

MOVING PEOPLE

CONNECTING COMMUNITIES

# BQX



AUGUST 2018

COMPLETION OF  
CONCEPTUAL  
DESIGN REPORT



NYCT  
SUNNYVALE  
ROTHSCHILD

# MAYORAL LETTER



**We came into office to right the longstanding wrong that too many New Yorkers were cut off from opportunity in too many ways.**

One of the most basic of those ways is transportation. To put it simply, if you can't get to a job, or an internship, or a great education, you can't get ahead. If you can't visit a sick relative, reach the healthcare you need, or just go out for a day of fun with your family, you aren't living the life that so many of us take for granted.

This isolation is pronounced along the Brooklyn-Queens Waterfront, home to over 400,000 people, including 40,000 New Yorkers in public housing. While our subway was designed a century ago for a Manhattan-centric economy, thriving new economic hubs have developed across the city—particularly along the Brooklyn-Queens Waterfront. That's why our Administration has made unprecedented efforts to connect communities along this corridor to the city and to one another. Over the past year we completed our vision for a six-line ferry system, stretching from the Rockaways to the Bronx and our waterborne transit system has already served 6 million riders.

The next great step towards creating a five-borough economy, addressing income inequality and easing the lives of so many hardworking New Yorkers is the Brooklyn Queens Connector: A state of the art, zero-emission streetcar that will run 11 miles from Astoria through Downtown Brooklyn down to Red Hook, connecting to 9 ferry landings, 13 subway routes and 30-plus bus lines.

The BQX, whose design is detailed in this report, will be a game changer. For the price of a MetroCard fare, the BQX will save many straphangers an average of up to 20 minutes a day on their commute. It will uplift our economy by bringing New Yorkers together in a new way and help us to become the fairest big city in America.



*Mayor Bill de Blasio*

**02 MAYORAL LETTER****06 EXECUTIVE SUMMARY****10 FEASIBILITY ANALYSIS AND  
CONCEPTUAL DESIGN**

PHASED APPROACH TO STUDY

KEY ELEMENTS OF ANALYSIS

MODE AND ALIGNMENT ASSESSMENT

CONCEPTUAL SERVICE PLAN

RIDERSHIP

TIME SAVINGS

UNDERGROUND UTILITIES AND SUBSURFACE CONDITIONS

RESILIENCY

## 22 **BQX: PROPOSED CONCEPT**

### PROPOSED ROUTE

- Red Hook and Columbia Street Waterfront
- Atlantic Avenue and Downtown Brooklyn
- Brooklyn Navy Yard
- Williamsburg
- Greenpoint
- Newtown Creek Bridge Crossing
- Long Island City
- Queensbridge to Astoria

### MAINTENANCE FACILITY AND YARD

### STREET DESIGN

- Conceptual Layouts
- Stops
- Signal Prioritization & Exclusive Right of Way
- On-street Parking
- Agency Operations

### POWER

- Propulsion System
- Traction Power Substations

### REAL ESTATE ACQUISITION

## 52 **PROJECT FINANCIALS**

### CAPITAL COST ESTIMATE

### ECONOMIC BENEFIT

## 56 **NEXT STEPS**

### EIS AND DESIGN

### OPERATIONS PLANNING

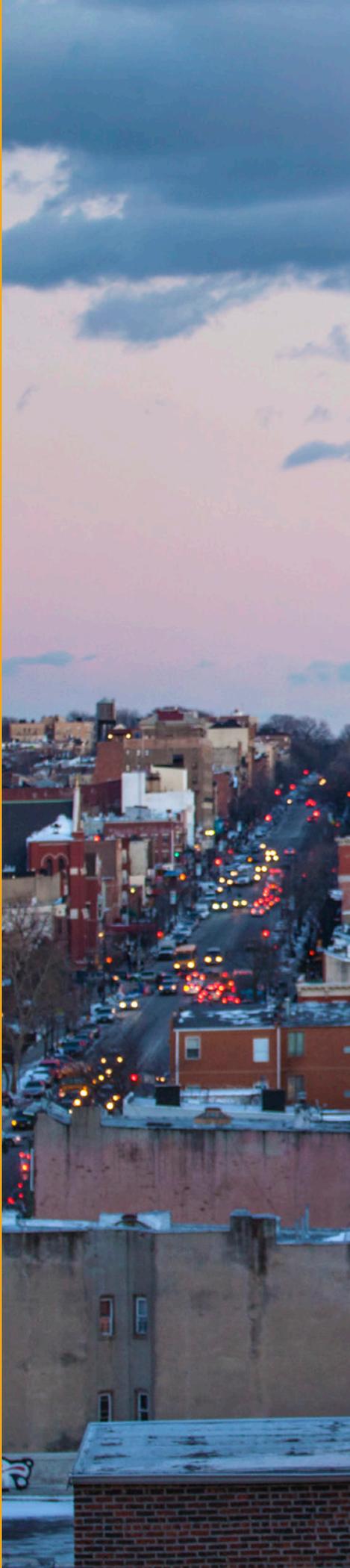
### PROJECT FUNDING

### PROJECT DELIVERY METHODS AND GOVERNANCE

### APPROVAL PROCESS

### PROJECT TIMELINE

# EXECUTIVE SUMMARY



**The Brooklyn Queens Connector (BQX) is a proposed state-of-the-art streetcar envisioned to link the rapidly growing and evolving waterfront communities from Brooklyn to Queens.**

BQX's modern and fully accessible vehicles will run along a largely exclusive right-of-way and have signal priority at intersections, giving passengers a comfortable ride as they by-pass on-street vehicle traffic. **At full build-out, BQX will connect over 400,000 New Yorkers—including 40,000 New York City Housing Authority (NYCHA) residents, many of whom live more than half-mile from a subway—to emerging employment hubs along the corridor.** In addition, BQX will provide much needed connections to the City's existing public transit system, including subways, buses, ferries, and CitiBike. Greater connectivity with the existing public transit system will increase access to the many parks, academic institutions, job opportunities, and cultural centers within the corridor.

**The proposed BQX project is expected to cost \$2.7 billion and generate \$30 billion in economic impact, plus \$1.3–1.4 billion in value capture—a strong return on investment.** In short, BQX represents a unique opportunity to strategically invest in a modern mode of public transportation that will:

- **Connect growing communities and increase access to neighborhood amenities**
- **Reduce travel times and enhance city-wide connectivity to economic opportunity**
- **Provide affordable and reliable service**
- **Support transit oriented development**
- **Create safer, more attractive, and inclusive streets**

Given the strong anticipated benefits of providing streetcar service along the Brooklyn and Queens waterfront, Mayor de Blasio announced BQX in 2016. Over the last two years, the City's BQX team studied key aspects of designing, building, and operating a streetcar service. The study was informed by robust public input generated through numerous workshops, community meetings, and individual meetings with elected officials and community organizations along the corridor. In response to this feedback, the team focused its efforts on understanding the engineering and design feasibility, physical impact on communities, cost of construction, and potential value capture associated with BQX.

