

May 2017

Staten Island Bus Study

Reimagining Express Buses

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About the Study



The Staten Island Bus Study was launched in summer 2015 to generate recommendations for improving Staten Island bus service. Though all bus lines are reviewed on a regular basis to adjust schedule frequencies and running times based on demand and operating environment conditions, the study provided an opportunity to examine how the network functions as a whole using performance data, ridership profiles, and public engagement.

Given the scale of the project, the study findings have been split into two parts. Part I outlines a proposal to redesign the Staten Island to Manhattan express bus network. Part II, to be released at a later date, will provide a set of short and long-term recommendations for improving local bus service.

Introduction

On an average weekday nearly 36,000 rides are taken on Staten Island express buses. Along with the Staten Island Ferry (66,000 riders a day) and the S53, S93, and S79 SBS bus connections to the R train (18,000 riders a day), they are the primary transit connection between Staten Island and Manhattan.

Much of the express bus network has evolved through piecemeal changes over several decades. As traffic congestion (particularly in Manhattan) has progressively worsened, express bus performance has suffered, and riders frequently complain of poor reliability and long travel times.

After examining the issues with express buses using data and public feedback, it was concluded that the most realistic way to make substantial improvements would be to undertake a comprehensive reorganization of the network, focusing on rider origins and destinations rather than specific routes.

Using an in-depth analysis of ridership data, this report proposes a redesign of the entire express bus network in order to simplify service and improve reliability, travel time, and frequency using existing resources. The redesign achieves these goals by reducing the amount of route miles on congested Manhattan streets, making routes more direct, reducing the number of route variants, and increasing the average distance between bus stops to keep buses moving with the flow of traffic and signal timing.

The following pages provide an overview of public outreach conducted in support of the study, the major issues identified with the existing express bus network, and details of the proposed redesign and how it addresses the major issues. The redesigned network is expected to significantly improve the travel experience for most Staten Island express bus riders.



Public Outreach

Public outreach and community feedback were important elements of the study. To kick off the project, New York City Transit representatives met with the transportation committees of all three Staten Island community boards. Staff also discussed the study and gathered feedback at meetings of the New York City Transit Riders Council, Midland Beach Civic Association, and Senior Citizens Advisory Committee to New York City Transit. The input and support of local elected officials has also been important in raising the visibility of the study among Staten Island residents.

Survey Research

New York City Transit conducted a survey of express bus riders in fall 2015, with survey staff riding all express bus routes and surveying customers on-board. Participants were asked about where they board the bus, how they get to the bus stop, how they get to their final destination, alternative travel modes they use to make the same trip, and suggestions for improving service. In fall 2016, a survey at Manhattan express bus stops was conducted to determine points of origin for riders. The two surveys reached nearly 2,100 riders.

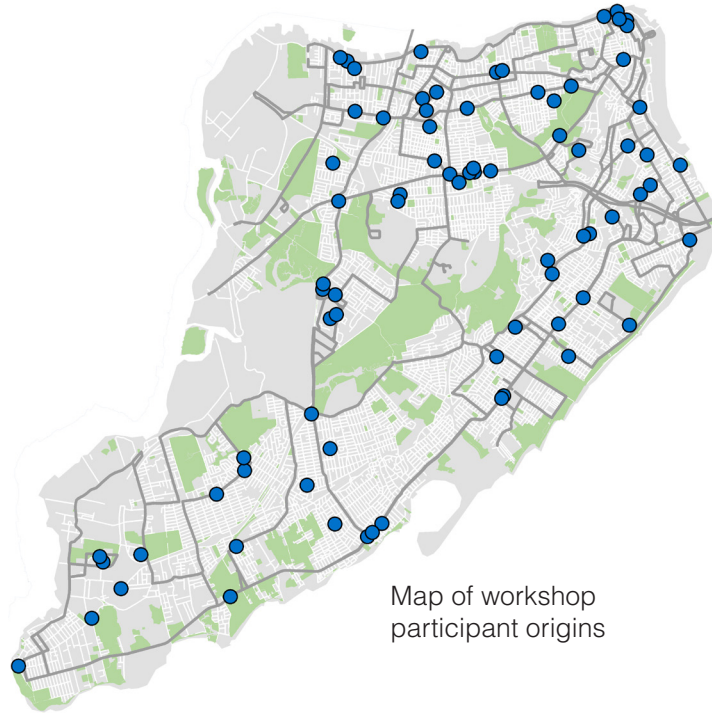
Online Feedback

New York City Transit received comments through its regular online customer feedback system and through an email address created for the study. Over 100 online submissions were received. The concerns and suggestions were combined with comments from the community meetings and public workshops into a master database.



Public Workshops

To gather public feedback and give riders the opportunity to learn more about the study and interact with New York City Transit staff, three public workshops were hosted in each of the three Staten Island community districts. At the workshops, New York City Transit staff presented an overview of the bus study before breaking attendees out into small groups with a facilitator and note taker from the MTA. Facilitators led participants through an interactive discussion of both local and express bus issues utilizing large bus maps with stickers and markers to highlight issues. There were over 100 participants across the three workshops from neighborhoods throughout the borough. When combined with robust data collection and statistical feedback, such as surveying, public workshops are a valuable part of research and outreach. The workshops provided insight into the perceptions, concerns, and ideas of a diverse array of people from all over Staten Island.



Map of workshop participant origins



Hackathon

New York City Transit partnered with the transportation foundation TransitCenter and New York University's Rudin Center for Transportation to host the Staten Island Bus Hackathon on March 5, 2016. Hackathons have traditionally been events where computer programmers and software development professionals assemble to collaborate intensively for one or multiple days on software projects. In recent years the concept has expanded to other fields, including transportation.

The Staten Island Bus Hackathon tasked participants to propose redesigns of the local or express bus network using data sets provided by New York City Transit. Data sets included an archive of Bus Time GPS data, bus stop boardings and alightings for express buses, origin-destination tables for express buses, express-bus-to-subway transfer data, peak load point data for local buses, GTFS route and schedule files, and the results of a 2009 MTA travel survey. Also available were taxi trips to and from Staten Island provided by the Taxi and Limousine Commission. On-site tools and technical support were provided by Google and CartoDB. Participants received access to the data the week before the event.

Around 150 programmers, planners, and transit advocates from New York City and beyond attended. The event kickoff included remarks from Staten Island Borough President James Oddo and then participants were set free to group into teams and work on proposals. At the end of the day, 15 teams submitted proposals for improving Staten Island bus service. A panel of judges from New York City Transit, TransitCenter, and the media company Intersection selected a grand prize winner and winners for best express bus solution and best local bus solution.

The Hackathon provided a unique opportunity for bus riders, planners, programmers, and advocates from Staten Island and beyond to work with New York City Transit data and provide input into the bus study. Some of the ideas formulated by groups at the Hackathon are incorporated into the express bus redesign concept.



