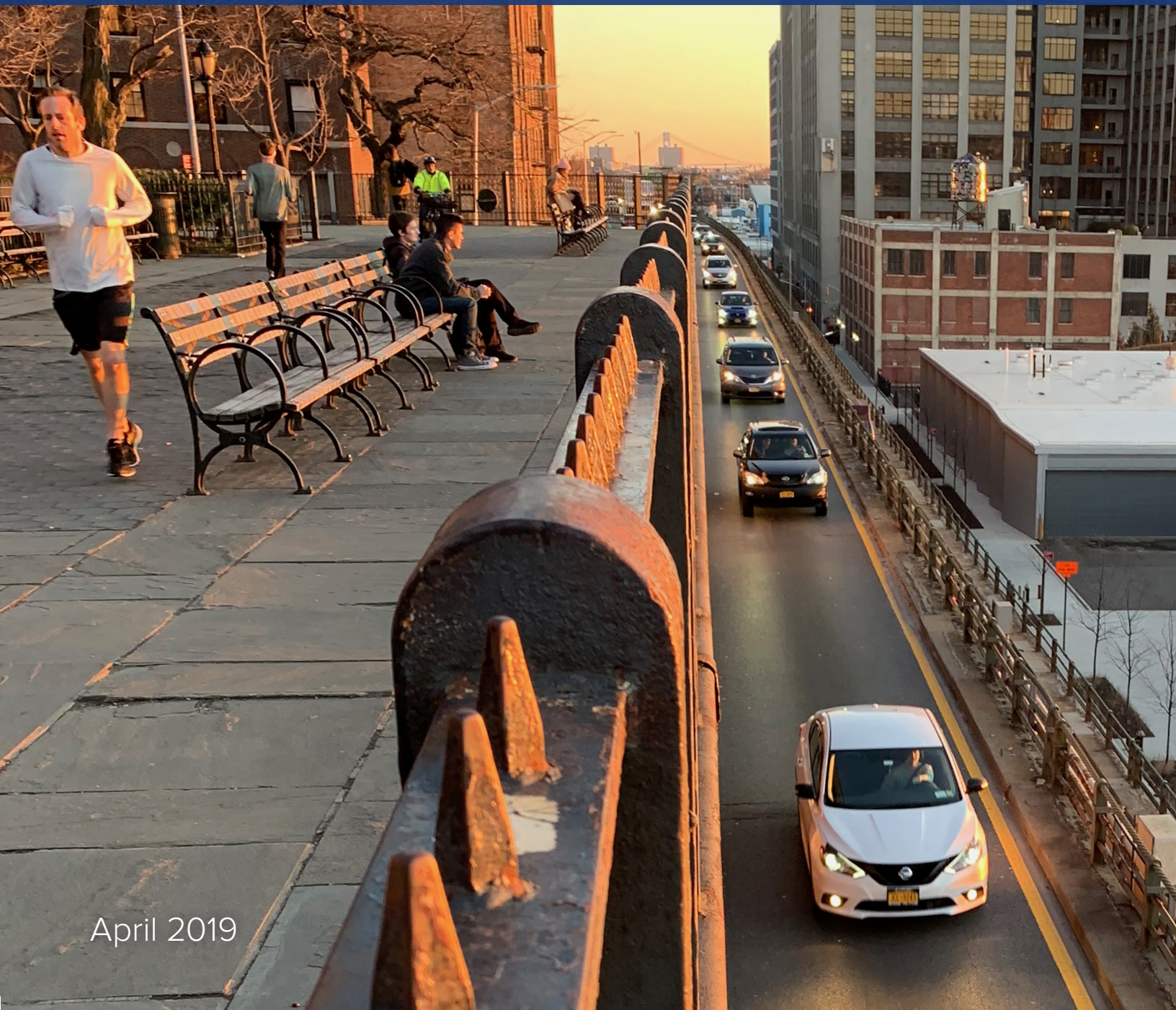




Regional Plan Association

Reimagining the BQE

Policy Options to Reduce Traffic on the
Brooklyn-Queens Expressway



April 2019



photo: Eric Pasquall

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Introduction and Summary of Findings

This report seeks to expand the list of realistic alternatives for restoring the Brooklyn-Queens Expressway (BQE) as a safe, efficient corridor for moving people and goods, one that serves both citywide and neighborhood residents and businesses.

In fall 2018, Regional Plan Association was asked by A Better Way, a local community organization in Brooklyn, to evaluate the BQE project to reconstruct a 1.5 mile section of the highway from Sands Street to Atlantic Avenue. The project area includes the unique “triple cantilever,” a section of highway supporting two levels of traffic and the Brooklyn Heights Promenade, an historic and iconic pedestrian walkway that is a cherished open space for neighborhood and city residents. The Promenade was built as a benefit to the community when the highway was first constructed in the middle of the last century.

The New York City Department of Transportation (NYC DOT) has proposed to reconstruct the highway in its current location as largely the same structure that currently exists. These plans have the purpose of providing capacity for the roughly

150,000 vehicles that use the highway today. NYC DOT has presented two preliminary construction staging concepts so far: a temporary six-lane highway over the Brooklyn Heights Promenade or a bi-level temporary highway combined with rolling lane-by-lane closures.

Regional Plan Association has a long history with the BQE. In the 1920s and 1930s, RPA recommended the construction of the BQE as an efficient way to move goods and people between the Gowanus Parkway and the Triborough Bridge. RPA originally developed the idea as an alternative to Robert Moses’ proposed Brooklyn Battery Bridge, which would have been even more detrimental to communities on both sides of the East River. However, as the environmental and social impacts of highway construction have become increasingly clear over the last century, RPA has become a strong advocate for reducing car dependency, and providing reliable and affordable alternatives to private vehicle travel. In particular, RPA wanted to see if policy changes affecting the regional network could reduce demand on the BQE, providing better options for rebuilding the aging highway.

