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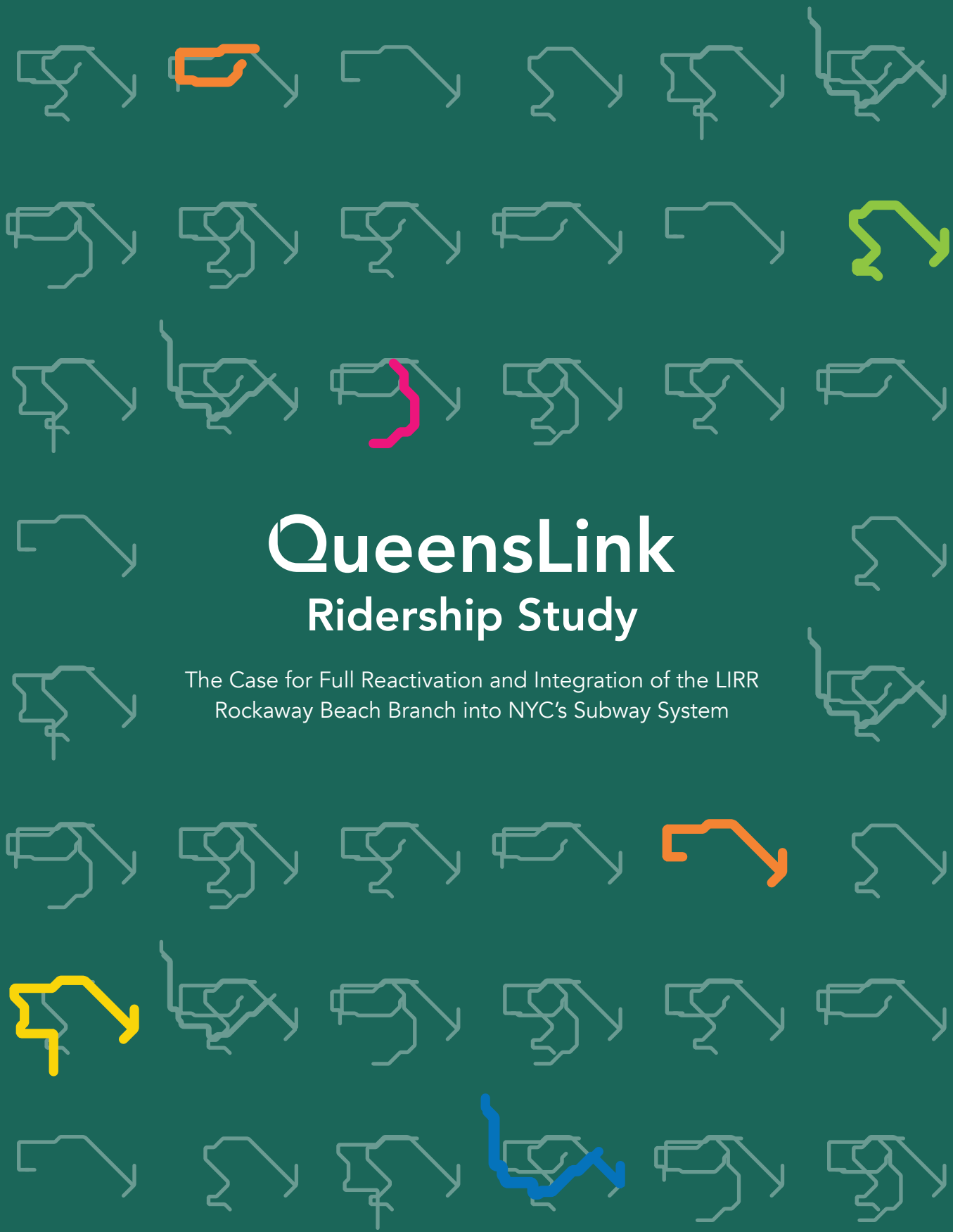

QueensLink
Ridership Study

The Case for Full Reactivation and Integration of the LIRR Rockaway Beach Branch into NYC's Subway System

Center for Urban Science and Progress

New York University

QueensLink Ridership Study: the Case for Reactivation of the Rockaway Beach Branch as Part of the NYC Subway System

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Abstract

The former LIRR Rockaway Beach Branch line has sat abandoned since 1962. Various proposals over the decades for reactivation have gone nowhere, while the City of New York has proposed converting the land into public park space. The QueensLink is a proposal to bring back service on the line, while providing community park space. But this idea has faced pushback from the MTA, which has claimed in the past that reactivation of service would bring high costs and low ridership. By applying the US-FTA's Simplified-Trips-On-Projects (STOPS) ridership estimation model, this study attempts to examine the ridership along the QueensLink corridor and its larger network ramifications, should the corridor is properly integrated into the NYC subway system via the Queens Boulevard Line. Aiming for an opening year of 2040, these scenarios consider different Manhattan bound trunk services and the corridor/borough specific ridership changes, and answer questions of "what if" in different service changes. The results of the ridership scenarios from STOPS are studied and analyzed, and its real-life implications and future outlook are discussed in depth in relation to next steps with respect to both the QueensLink non-profit and interested stakeholders.

Contents

I: Introduction

QueensLink, a non-profit transit advocacy organization, is proposing a rail and trail project that will be built along the old Rockaway Beach Branch (RBB) right-of-way. This former Long Island Rail Road (LIRR) rail line has been abandoned since service ceased in 1962, although ownership of the route remains public. More specifically, the QueensLink initiative proposes reactivating the RBB as a New York City Transit Authority service, creating a direct connection between the Queens Boulevard Line and the Rockaways.

This plan includes the development of four new stations, facilitating transfers to the existing A, J/Z, E, F, G, M, R, and 7 lines, as well as the LIRR. Additionally, the project envisions up to 33 acres of new parks and protected bike paths along the right-of-way, offering both transportation and recreational benefits to the community. Stakeholders of the local Queens and wider New York City community have long advocated for such a reactivation. This advocacy stems from the reality that the city's current subway system forces residents to use inefficient east-west routes and exacerbates congestion on municipal roads and highways. Generally, the city's monocentric system design favors lines that offer a singular connection to Manhattan, versus a line that actually connects the borough as a whole.

QueensLink remains a community-driven initiative, supported by local civic groups, transit advocates, and elected officials. It has garnered increased attention in recent years, including being awarded a $400,000 grant from the U.S. Department of Transportation (USDOT) as part of the Reconnecting Communities Pilot Program. Announced on January 10, 2025, this funding aims to support a comprehensive study assessing the social, environmental, economic, and equity impacts of reactivating the RBB for transit and greenspace purposes. The grant requires a matching contribution, and QueensLink successfully secured this through community fundraising efforts, raising over $100,000 in just 39 days. This rapid response underscores the strong community support for improved transit options in Queens.

By presenting a quantitatively and computationally rigorous estimation of projected ridership for different iterations of the reactivation, this report aims to make the case for improved transit access, reduced congestion, and enhanced connectivity of under-served communities that the RBB is uniquely positioned to bring. Ridership projections — both on the station and system-wide level — will be generated using the US Federal Transit Administration's Simplified Trips-On-Project Software (STOPS), a software designed for mixed-mode transit ridership estimation.

Considering various iterations of the RBB reactivation is key, as any one of them could be most optimal in terms of generating larger and more inclusive ridership. We consider scenarios of varying operational feasibility. As a final addition, we will provide estimates of the additional operating costs under each of these scenarios.

II: Literature Review

The current commute times from the Rockaways and Southern Queens are among the longest in New York City, longer than parts of Nassau County.[19] A reactivated RBB could save time and ease intra-borough travel for over half a million daily trips.[19] The MTA has shown little support, but local advocates and researchers — including a report by David Krulewitch[6] and a team from NYU Wagner[5] — argue it's feasible and potentially cost-effective compared to other megaprojects like East Side Access. Krulewitch's paper, in particular, examines six transit reactivation options in total, noting that many neighborhoods became transit-isolated after RBB service ended.[6] He argues that past low ridership was due to truncated service, not lack of need.

In its 2018 Rockaway Beach Branch Sketch Assessment,[16] the MTA explored the feasibility of restoring passenger rail service on the former LIRR RBB at a sketch planning level. Phase 1 of the study considered two reactivation options: integrating the RBB with the LIRR Main Line or connecting it to the NYCT subway's Queens Boulevard Line. Phase 2 explored linking the RBB (via LIRR service) directly to the Central Terminal Area of John F. Kennedy International Airport, potentially facilitating a one-seat ride between the airport and Midtown Manhattan.

The study estimated that reactivating the RBB as part of the LIRR would cost approximately $6.7 billion, while integration with the NYCT subway system would be around $8.1 billion.[16] The sketch assessment also provided ridership estimates for two scenarios. Reactivating the RBB as part of the LIRR was projected to serve approximately 11,000 riders on an average weekday. This service would facilitate a commute of about 30 minutes between Howard Beach and Penn Station. Integrating the RBB with the NYCT subway system, on the other hand, was estimated to accommodate around 47,000 daily riders, offering a commute of approximately 45 minutes between Howard Beach and 34th Street-Herald Square.[16]

The MTA's 2023 20-Year Needs Assessment[13] also assessed the viability of the RBB reactivation, generating new numbers for the cost estimate and ridership projections. This study estimated the cost of reactivation at $5.9 billion, a reduction from the 2019 estimate of $8.1 billion. In their report, the MTA projected that reactivating the RBB would serve approximately 39,200 daily riders, a 17% decrease from the 2019 estimate of 47,000 daily riders.[13] As a result of these numbers, the MTA decided to deprioritize the project in its long-term planning.

'Appendix D.1: Transportation—Ridership Modeling'[7] outlines the methodologies employed by the MTA to forecast transit ridership, with a particular focus on the Second Avenue Subway (SAS) project. Whether these methods were used to project ridership on the reactivated RBB is unknown, but since this document is the only information that the MTA has provided publicly on the subject, the literature review will elaborate on the models' specifics.

The MTA's document describes the integration of several modeling tools, in particularl the Transit Demand Forecasting Model (TDFM) and the Regional Transit Forecasting Model (RTFM). The TDFM, developed by NYCT is a GIS-based model that simulates the city's subway and bus networks. Utilizing TransCAD software, the TDFM incorporates a zone system based on census tracts, allowing for origin-destination trip analyses. The model accounts for various factors that influence transit demand, including service frequency, travel times, and transfer connections. Notably, it does distinguish between individual transit routes rather than aggregating services.

Complementing the TDFM, the RTFM offers a broader regional perspective, encompassing commuter rail, automobile, and other travel modes. This model is instrumental in assessing mode shifts, such as transitions from car to transit, and estimating the impact of commuter rail passengers transferring to subway lines.

The SAS project serves as a case study for the application of these models. According to the document, the process involved several key steps that illustrate the complexity of the forecast approach. First, a detailed representation of the city's transit infrastructure was created by dividing New York City into 2,294 zones. Next, trip tables for both the base year (2000) and the forecast year (2025) were developed using data from the 1990 U.S. Census, MetroCard usage, and projections of population and employment growth. These tables were further refined through the integration of outputs from the RTFM, which contributed estimates of commuter rail transfers and shifts in transportation modes. Finally, these projected trips were assigned across the modeled transit network, allowing analysts to estimate ridership levels on specific routes and stations. This comprehensive modeling effort projected substantial ridership for the Second Avenue Subway, demonstrating its role in relieving the overcrowded Lexington Avenue Line and redistributing transit demand across the network.

Ridership projection models such as TDFM and RTFM are powerful tools, but they are not without significant limitations. Chief among these is the extent to which human judgment shapes key inputs and assumptions. While the models are data-driven, they rely heavily on initial decisions about variables such as population growth rates, employment forecasts, trip distribution patterns, and even the attractiveness of transit compared to other modes. These inputs are not purely objective — they are selected, estimated, or adjusted by analysts, often based on judgment calls or incomplete data.

If the MTA allowed public access to the same depth of ridership forecasting insight for the RBB as they did for the SAS — and expounded on why and how model inputs were chosen — reproduction of these results for validation would be much simpler.

The decision to deprioritize the RBB project has generated criticism from local advocacy groups and community members, who argue that reactivating the RBB would provide much-needed transit options for underserved areas in Queens. They contend that the MTA's evaluation did not adequately lay out the process used to arrive at both its cost estimates and ridership projections. Both cost estimates provided by the MTA, for exam-

ple, are significantly higher than the transportation firm TEMS calculated (approximately $3.5 billion).[18] While the firm's findings effectively contest those of the MTA regarding the project's affordability, this report is a part of the literature that attempts to reproduce and/or challenge the MTA's ridership projections for QueensLink.

III: Necessary Assumptions

(A) Overall Assumptions

Broader Evaluation Parameters

This study focuses on the ridership numbers of proposed QueensLink services on the Rockaway Beach Branch corridor. The year in focus in the 2040 opening date. Both the RBB corridor under 2019 Sketch Assessment and 2023 MTA 20-Year Needs Assessment Metric will be evaluated as corridor ridership metrics, and the network impacts of the re-activation will be limited to stations and lines within the Borough of Queens. All proposed QueensLink scenarios will takeover the current Rockaway Shuttle between Broad Channel and Rockaway Park-Beach 116 St unless otherwise specified in the Build Scenario assumptions and scenario specific descriptions below.

Corridor and Station Nomenclatures

This report will adhere to the station names found on the current MTA subway map as well as the MTA's existing abbreviations of common roadway names, such as Boulevard $\rightarrow$ Blvd, Avenue $\rightarrow$ Av, and Street $\rightarrow$ St. In addition to station names, this report will abbreviate common agencies, subway line names, and alignment names for brevity.

For the sake of brevity and unified understanding, the "QueensLink corridor" refers to the section highlighted in Figure 1 from 63rd Dr down to the Rockaways and includes both branches of subway service on the Rockaway Peninsula. The "abandoned RBB corridor" represents the section of the derelict ROW between the LIRR mainline and the Liberty Av line (A train). The full list of abbreviations are in Appendix I.

Zoning and Land Use Changes

The STOPS software is programmed to consider the five boroughs of New York City and the surrounding counties as its study area. Throughout the formulation of the study, potential zoning and land-use changes are not considered, as these remain subject to considerable and unpredictable change and are beyond the scope of this study. This

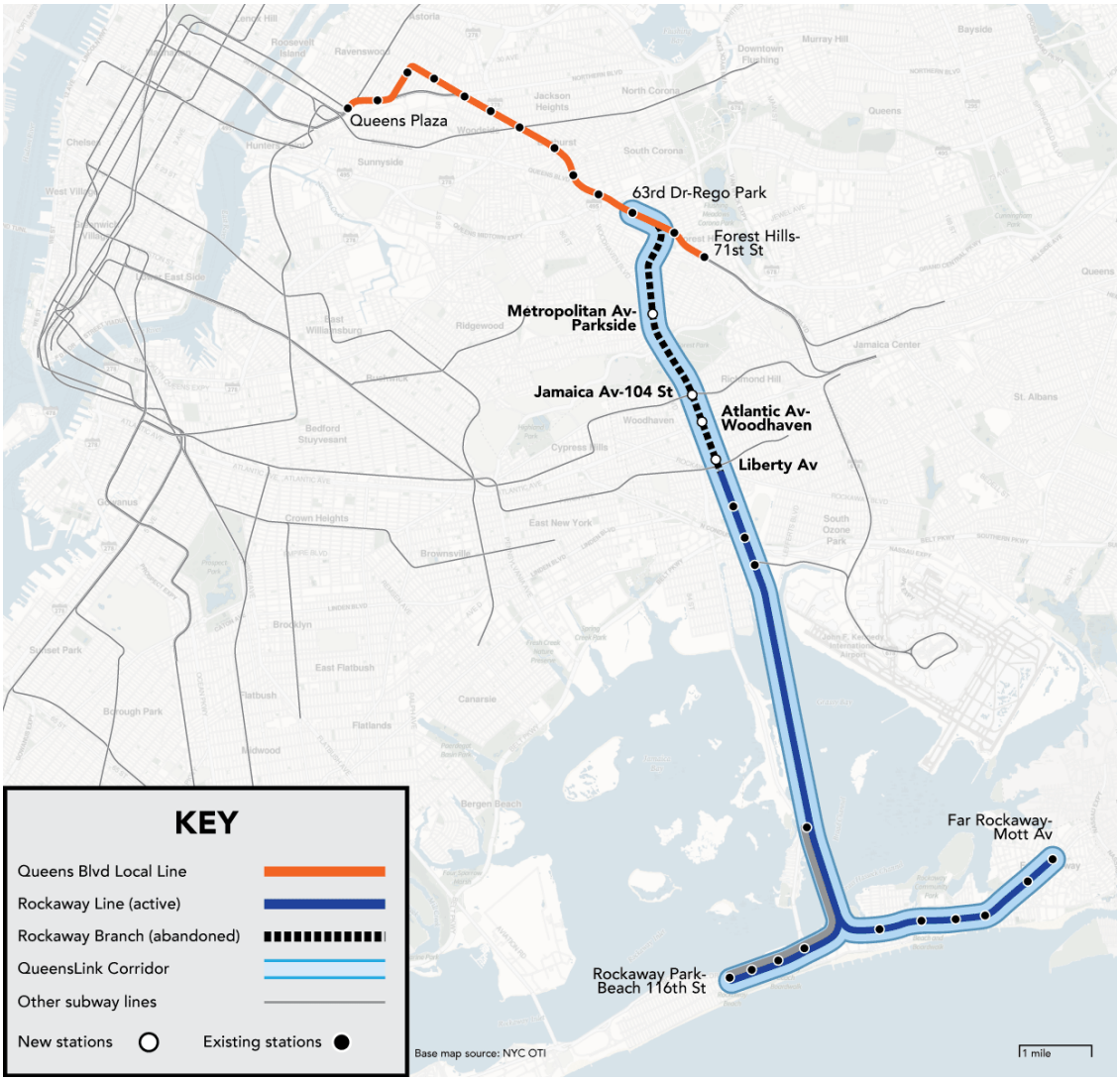


Figure 1: Site Map of the Rockaway Beach Branch Corridor. Source: QueensLink

also includes recent zoning reforms such as City of Yes, which are not considered in this study. Therefore, all scenarios (existing, no-build, and build alternatives) maintain existing zoning maps.

LIRR Alternatives and LIRR Atlantic Avenue Station

This study does not consider LIRR service in any proposed scenarios. Since the southern portion of the RBB is already integrated into the larger NYCT subway system; it is both operationally, logistically, and financially preferable to maintain NYCT operations rather than LIRR alternatives. This study will only consider NYCT subway build alternatives.

The QueensLink plan proposes reopening the Woodhaven Junction station on the LIRR Atlantic Branch which was closed in 1977. This study, however, does not consider network or ridership impacts of the LIRR resuming service at the Woodhaven Junction station, thereby connecting the QueensLink corridor with a direct LIRR Atlantic Branch. The larger ramifications of this LIRR/NYCT subway transfer point would have resulted in a significant scope creep, as many more variables and data sources would be required. As such, all proposed scenarios explored in this study do not consider the LIRR or the reopening of the LIRR Woodhaven station on the Atlantic Branch.

Far Rockaway Repairs

During the study period, the Rockaway Line Resiliency and Rehabilitation project shut down NYCT subway service on the southern portion of the NYCT Rockaway Line. The available static subway General Transit Feed Specification (GTFS, the standard data format for transit schedules) taken from February 2025 from MTA's official site at the time contained A line schedules that terminated all Far Rockaway bound A trains at Howard Beach-JFK Airport station. To recreate the post-repair schedule for the Existing Scenario STOPS model, the February 2025 GTFS is modified to account for the resumption of service patterns by the A train serving the Rockaways, using previous GTFS files that contained static schedules for normal Far Rockaway-Mott Av operations. Further details are in the Methodology section of the report, specifically in section 5(C).

The Existing scenario GTFS has been since updated to the November 2025 GTFS schedule after the conclusion of the Rockaway Line repairs. The MethodOlogy section 5(C) has since been updated.

Queens Bus Network Redesign

This study does not consider any Queens Bus Network Redesign changes. The redesign is slated to enter effect after the publication of this report, and there is no redesigned bus

GTFS dataset for all the new and modified routes available to the public. All bus GTFS files are based on the latest February 2025 static GTFS files available on MTA's developer resources website, and are ingested into STOPS as is.

(B) No-Build Scenario Assumptions

Ongoing MTA Projects: Second Avenue Subway Phase 2

The No-Build Scenario is a modified (but unified) GTFS schedule for MTA buses and subways. It includes relevant information about ongoing capital expansion projects. The selected opening date parameter for QueensLink in the context of this study is 2040. Since the three stations of SAS Phase 2 are slated to open before this year, we include SAS Phase 2 in all of the No-Build scenarios. The locations of the 3 stations of SAS Phase 2 are taken from the diagrams and illustrations in official MTA documents, such as in the illustration below (Figure 2).

At the publication of the study, the MTA has also released the feasbility study of the western extension of Phase 2 project.[35] This extension on 125 St is not considered in this study.

Ongoing MTA Projects: Interborough Express (IBX)

The Interborough Express (IBX) is an ongoing MTA capital expansion project with political support from New York State Governor Kathy Hochul. The project has received multiple funding rounds from the State and Federal governments. As of this study's publication, the IBX project has completed its preliminary scoping phase and is moving on to the engineering and design phase. This will eventually culminate in a public announcement of the intent of the environmental impact statement (EIS) in the near future. Looking forward from 2025, this study also anticipates a 2040 No-Build Scenario with the IBX completed, as current official MTA planning documents estimate its completion in late 2035, barring further delays.

Since the IBX is further along in the planning process and will likely open before the chosen QueensLink opening date of 2040, this study examines the synergies between these two circumferential lines.

CBTC on the Rockaway Beach Branch

This report assumes that a reactivated RBB will contain the full installation of the same Communication-Based Train Control (CBTC) equipment compliant with the CBTC mod-

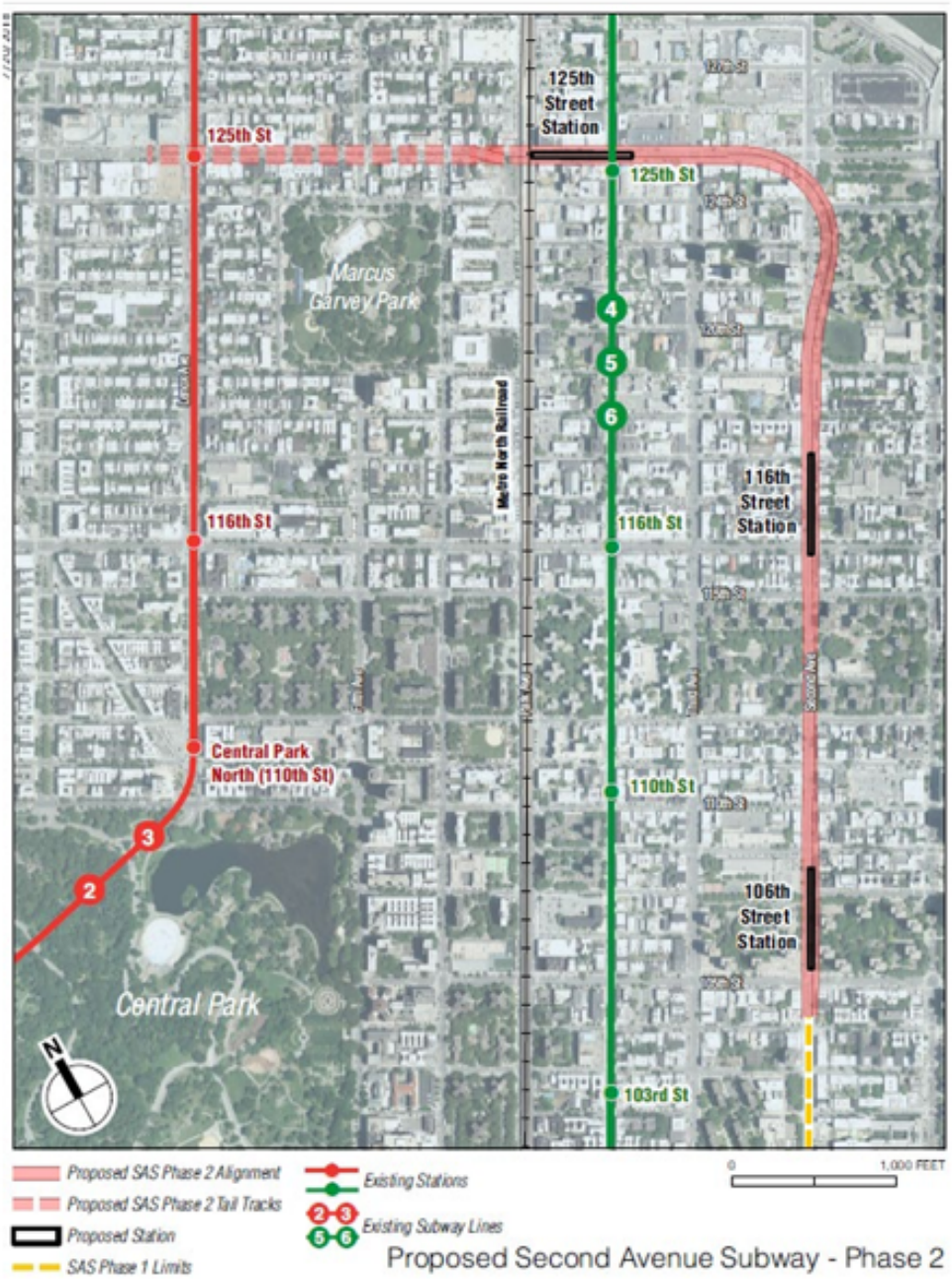


Figure 2: Alignment of the Second Avenue Subway Phase 2 Project. From the FTA[1]

ernization program on the Queens Boulevard Line (QBL) West project.[24][25][26][27] The MTA is also moving forward with CBTC signal modernization on the IND Fulton Street Line, the branch of the A train that currently operates the southern section of the existing RBB line from Aqueduct to Far Rockaway/Rockaway Park, as part of the 2025-2029 Capital Pla. This is afforded by revenue gathered by the reinstated Central business Tolling Program (more commonly known as Congestion Pricing) in January 2025.[28]

Modern CBTC signal systems unlock the full potential of the New York City subway by maintaining the safety of fast, frequent train operations on a double tracked system of up to 30-32 trains per hour, accounting for delays in real-life operations. As such, this study assumes that the entire fully reactivated RBB will be CBTC-enabled from day 1 of its revenue operations.

Existing operations on the QBL local tracks from 36 St Station to Forest Hills-71st Av see the R and M trains operating during weekdays, and only R trains during weekends. During weekends, the M train is shortened to Delancey St/Essex St in Manhattan, and on late nights, it operates as a shuttle operating between Myrtle Av and Middle Village-Metropolitan Av. Certain E/F train operations move to QBL local when construction/maintenance occurs on the express tracks/beyond Forest Hills-71st Av station. The proposed system of QueensLink will connect the former LIRR Rockaway Beach Branch line to the QBL local tracks using bellmouth provisions in the tunnels just East of the 63rd Dr - Rego Park station.