Hackathon Winners

Grand Prize

The grand prize winner, Sri Kanajan, noted that many express bus routes were circuitous and lengthy, particularly within Manhattan, and as a result unpredictable with very high variability in running times. His project analyzed population density, boardings and alightings, and running times and concluded that the best way to reduce running times and improve reliability while minimizing customer inconvenience would be to reduce the number of stops in Manhattan to key locations that minimize travel time.

Runner-Up

The runner-up award for express buses was awarded to Colin Foley, Maria Carey, Raymond Cha, Larry Gould, and David McCreery. Their group proposed concentrating peak hour express service into three main trunk lines on Staten Island with subway-style frequencies and 16 branches with 10-minute frequencies. Routes would be more direct and would serve either Downtown or Midtown Manhattan. The group contended that by serving high ridership corridors with frequent and direct service they could reduce wait times and on-board travel times.

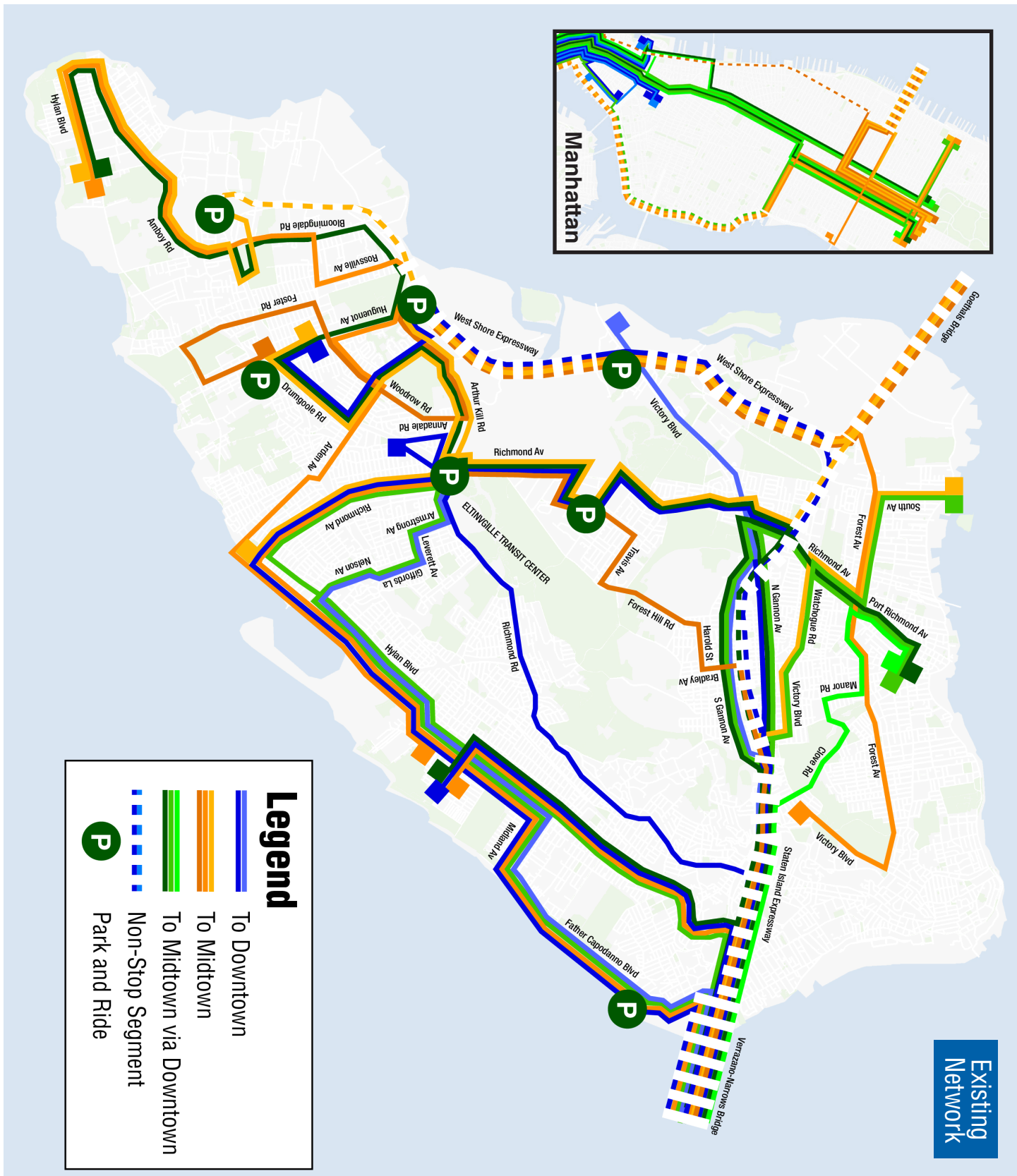


Network Design Issues

36,000 average weekday riders travel between Staten Island and Manhattan on an express bus network that was primarily developed in the 1960s through 1980s. At that time, many commuters wanted to avoid the subway system and traffic congestion was not as significant as it is today. Consequentially, routes were designed with door-to-door service in mind, using Manhattan local streets with many variants. The network has become more complex as Staten Island has grown and additions and modifications have been made over the years.

Today, express buses are often plagued by traffic and riders frequently complain of unreliability and long travel times. By listening to public feedback, analyzing data, and examining best practices in transit planning, a more thorough understanding of the issues that contribute to these problems was developed. This section provides an overview of the design choices of the current network that have led to many of the speed and performance problems that frustrate riders.