The team recently completed Conceptual Design—which represents approximately 5% of overall project design. The purpose of this report is to share the results of the City's analyses, with specific focus on the City's preferred route and updated project costs and economic benefits.

The public and community stakeholders will have additional opportunities to provide input and help further define the project as the process continues through the environmental review and advanced design stages. The City will also analyze project delivery methods, streetcar operations, governance models, project implementation, and phasing during future phases of work.

## PUBLIC TRANSIT BUILT NEW YORK CITY

New York City is one of the world's leading global cities, known for its unique and successful combination of mixed use communities, walkable streets, great public spaces, wealth of cultural and educational institutions, and job centers. Every year these attributes attract thousands of new residents, support business investment, catalyze job creation, and increase tourist visits to the city. There are many reasons for New York City's success, but it is often underappreciated the role past investments in transportation played in creating the vibrant city that exists today. In fact, New York City has a long history of leaders who embraced innovative transportation technology—from the steam ferry, to elevated trains, to a network of bridges and tunnels, and to one of the world's most extensive subway and bus systems—to proactively drive growth, connect communities, create opportunity, and shape the city's physical form. Ultimately, today's thriving New York City could not exist without its vast mass transit system.

Much of the subway system was built over 100 years ago. The system has been subject to some expansion and modifications over the years, but it largely functions on a Manhattan-centric basis. The current bus network is extensive and fills many of the gaps in subway service that tend to exist both between and within the four boroughs outside of Manhattan. However, these critical transportation modes have not changed significantly or adapted to the city's changing development and commuting patterns.

While Manhattan remains the single largest employment hub in the region, an increasing share of residents choose to both live and work in neighborhoods outside Manhattan. As a result, more businesses are opting to both follow talent and reduce operating costs by locating in the outer boroughs. These shifts in preferences are creating an emerging network of interconnected hubs of economic activity that are less dependent on the Manhattan business core.

Changing development and commuting patterns are occurring at a time when the de Blasio administration has committed to making New York City the most resilient, equitable, and sustainable city in the world. Investment in a diverse mix of affordable, reliable, safe, and accessible mobility options is one of the most effective strategies the City can adopt to build healthier and more prosperous neighborhoods for New Yorkers. In recognition of the important role mobility plays in building better and more inclusive communities, the City has already made smart investments in safe, affordable, and reliable mobility options, including:

- NYC Ferry system
- 15 Select Bus Service corridors, in partnership with Metropolitan Transportation Authority (MTA)
- Enhanced pedestrian facilities through Vision Zero
- Support for bike infrastructure and bike-share services
- \$2.5B contribution to MTA Capital Plan

## BQX: BUILDING THE NEW YORK CITY OF THE FUTURE

Neighborhoods along the corridor are growing faster than any other corridor in the city due to the combination of City-led investments, targeted rezonings, attractive building stock that lends itself to adaptive reuse, and rising residential and business costs in Manhattan. Significant job clusters are emerging in Red Hook, Downtown Brooklyn, Brooklyn Navy Yard, and Long Island City through a combination of City investments and market forces. This growth is projected to continue for the foreseeable future.

BQX will prepare the corridor for a future that is already emerging along the waterfront. It will first and foremost serve its function as a needed north-south transportation link. It will also act as a new central spine for the corridor. BQX will support economic development and job creation, and provide more equitable access to these economic opportunities. BQX represents a bold investment that will shape the future of the corridor and New York City.

## 1

## LONG ISLAND CITY

Long Island City is a growing business district, comprised of a mix of commercial and industrial businesses, film and television studios, and cultural and educational institutions. The City rezoned 37 blocks in 2001, leading to significant commercial and residential development.

- \$60 million in streetscape enhancements on Jackson Ave and Queens Plaza catalyzed significant commercial development and job creation
- The City catalyzed the 1.5 million square foot mixed-use Gotham Center with development of the 525,000 square 2 Gotham Center
- In 2008 Hunters Point South plan was approved and includes up to 5,000 units of housing, with at least 60% affordable

## 2

DOWNTOWN BROOKLYN  
AND BROOKLYN  
NAVY YARD

Downtown Brooklyn and Brooklyn Navy Yard are part of the Brooklyn Tech Triangle, the growing core of New York City's innovation economy

- The Downtown Brooklyn 2004 rezoning—supported by \$400 million in public investment—catalyzed \$11 billion in private sector investment, including development of over 700,000 square feet of office, 1.2 million square feet of retail, 1,571 hotel rooms, and 8,700 residential units
- Over \$100 million of public investment in parks and infrastructure in downtown Brooklyn
- Over the last 15 years the City invested approximately \$250 million in the Brooklyn Navy Yard, triggering an expansion that will bring jobs to 17,000 by 2020

## 3

RED HOOK AND  
COLUMBIA STREET  
WATERFRONT DISTRICT

Public investment of over \$1 billion in resiliency and remediation projects is helping support Red Hook's growing mix of industrial, maritime, distribution, and creative commercial businesses. Red Hook is home to over 5,000 jobs.

**OVER 400,000  
PEOPLE LIVE  
AND ALMOST  
300,000 PEOPLE  
WORK ALONG THE  
BROOKLYN QUEENS  
WATERFRONT—  
THE NEW SPINE OF  
NEW YORK CITY'S  
ECONOMY**



**MANHATTAN**

**QUEENS**

ASTORIA

RAVENSWOOD

QUEENSBRIDGE

**1**

LONG ISLAND CITY

GREENPOINT

WILLIAMSBURG

**2**

DUMBO

DOWNTOWN BROOKLYN

BROOKLYN HEIGHTS

**BROOKLYN**

**2**

COBBLE HILL

**3**

RED HOOK

CARROLL GARDENS

GOWANUS

-  BQX STOPS
-  NYC FERRY STOPS
-  MTA SUBWAY STOPS

**F  
E  
A  
S  
I  
B  
I  
L  
I  
T  
Y**

**A  
N  
A  
L  
Y  
S  
I  
S  
I  
S  
A  
N  
D**

**C  
O  
N  
C  
E  
P  
T  
U  
A  
L**

**D  
E  
S  
I  
G  
N**

- 1 Phased Approach to Study
- 2 Key Elements of Analysis
- 3 Mode and Alignment Assessment
- 4 Conceptual Service Plan
- 5 Ridership
- 6 Time Savings
- 7 Underground Utilities and Subsurface Conditions
- 8 Resiliency

# PHASED APPROACH TO STUDY

The BQX feasibility analysis and planning work occurred in three broad phases, which culminated in completion of Conceptual Design. The feasibility analysis and planning work examined a streetcar service within an approximately 16-mile corridor running from Sunset Park, Brooklyn to Astoria, Queens. This section will describe the goals and scopes of each phase.