Fumigation Work Rules

Operating the RBB as a branch of the QBL local will free up capacity at the congested terminal of Forest Hills-71st Av station, where both M and R trains terminate on weekdays during the day. The current terminal is hamstrung by stringent, existing fumigation work rules, which reduce the terminal's turnback capacity during peak hours. These rules require NYCT staff to walk each car arriving at the platform and manually remove any passengers lingering on the train before the train can use the layup tracks behind the station to reverse direction. The proposed operational changes of this study assumes existing fumigation work rules will remain in place. The QBL local tracks can see additional services added with the introduction of proposed QueensLink services on the RBB corridor where additional terminal locations in the Rockaways allows for smoother terminal and turnback operations away from the QBL terminals.

The F/M Swap

During the writing of this study, the MTA has announced the permanent service change named the F/M swap,[31] in which the F train would run via the 53rd street Tunnel and the M train via the 63rd street tunnel. This route change will eliminate two train merge points

in Long Island City, reducing delays caused by trains heading into and out of Midtown Manhattan, as shown in the illustration below (Figure 3).

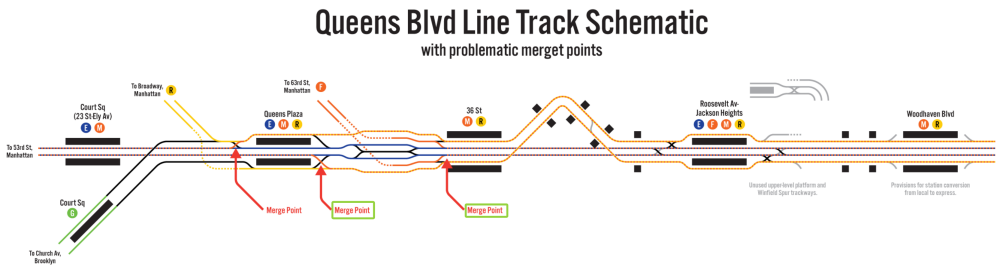


Figure 3: Queens Boulevard Line merging situation with current operations. Swapping the tunnel routing of F and M trains will eliminate two problematic merge points (in green boxes), reducing delays.[23]

In the swapped scenario, the M train will replace the F train to serve the three stations on the 63rd street tunnel corridor–Lexington Ave-63rd St, Roosevelt Island, and 21st St-Queensbridge–before moving on to serve the stations on the QBL local tracks.

Currently, the M is scaled back to Delancey St/Essex St after evening peak hours, and Myrtle Av during late nights. To avoid confusion and to imitate a more realistic service scheme, this study assumes that the M will run its full route length from Middle Village - Metropolitan Av to Forest Hills - 71st Av from approximately 5:00 AM in the morning until 9:30 PM, as this service schedule will satisfy the majority of the needs of the subway riders utilizing the M train. It will be scaled back first to Delancey/Essex Sts after 9:30 AM and then Myrtle Av during late nights. Starting from 9:30 PM to 5:00 AM to next morning, the F will run via the 63rd street tunnel to cover for the M scaling service back to Myrtle Av and Delancey/Essex Sts in the no-build scenarios. Some of the proposed operational schemes will make special note of whether this F/M route change (denoted as the The F/M Swap in descriptions) is part of the particular scheme and the changes are made at the GTFS fileset level. The No-Build GTFS Scenario containing the active F/M swap is the No-Build 2 Scenario (see Section 5(c) of the Methodology Section for More details). The F/M swap are now in effect as of December 8th, 2025.[31]

(C) Build Scenario Assumptions

Transfer Penalties

This existing transfer penalty between two subway stations, according to available MTA static GTFS schedules, is 180 seconds. As such, this study applies the same 180-second transfer penalty for passengers transferring between QueensLink Stations and existing A and J/Z trains in Southern Queens. QueensLink hopes that the transfer designs will be well implemented and transfer time will be kept in line with the rest of the existing

longer transfers in the subway network. Should QueensLink be built, the exact transfer passageway design and time impact would be left to the MTA's discretion.

Fleet Street Infill Station

The QueensLink proposal is based on the previous 2018 MTA Sketch Assessment, which included four new stations, with no additional stations suggested. However, extensive feedback during public outreach events has convinced QueensLink to explore a Fleet Street infill station option. To avoid redundant scenarios, the infill station within the STOPS model will be considered only if the Metropolitan Av-Parkside station sees a consistently strong ridership result across most proposed scenarios. If so, whichever proposed service pattern sees the highest ridership across the RBB will be further examined with the infill station to see if the overall ridership on the RBB increases or decreases. This methodology is intended to quantify the cost and impacts of adding this often-requested station on the reactivated line.

Far Rockaway/Rockaway Park Terminal Swap

The question of using the Far Rockaway-Mott Av station as the terminal for the proposed scenarios has also been raised during QueensLink's community outreach efforts, as the Far Rockaway-Mott Av branch serves more riders as opposed to the Rockaway Park-Beach 116 St branch (the Rockaway Shuttle between Rockaway Park-Beach 116th St and Broad Channel stations). In order to present a holistic picture of the ridership differences between the two terminals, the study will introduce the mirrored scenario where the new RBB service takes over the Far Rockaway Branch of the existing A train instead of taking over the Rockaway shuttle. In this mirrored scenario, the A train will use Rockaway Park-Beach 116 St as a full-time terminal instead of its existing terminal at Far Rockaway-Mott Av. The ridership results of the flipped terminals scenarios will be presented in scenarios 2D/2E (see Scenario Design section for more details).

Unconsidered Broadway Line Service Scenario

When mapping out hypothetical service scenarios, all three major B-Division trunk lines in Manhattan were considered: 8th Avenue, 6th Avenue, and Broadway. Examining the 8th Avenue capacity and schedules yielded the new H service scenario. An analysis of the 6th Avenue capacity yielded an extension of the existing M train and a possible new V service scenario. Examining the Broadway line yielded an extension of the existing R train. While a hypothetical new Broadway service was mapped out, this study deemed it infeasible under existing NYCT subway route structure. The prerequisites of a hypothetical new Broadway service include a major de-interlining effort across the entire NYCT Subway B-division and potential expansion of the City Hall terminal in downtown Manhattan. Thus, it

is outside the scope of the report, and this study does not pursue a Broadway Line-based new service scenario.

Flushing Line Maintainence and Current Long-term Repairs Outage

As of the writing, the 7 train is currently undergoing structural maintenance and repairs[32] that impact the completeness of static GTFS schedules of the 7 train. Certain stations are skipped in one direction during weekday hours as long term outages. To fully capture the ridership impacts of QueensLink services on the 7 train stations in Queens, the study utilizes 2019 GTFS for the 7 train that ran the full express and local services on both directions in weekdays within the Build scenario. This is done to account for service quality and travel behaviour changes once the current maintenance and repairs are concluded. In the detailed ridership analysis and comparisons, the stations currently facing long term outage in one direction are omitted from ridership comparison due to lack of good reference data to perform such comparison.

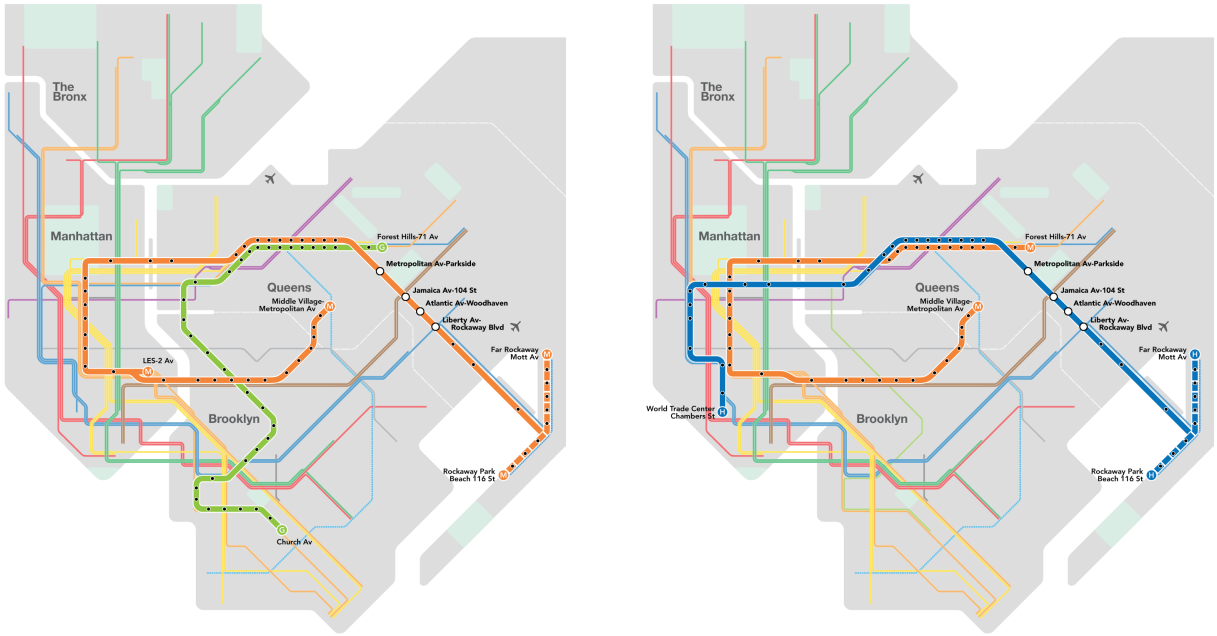
IV: Scenarios Examined

The specific scenario designs are laid out in 3 tiers. The proposed Tier 1 scenarios contain the most straightforward and contained scenario, where modifications only apply to the QueensLink corridor. The proposed Tier 2 scenarios are extended scenarios that utilize the QueensLink corridor with more modifications or proposed service extensions. The proposed Tier 3 scenarios considers QueensLink corridor's ridership synergy with the IBX.

(A) Tier 1: Core Scenarios

Tier 1 proposed scenarios contain the two core service scenarios considered in this study: the 6th Avenue M extension service and the 8th Avenue H extension service. See Build scenario assumptions for reasoning behind the lack of Broadway service scenario considered.

1A: 6th Avenue M Extension



(a) 6th Avenue M

(b) 8th Avenue H

Figure 4: Tier 1A/1B Scenarios

This scenario is one of the more intuitive service scenarios explored in this study, and it is consistent with QueensLink's existing advocacy efforts. The M train currently runs

from Middle Village-Metropolitan Av to Forest Hills-71st Av in daylight hours, with late evening service reduced to Delancey St/Essex St. Late night service exists as the Myrtle Avenue shuttle between Myrtle Av and Middle Village-Metropolitan Av. In the proposed service scenario, the M train will be reinstated as a full 24-hour service from Middle Village-Metropolitan Av to Rockaway Park-Beach 116 St, to maintain service on the four new stations on the QueensLink corridor and the three stations on the 63rd Street tunnel corridor. This service scenario accounts for the aforementioned F/M swap. Overall, it will run at its current frequency of 8-9 TPH (trains per hour) on all sections of its route during peak hours, 5-6 TPH on off-peak and intraday hours, and 3 TPH on late nights.

To further supplement service on the QBL local tracks and 6th Avenue local stations, this proposed service also adds a peak hour M trains that run between LES-2 Av and Rockaway Park- Beach 116 St. This peak hour supplemental service is not able to run on the M train segment between Delancey St/Essex St and Middle Village-Metropolitan Av due to infrastructure constrains on the Jamaica and Myrtle lines. Currently, the M train uses 8 car trains due to the shorter platforms on stations between Delancey St/Essex St and Middle Village-Metropolitan Av. However, the LES-2 Av to Rockaway Park-Beach 116 St route allows this supplemental M service to utilize full 10 car trains, since all stations on this route can accommodate the longer trains. The short-turn M train will have more optimal crew scheduling within the mainline 24-hour M service, where the same M and M train crews have the option to alternate between running the longer, full-route M train and peak hour, shorter M train.

Since in this scenario, the M train no longer utilizes Forest Hills-71st Av for its terminal, G train service can now be re-introduced to the QBL local tracks and terminate at Forest Hills-71st Av. The current Rockaway shuttle will be fully replaced by the M train, and the A train will continue to run to Far Rockaway-Mott Av and Ozone Park-Lefferts Blvd on its branches. During peak hours, services on the QBL local tracks will feature, on average, 8 TPH full service M trains, 4 TPH peak hour short-turn M trains, 8 TPH G trains, and 8 TPH R trains, which total up to 28 TPH. This proposed frequency is well within the operational capacity of the CBTC-enabled QBL local tracks and leaves room for incidental delays. On the 6th Ave local tracks, the M and F trains will see a combined frequency of 27 TPH (15 TPH on the F train, 8 TPH on the full service M train, and 4 TPH for short turn M trains), which is also within the operational capacity after CBTC upgrades and leaves room to account for incidental delays.

1B: 8th Avenue H New Service

The proposed H train service would utilize existing capacity on the 8th Avenue trunk line. After connecting onto the QBL local tracks at 63rd Dr-Rego Park, the H train travels alongside the M/R trains until it reaches the Queens Plaza station. Here, it merges with the E train to travel through the 53rd Street tunnel. After merging onto the 8th Avenue line at 50 St, the H train runs as an express train on 8th Avenue alongside the A train. Then, the H train switches back to the 8th Avenue local tracks at Canal Street to terminate at

World Trade Center alongside the E train. The total runtime of the H train in one direction is around 1 hour and 15 minutes, which is roughly equal to existing daytime E train trip durations – a relatively short route among all NYCT subway services. The alignment allows for the H train crew scheduling to be nested within the E train schedules, and the same set of crews can alternate between running the E train and H train.

As the 8th Avenue line undergoes CBTC modernization[24],[33] there will be sufficient capacity at World Trade Center to turn back both the E and H trains. In current peak direction operations, the A train runs at approximately 15-16 TPH on the express tracks in Manhattan, leaving the H train to supplement 8th Avenue express service in Manhattan with another 8 TPH. The E train runs at 15 TPH from both Jamaica Center-Parsons/Archer and Jamaica-179 St terminals. The combined peak turnback frequency at World Trade Center Terminal is 23 TPH–well below the turnback capacity offered by CBTC upgrades. As the H train utilizes the 53rd Street tunnel alongside the E train, there will be no F/M swap, but instead the F/M will both utilize the 63rd Street tunnel. The total tunnel capacity of the 53rd Street tunnel will allow the H to maintain its 8 TPH frequency heading onto the QBL tracks under CBTC signaling operations. For other existing services, the current M/R trains will continue to terminate at Forest Hills-71st Av and the G train will remain at its Court Sq terminal. The A train will continue to run to Far Rockaway-Mott Av and Ozone Park-Lefferts Blvd on its branches. The combined frequency of QBL local tracks west of 63rd Dr-Rego Park will increase to 24 TPH on peak hours with the express frequencies of E/F trains remaining unchanged.

The introduction of the F/M Swap (see section above) has rendered the H train currently infeasible to operate. However this route option is still studied due to a good utilization of current capacity without the F/M Swap. It is also a precursor to a potential disentanglement of QBL services should the F train move back to 63rd St due to other service and/or system expansions.

1C: 6th Avenue M Minimum Service Scenario

In scenario 1A, The 6th Ave M scenario is proposed to operate with 12 TPH peak frequency on a mixed 8/10 car M train fleet and 10 car G train fleet, which is an increase over the existing 8-9 TPH, 8 car M train fleet, and 5 car G train fleet. This study has also factored in a minimum viable service scenario based on the existing NYCT fleet and service levels. This minimum viable scenario sees no 10-car peak hour short turn M service terminating at 2 Av, but increases the peak frequency of the regular, full-length train being increased to 9 TPH to compensate for the removed short turn trains. The G is still extended back to its old terminal of Forest Hills-71 Av. No further changes from scenario 1A are made to create scenario 1C.

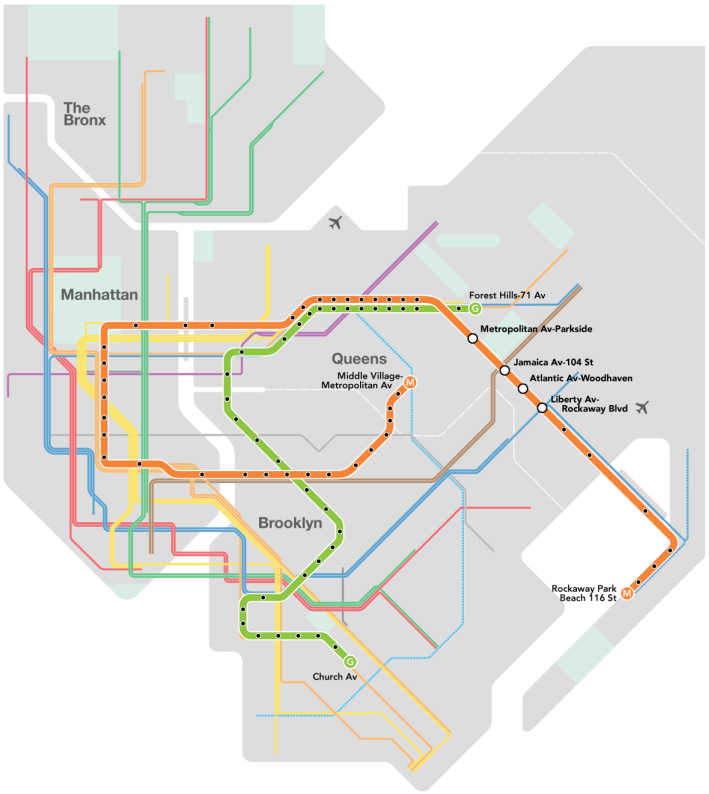


Figure 5: 6th Avenue Ⓜ Minimum Service Scenario

(B) Tier 2: Extended Scenarios

The new services and extensions scenarios in this section include the 6th Avenue V train, Broadway R train, and the Crosstown G train to Rockaway Beach. The M/H trains with flipped terminals and the M train with the A/C Split are also included in this tier.

2A: 6th Avenue V New Service

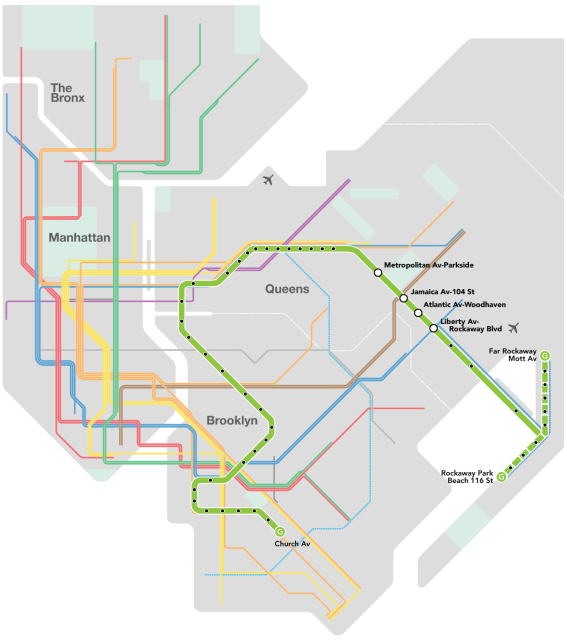
The V train was a service pattern that the NYCT subway ran between 2001 and 2010 when budget cuts eliminated it from the subway network. It ran from Forest Hills-71st Av via the QBL local tracks, the 53rd Street tunnel with the E, and the 6th Avenue local tracks, terminating at the LES-2 Av station. Starting service from its old terminal at LES-2 Av, this study's V train scenario runs alongside the F and M trains on the 6th Avenue local tracks, and uses the 63rd Street tunnel alongside the M. From there, it runs on the QBL local tracks, splitting onto the RBB after 63 Dr-Rego Park to serve the QueensLink and Rockaway stations. Finally, it terminates at Rockaway-Park Beach 116 St. This service scenario accounts for the aforementioned F/M swap.

The V train will run at 7.5 TPH during peak hours, 6 TPH intraday and off-peak, 5 TPH in late evenings, and 3 TPH during weekday late nights. In terms of tunnel usage, the V will run alongside M via the 63rd Street tunnel. On weekends and nights when the M does not run in Queens, the V will continue to operate. During peak hours, services on the QBL local tracks will feature, on average, 8 TPH for M trains, 7.5 TPH for V trains, and 8 TPH for R trains–well within the operational capacity of post-CBTC upgrades. On the 6th Ave local tracks, the M, V, and F will see a combined frequency of 31.5 TPH (15 TPH F, 8 TPH M, and 7.5 TPH V), which is within its operational capacity of CBTC. However, this leaves very little room for incidental delays. The reintroduction of the V train requires a different set of crews operationally, meaning additional operational funds must be allocated for the V train (instead of the potential of creating nested crew schedules of the M train extension crew and E/H extension crew respectively). The current M/R trains will continue to follow their current schedules. The G train will continue to terminate at Court Sq, and the A train will continue to run to Far Rockaway-Mott Av and Ozone Park-Lefferts Blvd on its branches. The current Rockaway shuttle will be replaced by the V train full-time.

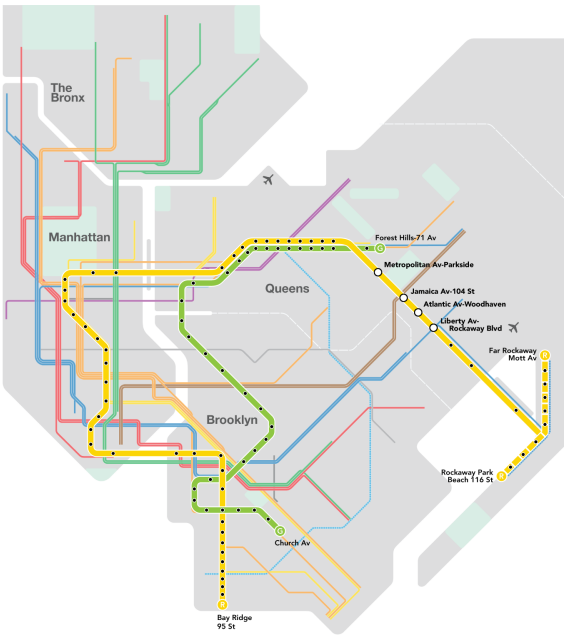
2B: Crosstown G Extension

Ever since QueensLink commenced community outreach efforts, there have been extensive discussions about modifications to the G train service. The most common discussion regarding the G train is the potential of extending service back to Forest Hills-71st Av in some shape or form, which has been included in the aforementioned scenarios. The natural extension of that discussion is to run the G train via the RBB down to Rock-

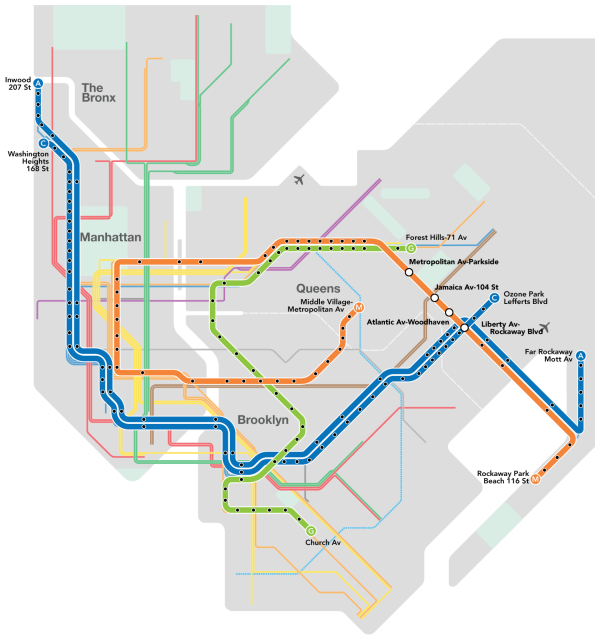
(a) Scenario 2A: 6th Av V New Service



(b) Scenario 2B: Crosstown G Extension



(c) Scenario 2C: Broadway R Extension



(d) Scenario 2D: 6th Av M with A/C Split Service

Figure 6: Tier 2 Service Scenarios

away Park-Beach 116 St. In this scenario, the G train becomes a fully circumferential line, starting from Church Av in Brooklyn, first reaching Long Island City, then Jackson Heights, and terminating in the Rockaways. This extended G train covers the full extent of the QueensLink corridor, merging with the QBL local tracks at 63rd Dr-Rego Park. At Long Island City, it switches back to its original crosstown route, continuing on to its current Brooklyn terminus, Church Ave. It will run at its current frequency on all sections of its route. The current Rockaway shuttle will be replaced by the G train full-time. The M train will continue to run on the IND 6th Avenue local line with the F train in Manhattan, and the train pair uses 63rd and 53rd street tunnels to enter/exit Queens under the F/M Swap, respectively.

Operationally, this crosstown G train extension scenario is not optimal due to its excessive run time of 1 hour and 50 minutes in one direction and the requirements for a massive expansion of G train crews. It would also require either 8-car or 10-car trains on the G train due to the QBL local line demands during peak hours. The current 5-car trains of the G train will not be sufficient for passenger capacity on the QBL local line, requiring further capital expenditure or rolling stock shuffling for the MTA. For other trains, the A will continue to run to Far Rockaway-Mott Av and Ozone Park-Lefferts Blvd on its branches. The M train will continue to terminate at Delancey St/Essex St on weekends and operate as a shuttle to Myrtle Av on weekend late nights. The R service is unchanged in this scenario. The combined weekday peak frequency of the QBL local line west of 63rd Dr-Rego Park will increase to approximately 24 TPH with the G, M, and R trains serving the local tracks.

2C: Broadway R Extension

Although this scenario extends one of the longest all-local trains in the NYCT subway system, this service scenario is very popular among curious QueensLink supporters. This R train scenario will continue to run around 8-9 TPH. G train will resume service on the QBL local tracks and terminate at Forest Hills-71st Av alongside the M train, occupying the extra terminal capacity that the R no longer occupies. The M train will continue to run on the 6th Avenue local line with the F train in Manhattan, and the train pair uses 63rd and 53rd street tunnels respectively to enter/exit Queens under the F/M Swap. Operationally, this R train extension scenario is the least optimal due to its excessive run time of 2 hours and 4 minutes in one direction. This further exposes the already long service to cascading delays on the system due to the R train's interlining with many other trains. The long total runtime in one direction would require additional crews to man the 24-hour service, accruing additional operational expenditure.

Under this scenario, the Rockaway shuttle will be replaced by the R train full-time, while the M train will continue to terminate at Delancey St/Essex St on weekends. The combined frequency of the QBL local line west of 63rd Dr-Rego Park will increase to 24 TPH during peak hours.

2D: 6th Avenue M Extension + A/C Split

This service pattern is an expansion of the previous 6th Avenue M train Extension scenario (1A). With the resumption of the IND Fulton Line CBTC project, this study also considers the ridership and operational impacts of providing additional service to Rockaway residents via the A/C split. The A/C split scenario reduces the southern terminals of the A train to only Far Rockaway-Mott Av, replacing the 3 stop Lefferts Blvd branch with an extended C train service. The merge east of the current C train terminal at Euclid Av is in theory less troublesome to operate due to the new CBTC signals.

The rest of the service arrangement is the same as the 6th Avenue M train extension scenario (Scenario 1A), where the M train terminates at Rockaway Park and the G train is reinstated back to Forest Hills-71st Av. This scenario is a service alternative specifically configured to explore the impacts of additional single-terminal A train operation. This scenario investigates whether this configuration will yield additional ridership growth due to more frequent service in the Rockaways with the north-south running RBB service. In GTFS scheduling differences, extending the C train to Ozone Park-Lefferts Blvd adds 10 minutes of train run time in each direction. This increase has a smaller impact on existing crew scheduling due to the shorter extra run time compared to the crew scheduling strain on more extreme examples of service extension, such as the G/R train extensions to the Rockaways.