RPA hopes this report will help reframe the dialogue as the project moves forward, and lead to a design that is more acceptable to the city and neighboring communities.

Key findings and recommendations

The project evaluated five policy options using available public data and assumptions for how drivers would respond to the changes in incentives and requirements embodied in each alternative. It also conducted a scan of other urban highways, both in New York City and elsewhere, that were either permanently replaced or temporarily had traffic reduced either through reduced capacity or policies that restricted traffic.

The results should be considered order-of-magnitude estimates that should be tested and evaluated with more detailed analysis and traffic modeling. However, the findings strongly suggest that these policies, some individually and others in combination, could reduce traffic enough to accommodate remaining demand with fewer lanes than the existing six-lane highway.

- ▶ **The congestion pricing plan recently approved by the New York State legislature** could, depending on how it is implemented, remove enough cars and trucks from the relevant section of the BQE to allow remaining traffic to be accommodated with a four-lane highway.
- ▶ **Requiring cars on the BQE to have three or more occupants during peak periods** could also reduce traffic sufficiently to accommodate remaining traffic with a four-lane highway.
- ▶ **Two other policy changes**—reinstating two-way tolls on the Verrazano Bridge and requiring cars to have three or more passengers when crossing the free East River bridges—would have less impact but still reduce traffic significantly.

- ▶ **A smaller highway** should still be considered, even if these policies would not reduce traffic sufficiently to accommodate all remaining demand with a four-lane highway. Other cities have transformed urban highways to achieve neighborhood and regional benefits without substantially worsening traffic.

Based on these findings, we recommend three actions that would create the conditions for an improved BQE that maximizes benefits for the city, state and affected neighborhoods:

- 1. The congestion pricing policy approved by Governor Cuomo and the legislature** should be designed to maximize traffic reduction on the BQE and other roadways. In addition to the wider benefits of reduced congestion, increased funding for transit, improved air quality and public health, this is one of the most potent policy tools for reducing traffic on the BQE.
- 2. New York City DOT** should further evaluate the potential impact of policies described in this report and proposals beyond the current alternatives as part of the Environmental Impact Statement. NYC DOT should also establish an independent advisory group using expertise of top architects, transportation experts, community leaders and urban planners to advise the process.
- 3. New York State** should be an active partner with New York City to implement demand management policies and reconstruct the highway to achieve the best outcomes for residents of the city and state.

What this report is and what it is not

This report evaluates a range of policies that could reduce the amount of passenger and commercial traffic on the BQE, potentially reducing the number of traffic lanes required both during and after reconstruction.

This report does not lay out an “alternative” that can be reviewed in the environmental review nor does it offer a specific design proposal.



photo: RPA



Summary of NYC DOT project

Reconstruction of the BQE represents a particular challenge. Its traffic volumes are particularly heavy and its physical constraints are many. While New York City has assumed the burden of repairing the highway, many actions to manage or divert traffic would need state or federal approval.

History

The BQE was built starting in 1944 by Robert Moses. Like other urban highways, construction was controversial because it cut through city neighborhoods and displaced residents. In the 1940s and 1950s, the Brooklyn Heights community fought Robert Moses and the government's traditional six-lane highway design. A concession to appease opponents was a highway with a smaller width and in an unusual three deck structure. The design allowed a park on top, which became the iconic Brooklyn Heights Promenade. The BQE has since become one of the most heavily used urban highways in the nation, and serves a vital transportation corridor. As Brooklyn's only interstate highway, the BQE is subject to federal as well as state regulations.

The triple cantilever has not had a major rehabilitation since it was constructed decades ago, and concerns are growing about its safety. From 2006-2011, New York State Department of Transportation initiated a process to evaluate alternatives to fix the roadway. That process was terminated in 2011 due to budget constraints, although it's likely that strong community opposition also played a role.



A triple cantilever supports the BQE on two lower levels and the Brooklyn Heights Promenade on the top level.

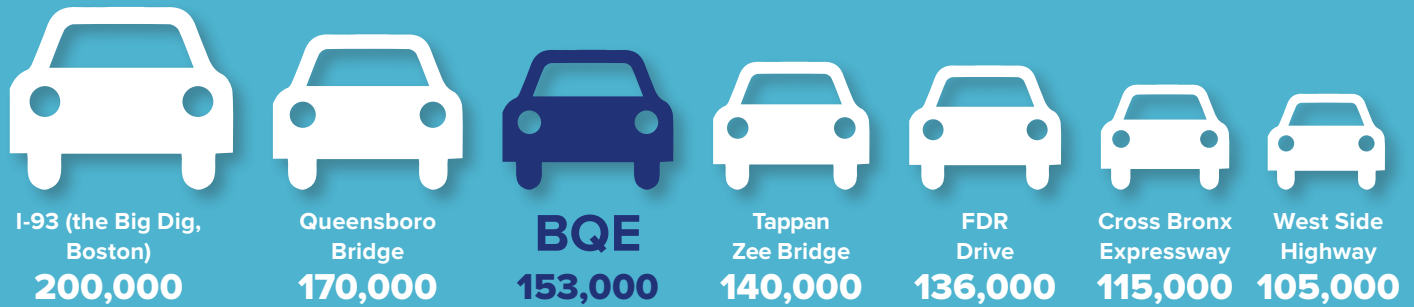
NYS DOT did not move forward with the project, and in 2014, worried about the condition of the road, NYC DOT started its own project to rebuild the highway. NYC DOT has worked since to develop a manageable, doable solution that minimizes impacts.

