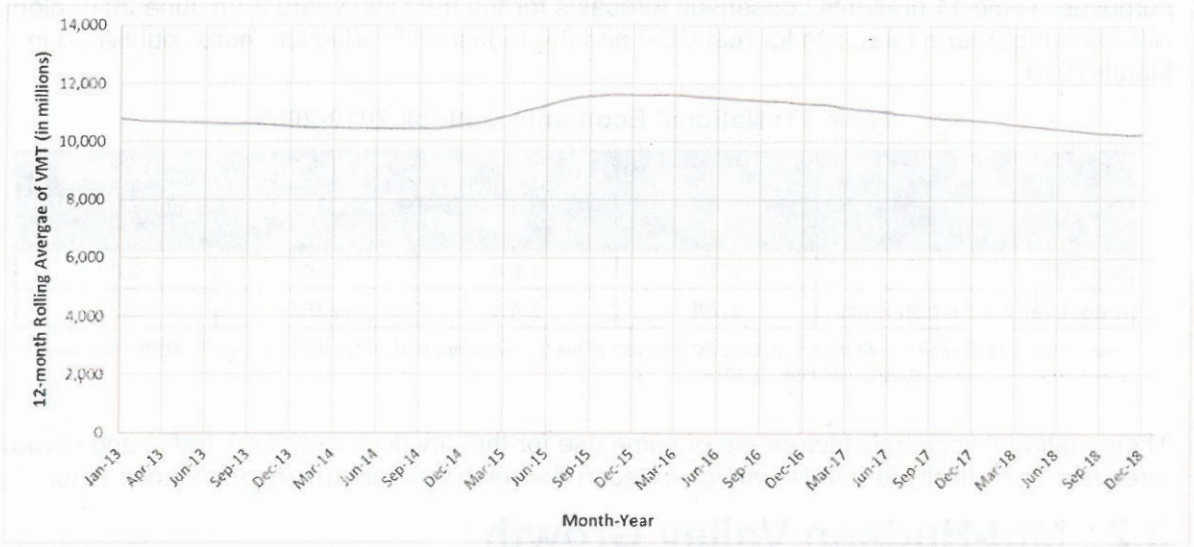
[1] U.S. Department of Energy, Alternative Fuels Data Center, Maps and Data - Annual Vehicle Miles Traveled in the U.S.
[2] State Smart Transportation Initiative News, "Per capita VMT drops for ninth straight year; DOTs taking notice," Chris Cahill, February 24, 2014.

Figure 22: National Historic Vehicle Miles Traveled (VMT), 12-month Moving Average



For comparison, Figure 23 shows historic traffic growth in New York State. The figure shows steady overall declines in New York VMT starting in 2006. The most recent available *monthly* data show that December 2018 VMT was 0.2 percent lower than in December 2017 for New York State[3], compared with a 0.8 percent decrease for the entire Northeast and a 0.3 percent decrease for the U.S.[4]

Figure 23: NY State Recent Vehicle Miles Traveled (VMT), 12-month Moving Average



Source: FHWA Office of Highway Policy Information. Most recent data available

The Federal Highway Administration prepares long term forecasts of VMT for three different economic scenarios over two different timeframes; though growth forecasts vary by vehicle type, forecast compound annual growth rates are as shown in Table 10.

Table 10: FHWA Long-Term Growth Forecasts of National Vehicle Miles Traveled (VMT)

Time Period	Low Economic Growth	Baseline Economic Growth	High Economic Growth
2016-2036 (20 year)	0.9%	1.2%	1.3%
2016-2046 (30 year)	0.8%	0.9%	1.1%

Source: Office of Highway Policy Information U.S. DOT, Federal Highway Administration, May 2018

Historically, regional traffic trends have been influenced by socioeconomic conditions, with correlations often observed between passenger car growth and Gross Domestic Product (GDP)

[3] FHWA Office of Highway Policy Information, Traffic Volume Trends, November 2018 as accessed March 14, 2019 at https://www.fhwa.dot.gov/policyinformation/travel_monitoring/18novtvt/page6.cfm
[4] FHWA Office of Highway Policy Information, Traffic Volume Trends, November 2018 as accessed March 14, 2019 at https://www.fhwa.dot.gov/policyinformation/travel_monitoring/18novtvt/page6.cfm

growth and between commercial vehicle growth and Industrial Production Index (IPI) growth. These economic indicators are generally indicative of the overall state of the economy so it is helpful to review GDP and IPI forecasts in in the development of traffic growth estimates since travel behaviors are also generally influenced by the economy.

Stantec typically uses the consensus forecast from more than 50 financial institutions and economic forecasting firms as an input into its traffic growth forecasts for revenue estimation purposes. Table 11 presents consensus forecasts for the next two years from June 2019 along with two longer term forecasts for real GDP and the Industrial Production Index, published in March 2019.

Table 11: National Economic Outlook 2019-2030

Economic Measure	2019 Growth Forecast	2020 Growth Forecast	2021-2025 Annual Growth Forecast	2026-2030 Annual Growth Forecast
Real GDP	2.5%	1.8%	1.9%	2.0%
Industrial Production Index	1.7%	1.4%	2.0%	2.2%

Source: Blue Chip Economic Indicators: Top Analysts' Forecasts of the U.S. Economic Outlook for the Year Ahead", Wolters and Kluwer Law & Business, March 10, 2019 and June 10, 2019.

These national economic factors are of some use for the development of the traffic and revenue forecasts, specifically for the Newburgh-Beacon Bridge that caters to longer distance trips.

3.2 Mid-Hudson Valley Growth

Given that the Authority's facilities generally serve the local communities they connect, Stantec determined that it should take into consideration growth forecasts for population and employment in the six counties directly served by the five Hudson River bridges operated by the Authority. These counties are Columbia, Dutchess and Putnam counties on the east side of the Hudson River and Greene, Ulster and Orange counties on the west side of the river.

Westchester and Rockland counties, which are located on the east and west sides of the Hudson River, respectively, would be expected to contribute to recreational trips to the Bear Mountain Bridge that is operated by the Authority. These two counties, however, are primarily served by the Governor Mario M. Cuomo Bridge, which is operated by the Thruway Authority.

To estimate population and employment growth within the Mid-Hudson Valley, Stantec used forecasts from Woods & Poole. Woods & Poole is a highly respected research and forecasting firm whose forecasts of socioeconomic factors are widely used by government agencies, corporations and consulting firms nationwide. Stantec has successfully used their socio-economic forecasts for several toll facility assignments. They provide economic and demographic forecasts for every county in the United States through the year 2050. Stantec obtained historical and forecast data through 2030 at the county level for total employment, households and population. Employment data measure both full-time and part-time employment from the U.S. Department of Commerce, Bureau of Economic Analysis (BEA).

3.2.1 Population

As shown in Table 12, the six counties in the Mid-Hudson Valley had a total population of 1.066 million persons in 2010.

Historical population by county for the period 2010 through 2017 are from the U.S. Census Bureau, and the projections for 2020, 2025 and 2030 are from Woods & Poole.

Between 2010 and 2017, population in the six counties was basically flat. Only Orange County showed any growth (by just over 8,000 people) - this county's population growth almost exactly offset the population losses in four of the other five counties (Putnam County grew in population but by fewer than 200 people.) Woods & Poole forecasts that growth will resume slightly with annual growth rates for the period 2017 through 2030 of around 0.6 percent. The forecast six-county population in 2030 is 1.155 million.

At the county level, the highest average annual growth rate between 2020 and 2030 is expected to be in Putnam County (+1.2 percent), while Ulster County is expected to have an average annual growth rate of 0.4 percent.

Table 12: Hudson Valley Population

Six Counties Directly Served by NYSBA Hudson River Bridges, 2010-2030

Year	Greene	Ulster	Orange	Columbia	Dutchess	Putnam	Grand Total	Compound Annual Growth Rate (CAGR)
	Population (000)							
2010	49.1	182.4	373.5	63.0	297.8	99.8	1,066	
2017	47.8	179.8	381.6	61.3	295.8	100.0	1,066	0.0%
2020	48.7	182.0	389.6	62.4	300.4	103.6	1,087	0.6%
2025	50.4	185.5	403.2	64.1	308.0	109.9	1,121	0.6%
2030	51.9	188.9	416.6	65.9	315.4	116.4	1,155	0.6%
CAGR '10-'20	-0.1%	0.0%	0.4%	-0.1%	0.1%	0.4%	0.2%	
CAGR '20-'30	0.6%	0.4%	0.7%	0.5%	0.5%	1.2%	0.6%	

Source: Woods & Poole Economics, Inc., The Complete Economic and Demographic Data Source, 2018

3.2.2 Employment

Historical employment for the period 2010 through 2017 and projections for 2020, 2025, and 2030 are shown in Table 13. These estimates and projections are also from Woods & Poole.