2E/2F: 6th Avenue M / 8th Avenue H with Flipped Rockaway Terminals

As part of a comprehensive analysis, and to understand the ridership dynamics of the Rockaways, this study also looks into scenarios where the Far Rockaway - Mott Av bound A train and the prospective RBB service to Rockaway Park - Beach 116 St (in this case M/H) swap terminals in each direction. Other than this change, the premise of scenarios 2D/2E are the same as those in 1A/1B. The GTFS block schedule shows a 5-minute total travel time difference between the two Rockaway terminals, making the operational impact mostly negligible for either the A train or the M/H trains.

(C) Tier 3: Core Scenarios with IBX

QueensLink & the Interborough Express (IBX)

During multiple community outreach events along the RBB corridor, the QueensLink community outreach team has encountered many questions regarding the differences and similarities between the Interborough Express (IBX) and QueensLink. This section discusses the two projects and clarifies some previous common misconceptions that were raised during outreach events.

The only existing circumferential train service directly connecting Brooklyn and Queens without entering Manhattan is the IND Crosstown Line, most commonly known as the G train. Many factors make the G train unattractive to provide adequate transit from inner Queens to Brooklyn, including unfortunate station locations, missed transfers with the J/M/Z trains in Williamsburg, missed transfers to the D/N/R/B/Q/2/3/4/5 trains in Downtown Brooklyn, and a long transfer with the L train. Using an outer-borough alignment, the IBX aims to connect with even more trains than the G does across both Brooklyn and Queens. The MTA claims that there could be more than 20 minutes of time savings for Brooklyn-Queens trips that currently necessitate a detour into Manhattan.

QueensLink, on the other hand, contains many stark differences to the alignment of the proposed IBX. Long before purchasing the RBB corridor from the LIRR in the 1950s, New York City had planned the full corridor to be a branch of the QBL.[30] It was designed as a radial trunk line, feeding commuters from the furthest reaches of Queens and Nassau counties into Manhattan. The designed intention of the QBL makes the RBB a radial line by direct association in its planned integration.

The additional trains originating from the RBB corridor and merging onto QBL local tracks also serve to alleviate some direct crowding concerns at the platforms of major express stations such as Queens Plaza and Jackson Heights-Roosevelt Av. During peak AM rush hours, local riders who used to walk to these express stations to catch an express train can now expect much more frequent local trains arriving at their closer local stations. In the reverse direction from Manhattan to the outer boroughs, QueensLink also reduces travel time for JFK Airport-bound travelers from Midtown origins, as the RBB services reduce the total trip time from midtown Manhattan to JFK terminals. This is because with QueensLink, the Howard Beach/JFK station is closer to the JFK terminal zone than the Sutphin Blvd-Archer Av-JFK Airport station on the E/J trains.

Despite the differences, QueensLink and IBX are both desirable projects that serve to balance system ridership, reduce certain trip travel times, create new origin-destination travel patterns, and reduce crowding for congested stations and corridors. To explore the ridership synergies, this study considers three scenarios named 3A, 3B, and 3C respectively. These scenarios are the same as the 1A, 1B, and 1C scenarios but also consider the ridership impact of IBX. As the IBX is well underway in its design and environmen-

tal studies scoping phases,[36] it is natural to assume that QueensLink would be part of a system where the IBX has been built in 2040. As such, the point of comparison on Build vs No-Build impact is between an NYCT subway system with IBX and QueensLink and the system with IBX and without QueensLink. No-Build 2 is the foundational No-Build scenarios in which IBX is completed by 2035. They will serve as the basis of comparison for network effects in scenarios 3A/3B/3C.

3A: 6th Avenue M Extension + IBX

The proposed IBX service in this scenario (the magenta X train in the illustration) will be evaluated with currently advocated peak headways of 5 minutes to explore the ridership impacts on QueensLink corridor and the larger subway system. It is assumed that the X will be completed before QueensLink is complete and is therefore factored into a separate No-Build Scenario (No-Build 3) for separate build evaluations. The X train will run at 12 TPH during peak hours, 8 TPH intraday, 5 TPH in late evenings, and 3 TPH in late nights. The frequency of the M train has not changed from scenario 1A.

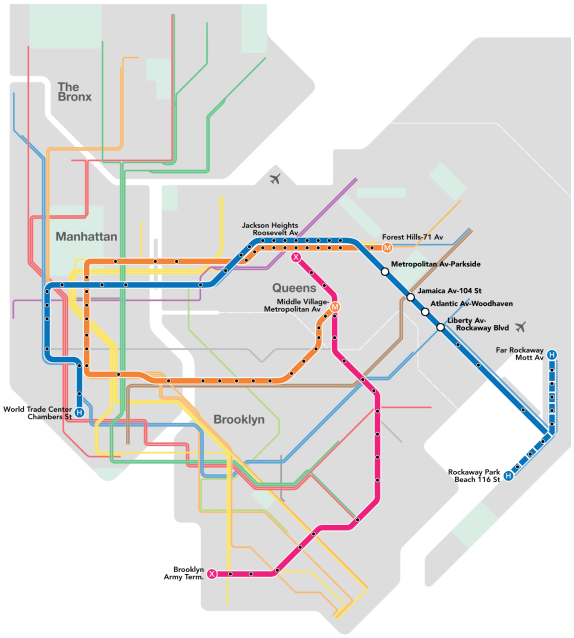
3B: 8th Avenue H New Service + IBX

As in the previous scenario, where the impacts of the IBX are studied with the M train extension, this scenario studies the impacts of the X train alongside the 8th Av H train service. The frequency of the X train has not changed and the same H train frequencies remain from the scenario 1B .

3C: 6th Avenue M Extension Minimum Service Scenario + IBX

Scenario 3C examine the ridership impacts of the IBX are studied with the M train extension under minimum viable service scenario, this scenario studies the impacts of the IBX alongside the 8th Av H train service. The frequency of the IBX trains has not changed in this scenario. The frequency of the M train has not changed from scenario 1C, where the Peak hour short turn M trains are removed and the full length M train frequency are increased to 9 TPH.

(a) 6th Av M train with IBX



(b) 8th Avenue H train with IBX

(c) 6th Av M Train Minimum Service Scenario with IBX

Figure 7: Tier 3 Scenarios

Summary of Scenarios examined

	Tier 1A (M)	Tier 1B (H)	Tier 1C (MVS)	Tier 2A (V)	Tier 2B (G)	Tier 2C (R)	Tier 2D (M)/(A) Terminal Swap	Tier 2E (H)/(A) Terminal Swap	Tier 2F (M)+(A)(C) Split	Tier 3A (M+X)	Tier 3B (H+X)	Tier 3C (MVS+X)
SAS Phase 2	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
IBX?	×	×	×	×	×	×	×	×	×	✔	✔	×
F/M Swap?	✔	×	✔	✔	✔	✔	✔	×	✔	✔	×	✔
A/C Split	×	×	×	×	×	×	×	×	✔	×	×	×
Rockaway Terminal Swap	×	×	×	×	×	×	✔	✔	×	×	×	×
Manhattan via 8th Avenue	×	✔	×	×	/	/	×	✔	×	×	✔	×
Manhattan via 6th Avenue	✔	×	✔	✔	/	/	✔	×	✔	✔	×	✔
Peak hour short turns services	✔ 4 TPH	×	×	×	×	×	✔ 4 TPH	×	✔ 4 TPH	✔ 4 TPH	×	×
Peak Hour Full Length Service Frequency	8 TPH	8 TPH	9 TPH	8 TPH	Existing Frequency	Existing Frequency	8 TPH	8 TPH	8 TPH	8 TPH M 12 TPH X	8 TPH H 12 TPH X	9 TPH 12 TPH X
Improvement on Existing QBL Local Frequency	~75%	~50%	~56%	~50%	~50%	~50%	~75%	~50%	~50%	~75%	~50%	~56%
Improvement on Manhattan Trunk Frequency	~17% On 6 Av Local	~50% On 8 Av Express	~4% on 6 Av Local	~33% On 6 Av Local	/	/	~17% On 6 Av Local	~50% On 8 Av Express	~17% On 6 Av Local	~17% On 6 Av Local	~50% On 8 Av Express	~4% on 6 Av Local

Figure 8: Summary of Scenarios Examined

V: Methodology

(A) Overview of STOPS Software & General Methodology

The methodology used in this study entails three major components: the Simplified Trips-On-Project Software (STOPS) modeling software, the GTFS Editor (GTFSed), and the manually created GTFS schedules of the New York City Subway for all the examined scenarios listed above. The GTFS schedules for MTA buses operated by each bus company/bus district are untouched and integrated into STOPS as is. The GTFS for each scenario are edited on GTFSed and manually examined in software and in Notepad++, a text editor to ensure there are no compute errors during STOPS integration. The GTFS creation process is detailed in the subsequent sections of this report.

The STOPS Software is a computerized model with a Graphical User Interface (GUI) for transit ridership estimation. It is a software developed by the United States Federal Transit Administration (USFTA) aimed to help smaller public transit agencies examine potential ridership of new public transit service expansion. The software allows planning for bus, bus rapid transit, light rail transit, and heavy rail, and can account for guideway differences (fixed vs. mixed guideway). It contains specific modifiers reflecting American transit usage, such as Kiss-n-Ride transfers, Park-n-Ride transfers to bus, and congestion modifiers in the form of highway travel time penalty constants and ratios. The detailed steps that STOPS undergoes with human input eventually produces a detailed, comprehensive report on system ridership. Further information on this is in Appendix A. Further directions can be found on the FTA website for its official user handbook.[29]

Arriving at a Good Initial Approximation of Real Life Ridership

There are some guiding metrics that tell the STOPS software user whether their data inputs have correctly reigned in the transit system's preliminary interpretation of ridership distribution. To ensure the preliminary ridership distribution is performed properly by STOPS overall, this study makes careful adjustments to a set of parameters named "Auto Travel Time constant/multiplier." These two modifiers allow the STOPS model to add additional highway travel time based on the travel time for the current year and existing year, initially predicted by the regional New York Municipal Planning Organization (NYMPO). The addition of extra travel time reflects the increase in congestion and therefore travel time on auto-based trips, which is a key evaluation metric to prompt a hypothetical trip previously made on a car to be on public transportation instead. By placing additional travel time on the zone-to-zone auto-travel times previously predicted by NYMTC, the model was able to converge internally to a total weekday daily unlinked trip count that is very close to what is actually reported in real life. This is based on the MTA reports for the weekday trip count on the agency data reporting website. This converged initial understanding of total ridership count and daily platform level ridership (for subway) and route

level ridership distribution (for buses) will be the staging point for ridership forecasting into the future made by STOPS.

Last 30 Days of Ridership for Selected Agencies

Date	Subways	Buses
Sat, 04/12/2025	2,528,127	842,497
Fri, 04/11/2025	3,864,826	1,396,300
Thu, 04/10/2025	4,299,477	1,524,644
Wed, 04/09/2025	4,343,794	1,548,648
Tue, 04/08/2025	4,324,220	1,536,222
Mon, 04/07/2025	3,848,628	1,424,204
Sun, 04/06/2025	2,059,867	742,341
Sat, 04/05/2025	2,658,935	915,296
Fri, 04/04/2025	3,990,036	1,465,455
Thu, 04/03/2025	4,286,943	1,515,578

Figure 9: Reported daily network ridership on subway and buses.[9]

The total weekday unlinked trip count data this study selected was the reported ridership for April 9th, 2025, at approximately 5.5 million combined riders for the subway and buses. This number serves as the convergence point for the STOPS model to understand the existing ridership conditions. It also uses the route level and platform level ridership of buses and subway lines to properly distribute the total ridership onto the bus network and subway stations for future scenario ridership estimates. (Note that the MTA website updates the ridership numbers for one particular day constantly due to rolling data analytics.)

As a result, the regional calibration factor under existing conditions for all studied scenarios is at 1.00, a quantified metric that demonstrates that the model was able to distribute all reported ridership correctly onto the respective subway stations and bus stops. Although not a perfect 1 to 1 distribution of daily ridership inputs, the converging raw unlinked transit trips count and the subsequent regional calibration factor shows that the model is ready to forecast future ridership trends holistically under the existing inputs and constraints.

CTPP Calibration Methods

The CTPP calibration methods used in this study is Group 11, OD-Route Level. This method was chosen mainly because of the availability of bus route level data present on the MTA's yearly network reporting. During the writing of this report, Dr. Eric Goldwyn, the faculty advisor for this study, reached out to the MTA's data science team regarding the possibility of releasing granular bus boarding data for each existing bus route down to each individual bus stop on the entire NYCT and MTA bus network. The MTA replied

courteously that there have been internal evaluations of whether data at this granular level (which the subway ridership data has already been presented and available to the public) would be fully released to the public, and the evaluations are inconclusive. Therefore, the calculation method based on OD for Group 11, aided by bus route level ridership, allows for further granular tuning of STOPS's initial understanding of existing ridership distribution within the NYCT network, and is a better calibration method than then simpler Group 10 (OD Level only) without the route-level ridership.

Inputting Existing Platform Boarding Numbers

There are some specific steps that this study performs to ensure a more accurate ridership model that reflects the current ridership trends. Currently, there are two types of station-level ridership data available to the public: MTA Subway Hourly Ridership: 2020-2024 and MTA Subway Origin-Destination Ridership Estimate: 2024. MTA Subway Hourly Ridership: 2020-2024 logs contain all paid OMNY and Metrocard swipes at stations at every hour of the day. However, the key logs do not distinguish between specific locations of the turnstiles. The lack of turnstile location data makes any proxy calculations difficult to perform for the location and turnstile proximity to the nearest train platform. Although this study has collected daily station card swipe data by tallying all paid OMNY and Metrocard swipes on the hourly dataset onto a 24-hour basis, the data collected here are not granular enough to input the platform level daily boarding count for a specific station into STOPS. Therefore, the card swipe data was used for internal reference only and not integrated into the existing data reporting for STOPS.

To ensure that STOPS is aware of existing daily board count on the subway platforms, the second available dataset–MTA Subway Origin-Destination Ridership Estimate: 2024–is used as the basis point to approximate a more accurate distribution of daily platform level ridership on weekdays. With the gracious assistance of Marron Institute researchers Joao Pauloro and Elif Ensari, this study was able to extrapolate the daily per platform ridership at all subway stations based on the OD data provided by the MTA data science team. First and foremost, the data selected from the available entries in MTA Subway Origin-Destination Ridership Estimate: 2024 database are filtered around working days only. Weekends, holidays or vacation months are not considered in the calculation of the algorithm. This selection rule aligns with the intent of the STOPS daily board reporting needs, as the software requires this metric to have a preliminary sense of the platform-level ridership in addition to the other planning data it can import from other inputs. Using an existing static GTFS fileset, network graphics are generated from the data where station transfers and walking connections can be made. Travel times and centrality metrics are calculated based on the walking and transit network connections, where a probabilistic routing can finally be made. After the probabilistic routing is made, data from MTA Subway Origin-Destination Ridership Estimate: 2024 are distributed across northbound and southbound platforms on each service. This produces a final number for ridership per platform that the STOPS software can import.

The MTA Subway Origin-Destination Ridership Estimate: 2024 dataset accounts for the total number of riders engaging on this OD pair in a day, but the layout of the NYCT subway means that there are many OD pairs that can have multiple routings. One, two, or even three different lines can participate in creating this OD pair-specific trip. It is very possible that due to the station placements for certain destinations, there are certain preferences for one route over another in addition to trip time considerations. Therefore, this study has employed a relatively straightforward algorithm to account for the possibility of ranked choice of routing within one OD pair. The probabilistic method returns up to 4 fastest routes (within our own simple routing rules and logics), with each assigned a probability factor (0 to 1) according to total journey time (x) and train frequency (y). The riders are then distributed onto the correct northbound/southbound platforms required to start their respective journeys using the probability factor. This algorithm allows for a better distribution of platform level ridership, when multiple routes using multiple different platforms yield similar travel times but different frequencies. Oftentimes, this is due to the variance in scheduling that NYCT has run for the different train routes.

Ridership Reporting

When reporting ridership numbers, the STOPS software reports unlinked boardings (ons), alightings (offs), and average numbers at a station with the two platforms in each direction individually. The sum of boarding and sum of alighting on all platforms, each individually consist of the same total ridership on the entire subway network, not the sum of both. Therefore, the ridership at one station is considered either by its boarding, its alighting, or its averages. For the NYCT subway farebox and current open data reporting purposes, the subway turnstiles consider ridership with a card swipe when entering the station, but no swipes are recorded when exiting the station. Therefore, total boarding count per platform per station is a rational comparison of the MTA's existing ridership estimates for the corridor. Platforms at large transfer stations are forecasted higher than further growth estimates for non-transfer stations. This is due to the fact that the boarding metric considers in-system transfers (e.g. local-express, bus-subway). These are not captured fully by available Opendata card-swipe-metrics. The metric of boarding count as the ridership numbers, therefore, can be seen as a representation of rider patronage at the platform level.

STOPS vs RTFM

STOPS is the made available by the US Department of Transportation (USDOT) Federal Transit Administration for the use by US public transportation agencies that necessary cannot afford their own ridership modeling division or ridership models. Currently, the MTA utilizes an approved closed-source model called Regional Transportation Forecast Model (RTFM). According to documents published by the MTA, the RTFM is "a travel demand model that predicts future travel patterns and transit ridership in response to

socioeconomic, demographic, and transportation system changes in the region, including 28 counties in New York, New Jersey, and Connecticut."[35] It utilizes some of the same data sources that STOPS relies on, such as the Census Transportation Planning Product and American Community Survey (ACS) 2012-2016 data, and 2018 New York City Travel Survey. As RTFM is closed-source, STOPS is the natural software to use by third parties to explore ridership forecasting.

(B) Data Sources

Data and documents have been gathered from multiple sources, including but not limited to: the New York Metropolitan Transportation Council (NYMTC), the United States Federal Transit Administration (USFTA), OpenDataNYS, OpenDataNYC, and the Metropolitan Transit Administration (MTA). Help from the Transit Costs Project team, led by faculty advisor Dr. Eric Goldwyn, allowed this study to prepare the dataset for STOPS importation. The full data set, data availability, and dataset access (if possible) is available in "Appendix IV, List of Data Sources." Some datasets are unavailable online and are only available upon request with the relevant agency. TransitLand, for example, requires a paid subscription to access older iterations of MTA's static GTFS. Alternate data sources that STOPS does not utilized are not considered in this study.

(C) Creating GTFS Files

This flow chart describes the process by which each of the GTFS scenarios are created from the publicly-available MTA NYCT subway static GTFS and modified GTFS schedules from November 2025. A previous version of the GTFS creation process utilized Feburary 2025 MTA NYCT subway static GTFS, but the GTFS creation methdology has since then been updated to utilize the November 2025 MTA NYCT Subway static GTFS.

The accompanying GTFS editing software (GTFSed) created for STOPS was used to edit GTFS schedules to create the service scenarios. GTFSed is a software that reads a complete set of required GTFS files, identifies possible errors before importing the GTFS files, and puts relevant information onto a GUI on the Windows operating system similar to the STOPS graphical interface. The software is relatively stringent regarding good GTFS coding practices and will not open a GTFS file unless all errors that GTFSed identified are manually corrected and removed by the user. All proposed QueensLink scenarios are reflected in the STOPS software as part of complete GTFS file folders, replacing existing operational patterns. GTFS, is a series of comma-separated data files that contain time and location information of a specific public transit service. The format of the files is standardized to contain certain necessary information. STOPS allows additional transit-adjacent information, such as Park-n-Ride and Kiss-n-Ride locations, to be integrated into the same GTFS folder for a specific service for additional auxiliary context and better ridership forecasting. The software is also publicly available on the USDOT FTA website.[38]

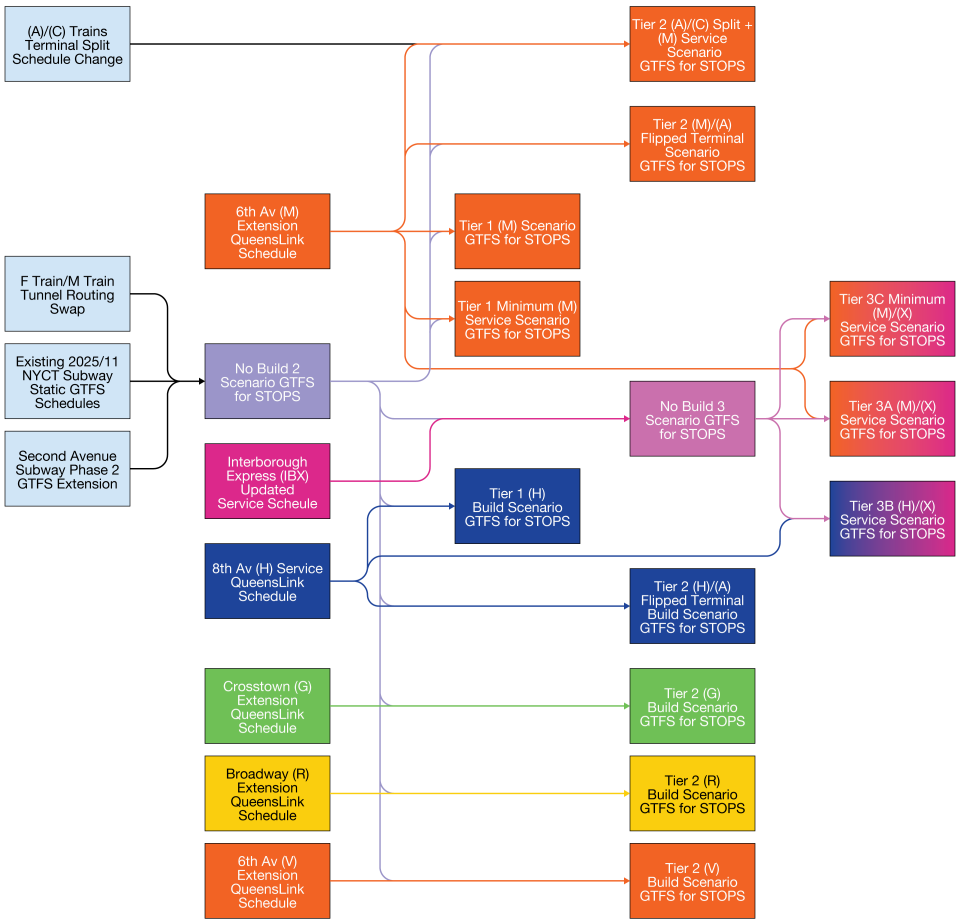


Figure 10: Flow chart of the GTFS creation process.

The Existing and No Build Scenario GTFS filesets were created first as a basis line. The existing scenario GTFS is currently based on the MTA NYCT Subway November 2025 static GTFS. Previously, the February 2025 GTFS file omits all service to the Rockaway Peninsula because of the Rockaway Line shutdown, which has since been completed as the publishing of this study. Therefore, the Feburary 2025 GTFS are not used. The existing and No-Build Sceanario GTFS are later rebuilt with MTA NYCT Subway November 2025 static GTFS.

In the initial runs, there were two versions of the No-Build Scenarios, No-Build 1 and No-Build 2, reflective of the current operational changes and ongoing capital expansion projects. No Build 1 builds on the Existing GTFS schedules but integrates the Second Avenue Subway (SAS) Phase 2 project, which is currently in construction after receiving a Full Funding Grant Agreement from the USDOT in 2023. No-Build 2 adjusts No Build 1 by incorporating SAS Phase 2, but also adds the F/M Swap. Since th final publishing of this study, the F/M Swap has been implemented and No-Build 1 has been discarded as a No-Build GTFS source. No-Build 2 is now used exclusively as the base for creating all Tier 1/2 runs.

In No Build 2, the full length M runs via the 63rd Street tunnel, and the F runs via the 53rd Street tunnel alongside the E. The full length M train (Middle Village-Metropolitan Av to Forest Hills-71st Av) runs from approximately 5:00 AM to midnight, and during late nights, the M train operates as the Myrtle Av shuttle. During late nights, between midnight and approximately 5 AM, the F train runs via the 63rd Street tunnel to cover for the reduced M train service.

Scenarios 1A, 1B, and 2A are created with the ”frequencies.txt” supplementary file to reflect the different headways during peak, intraday, late evenings, and late nights. Scenarios 2B and 2C are extracted from the February 2025 static GTFS and then modified to include QueensLink services. The 2B and 2C existing service frequencies and trips written into the February 2025 static GTFS are maintained.

In scenarios 2D, 2E, and 2F, no additional trips on the A and C trains are added, and all existing trip frequencies are maintained. Trip time to the new stations and terminals are replicated from the same existing schedule without modifications.

Lastly, in Tier 3 scenarios the IBX schedules are written with the ”frequencies.txt” supplementary file to reflect the different headways during peak, intraday, late evenings, and late nights. Since current plans for the IBX advocate for 5 minute headways during peak, the headways of the IBX services during peak, intraday, late evening and late nights are set at 5, 8, 15, and 20 minute intervals respectively. This study does not explore further headway reductions in separate scenarios for the IBX, but does take into account the updated travel time forecast for the IBX made by MTA and NYS officials in August 2025.[34]

A new No Build scenario named ”No Build 3” represents the 2040 scenario in which the QueensLink corridor does not see subway service but the IBX does operate. This No Build scenario forms the basis of the Build scenarios 3A and 3B. Scenarios 3A and 3B

are scenarios where the 6th Av M and 8th Av H trains scenarios are studied together with the IBX service in 2040 as opening date. These two scenarios gauge the impacts of the IBX on the QueensLink corridor services.

(D) Deriving Post-COVID Trip Count based on MTA Survey data

In addition to an assumed national baseline coded within the software, STOPS also encourages the user to input the trip distributions in the project and network area based on real life surveys conducted by the transit agency examining the project in question. The dialogue box to input the categorical trip data is in Step 2 of the software in the form of STOPS Parameters, shown below.