NYC DOT now estimates that the highway is so deteriorated that trucks may need to be banned from the roadway in 2026. It estimates that the roadway may not be safe for any vehicular travel as soon as 2036.

The project is complicated and very expensive, expected to cost between \$3 and \$4 billion, making it one of the most expensive projects in the NYC capital program. NYC DOT has authority to repair the roadway using Design Build, but the Request for Qualifications needs to be authorized by April 2020.

The BQE sees high traffic volumes

Average number of vehicles per weekday:



Current status

In September 2018, the NYC DOT presented updated plans to repair the deteriorating 1.5 mile stretch of the BQE extending from Atlantic Avenue to Sands Street.

NYC DOT plans to begin its Environmental Impact Statement work in 2019, but current plans call for reconstructing the highway in its current location as largely the same structure that currently exists.

NYC DOT is evaluating feasible construction concepts. Of the two concepts presented in September 2018, the preferred option would construct a temporary structure over the Brooklyn Bridge on ramp and above the Promenade.

One of the biggest challenges facing the reconstruction is the very high traffic volumes on the BQE, which sees over 150,000 vehicles on the average weekday.

The highway is actually a series of interconnected bridges snaking through Brooklyn. The NYC DOT Bridges Division is leading the reconstruction effort.

NYC DOT project parameters

Different underlying assumptions for how the new highway section should be designed and built could lead to a different project.

NYC DOT parameters for the project's design and construction include the following:

- ▶ Maintain the existing traffic capacity and local connections in order to minimize congestion and safety impacts on local streets and regional transportation network.
- ▶ Rebuild in generally the same footprint, given the surrounding geographic constraints (bridges and other infrastructure, historic Brooklyn Heights, Brooklyn Bridge Park, etc).
- ▶ Given that this is a City of New York project, NYC DOT is operating under the constraints of local control. For example, City roads and bridges are not tolled, unlike those of Port Authority and MTA.¹

¹ https://9670f26306f0aa722eb1-bf8a0720b767c6949515361a19a9737f.ssl.cf2.rackcdn.com/uploads/website_attachment/attachment/174/Final_Public_Meeting_Presentation_9_27.pdf

Travel Demand Management

Policy changes are often used to reduce traffic on roads and eliminate the need to new or wider highways. There are various options that government has at its discretion – freight policy that encourages night time deliveries, improvements to transit service to provide alternatives

means of travel, restrictions on use by single-occupancy vehicles, or pricing strategies that discourage driving during busy times of day.

In the transportation world we call these strategies “demand management,” and they have been proven in many cases to reduce traffic.²

² https://ops.fhwa.dot.gov/plan4ops/trans_demand.htm



photo: Ryan DeBerardins

Examples from Other Urban Highways

Throughout the world, cities are rethinking urban highways that were constructed in the middle of the 20th century to accommodate the automobile as the primary means of transportation. In hindsight, the mistakes and excesses of many of those decisions are clear, from dissected neighborhoods to increased air pollution and traffic-related deaths and injuries. Yet we continue to live with the consequences of those decisions decades later. Rehabilitation and new construction projects present opportunities to correct some of these consequences.

Today, cities from San Francisco to Milwaukee have taken down many of these freeways, turning them into boulevards or smaller highways, and to the surprise of many, without worsening traffic.

While evidence is mounting that removal of highway lanes results in reduced traffic and seldom results in the kind of congestion that is frequently feared, the phenomenon is not well understood. This makes it a difficult option to pursue without understanding the context for particular projects, but one that deserves consideration for the BQE. Some past examples, both in New York City and elsewhere, provide outcomes to consider when thinking about rebuilding this segment of the BQE:



photo: M. Shcherbyna

Williamsburg Bridge

After determining that the Williamsburg Bridge was no longer safe, NYC DOT closed it to all traffic on April 11, 1988. The bridge was reopened—for cars only—on May 27. The average daily traffic of approximately 107,000 vehicles was absorbed into the system³. Data are not available showing how the traffic was dispersed, but based on annual bridge traffic reporting, it appears that about half the displaced traffic was accommodated on the Queensboro Bridge. It is unlikely that most of this traffic was shifted to the Manhattan Bridge, as that bridge (Manhattan), experienced a drop in traffic in the same year and continued to show decreases in the year after. It is possible that some individual trips that had been made on the

³ Williamsburg Bridge ADT for 1987 and 1989 (the years surrounding the shutdown) is 107,362 and 107,386 respectively. In 1988, when the bridge was shut down for 46 days, the ADT was 102,643. This analysis assumes 107k as the normal level of traffic with 102k the average over the entire year. The numbers are from 2016 New York City Bridge Traffic Report produced by the NYC DOT <http://www.nyc.gov/html/dot/downloads/pdf/nyc-bridge-traffic-report-2016.pdf> in particular page 61 East River Bridges average daily traffic volumes 1948-2016.

Williamsburg Bridge did shift to the Manhattan Bridge, but those individual trips would have displaced trips from the Manhattan Bridge as more trips were shifted away.

We were not able to obtain historic data on the Manhattan Bridge's status but speculate that the decrease in traffic on the Manhattan Bridge, at that time, was due to lane closures associated with bridge repairs. Since 1982 the bridge has been in a near constant state of repair⁴ with 15 repair contracts awarded—the latest for \$80 million—between 1982 and 2018. While the city has experienced significant population growth since the 1980s, the example still provides an example of the effect of reduced highway capacity



West Side Highway

In 1973 part of the West Side highway collapsed under the weight of a truck. The highway, which had carried ~140,000 average daily vehicles⁵ was subsequently closed and de facto converted into a boulevard until an actual reconstruction project was completed. We have not been able to obtain specific traffic impacts due to the closure, but by one account 53 percent of the traffic formerly carried on the highway simply disappeared.⁶

⁴ An argument can be made that when bridges are repaired the capacity is not maintained though steps are taken to minimize impact. It is not without precedent then to simply reduce capacity for maintenance.