The number of jobs in the six counties increased between 2010 and 2017 at a compound annual rate of 1.2 percent, reaching 544,000 jobs in that year. This job growth was a positive development after the employment losses that began in 2007, due to the downturn in the national economy. Between 2005 and 2010, the number of jobs in the Mid-Hudson valley dropped by more than two percent. The forecast indicates that employment between 2017 and 2020 is expected to grow at a compound annual rate of 0.8 percent, resulting in a compound annual rate of 1.3 percent for the 2010 through 2020 decade. Between 2020 and 2030, employment is forecast to grow at a compound annual rate of 1.1 percent, reaching 634,000 jobs in 2030. This would represent 133,000 more jobs than in 2010 and 67,000 more jobs than in 2020.

At the county level, employment growth between 2020 and 2030 is expected to be greatest in the counties of Orange (+26,000 jobs) and Dutchess (+19,000), while each of the remaining counties shows an increase of 2,000 to 10,000 jobs.

Table 13: Hudson Valley Employment
Six Counties Directly Served by NYSBA Hudson River Bridges, 2010-2030

Year	Greene	Ulster	Orange	Columbia	Dutchess	Putnam	Grand Total	Compound Annual Growth Rate (CAGR)
	Employment (000)							
2010	20.9	86.7	175.6	29.5	148.7	39.2	501	
2017	21.8	92.9	196.9	33.2	156.5	43.0	544	1.2%
2020	22.6	96.3	205.6	34.7	163.0	44.8	567	0.8%
2025	23.7	101.6	218.7	36.8	172.6	47.5	601	1.2%
2030	24.8	106.6	231.7	39.0	181.8	50.1	634	1.1%
CAGR '10-'20	0.8%	1.1%	1.6%	1.6%	0.9%	1.3%	1.3%	
CAGR '20-'30	0.9%	1.0%	1.2%	1.2%	1.1%	1.1%	1.1%	

Source: Woods & Poole Economics, Inc., The Complete Economic and Demographic Data Source, 2018

These projected regional population and employment data along with the recent historical data since 2010 provides input into the traffic and revenue forecasting model, suggesting the potential for low to modest growth through 2030.

4.0 Operating and Capital Costs

This section presents the estimated operating costs and capital expenses for the duration of the forecast period.

4.1 Operating Expenses

Historical operating expenses are presented in Table 14 covering the period from 2008 through 2018. Operating expense items consist of salaries, employee benefits, commercial insurance and electronic toll costs. Over the 11-year period, Operating Expenses have increased at an average annual rate of 1.2 percent. Operating costs increased 4.3 percent from 2017 to 2018.

Table 14: Historical Operating Expenses (In Thousands)

Year	Operating Expenses(1)
2008	$ 23,901
2009	$ 21,327
2010	$ 23,177
2011	$ 22,426
2012	$ 23,210
2013	$ 24,739
2014	$ 25,089
2015	$ 24,557
2016	$ 24,948
2017	$ 25,900
2018	$ 27,007

Source: New York State Bridge Authority

Note: (1) Incorporates forecasted September 2018 budget for 2019 through 2022 and annual increases between 3% to 4% for all other costs thereafter. Estimates do not include depreciation expense, equipment cost (allowed for in Capital Projections), postemployment benefits which began in 2007, GASB 68 that began in 2015, or mark to market on Investments that began in 2017. Does not provide for any impact as a result of all-electronic tolling.

Operating and Capital Costs

December 20, 2019

Operating expenses for 2018 through 2035, as estimated by the Authority, are presented in Table 15. Estimates include an increase of approximately 10 percent in 2019. The Authority typically projects conservatively. These estimates account for the possibility of heavy winter expenses, and recent variations in health care and insurance costs. The Authority also anticipates higher short-term professional fees in connection with toll evaluation and preliminary preparation for capital bonding as well as the routine cyclical bridge inspections. For the remainder of the forecasts, costs are projected to increase three to four percent annually, with average growth for the period 2019 through 2035 of 3.9 percent.

Table 15: Projected Operating Expenses (In Thousands)

Year	Operating Expenses (2)
2018 (1)	$ 27,007
2019	$ 29,588
2020	$ 30,766
2021	$ 31,860
2022	$ 32,993
2023	$ 34,168
2024	$ 35,534
2025	$ 36,956
2026	$ 38,434
2027	$ 39,971
2028	$ 41,570
2029	$ 43,233
2030	$ 44,962
2031	$ 46,761
2032	$ 48,631
2033	$ 50,576
2034	$ 52,599
2035	$ 54,703

Source: *New York State Bridge Authority*

Notes: (1) Actual

(2) Incorporates forecasted September 2018 budget for 2019 through 2022 and annual increases between 3% to 4% for all other costs thereafter. Estimates do not include depreciation expense, equipment cost (allowed for in Capital Projections), postemployment benefits which began in 2007, GASB 68 that began in 2015, or mark to market on Investments that began in 2017. Does not provide for any impact as a result of all-electronic tolling.

Net Revenues available for the Authority's Capital Program include forecasted toll revenues and estimated revenues from other sources. The major component of "other revenues" is interest income which has been assumed by the Authority based on current interest rates and existing reserve balances. In addition, during 2019, "other revenues" include a one-time $1.5 million grant to support the Empire State Trail. "Other revenues" are presented in Table 16.

Table 16: Projected Other Revenues (In Thousands)

Year	Other Revenues (2)
2018 (1)	$ 2,618
2019	$ 3,850
2020	$ 1,550
2021	$ 1,050
2022	$ 950
2023	$ 950
2024	$ 950
2025	$ 950
2026	$ 950
2027	$ 950
2028	$ 950
2029	$ 950
2030	$ 950
2031	$ 950
2032	$ 950
2033	$ 950
2034	$ 950
2035	$ 950

Source: New York State Bridge Authority

Notes: (1) Actual

(2) Estimate based on 2020 Budget and Financial Plan for interest and miscellaneous income in 2019 through 2023. After 2021, interest approximated at a static amount on the basis of a declining balances available to invest offset by rising interest rates. Assumes interest rates continue to be lower than levels experienced prior to 2008, revised overweight charges, advertising, and fiber leasing increase the annual miscellaneous income estimate.

4.1.1 Operating Cost Assumptions for All-Electronic Tolling

Assuming implementation of AET on the Authority's facilities, E-ZPass transactions would continue to be processed the same way as they are today. For all other transactions, a video

image of the vehicle's license plate would be captured, and the registered owner would be billed periodically. This type of transaction may be referred to as a "video toll" although the New York Customer Service Center (NYCSC) uses the term Tolls by Mail. Thus, there are two basic groups of customers: E-ZPass customers and Tolls by Mail customers. Each group's transactions require different cost components for processing.

It is assumed that back-office processing would continue to be provided under the same contractual arrangement between NYSTA and NYSBA that exists today in which NYSBA pays NYSTA for E-ZPass processing. For E-ZPass transaction processing, the bulk of the costs are based on a "usage day" formula. Each of the three major toll authorities that are part of the NYCSC (MTA B&T, NYSTA, and PANYNJ) are assigned a percentage each month and each pays the NYCSC that share of the costs, which in turn are based on a unit cost multiplied by the total number of active E-ZPass accounts during the month.

The Stantec team used historical data related to NYSBA's invoices from NYSTA for NYCSC costs to develop the assumptions for future E-ZPass operating costs shown in Table 17.

Table 17: Key Assumptions for E-ZPass Operating Costs

Variable	2022 Assumption	2028 Assumption
NYSBA share of NYCSC costs	6%	6%
Number of NYCSC E-ZPass accounts	7.0 million	8.5 million
NYSBA annual credit card fees	$67K	$80K
NYSBA annual postage costs	$20K	$31K
NYSBA annual misc. costs	$20K	$20K

For purposes of this analysis, Stantec assumed that the majority of cash-paying customers would become Tolls by Mail customers with the implementation of AET. Under the current contract for Tolls by Mail processing, there are two broad categories of costs: Shared Costs and Direct Costs.

Table 18 shows current contract costs for each category and cost component and the assumptions used to project future NYSBA expenses.