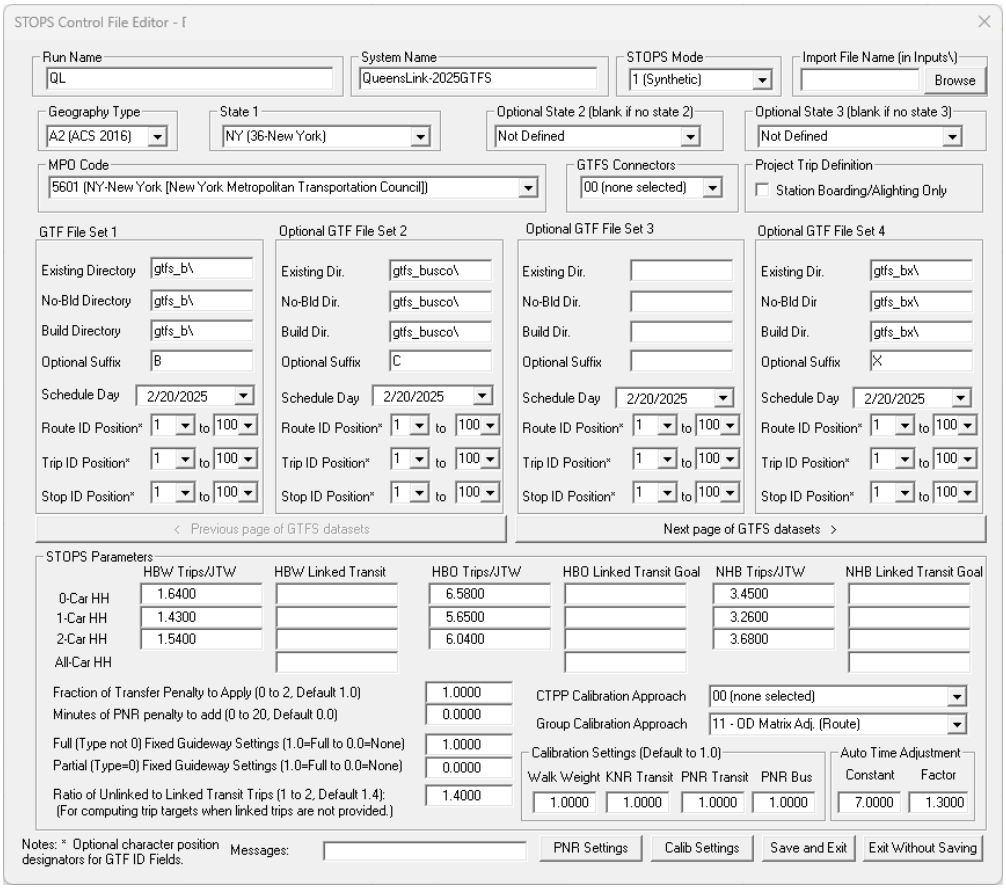
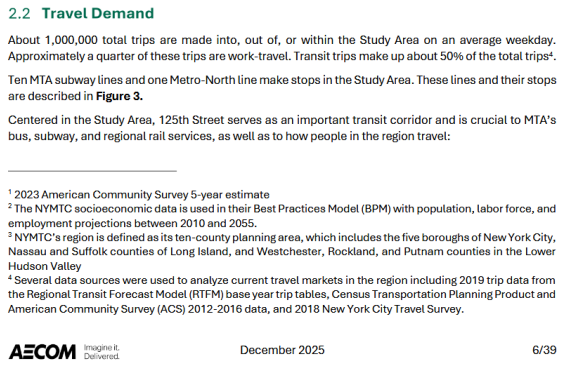


Figure 11: Example Step 2 Parameter Interface

In addition to the stock numbers under the ***HBW/HBO/NHB*** (Home-based Work/Home-Based Other/Non-Home Based) trips per ***JTW*** (Journey-to-Work) parameters, the MTA 2018 Agency Survey allows for the input of the Linked Transit Trips categorized to household car ownership (0-Car HH, 1-Car HH, etc on the left side of the dialogue box). The results of the Linked Transit trip data by household car ownership are derived by processing the raw 2018 survey data via Python, the programming language used by data

scientists. This data source is also used by the MTA in their feasibility study for Second Avenue Phase 2 Western extension study. The resulting Linked Transit Trip numbers are applied with a 75% ridership modifier to reflect the current post-COVID ridership recovery on the NYCT subway network. A Similar Post-COVID adjustment are also applied by the MTA in their own internal models, also confirmed by the Second Avenue Subway Phase 2 Western extension feasibility study.



2.2 **Travel Demand**

About 1,000,000 total trips are made into, out of, or within the Study Area on an average weekday. Approximately a quarter of these trips are work-travel. Transit trips make up about 50% of the total trips[4].

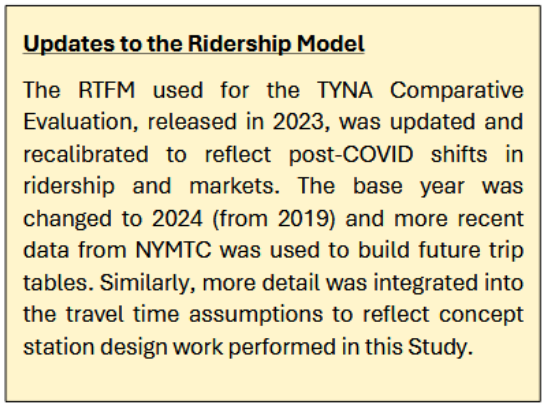
Ten MTA subway lines and one Metro-North line make stops in the Study Area. These lines and their stops are described in **Figure 3.**

Centered in the Study Area, 125th Street serves as an important transit corridor and is crucial to MTA's bus, subway, and regional rail services, as well as to how people in the region travel:

[1] 2023 American Community Survey 5-year estimate
[2] The NYMTC socioeconomic data is used in their Best Practices Model (BPM) with population, labor force, and employment projections between 2010 and 2055.
[3] NYMTC's region is defined as its ten-county planning area, which includes the five boroughs of New York City, Nassau and Suffolk counties of Long Island, and Westchester, Rockland, and Putnam counties in the Lower Hudson Valley
[4] Several data sources were used to analyze current travel markets in the region including 2019 trip data from the Regional Transit Forecast Model (RTFM) base year trip tables, Census Transportation Planning Product and American Community Survey (ACS) 2012-2016 data, and 2018 New York City Travel Survey.

AECOM Imagine it. Delivered. December 2025 6/39

(a) Confirmation of similar data sources between STOPS and RTFM[35]



Updates to the Ridership Model

The RTFM used for the TYNA Comparative Evaluation, released in 2023, was updated and recalibrated to reflect post-COVID shifts in ridership and markets. The base year was changed to 2024 (from 2019) and more recent data from NYMTC was used to build future trip tables. Similarly, more detail was integrated into the travel time assumptions to reflect concept station design work performed in this Study.

(b) Update Post-COVID metrics utilize by the MTA[35]

Figure 12: Confirmations of Data Sources and Post-COVID adjustment Application

The Linked Transit Trip data for each category are shown on the next page. The Linked Transit Trip data are applied equally across the parameter input box across all studied scenarios. The *Calibration Settings* boxes and *Auto Time Adjustment* boxes are untouched across all studied scenario. As both the stock trips/JTW settings and the Linked Transit Goals are now inputted into the parameters, STOPS will now have a more comprehensive sense of the daily trip goals of each car-ownership household category by purpose. This allows the software to distribute existing trip pattern on the studied network in a more holistic manner, closer to an real-life flows.

The positive impact of having both the national average and a real-life survey based Linked transit trip goal allows for a robust result in the STOP ridership report. In Section 2.04 *Station Group Boardings Prior to Adjustment* of a full ridership report of a specific scenario, the regional calibration factor is ideally placed at 1.00, meaning STOPS software under existing inputs have an adequate enough understanding of existing travel patterns.

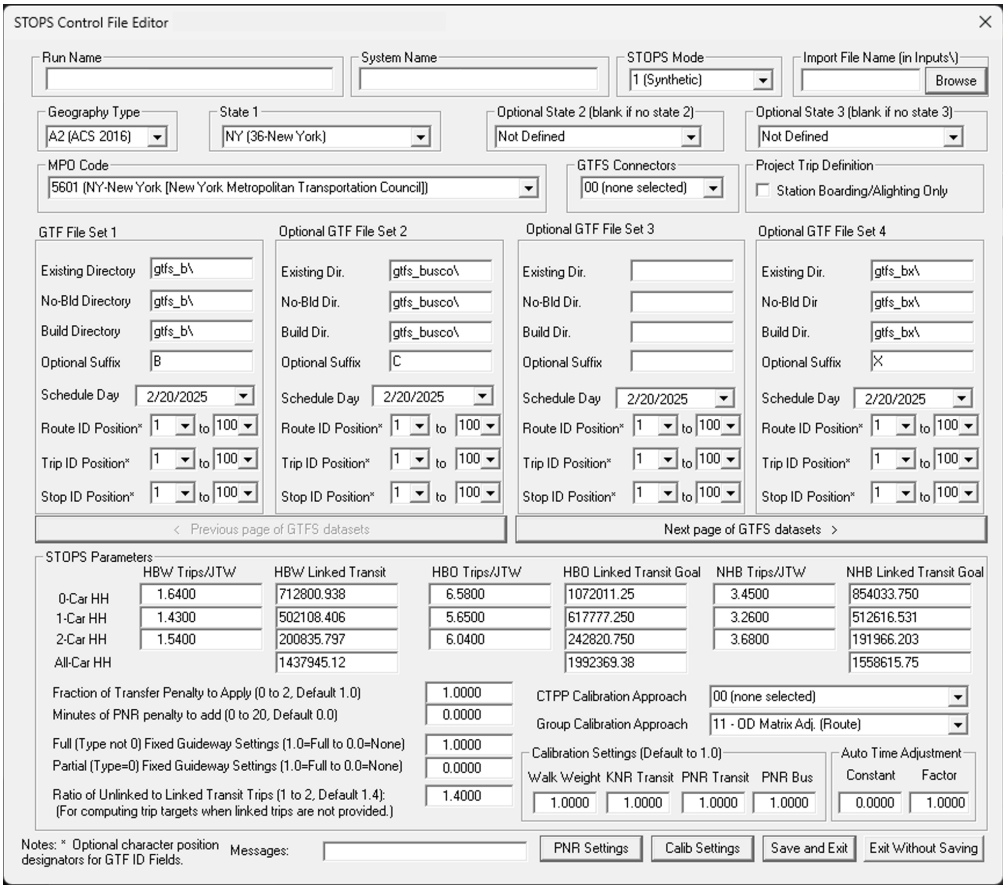


Figure 13: Tabulated Total Linked Transit Trip Count from MTA 2018 Survey

```
Program STOPS - FTA Simplified Trips-on-Project Software
Version: STOPS-v2.55 - 12/13/2024
Run:
System:
Table     2.04

Station Group Boardings Prior to Adjustment
Scenario  1: Y2025 EXISTING
Raw linked transit trips:            4568455.82
Raw unlinked transit trips:          5843737.83
Target unlinked transit trips:       5864129.00
Regional calibration:                      1.00
```

Figure 14: Regional Calibration Factor in the full report of a scenario. The preferred range for the facor is between 0.98 and 1.01. Any number out of the range shows the software have a hard time understanding existing trip patterns given the input data and something is wrong.

VI: Results & Discussion

(A) Corridor-Level Specific Ridership Analysis

Part 1: Context

The 2018 Rockaway Beach Branch Sketch Assessment estimated that in 2025, the stations between 63rd Dr - Rego Park and Howard Beach would see an average of 47,000 daily riders. This estimation was based on the 4-hour peak AM time period, with 10-minute headways (or 6 TPH). Ridership was then estimated for the rest of the day using a ”daily factor of 2.91”.

7.2 NYCT

For the NYCT alternative, the RBB was modeled with 10 minute headways in both directions in the 4-hour AM peak period. In order to create capacity along the Queens Boulevard track line, the following subway lines require a reduction in service:

- “R” train reduced inbound and outbound trains to and from Manhattan from 6 minute to 8.67 minute headways.
- “M” train reduced inbound trains to Manhattan from 6 minute to 8.67 minute headways and outbound trains from Manhattan from 10 minute to 20 minute headways.

Table 14 demonstrates the year 2025 station level ons and offs for the RBB for the 4-hour AM peak period. Using an AM peak period to a daily factor of 2.91 for NYCT ridership, has the project stations of Howard Beach to Parkside generating approximately 47,000 riders per day.

Table 14: Forecasted Year 2025 NYCT RBB AM Peak Period Ridership by Station

	Inbound		Outbound	
	Ons	*Offs*	*Ons*	*Offs*
Howard Beach	9,063	0	0	4,616
Aqueduct	871	0	0	709
Ozone Park	4,015	317	118	2,857
Woodhaven	1,278	215	170	763
Brooklyn Manor	2,537	781	499	1,276
Parkside	837	512	446	426
63rd Drive-Rego Park	852	2,492	1,720	262
Total	**19,453**	**4,317**	**2,953**	**10,909**

Figure 15: Estimation of AM peak ridership in the Sketch Assessment.[16]

Within the contents released by FOIL requests, the sketch assessment does not detail the methodology or reasoning behind the specific “2.91” factor that the MTA used to deduce ”total corridor daily ridership” from ”peak hour ridership” for the four new QueenLink corridor stations.

In the 2023 20-Year Needs Assessment (20YNA) appendix, the MTA revised their outlook for ridership on the RBB. In it, the agency further reduced the corridor’s projected ridership to 39,200 daily riders for the NYCT (subway) scenario. While the illustration in Figure 13 shows the study corridor starting at 63rd Dr-Rego Park and ending at Howard Beach, QueensLink has confirmed with MTA staffers that the 20YNA assessment also considers ridership from the Rockaway Shuttle stations. The 20YNA comparative evaluation only considered 4 TPH, as the MTA wanted to prevent further reduction to QBL services. The MTA did not consider the possibility of introducing more service onto the QBL as part

Per the NYCT Trip Planner, the approximate travel time for each route between 63rd Drive – Rego Park and 34th Street/Herald Square is 30 minutes. Combined with the above TPC runs, an overall travel time from Howard Beach to 34th Street/Herald

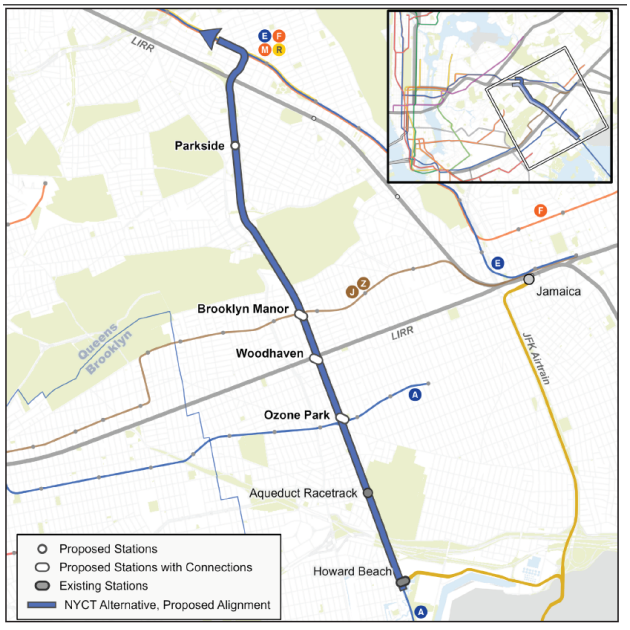
3

Square of approximately 45 minutes is derived. Based on the combined headway of 5 or 10 minutes along Queens Boulevard, it is proposed that a new service (MX) operate along the local tracks. The service should consist of three former "M" and three former "R" trains that operate along both the 6th Avenue and 7th Avenue-Broadway lines in Midtown. The new service would provide 10 minute headway along the RBB to Howard Beach. A lower frequency 15 minute headway, which would only eliminate two trains from each of the existing service, has also been tested and is provided for analysis of the impact of train frequency on NYCT passenger ridership.

Figure 16: Planned service examined in the Sketch Assessment.[16]

For the NYCT alternative, the RBB was modeled with 10 minute headways in both directions in the 4-hour AM peak period. Table ES-4 demonstrates the year 2025 station level ons and offs for the RBB for the 4-hour AM peak period. Using an AM peak period to a daily factor of 2.91 for NYCT ridership, has the project stations of Howard Beach to Parkside generating approximately 47,000 riders per day.

Figure 17: Frequency of the planned service examined in the Sketch Assessment.[16]



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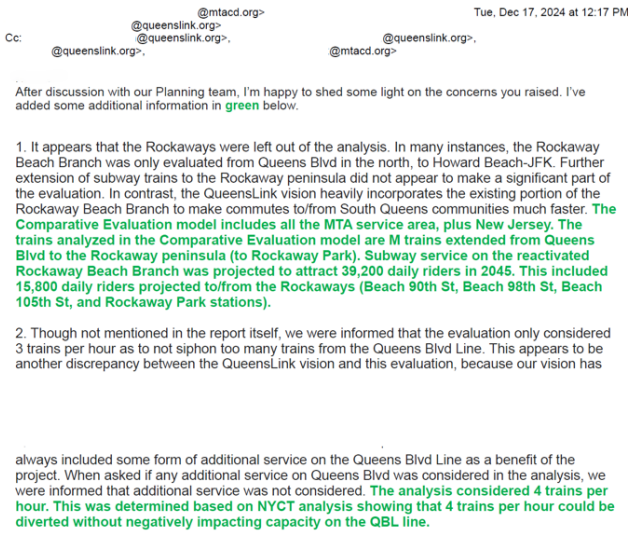
Above, Rockaway Beach Branch Reactivation (NYCT)

Figure 18: Illustration from MTA 20-Year Needs Assessment showing study corridor terminating at Howard Beach

of their RBB analysis. In contrast, the QueensLink vision has always considered and advocated for additional service on the QBL as a central component of the project.



@mtacd.org> Tue, Dec 17, 2024 at 12:17 PM
@queenslink.org>
Cc: @queenslink.org>, @queenslink.org>,
@queenslink.org>, @mtacd.org>

After discussion with our Planning team, I'm happy to shed some light on the concerns you raised. I've added some additional information in green below.

1. It appears that the Rockaways were left out of the analysis. In many instances, the Rockaway Beach Branch was only evaluated from Queens Blvd in the north, to Howard Beach-JFK. Further extension of subway trains to the Rockaway peninsula did not appear to make a significant part of the evaluation. In contrast, the QueensLink vision heavily incorporates the existing portion of the Rockaway Beach Branch to make commutes to/from South Queens communities much faster. **The Comparative Evaluation model includes all the MTA service area, plus New Jersey. The trains analyzed in the Comparative Evaluation model are M trains extended from Queens Blvd to the Rockaway peninsula (to Rockaway Park). Subway service on the reactivated Rockaway Beach Branch was projected to attract 39,200 daily riders in 2045. This included 15,800 daily riders projected to/from the Rockaways (Beach 90th St, Beach 98th St, Beach 105th St, and Rockaway Park stations).**

2. Though not mentioned in the report itself, we were informed that the evaluation only considered 3 trains per hour as to not siphon too many trains from the Queens Blvd Line. This appears to be another discrepancy between the QueensLink vision and this evaluation, because our vision has

always included some form of additional service on the Queens Blvd Line as a benefit of the project. When asked if any additional service on Queens Blvd was considered in the analysis, we were informed that additional service was not considered. **The analysis considered 4 trains per hour. This was determined based on NYCT analysis showing that 4 trains per hour could be diverted without negatively impacting capacity on the QBL line.**

Figure 19: Confirmation from correspondence with the MTA for the 20YNA corridor scope. MTA employee names and emails are redacted to protect the individuals' privacy.

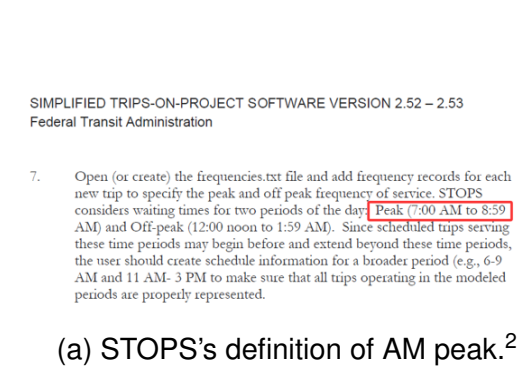
The 2018 Sketch Assessment and the 20YNA reports form the basis of comparison for this study's ridership estimation. In Short, the 2018 Sketch Assessment tallies RBB corridor ridership between 63 Dr-Rego Park to Howard Beach-JFK Airport, and the 20YNA corridor tallies RBB corridor ridership between 63 Dr-Rego Park to both branches of the Rockaway Beach line on the Rockaway Peninsula.

Part 2: Study Results on Peak Period Ridership & Comparison with Sketch Assessment Metrics

The 2018 Sketch Assessment proposes a reverse-branching service consisting of some M some and R trains that would be rerouted from Forest Hills-71 Av to the RBB. This introduces additional interlining, making the service needlessly complex and more susceptible to service gaps. Instead, operating a single branch of the QBL local trunk service is a much simpler solution–one that this study considers in all scenarios. Furthermore, the sketch assessment assumed that the QBL local tracks lack the capacity to handle an increase in service should the RBB be reactivated. However, as the QBL CBTC project continues throughout the entire QBL corridor, this signal upgrade project increases the operational capacity up to 30 TPH on both the express and local services (see more in Necessary Assumptions sections for more details relating to CBTC). Under more modern and reasonable assumptions, this study shows that QueensLink corridor ridership is much more robust than the 2018 sketch assessment's less-than-ideal service considerations.

The STOPS software defines "peak period" as the time from 7:00AM to 8:59 AM, and it provides a tally of ridership (Board, Alight, Leave-load, and Cumulative) for each trip

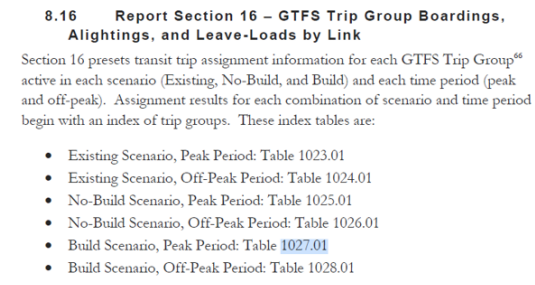
group in question (in this case, the QueensLink specific subway service). This is different from the numbers reported by the sketch assessment's peak 4-hour AM period, of which the assessment did not clarify the exact time frame.



SIMPLIFIED TRIPS-ON-PROJECT SOFTWARE VERSION 2.52 – 2.53
Federal Transit Administration

7. Open (or create) the frequencies.txt file and add frequency records for each new trip to specify the peak and off peak frequency of service. STOPS considers waiting times for two periods of the day: Peak (7:00 AM to 8:59 AM) and Off-peak (12:00 noon to 1:59 AM). Since scheduled trips serving these time periods may begin before and extend beyond these time periods, the user should create schedule information for a broader period (e.g., 6-9 AM and 11 AM- 3 PM to make sure that all trips operating in the modeled periods are properly represented.

(a) STOPS's definition of AM peak.[2]



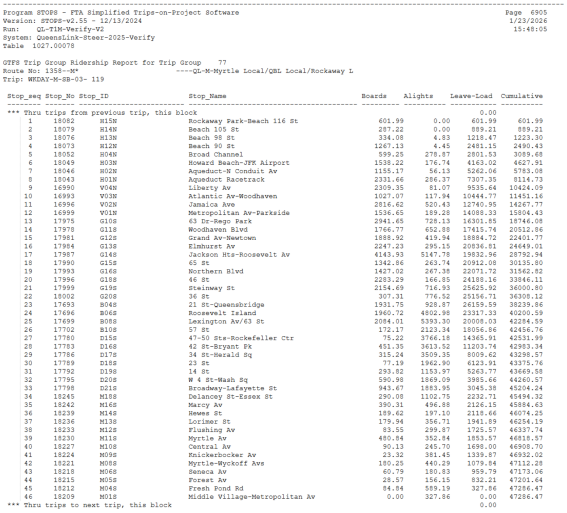
8.16 Report Section 16 – GTFS Trip Group Boardings, Alightings, and Leave-Loads by Link

Section 16 presets transit trip assignment information for each GTFS Trip Group[66] active in each scenario (Existing, No-Build, and Build) and each time period (peak and off-peak). Assignment results for each combination of scenario and time period begin with an index of trip groups. These index tables are:

- Existing Scenario, Peak Period: Table 1023.01
- Existing Scenario, Off-Peak Period: Table 1024.01
- No-Build Scenario, Peak Period: Table 1025.01
- No-Build Scenario, Off-Peak Period: Table 1026.01
- Build Scenario, Peak Period: Table 1027.01
- Build Scenario, Off-Peak Period: Table 1028.01

(b) Report Section 16 details in the user guidebook.[2]

Figure 20: Visuals from the STOPS user guidebook illustrating peak period definitions and reporting standards.