## PHASE I

From late 2015 to early 2016, the City conducted its first phase, which was a Rapid Assessment of the feasibility of an earlier plan for BQX, proposed by the Friends of Brooklyn Queens Connector (Friends of BQX) —an advocacy group in support of the proposal. The Rapid Assessment was intended to serve as a fast, but in-depth, examination of the Friends of BQX plan with the goal of identifying potential fatal project flaws.

At a high-level, the Phase I assessment investigated:

- Right-of way, turning radii and grades
- Bridges and utilities
- Traffic, parking and curbside impacts; and
- Environmental issues

The Rapid Assessment concluded that the proposed alignment could support street-running rail infrastructure with some modifications to the alignment and that dedicated travel lanes were preferred to improve service reliability. The assessment also recommended phasing the potential project in order to reduce initial implementation time, operating costs, and both the cost and impacts of uninterrupted construction along the originally proposed 16-mile corridor.



# GOALS AND OBJECTIVES

---

## 1

### IMPROVE TRANSPORTATION MOBILITY/ CONNECTIVITY THROUGH THE PROVISION OF EFFICIENT, RELIABLE, AND AFFORDABLE TRANSIT

#### OBJECTIVES

- Provide improved transit accessibility within the study area
  - Improve transit accessibility to underserved populations within the study area
  - Offer intermodal connectivity with existing transit systems
  - Enhance pedestrian connectivity and safety
  - Integrate with existing/planned bikeways
  - Minimize conflicts with utility infrastructure
- 

## 2

### ENHANCE ECONOMIC DEVELOPMENT AND PRESERVE COMMUNITY CHARACTER

#### OBJECTIVES

- Serve existing and stimulate proposed/future development, while preserving community resources
  - Improve citywide job accessibility
  - Support transit oriented development
  - Shorten travel times to and from major trip-generators
  - Minimize property acquisition
- 

## 3

### PROVIDE SUSTAINABLE SOLUTIONS AND RESILIENT TRANSIT SYSTEM

#### OBJECTIVES

- Provide a transit system that is resilient against climate change and sea level rise
- Choose a technology that supports the City's sustainability goals

## PHASE II

Following the Rapid Assessment, the City concluded that a more detailed analysis of all mode options was required for such a transformational transportation project. At the outset of Phase II the City established a set of goals and objectives for BQX, which guided the design of the study. A summary of the goals and objectives is on page 12.

Phase II was conducted from mid-2016 to early 2017 and included:

- **Public engagement**
- **Investigation into the effectiveness other modes of transportation in the proposed corridor**
- **Definition of the purpose and need of BQX along the Brooklyn and Queens waterfront**
- **Analysis of alignment options**
- **Investigation into key operations and technology options**
- **Travel times and ridership**
- **Capital and operating costs**
- **Evaluation of risks and project development options**
- **Assessment of potential value capture**

### PHASE II: PUBLIC ENGAGEMENT

Following the Mayor's announcement of the project, the City conducted a collaborative process, led by New York City Economic Development Corporation (NYCEDC) and New York City Department of Transportation (DOT), of visioning and public engagement to create a community-driven process for the BQX study. Recognizing that the distinct neighborhoods in the study area have diverse needs, public engagement efforts were designed to reach out to, engage with, and solicit input from stakeholders in each community in the study area.

The public engagement program included several activities and programs including:

- **Web page on NYEDC's website dedicated solely to BQX: <http://www.nycedc.com/project/brooklyn-queens-connector-bqx>. It featured an email address (BQXinfo@edc.nyc) for persons or organizations seeking more information on the study**
- **Telephone Town Hall that gave New Yorkers an opportunity to ask questions about BQX**
- **Sharing of upcoming study-related events via social media and digital distribution to help increase awareness of BQX**
- **Briefings of local elected officials, community boards, and other officials and stakeholders**

- **Series of Community Visioning sessions to inform the communities along the study corridor about the project and seek their input into how best to incorporate new reliable transit into their neighborhoods**

The City held seven Community Visioning sessions in mid-2016 and over 500 people attended. The seven visioning sessions were designed to open the lines of communication between the communities and the City on the project. Specific objectives included gaining insights into residents' travel patterns and starting the conversation on how best to integrate substantial new investments onto city streets. Key themes and issues identified included:

- **Improve north-south connectivity**
- **Serve transit deserts**
- **Create connections to other transit modes**
- **Enhance access to emerging neighborhoods**
- **Ensure accessibility**
- **Integrate BQX fare payment with other transit systems**
- **Enhance pedestrian safety**
- **Ensure design leads to a system resilient against extreme weather**
- **Explore alternative modes, such as buses**

Input from the visioning sessions was incorporated into the subsequent planning and feasibility analyses.

Following completion of Phase II, the City decided to move forward with conceptual design.

### PHASE III

Phase III was initiated in 2017 to advance planning and Conceptual Design. The main goals were to:

- **Narrow alignment options to one primary alignment with some local alternative routes**
- **Conduct preliminary review of the physical environment along proposed alignments to understand potential impediments or obstacles that adversely impact construction of the streetcar infrastructure**
- **Investigate locations of underground utilities and soil conditions**
- **Produce conceptual design of primary streetcar system elements for the purpose of further study and community consultation but also for the coming Environmental Impact Assessment.**
- **Refine project cost estimates and value capture estimates**

Overall, feasibility and planning work to date has focused primarily on issues related to: engineering feasibility, street design and neighborhood impacts, utility impacts, capital costs, and value capture. Future phases of work will include environmental review, streetcar operations planning, project delivery options, and governance.

## PEER REVIEW

The City engaged the American Public Transportation Association (APTA) to organize and facilitate an international peer review of BQX feasibility and planning. The review occurred in late September 2017 and analyzed all of the City's work completed at that point in time. The panel consisted of ten experts in the areas of transit operations, planning, and construction from Europe, Canada, and the United States. Key takeaways from the review included:

- **No fatal flaws that would prevent the project from moving to the next stage**
- **Alignment and right-of-way seemed feasible and well thought out**
- **Ridership projections should be treated as conservative estimates**
- **Comprehensive operations plan should be developed as part of next phase of work**
- **Utility relocation should be minimized**
- **Sunset Park segment should be deferred**
- **Some maintenance facilities can be provided off-alignment**

## KEY ELEMENTS OF ANALYSIS

Planning and analyzing an entirely new transit service is an iterative process, which generally combines:

- **Assessing potential modes of transportation, alternative routes, and phasing plans**
- **Modelling ridership and service plans, and capital and operating costs and revenues**
- **Testing engineering feasibility**
- **Integrating community feedback**
- **Analyzing and refining concept street designs**

The City examined a substantial number of BQX scenarios during two years of feasibility assessments and conceptual design. This section provides an explanation of the City's approach to studying the main issues that informed the proposed BQX project.