Table 18: Key Assumptions for Tolls by Mail Operating Costs

Tolls by Mail Cost Component	Current Cost	Assumption for AET Analysis
Shared Costs		
Fixed Monthly Fee	$586,374 per month	Escalated at 2.5% per year
AET Customer Service Fee	$.58 per active Tolls by Mail account	Escalated at 2.5% per year
Toll Bill Fee	$.66 per bill mailed	Ratio of .94 bills to AET accounts. Escalated at 2.5% per year
DMV Passthrough Cost	$107, 549/month for all NYCSC	Escalated at 2.5% per year, with NYSBA share based on usage day factor
Direct Costs		
Manual Image Review	$.32 per set of images reviewed	Escalated at 2.5% per year
Automated Image Review	$.03 per set of images reviewed	Escalated at 2.5% per year
Violation Invoices Mailed	$0.655 per invoice with no image and $0.66 per invoice with an image	Escalated at 2.5% per year

For the purpose of developing an initial estimate for AET costs, Stantec used the following assumptions:

- NYSBA's cash traffic for 2022 is estimated to be 472,512. With AET, cash would no longer be offered as a form of payment at the toll plaza and a majority of this traffic will become Tolls by Mail transactions.
- NYSTA's Tolls by Mail traffic in 2022 will increase due to AET implementation on the mainline road segments. The December 2018 cash traffic on the mainline was 3,061,189. It was assumed that this traffic will grow and the majority of cash transactions will become Tolls by Mail transactions.
- In December 2018, the NYCSC processed 1,957,943 Tolls by Mail transactions. After application of the usage day formula there were 1,366,086 "counts" across the agencies. Thus, every Tolls by Mail transaction resulted in an average of 0.698 "counts". Stantec applied this factor to the anticipated traffic to calculate a usage day portion effectively passed on to NYSBA through their agreement with NYSTA.
- For NYSBA's share, Stantec assumed that projected cash customers assumed to be Tolls by Mail Customers for 2022 and 2028 will go through image review, 50 percent automated and 50 percent manual.
- Unpaid Tolls by Mail invoices are sent to violations and each agency pays for the processing of their own customers' violations.
- Stantec based estimates of uncollected toll revenue on preliminary traffic projections. Stantec used the estimated toll revenue for each year and multiplied by a percent of Tolls by Mail transactions that are never collected. Other agencies' experience shows that this percentage can vary from about 30 percent to over 50 percent of Tolls by Mail transactions. Stantec assumed that 45 percent of NYSBA Tolls by Mail transactions would not be paid and assumed 16 percent collection agency fees for invoices sent to collections.

- NYSBA provided Toll Collection-related Operational Costs and they estimate that those costs can be reduced by approximately 75 percent with the implementation of AET.

Based on these assumptions, Stantec developed pro forma expenses with an assumed conversion to AET in January 2021 and projected expenses through 2035. These projections are shown in Table 19 and Table 20 below. It should be noted that these expenses are representative of the cost components that may fluctuate with AET which form the basis for estimating the adjustments that may be made to the Authority's operating cost estimates to reflect AET conditions.

Table 19: Comparison of Expenses with AET Conversion (In Thousands)

Year	Estimated Non-AET Costs (000s)		Estimated AET Costs (4) (000s)			AET Cost Adjustment (000s)
	Toll Processing	Labor	Toll Processing	Labor	Other Adjustments	
2018 (1)	$ 3,837	$ 6,397				
2019	$ 4,143	$ 6,640				
2020(2)	$ 4,448	$ 6,882			$ 370	$ 370
2021 (2)(3)	$ 4,753	$ 7,125	$ 10,492	$ 2,196	$ 2,950 (5)(6)	$ 3,760
2022 (2)	$ 5,059	$ 7,367	$ 10,622	$ 2,256	$ 395	$ 848
2023 (2)	$ 5,313	$ 7,563	$ 10,753	$ 2,316	$ 408	$ 600
2024	$ 5,568	$ 7,759	$ 10,883	$ 2,377	$ 421	$ 353
2025	$ 5,823	$ 7,956	$ 11,013	$ 2,437	$ 438	$ 109
2026	$ 6,078	$ 8,152	$ 11,144	$ 2,497	$ 455	$ (134)
2027	$ 6,333	$ 8,348	$ 11,274	$ 2,557	$ 474	$ (376)
2028	$ 6,587	$ 8,544	$ 11,405	$ 2,617	$ 493	$ (617)
2029	$ 6,842	$ 8,740	$ 11,535	$ 2,677	$ 512	$ (858)
2030	$ 7,097	$ 8,936	$ 11,665	$ 2,737	$ 533	$ (1,098)
2031	$ 7,352	$ 9,132	$ 11,796	$ 2,797	$ 554	$ (1,337)
2032	$ 7,606	$ 9,328	$ 11,926	$ 2,857	$ 576	$ (1,575)
2033	$ 7,861	$ 9,524	$ 12,057	$ 2,917	$ 599	$ (1,812)
2034	$ 8,116	$ 9,720	$ 12,187	$ 2,977	$ 623	$ (2,049)
2035	$ 8,371	$ 9,916	$ 12,317	$ 3,037	$ 648	$ (2,284)

Notes: (1) Actual

(2) Assumed Toll Increase May 2020, 2021, 2022 and 2023

(3) Assumed All-Electronic (AET) Conversion January 2021

(4) AET costs include E-ZPass and Tolls-by-Mail costs

(5) Includes $2,168,000 severance due to union for toll collectors

(6) Includes AET marketing costs of $400,000 in 2021

Table 20: Projected Operating Expenses with AET Conversion (In Thousands)

Year	Non-AET Operating Expenses (000s)	AET Cost Adjustment (2) (000s)	AET Adjusted Operating Expenses (000s)
2018 (1)	$ 27,007	$ -	$ 27,007
2019	$ 29,588	$ -	$ 29,588
2020	$ 30,766	$ 370	$ 31,136
2021	$ 31,860	$ 3,760	$ 35,620
2022	$ 32,993	$ 848	$ 33,841
2023	$ 34,168	$ 600	$ 34,768
2024	$ 35,534	$ 353	$ 35,887
2025	$ 36,956	$ 109	$ 37,065
2026	$ 38,434	$ (134)	$ 38,300
2027	$ 39,971	$ (376)	$ 39,596
2028	$ 41,570	$ (617)	$ 40,953
2029	$ 43,233	$ (858)	$ 42,375
2030	$ 44,962	$ (1,098)	$ 43,864
2031	$ 46,761	$ (1,337)	$ 45,424
2032	$ 48,631	$ (1,575)	$ 47,056
2033	$ 50,576	$ (1,812)	$ 48,764
2034	$ 52,599	$ (2,049)	$ 50,550
2035	$ 54,703	$ (2,284)	$ 52,419

Notes: (1) Actual
(2) from Table 19

4.2 Capital Needs Program and Cost

The Authority has maintained the five vehicular bridges in good structural and functional condition by its ongoing Capital Improvement Program. As shown in Table 21, the oldest of the Authority's bridges, the Bear Mountain Bridge, has been in operation for 95 years. The most recently built facility, the south span of the Newburgh-Beacon Bridge, is nearly 40 years old. As the bridges age, the Authority schedules repairs and rehabilitation necessary to maintain them in good condition through its Capital Improvement Program.

Table 21: NYSBA Bridge Opening Dates

Bridge	Opening Year
Bear Mountain	1924
Mid-Hudson	1930
Rip Van Winkle	1935
Kingston-Rhinecliff	1957
Newburgh-Beacon North Span	1963
Newburgh-Beacon South Span	1980

The Authority's largest major costs are cyclical. The capital costs for the study period (2019-2035) are based on the Consulting engineer's opinion of capital project needs for the relevant period. Included in the capital program are re-decking of the north span of the Newburgh-Beacon Bridge, the Bear Mountain Bridge, and the Mid-Hudson Bridge, systemwide painting, and suspender replacement on the Bear Mountain and Mid-Hudson Bridges, among other expenditures. The Authority Board adopts a 5-year capital program annually. That program also incorporates capital expenses related to the Authority's responsibility for maintaining the structure of the Walkway Over the Hudson Bridge including bridge inspection, steel and river pier base repairs, and miscellaneous painting.

The Authority's Capital Improvement Program for the period 2019 through 2035 is shown in Table 22, as provided by the Authority.

Table 22: NYSBA Capital Improvement Program (In Thousands)

Year	Capital Plan Costs (000s)
2019	$ 20,299
2020	$ 48,143
2021	$ 63,701
2022	$ 64,592
2023	$ 29,683
2024	$ 37,138
2025	$ 29,450
2026	$ 33,015
2027	$ 28,815
2028	$ 27,615
2029	$ 40,805
2030	$ 24,890
2031	$ 21,650
2032	$ 52,650
2033	$ 46,650
2034	$ 18,650
2035	$ 56,650
17-year Total	$ 644,396

Source: New York State Bridge Authority
Note: Capital Improvement Based on latest Engineering Estimate

5.0 Traffic and Revenue Estimates

Stantec conducted an extensive analysis to estimate the traffic and revenue on the Authority bridges for forecast period 2019 through 2035. The analysis was supported by observed historical data, as discussed in Section 2.0. This section discusses the toll increase assumptions, an overview of the methodology adopted to model the toll increase, and the toll transaction and revenue forecasts generated for both the current and proposed toll increase scenarios.

5.1 Proposed Toll Schedule and Estimated Effects on Traffic and Revenue

In consultation with the Authority, it was determined that future revenue derived from tolls in effect since January 30, 2012 would not be sufficient to meet the Authority's prime directive of maintaining the bridges in a state of good repair. To provide the revenues necessary to fund the Authority's capital program, the Authority is proposing a toll rate increase to be phased in over a four year period, commencing May 1st of 2020 and continuing in May 2021, 2022 and 2023.

The tolls in effect since January 30, 2012 for the Authority's bridges are shown in Table 23. Also shown are the proposed tolls beginning May 1, 2020 through May 1, 2023.