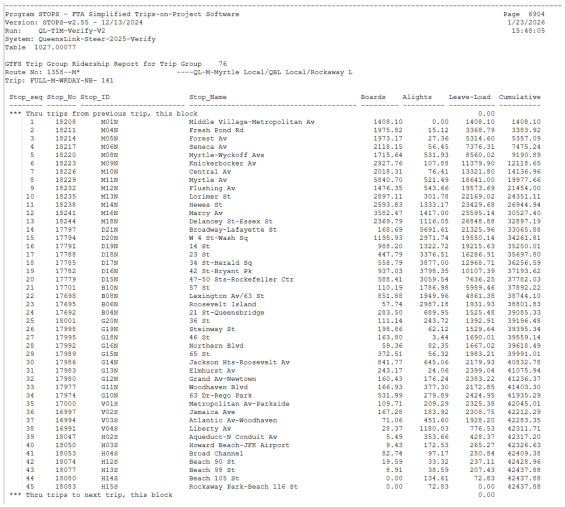


Program STOPS - FTA Simplified Trips-on-Project Software — Page 6905
Version: STOPS-v2.55 - 12/13/2024 — 1/23/2026
Run: QL-TIM-Verify-V2 — 15:48:05
System: QueensLink-Steer-2025-Verify
Table 1027.00078

GTFS Trip Group Ridership Report for Trip Group 77
Route No: 1358--M* ----QL-M-Myrtle Local/QBL Local/Rockaway L
Trip: WKDAY-M-SB-03- 119

Stop_seq	Stop_No	Stop_ID	Stop_Name	Boards	Alights	Leave-Load	Cumulative
*** Thru trips from previous trip, this block						0.00	
1	18082	M15N	Rockaway Park-Beach 116 St	601.99	0.00	601.99	601.99
2	18079	M14N	Beach 105 St	287.22	0.00	889.21	889.21
3	18076	M13N	Beach 98 St	334.08	4.83	1218.47	1223.30
4	18073	M12N	Beach 90 St	1267.13	4.45	2481.15	2490.43
5	18052	M04N	Broad Channel	599.25	275.87	2801.53	3089.68
6	18049	M03N	Howard Beach-JFK Airport	1538.22	176.74	4163.02	4627.91
7	18046	M02N	Aqueduct-N Conduit Av	1155.17	56.13	5262.06	5783.08
8	18043	M01N	Aqueduct Racetrack	2331.66	286.37	7307.35	8114.73
9	16990	V04N	Liberty Av	2309.35	81.07	9535.64	10424.09
10	16993	V03N	Atlantic Av-Woodhaven	1027.07	117.94	10444.77	11451.16
11	16996	V02N	Jamaica Ave	2816.62	520.43	12740.95	14267.77
12	16999	V01N	Metropolitan Av-Parkside	1536.65	189.28	14088.33	15904.43
13	17975	G10S	63 Dr-Rego Park	2941.65	725.13	16301.85	18746.08
14	17978	G11S	Woodhaven Blvd	1766.77	652.88	17415.74	20512.86
15	17981	G12S	Grand Av-Newtown	1888.92	419.94	18884.72	22401.77
16	17984	G13S	Elmhurst Av	2247.23	295.15	20836.81	24649.01
17	17987	G14S	Jackson Hts-Roosevelt Av	4143.93	5147.78	19932.96	28792.94
18	17990	G15S	65 St	1342.86	243.74	20932.08	30135.80
19	17993	G16S	Northern Blvd	1427.02	267.38	22071.72	31562.82
20	17996	G18S	46 St	2283.29	166.85	24189.16	33846.11
21	17999	G19S	Steinway St	2154.69	716.93	25625.92	36000.80
22	18002	G20S	36 St	307.31	776.52	25156.71	36308.12
23	17693	B04S	21 St-Queensbridge	1931.75	928.87	26159.59	38239.86
24	17696	B06S	Roosevelt Island	1960.72	4802.98	23317.33	40200.59
25	17699	B08S	Lexington Av/63 St	2084.01	5393.30	20008.03	42284.59
26	17702	B10S	57 St	172.17	2123.34	18056.86	42456.76
27	17780	D15S	47-50 Sts-Rockefeller Ctr	75.22	3766.18	14365.91	42531.99
28	17783	D16S	42 St-Bryant Pk	451.35	3613.52	11203.74	42983.34
29	17786	D17S	34 St-Herald Sq	315.24	3509.35	8009.62	43298.57
30	17789	D18S	23 St	77.19	1962.90	6123.91	43375.76
31	17792	D19S	14 St	293.82	1153.97	5263.77	43669.58
32	17795	D20S	W 4 St-Wash Sq	590.98	1869.09	3985.66	44260.57
33	17798	D21S	Broadway-Lafayette St	943.67	1883.95	3045.38	45204.24
34	18245	M18S	Delancey St-Essex St	290.08	1102.75	2232.71	45494.32
35	18242	M16S	Marcy Av	390.31	496.88	2126.15	45884.63
36	18239	M14S	Hewes St	189.62	197.10	2118.66	46074.25
37	18236	M13S	Lorimer St	179.94	356.71	1941.89	46254.19
38	18233	M12S	Flushing Av	83.55	299.87	1725.57	46337.74
39	18230	M11S	Myrtle Av	480.84	352.84	1853.57	46818.57
40	18227	M10S	Central Av	90.13	245.70	1698.00	46908.70
41	18224	M09S	Knickerbocker Av	23.32	381.45	1339.87	46932.02
42	18221	M08S	Myrtle-Wyckoff Ave	180.25	440.29	1079.84	47112.28
43	18218	M06S	Seneca Av	60.79	180.83	959.79	47173.06
44	18215	M05S	Forest Av	28.57	156.15	832.21	47201.64
45	18212	M04S	Fresh Pond Rd	84.84	589.19	327.86	47286.47
46	18209	M01S	Middle Village-Metropolitan Av	0.00	327.86	0.00	47286.47
*** Thru trips to next trip, this block						0.00	

(a) Full AM peak 6th Avenue Northbound M QueensLink service scenario report



Program STOPS - FTA Simplified Trips-on-Project Software — Page 6904
Version: STOPS-v2.55 - 12/13/2024 — 1/23/2026
Run: QL-TIM-Verify-V2 — 15:48:05
System: QueensLink-Steer-2025-Verify
Table 1027.00077

GTFS Trip Group Ridership Report for Trip Group 76
Route No: 1358--M* ----QL-M-Myrtle Local/QBL Local/Rockaway L
Trip: FULL-M-WKDAY-NB- 141

Stop_seq	Stop_No	Stop_ID	Stop_Name	Boards	Alights	Leave-Load	Cumulative
*** Thru trips from previous trip, this block						0.00	
1	18208	M01N	Middle Village-Metropolitan Av	1408.10	0.00	1408.10	1408.10
2	18211	M04N	Fresh Pond Rd	1975.82	15.12	3368.79	3383.92
3	18214	M05N	Forest Av	1973.17	27.36	5314.60	5357.09
4	18217	M06N	Seneca Av	2118.15	56.45	7376.31	7475.24
5	18220	M08N	Myrtle-Wyckoff Ave	1715.64	531.93	8560.02	9190.89
6	18223	M09N	Knickerbocker Av	2927.76	1071.88	11379.90	12118.65
7	18226	M10N	Central Av	2018.31	76.41	13321.80	14136.96
8	18229	M11N	Myrtle Av	5840.70	521.49	16641.00	19977.66
9	18232	M12N	Flushing Av	1476.35	543.66	19573.69	21454.00
10	18235	M13N	Lorimer St	2897.11	301.78	22169.02	24351.11
11	18238	M14N	Hewes St	2593.83	1333.17	23429.68	26944.94
12	18241	M16N	Marcy Av	3582.47	1417.00	25595.14	30527.40
13	18244	M18N	Delancey St-Essex St	2369.79	1116.05	26848.88	32897.19
14	17797	D21N	Broadway-Lafayette St	168.69	5691.61	21325.96	33065.88
15	17794	D20N	W 4 St-Wash Sq	1195.93	2971.74	19550.14	34261.81
16	17791	D19N	14 St	988.20	1322.72	19215.63	35250.01
17	17788	D18N	23 St	447.79	3376.51	16286.91	35697.80
18	17785	D17N	34 St-Herald Sq	558.79	3677.00	12968.71	36256.59
19	17782	D16N	42 St-Bryant Pk	937.03	3798.35	10107.39	37193.62
20	17779	D15N	47-50 Sts-Rockefeller Ctr	988.41	3059.54	7636.25	37782.03
21	17701	B10N	57 St	110.19	1786.98	5959.46	37892.22
22	17698	B08N	Lexington Av/63 St	851.88	1949.96	4861.38	38744.10
23	17695	B06N	Roosevelt Island	57.74	2987.18	1931.93	38801.83
24	17692	B04N	21 St-Queensbridge	283.50	689.95	1525.48	39085.33
25	18001	G20N	36 St	111.14	243.72	1392.91	39196.48
26	17998	G19N	Steinway St	198.86	62.12	1529.64	39395.34
27	17995	G18N	46 St	163.80	3.44	1690.01	39559.14
28	17992	G16N	Northern Blvd	59.36	82.35	1667.02	39618.49
29	17989	G15N	65 St	372.51	56.32	1983.21	39991.01
30	17986	G14N	Jackson Hts-Roosevelt Av	841.77	645.06	2179.93	40832.78
31	17983	G13N	Elmhurst Av	243.17	24.06	2399.04	41075.94
32	17980	G12N	Grand Av-Newtown	160.43	176.24	2383.22	41236.37
33	17977	G11N	Woodhaven Blvd	166.93	377.30	2172.85	41403.30
34	17974	G10N	63 Dr-Rego Park	531.99	279.09	2424.95	41935.29
35	17000	V01S	Metropolitan Av-Parkside	109.71	209.29	2325.38	42045.01
36	16997	V02S	Jamaica Ave	167.28	183.92	2308.75	42212.29
37	16994	V03S	Atlantic Av-Woodhaven	71.06	451.60	1928.20	42283.35
38	16991	V04S	Liberty Av	28.37	1180.03	776.53	42311.71
39	18047	M02S	Aqueduct-N Conduit Av	5.49	353.66	428.37	42317.20
40	18050	M03S	Howard Beach-JFK Airport	9.43	172.53	265.27	42326.63
41	18053	M04S	Broad Channel	82.74	97.17	250.84	42409.38
42	18074	M12S	Beach 90 St	19.59	33.32	237.11	42428.96
43	18077	M13S	Beach 98 St	8.91	38.59	207.43	42437.88
44	18080	M14S	Beach 105 St	0.00	134.61	72.83	42437.88
45	18083	M15S	Rockaway Park-Beach 116 St	0.00	72.83	0.00	42437.88
*** Thru trips to next trip, this block						0.00	

(b) Full AM peak 6th Avenue Southbound M QueensLink service scenario report

Figure 21: STOPS output excerpts for the full AM peak 6th Avenue M QueensLink service scenario.

The "Build, Peak" transit ridership in question is first shown in the two images below (for North-and Southbound directions) for a theoretical like-for-like, peak hour comparison with the peak hour on/offs with the sketch assessment numbers below.

While STOPS only considers the hours of 7 AM to 8:59 AM as the time of peak morning ridership, the sketch assessment considers a four-hour time window as the peak period for the AM.Under the same assumed 2025 opening date and normalized to the same 4 hour period, the change from 6 TPH with two different services (rerouted M/R) from the sketch assessment to a proposed 12 TPH (M and M combined) shows a 45% increase

Table M: Forecasted Year 2025 NYCT RBB AM Peak Period Ridership by Station

	Inbound		Outbound	
	Ons	*Offs*	*Ons*	*Offs*
Howard Beach-JFK Airport	3,076	353	19	417
Combined Aqueduct	6,974	685	21	728
Liberty Av	4,619	162	65	2,597
Atlantic Av-Woodhaven	2,054	236	160	1,023
Jamaica Ave	5,633	1,041	474	659
Metropolitan Av-Parkside	3,121	379	248	715
63 Dr-Rego Park	5,913	1,456	1,329	634
Total	**31,390**	**4,312**	**2,317**	**6,775**

Table 14: Forecasted Year 2025 NYCT RBB AM Peak Period Ridership by Station

	Inbound		Outbound	
	Ons	*Offs*	*Ons*	*Offs*
Howard Beach	9,063	0	0	4,616
Aqueduct	871	0	0	709
Ozone Park	4,015	317	118	2,857
Woodhaven	1,278	215	170	763
Brooklyn Manor	2,537	781	499	1,276
Parkside	837	512	446	426
63rd Drive-Rego Park	852	2,492	1,720	262
Total	**19,453**	**4,317**	**2,953**	**10,909**

Figure 22: Side-by-side comparison of peak ons/offs, 2-hour vs. 4-hour. The left side table shows this study's analysis of the Scenario 1A with peak hour short turn trains, while the right side shows the original 2018 Sketch Assessment estimate table.[16]

in inbound boarding ridership (Manhattan-bound ridership). This demonstrates that ridership demand on the RBB corridor remains driven by Manhattan-bound trips.

Part 3: Comparison of Study Results between Scenarios 1A/1C under Sketch Assessment Metrics

Separately, under the same normalized Sketch Assessment peak hour ridership metric, a cross comparison between peak hours ridership in 2040 for Scenarios 1A (Full service M M) and 1C (Minimum Service M) can be made to examine whether there is actually the need for additional service beyond the minimum service scenario of 9 TPH M trains and no peak hour short-turn services. The results showed that even in 2040, the existing densities on the RBB corridor allows Scenario 1C (minimum service scenario) to capture the majority of the peak hours ridership while saves on the operating cost of operating more longer empty trains.

Table T1M: Forecasted Year 2040 NYCT RBB AM Peak Period Ridership by Station

	Inbound		Outbound	
	Ons	*Offs*	*Ons*	*Offs*
Howard Beach-JFK Airport	3,032	350	19	411
Combined Aqueduct	6,975	663	21	370
Liberty Av	4,473	157	63	2,599
Atlantic Av-Woodhaven	2,017	229	161	1,016
Jamaica Ave	5,651	1,024	472	668
Metropolitan Av-Parkside	3,044	380	243	713
63 Dr-Rego Park	5,829	1,454	1,321	633
Total	**31,020**	**4,258**	**2,299**	**6,410**

Table T1MVS: Forecasted Year 2040 NYCT RBB AM Peak Period Ridership by Station

	Inbound		Outbound	
	Ons	*Offs*	*Ons*	*Offs*
Howard Beach-JFK Airport	2,836	506	19	333
Combined Aqueduct	6,889	287	21	455
Liberty Av	4,828	148	57	2,380
Atlantic Av-Woodhaven	1,912	156	149	1,051
Jamaica Ave	5,373	1,105	426	871
Metropolitan Av-Parkside	2,930	403	268	700
63 Dr-Rego Park	5,708	1,629	1,284	426
Total	**30,476**	**4,234**	**2,223**	**6,216**

Figure 23: Side-by-side comparison of peak ons/offs on the RBB corridor Between Scenario 1A and Scenario 1C.

The figure above shows the peak hour ridership on the RBB corridor (normalized to the same sketch assessment standard between Scenarios 1A (Full service M M) and 1C (Minimum Service M). The data demonstrates that the extra peak hour short turns does not result in increased induction of demand on the RBB corridor. The cost of operating a full-length NYCT subway is significant due to its current TPTO work rules, and achieving similar levels of ridership with 33% reduction in peak hour frequency (12 TPH combined M M in Scenario 1A vs 9 TPH M in Scenario 1C) shows the case for Scenario 1C to be a more realistic proposed service vs Scenario 1A. However, once built, QueensLink can

faciliate the peak hour M to operate if demand on Queens Boulevard requires additional capacity.

Part 4: Study Results & Comparison with Sketch Assessment Metrics

In terms of total daily ridership, the sketch assessment corridor sees 55,146 riders daily in the STOPS model (under the Scenario 1A M Extension), which is 17% higher than the projected daily ridership of 47,000 riders on the corridor originally made by the sketch assessment. With a more direct connection to Northern Queens, Long Island City, Forest Hills, and Flushing, ridership at the Aqueduct stations increased significantly versus a STOPS-run 2025 existing/no-build scenario. This study shows that with consistent and frequent service from the Rockaways to Forest Hills (8-12 TPH across all scenarios), even factoring the post COVID decline of existing daily ridership on the entire subway network, QueensLink outperforms the sketch assessment's daily ridership performance by an average of 15%. It is evident that a service offering faster access to key Manhattan locations on the 6th Av/8th Av trunk lines outperforms other services that don't enter Manhattan (Scenario 2B: Crosstown G) or result in longer total run times (Scenar 2C: Broadway R). The incremental increase in ridership on the sketch assessment corridor with more complex service changes (such as the flipped terminals scenarios and A/C split) is not worth the additional operational cost and complexities.

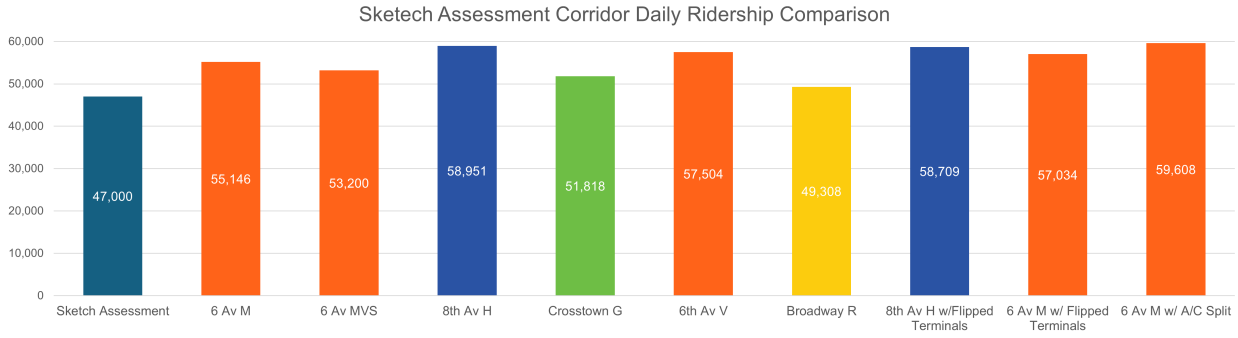


Figure 24: Sketch Assessment corridor daily ridership comparison.

The four new stations also corroborate the larger trend in overall Sketch Assessment Corridor ridership. The stations with higher ridership numbers are naturally the two transfer stations in southern Queens: Jamaica Av-104 St and Liberty Av (being the best performer and second best respectively). The Metropolitan Av-Parkside and Atlantic Av-Woodhaven stations see lower ridership due to existing low density around the station area. Aside from the lower ridership exhibited by scenario 2B (Crosstown G), these results show that the projected station ridership for the four new QueensLink stations are relatively constant regardless of the final direct one-seat ride destination in Manhattan offered by the various QueensLink service scenarios. If the QueensLink stations do not have a one-seat ride service into Manhattan, the ridership on these four stations will be lower. Transfer stations such as Liberty Av (Ozone Park in Table 14 of Sketch Assessment) and Jamaica

Ave (Brooklyn Manor in Table 14 of Sketch Assessment) exhibit much more robust ridership due to more frequent reliable services offered by the higher frequency applied by this study. Unfortunately, due to the unavailability of per-station ridership breakdowns in the sketch assessment, a direct comparison between the STOPS results and the sketch assessment results cannot be made.

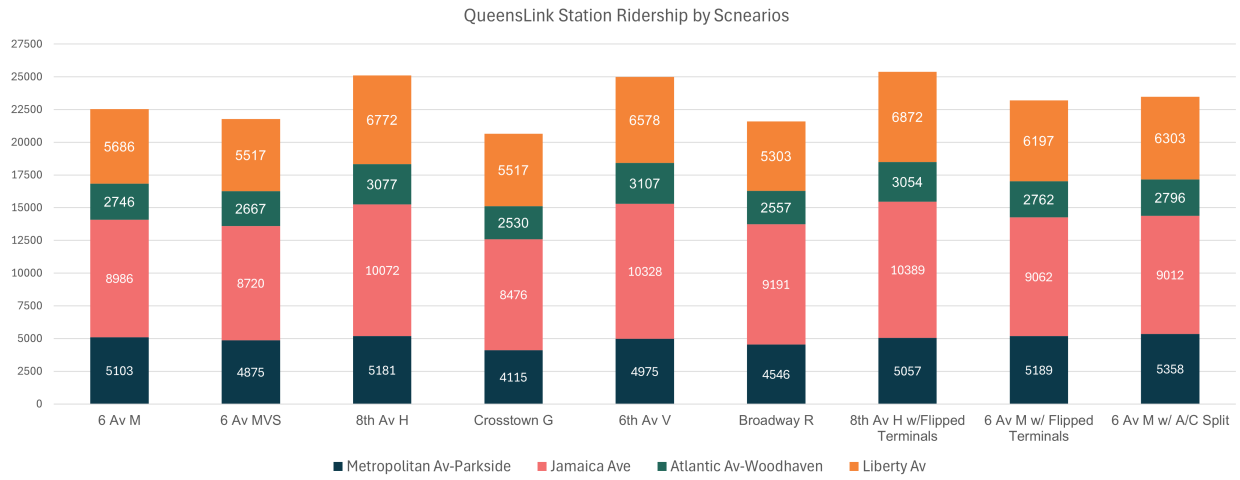


Figure 25: QueensLink station ridership by scenarios.

Furthermore, under the standardized Existing, No-Build, and Build service scenarios, all scenarios show that the Metropolitan Av-Parkside station has the second-lowest ridership between the four new proposed QueensLink stations on the RBB corridor. As such, under the existing commuting patterns and housing density, barring a dramatic shift in development patterns in the area (rezoning,upzoning,etc), the Fleet Street infill station option is not worth further consideration. Metropolitan Av-Parkside station provides adequate connection to its walkshed area with the proposed exit locations. Adding provisions for even a future Fleet St station will not only add to the construction cost of the tunneled section in this area, but it also increases travel time for riders using all stations south of Fleet St on the RBB. In addition, a Fleet St station would further depress ridership at the Metropolitan Av-Parkside station, which already has the lowest ridership among the new-build QueensLink stations. Therefore, a station at Fleet Street north of the proposed Metropolitan Av-Parkside station is not considered in any scenarios and is not recommended to be implemented should the MTA decide to pursue QueensLink.

Part 5: Study Results & Comparison with 20YNA Metrics

The MTA 20 Year Needs Assessment in 2023 updated the Agency's latest evaluation of the RBB corridor, of which the report further guided down the ridership estimate for the RBB corridor and confirmed with QueensLink due to Post-COVID ridership pattern changes. This study shows that with adequate frequency of any service introduced onto the RBB corridor in earnest, the QueensLink corridor has the potential to outperform the

20YNA ridership projections by over 100%, even under the Post-COVID ridership patterns and projecting a later opening date of 2040 (vs 20YNA's 2035 opening date).

Several major observations are consistent across all Tier 1 and 2 scenarios. In all scenario where all QueensLink services terminate at Rockaway Park-Beach 116 St, the M train scenario lags behind the H train scenario by a small margin, but both options consistently outperform the G/R train scenarios (Scenarios 2B and 2C) due to a combination of frequency, travel time, and access to Manhattan destinations. Flipping the terminals for the A train and M/H trains (scenarios 2D and 2E) does not induce a rise in total corridor ridership. Increasing the TPH to the Rockaways doesn't induce QL-level ridership on the peninsula. This scenario shows that we really need a north-south connection via QL in order to generate better ridership and truly connect the borough. Furthermore, in the scenario with the A/C trains being cleanly split between the Far Rockaway-Mott Av/Ozone Park-Lefferts Blvd terminals (scenario 2F), the extended M (Scenarios 1A/1C) ridership did not change significantly either. Crosstown G ridership performs poorly due to the lack of direct Manhattan access versus all other Manhattan-bound scenarios. The 6th Av V train (scenario 2A) as a new service performs better than the Broadway R train (scenario 2C) by a small margin.

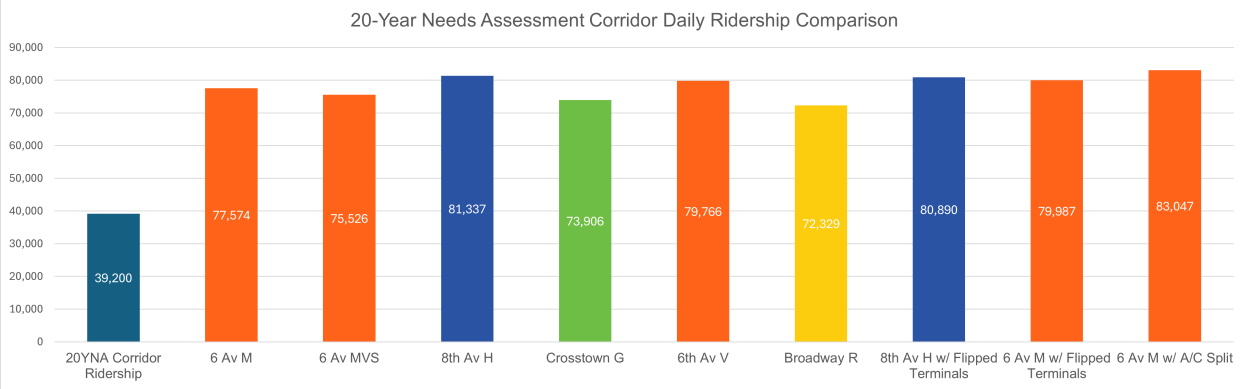


Figure 26: 20-Year Needs Assessment corridor daily ridership comparison.

(B) System Level Impacts

System-level impacts are an important metric that this study also strives to understand in addition to the corridor-level impacts explained above. Previous official MTA attempts did not touch on system-level impacts in any significant way; in the sketch assessment, little explanation was given for the corridor-level ridership and no system-corridor impacts were outlined. The 20YNA report card on the RBB corridor discredited the potential of the corridor, stating, "there is minimal crowding reduction since some Queens Blvd Line subway service would be moved to serve this new line, and there is no improvement in geographic distribution, resulting in low scores for both."[13] However, The STOPS results across multiple scenarios paint a completely different picture than the projection given by the 20YNA, and this section of the report will thoroughly examine the network effects of

a fully-integrated RBB on the existing subway network in Queens. Due to current station upgrades on the 69 St and 52 St stations on the Flushing line (7 Train), the ridership numbers are excluded from the consideration.

Part 1: Overall Ridership Share Validation

Throughout all scenarios, the model has consistently predicted, given an approximate total unlinked weekday trip count of 5.85 million riders across both subway and bus networks, that ridership recovery would continue into 2040 with an average 6.14 million daily riders for the subway system and another 1.25 million daily riders on the bus network. This totals to around 7.71 million for the combined NYCT system. For pre-COVID era ridership, the subway saw average weekday subway ridership at 5.5 million, and the bus system saw 2.2 million under the same metric, according to official MTA reporting from 2019. Cross comparing Pre-COVID statistical highs versus the STOPS 2040 total system ridership reporting, this report posits that STOPS's forecasting of ridership growth and recovery could be a relatively conservative forecast. Overall, it places an emphasis on ridership distribution favoring subway ridership recovery more than buses–a trend reflected in the slower bus ridership recovery in real-life ridership tallies at "metrics.mta.info"[9] as of the writing of this report.

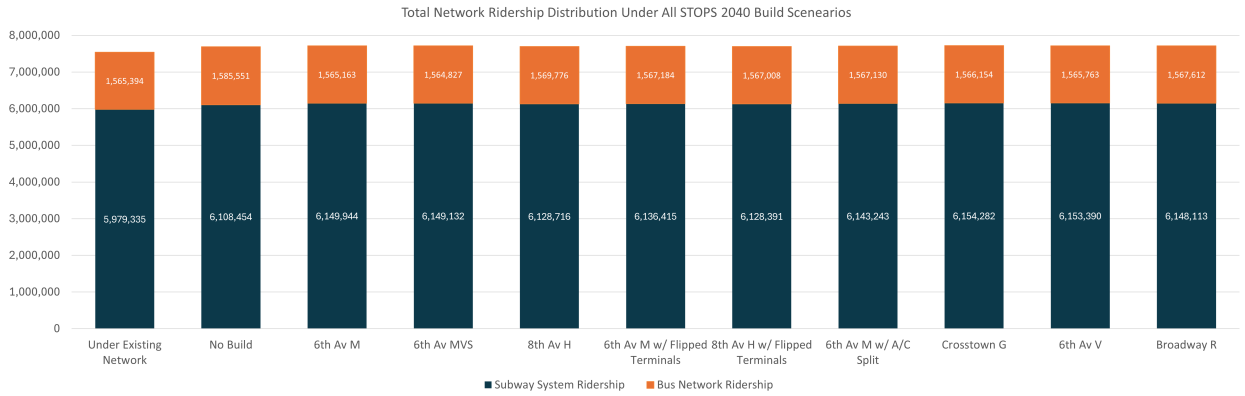


Figure 27: Total network ridership distribution.

Part 2: Network Effect on Parallel Bus Services

All core scenarios have demonstrated a similar impact on the existing bus routes that parallel the alignment of the RBB ROW. Based on known ridership data for the existing bus network, the results show that any consistent QueensLink service scenario explored in Tier 1 and Tier 2 can reduce Q52 and Q53 ridership by 40% to 50% on average. This is consistent in every core scenario this study examined. Indeed, great bus service can serve as attractors toward potential riders, hence this report does not see a definite reason for reducing Q52/Q53 service after QueensLink is complete. However, the reduction in

ridership on the Q52/Q53 SBS due to mode shift to RBB train services will allow for a reduction in the MTA's Q52/Q53 operating expenses. It will allow the agency to redirect these resources elsewhere to other routes where more services are needed in Queens.

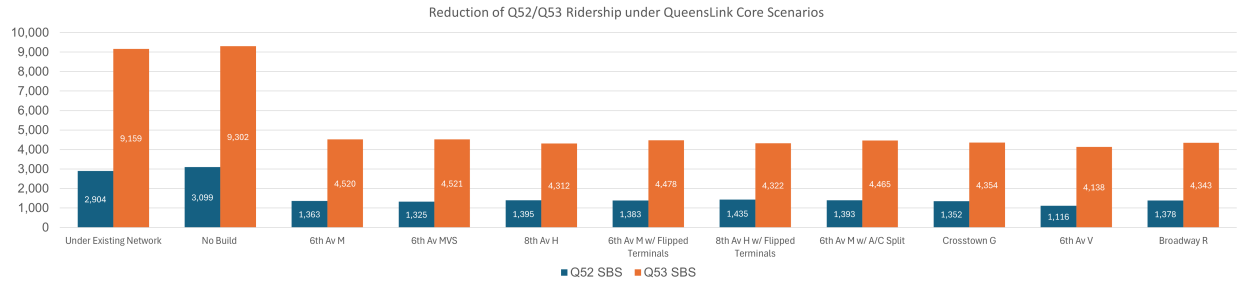


Figure 28: Reduction of Q52/Q53 ridership under proposed core scenarios.