⁵ Keenan, Edward June 5, 2015 "San Francisco's waterfront freeway was removed 25 years ago. No one misses it" Toronto Star <https://www.thestar.com/news/gta/2015/06/05/san-francisco-waterfront-freeway-was-removed-25-years-ago-no-one-misses-it.html>

⁶ Removing Freeways, Restoring Cities <http://www.preservenet.com/freeways/Freeway-sWestSide.html>



Embarcadero, San Francisco, CA

In 1989 the Loma Prieta earthquake severely damaged the Embarcadero freeway. The Embarcadero, which served over 100,000 trips per day, was replaced by a boulevard that carries about 70 percent of that traffic. In the time frame that the freeway was closed, removed, and reconstructed, public transit trips in areas defined as "impact zones" increased ~75 percent.⁷



MacGrath Highway, Somerville, MA

When the MacGrath Highway was in need of repair, MassDOT decided to establish a working group to investigate options and advise on the possible design. Through a 15-month community and design process, MassDOT decided to "ground" a six-lane overpass of Route 28, and transform it into an at grade boulevard with four lanes of traffic. The process resulted in a selection of a four-lane boulevard design with pedestrian and bicycle improvements. MassDOT is currently pursuing environmental permits so it can start design and construction. While traffic volumes are much lower than the BQE, the community and design process could provide a model for the BQE.

⁷ Billings, Jason (2011) The Impacts of Roadway Capacity Removal. https://opencommons.uconn.edu/cgi/viewcontent.cgi?referer=https://www.google.com/&httpsredir=1&article=1103&context=gs_theses

Cities are transforming urban highways:

Paris - Georges Pompidou Expressway, which served 43,000 cars per day was transformed into a waterfront “beach” and pedestrian walkway. The Mayor tested a closure by temporarily closing the street to traffic in 2002. After an eight year period of closing the road temporarily, support for a permanent closure grew and he transformed the highway into a 35 acre park.

Seoul - Cheonggyecheon Freeway served 168,000 cars per day. It was torn down and is now a beautiful green space in the city and the city has increased transit significantly to accommodate traffic.

Seattle, WA - Alaskan Way Viaduct in Seattle was buried underground to open up waterfront space for parks and housing.

Rochester, NY - Through the Inner Loop East Transformation Project, this highway was converted into a boulevard with sidewalks and bicycle lanes.

Milwaukee, WI - Park East Freeway was transformed into a park and landscaped walkable boulevard.



Traffic volumes of freeways removed

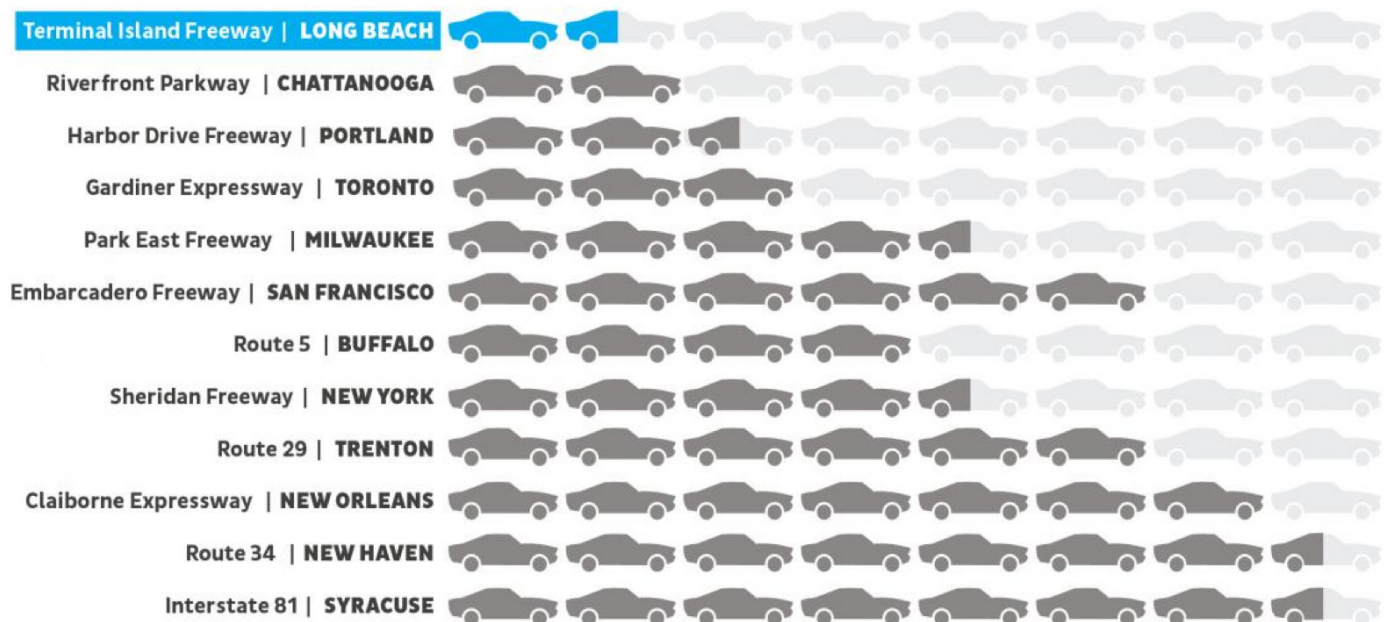


Chart by Congress for New Urbanism

10,000 AADT



Traffic Estimates for Five Policy Options

This analysis describes the impact of potential policy changes on BQE traffic demand, particularly on the section from Sands Street to Atlantic Avenue that the NYC DOT plans to reconstruct. The objectives are to identify which policies have the most potential for reducing traffic, and whether any could reduce traffic sufficiently to consider a structure with fewer than six lanes, either permanently or temporarily while the section is under reconstruction.