Table 23: Current and Proposed Toll Schedules

Vehicle Class		Payment Method	Current Toll Rate	Proposed Toll Rate				% Change	
				May 2020	May 2021	May 2022	May 2023	Current - May 2020	Current - May 2023
Passenger Cars - Commuter									
Class 11	Commuter	E-Z Pass	$ 1.00	$ 1.10	$ 1.20	$ 1.30	$ 1.40	10.0%	40.0%
Passenger Cars - Non-Commuter									
Class 1	Passenger	Video	$ 1.50	$ 1.75	$ 1.75	$ 2.00	$ 2.15	16.7%	43.3%
Class 1	Passenger	E-Z Pass	$ 1.25	$ 1.35	$ 1.45	$ 1.55	$ 1.65	8.0%	32.0%
Class 7	Psgr Extra Axle	Video	$ 1.00	$ 1.25	$ 1.25	$ 1.50	$ 1.70	25.0%	70.0%
Class 7	Psgr Extra Axle	E-Z Pass	$ 0.90	$ 1.00	$ 1.10	$ 1.20	$ 1.30	11.1%	44.4%
Commercial Vehicles									
Class 2	Truck 2 Axle	Video	$ 5.00	$ 6.00	$ 6.00	$ 7.00	$ 8.00	20.0%	60.0%
Class 2	Truck 2 Axle	E-Z Pass	$ 4.50	$ 4.90	$ 5.30	$ 5.70	$ 6.10	8.9%	35.6%
Classes 3 - 6	Trucks per Axle	Video	$ 2.50	$ 3.00	$ 3.00	$ 3.50	$ 4.00	20.0%	60.0%
Classes 3 - 6	Trucks per Axle	E-Z Pass	$ 2.25	$ 2.45	$ 2.65	$ 2.85	$ 3.05	8.9%	35.6%
Class 8	Trucks Extra Axle	Video	$ 2.50	$ 3.00	$ 3.00	$ 3.50	$ 4.00	20.0%	60.0%
Class 8	Trucks Extra Axle	E-Z Pass	$ 2.25	$ 2.45	$ 2.65	$ 2.85	$ 3.05	8.9%	35.6%

The proposed toll rates would be increased in phases over a period of four years. Over this period, full-fare auto tolls for vehicles paying via video toll (currently cash-paying vehicles) would be increased by $0.65 to $2.15 and tolls for trucks with 3 or more axles would be increased by

$1.50 per axle to a rate of $4.00 per axle. Under the revised toll schedule, motorists paying by E-ZPass would continue to pay a lower rate than those paying by video (currently cash). If payment is made by E-ZPass, the passenger car toll would be $1.65, while the truck toll would be $3.05 per axle. The current toll schedule offers discounts of roughly 17 percent for E-ZPass paying cars and 10 percent for trucks. Under the proposed toll schedule, E-ZPass cars and truck would both receive a larger 23 percent discount.

The commuter toll rate, with payment by E-ZPass, would be $1.40, which maintains the $0.25 discount from the E-ZPass rate. When compared to the proposed video toll rate, however, the discount for commuters increases from a discount of $0.50 (versus current cash) to $0.75 (versus proposed video), maintaining the existing 33 percent discount.

Trucks paying by E-ZPass would also receive a reduced fare compared to the video fare. For a 2-axle truck, the video rate would be $8.00 and the E-ZPass rate would be $6.10, or approximately 24 percent less. For trucks with 3 or more axles, the cash rate would be $4.00 per axle and the E-ZPass rate would be $3.05 per axle, also 24 percent less.

The model assumed that there would be some driver reaction to a toll increase. In addition, it was also assumed that there would be an additional shift in payment choice resulting in a 2 percent increase in E-ZPass market share with the implementation of AET, along with an adjustment in video toll (formerly cash) vehicle demand of negative 4 percent for cars and negative 2 percent for trucks. In other words, we assumed that the conversion to AET would cause some additional diversion of current cash-paying vehicles, as well as a larger one-time shift from video toll (currently cash) payment to E-ZPass payment.

With all-electronic tolling, tolls from some portion of video transactions will not be collectable due to various reasons including low quality images, lack of or incorrect registered vehicle owner address, and customer failure to pay late invoices. As was discussed in Section 4.1.1, we assumed that 45 percent of video transactions would not be collectable.

With the proposed toll increases, cash and commuter passenger car tolls as well as truck tolls (see Table 23) will remain lower on the Authority's five vehicular bridges than those on the George Washington and Governor Mario M. Cuomo bridges. However, proposed cash tolls on the Authority's bridges are higher than those on the Castleton-on-Hudson Bridge. Although rates for heavy trucks are higher than those on the Castleton-on-Hudson Bridge, the impact on traffic is expected to be minimal. These differentials are not anticipated to have a significant impact on truck traffic patterns since most trucks on the Authority's bridges use the Newburgh-Beacon Bridge and the Castleton-on-Hudson serves New York State Thruway – Massachusetts Turnpike traffic. The facilities serve different primary travel corridors and the changes in travel times that would result in switching travel routes are not worth any variation in toll rates compared to current rates on both facilities. Thus, it is not likely there will be any significant shift of truck traffic because of rate changes or construction between these Authority's facilities and the Castleton on Hudson Bridge.

Another way to view the Authority's toll schedule is illustrated by "indexing" the previous and new tolls to the value of the dollar in 2012. As indicated in Table 24, the previous Authority toll increase, to the $1.00 toll level, was in 2012. Since 2012, inflation (based on the Consumer Price Index) has increased the cost-of-living (through 2019) by 10.6 percent. Therefore, the $1.50 cash toll today is equivalent to $1.36 in 2012 dollars, in terms of its effect on the motorist's budget. This is illustrated in Table 24 for the full-fare autos, as well as for commuters and five-axle trucks.

Table 24: Tolls Indexed to 2012 Dollars*

Vehicle Class	Payment Method	Toll Rate	
		Current Toll	Current Toll Indexed to 2012 dollars
Passenger Cars - Commuter	E-Zpass	$1.00	$0.90
Passenger Cars - Non-Commuter	Cash	$1.50	$1.36
	E-Z Pass	$1.25	$1.13
Commercial Vehicles - Toll per Axle	Cash	$2.50	$2.26
	E-Z Pass	$2.25	$2.03

With increases in tolls, it can be expected that there will be some loss in traffic, due to carpooling, consolidation of trips and minimal switches in travel modes. Population and employment centers and other trip origins and destinations are generally widely scattered within the Authority's service area, and, therefore, they are not suited to effective trans-river public transportation. This leaves both commuters and infrequent users of the Authority's bridges little choice in changing travel modes, except for carpooling or not making the trip at all.

It is important to note that, despite the toll increase, the Authority's crossing charges are substantially lower than the Thruway Authority's Governor Mario M. Cuomo Bridge and the Port Authority's bridges and tunnels, especially for trucks. For this reason, we expect low sensitivity to the toll increase.

5.2 Forecasted Toll Transactions and Revenue

This section presents forecasted toll transactions and revenues through 2035, along with a summary of the process and assumptions used to develop the forecasts and a discussion of proposed toll rate modifications. Forecasts are presented for the current toll rate scenario, as well as a scenario where toll is increased on all Authority bridges on May 1st of each year from 2020 through 2023, with a conversion of all bridges to all-electronic toll collection in January 2021.

5.2.1 Modeling Methodology

To develop toll transaction and revenue forecasts for the period 2019 through 2035, Stantec developed a spreadsheet-based model capable of analyzing each of the authority's five bridges

individually. The model is built upon a base of historical transaction data separated by vehicle class and payment type, and allows for flexibility in modeling assumptions related to future traffic shares and trends, including traffic growth by class, facility & payment type, toll rate modifications, alternative toll collection systems such as AET, and customized reactions to modifications by facility over the forecast term. This section discusses the key modeling inputs considered.

5.2.1.1 Annual Traffic Growth by Bridge

The historical year-over-year change in traffic between year 2010 and 2018 was reviewed for each bridge, by vehicle type. The historical growth by facility and vehicle type were discussed in Section 2.1 of this report.

Based on a combination of historical trends and socioeconomic factors, it is estimated that the Authority's facilities will experience generally low growth over the forecast period. Although many of the Authority's bridges have seen growth in recent years, it was conservatively forecasted that volumes would level out in the near future. It was also observed that truck volumes on the Newburgh-Beacon Bridge, which account for a large percentage of Authority revenues, have been trending downward. It was assumed that this trend would continue into 2019 before flattening out.

Figure 24 shows the recent and future growth assumptions for cars and trucks under the current toll scenario.

Figure 24: Traffic Growth

5.2.1.2 Electronic Payment Market Share

A discussion of recent trends in E-ZPass market share was presented in Section 2.2. E-ZPass market share typically increases gradually over time, slowing in growth as it reaches higher levels of market saturation. However, beginning in 2016, E-ZPass has been growing somewhat higher than previous growth, which coincides with the conversion of numerous regional toll facilities to all-electronic tolling, as discussed previously in Sections 1.2 and 2.2 of this report.