Part 3: Network Effect on the Flushing Line

The 7 train interfaces with QBL services at 2 locations: the Court Sq-23 St complex and the Jackson Heights-Roosevelt Av/74 St-Broadway intermodal hub. Based on the data reported, the 7 train sees an additional influx of ridership due to QBL riders transferring to other services. The growth of ridership at 74 St-Broadway for the 7 train is present in all core scenarios, as the 7 train offers a direct, in-system transfer to both Manhattan destinations and Flushing rather than bus alternatives. An interesting observation can be seen at the Court Sq 7 train station, as the 8th Av H train induces more riders back to the 7 train, but the 6th Av M train reduces 7 train boarding at Court Sq. This could be partially explained by the difference in destinations that the M and the H directly serve in Manhattan, and also how the H train requires the F/M swap to unmade, thereby placing more transfer load back to the 7 train. Due to current station upgrades on the 69 St and 52 St stations, the ridership numbers are excluded from the consideration.

Concurrently, station on the Flushing line that is geographically closer to QBL services (90 St-Elmhurst Av, 82 St-Jackson heights) sees a modest reduction in ridership due to an increase in QBL local service frequency. This slight reduction in ridership consistent across all Tier 1 and 2 scenarios for these station.

Flushing Line (7) Stations	Existing	No Build	8th Av H	% Change Vs No Build	8th Av H w/ Flipped Terminals	% Change Vs No Build	6th Av M	% Change Vs No Build	6th Av MVS	% Change Vs No Build	6th Av M w/ Flipped Terminals	% Change Vs No Build
Flushing-Main St	39,984	39,659	41,163	3.79%	41,129	3.71%	42,997	8.42%	43,150	8.80%	41,065	3.55%
Mets-Willets Point	2,158	2,079	2,214	6.51%	2,253	8.37%	2,659	27.93%	2,680	28.91%	2,243	7.90%
111 St	13,558	13,454	13,330	-0.92%	13,304	-1.11%	14,795	9.97%	14,817	10.13%	13,271	-1.36%
103 St-Corona Plaza	20,225	19,863	19,152	-3.58%	19,142	-3.63%	18,149	-8.63%	18,321	-7.76%	19,148	-3.60%
Junction Blvd	17,389	17,080	18,255	6.88%	18,198	6.55%	19,464	13.96%	19,716	15.43%	17,995	5.36%
90 St-Elmhurst Av	17,288	17,239	16,310	-5.39%	16,446	-4.60%	16,399	-4.87%	16,432	-4.68%	16,716	-3.03%
82 St-Jackson Hts	7,847	7,920	7,508	-5.21%	7,546	-4.73%	6,498	-17.96%	6,492	-18.04%	7,181	-9.33%
74 St-Broadway	15,601	15,279	18,610	**21.81%**	17,994	**17.77%**	17,241	**12.85%**	16,741	**9.57%**	18,342	**20.05%**
61 St-Woodside	15,427	16,049	12,959	**-19.25%**	12,902	**-19.61%**	13,069	**-18.57%**	12,977	**-19.14%**	12,665	**-21.09%**
46 St-Bliss St	26,770	26,851	22,187	**-17.37%**	22,177	**-17.41%**	22,035	**-17.94%**	22,065	**-17.82%**	22,142	**-17.54%**
40 St-Lowery St	19,074	19,374	19,197	-0.91%	19,109	-1.37%	18,784	-3.05%	18,768	-3.13%	19,137	-1.22%
33 St-Rawson St	3,648	3,612	3,518	-2.62%	3,445	-4.62%	3,411	-5.57%	3,385	-6.30%	3,408	-5.67%
Queensboro Plaza	16,052	18,118	17,468	-3.59%	17,296	-4.54%	18,299	1.00%	18,220	0.56%	16,716	-7.74%
Court Sq	11,746	12,698	16,625	30.93%	12,835	1.08%	13,650	7.49%	13,831	8.92%	12,342	-2.81%
Hunters Point Av	24,128	27,263	27,682	1.54%	26,195	-3.92%	22,234	-18.44%	22,287	-18.25%	24,922	-8.59%
Vernon Blvd-Jackson Av	14,044	16,189	18,537	14.51%	16,248	0.37%	16,255	0.41%	16,357	1.04%	16,128	-0.37%

Flushing Line (7) Stations	Existing	No Build	Crosstown G	% Change Vs No Build	6th Av V	% Change Vs No Build	Broadway R	% Change Vs No Build	6th Av M w/ A/C Split	% Change Vs No Build
Flushing-Main St	39,984	39,659	43,184	8.89%	43,110	8.70%	43,129	8.75%	40,951	3.26%
Mets-Willets Point	2,158	2,079	2,673	28.59%	2,656	27.78%	2,683	29.08%	2,237	7.61%
111 St	13,558	13,454	14,871	10.53%	14,722	9.42%	14,832	10.24%	13,282	-1.27%
103 St-Corona Plaza	20,225	19,863	18,229	-8.23%	18,206	-8.34%	18,384	-7.45%	19,204	-3.32%
Junction Blvd	17,389	17,080	19,734	15.54%	19,644	15.01%	19,877	16.38%	17,821	4.34%
90 St-Elmhurst Av	17,288	17,239	16,881	-2.08%	16,745	-2.86%	16,938	-1.74%	16,576	-3.85%
82 St-Jackson Hts	7,847	7,920	6,680	-15.65%	7,020	-11.36%	7,006	-11.54%	7,149	-9.74%
74 St-Broadway	15,601	15,279	17,449	14.20%	17,397	13.86%	17,490	14.47%	18,180	18.99%
61 St-Woodside	15,427	16,049	13,521	-15.75%	13,444	-16.23%	13,683	-14.74%	12,714	-20.78%
46 St-Bliss St	26,770	26,851	22,042	-17.91%	22,132	-17.57%	22,181	-17.39%	22,128	-17.59%
40 St-Lowery St	19,074	19,374	18,775	-3.09%	18,771	-3.12%	18,777	-3.08%	19,130	-1.26%
33 St-Rawson St	3,648	3,612	3,411	-5.58%	3,463	-4.12%	3,416	-5.42%	3,405	-5.73%
Queensboro Plaza	16,052	18,118	18,734	3.40%	19,225	6.11%	18,778	3.64%	16,682	-7.93%
Court Sq	11,746	12,698	17,636	38.89%	15,196	19.67%	14,660	15.45%	12,367	-2.61%
Hunters Point Av	24,128	27,263	15,599	-42.78%	25,260	-7.35%	23,077	-15.35%	24,962	-8.44%
Vernon Blvd-Jackson Av	14,044	16,189	16,084	-0.65%	16,962	4.78%	16,371	1.12%	16,106	-0.51%

Figure 29: Network effects on the Flushing Line stations by scenario.

Part 4: Network Effect on the Queens Boulevard Line

The QBL and its feeder tunnels heading into Manhattan constitute the undisputed trunk line of northern Queens. However, the ridership behavior of QBL stations in this study varies in clusters, where the Jackson Heights-Roosevelt Av/74 St-Broadway complex act as the the division point.

Starting from QBL stations east of Jackson Heights-Roosevelt Av in Jamaica, the proposed QueensLink services decrease the Sutphin Blvd-Archer Av/JFK station's ridership due to a much more direct Manhattan bound service, eliminating the need to transfer at Jamaica toward Manhattan QBL express trains, as well as a quicker route to the AirTrain at Howard Beach. There is a consistent 20%-25% reduction across all core scenarios. Hillside Avenue stations are minimally affected by the introduction of QueensLink serices due to their different ridership casement areas. For stations west of Jamaica and east of Jackson Heights-Roosevelt Av, overall station ridership slightly decreases. The ridership at Forest Hills-71st Av decreases by an average of 15% and 67 Av ridership decreases by an average of 11%. In return, there is significant ridership growth at the 63rd Dr-Rego Park and Woodhaven Blvd (QBL) stations by an average of 35% and 20% respectively. In addition, the increase in ridership at the nearby Elmhurst Av and 65 St local stations partially alleviate the overcrowding issues at Jackson Heights-Roosevelt Av. The pattern of local stations gaining more ridership than the overcrowded express stations is consistent across all examined QueensLink scenarios, which is explained by a high reduction in

wait times at local stations during peak hours, when QueensLink scenarios adds a 50% additional local service west of 63rd Dr-Rego Park. Furthermore, these ridership patterns show that augmenting local service during peak hours will prepare the system for future ridership recovery and growth as the Queens population further increases towards 2040. This redistribution of ridership on stations between Jackson Heights and Forest Hills-71 Av is conducive to further densification and upzoning on the corridor.

West of Jackson Heights/Roosevelt Av toward Queens Plaza and Court Sq-23 St, the benefits of improved QBL local services continue. 36 St, 46 St and Steinway St stations all sees a massive increase in ridership due to much more consistent local service. In all scenarios that does not access 53rd St tube directly (all scenarios except for Scenario 1B), Queens Plaza sees more patronage than current arrangements. In scenarios where the G is extended to Forest Hills-71st Av, Queens Plaza ridership increases by a large, though not double, amount, proving the validity of bringing G back to Forest Hills-71st Av as a way to further augment QBL local attractiveness as an alternative to the express at Jackson Heights-Roosevelt Av. In scenarios where the M sees augmented peak service frequency at a combined frequency of 12 TPH (8 TPH 8 car trains and 4 TPH 10 car trains), or where the 8 TPH V augment the unchanged M at 8 TPH or when the H train utilizes the 53rd tube and F is rerouted back to 63rd St tube, these service improvement induces ridership growth at 21st St-Queensbridge significantly, at an average of 30%. Furthermore, the increase of Queens Boulevard Local services near 36 St will provide immediate rapid transit service for the proposed Sunnyside Yards housing redevelopment program, where the Mamdani administration has proposed to revive the plans to build 120,000 units of housing and parks on the railway yard.[39]

QueensLink service's network impacts can be most directly seen on the QBL stations. Express station growth is curtailed, while local stations see much higher utilization, especially on local stations currently seeing low ridership such as 36 St, 46 St, Steinway St, and 63rd-Rego Park. The construction of QueensLink can immediately provide direct, frequent and fast rapid transit connection that Sunnyside Yard need without another new subway trunk line into Sunnyside Yard area.

Queens Boulevard Line Stations	Existing	No Build	8th Av H	% Change Vs No Build	8th Av H w/ Flipped Terminals	% Change Vs No Build	6th Av M	% Change Vs No Build	6th Av MVS	% Change Vs No Build	6th Av M w/ Flipped Terminals	% Change Vs No Build
Jamaica Center-Parsons/Ar	29,736	29,581	23,504	-20.54%	23,594	-20.24%	25,581	-13.52%	26,375	-10.84%	23,375	-20.98%
Sutphin Blvd-Archer Av-JF	13,691	14,199	12,728	-10.36%	13,124	-7.57%	12,147	-14.46%	12,624	-11.09%	13,399	-5.64%
Jamaica-Van Wyck	6,616	6,554	5,357	-18.27%	5,377	-17.96%	6,274	-4.28%	6,493	-0.93%	5,447	-16.89%
Jamaica-179 St	24,104	23,523	22,285	-5.26%	22,102	-6.04%	23,796	1.16%	23,736	0.90%	22,299	-5.20%
169 St	9,494	9,606	9,233	-3.88%	9,320	-2.98%	9,610	0.04%	9,612	0.06%	9,397	-2.17%
Parsons Blvd	8,356	7,727	7,813	1.11%	7,345	-4.94%	7,797	0.90%	7,840	1.46%	7,403	-4.20%
Sutphin Blvd	6,523	5,767	6,699	16.17%	6,297	9.18%	5,733	-0.58%	5,814	0.81%	6,224	7.93%
Briarwood	8,859	8,942	8,274	-7.47%	8,374	-6.36%	8,913	-0.33%	8,936	-0.07%	8,420	-5.84%
Kew Gardens-Union Tpke	14,144	11,919	12,005	0.72%	10,756	-9.76%	11,233	-5.76%	11,398	-4.38%	10,856	-8.92%
75 Av	4,037	4,184	3,668	-12.34%	3,964	-5.27%	4,237	1.25%	4,241	1.36%	3,932	-6.04%
Forest Hills-71 Av	54,767	51,679	41,007	-20.65%	39,998	-22.60%	46,078	-10.84%	48,784	-5.60%	40,999	-20.67%
67 Av	14,093	14,096	12,631	-10.40%	12,778	-9.35%	11,858	-15.88%	12,777	-9.36%	12,338	-12.47%
63 Dr-Rego Park	14,655	14,605	19,474	**33.33%**	20,993	**43.74%**	19,177	**31.30%**	25,890	**77.26%**	21,069	**44.26%**
Woodhaven Blvd	14,890	14,529	16,680	14.80%	16,894	16.28%	16,387	12.79%	16,873	16.13%	16,631	14.46%
Grand Av-Newtown	15,314	14,966	15,563	3.99%	15,599	4.23%	15,567	4.02%	15,540	3.84%	15,899	6.23%
Elmhurst Av	18,237	17,638	20,950	**18.78%**	20,184	**14.44%**	21,321	**20.88%**	20,505	**16.26%**	21,206	**20.23%**
Jackson Hts-Roosevelt Av	112,238	113,706	94,699	**-16.72%**	93,126	**-18.10%**	114,019	**0.27%**	113,255	**-0.40%**	109,220	**-3.95%**
65 St	15,300	13,983	16,752	**19.81%**	17,136	**22.55%**	17,552	**25.53%**	17,649	**26.22%**	17,195	**22.97%**
Northern Blvd	12,752	12,839	13,841	7.80%	13,546	5.51%	13,214	2.92%	12,950	0.86%	12,966	0.99%
46 St	23,106	22,828	23,801	4.26%	23,725	3.93%	23,812	4.31%	24,192	5.98%	23,315	2.13%
Steinway St	14,438	15,219	18,728	**23.06%**	19,012	**24.92%**	19,120	**25.63%**	19,803	**30.12%**	18,999	**24.84%**
36 St	3,385	3,858	5,915	**53.31%**	5,374	**39.29%**	6,549	**69.75%**	8,142	**111.02%**	6,828	**76.97%**
Queens Plaza	12,946	20,405	9,391	-53.98%	18,145	-11.08%	42,028	105.97%	41,233	102.07%	40,703	99.47%
Court Sq	10,562	11,153	11,230	0.69%	11,193	0.36%	3,839	-65.58%	3,858	-65.41%	3,727	-66.59%
Court Sq-23 St	67,755	84,958	69,076	-18.69%	87,656	3.18%	67,609	-20.42%	67,579	-20.46%	68,210	-19.71%
21 St	1,455	1,419	1,406	-0.89%	1,309	-7.74%	2,446	72.41%	2,369	66.98%	2,300	62.13%
21 St-Queensbridge	15,084	11,614	19,796	70.45%	12,080	4.01%	13,326	14.74%	13,336	14.82%	13,284	14.38%

Queens Boulevard Line Stations	Existing	No Build	Crosstown G	% Change Vs No Build	6th Av V	% Change Vs No Build	Broadway R	% Change Vs No Build	6th Av M w/ A/C Split	% Change Vs No Build
Jamaica Center-Parsons/Ar	29,736	29,581	25,382	-14.19%	25,592	-13.48%	25,116	-15.09%	23,039	-22.11%
Sutphin Blvd-Archer Av-JF	13,691	14,199	12,273	-13.56%	12,101	-14.78%	12,347	-13.05%	13,068	-7.96%
Jamaica-Van Wyck	6,616	6,554	6,321	-3.56%	6,033	-7.95%	6,173	-5.82%	5,305	-19.06%
Jamaica-179 St	24,104	23,523	23,695	0.73%	23,522	-0.01%	23,867	1.46%	22,389	-4.82%
169 St	9,494	9,606	9,603	-0.03%	9,521	-0.88%	9,666	0.62%	9,431	-1.82%
Parsons Blvd	8,356	7,727	7,714	-0.17%	7,625	-1.33%	7,796	0.89%	7,488	-3.10%
Sutphin Blvd	6,523	5,767	5,801	0.60%	5,741	-0.45%	5,865	1.71%	6,241	8.23%
Briarwood	8,859	8,942	8,925	-0.19%	8,859	-0.93%	8,921	-0.23%	8,443	-5.58%
Kew Gardens-Union Tpke	14,144	11,919	11,187	-6.14%	11,094	-6.92%	10,962	-8.03%	10,817	-9.25%
75 Av	4,037	4,184	4,234	1.19%	4,205	0.50%	4,251	1.59%	3,926	-6.17%
Forest Hills-71 Av	54,767	51,679	46,801	-9.44%	45,517	-11.92%	48,493	-6.16%	40,732	-21.18%
67 Av	14,093	14,096	13,115	-6.96%	12,608	-10.56%	12,112	-14.08%	12,146	-13.84%
63 Dr-Rego Park	14,655	14,605	18,169	24.40%	18,242	24.90%	16,935	15.95%	21,226	45.33%
Woodhaven Blvd	14,890	14,529	16,203	11.52%	15,515	6.79%	15,904	9.46%	16,462	13.30%
Grand Av-Newtown	15,314	14,966	15,800	5.57%	15,473	3.39%	14,900	-0.44%	16,152	7.92%
Elmhurst Av	18,237	17,638	20,668	**17.18%**	19,514	**10.64%**	18,397	**4.30%**	21,759	**23.37%**
Jackson Hts-Roosevelt Av	112,238	113,706	118,489	**4.21%**	116,974	**2.87%**	118,253	**4.00%**	109,089	**-4.06%**
65 St	15,300	13,983	16,185	**15.75%**	15,475	**10.67%**	15,473	**10.65%**	16,885	**20.75%**
Northern Blvd	12,752	12,839	12,658	-1.41%	12,395	-3.45%	12,152	-5.35%	13,097	2.01%
46 St	23,106	22,828	23,435	2.66%	22,954	0.55%	22,097	-3.20%	23,097	1.18%
Steinway St	14,438	15,219	17,690	16.24%	17,182	12.90%	16,271	6.91%	19,141	25.77%
36 St	3,385	3,858	8,557	121.78%	4,756	23.27%	8,584	122.48%	6,309	63.51%
Queens Plaza	12,946	20,405	44,317	117.18%	18,843	-7.66%	42,033	105.99%	40,320	97.59%
Court Sq	10,562	11,153	3,655	-67.23%	10,402	-6.73%	3,908	-64.96%	3,795	-65.98%
Court Sq-23 St	67,755	84,958	70,531	-16.98%	82,213	-3.23%	68,270	-19.64%	68,070	-19.88%
21 St	1,455	1,419	2,725	92.08%	1,312	-7.52%	2,355	66.02%	2,273	60.24%
21 St-Queensbridge	15,084	11,614	11,614	0.00%	13,508	16.31%	11,661	0.40%	13,452	15.83%

Figure 30: Network effects on the Queens Boulevard Line stations by scenario.

Part 5: Network Effects on the Liberty Av and Jamaica Lines

On the Liberty Av Line, Howard Beach ridership sees a lift that is partially reflected in the ridership reduction at Jamaica Center-Sutphin Archer station (E/J train). Any service on the full RBB offers Midtown Manhattan riders a faster way to get to JFK Airport through Howard Beach, instead of going through Jamaica-Sutphin for AirTrain Jamaica, as the total trip time to reach JFK airport terminal area from Midtown Manhattan will be reduced from a shorter AirTrain ride from Howard Beach (as opposed to Jamaica). More frequent subway service reduces wait times and missed transfers between AirTrain and other subway lines.

Separately, the impacts of QueensLink providing a faster service can be seen on neighboring stations on existing Liberty and Jamaica lines. Woodhaven Blvd on the J train and 111 St on the A line sees the most impact due to these stations being only 1 stop over to the transfer stations that feature more frequent QueensLink service. For transit riders making their trip on the system, they can walk directly to QueensLink stations instead of waiting for an A or a J train. Stations further away from QueensLink transfer stations (80 St and 85 St-Forest Pkwy) sees a much smaller ridership impact, showing transit trips are still made from these stations with or without the intent to utilize QueensLink services.

The increased ridership on the Rockaway peninsula sees a healthy rise in patronage due to the massively increased service frequency in to the region by a QueensLink service instead of the unreliable Rockaway shuttle. A more reliable QueensLink service increases ridership on the Far Rockaway line station as well. As the peninsula is one of the most car-dependent communities in the city, any increase in subway ridership will be a boon to drivers who otherwise needs a car to reach their destination on time, as drivers who can finally utilize the subway alternative will not be driving on the crowded roads, but will switch to the train instead. The overall ridership on the Rockaways increases in all core scenarios considered.

Liberty Avenue Line (A)/ Jamaica Line (J) Stations	Existing	No Build	8th Av H	% Change Vs No Build	8th Av H w/ Flipped Terminals	% Change Vs No Build	6th Av M	% Change Vs No Build	6th Av MVS	% Change Vs No Build	6th Av M w/ Flipped Terminals	% Change Vs No Build
Aqueduct Racetrack	2,122	2,087	3,514	68.37%	3,524	68.84%	5,954	185.29%	4,289	105.50%	3,967	90.07%
Aqueduct-N Conduit Av	1,460	1,433	6,551	357.19%	3,207	123.82%	3,518	145.48%	3,043	112.38%	2,805	95.74%
Howard Beach-JFK Airport	1,543	1,492	4,311	188.84%	5,613	276.06%	3,975	166.31%	3,539	137.10%	5,982	300.85%
Broad Channel	2,246	2,206	1,717	-22.17%	1,417	-35.79%	2,252	2.10%	2,130	-3.44%	1,525	-30.88%
Beach 67 St	1,581	1,544	1,550	0.42%	1,570	1.70%	1,506	-2.45%	1,565	1.38%	1,638	6.08%
Beach 60 St	1,065	1,071	1,102	2.91%	1,139	6.37%	1,111	3.75%	1,104	3.10%	1,163	8.57%
Beach 44 St	2,698	2,663	2,805	5.34%	3,008	12.99%	2,756	3.50%	2,740	2.90%	3,082	15.76%
Beach 36 St	1,829	1,866	1,271	-31.90%	1,325	-29.00%	1,923	3.04%	1,884	0.98%	1,395	-25.22%
Beach 25 St	3,252	3,206	4,219	31.59%	3,590	11.98%	3,324	3.67%	3,283	2.39%	4,085	27.43%
Far Rockaway-Mott Av	4,877	5,043	5,674	12.52%	5,850	16.00%	5,562	10.29%	5,334	5.76%	5,796	14.93%
Beach 90 St	1,444	1,423	2,039	43.26%	2,087	46.64%	2,030	42.61%	1,820	27.87%	2,068	45.32%
Beach 98 St	411	399	546	36.78%	549	37.50%	550	37.82%	511	28.06%	551	38.08%
Beach 105 St	415	405	518	27.88%	537	32.61%	510	25.92%	487	20.13%	528	30.27%
Rockaway Park-Beach 116	698	684	945	38.18%	1,109	62.14%	905	32.36%	821	20.05%	1,121	63.98%
80 St	5,180	5,042	4,614	-8.49%	4,589	-8.98%	4,848	-3.83%	4,859	-3.61%	4,633	-8.11%
88 St	3,393	3,329	2,837	-14.77%	2,814	-15.47%	3,001	-9.85%	3,023	-9.18%	2,876	-13.61%
Rockaway Blvd	6,365	6,533	5,458	-16.45%	5,643	-13.61%	5,879	-10.01%	5,812	-11.04%	5,657	-13.41%
104 St	1,459	1,425	1,410	-1.10%	1,396	-2.06%	1,306	-8.40%	1,310	-8.12%	1,295	-9.16%
111 St	3,396	3,312	2,659	-19.73%	2,615	-21.04%	2,806	-15.28%	2,812	-15.09%	2,597	-21.60%
Ozone Park-Lefferts Blvd	8,046	7,844	7,893	0.62%	7,747	-1.24%	8,089	3.13%	8,061	2.77%	7,900	0.72%
121 St	3,906	3,829	4,098	7.01%	4,026	5.15%	3,716	-2.95%	3,744	-2.22%	3,959	3.39%
111 St	3,995	3,905	4,122	5.56%	3,928	0.59%	3,222	-17.49%	3,430	-12.15%	4,049	3.71%
104 St	4,067	4,063	4,763	**17.23%**	4,915	**20.97%**	4,294	**5.70%**	4,945	**21.72%**	5,042	**24.10%**
Woodhaven Blvd	5,446	5,357	3,465	-35.32%	3,575	-33.26%	3,300	-38.40%	3,834	-28.43%	3,572	-33.32%
85 St-Forest Pkwy	3,956	3,920	4,030	2.81%	4,096	4.48%	3,654	-6.81%	3,814	-2.73%	4,087	4.24%
75 St-Elderts Ln	3,871	3,833	4,003	4.45%	4,006	4.52%	3,920	2.27%	3,854	0.57%	4,037	5.32%

Liberty Avenue Line (A)/ Jamaica Line (J) Stations	Existing	No Build	Crosstown G	% Change Vs No Build	6th Av V	% Change Vs No Build	Broadway R	% Change Vs No Build	6th Av M w/ A/C Split	% Change Vs No Build
Aqueduct Racetrack	2,122	2,087	5,280	152.97%	4,671	123.82%	4,755	127.85%	6,780	224.83%
Aqueduct-N Conduit Av	1,460	1,433	3,333	132.61%	6,084	324.58%	3,222	124.81%	3,679	156.74%
Howard Beach-JFK Airport	1,543	1,492	4,398	194.66%	3,518	135.75%	2,800	87.60%	4,455	198.48%
Broad Channel	2,246	2,206	1,975	-10.48%	1,958	-11.26%	3,163	43.39%	1,932	-12.43%
Beach 67 St	1,581	1,544	1,537	-0.47%	1,516	-1.82%	1,478	-4.27%	1,714	11.04%
Beach 60 St	1,065	1,071	1,104	3.09%	1,117	4.23%	1,117	4.25%	1,183	10.46%
Beach 44 St	2,698	2,663	2,719	2.11%	2,748	3.20%	2,770	4.02%	2,945	10.62%
Beach 36 St	1,829	1,866	1,903	1.98%	1,928	3.35%	1,922	3.03%	1,336	-28.38%
Beach 25 St	3,252	3,206	3,333	3.97%	3,344	4.31%	3,322	3.61%	4,379	36.58%
Far Rockaway-Mott Av	4,877	5,043	5,512	9.29%	5,646	11.95%	5,395	6.98%	5,978	18.53%
Beach 90 St	1,444	1,423	2,006	40.92%	2,006	40.97%	1,912	34.33%	1,986	39.51%
Beach 98 St	411	399	560	40.35%	547	37.09%	538	34.86%	554	38.69%
Beach 105 St	415	405	502	23.88%	508	25.43%	502	23.96%	520	28.34%
Rockaway Park-Beach 116 S	698	684	938	37.13%	944	38.08%	902	31.92%	912	33.41%
80 St	5,180	5,042	4,981	-1.21%	4,822	-4.36%	4,954	-1.74%	4,892	-2.96%
88 St	3,393	3,329	3,095	-7.02%	2,976	-10.60%	3,107	-6.65%	3,205	-3.73%
Rockaway Blvd	6,365	6,533	6,066	-7.15%	5,786	-11.43%	5,899	-9.71%	6,158	-5.74%
104 St	1,459	1,425	1,357	-4.81%	1,346	-5.59%	1,408	-1.20%	1,284	-9.90%
111 St	3,396	3,312	2,819	-14.90%	2,707	-18.28%	2,810	-15.17%	3,031	-8.49%
Ozone Park-Lefferts Blvd	8,046	7,844	8,188	4.39%	8,144	3.82%	7,886	0.53%	8,487	8.21%
121 St	3,906	3,829	3,749	-2.10%	3,854	0.65%	3,768	-1.59%	3,965	3.55%
111 St	3,995	3,905	3,253	-16.69%	3,253	-16.70%	3,345	-14.33%	4,075	4.35%
104 St	4,067	4,063	4,045	-0.42%	4,028	-0.86%	3,976	-2.14%	4,746	16.82%
Woodhaven Blvd	5,446	5,357	3,368	-37.11%	3,159	-41.03%	3,379	-36.93%	3,435	-35.87%
85 St-Forest Pkwy	3,956	3,920	3,776	-3.69%	3,676	-6.23%	3,811	-2.80%	3,976	1.43%
75 St-Elderts Ln	3,871	3,833	3,845	0.32%	3,809	-0.63%	3,882	1.28%	4,016	4.78%

Figure 31: Network effects on the Southern Queens stations by scenario.