## MODE SCREENING

The City studied eight alternative modes of transportation in order to select a technology with the greatest potential to best:

- 1 Achieve the City's stated goals and objectives for BQX**
- 2 Enhance the urban form of the corridor**
- 3 Maximize capacity while meeting projected ridership and service levels**

The table to the right provides a summary of modes that were considered. Modern streetcar vehicles are fully accessible, include all-door boarding, route stop announcements/maps, WiFi, off-board payment systems, air conditioning, and bike storage. Streetcars provide a greater level of comfort than do buses due to the stability and smoothness inherent in track design. They are also better equipped than buses to navigate narrow streets and tight turns. Streetcars tend to support transit oriented development at a scale that is typical along the corridor. For these reasons, the City concluded that streetcar technology was most appropriate for BQX.

## ALIGNMENT SCREENING

During Phases II and III, potential BQX alignments were evaluated with the following criteria:

- **Community consultation**
- **Ridership potential**
- **Service provision to subway deserts**
- **Speed, reliability and priority potential**
- **Distance/cost**
- **Network connectivity, particularly with subway entrances**
- **Stop location potential**
- **Street and track geometry**
- **Traffic and community resources impact**
- **Ridership trip generators and land use development**

Using the criteria, the preliminary evaluation yielded a list of over 70 route segments that could be assembled into possible route alignments. The segments formed a pool of routing choices that, after screening, yielded a shortlist of possible route alternatives.

The BQX alignment studied during Phase III begins at the Brooklyn Army Terminal at 59th Street and 2nd Avenue in Sunset Park, Brooklyn and ends at the north end at Hoyt Avenue South and 21st Street in Astoria, Queens. The map on page 16 shows the alignment and conceptual stop locations.

# MODE AND ALIGNMENT ASSESSMENT

	MODE	RIGHT OF WAY TYPE	PRIMARY ALIGNMENT LOCATION	TYPICAL STOP SPACING	VEHICLE SIZE/ CAPACITY	PRIMARY POWER SOURCE
	Urban Rail (Streetcar / Light Rail)	Shared, exclusive, or mixture	Surface	0.5–1.5 miles	30–80 seated 120–180 total (one car)	Overhead electric; on-board (off-wire) power is secondary source
	Bus Rapid Transit	Shared, exclusive, or mixture	Surface	0.5 mile	60 seated 95–105 total	Diesel or electric
	Enhanced Bus/SBS	Shared	Surface	0.25–0.5 mile	40–45 seated 60–70 total	Diesel or electric
	Commuter Rail	Exclusive	Surface	2–10 miles	90–190 seated (one car)	Overhead electric or diesel
	Subway	Exclusive	Underground or elevated	0.5–1 mile	65–75 seated 100–175 total (one car)	Third rail electric
	Automated Guideway Transit (AGT)	Exclusive	Elevated	0.25–2 miles	60–100 total (one car)	Third rail electric
	Ferry	Exclusive	Surface	varies	49–6000 total	Diesel
	Aerial Tramway	Exclusive	Elevated	0.25–1 mile	20–200 total	Overhead electric



MANHATTAN

QUEENS

BROOKLYN

 BQX STOPS



# CONCEPTUAL SERVICE PLAN

The final BQX operating plan will be determined following future phases of planning and analysis. For planning purposes a conceptual service plan was developed to evaluate the system's potential trip characteristics, associated ridership, and potential alignments, as well as system costs. The following service schedule was used throughout the analysis of this project:

	TIME-PERIOD	FREQUENCY
<b>WEEKDAYS</b>		
Peak	6:30 AM–9:30 AM 4:30 PM–7:30 PM	5 min
Off-peak	5:00 AM–6:30 AM 9:30 AM–4:30 PM 7:30 PM–11:00 PM	10 min
Late Night	11:00 PM–1:00 AM (overnight service TBD)	20 min
<b>WEEKENDS/MAJOR HOLIDAYS</b>		
Daytime	6:00 AM–9:00 PM	10 min
Off-Peak/ Late Night (Fri/Sat)	9:00 PM–2:00 AM	10 min

**MODELLING INDICATED THAT BQX WILL BE USED MOST HEAVILY BETWEEN DOWNTOWN BROOKLYN AND GREENPOINT**

# RIDERSHIP

## MODELING

Ridership was modeled using the Federal Transit Administration's Simplified Trips-on-Project Software (STOPS) model. In order to evaluate ridership, additional operating and trip demand assumptions were used:

- Fare pegged to the bus/subway fare of \$2.75, with free transfers to MTA bus and subways.
- Census Transportation Planning Package's "Journey to Work" tables
- MTA schedule and boarding counts (by station, stop and route)
- New York Metropolitan Transportation Council (NYMTC) regional forecasting population/employment growth model to 2040

Ridership and time savings projections are based on the relatively early stage of the project. There will be an opportunity to improve projections as operating and fare assumptions, vehicle type, and alignment priority and design are further developed.