Figure 25 and Figure 26 present recent and forecasted E-ZPass market share by facility for cars and trucks.

Figure 25: E-ZPass Market Share Assumptions - Cars

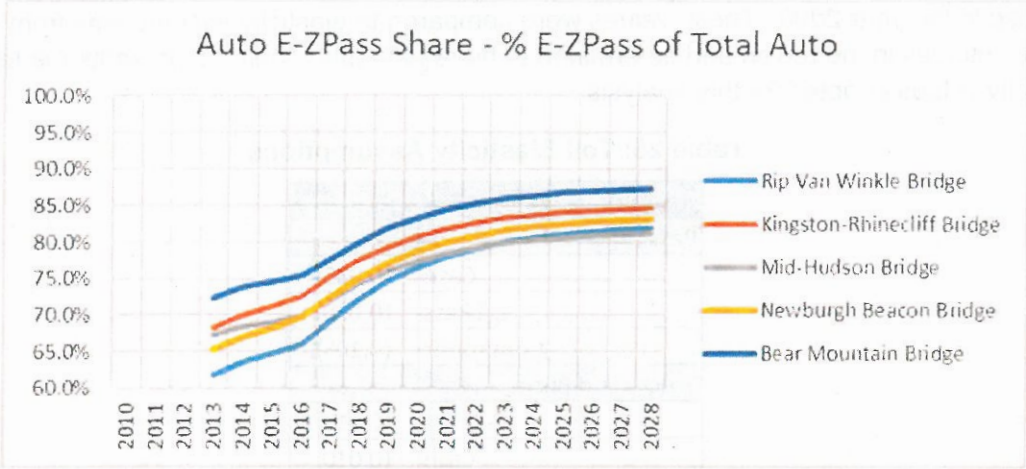
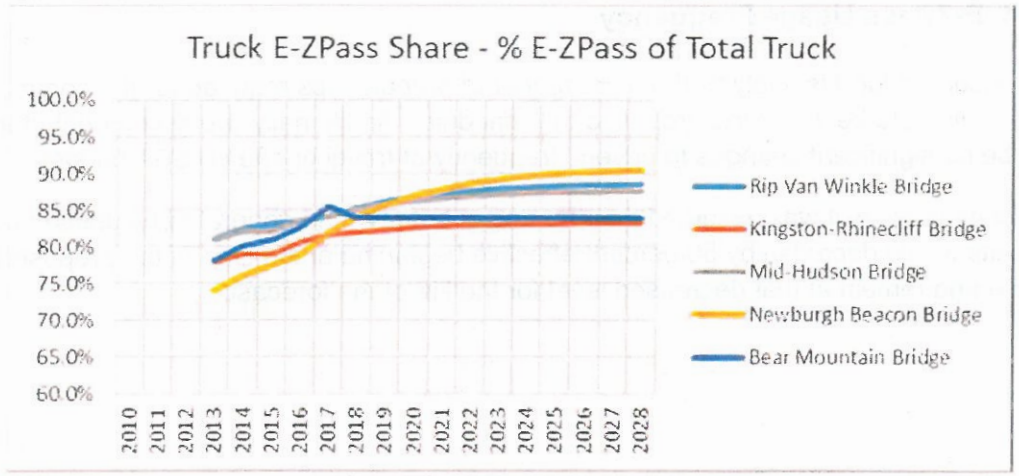


Figure 26: E-ZPass Market Share Assumptions - Trucks



5.2.1.3 Toll Elasticity

As tolls increase, traffic tends to decrease. The ratio of change in tolls against resulting change in traffic volumes is referred to as elasticity. Stantec reviewed the historical transactions data to assess the impact of the most recent toll increase on the traffic on each of the Authority bridges. For this purpose, the transaction data for a 12-month period before and after January 2012 was analyzed. Contrarily, it was observed that several vehicle classes showed an increase in

transactions even after the tolls were increased, possibly a result of recovery from decreased traffic in 2011, as discussed in Section 2.1.

A prior 2012 Stantec study developed toll elasticity values based on the data from the toll increase in the year 2000. These values were compared to elasticity assumptions from other Stantec studies in the region and determined to be reasonable. Table 25 presents the toll elasticity values adopted for this analysis.

Table 25: Toll Elasticity Assumptions

Vehicle Class	Elasticity
Passenger Cars	
Cash	(0.035)
E-ZPass	(0.035)
Commuter	(0.105)
Trucks and Buses	
E-ZPass	(0.010)
Cash	(0.010)

5.2.1.4 E-ZPass Usage Frequency

It was assumed for this analysis that the number of prepaid trips required for the commuter plan would continue to be 17 for the proposed toll schedule. Additionally, we assumed that there would be no significant changes to drivers' frequency of travel on the NYSBA bridges.

To be conservative, it was assumed that the amount of revenue generated by unused commuter toll credits would decrease by 50 percent effective beginning at the time of the proposed toll increase and remain at that decreased level for the life of the forecast.

5.2.2 Estimated Traffic and Revenue with Current Toll Schedule

Forecasted toll transactions and revenue with the current toll schedule are presented in Table 26. For the majority of the forecast period, traffic levels are estimated to remain flat. As E-ZPass market share gradually grows over time and an increased portion of Authority traffic receives the discounted toll rate, toll revenues are expected to decrease gradually from $59.0 million in 2018 to an estimated $57.1 million in 2035.

Table 26: Estimated Toll Transactions and Revenue, Current Toll Schedule

Year	Annual Toll Transactions (000)	Annual Revenue (000)	Average Toll
2018 (1)	31,764	$ 59,000	$ 1.86
2019	32,057	$ 59,100	$ 1.84
2020	32,104	$ 57,500	$ 1.79
2021	32,104	$ 57,400	$ 1.79
2022	32,104	$ 57,300	$ 1.78
2023	32,104	$ 57,300	$ 1.78
2024	32,104	$ 57,300	$ 1.78
2025	32,104	$ 57,200	$ 1.78
2026	32,104	$ 57,200	$ 1.78
2027	32,104	$ 57,200	$ 1.78
2028	32,104	$ 57,200	$ 1.78
2029	32,104	$ 57,200	$ 1.78
2030	32,104	$ 57,200	$ 1.78
2031	32,104	$ 57,200	$ 1.78
2032	32,104	$ 57,100	$ 1.78
2033	32,104	$ 57,100	$ 1.78
2034	32,104	$ 57,100	$ 1.78
2035	32,104	$ 57,100	$ 1.78

Notes: (1) Actual

Table 27 presents a comparison of toll revenues, operating expenses and other revenues under the current toll schedule. Net revenues are expected to decrease from $34.61 million in 2018 to $3.35 million in 2035. Estimated operating costs were presented previously in Section 4.1 of this report.

Table 27: Estimated Revenues and Expenses, Current Toll Schedule

Year	Toll Revenue (000s)	Operating Expenses (000s) (1)	Net Operating Revenues (000s)	Other Revenues (000s) (2)	Net Revenues (000s)
2018 (3)	$ 59,000	$ 27,007	$ 31,993	$ 2,618	$ 34,611
2019	$ 59,100	$ 29,588	$ 29,512	$ 3,850	$ 33,362
2020	$ 57,500	$ 30,766	$ 26,734	$ 1,550	$ 28,284
2021	$ 57,400	$ 31,860	$ 25,540	$ 1,050	$ 26,590
2022	$ 57,300	$ 32,993	$ 24,307	$ 950	$ 25,257
2023	$ 57,300	$ 34,168	$ 23,132	$ 950	$ 24,082
2024	$ 57,300	$ 35,534	$ 21,766	$ 950	$ 22,716
2025	$ 57,200	$ 36,956	$ 20,244	$ 950	$ 21,194
2026	$ 57,200	$ 38,434	$ 18,766	$ 950	$ 19,716
2027	$ 57,200	$ 39,971	$ 17,229	$ 950	$ 18,179
2028	$ 57,200	$ 41,570	$ 15,630	$ 950	$ 16,580
2029	$ 57,200	$ 43,233	$ 13,967	$ 950	$ 14,917
2030	$ 57,200	$ 44,962	$ 12,238	$ 950	$ 13,188
2031	$ 57,200	$ 46,761	$ 10,439	$ 950	$ 11,389
2032	$ 57,100	$ 48,631	$ 8,469	$ 950	$ 9,419
2033	$ 57,100	$ 50,576	$ 6,524	$ 950	$ 7,474
2034	$ 57,100	$ 52,599	$ 4,501	$ 950	$ 5,451
2035	$ 57,100	$ 54,703	$ 2,397	$ 950	$ 3,347

Notes: (1) Operating Expenses from Table 15. Does not include "Other Post-Employment Benefits", depreciation on equipment and net loss on sale of equipment.

(2) Primarily interest income; estimated by Authority based on current interest rates and existing reserve balances.

(3) Actual

Net revenues available for capital expenditures after provision for debt service are shown in Table 28. The debt service amounts shown include the amount for the outstanding 2012 bonds.