Part 6: Network Effect on Myrtle and Astoria Lines

Myrtle Avenue Line (M)/ Astoria Line (N/W) Stations	Existing	No Build	8th Av H	% Change Vs No Build	8th Av H w/ Flipped Terminals	% Change Vs No Build	6th Av M	% Change Vs No Build	6th Av MVS	% Change Vs No Build	6th Av M w/ Flipped Terminals	% Change Vs No Build
Middle Village-Metropolitan Av	4,750	4,685	4,538	-3.13%	4,540	-3.11%	4,777	1.95%	4,969	6.06%	4,784	2.11%
Fresh Pond Rd	5,898	5,737	5,821	1.45%	5,842	1.82%	6,209	8.23%	6,176	7.65%	6,195	7.98%
Forest Av	6,315	6,202	6,558	5.76%	6,660	7.39%	7,335	18.27%	7,362	18.71%	7,293	17.60%
Seneca Av	6,954	6,671	7,343	10.07%	7,370	10.48%	8,124	21.79%	8,002	19.96%	8,177	22.57%
Myrtle-Wyckoff Avs	4,584	5,096	5,166	1.38%	5,128	0.64%	6,447	26.52%	6,251	22.68%	6,250	22.66%
Astoria-Ditmars Blvd	28,849	28,985	28,765	-0.76%	29,021	0.12%	28,698	-0.99%	28,798	-0.65%	29,015	0.10%
Astoria Blvd	21,469	22,183	21,693	-2.21%	21,715	-2.11%	21,973	-0.95%	21,945	-1.07%	22,124	-0.26%
30 Av	20,810	21,318	21,163	-0.73%	21,237	-0.38%	20,971	-1.63%	21,033	-1.33%	21,065	-1.19%
Broadway	17,975	18,445	16,916	-8.29%	16,779	-9.03%	17,977	-2.54%	17,335	-6.02%	17,742	-3.81%
36 Av	13,355	14,231	12,854	-9.67%	13,108	-7.89%	13,114	-7.85%	13,201	-7.24%	13,317	-6.42%
39 Av-Dutch Kills	5,346	6,241	6,072	-2.70%	5,802	-7.02%	6,313	1.16%	6,367	2.02%	6,218	-0.35%
Queensboro Plaza	33,842	35,455	35,099	-1.00%	34,331	-3.17%	36,942	4.19%	36,948	4.21%	35,012	-1.25%

Myrtle Avenue Line (M)/ Astoria Line (N/W) Stations	Existing	No Build2	Crosstown G	% Change Vs No Build2	6th Av V	% Change Vs No Build2	Broadway R	% Change Vs No Build2	6th Av M w/ A/C Split	% Change Vs No Build2
Middle Village-Metropolitan Av	4,750	4,685	4,365	-6.83%	4,390	-7.58%	4,403	-7.31%	4,764	0.29%
Fresh Pond Rd	5,898	5,737	5,750	0.22%	5,701	-3.35%	5,692	-3.50%	6,201	5.14%
Forest Av	6,315	6,202	6,228	0.43%	6,181	-2.12%	6,179	-2.15%	7,287	15.39%
Seneca Av	6,954	6,671	6,613	-0.87%	6,737	-3.12%	6,625	-4.73%	8,172	17.52%
Myrtle-Wyckoff Avs	4,584	5,096	4,734	-7.11%	4,922	7.36%	4,813	5.00%	6,324	37.96%
Astoria-Ditmars Blvd	28,849	28,985	28,991	0.02%	28,926	0.27%	29,152	1.05%	28,866	0.06%
Astoria Blvd	21,469	22,183	22,133	-0.22%	22,113	3.00%	22,333	4.02%	22,067	2.79%
30 Av	20,810	21,318	21,286	-0.15%	21,132	1.55%	21,322	2.46%	21,021	1.02%
Broadway	17,975	18,445	18,232	-1.15%	17,821	-0.85%	18,535	3.12%	17,695	-1.56%
36 Av	13,355	14,231	13,880	-2.46%	13,877	3.90%	14,588	9.23%	13,374	0.14%
39 Av-Dutch Kills	5,346	6,241	6,444	3.26%	6,288	17.63%	6,220	16.35%	6,347	18.74%
Queensboro Plaza	33,842	35,455	37,167	4.83%	36,381	7.50%	38,480	13.70%	35,737	5.60%

Figure 32: Network effects on the Astoria and Myrtle Line stations by scenario.

The stations on the Astoria Line are indirectly affected by service increases on QBL local service, but the reduction in ridership is not significant aside from at the 36 Av and Broadway stations, the stations that are located the closest to the QBL. Ridership on the Myrtle Avenue Line stations (which remain within the boundaries of the borough of Queens) sees an increase compared to other scenarios when the extension/new service to and from the Rockaways is not an Ⓜ train, by an average of 15%. This shows that ridership on the Myrtle Avenue Line benefits from increased service quality/frequency that is currently hampered by the current conditions on the western section of the Jamaica line, of which the Ⓜ train interlines onto at Myrtle Av in Brooklyn. Astoria line ridership are relatively unaffected by any QueensLink services.

(C) QueensLink and IBX Ridership Synergies

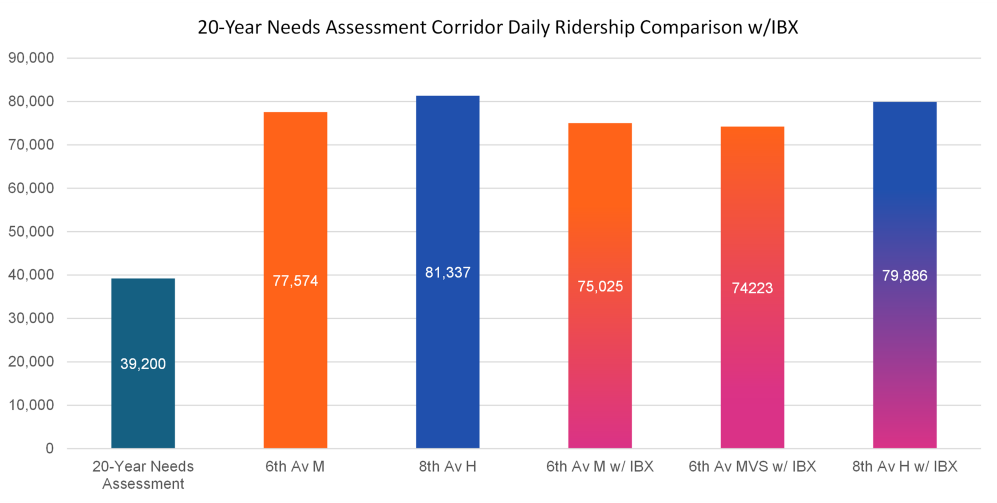


Figure 33: 20YNA corridor ridership with and without IBX.

The network impacts of QueensLink and the IBX examined under the same scenario could be seen in QBL and the 7 train corridor, where all northbound IBX ridership terminates at the station complex of Jackson Height-Roosevelt Av/74 St-Broadway. A smaller network effect could be seen at the Myrtle Avenue Line, which will be examined subsequently. Considering IBX within the No-Build scenario and then incorporating QueensLink in the Build scenario (with IBX in mind), figure 33 shows the that RBB corridor ridership is generally independent from the IBX corridor. The construction and completion of the IBX corridor does not preclude the need of QueensLink, as the two corridors serve two distinct and different ridership catchment areas.

The network impacts of IBX can be seen on the two stations before and after the Jackson Height-Roosevelt Av/74 St-Broadway complex, where transferring ridership from the IBX and increasing service frequency of the proposed QueensLink scenarios encourage riders to use the local stations as transfer instead of clustering at the Jackson Height-Roosevelt Av express stop, specifically 69 St on the 7 train and 65 St on the QBL local sees the higher ridership induction. The network impacts on other QBL and 7 train stations are also seen in the previous system-level impact sections.

Under the same model, STOPS is predicting that there will be 24,500 riders alighting at Roosevelt Av, which is IBX's current northern terminus. The further growth of ridership at Roosevelt Av can be seen under the 6th Av M extension + IBX scenario, where there are another 4,000 daily riders using the QBL platforms when the two services are examined together. In the 8th Av H new service + IBX scenario, the additional IBX transfer load is placed onto the 7 train. Due to the physical distance between IBX and southern Queens subway lines and stations, the impacts of ridership remain more or less the same from the results in Part 5 of the previous section, and the ridership tables for these stations are not included to avoid cluttering this section further.

Flushing Line (7) Stations	Existing	No Build 2	6th Av M w/ IBX	% Change vs No Build 2	8th Av H w/ IBX	% Change vs No Build 2	6th Av MVS w/ IBX	% Change vs No Build 2
Flushing-Main St	39,984	40,140	43,662	8.77%	41,987	4.60%	43,817	9.16%
Mets-Willets Point	2,158	2,117	2,724	28.69%	2,356	11.32%	2,747	29.78%
111 St	13,558	13,526	14,964	10.63%	13,466	-0.45%	14,990	10.83%
103 St-Corona Plaza	20,225	20,021	18,379	-8.20%	19,329	-3.46%	18,546	-7.37%
Junction Blvd	17,389	17,181	19,792	15.20%	18,544	7.93%	20,068	16.80%
90 St-Elmhurst Av	17,288	17,399	16,704	-4.00%	16,554	-4.86%	16,735	-3.81%
82 St-Jackson Hts	7,847	7,776	6,414	-17.50%	7,386	-5.02%	6,424	-17.39%
74 St-Broadway	15,601	17,851	15,323	-14.16%	16,900	-5.33%	14,664	-17.86%
61 St-Woodside	15,427	15,178	12,252	-19.28%	12,037	-20.69%	12,123	-20.13%
46 St-Bliss St	26,770	27,015	22,263	-17.59%	22,394	-17.10%	22,286	-17.50%
40 St-Lowery St	19,074	19,343	18,746	-3.09%	19,181	-0.84%	18,732	-3.16%
33 St-Rawson St	3,648	3,617	3,411	-5.68%	3,516	-2.80%	3,410	-5.72%
Queensboro Plaza	16,052	18,000	18,290	1.61%	17,273	-4.04%	18,217	1.21%
Court Sq	11,746	11,302	12,671	12.11%	15,312	35.49%	12,735	12.68%
Hunters Point Av	24,128	26,568	22,085	-16.87%	26,944	1.41%	22,163	-16.58%
Vernon Blvd-Jackson Av	14,044	16,194	16,255	0.38%	18,537	14.47%	16,357	1.01%

Queens Boulevard Line Stations	Existing	No Build 2	6th Av M w/ IBX	% Change vs No Build 2	8th Av H w/ IBX	% Change vs No Build 2	6th Av MVS w/ IBX	% Change vs No Build 2
Jamaica Center-Parsons/Ar	29,736	28,709	25,346	-11.72%	23,459	-18.28%	26,168	-8.85%
Sutphin Blvd-Archer Av-JF	13,691	13,458	11,931	-11.34%	12,123	-9.92%	12,403	-7.83%
Jamaica-Van Wyck	6,616	6,511	6,256	-3.92%	5,308	-18.48%	6,500	-0.17%
Jamaica-179 St	24,104	23,606	23,858	1.07%	22,311	-5.49%	23,779	0.74%
169 St	9,494	9,638	9,635	-0.03%	9,263	-3.89%	9,631	-0.07%
Parsons Blvd	8,356	7,744	7,815	0.92%	7,777	0.42%	7,851	1.38%
Sutphin Blvd	6,523	5,756	5,730	-0.44%	6,705	16.50%	5,809	0.92%
Briarwood	8,859	8,957	8,934	-0.26%	8,295	-7.40%	8,957	-0.01%
Kew Gardens-Union Tpke	14,144	11,794	11,211	-4.94%	11,968	1.48%	11,329	-3.95%
75 Av	4,037	4,198	4,250	1.23%	3,671	-12.56%	4,254	1.32%
Forest Hills-71 Av	54,767	50,600	45,518	-10.04%	40,219	-20.52%	48,383	-4.38%
67 Av	14,093	14,218	11,841	-16.72%	12,628	-11.18%	12,829	-9.77%
63 Dr-Rego Park	14,655	14,212	18,200	**28.06%**	18,962	**33.42%**	25,056	**76.30%**
Woodhaven Blvd	14,890	13,539	15,325	13.19%	15,176	12.09%	15,669	15.73%
Grand Av-Newtown	15,314	10,648	11,070	3.96%	11,234	5.51%	10,947	2.81%
Elmhurst Av	18,237	17,426	21,037	**20.72%**	20,768	**19.18%**	20,210	**15.98%**
Jackson Hts-Roosevelt Av	112,238	121,760	120,978	**-0.64%**	101,929	**-16.29%**	120,353	**-1.16%**
65 St	15,300	13,737	17,063	**24.21%**	16,564	**20.58%**	17,114	**24.59%**
Northern Blvd	12,752	12,475	12,882	3.26%	13,410	7.50%	12,673	1.58%
46 St	23,106	22,779	23,664	3.88%	23,772	4.36%	24,033	5.50%
Steinway St	14,438	15,231	19,068	25.20%	18,759	23.17%	19,867	30.44%
36 St	3,385	3,950	6,528	65.28%	5,930	50.13%	8,189	107.35%
Queens Plaza	12,946	20,453	40,726	99.12%	9,346	-54.30%	39,987	95.51%
Court Sq	10,562	9,318	3,461	-62.86%	9,657	3.64%	3,474	-62.72%
Court Sq-23 St	67,755	84,563	67,577	-20.09%	68,596	-18.88%	67,577	-20.09%
21 St	1,455	1,410	2,436	72.83%	1,397	-0.89%	2,360	67.37%
21 St-Queensbridge	15,084	11,313	13,303	17.59%	19,736	74.46%	13,290	17.48%

Figure 34: Network effects on the Flushing, Queens Boulevard stations with IBX.

The Myrtle Avenue Line is one of the other corridors that have been more significantly affected by the introduction of the IBX as a new subway service. From the Middle Village-Metropolitan Av terminal, riders on the Myrtle Avenue Line now have an alternative rapid transit corridor to popular destinations in midtown. Instead of riding the Myrtle Avenue M train first into Brooklyn, Ridgewood and Middle Village riders now can ride the IBX north to transfer at Jackson Heights-Roosevelt Av/74 St-Broadway station complex for the 7 train or an QBL express/local train to Long Island City and Midtown Manhattan. Therefore, the further reduction of station boarding on the Myrtle Avenue Line compared to the previous number seen in Part 6 section displayed here could be explained by the reduction in trip time on the IBX corridor.

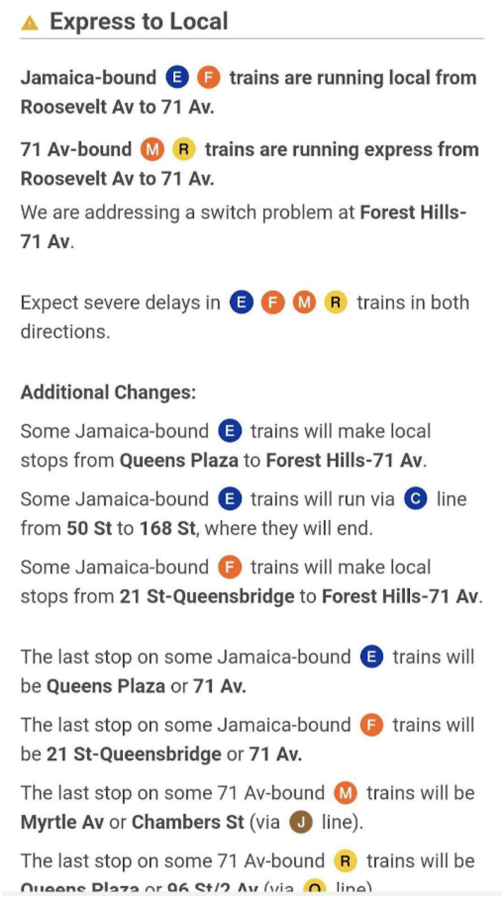
Myrtle Avenue Line (M)/ Astoria Line (N/W) Stations	Existing	No Build 2	6th Av M w/ IBX	% Change vs No Build 2	8th Av H w/ IBX	% Change vs No Build 2	6th Av MVS w/ IBX	% Change vs No Build 2
Middle Village-Metropolit	4,750	2,704	3,363	**24.40%**	2,426	-10.26%	3,425	**26.69%**
Fresh Pond Rd	5,898	3,360	3,897	**15.96%**	3,378	0.52%	3,945	**17.39%**
Forest Av	6,315	5,577	6,574	17.87%	5,784	3.72%	6,391	14.60%
Seneca Av	6,954	6,582	8,203	24.63%	7,358	11.79%	8,072	22.64%
Myrtle-Wyckoff Avs	4,584	4,688	5,957	27.07%	4,482	-4.40%	6,159	31.39%
Astoria-Ditmars Blvd	28,849	28,977	28,692	-0.99%	28,749	-0.79%	28,799	-0.62%
Astoria Blvd	21,469	22,142	21,949	-0.87%	21,672	-2.13%	21,921	-1.00%
30 Av	20,810	21,329	20,992	-1.58%	21,125	-0.95%	21,054	-1.29%
Broadway	17,975	18,398	17,961	-2.37%	16,900	-8.14%	17,337	-5.77%
36 Av	13,355	14,157	13,110	-7.40%	12,820	-9.44%	13,213	-6.67%
39 Av-Dutch Kills	5,346	6,150	6,239	1.44%	6,016	-2.17%	6,286	2.22%
Queensboro Plaza	33,842	35,034	36,610	4.50%	34,901	-0.38%	36,616	4.52%

Figure 35: Compilation of Astoria/Myrtle stations ridership impacts with IBX.

(D) The Case for Operational Redundancy

During the evening peak hour of 8 May 2025, a switch failed at Forest Hills-71 Av, severely disrupting the operations of the entire QBL, and its disruptions rippled onto the Manhattan trunk lines feeding into the quad track corridor. As shown in the image below, multiple service changes were issued to get people moving. The E/F train ran local, while the M/R train ran express between two busy intermodal hub stations. The delays on the E train cascaded onto the C, and some R trains used 96 St/2 AV on the Upper East Side to terminate, and some M trains were forced to terminate in Lower Manhattan. This incident shows the fragility of core components on this ridership powerhouse, as the location of this failure rippled out onto most of the B-division letter lines.

This incident is a real life example of why the QueensLink proposal of integrating the RBB makes sense for QBL redundancy. The existing provision for the RBB to connect to QBL are placed at 63rd Dr-Rego Park station before Forest Hills-71st Av. Should this incident have happened when RBB was already integrated as a branch of the QBL, then trains could have been rerouted along the RBB corridor to unload passengers, removing trains out of service, and short turning at pocket tracks on the corridor. For example, some E/F trains could terminate at Rockaway Park or Howard Beach should these trains be stuck on Queens Boulevard Line after the switch had malfunctioned, and some R trains can use a hypothetical third track at Metropolitan Av-Parkside to quickly turn back to



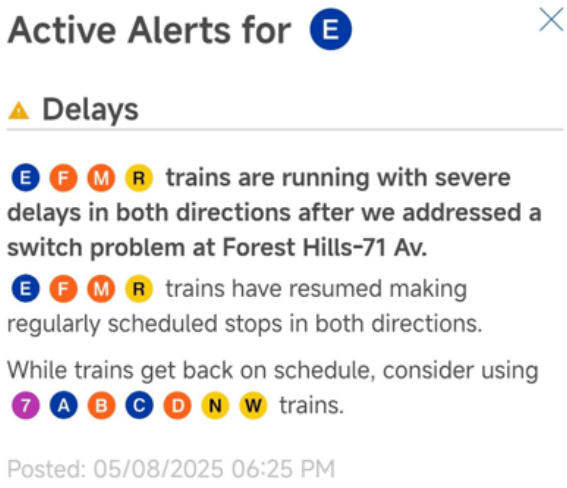


Figure 36: Detailed QBL Service Changes during Disruption. Screenshots captured from new.mta.info

Manhattan, should the station have such a design. This operational redundancy is not easily found elsewhere without investing in costly land-taking measures. The minimum service scenario's lower frequency on the corridor also allows for additional headroom to handle reroutes, as this corridor would be built with CBTC in mind.

(F) Cost Per Rider Analysis

Although cost per rider is not the focus of the ridership results found in this study, a straightforward comparison based on existing, public, and available cost estimates and ridership projections can still be made with the two major capital expansion projects being undertaken by the MTA: Second Avenue Subway (SAS) Phase 2 and the IBX. The Cost per rider comparison is broken down into the chart below.

Project	**Second Avenue Subway Phase 2**	**Interborough Express**	**QueensLink**
Ridership Estimate	123,000 daily riders (2035)[21]	160,000 daily riders (2035)[34]	77,000 daily riders (2040)
Cost Estimate	$7.7 billion	$5.5 billion[11]	$3.5 billion[19]
Cost Per Rider	$62,500[3]	$34,375	$45,400

Table 1: Comparison of Transit Projects by Ridership and Cost

VII: Limitations

Scope Constraints

An often suggested solution providing faster travel time for RBB riders is the conversion of the Woodhaven Blvd (QBL) station from local-only to a full express and local stop. The operational pattern applied in this study does not consider modifying Woodhaven Blvd station, as this project is a complex engineering challenge of its own. While it theoretically allows an earlier transfer point between QBL local and QBL express services and has the potential to reduce congestion at the existing express/local stop of Roosevelt Blvd-Jackson Heights, this project is not absolutely necessary for the RBB to be integrated into the subway system.

The exploration of the IBX/QueensLink synergy is limited exclusively at the ridership level, where the current frequency and service pattern advertised by the IBX project team repeated during open houses and community outreach events - 5 minutes during peak and an updated 32 minutes runtime. There are no discussions about ridership impacts with regard to potential land use/zoning changes, a topic previously covered in the assumption sections of the report. No change of service on the LIRR Atlantic is considered in this study, also to contain the study scope.

Rolling Stock Considerations

STOPS does not consider the implication of projected ridership with existing rolling stock available for potential future operation of B-division trains on the RBB; but rather the software projects a ridership based on service frequency (headway) and a generalized parameter of fixed-guideway transit capacity. For interpretation of ridership estimates into real-life implication purposes (especially for actual operations planning), it could be reasonably assumed that the capacity of the G and M trains is assumed to be on par with the rest of service pattern proposals such as the full 10 car train H, V, and R, and the real-life operations utilize the proper train sets to accommodate the projected ridership adequately.

Projection Years and the COVID Black-Swan Event

The COVID-19 pandemic has halted public transit ridership growth seen in the 2010s, and major North American public transit systems have seen ridership recovery post COVID to around 75% of pre-COVID levels across the continent. However, as some available public data required to run STOPS was created before the pandemic, projections that this data provides cannot possibly account for post-COVID travel patterns and human behav-

ioral changes. Before running any models, existing available data such as the reference number for the latest weekday unlinked ridership from metric.mta.info[14] were refreshed and other data sources were rechecked to make sure to reflect the impacts of COVID-19 pandemic, if any, whenever possible.

QueensLink Scenario Viability In Real-Life

The service proposals were created under the assumption that there is no excessive schedule padding on the QBL service. Modern CBTC signaling system allows for interlining of services pattern seen on NYCT subways with precision and accuracy, but the effectiveness of the additional capacity afforded by these signal upgrades are diminished if the additional frequency unlocked by CBTC and moving block signaling is partially given back to unnecessary schedule padding, causing inadequate service to suppress ridership.

Existing Platform Level Data Accuracy

STOPS software utilizes existing daily ridership reports to have a distribution of ridership by platform(s). However, existing MTA hourly ridership data reports subway stations only by station complex. We were able to ascertain with our MTA contact on how to further distribute the station complex-level of ridership numbers onto specific platforms. The method remains an estimation. Due to how the MTA's fare system only requires tap-ins, certain incomplete round-trips to and from main destination spots are not properly accounted for even under a complex algorithm estimating as many trips as possible.

Fare Evasion

Past studies and news reports from MTA and third party sources have confirmed the widespread problem of fare evasion on the NYCT bus and subway systems. This study has not applied any fare evasion modifiers to existing ridership numbers during any steps of the study, as fare evasion estimates have varied from report to report. While the MTA's Origin-Destination Dataset[12] , where this report draws upon its estimation of platform level ridership, might have accounted for certain fare evasion modifier, there is no concrete evidence of the modifier existing. Therefore, the estimation of platform level ridership was taken at face value, meaning all riders using the platform at a certain NYCT subway station are all paid subway riders.

Impacts of Inter-system Relationships on Ridership Inputs

Similar to how fare evasion threatens to misrepresent actual subway ridership, transfer ridership from other systems such as NJ Transit, Amtrak, JFK AirTrain at major intermodal hubs, as well as intra-system transfer points such as New York Penn Station, Woodside, and Jamaica are not directly represented in the existing platform level ridership inputs of the STOPS model. The platform level estimates continue to utilize the probabilistic distribution algorithm based on the data from MTA's Origin-Destination Dataset as the direct proxy of ridership transferred from riders transferring onto the subway at different intermodal hubs. As QueensLink's proposed station locations do not directly interface with existing, operating LIRR stations, this study sees the direct proxy as an adequate representation of regional ridership of the NYCT subway system for this study.

VIII: Conclusion & Future Outlook

This ridership study shows that the Rockaway Beach Branch, in its full length and fully realized integration into the existing subway system, is of massive benefit to the Queens transit riders throughout the borough. The addition of the corridor to the overall NYCT subway system has the potential to further improve robustness, service quality, and flexibility of the system, in addition to providing Rockaway residents a fast, reliable, and high capacity fixed guideway service to multiple intermodal transfer hubs in northern and southern Queens. QueensLink's proposal of full reactivation of the RBB readies the subway system to serve the inevitable additional influx of transferring riders of the ongoing Interborough Express project at one of the already busiest stations on the subway network, and the data presented in the results of the study has shown that not only the construction of IBX does not preclude the necessity for the reactivating the Rockaway Beach Branch, but rather complements each other in their constructive impacts to the overall subway network for reducing congestion and travel time together. Furthermore, through smart design and engineering of layout of certain new stations, QueensLink's proposal of full reactivation offers much needed system redundancy to provide more consistent Queens Boulevard subway service from a viable alternative terminal of operations in central Queens in the event of reroutes and other service disruptions, in contrast to the real life events that was disruptive to riders on the corridor during the writing of this report.