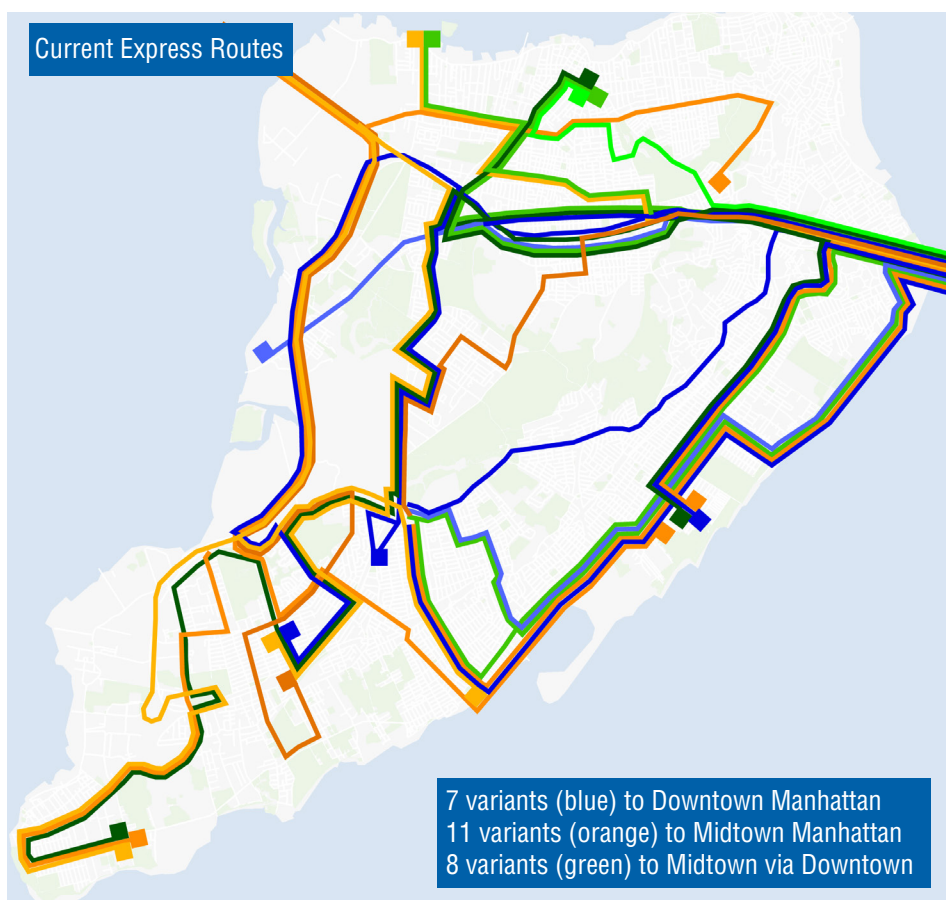
Network Complexity

The Staten Island express bus network is very complex. There are 26 different route variants originating from nine different starting points on Staten Island and ending at eight terminals in Manhattan. Though the intent of express service is to connect Staten Islanders to the Manhattan business districts and transit network, the routes function almost like local transit within Manhattan, branching out onto many different streets and making frequent stops.

Many comments from riders focused on the routes that buses take on Staten Island and in Manhattan. Some routes were criticized as too indirect, requiring lengthy travel in Staten Island before beginning the non-stop express segment to Manhattan. Others said that they find the express bus network to be confusing, with too many variants that are hard to understand. In general

there was a demand for more direct, frequent, and reliable express service with less stopping.

The numerous route variants mean that many riders have an express bus that picks them up near their home and drops them off near their destination on a one-seat ride. However, the many diverging and converging route options can make it difficult to choose the best route to use each day. On streets where multiple express bus lines operate, many riders say they simply take the first bus to arrive so that they can get into Manhattan as quickly as possible. In a survey of Staten Island express bus riders, 52 percent of riders said they do not use the same route each day to travel into Manhattan. 58 percent said they sometimes use a different route to return to Staten Island in the evening than they use in the morning.

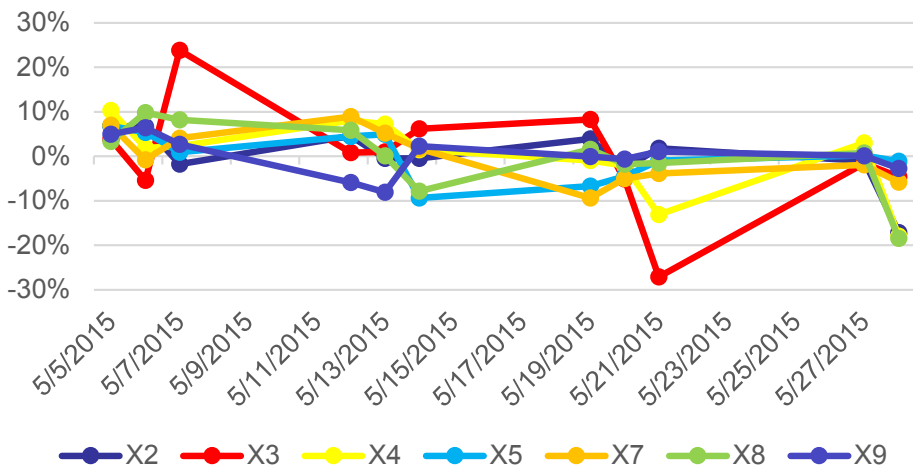


For New York City Transit, this makes managing and scheduling reliable service challenging as ridership on a given route can vary significantly from day to day. A particular trip that has plenty of empty seats on one day could be over capacity on the next, forcing riders to stand.

For example, on weekdays, the Hylan Boulevard express lines (X1 through X9) have a less than 10 percent day-to-day variation in total combined ridership on the corridor. This level of variability in daily ridership is common for bus routes due

to factors such as weather, traffic, holidays, and special events. However, with many riders not taking the same route every day, the variability in day-to-day ridership on each individual route is far more extreme. For example, in an analysis of one month, X3 ridership was 24 percent above its average on one day and nearly 30 percent below it on another. This high ridership variability caused by the numerous route variants contributes to performance problems and makes routes difficult to schedule.

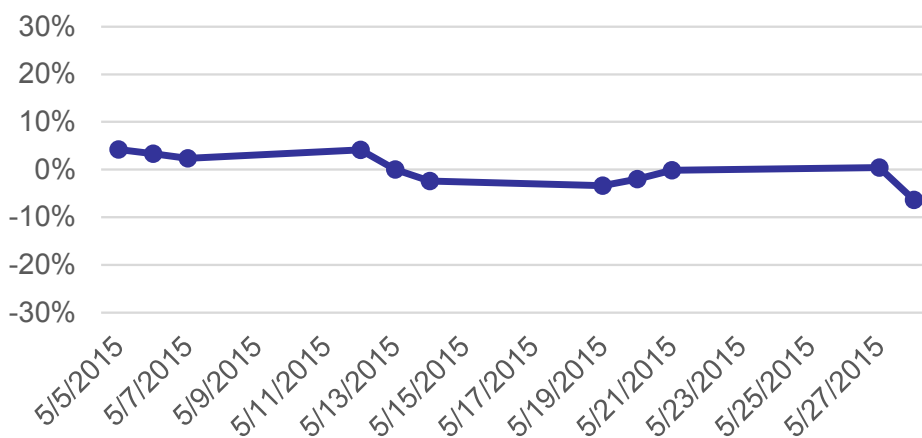
Ridership Variation, Individual Hylan Routes



52% of riders do not use the same route each day to travel into Manhattan

58% of riders sometimes use a different route in the evening than in the morning

Ridership Variation, Combined Hylan Ridership



Midtown via Downtown Routes

Nearly 17,000 daily Staten Island express bus riders use route variants that serve both Downtown and Midtown on the same trip. During public feedback, many riders complained about the amount of travel time within Manhattan, particularly on these Midtown via Downtown routes. On these lengthy routes, Midtown riders must endure street congestion and Downtown bus stops on the way to and from their destination. Additionally, riders boarding these routes Downtown are subjected to the delays that occur as buses make their way south from their Midtown terminals. Buses are often behind schedule or bunched together by the time they reach Downtown.