Table 28: Estimated Revenues Available for Capital Program, Current Toll Schedule

Year	Net Revenue (000s) (1)	Debt Service (000s) (2) (3)	Revenue Available for Capital Projects (000s)
2019	$ 33,362	$ 11,237	$ 22,125
2020	$ 28,284	$ 11,237	$ 17,047
2021	$ 26,590	$ 11,240	$ 15,350
2022	$ 25,257	$ 11,235	$ 14,022
2023	$ 24,082	$ 11,236	$ 12,846
2024	$ 22,716	$ 11,239	$ 11,477
2025	$ 21,194	$ 11,237	$ 9,957
2026	$ 19,716	$ 11,237	$ 8,479
2027	$ 18,179	$ -	$ 18,179
2028	$ 16,580	$ -	$ 16,580
2029	$ 14,917	$ -	$ 14,917
2030	$ 13,188	$ -	$ 13,188
2031	$ 11,389	$ -	$ 11,389
2032	$ 9,419	$ -	$ 9,419
2033	$ 7,474	$ -	$ 7,474
2034	$ 5,451	$ -	$ 5,451
2035	$ 3,347	$ -	$ 3,347

Notes: (1) From Table 27. Does not include provision for debt service requirements.
(2) Debt Service includes outstanding 2012 debt as noted above.
(3) Provided by the Authority.

Revenues available for capital projects from Table 28, including the funds from the proposed 2021 and 2022 bond sales, are compared to the funds required for the capital improvement program in Table 29. The cumulative column shows that, for the period indicated, funds are estimated to be insufficient to provide for the Capital Improvement Program.

Table 29: Comparison of Revenue Available and Funds Required for Capital Program, Current Toll Schedule

Year	Revenue Available for Capital Projects (000s) (1)	Capital Improvement Program (000s) (2)	Surplus or (Deficit) (000s)	
			Annual	Cumulative
2019	$ 22,125	$ 20,299	$ 1,826	$ 50,410
2020	$ 17,047	$ 48,143	$ (31,096)	$ 19,314
2021	$ 15,350	$ 63,701	$ (48,351)	$ (29,037)
2022	$ 14,022	$ 64,592	$ (50,570)	$ (79,607)
2023	$ 12,846	$ 29,683	$ (16,837)	$ (96,443)
2024	$ 11,477	$ 37,138	$ (25,661)	$ (122,105)
2025	$ 9,957	$ 29,450	$ (19,493)	$ (141,597)
2026	$ 8,479	$ 33,015	$ (24,536)	$ (166,133)
2027	$ 18,179	$ 28,815	$ (10,636)	$ (176,769)
2028	$ 16,580	$ 27,615	$ (11,035)	$ (187,804)
2029	$ 14,917	$ 40,805	$ (25,888)	$ (213,692)
2030	$ 13,188	$ 24,890	$ (11,702)	$ (225,394)
2031	$ 11,389	$ 21,650	$ (10,261)	$ (235,655)
2032	$ 9,419	$ 52,650	$ (43,231)	$ (278,886)
2033	$ 7,474	$ 46,650	$ (39,176)	$ (318,062)
2034	$ 5,451	$ 18,650	$ (13,199)	$ (331,262)
2035	$ 3,347	$ 56,650	$ (53,303)	$ (384,565)

Notes: (1) From Table 28. Based on toll and other revenues.
(2) Provided by the Authority (from Table 22)

5.2.3 Estimated Traffic and Revenue with Proposed Toll Schedule

To meet the needs of the Capital Program, a scenario with a toll increase was considered. For this scenario, it was assumed that the toll increase will be phased in over four years beginning in May, 2020, as shown in Table 23, with the system converting to all-electronic toll collection on January 1, 2021.

Table 30 presents our forecast of toll transactions and revenue with the proposed toll schedule and assuming implementation of all-electronic toll collection. For the majority of the forecast

period, traffic levels are estimated to remain flat, with some diversion spread over 2020 through 2023 due to the proposed toll increase phases on May 1st of each these years. With the proposed toll increase, toll revenues are expected to increase from $59.0 million in 2018 to an estimated $72.3 million in 2035.

Table 30: Estimated Toll Transactions and Revenue, Proposed Toll Schedule

Year	Annual Toll Transactions (000s)	Annual Revenue (000s) (2)	Average Toll
2018 (1)	31,764	$ 59,000	$ 1.86
2019	32,057	$ 59,100	$ 1.84
2020	32,018	$ 61,400	$ 1.92
2021	31,911	$ 60,700	$ 1.90
2022	31,806	$ 65,400	$ 2.06
2023	31,708	$ 70,200	$ 2.21
2024	31,677	$ 71,800	$ 2.27
2025	31,677	$ 71,900	$ 2.27
2026	31,677	$ 72,000	$ 2.27
2027	31,677	$ 72,000	$ 2.27
2028	31,677	$ 72,000	$ 2.27
2029	31,677	$ 72,100	$ 2.28
2030	31,677	$ 72,100	$ 2.28
2031	31,677	$ 72,100	$ 2.28
2032	31,677	$ 72,200	$ 2.28
2033	31,677	$ 72,200	$ 2.28
2034	31,676	$ 72,200	$ 2.28
2035	31,676	$ 72,300	$ 2.28

Notes: (1) Actual
(2) Collectable Toll Revenue

It is typical that video invoices sent out through the New York Customer Service Center (NYCSC) charge violation fees beginning with the issuance of a second invoice ($5 per invoice) and escalate to $50 per transaction on the third invoice. Based on our experience on other AET facilities, it was estimated that approximately 20 percent of the video customers who pay their invoices would pay the $5 invoice fee, and that only around 4 percent of settled video transactions would pay the $50 fee.

Table 31 presents estimated annual violation fee revenue and combined toll plus fee revenues for AET.

Table 31: Estimated Violation Fee Revenue, Proposed Toll Schedule

Year	Annual Violation Fee Revenue (000s)	Total Annual Toll+Fee Revenue (000s) (2)
2018 (1)	$ -	$ 59,000
2019	$ -	$ 59,100
2020	$ -	$ 61,400
2021	$ 400	$ 61,100
2022	$ 400	$ 65,800
2023	$ 300	$ 70,500
2024	$ 300	$ 72,100
2025	$ 300	$ 72,200
2026	$ 300	$ 72,300
2027	$ 300	$ 72,300
2028	$ 300	$ 72,300
2029	$ 300	$ 72,400
2030	$ 200	$ 72,300
2031	$ 200	$ 72,300
2032	$ 200	$ 72,400
2033	$ 200	$ 72,400
2034	$ 200	$ 72,400
2035	$ 200	$ 72,500

Notes: (1) Actual
(2) Collectable Toll Revenue

Table 32 presents a comparison of toll revenues, operating expenses and other revenues under the proposed toll schedule. Gap closing revenues generated from a future toll increase are shown beginning in 2024. Net revenues are expected to increase from $34.61 million in 2018 to $39.16 million in 2024, before decreasing to $23.03 million in 2035. Estimated operating costs for AET were presented previously in Section 4.1.1 of this report.

Table 32: Estimated Revenues and Expenses, Proposed Toll Schedule

Year	Toll Revenue (000s)	Violation Fee Revenue (000s)	Tolls By Mail Adjustment to Cash Basis (000s)	Gap Closing Revenues (1)	Operating Expenses (000s) (2)	Net Operating Revenues (000s)	Other Revenues (000s) (3)	Net Revenues (000s)
2018 (4)	$ 59,000	$ -			$ 27,007	$ 31,993	$ 2,618	$ 34,611
2019	$ 59,100	$ -			$ 29,588	$ 29,512	$ 3,850	$ 33,362
2020	$ 61,400	$ -			$ 31,136	$ 30,264	$ 1,550	$ 31,814
2021	$ 60,700	$ 400	$ (2,400)		$ 35,620	$ 23,080	$ 1,050	$ 24,130
2022	$ 65,400	$ 400			$ 33,841	$ 31,959	$ 950	$ 32,909
2023	$ 70,200	$ 300			$ 34,768	$ 35,732	$ 950	$ 36,682
2024	$ 71,800	$ 300		$ 2,000	$ 35,887	$ 38,213	$ 950	$ 39,163
2025	$ 71,900	$ 300		$ 2,000	$ 37,065	$ 37,135	$ 950	$ 38,085
2026	$ 72,000	$ 300		$ 2,000	$ 38,300	$ 36,000	$ 950	$ 36,950
2027	$ 72,000	$ 300		$ 2,000	$ 39,596	$ 34,704	$ 950	$ 35,654
2028	$ 72,000	$ 300		$ 2,000	$ 40,953	$ 33,347	$ 950	$ 34,297
2029	$ 72,100	$ 300		$ 2,000	$ 42,375	$ 32,025	$ 950	$ 32,975
2030	$ 72,100	$ 200		$ 2,000	$ 43,864	$ 30,436	$ 950	$ 31,386
2031	$ 72,100	$ 200		$ 2,000	$ 45,424	$ 28,876	$ 950	$ 29,826
2032	$ 72,200	$ 200		$ 2,000	$ 47,056	$ 27,344	$ 950	$ 28,294
2033	$ 72,200	$ 200		$ 2,000	$ 48,764	$ 25,636	$ 950	$ 26,586
2034	$ 72,200	$ 200		$ 2,000	$ 50,550	$ 23,850	$ 950	$ 24,800
2035	$ 72,300	$ 200		$ 2,000	$ 52,419	$ 22,081	$ 950	$ 23,031