The currently derelict Right-of-Way of the Rockaway Beach Branch resonates with the overall existing planning and capital expansion approaches with regards to utilizing existing infrastructure and right-of-ways for high-capacity, high throughput public transit in New York City. Even after the watershed event of COVID-19 that changed travel and work behaviour of many urban dwellers, New York City remains the North American city that moves on public transportation much more than its continental peers. After two brief visits in 2018 and 2023 in the form of agency-led studies, the full reactivation and integration of the Rockaway Beach Branch onto the Queens Boulevard subway is corridor worth a fresh look for the value of its layered benefits for riders on the corridor and the larger subway network for policymakers and local and regional stakeholders alike.

IX: Acknowledgements

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XI: Appendices

Appendix I: Table of Abbreviations

USDOT - United States Department of Transportation

FTA - Federal Transit Administration

FRA - Federal Railway Administration

MPO - Metropolitan Planning Organization

JTW - Journey To Work

SWO - Stop Work Order

ROW - Right of Way

GTFS - General Transit Feed Specification

MTA - Metropolitan Transit Authority

NYCT - New York City Transit

NTT - New Technology Trains

WTC - World Trade Center

LIRR - Long Island Rail Road

RBB - Rockaway Beach Branch

QBL - Queens Boulevard Line

IND - The Independent Subway

BMT - Brooklyn Manhattan Transit

IBX - Interborough Express

CBTC - Communication Based Train Control

TPH - Trains Per Hour

PSD - Platform Screen Doors

ATO - Automatic Train Operations

NYMTC - New York Metropolitan Transportation Council

TAZ - Transportation Analysis Zone

CTPP - Census Transportation Planning Products

VOT - Value of Time

STOPS - Simplified Trips-On-Project Software

EIS - Environmental Impact Statement

20YNA - 20-Year Needs Assessment

SOGR - State of Good Repair

RTFM - Regional Transportation Forecast Model

TPTO - Two Person Train Operation

Appendix II: Data Ingestion Steps

Step 1. Control File

Step 1 sets a control file for every iteration of a specific STOPS run where the software learns what and where the folders for the specific STOPS run are located. Please note that the steps are parallel from each other and a user needs to collect and verify data step by step.

Step 2: Edit Parameter File

The control file works in tandem with Step 2: Edit Parameter File. In Step 2, we established the run and system name. The STOPS mode is set at Mode 1 (Synthetic) and the GTFS connectors are set at 00 as a default per the STOPS user handbook for general ridership estimation studies barring other circumstances. To account for multiple GTFS folders using similar routes (in the case of NYCT buses, the route.txt file are the same across all five GTFS folders for five boroughs), we have utilized STOPS optional suffix when setting up the GTFS file directory. This will streamline final STOPS ridership reporting and avoid confusion internally in the software and externally to the reader. The geography type and the Metropolitan Planning Organization (MPO) is specified for the software to understand the larger area of study. All GTFS file locations are determined in this step, up to 20 GTFS files for larger public transportation systems. The second section of the Step 2 are the STOPS software parameters: Journey-To-Work trip counts, transfer

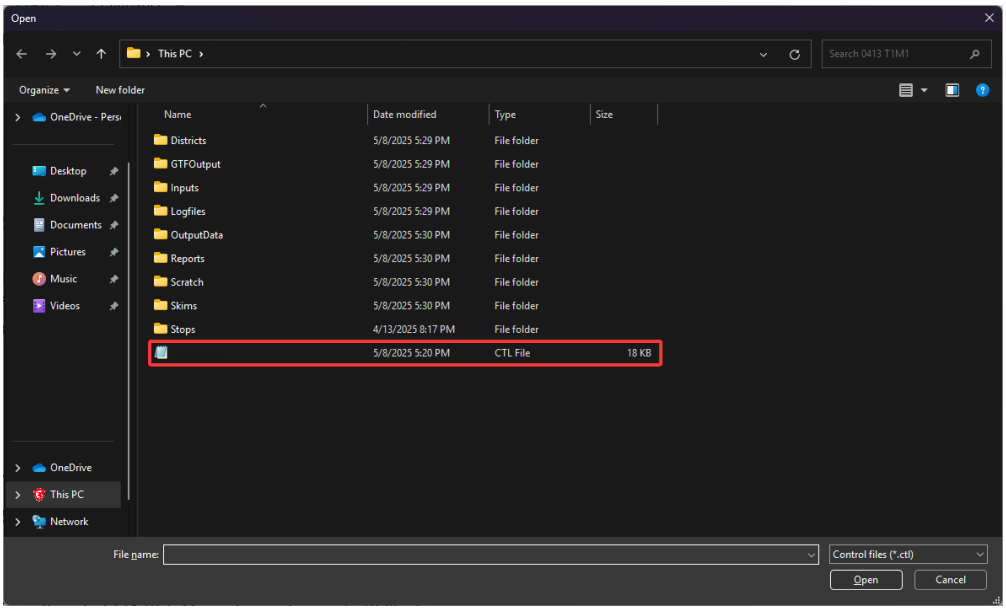

Figure 37: Selecting Control File from Setup. All changes made in the parameter will be written into the control file.

penalty, fixed guideway settings, calibration approaches and settings, linked to unlinked trip modifiers, and Auto travel time adjustment modifiers.

Step 3. List and Check TAZ and CTPP Files

Starting from Step 3, STOPS allows the user to visually confirm file completeness by categorizing the required data into 3 larger portions, starting from Step 3 to Step 5. This section of the report will comb through each of the applied data sources of Step 3.

The MPO/Population/Employment File is adapted from NYMTC's population and employment projections of the TAZ within the MPO's jurisdiction. These projections are merged into a NYMTC shapefile detailing the TAZ boundaries. The MPO Highway Skim File is a matrix containing individual zone to zone highway travel time between each individual NYMTC zone. This file is created using NYMTC's existing highway travel time skim projections. The route count.txt file contains all MTA bus and subway ridership by specific route. As the STOPS user guide has explicitly stated The data was extracted from MTA's hourly card swipe data for 2024. The official tally for all bus routes operated by NYCT and MTA Bus company was not available when this report was written. The fare structure file, strongly recommended by the user guide, is created to reflect the existing fare scheme of the NYCT Bus and Subway services. First and foremost in the file, the Value of Time (VOT) is set at $13.5. Secondly, for regular bus, select bus service, and subways, the type-specific fare is $2.90, and express buses cost $7.00 per trip, whereas the subway replacement shuttles run during weekends and holiday subway shutdown are free. With metrocard and OMNY, transfers between bus and subway are free, and this free transfer

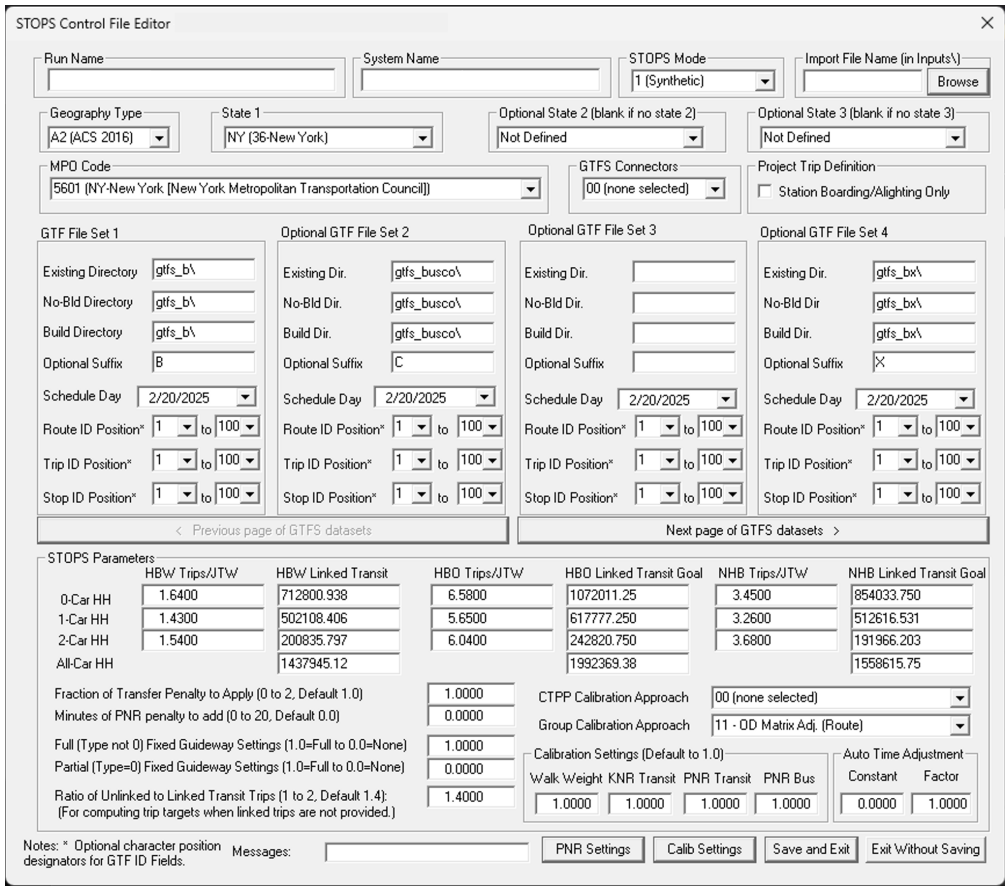

Figure 38: Example Step 2 Parameter Interface

is accounted for in the file.

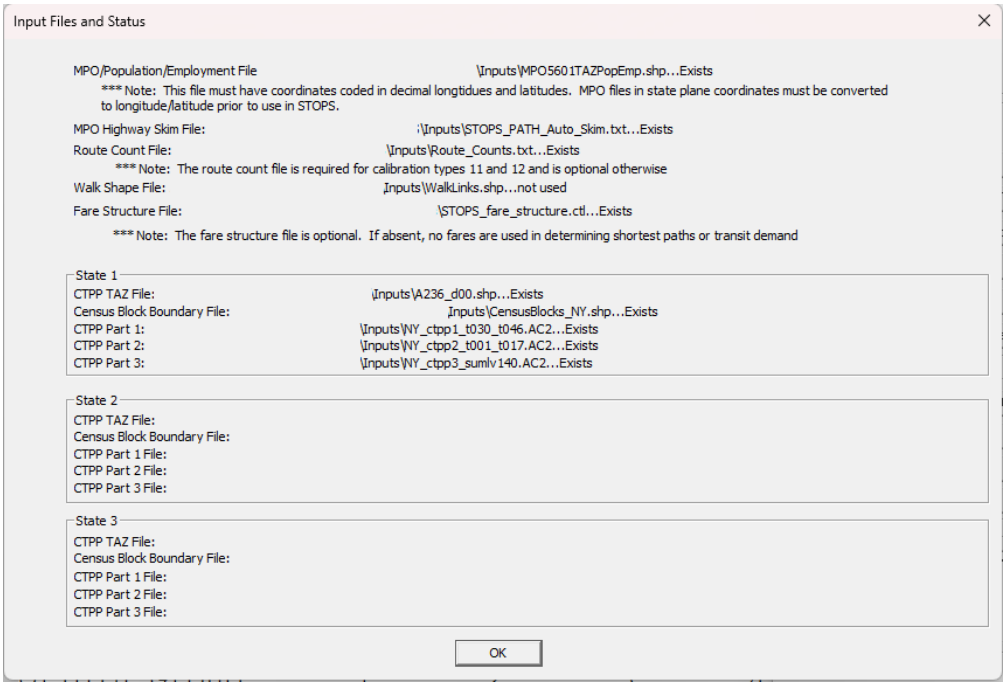

Figure 39: Step 3 Input files check interface. Missing files will be noted as ”DOES NOT EXIST” instead of ”Exists”.

To properly apply the correct value of MTA fares onto the various bus and subway routes types in the 8 different GTFS files, the GTFS file’s ”route_type” column in the routes.txt are edited to correspond to the fare file’s assigned route value, namely ”1” = subway, ”3” = regular and select bus service, ”7” = express bus, and ”711” for free subway shuttles. Note that in the original MTA GTFS, all non-free buses are categorized as 3, and manual edits are made for the sake of reflecting the fare difference within STOPS.

The Walk Shapefile is not used in the usage of this study. The CTPP based TAZ and AC2 planning files alongside the CensusBlocks for each considered are used without modification from its original form. For this study, only the New York state shapefiles and data are utilized.

Step 4. Define Forecast Years.

This step allows the user to set the specific projected year based on the columns within the MPO/Population/Employment shapefile. STOPS extracts the TAZ based information from the shapefile’s attribute table, and user designates the current year, opening year, 10-year forecast and 20-year Forecast (if applicable) for the software to consider. The Weekday Unlinked Regional Bus and Rail Transit Trips is A key metric for the overall system that is within the step, most commonly interpreted as existing unlinked trip count for the rapid transit system. For the total weekday unlinked trip number used in this report, we are

using the latest average weekday unliked trip count based on data provided by the sum of the hourly turnstile ridership from buses and subway, retrieved MTA's OpenDataNYS portal and processed locally. The official 2024 average weekday unlinked trip was not published during the creation of this report. The Zone-based Growth Factor Geography as the recommended default are also used in this study, as recommended by the STOPS User Guide.

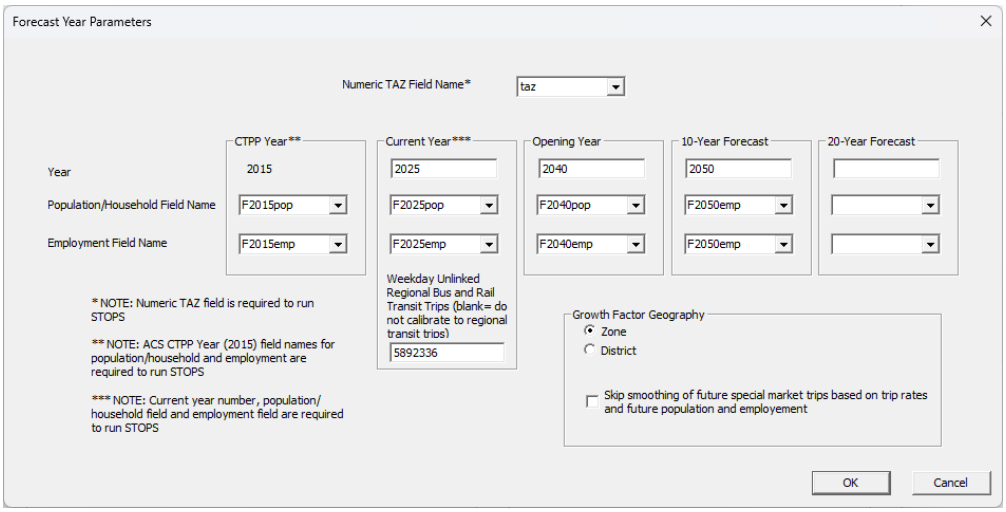

Figure 40: Step 4. The expected total weekday linked trip number is inputted here alongside the employment/population projections.

Step 5. List and Check GTFS Files

The latest MTA bus and subway services static GTFS (GTFS non-RT) data are downloaded from MTA's developer resources as the basis of the existing and no-build scenarios. See methodology section for further details on GTFS editing.

Step 6. Specify Station Locations

STOPS is able to generate a shapefile containing all the transit stops imported from the GTFS files that the user ingested into the folder system. The shapefile then can be manipulated to contain key travel information such as DAILYBOARD (Weekday daily unlinked ridership data), station groups (groups of stations belonging to a specific route, mainly for buses), and districts that these stations fall into.

Step 7. Create Station Buffers

Station buffers are created after the shapefile in Step 6 is verified complete by the user. It will generate the buffer of 25 miles of all the specified station stops in use in the run, but it will not count users as far as 25 miles being rational users of this station.

Step 8. Define Districts, Station Groups, and Zonal Data

This step is a manual configuration of Zonal data and districts in the examined TAZ area. STOPS will generate a blank TAZ-based district shapefile for the user to configure in a GIS file. The user can also edit the district shapefile outright and paste the results into the correct district folder for STOPS to reference during the batch steps.

Step 9. Create MPO-TAZ Equivalency and Generate Zonal SE Forecasts

This step is prepared automatically by the STOPS software after all previous 9 steps have been fulfilled. It creates an equivalency between the MPO defined zones and the Traffic Analysis Zones for future steps to process.

Step 10. Prepare Pedestrian Environment Data

This step is prepared automatically by the STOPS software after all previous 10 steps have been fulfilled. Pedestrian environment data is pulled from STOPS database and existing geographical data ingested in previous steps.

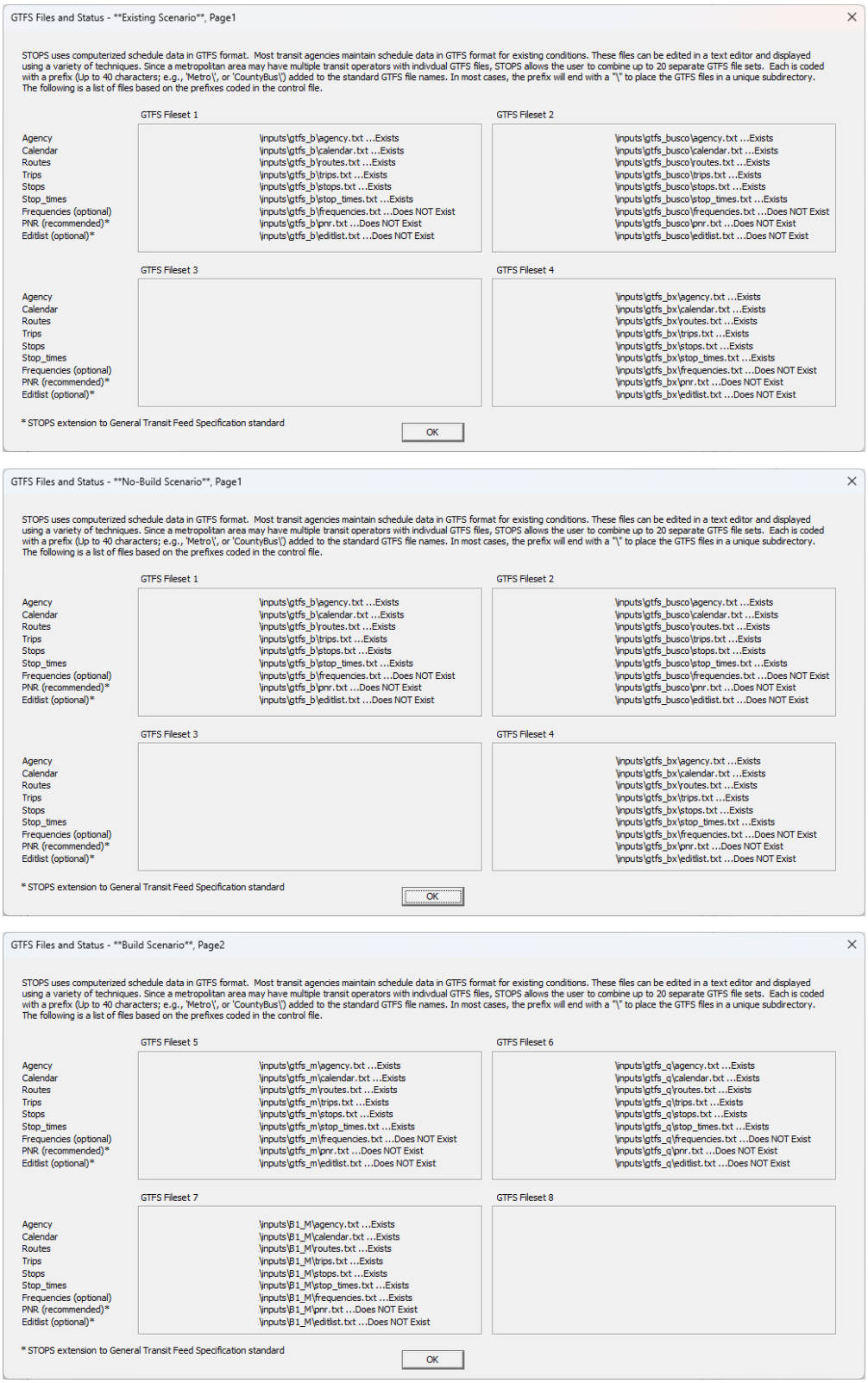

Figure 41: Step 5. GTFS File check. Missing files will be noted as ”DOES NOT EXIST” instead of ”Exists”.

Step 11. Running Batch Steps

Assuming all previous 10 steps are configured without error, the STOPS software will run the Batch Steps that yield the calculations based on the input data provided. For a system as big as New York City and NYCT, one correctly run batch step usually takes around 4.5 to 5.5 hours to complete. A modern multi-core CPU platform with 32GB of system memory can run up to 4 different scenarios in the batch step concurrently, system resource permitting.

Step 12 and Beyond.

Step 12 contains the reporting tool where the software will open the default text editor to display the results of the run. Notepad++ is strongly recommended to be used to open the report directly from the “reports” folder instead of clicking on the report button due to default windows .txt editor notepad tries to resume all previously opened instances. An example of a completed run of a certain scenario is in the figure below.

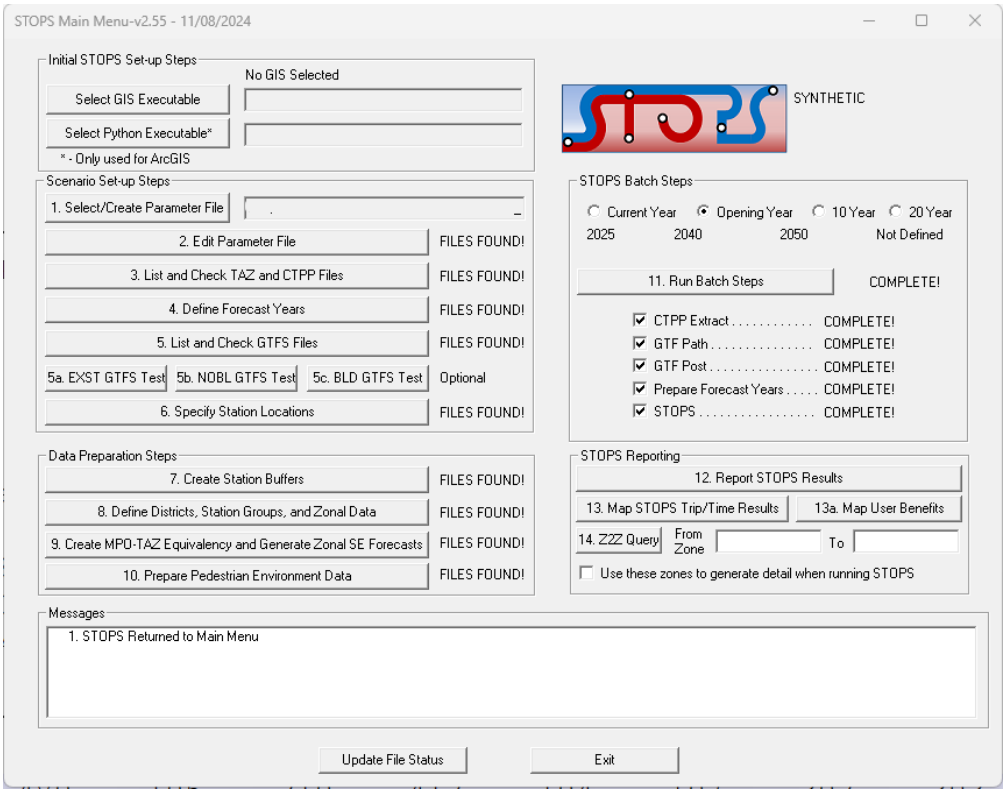

Figure 42: An example of a complete run for a sepcific scenario. The full report can be found on the report folder of the scenario specific folder.

Appendix III: Parameters for Probabilistic Distribution of Platform Ridership

Routing Parameters

- `time_threshold (1.35)`: Consider routes up to 35% slower
- `freq_weight (0.5)`: Weight given to service frequency vs travel time
- `absolute_max_time (None)`: Maximum acceptable travel time in the network
- `group_by_station (True)`: Ridership distributed across stations in station complexes
- `min_probability (0.15)`: Minimum probability for route inclusion
- `max_candidates (4)`: Maximum number of routes to return per origin-destination
- `min_trip_count (1)`: Minimum trip frequency in routes

Routing rules

- Basic path and travel time integrity
- Basic routing parameter limitations
- No self-loops
- No platform changes at endpoints (start, end stations)
- Probability sorted by score (where `time_score` and `freq_score` are normalised values):

$$\text{probability} = (1 - \texttt{freq\_weight}) \times \text{time\_score} + \texttt{freq\_weight} \times \text{freq\_score}$$

Routing Logic and Ridership Inference

1. Identify all possible platform combinations between origin and destination stations
2. Score paths based on combined time and frequency metrics
3. Filter candidate routes based on minimum probability thresholds
4. Normalize probabilities across candidates to create distribution
5. Distribute ridership from OD station complexes to specific platforms by probability ratio of valid routes, or assign directly to the top probable route.

A special thanks for Joao Pauloro at the Marron Institute of Urban Management, Transportation and Land Use Program, for authorizing the use of his algorithm and explanation and the resulting output for platform level probabilistic distribution of ridership on existing NYCT subway stations.

Appendix IV: List of Data Sources

Dataset Name	Source	Availability	URL
MTA Bus Hourly Ridership: 2020-2024	MTA OpenData, OpenDataNYS	Public, Open	https://data.ny.gov/d/kv7t-n8in
MTA Subway Stations	MTA OpenData, OpenDataNYS	Public, Open	https://data.ny.gov/d/39hk-dx4f
MTA Subway Hourly Ridership: 2020-2024	MTA OpenData, OpenDataNYS	Public, Open	https://data.ny.gov/d/wuuj-7c2s
MTA Bus Route 2023 Weekday Ridership	MTA	Public, Open	https://www.mta.info/agency/new-york-city-transit/subway-bus-ridership-2023
MTA Subway+Bus Reported Daily Ridership	MTA	Public, Open	https://metrics.mta.info
MTA Subway Origin-Destination Ridership Estimate: 2024	MTA OpenData, OpenDataNYS	Public, Open	https://data.ny.gov/Transportation/MTA-Subway-Origin-Destination-Ridership-Estimate-2/jsu2-fb7/about_data
Socioeconomic and Demographic Forecasts — Population (through 2050)	NYMTC	Public, Open	https://www.nymtc.org/en-us/DATA-AND-MODELING/SED-Forecasts
Socioeconomic and Demographic Forecasts — Employment (through 2050)	NYMTC	Public, Open	https://www.nymtc.org/en-us/DATA-AND-MODELING/SED-Forecasts

End of table

Continued on the next page

Dataset Name	Source	Availability	URL
Census Transportation Planning Products - New York, 2012-2016 American Community Survey Zones	USFTA	Inquiry Based	/
Census Blocks, New York City	USFTA	Inquiry Based	/
NYC Traffic Analysis Zones Shapefiles	NYMTC	Inquiry Based	/
NYC Highway Auto Travel Time projections, 2025-2055	NYMTC	Inquiry Based	/
City Council Community Districts	NYC	Public, Open	https://boundaries.beta.nyc/?map=cc_upcoming
New York City Subway GTFS	TransitLand, MTA Developer Resources	Public, Open	https://www.transit.land/feeds/f-dr5r-nycsubway/versions https://gtfsfeeds.s3.amazonaws.com/gtfs_subway.zip
GTFSed Software and static GTFS schedules	USFTA, Capstone Team	Public, Open	https://www.transit.dot.gov/funding/grants/grant-programs/capital-investments/stops-modifying-general-transit-feed
STOPS Software	USFTA	Public, Open	https://www.transit.dot.gov/funding/grants/grant-programs/capital-investments/stops

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