In addition to these policies—congestion pricing, two-way tolling on the Verrazano Bridge, and two HOV alternatives—the potential impact of reducing this section of the BQE to a four lane highway without any related policy change is discussed.

These results were derived from spreadsheet analysis using publicly available data, including output from the Balanced Transportation Analyzer (BTA) developed by Charles Kom-anoff. Assumptions were informed by historic precedents, but in large measure rely on judgements for how drivers would logically respond to the restrictions or incentives embodied in each alternative. These should be considered order-of-magnitude estimates rather than more precise estimates that could be derived from highway network traffic modeling.

Existing traffic and lane requirements

Currently, the BQE serves around 31,800 vehicles in the 4:00 – 8:00 PM peak period, 15,300 eastbound and 16,500 westbound.⁸ Automobiles represent 91 percent of the eastbound vehicles and trucks makeup the remainder. The westbound vehicles are 93 percent passenger cars. Based on these conditions, and today's mix of trucks and passenger vehicles, a BQE lane, at peak use, serves around 1,550 vehicles/lane/hour, i.e., that volume is currently served by the more heavily trafficked westbound lanes. For the purpose of this analysis, trucks are converted to their passenger car equivalent (PCE). Since trucks are larger and require more road capacity, a truck will usually count for more than one PCE. The number will vary by the type of truck.⁹

The newly constructed BQE, including any temporary structure is likely to have an hourly lane capacity of 1,800 PCEs. This matches peak volumes in the traffic model used by NYC DOT and other transportation agencies, and is consistent with agency assumptions for a reconstructed highway.

BQE vehicle traffic in the 4:00-8:00 PM evening peak

	Auto- mobiles	Trucks/ Buses	Total (PCE)	Hourly traffic	Vehicles/ lane/hour
Eastbound	13,900	1,380	16,860	4,200	1,510
Westbound	15,500	1,000	17,760	4,400	1,565
Total	29,400	2,380	34,620	8,600	

Source: NYC DOT BQE Origin and Destination Study 2016 Appendix C

⁸ PM peak period was used for this analysis.

⁹ Trucks on urban, congested highways have a capacity impact equivalent to between two and three passenger vehicles (FHWA 2000 Comprehensive Truck Size and Weight Study chapter 9 Table 9-2) <https://www.fhwa.dot.gov/reports/tswstudy/Vol3-Chapter9.pdf>. Converting the current mix to PCEs yields a capacity of ~2,100 vehicles/per lane/hour.

Policy scenarios

Of the scenarios described below, scenarios 1 and 3 would affect only trips that originate in or are destined for Manhattan, and the other three would potentially affect all the trips. Scenario 1, implementing the Fix NYC congestion pricing proposal, would reduce BQE traffic by both reducing overall traffic volumes into Manhattan and effectively equalizing the money cost (as opposed to the time cost) of entering Manhattan on all crossings. Scenario 2 examines the impact of two-way tolling on the Verrazano Narrows Bridge (VNB), thereby increasing the cost of eastbound travel from Staten Island and New Jersey. Scenarios 3 and 4 look at implementing high occupancy vehicle (HOV) restrictions on the East River crossings and the BQE, respectively. Scenario 5 describes lane reduction without pricing or demand management policies. In a system that already operates at capacity, a lane reduction will yield the amount of traffic that can be accommodated. There is no additional analysis required to support this conclusion. That would be considered unmet demand at the price point (time cost plus vehicle operating cost as there is no road use cost). What happens with this demand is a separate but important question.

While each of these scenarios estimates the traffic impacts of a single policy change, it may be desirable implement multiple policy changes. For example, congestion pricing is likely to have a greater impact on automobile traffic while two-way tolling on the Verrazano Narrows Bridge would have a larger impact on trucks. The scenarios also do not consider how improvements in transit or project design could help to further reduce traffic.



Scenario 1: Fix NYC congestion pricing plan

The historic agreement by Governor Cuomo and the New York State legislature to implement a charge for driving into the Manhattan central business district also provides a unique opportunity to manage traffic on the BQE. Many of the details for how the charge will be implemented are still to be determined, and these will have a significant effect on how much traffic is reduced on the BQE. This analysis uses recommendations from the Fix NYC Advisory Panel to estimate the potential effects of a congestion charge, understanding that the actual effects will depend on the implementation plan that is eventually adopted.

Modeling of current traffic in the section of the BQE that needs to be reconstructed shows that ~25 percent of the eastbound peak automobile traffic and nine percent of truck traffic is ultimately destined for Manhattan. Nearly half of this Manhattan bound traffic, or 12 percent of all eastbound auto traffic, originates in Brooklyn, accessing the highway at Atlantic Avenue or points further south. Manhattan bound autos from Staten Island account for ten percent of eastbound traffic and New Jersey origins account for an additional four percent. Westbound traffic originating in Manhattan comprises 20 percent of automobiles and 48 percent of trucks.