Route Destination	# of Variants	# of Riders	% of Ridership
Downtown	7	6,470	18%
Midtown	11	12,530	35%
Midtown via Downtown	8	16,780	47%

47% of riders use routes that serve both Downtown and Midtown

Route	X1	X7	X9	X10	X12	X17
PM Peak On-Time Downtown	49.2%	41.4%	41.4%	47.5%	54.9%	49.7%

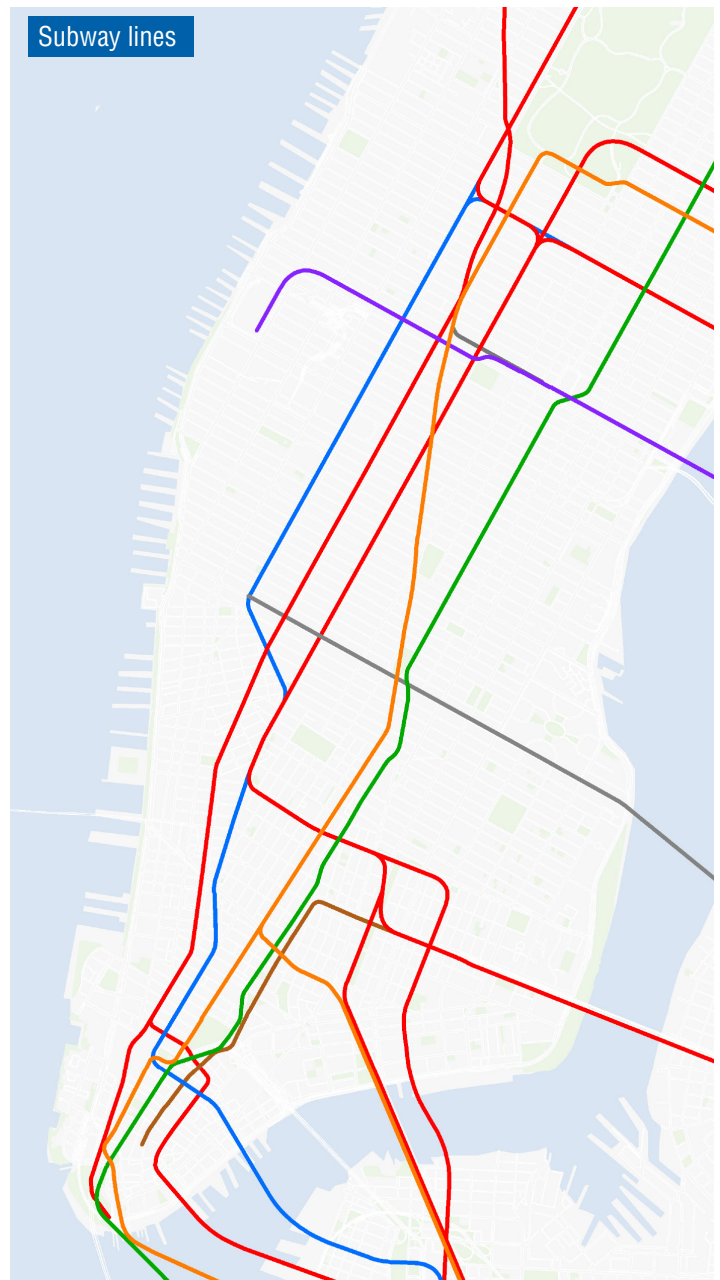
By the time Staten Island-bound buses have reached Downtown, on-time performance has deteriorated significantly on Midtown via Downtown express routes

Route	Manhattan Routing	Average SB Travel Time (minutes)	Average SB Travel Speed (mph)
X2	Midtown	80	15.9
X3	Downtown	63	14.3
X9	Midtown/Downtown	103	11.4

Traveling through congested Manhattan neighborhoods leads to slower speeds and longer trips on the X9 compared to the more direct X2 and X3

Traffic in Manhattan has increased dramatically since the express bus lines were created. On some routes, up to 50 percent of running time is spent on congested Manhattan streets, often operating directly above the much faster subways below. With a fixed operating budget and vehicle availability, time spent operating locally in Manhattan takes resources that could be used to move riders between Staten Island and Manhattan.

To speed up their trips, many riders do switch to the subway, with an estimated 27 percent of Staten Island express bus riders transferring to the subway on an average weekday. Transfers are highest among riders getting off express buses in Downtown Manhattan, where approximately 38 percent of riders transfer to the subway.



Frequency

The number of route variants determines the effective frequency of service on a given corridor. Since resources (budget and bus fleet size) are fixed, more corridors means less frequency. Lower frequencies lengthen wait times at bus stops, causing longer overall travel times.

For example, a rider leaving work on 42nd Street in Midtown Manhattan during the evening rush hour traveling to Hylan Boulevard and New Dorp Lane can take the X2, X5, X7, or X9. However, the X2 and X5 operate on Lexington Avenue, while the X7 and X9 operate on Fifth Avenue—two streets that are just 1,500 feet apart. By having to choose in advance whether to walk to Lexington Avenue or Fifth Avenue, the rider has less frequent bus

service than they would if the routes ran on the same streets.

This presents a trade-off: More variants on different streets mean a shorter walk on average to a bus stop, but there will be a higher average wait time for the bus to arrive. Additionally, if there is a delay with a given scheduled trip, the impact will be felt more on a route with a lower frequency.

By concentrating service into fewer variants, some riders may have longer walks to access the bus, but the bus will arrive more frequently and reliably. Frequency is an important factor in determining the day-to-day consistency of a rider's overall travel.