## RESULTS

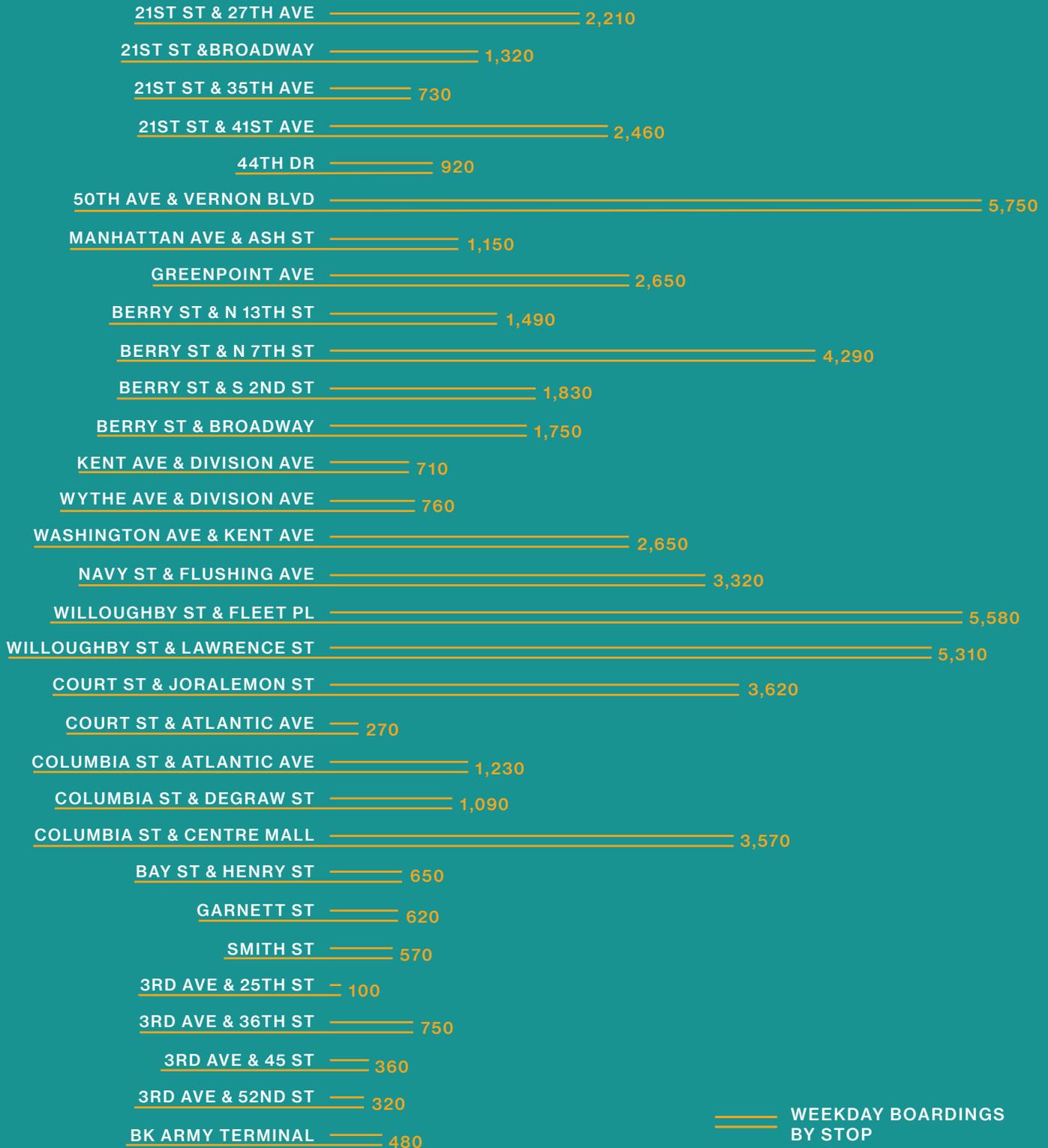
Modeling of the various potential full alignments indicated opening year ridership on BQX of approximately 50,000 passengers per weekday, which grew to 60,000-90,000 riders a day in 2050, depending on future development assumptions along the corridor.

Modelling indicated that BQX will be used most heavily between Downtown Brooklyn and Greenpoint. Most users will use it to travel a few miles, as the greater speed of subways makes that mode more efficient for longer journeys in most cases, and many users will have an origin or destination outside the corridor. About 70% of riders will use BQX to transfer to/from subways or buses to reach their final destination.

Speed was modelled at approximately 12 miles per hour, including stop time. When the same model was run with lower average speeds, to account for the potential of reduced speed priority along the alignment, ridership fell significantly. At 8 mph, ridership declined to approximately 30,000 riders per weekday in the opening year, and 35,000-50,000 riders per weekday in 2050. **How riders respond to travel speed within this model underlines the importance of on-street transit priority and efficient operations to the desirability of BQX.**

At planned service frequencies, ridership modeling indicated significant spare capacity during BQX's opening years, with peak demand potentially approaching available capacity at scheduled frequency in 2050, if there is higher development along the corridor than NYMTC's projections. Ridership projections with alternate operating plans were not modelled.

# SUNSET PARK TO ASTORIA RIDERSHIP





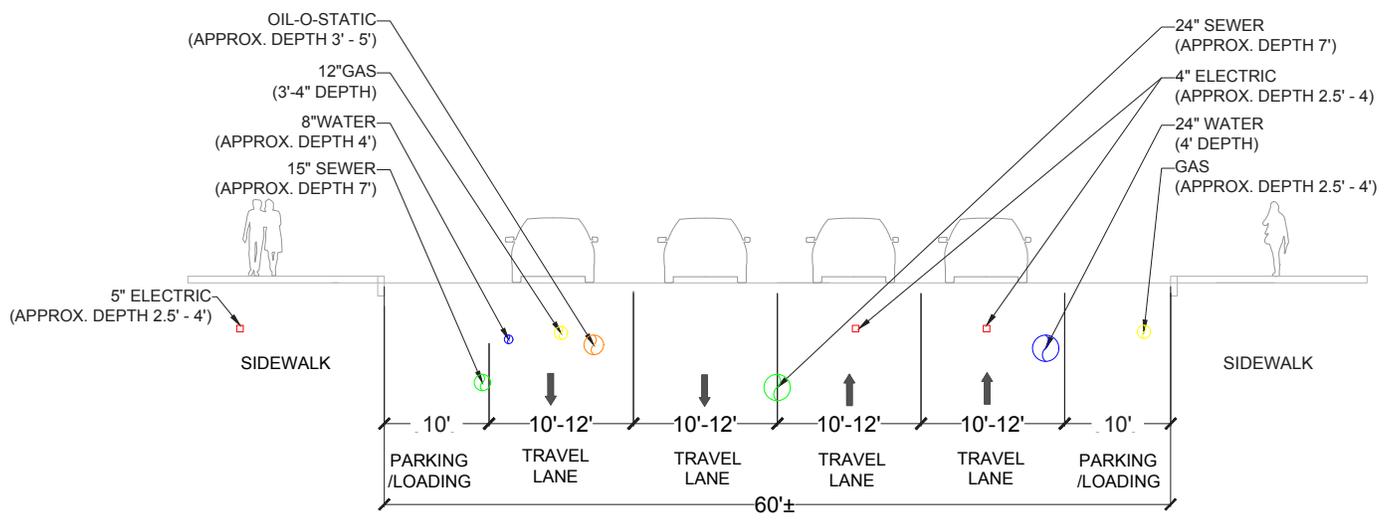
## TIME SAVINGS

Speed was evaluated using various route alignment options, incorporating the future use of traffic signal priority where feasible, street priority where feasible, turning movements, streetcar stops, and acceleration/deceleration modeling. The resulting speed profiles were used to determine vehicle requirements, system costs, travel time comparisons to existing modes, and system ridership. These transit priority improvements, coupled with the aggressive service frequency described above, enable BQX to save riders time over existing transit options in some circumstances. In particular, riders with relatively poor subway access in Red Hook, the Brooklyn Navy Yard, and South Williamsburg will experience reduced travel times. **Most riders will experience a few minutes of time savings with BQX on relatively short trips, but many trips within Brooklyn will be more than ten minutes quicker than today.**

LOCATION	ETA
Downtown Brooklyn to Astoria	<b>40 minutes (2-5 minutes faster)</b>
Greenpoint to Downtown Brooklyn	<b>25 minutes (7-10 minutes faster)</b>
Downtown Brooklyn to Red Hook	<b>26 minutes (2-3 minutes faster)</b>
Sunset Park to Downtown Brooklyn	<b>40 minutes (8-9 minutes longer)</b>
Red Hook to Hunters Point	<b>40 minutes (5-9 minutes longer)</b>
Astoria (Halletts) to LIC	<b>23 minutes (9-14 minutes faster)</b>