With the exception of those vehicles entering at Atlantic (about eight percent of total BQE traffic measured prior to the Cadman Plaza West exit), all the Manhattan bound traffic on the link bypasses the Hugh Carey Tunnel, formerly the Brooklyn Battery Tunnel (BBT). The Fix NYC Advisory Panel Report indicates that trips into the Manhattan CBD from all directions would be reduced by 13 percent if Fix NYC policies were to be implemented. That outcome aligns with the Fix NYC higher-range plan¹⁰ analyzed in the Balanced Transportation Analyzer (BTA). All of the traffic reduction should be expected to come at entry points, including the free East River bridges, that are currently un-tolled and, therefore, currently serving a disproportionate share of Manhattan bound traffic, i.e., little to none of the Manhattan bound traffic currently using a tolled facility is likely to divert or forego the trip. Hence, to achieve a 13 percent overall reduction there would be disproportionate reductions at the un-tolled facilities and little or no reduction at the tolled facilities.

This scenario assumes that the 13 percent traffic reduction would be distributed equally among the market segments that currently include free entry points, primarily from upper Manhattan into Midtown and from Brooklyn into Lower Manhattan. If there is a 13 percent reduction from cars using the Brooklyn Battery Tunnel and free East River crossings into lower Manhattan, and all of this came off of the free crossings, there would be a 17 percent reduction in traffic on the free crossings.

In addition, equalizing the tolls across the BBT and the East River crossings would remove the incentive for most drivers to bypass the tunnel in favor of the Brooklyn and Manhattan Bridges.¹¹ For some drivers, particularly those destined for Canal Street and its environs, the East River crossings might still be a preferred route. The limited street network on the Manhattan side of the BBT could also constrain the number of drivers taking this route. But for most passenger vehicle drivers and some truck drivers, passage through the BBT would be both viable and preferred.

The assumed diversion in this scenario would be between 60 percent and 80 percent of the remaining Manhattan bound auto traffic. A slightly lower range of 50 percent to 70 percent was used for trips originating in Manhattan, since the final destination for these trips is more dispersed. Some portion of the truck traffic can be accommodated in the Hugh Carey Tunnel but the

¹⁰ There are three FixNYC plans, "higher-range" is the mid-level

¹¹ This scenario assumes that the congestion charge would match tolls on the BBT in both directions. This could be achieved either by have the congestion charge applied both when entering and leaving Manhattan, or by changing tolls on the BBT to a one-way toll entering Manhattan.

tunnel restrictions are somewhat more constraining than the Manhattan Bridge restrictions. Without additional information, this scenario uses the arbitrary assumption that 30 percent of the existing truck traffic can and will be diverted.

In summary, the assumptions for this scenario are:

- ▶ A final congestion pricing plan approximating FixNYC recommendations is implemented, resulting in a 13 percent reduction in overall traffic realized as a 17 percent reduction on the East River crossings.
- ▶ Between 60 percent and 80 percent of the remaining Manhattan bound automobile traffic (eastbound) uses the Hugh Carey Tunnel.
- ▶ Between 50 percent and 70 percent of remaining automobile traffic with Manhattan origins (westbound) uses the Hugh Carey Tunnel.
- ▶ Buses and two and three-axle single unit trucks in both directions can fit in the tunnel and will use it in the same proportion as passenger vehicles.

The more conservative estimate of 60 percent diversion of trips with a Manhattan trip end yields an eastbound demand of 3,600 PCE vehicles/hour, and westbound 3,800. The higher estimate of 80 percent diversion yields an eastbound demand of 3,450 PCE vehicles/hour, with 3,600 in the peak (westbound) direction.

**Trip reductions and diversions
resulting from Fix NYC higher-range plan**

	Current (PCE)	Trip reduction (1)	Low Diversion (2)	High Diversion (3)	Low Diversion Lanes Required	High Diversion Lanes Required
Eastbound	4,200	4,000	3,600	3,450	2	2 (1.9)
Westbound	4,400	4,250	3,800	3,600	2 (2.1)	2

(1) All BQE trips with starting or ending in Manhattan reduced by 17 percent
 (2) 60 percent of remaining Manhattan based trips diverted to BBT
 (3) 80 percent of remaining Manhattan based trips diverted to BBT

Only vehicles with a Manhattan origin or destination are affected by this policy scenario. Both scenarios would reduce traffic to approximate levels that could be handled by four lanes of traffic. Estimated trips in the low diversion scenario are ~200 trips/hour more than is comfortably accommodated in two lanes in the peak period. However, all of the estimates are approximate and would be within an error margin that warrants further analysis. Also, as described below, some level of unmet demand, or peak spreading could be accepted to meet other policy objectives.



**Scenario 2:
Two-way tolling on the Verrazano
Narrows Bridge**

Vehicles using the Verrazano Narrows Bridge (VNB) pay tolls only in the westbound direction (crossing from Brooklyn into Staten Island). This effectively discounts the trip from Staten Island to other parts of NYC, and the discount also applies to trips originating west of Staten Island. The table below shows the number of vehicles on the select link that utilize the VNB (in both directions). As expected, westbound trips –where payment is made—are fewer than eastbound trips. An equalization of the toll, i.e. charging half the total but in each direction, would shift some of the eastbound trips to other routes.