Notes:
(1) Additional Toll Revenues of $2,000,000 beginning in 2024 derived from future toll increase as needed to support the issuance of $50 million new money generated from additional 30 year long term debt.
(2) From Table 20. Estimates do not include depreciation expense, equipment cost (allowed for in Capital Projections), postemployment benefits which began in 2007, GASB 68 that began in 2015, or mark to market on Investments that began in 2017.
(3) Primarily interest income; estimated by Authority based on current interest rates, existing reserve balances.
(4) Actual

Traffic and Revenue Estimates

December 20, 2019

Net revenues available for capital expenditures after provision for debt service are shown in Table 33. Similar to the tables presented for the current toll schedules, the debt service amounts shown include the amount for the outstanding 2012 bonds plus estimated debt service, as provided by the Authority, on new bonds proposed to be issued in 2021 and 2022. Table 33 also shows the additional funds available for the Capital Improvement Program from the 2021 and 2022 bond issue, as well as an additional anticipated debt issuance in 2024.

Table 33: Estimated Revenues Available for Capital Program, Proposed Toll Schedule

Year	Net Revenue (000s) (1)	Debt Service (000s) (2) (3)	Revenue Available for Capital Projects (000s)		
			From Tolls and Other Revenues	Funds from 2021 Bond Issue (3)(4)	Total
2019	$ 33,362	$ 11,237	$ 22,125		$ 22,125
2020	$ 31,814	$ 11,237	$ 20,577		$ 20,577
2021	$ 24,130	$ 12,253	$ 11,878	$ 40,000	$ 51,878
2022	$ 32,909	$ 14,436	$ 18,473	$ 50,000	$ 68,473
2023	$ 36,682	$ 14,834	$ 21,848		$ 21,848
2024	$ 39,163	$ 16,676	$ 22,486	$ 50,000	$ 72,486
2025	$ 38,085	$ 17,912	$ 20,173		$ 20,173
2026	$ 36,950	$ 17,913	$ 19,036		$ 19,036
2027	$ 35,654	$ 8,511	$ 27,143		$ 27,143
2028	$ 34,297	$ 8,512	$ 25,785		$ 25,785
2029	$ 32,975	$ 8,509	$ 24,466		$ 24,466
2030	$ 31,386	$ 8,510	$ 22,875		$ 22,875
2031	$ 29,826	$ 8,514	$ 21,312		$ 21,312
2032	$ 28,294	$ 8,509	$ 19,785		$ 19,785
2033	$ 26,586	$ 8,516	$ 18,071		$ 18,071
2034	$ 24,800	$ 8,508	$ 16,292		$ 16,292
2035	$ 23,031	$ 8,512	$ 14,519		$ 14,519

Notes: (1) From Table 32. Includes Gap Closing Revenues.

(2) Debt Service includes outstanding 2012 debt as noted above.

(3) Provided by the Authority.

(4) Estimates assume the Authority issues a BAN in 2021 of $40 million, $50 million new money from a projected Series 2022 to finance a new deck for North Span Newburgh Beacon with construction beginning in 2020 and an anticipated $50 million new money from a 2024 debt issuance.

Revenues available for capital projects from Table 33, including the funds from the proposed bond sales, are compared to the funds required for the capital improvement program in Table 34. The cumulative column shows that funds are estimated to be adequate through 2031 to provide for the Capital Improvement Program under the proposed toll schedule coupled with the conversion to All-Electronic Tolling and re-decking, additional toll revenues of some $2,000,000 beginning in 2024, and the proposed bond issue plan.

Table 34: Comparison of Revenue Available and Funds Required for Capital Program, Proposed Toll Schedule

Year	Revenue Available for Capital Projects (000s) (1)	Capital Improvement Program (000s) (2)	Surplus or (Deficit) (000s)	
			Annual	Cumulative
2019	$ 22,125	$ 20,299	$ 1,826	$ 50,410
2020	$ 20,577	$ 48,143	$ (27,566)	$ 22,844
2021	$ 51,878	$ 63,701	$ (11,823)	$ 11,021
2022	$ 68,473	$ 64,592	$ 3,881	$ 14,902
2023	$ 21,848	$ 29,683	$ (7,835)	$ 7,066
2024	$ 72,486	$ 37,138	$ 35,348	$ 42,415
2025	$ 20,173	$ 29,450	$ (9,277)	$ 33,137
2026	$ 19,036	$ 33,015	$ (13,979)	$ 19,159
2027	$ 27,143	$ 28,815	$ (1,672)	$ 17,487
2028	$ 25,785	$ 27,615	$ (1,830)	$ 15,657
2029	$ 24,466	$ 40,805	$ (16,339)	$ (682)
2030	$ 22,875	$ 24,890	$ (2,015)	$ (2,697)
2031	$ 21,312	$ 21,650	$ (338)	$ (3,035)
2032	$ 19,785	$ 52,650	$ (32,865)	$ (35,900)
2033	$ 18,071	$ 46,650	$ (28,579)	$ (64,479)
2034	$ 16,292	$ 18,650	$ (2,358)	$ (66,837)
2035	$ 14,519	$ 56,650	$ (42,131)	$ (108,968)

Notes: (1) From Table 33. Based on toll and other revenues.
(2) Provided by the Authority.

6.0 Net Revenue

This section of the report presents the bond resolution requirements and the net revenue for the current toll schedule and the proposed toll schedule.

6.1 Bond Resolution Requirements

The Authority has covenanted in the General Revenue Bond Resolution relating to the General Revenue Bonds, Series 2012, that the Authority shall at all times fix, charge and collect tolls for the use of the Bridge System as shall be required in order that in each calendar year Net Revenues shall at least equal the Net Revenue Requirement for each year in which Bonds are outstanding. The Net Revenue Requirement is defined in the Bond Resolution to mean, for any particular period, an amount equal to the greater of: (i) the sum of the Aggregate Debt Service and Required Deposits for such period, or (ii) 1.75 times the Aggregate Debt Service for such period. Tolls are required to produce revenues necessary to meet the coverage test for a 5-year period.

Table 35 presents total revenues through the period 2035 maintaining the current toll schedule (shown previously on page 1.10). Revenues of $61.62 million in 2018 are estimated to decrease gradually over time to $58.10 million in 2035, as the average toll decreases with the gradual increase of E-ZPass marketshare.

Table 35: Estimated Pro Forma Revenues, Current Toll Schedule, 2019 – 2035

Year	Toll Revenue (000s)		Other Revenues (000s) (1)	Total (000s)
2018	$ 59,000	(2)	$ 2,618	$ 61,618
2019	$ 59,100		$ 3,850	$ 62,950
2020	$ 57,500		$ 1,550	$ 59,050
2021	$ 57,400		$ 1,050	$ 58,450
2022	$ 57,300		$ 950	$ 58,250
2023	$ 57,300		$ 950	$ 58,250
2024	$ 57,300		$ 950	$ 58,250
2025	$ 57,200		$ 950	$ 58,150
2026	$ 57,200		$ 950	$ 58,150
2027	$ 57,200		$ 950	$ 58,150
2028	$ 57,200		$ 950	$ 58,150
2029	$ 57,200		$ 950	$ 58,150
2030	$ 57,200		$ 950	$ 58,150
2031	$ 57,200		$ 950	$ 58,150
2032	$ 57,100		$ 950	$ 58,050
2033	$ 57,100		$ 950	$ 58,050
2034	$ 57,100		$ 950	$ 58,050
2035	$ 57,100		$ 950	$ 58,050

Notes: (1) Provided by the Authority.
(2) Actual

NEW YORK STATE BRIDGE AUTHORITY TOLL TRAFFIC & REVENUE FORECASTS

Net Revenue

December 20, 2019

Table 36 presents total revenues through 2035 with the proposed phased toll increase commencing in May 2020. Revenues of $61.62 million in 2018 are estimated to increase gradually to $75.45 in 2035. While the average toll charged is expected to trend downward over time as E-ZPass marketshare increases, the increase in E-ZPass marketshare will also decrease the amount of unpaid video tolls, effectively increasing the average toll collected.