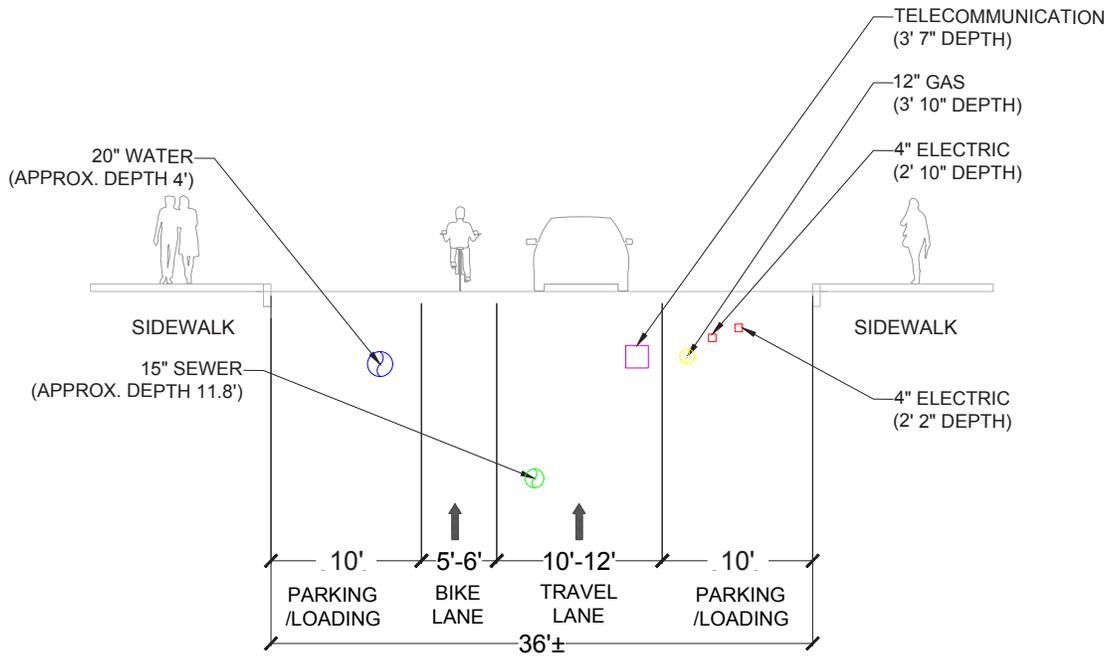
# TYPICAL EXISTING CONDITION

## 60' WIDE STREET



# TYPICAL EXISTING CONDITION

## 36' WIDE STREET



# UNDERGROUND UTILITIES AND SUBSURFACE CONDITIONS

## UNDERGROUND UTILITIES

The density and location of underground utilities in New York City represents one of the greatest challenges to constructing the right-of-way for BQX. Utilities can include both public (water and sewers) and private (power, gas and telecom) infrastructure. These range from small TV cables that are ¼ inch in diameter to large sewer chambers that can be the size of a studio apartment. Cross sections of typical streets in the corridor are shown on page 20.

Work crews typically conduct maintenance and repairs of underground utilities by opening up affected streets for the duration of the needed work program. BQX's right-of-way will be unavoidably located above a range of underground utilities. Without a thorough understanding of the locations of utilities, and an agreed upon set of protocols and procedures between the streetcar operator and utility providers, costly road work and lengthy streetcar service shutdowns can occur during planned maintenance and emergency situations.

The City dedicated extensive effort to understanding the locations of underground utilities to mitigate the risk of unplanned and costly BQX shutdowns. Over several months the City examined utility maps, performed laser aided surveys, and conducted a test pit program to gain greater confidence in the locations of underground utilities.

The City used the combined findings of its investigation to develop a preliminary cost estimate that accounts for potential relocation of certain utilities and protect-in-place programs for utilities that cannot be moved. The current cost estimate, found on page 53, includes a line item for utility work that represents one of the largest line-item costs of the project. Future phases of work will include collaboration with the public and private utilities to advance design of the right-of-way, identify specific utilities for relocation, and sequence capital construction work to minimize both service disruptions and total overall cost to the utilities and BQX. We anticipate that the private utilities and BQX will share these costs evenly.

## SUBSURFACE CONDITIONS

The City also performed a geotechnical exploration program, which included 59 pavement cores and four borings to understand soil characteristics and load bearing capacity to support the streetcar and its right-of-way. The geotechnical program concluded that the soils tested were typical and no unexpected issues were identified.

# RESILIENCY

As a coastal city, New York is vulnerable to flooding and sea level rise. Approximately 18 percent of BQX service corridor falls within the Federal Emergency Management Agency's (FEMA) 100-year flood zone designation.

The following best practices will be incorporated into the design and operations of BQX:

- **Raised power systems**
- **Fortified facilities and yards**
- **Relocated vehicles to higher ground, if necessary**
- **Hardened track bed to withstand prolonged flooding with salt water, and moving water**
- **Strengthened overhead wires to mitigate high wind conditions**

Further planning, engineering design, and environmental review efforts will be closely coordinated with the City's Office of Resiliency and Recovery (ORR).



**B  
Q  
X**

**D  
E  
M  
S  
O  
P  
R  
O  
P  
O  
S  
E  
D**

**T  
P  
E  
C  
O  
N  
C  
E  
P  
T**

- 1 Proposed Route
- 2 Maintenance Facility and Yard
- 3 Street Design
- 4 Power
- 5 Real Estate Acquisitions





## PROPOSED ROUTE

Based on its analysis, the City proposes to move forward with an approximately 11-mile route that will run between Red Hook, Brooklyn and Astoria, Queens.

The Red Hook to Astoria route is the most beneficial route that was analyzed. The route is expected to generate the highest ridership, connect the greatest number of people to jobs, amenities and other modes of transportation, and minimize disruptions to utilities and local businesses. As noted earlier, the most heavily used portion of the route is expected to be Downtown Brooklyn to Greenpoint.

The City studied providing BQX service from Red Hook to Sunset Park. The primary route that was analyzed ran along 3rd Avenue from 10th Street in the north to Brooklyn Army Terminal in the south. The analysis considered five stops along 3rd Avenue.

The City ultimately decided to not extend BQX to Sunset Park due to a combination of low projected ridership and high estimated cost of construction.

The MTA's R subway line runs one block to the east, which gives local residents and workers an existing transit service that provides faster travel times than BQX could. In fact, projected travel times, shown on page 19, indicate that BQX riders from Sunset Park to Downtown Brooklyn would have a longer journey by 8 to 9 minutes than on existing modes. As such, projected ridership for the combined five Sunset Park stops was estimated at just over 2,000 per day, whereas a number individual stops between Red Hook and Astoria are projected to attract between 1,000 and almost 6,000 per day (please see page 18).