**Verrazano Narrows Bridge Vehicles
in Morning and Evening Peak**

	Automobiles		Trucks	
	AM Peak	PM Peak	AM Peak	PM Peak
Eastbound	4,930	3,340	1,170	680
Westbound	2,590	4,350	280	100

Source: NYC DOT BQE Origin and Destination Study 2016 Appendix C

All trips that traverse the VNB would be affected by a change in tolls, but this is a potentially small number, especially for automobiles. We assume that eastbound AM traffic corresponds to westbound PM traffic and vice versa. Eastbound traffic in the PM peak—3,340 cars and 680 trucks—would not be likely to fall below the volume of westbound traffic in the AM peak—2,600 cars and 280 trucks. Vehicles that travel westbound are likely taking a symmetrical eastbound trip. Since they are already paying the toll, it is safe to assume that they will not alter their eastbound behavior if they pay the same amount with a two-way toll. If we assume that the difference between westbound PM and eastbound AM are price sensitive drivers that alter their morning and evening trips, then the number of automobile trips likely to be affected is ~750 (less than 200/hour). Truck traffic would not necessarily have the same symmetry. But even if all of those are diverted, the remaining traffic demand would exceed the level that could be accommodated by four lanes. Therefore, equalization of VNB tolls, in and of itself, would still require five lanes. However, it could be an important part of a comprehensive program of traffic management and would have other benefits, such as reduced truck traffic along Canal Street in Manhattan.



HOV 3+ on the free bridges

Scenario 3: HOV 3+ on the free bridges

To estimate how much traffic would be reduced with an HOV restriction requiring at least three occupants per vehicle (HOV 3+), we used data generated from the HOV restrictions that were implemented following the 9/11 attack on the World Trade Center. The is the most relevant precedent for estimating what might occur if similar restrictions were placed on the East River bridges today. Shortly after September 11, 2001, NYC DOT restricted the East River crossings to HOV 3+. The restriction was to maximize the system capacity while much of the subway system and part of the road system were not operable. Given the extreme reduction in system capacity, the impetus for the emergency measure was to accommodate as many person trips as possible in as few vehicles as practicable. Implemented on September 27th, and encompassing all access to the hub, the city experienced a 23 percent reduction in traffic below 60th street and a 30 percent reduction on the city's bridges. On October 17th the restricted period was rolled back to cover only the "traditional" peak period 6am to 10am.¹² The reduction in bridge traffic was re-estimated in October to be 23 percent (this could be due to increases in traffic due to more city functions recovering and/or to the reduced period in which the restriction was implemented). Also, at the time, local newspaper reports indicated that enforcement was relatively lax and the vehicle increase could be due to increasingly bold scofflaws.

Using the 23 percent peak period reduction after 9/11 as a benchmark, this scenario assumes that implementation of an HOV 3+ requirement will yield a 20 percent to 25 percent reduction in vehicle traffic over the East River bridges. Applying this reduction to the BQE traffic with Manhattan origins and destinations yields a peak period PCE demand of ~32,400 to 32,900 vehicles.



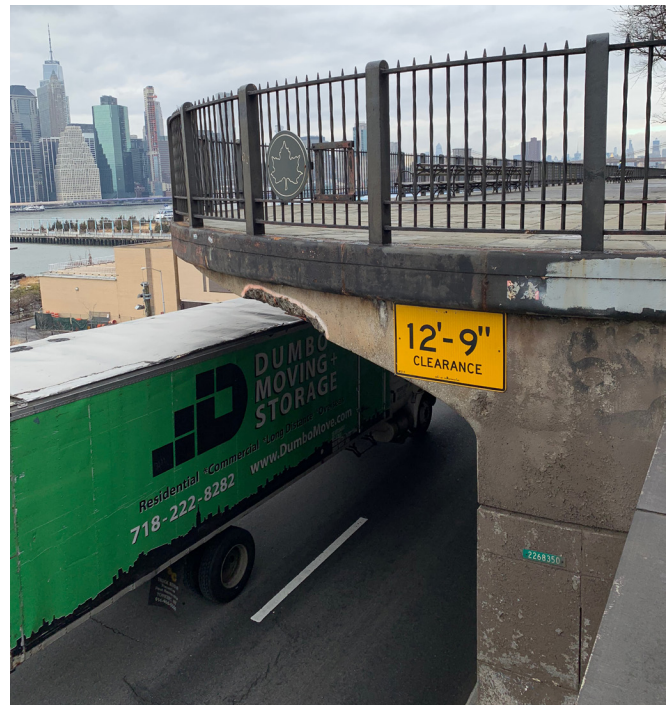
HOV 3+ on the full length of the BQE

Scenario 4: HOV 3+ on the full length of the BQE

An HOV restriction on the entire length of the BQE would affect all automobiles, not just those with a Manhattan origin or destination. Applying the same assumption used in Scenario 3 of a 20-25 percent reduction to BQE traffic yields a peak period demand of 27,500 PCE to 28,900 PCE vehicles. This level of traffic could be accommodated by four lanes. The impacts would obviously be wider as well, requiring carpooling for through traffic and along routes for which there are few transit options.

Trip reductions and diversions resulting from HOV implementation

	Current (PCE)	HOV 3+ Bridges (25%)	HOV 3+ Bridges Lanes Required	HOV 3+ BQE Atlantic to Sands	HOV 3+ BQE Lanes Required
Eastbound	4,200	3,900	3 (2.2)	3,500	2 (2-)
Westbound	4,400	4,200	3 (2.3)	3,700	2 (2+)
Total	8,600	8,100	6	7,200	4



¹² USDOT ITS Joint Program Office (April 2002) Effects of Catastrophic Events on Transportation System Management and Operations NYC September 11, 2001.

Lane Reduction



photo: Mai Justrace

Scenario 5: Lane reduction

Traffic is a function of demand for a finite capacity. When congestion exists there is greater demand than capacity but that extra demand is unserved. It is typically referred to as latent demand. Latent demand is one reason that capacity increases result in more traffic, not faster travel and reduced congestion. Another factor is induced demand, i.e., by adding capacity travel can become faster—effectively cheaper since time is money. In economic terms the price of travel is reduced and that draws more consumers into the market. The “price drop” (time is money) induces more people to travel on that route, by that mode, at that time.