Table 36: Estimated Pro Forma Revenues with Proposed Toll Schedule, 2019 – 2035

Year	Toll Revenue (000s)	Violation Fee Revenues (000s)	Gap Closing Revenues (1)	Other Revenues (000s) (2)	Total (000s)
2018 (3)	$ 59,000	$ -	$ -	$ 2,618	$ 61,618
2019	$ 59,100	$ -	$ -	$ 3,850	$ 62,950
2020 (4)	$ 61,400	$ -	$ -	$ 1,550	$ 62,950
2021 (4)(5)	$ 60,700	$ 400	$ -	$ 1,050	$ 62,150
2022 (4)	$ 65,400	$ 400	$ -	$ 950	$ 66,750
2023 (4)	$ 70,200	$ 300	$ -	$ 950	$ 71,450
2024	$ 71,800	$ 300	$ 2,000	$ 950	$ 75,050
2025	$ 71,900	$ 300	$ 2,000	$ 950	$ 75,150
2026	$ 72,000	$ 300	$ 2,000	$ 950	$ 75,250
2027	$ 72,000	$ 300	$ 2,000	$ 950	$ 75,250
2028	$ 72,000	$ 300	$ 2,000	$ 950	$ 75,250
2029	$ 72,100	$ 300	$ 2,000	$ 950	$ 75,350
2030	$ 72,100	$ 200	$ 2,000	$ 950	$ 75,250
2031	$ 72,100	$ 200	$ 2,000	$ 950	$ 75,250
2032	$ 72,200	$ 200	$ 2,000	$ 950	$ 75,350
2033	$ 72,200	$ 200	$ 2,000	$ 950	$ 75,350
2034	$ 72,200	$ 200	$ 2,000	$ 950	$ 75,350
2035	$ 72,300	$ 200	$ 2,000	$ 950	$ 75,450

Notes: (1) Additional Toll Revenues of $2,000,000 beginning in 2024 derived from future toll increase as needed to support the issuance of $50 million new money generated from additional 30 year long term debt.

(2) Provided by the Authority

(3) Actual

(4) Phased Toll Increase Commencing in May 2020

(5) All-Electronic Conversion January 2021

Table 37 presents the estimated debt service coverage ratios through the period 2035 with no toll increase. Table 38 shows the estimated debt service coverage ratios with the phased toll increase proposed to begin in May 2020, with revenues as outlined in Table 36.

Table 37: Debt Service Coverage Ratios, Current Toll Schedule

Year	Total Revenue (000s) (1)	Operating Expenses (000s) (2)	Net Operating Revenues (000s)	Debt Service (000s) (2)	Debt Service Coverage Ratio
2018 (3)	$ 61,618	$ 27,007	$ 34,611	$ 11,237	3.08
2019	$ 62,950	$ 29,588	$ 33,362	$ 11,237	2.97
2020	$ 59,050	$ 30,766	$ 28,284	$ 11,237	2.52
2021	$ 58,450	$ 31,860	$ 26,590	$ 11,240	2.37
2022	$ 58,250	$ 32,993	$ 25,257	$ 11,235	2.25
2023	$ 58,250	$ 34,168	$ 24,082	$ 11,236	2.14
2024	$ 58,250	$ 35,534	$ 22,716	$ 11,239	2.02
2025	$ 58,150	$ 36,956	$ 21,194	$ 11,237	1.89
2026	$ 58,150	$ 38,434	$ 19,716	$ 11,237	1.75
2027	$ 58,150	$ 39,971	$ 18,179	$ -	-
2028	$ 58,150	$ 41,570	$ 16,580	$ -	-
2029	$ 58,150	$ 43,233	$ 14,917	$ -	-
2030	$ 58,150	$ 44,962	$ 13,188	$ -	-
2031	$ 58,150	$ 46,761	$ 11,389	$ -	-
2032	$ 58,050	$ 48,631	$ 9,419	$ -	-
2033	$ 58,050	$ 50,576	$ 7,474	$ -	-
2034	$ 58,050	$ 52,599	$ 5,451	$ -	-
2035	$ 58,050	$ 54,703	$ 3,347	$ -	-

Notes: (1) From Table 35
(2) Provided by the Authority.
(3) Actual

Table 38: Debt Service Coverage Ratios, with Proposed Toll Schedule

Year	Total Revenue (000s) (1)	Operating Expenses (000s) (2)	Net Operating Revenues (000s)	Debt Service (000s) (2)	Debt Service Coverage Ratio
2018 (3)	$ 61,618	$ 27,007	$ 34,611	$ 11,237	3.08
2019	$ 62,950	$ 29,588	$ 33,362	$ 11,237	2.97
2020	$ 62,950	$ 31,136	$ 31,814	$ 11,237	2.83
2021	$ 62,150	$ 35,620	$ 26,530	$ 12,253	2.17
2022	$ 66,750	$ 33,841	$ 32,909	$ 14,436	2.28
2023	$ 71,450	$ 34,768	$ 36,682	$ 14,834	2.47
2024	$ 75,050	$ 35,887	$ 39,163	$ 16,676	2.35
2025	$ 75,150	$ 37,065	$ 38,085	$ 17,912	2.13
2026	$ 75,250	$ 38,300	$ 36,950	$ 17,913	2.06
2027	$ 75,250	$ 39,596	$ 35,654	$ 8,511	4.19
2028	$ 75,250	$ 40,953	$ 34,297	$ 8,512	4.03
2029	$ 75,350	$ 42,375	$ 32,975	$ 8,509	3.88
2030	$ 75,250	$ 43,864	$ 31,386	$ 8,510	3.69
2031	$ 75,250	$ 45,424	$ 29,826	$ 8,514	3.50
2032	$ 75,350	$ 47,056	$ 28,294	$ 8,509	3.33
2033	$ 75,350	$ 48,764	$ 26,586	$ 8,516	3.12
2034	$ 75,350	$ 50,550	$ 24,800	$ 8,508	2.91
2035	$ 75,450	$ 52,419	$ 23,031	$ 8,512	2.71

Notes: (1) From Table 36
(2) Provided by the Authority. Estimates assume the Authority issues a BAN in 2021 of $40 million, $50 million new money from a projected Series 2022 to finance a new deck for North Span Newburgh Beacon with construction beginning in 2020 and an anticipated $50 million new money from a 2024 debt issuance.
(3) Actual

7.0 Limitations and Disclaimers

It is Stantec's opinion that the traffic and toll revenue estimates provided herein represent reasonable and achievable levels of traffic and toll revenues that can be expected to accrue at the Authority's toll facilities over the forecast period and that they have been prepared in accordance with accepted industry-wide practice. However, as should be expected with any forecast, and given the uncertainties within the current economic climate, it is important to note the following assumptions which, in our opinion, are reasonable:

- This limited synopsis presents the highlighted results of Stantec's consideration of the information available as of the date hereof and the application of our experience and professional judgment to that information. It is not a guarantee of any future events or trends.
- The traffic and toll revenue estimates will be subject to future economic and social conditions, demographic developments and regional transportation construction activities that cannot be predicted with certainty.
- The estimates contained in this document, while presented with numeric specificity, are based on a number of estimates and assumptions which, though considered reasonable to us, are inherently subject to economic and competitive uncertainties and contingencies, most of which are beyond the control of the Authority and cannot be predicted with certainty. In many instances, a broad range of alternative assumptions could be considered reasonable with the availability of alternative toll schedules, and any changes in the assumptions used could result in material differences in estimated outcomes.
- The standards of operation and maintenance on all of the System will be maintained as planned within the business rules and practices.
- The general configuration and location of the System and its interchanges will remain as discussed in the report.
- Access to and from the System will remain as discussed in the report.
- No other new competing highway projects are assumed to be constructed or significantly improved in the project corridor during the project period, except those identified within the report.
- Major highway improvements that are currently underway or fully funded will be completed as planned.
- The System will be well maintained, efficiently operated, and effectively signed to encourage usage.

- No reduced growth initiatives or related controls that would significantly inhibit normal development patterns will be introduced during the forecast period.
- There will be no future serious protracted recession during the forecast period.
- There will be no protracted fuel shortage during the forecast period.
- No local, regional, or national emergency will arise that will abnormally restrict the use of motor vehicles.

In Stantec's opinion, the assumptions underlying the study provide a reasonable basis for the analysis. However, any financial projection is subject to uncertainties. Inevitably, some assumptions used to develop the projections will not be realized, and unanticipated events and circumstances may occur. There are likely to be differences between the projections and actual results, and those differences may be material. Because of these uncertainties, Stantec makes no guaranty or warranty with respect to the projections in this study.

This document, and the opinions, analysis, evaluations, or recommendations contained herein are for the sole use and benefit of the contracting parties. There are no intended third-party beneficiaries, and Stantec Consulting Services Inc. (and its affiliates) shall have no liability whatsoever to any third parties for any defect, deficiency, error, omission in any statement contained in or in any way related to this document or the services provided.

Neither this document nor any information contained therein or otherwise supplied by Stantec Consulting Services Inc. in connection with the study and the services provided to our client shall be used in connection with any financing solicitation, proxy, and proxy statement, proxy soliciting materials, prospectus, Securities Registration Statement or similar document without the express written consent of Stantec Consulting Services Inc

Sincerely,

STANTEC CONSULTING SERVICES INC.