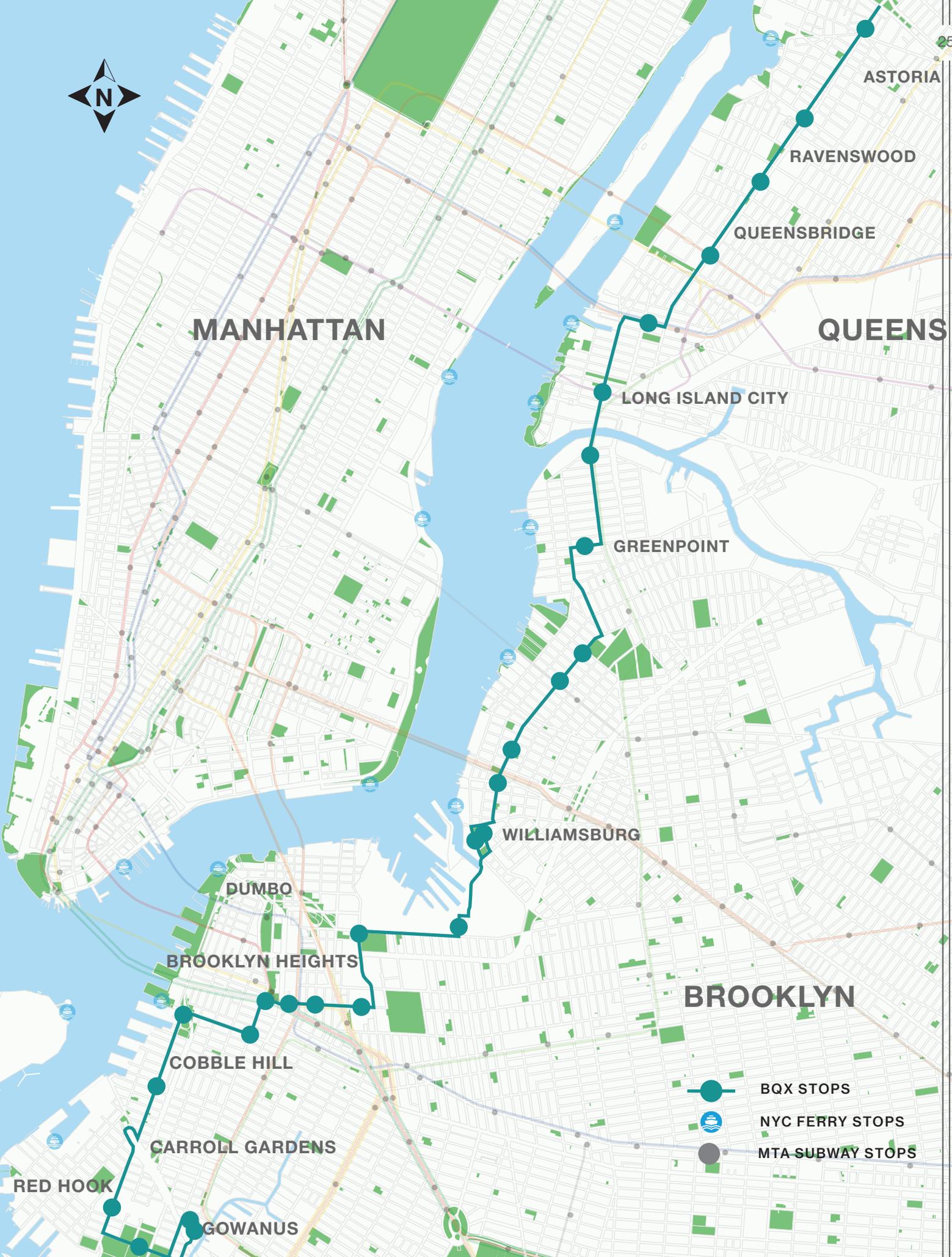
In addition, the estimated cost to construct the Sunset Park segment was over \$500 million. Construction costs for this segment were particularly high due to a number of complex interactions with utilities and the need to construct a bridge over the Gowanus Canal

Potential expansions to the south of Red Hook may be considered and analyzed in the future if and when conditions warrant.

The route described in this section is the City's preferred option. However, the final route is subject to change, based on community input, and further planning and design.

To minimize disruption, the City anticipates breaking the project into a series of phases. The exact phasing plan will be determined following further design and planning work, as well as more detailed operations planning.

The following section provides an overview of the alignment as it traverses seven broad areas from Red Hook, Brooklyn to Astoria, Queens.



**MANHATTAN**

**QUEENS**

**BROOKLYN**

ASTORIA

RAVENSWOOD

QUEENSBRIDGE

LONG ISLAND CITY

GREENPOINT

WILLIAMSBURG

DUMBO

BROOKLYN HEIGHTS

COBBLE HILL

CARROLL GARDENS

RED HOOK

GOWANUS

-  BQX STOPS
-  NYC FERRY STOPS
-  MTA SUBWAY STOPS

# RED HOOK AND COLUMBIA STREET WATERFRONT DISTRICT



BQX's southern terminus will be located in the vicinity of Smith and 9th Streets, which will provide a transit connection to the MTA's nearby F/G lines at the Smith/9th Station. The alignment will then head west toward Columbia Street, making connections to the Red Hook Recreation Center and NYCHA's Red Hook Houses. The line will head north along Columbia Street, through the Columbia Street Waterfront District, to Atlantic Avenue.

Building BQX in this section of Brooklyn will bring transit equity to an area that struggles with insufficient transportation. In addition, BQX will help support growth of Red Hook's emerging distribution and logistics hub and the potential redevelopment of the waterfront.

Both Red Hook and the Columbia Street Waterfront District are low-lying and at risk of flooding. The right-of-way will be designed and built to be resilient against flooding, which will allow service to resume quickly once floodwaters recede and the alignment has been cleared of debris.