The converse is also true. If capacity is reduced the added time will dissuade some people from their interest in the trip. Capacity is also a binding constraint on the number of trips that can be served. Demand will only be as much as the capacity to accommodate it.

If the BQE is reduced to four lanes without other policy changes to reduce demand, some of the unmet demand will spill onto the rest of the existing network and some trips will be suppressed. In some cases, auto drivers will switch to transit when transit options are available. In other cases where there is some discretion and desirable options do not exist, the trip will not be made at all. Estimating how many trips would be diverted to other parts of the road network, to subways and buses, or would not be made at all would require further analysis. As described earlier, other urban highways have been converted to smaller facilities without obvious negative effects.

Summary table

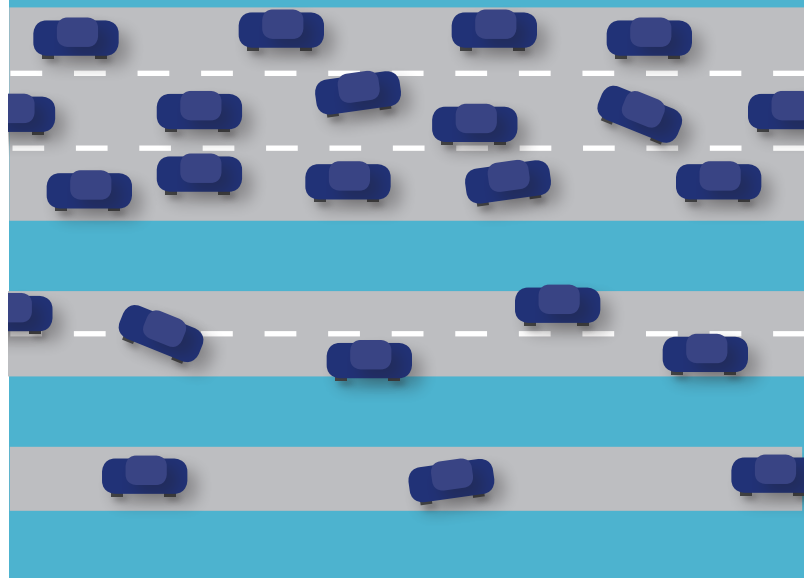
Scenario	Affected Trips	Automobiles	Trucks	PCE	Lane requirement (demand)
Existing peak period average hour		7,400	600	8,650	6
Fix NY (LB diversion)	Manhattan Origin/Destination	6,100	550	7,400	4 (4.1)
Fix NY (UB diversion)	Manhattan Origin/Destination	5,800	540	7,100	4
Two-way tolls on VNB	All	7,200	500	8,250	6
HOV on free bridges (25%)	Manhattan Origin/Destination	6,800	600	8,100	6
HOV on BQE (20%)	All	5,900	600	7,200	4 (4.03)
HOV on BQE (25%)	All				4 (3.9)
Lane reduction	Serves demand = to capacity				

Induced demand

Government leaders often say “build it and they will come.” This is certainly the case for highways. Many states and cities have tried to build new and wider highways in order to address congestion, only to see the bigger highways fill with traffic a few years later.

This concept is called “induced demand” where a larger highway encourages more traffic to use the road. This is why many urban planners say it is not possible to “build your way out of congestion.” New and wider highways are expensive to build and come with substantial environmental and community impacts. Favored approaches are those that manage capacity of highways using policies and pricing approaches.

On the flip side, where highways have been narrowed or removed entirely, traffic has declined and public transit use has grown.



Conclusions

The analysis indicates that all of the evaluated policies have the potential to significantly reduce traffic. Two of the scenarios—implementing the Fix NYC congestion pricing plan and requiring at least three occupants in cars on BQE during peak periods—could reduce traffic to a degree that a four-lane highway could accommodate the remaining volume of cars and trucks. Other policies, such as reinstating two-way tolls on the Verrazano Bridge or HOV requirements on the free bridges, could also be used in combination to reach this threshold or to further ease traffic flows.

These results are far from conclusive, but they strongly suggest that traffic management strategies would make it easier to consider a wider range of highway reconstruction or replacement options. Even if these policies do not reduce traffic sufficiently to accommodate all remaining demand with fewer lanes under existing conditions, a smaller four-lane highway should still be considered. A new roadway design could improve efficiency and accommodate more vehicles per lane than the BQE does today. And the results from other cities that have transformed urban highways demonstrate that improved health and neighborhood environments can be achieved without worsening traffic or damaging the economy.

These policies also have a wide range of benefits in and of themselves. Congestion pricing would reduce street congestion throughout the commercial core of the city while raising funds to improve the transit network. All of the policies, including lane reduction itself, would help New York City achieve its ambitious carbon reduction goals by reducing the number of cars and trucks on the road. While most cannot be implemented without the approval or participation of New York State or the federal government, these entities should be partners in implementing a comprehensive solution. The BQE is part of the national interstate system, and state and federal regulations are part of the policy environment that is constraining alternatives that could bring the greatest benefits to the city, state and region.





Regional Plan Association

Regional Plan Association is an independent, not-for-profit civic organization that develops and promotes ideas to improve the economic health, environmental resiliency and quality of life of the New York metropolitan area. We conduct research on transportation, land use, housing, good governance and the environment. We advise cities, communities and public agencies. And we advocate for change that will contribute to the prosperity of all residents of the region. Since the 1920s, RPA has produced four landmark plans for the region, the most recent was released in November 2017. For more information, please visit rpa.org or fourthplan.org.

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