Bus Stop Spacing

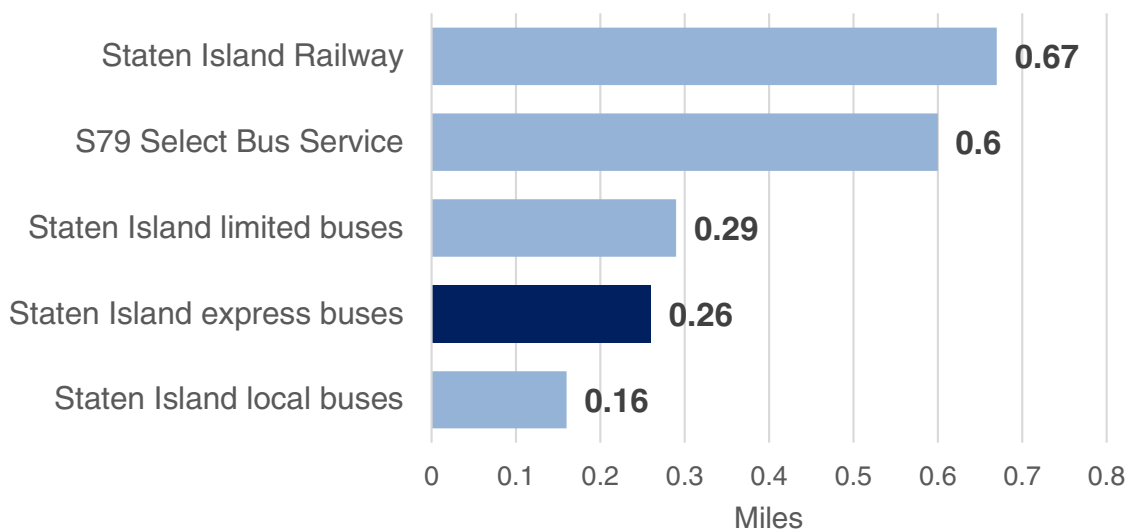
The spacing of bus stops along a route is another important factor in both speed and reliability of bus service. Every bus stop is a trade-off between convenience of access to the bus and the speed and reliability of service. When making a stop, buses must decelerate and pull out of traffic, wait at the stop for riders to board or disembark, then pull back into traffic and accelerate, a process that slows the bus. Additionally, as many major streets have traffic signals timed for continuous green lights when traveling at the speed limit, pulling out of the flow of traffic to access a stop often means the bus then gets stopped by a red traffic signal.

Given the long distances traveled on express routes, riders must sit through many bus stops. Over the years, new bus stops have been added without removing others. On average, Staten Island express bus routes have 27 stops on Staten Island and 12 in Manhattan. Bus stops are spaced approximately every quarter-mile in both Staten Island and Manhattan. However, all stops are not

equal in terms of popularity. 83 percent of express bus ridership is estimated to be concentrated into 50 percent of the bus stops. Conversely, the bottom 20 percent of bus stops are estimated to have only two percent of ridership. When a bus on a busy express route stops to pick up only one or two riders, riders already onboard are inconvenienced for little overall benefit.

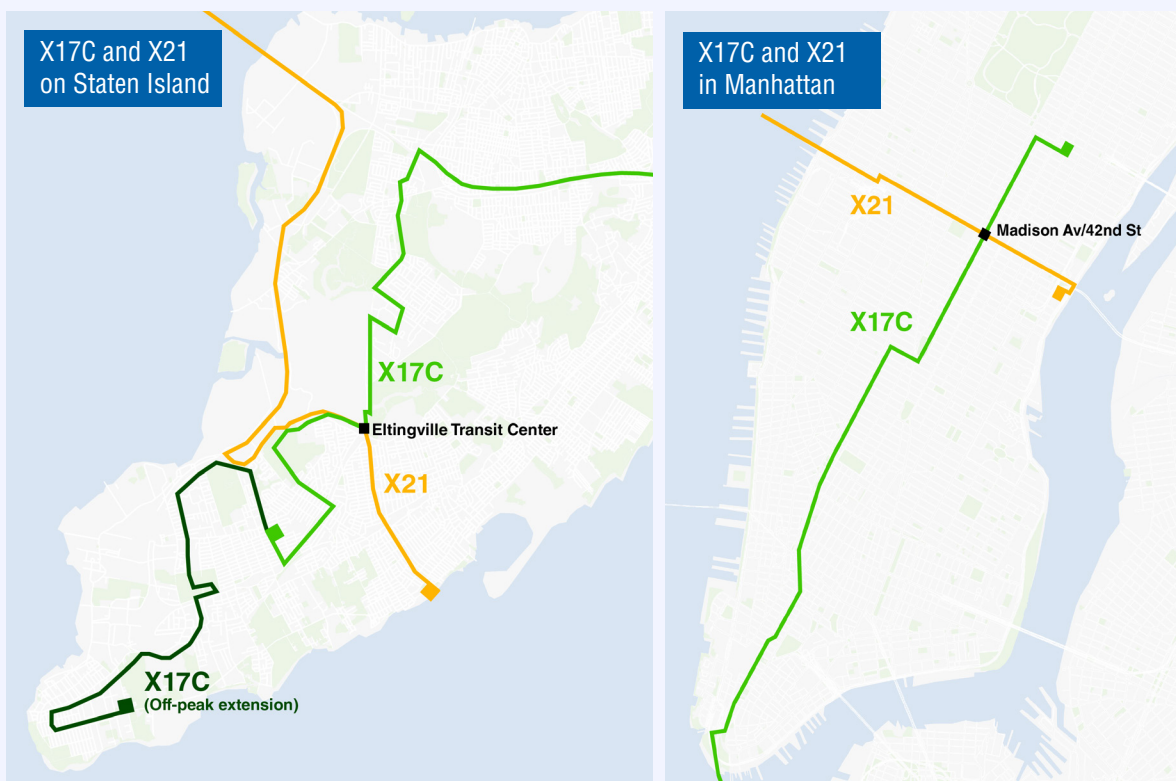
The busy express bus corridors of Richmond Avenue and Hylan Boulevard provide a helpful comparison. An analysis of the morning peak period showed that the X1, X4, and X5 routes traveled between Eltingville Transit Center and Hylan Boulevard/Midland Avenue at an average speed of 12.77 miles per hour. The S79 Select Bus Service, which makes half as many stops as the express buses, traveled along the same segment at an average speed of 14.41 miles per hour, an improvement of nearly 13 percent.

Average Miles Between Stops



Case Study: X21 and X17C

Many of the design choices discussed in this report can be compared in the X17 and X21 routes. In its weekday afternoon off-peak variant, the X17 has 86 stops on a nearly 40 mile route between Tottenville and 57th Street. The average travel time from end to end is around two and a half hours. The average time from Eltingville Transit Center to Madison Avenue and 42nd Street is 91 minutes. The X17 rates near the bottom of express buses in reliability measurements. This is a prime example of how attempting to give everyone a one seat, door-to-door ride can create inefficient service for all.



In contrast, the X21 ‘Super Express’ was implemented in 2014 to address some of these problems. The X21 was designed to maximize highway running, use wider bus stop spacing, minimize route mileage on congested Manhattan streets, and minimize the use of turns. Average travel time from beginning to end is 89 minutes. Average time from Eltingville Transit Center to 42nd Street and Madison Avenue is 69 minutes. The X21 scores near the top in reliability ratings. Since its inception, growth in demand has prompted an increase in service from 10 trips a day to 14. Ridership increased 28 percent after one year of service and another 24 percent after two.

Reimagining Express Buses

Having examined the issues that contribute to slow and unreliable express bus trips, an effort was launched to comprehensively redesign the Staten Island express bus network with four goals in mind:

1. Improve reliability
2. Reduce travel times
3. Increase effective service frequency
4. Make the network more logical and user-friendly

Methodology

The express bus network has evolved through piecemeal changes over several decades. To make substantial improvements a comprehensive examination of the network as a whole was required, focusing on street corridors rather

than specific routes. To analyze travel patterns, a ridership model of express bus stop boardings and destinations was used, estimating rider trip information based on Bus Time GPS data and MetroCard swipe data. Using the model, each corridor segment (for example, Richmond Avenue from Eltingville Transit Center to Hylan Boulevard) was examined to estimate overall ridership and the geographic distribution of riders within Manhattan. Once the entire express network was broken down into these individual segments, the pieces could be reassembled in a way that satisfies the four project goals better than the existing network.

Several processes were established as mechanisms for achieving the four goals of the redesign:

Process	Reliability	Travel Time	Frequency	Network Simplicity
Apply the successes of the 'Super Express' concept to the rest of the borough	✓	✓		✓
Replace the long and unreliable Downtown/Midtown combination routes	✓	✓		✓
Concentrate service into fewer route variants			✓	✓
Reduce the number of bus stops to allow buses to stay moving with the flow of traffic	✓	✓		
Make better connections to the subway to open up more destinations and enable faster travel		✓		✓

Some limitations were established for redesigning the network: First, that express bus service be maintained in the general areas that it currently exists on Staten Island, ruling out ideas such as concentrating express service into a few select corridors or park and ride lots. Second, the redesign was required to fit within existing operating budget and bus fleet constraints so that it could realistically be implemented.

The proposed concept for redesigning the express bus network strikes a balance between optimizing the network while minimizing the extent to which existing riders are required to change their travel habits (though some level of change is unavoidable

for many riders). Though a more detailed operational plan would be required to make this concept a reality, a test schedule simulation has shown that it can be implemented using existing resources.

Finally, the X23 and X24 express bus routes are funded by the New York City Economic Development Corporation and operated by Academy Bus. Given the comprehensive nature of this study, they are considered in the redesign plan. Changes to the X23 and X24 routes are expected to be cost-neutral or cost-saving to the operator.



Redesign Concept

Streamlining Manhattan Routing

The express bus network redesign is composed of 19 routes providing service to more than 99 percent of the existing Staten Island ridership. 11 routes travel to Midtown Manhattan and eight to Downtown, providing convenient free transfers to the subway and local bus network for trips to other destinations.

Changing the Manhattan routing is the key element to improving service. By sending buses directly to either Downtown or Midtown, the average route mileage used on congested Manhattan streets is cut in half, leading to faster trips for many riders and improved reliability for all.

In Downtown and Midtown, service would be concentrated into key corridors to serve the most popular destinations and make good connections to the subway. For some riders, this could mean a longer walk to their final destination. Riders not traveling to Downtown or Midtown would transfer to the subway or local bus to reach their final destination. Today, an estimated 96 percent of existing riders use express bus stops in Downtown or Midtown (42 percent in Downtown, 54 percent in Midtown, and four percent in between).

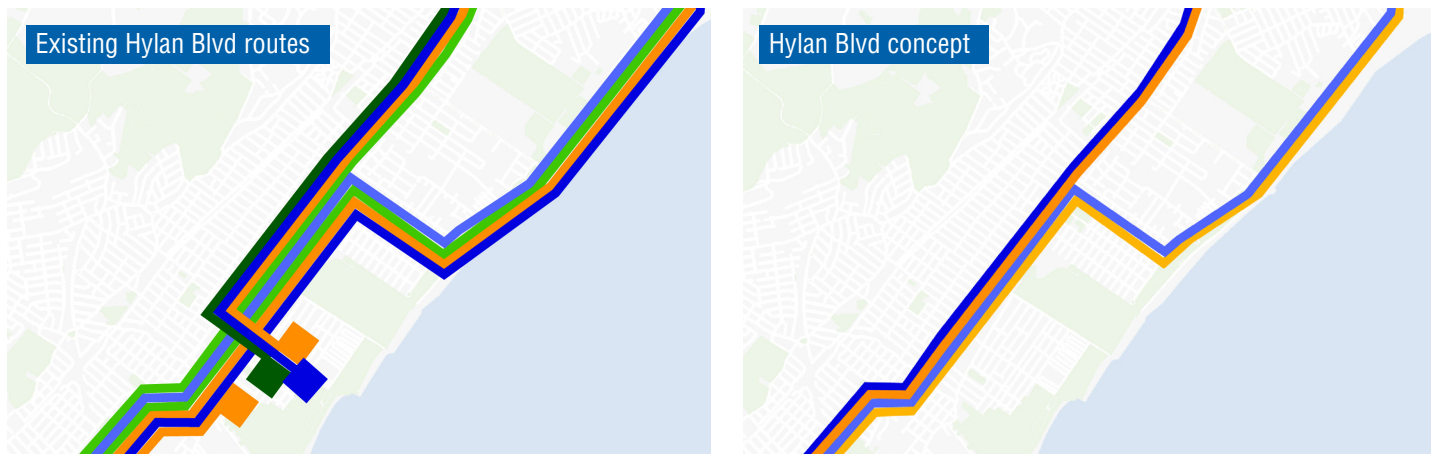
Less Frequent Stopping

Bus stops would be re-spaced along routes in the redesigned network to improve speed and reliability. The average distance between stops would be similar to existing Select Bus Service routes in the city. The location of bus stops would be determined by existing ridership trends to minimize the impact of the new spacing on riders. Most riders would continue to use the same bus stop they use today. For riders at removed stops, the maximum added walk to their new stop would be approximately five minutes.



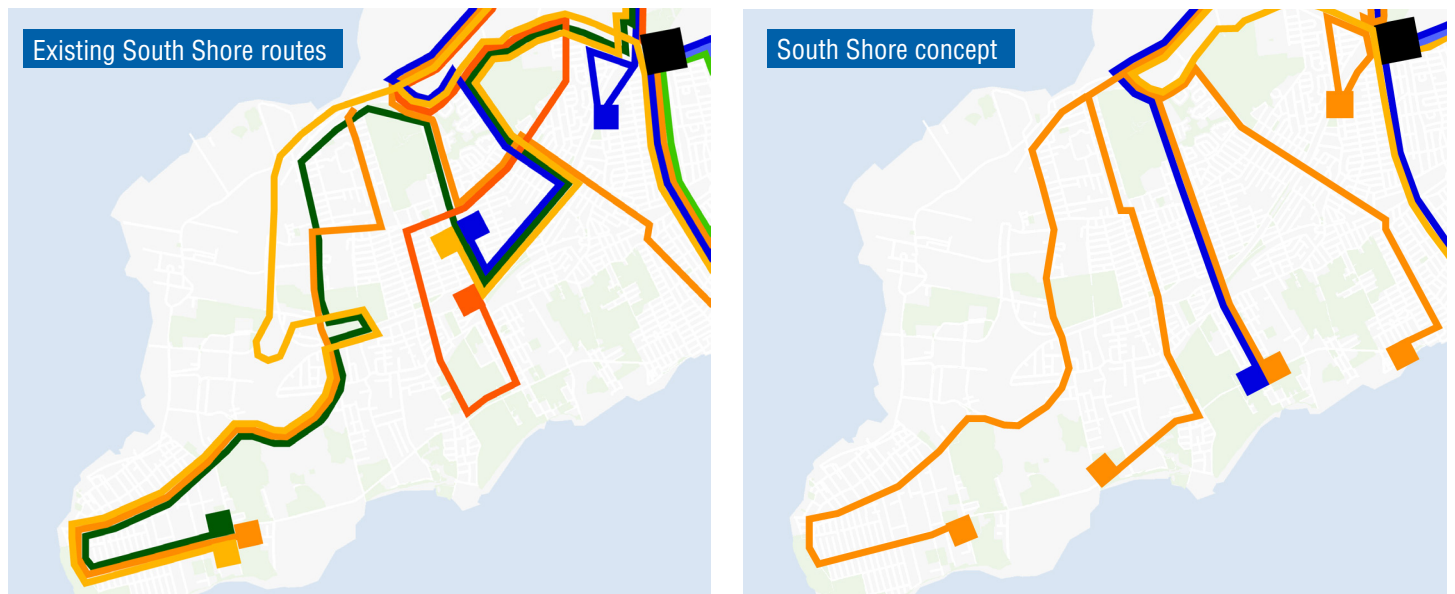
Frequency Through Simplicity

Simplifying the network in Manhattan allows for a more logical network on Staten Island, with fewer route variants each providing more frequent service. For example, the Hylan Boulevard corridor currently has eight routes each operating on average every nine minutes in the peak hour. In the redesign, it would have four routes operating approximately every 4.5 minutes in the peak hour. This reduces the average wait time at the bus stop for many riders, reducing the overall average trip length. It also makes ridership distribution on each route more consistent and predictable, allowing buses to be scheduled more reliably.



Directness and Speed

The redesign also makes service more logical and direct on Staten Island. This is most notable on the South Shore, where the existing routes are often indirect, sometimes overlapping with each other while running in opposite directions. The redesign organizes routes with an emphasis on directness and speed, creating routes that minimize turning and travel in straight lines to the extent possible.



Redesigned Routes (Weekday Peak Hours)

Staten Island Streets Served	Destination	Old Routes
Hylan Blvd, Steuben St	Midtown	X1, X2, X5
Eltingville Transit Center, Richmond Av, Hylan Blvd, Steuben St	Downtown	X1, X3, X4
Eltingville Transit Center, Richmond Av, Giffords Ln, Nelson Av, Hylan Bl, Midland Av, Father Capodanno Blvd, Lily Pond Av	Midtown	X5, X7
Eltingville Transit Center, Richmond Av, Giffords Ln, Nelson Av, Hylan Bl, Midland Av, Father Capodanno Blvd, Lily Pond Av	Downtown	X4, X8
Eltingville Transit Center, Arthur Kill Rd, Richmond Rd	Downtown	X15
Eltingville Transit Center, Richmond Av, Staten Island Mall	Midtown	X17, X31
Eltingville Transit Center, Richmond Av, Staten Island Mall	Downtown	X17
Huguenot Av, Arthur Kill Rd	Midtown	X17, X19, X23, X24
Huguenot Av, Arthur Kill Rd	Downtown	X17, X19, X23, X24
Richmond Av, Eltingville Transit Center, Arthur Kill Rd	Midtown	X1, X5, X21
Hylan Blvd, Amboy Rd, Bloomingdale Rd	Midtown	X22, X22A
Hylan Blvd, Seguine Av, Foster Rd, Rossville Av, Arthur Kill Rd	Midtown	X22, X23
Hylan Blvd, Arden Av, Arthur Kill Rd	Midtown	X17, X19, X24
Annadale Rd, Eltingville Transit Center, Richmond Av, Staten Island Mall, Travis Av, Forest Hill Rd, Harold St, Bradley Av	Midtown	X17, X31
Port Richmond Av, Forest Av, Manor Rd, Martling Av, Clove Rd	Downtown	X14
Port Richmond Av, Richmond Av, Watchogue Rd, Victory Blvd, Slosson Av	Midtown	X10, X12, X42
South Av, Forest Av, Richmond Av, Watchogue Rd, Victory Blvd, Slosson Av	Downtown	X10, X12, X42
Victory Blvd, Gannon Av	Downtown	X10, X11
Forest Av	Midtown	X14, X30

Service Span and Frequency

As with the existing express network, most routes would operate during weekday morning and evening peak hours only. The existing routes have inconsistent start and end times, but under the new network all peak hour routes would start and end at the same times, making the service easier to understand and more consistent from neighborhood to neighborhood.

The most popular redesigned routes would operate during off-peak and weekend hours. In the existing network, there are three routes (the X1, X10, and X17C) that operate off-peak and weekends, with one route (the X1) operating overnight. Further analysis is needed to determine specific off-peak and weekend routes for the new redesign concept, but it is expected that the more efficient route structure would enable more than three routes to operate off-peak and weekends. Generally, neighborhoods that have off-peak and weekend service today would continue to have it under the redesigned network.

Bus frequencies are determined by ridership levels. Frequencies of routes in the redesigned network would be based off of existing ridership conditions. Bus Time and Metrocard ridership data was used in designing the new network and it would be used to determine the required frequencies on the new routes. Ridership would continue to be monitored over time and frequencies adjusted accordingly.

Benefits

This network redesign is expected to improve speed, reliability, frequency, and user-friendliness and could be implemented using the dollars and buses that are allocated to the existing network. These improvements would be made by:

- Cutting in half the average amount of mileage allocated to congested Manhattan streets from three miles to 1.5 miles per route
- Making routes more direct by reducing the average number of turns at intersections from 10 to 6.5 per route
- Increasing the percent of route mileage spent running non-stop on highways from 63 percent to 72 percent
- Increasing the average distance between bus stops from a quarter-mile to a half-mile to keep buses moving with the flow of traffic and signal timing

Nearly all existing riders (approximately 99.5 percent) would be expected to have average travel times similar to or faster than their trips today, with all riders experiencing the benefits of a more reliable system. The average end-to-end route running time would be reduced by an estimated 20 minutes. In addition to providing many riders with a faster trip this would improve reliability as reducing route length generally improves performance.

Approximately 86 percent of riders who currently have a one-seat ride to their destination would continue to have a one-seat ride. The remaining 14 percent would be anticipated to make a transfer to the subway in Manhattan to reach their destination, but most of those new transferring riders (more than 70 percent) are expected to have faster overall trips than they do today, with the remaining 30 percent having comparable overall times to today. This is due to the significantly faster speed of the subway (even when accounting for transfer time from the bus) in comparison to existing inefficient express bus segments on congested local streets.

Creating more direct routes and reducing the variation of service patterns in Manhattan would also make the express bus network easier to understand for new riders. Though many riders today have developed an understanding of the system through years of experience, the complexity of the existing network is a barrier to entry for potential new riders. In addition to simplifying the network, a redesign should be accompanied by a new express bus-only map.

Additionally, under the redesign, many of the routes could more easily be re-routed in the field as needed between the Gowanus Expressway/Hugh L. Carey Tunnel and New Jersey Turnpike/Lincoln Tunnel in response to road incidents causing delays. Due to the design of the existing network, this flexibility is not possible on most routes without skipping large portions of the route. Separating Midtown routes from Downtown routes allows many of the Midtown routes the flexibility of traveling via Brooklyn or New Jersey without changing which bus stops are served on Staten Island or in Manhattan. When the Verrazano Bridge bus/HOV lane is completed, providing a seamless bus/HOV connection from the Staten Island Expressway to the Hugh L. Carey Tunnel, Midtown express routes that travel through New Jersey could be routed through Brooklyn instead if travel times proved to be faster and more reliable.

Further Issues

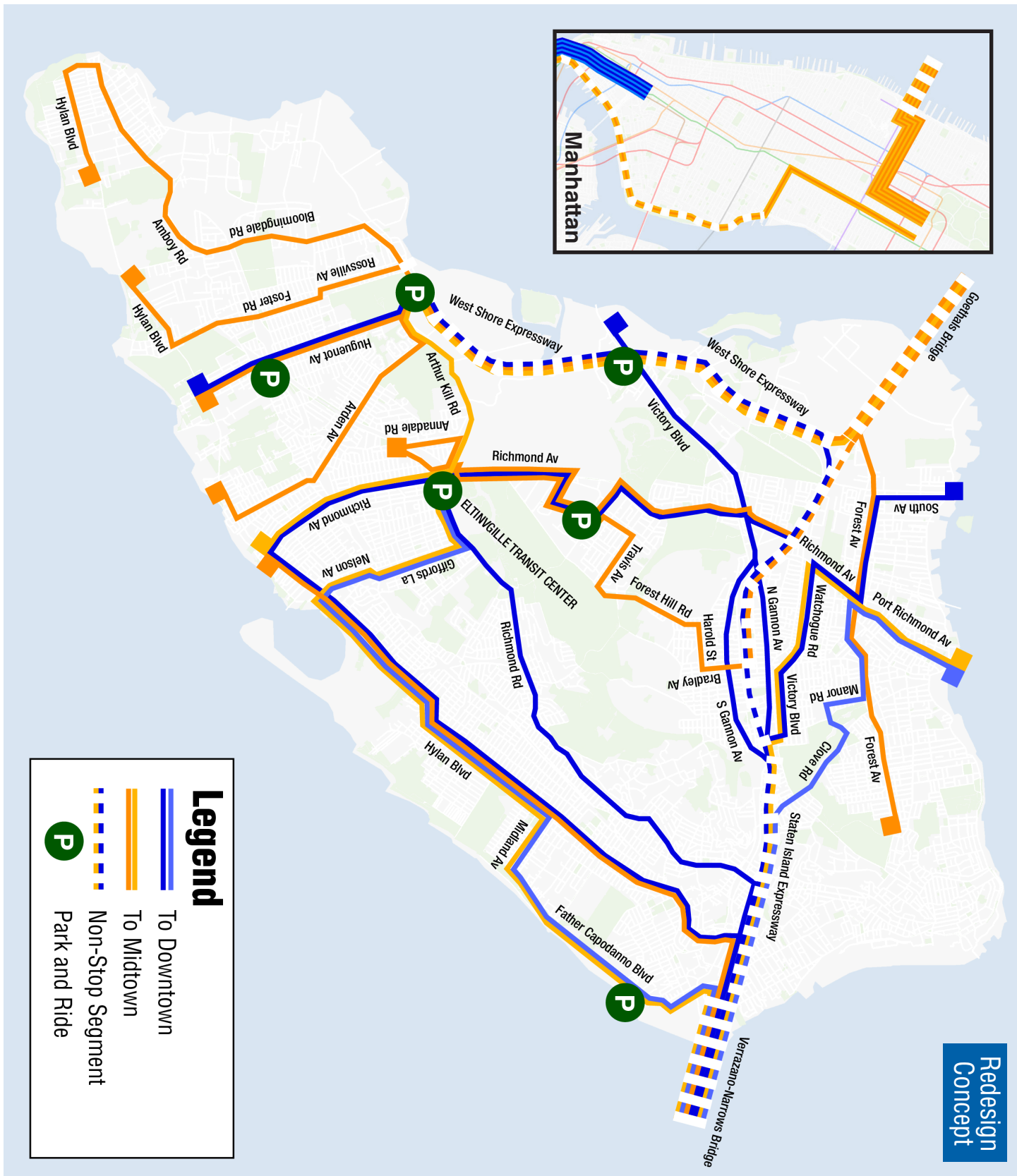
Further benefits to reliability and travel times are possible if the performance of the bus lanes in Manhattan can be improved in coordination with the New York City Department of Transportation (NYCDOT) and New York City Police Department (NYPD). The new network redesign would make use of existing bus lane segments, but today the bus lanes are often blocked by vehicles illegally parked, standing, or driving in them. On most

days, buses cannot consistently travel in the bus lanes without needing to merge into the adjacent lane to avoid an obstruction, negating much of the intended benefit of the lanes. Better enforcement of bus lane violations or physical separation of the lanes would improve bus speeds and reliability.

Additionally, on Staten Island, express bus performance could be improved by extending existing bus lanes in locations where bus speeds and reliability deteriorate. The two most notable example of this are on Hylan Boulevard south of Lincoln Avenue and on Father Capodanno Boulevard and Lily Pond Avenue north of Ocean Avenue.

Implementation of the network redesign plan would require coordination with NYCDOT to identify specific streets of operation in Manhattan, bus stop locations, and layover space. Bus stops and layover spaces in New York City are managed by NYCDOT in collaboration with the MTA.

Given the limited highway connections between Manhattan and Staten Island and heavy traffic volumes, congestion on major arterials and highways is likely to continue to be an obstacle to fast and reliable express bus travel, but redesigning the network would enable buses to perform more efficiently within this environment. Overall, implementing this express bus network redesign would modernize the system and provide significant benefits to riders by improving travel time, reliability, frequency, and user experience.



Redesign
Concept