## MOBILITY CONNECTIONS

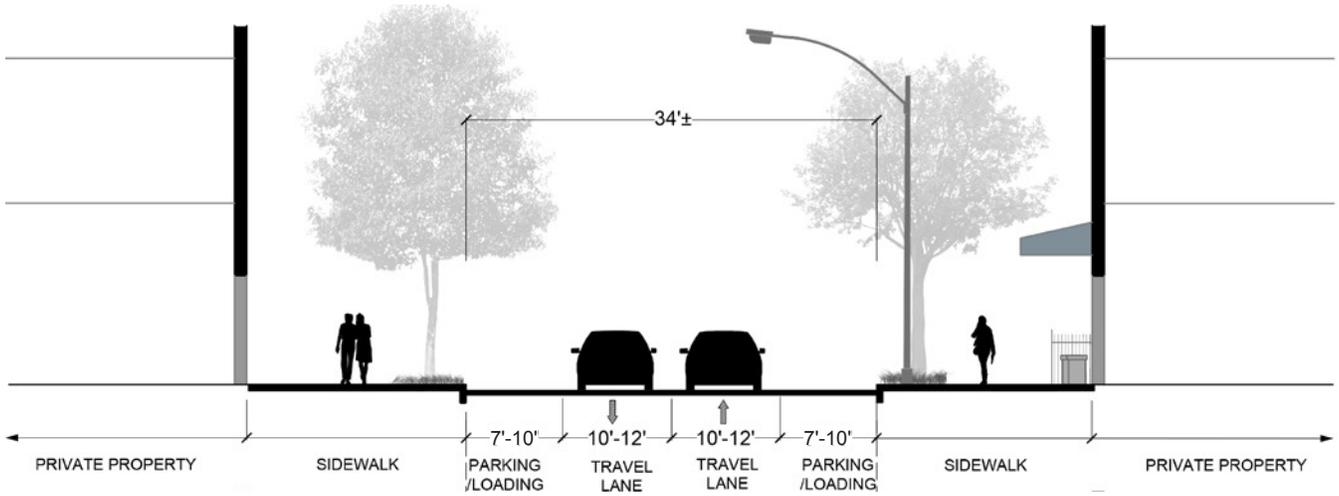
- MTA: Subway—F/G at Smith/9th and local bus routes
- NYC Ferry: Red Hook at Atlantic Basin and Atlantic Avenue at Brooklyn Bridge Pier 6
- Governors Island Ferry: Atlantic Avenue and Brooklyn Bridge Pier 6
- Ikea Express Shuttle: Ikea Dock
- CitiBike stations: 7

## NEIGHBORHOOD CONNECTIONS

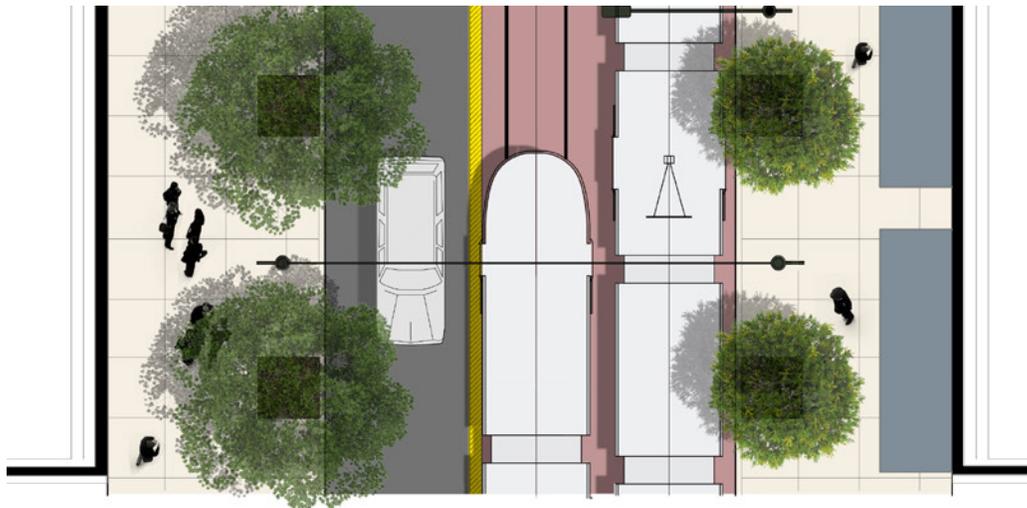
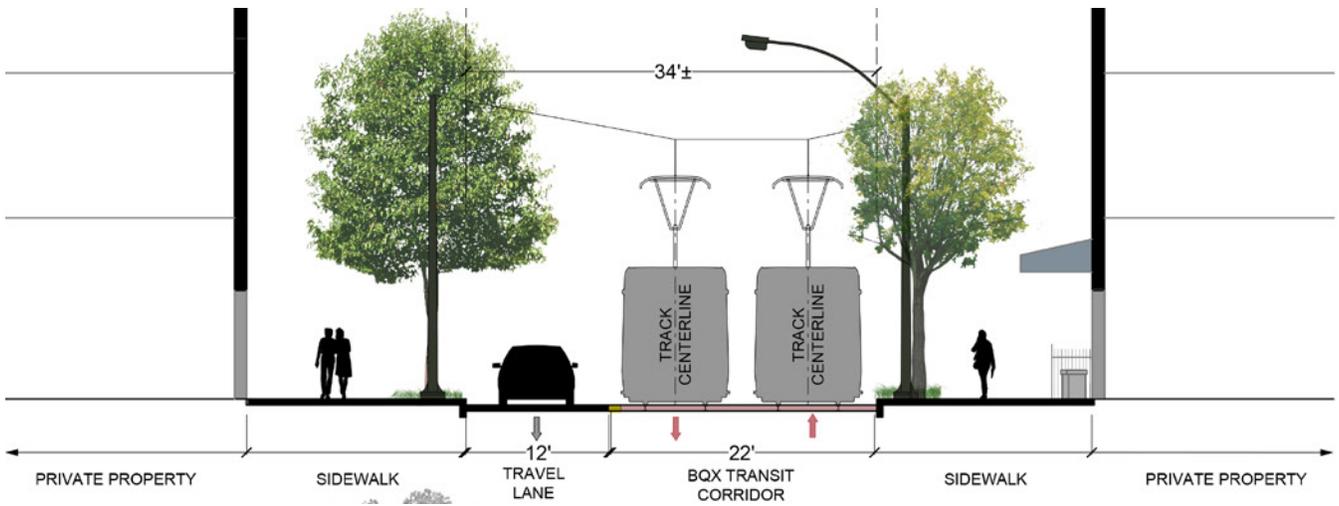
- Red Hook Houses
- Red Hook Recreation Center
- Coffey Park
- Red Hook Houses Farm
- Ikea
- Fairway
- Brooklyn Cruise Terminal
- Van Voorhees Park
- Brooklyn Bridge Park

# COLUMBIA STREET, BETWEEN VERONA STREET AND SEABRING STREET

## EXISTING CONDITION



## PROPOSED CONDITION



# RED HOOK AND COLUMBIA STREET WATERFRONT DISTRICT





# ATLANTIC AVENUE AND DOWNTOWN BROOKLYN



Downtown Brooklyn, the third largest business district in New York City, has experienced tremendous residential and commercial growth in recent years. It is well served by numerous MTA Long Island Rail Road, subway and bus routes. Today it is a major hub of employment, cultural amenities, and post-secondary educational institutions and is considered part of Brooklyn’s “Tech Triangle”. In the past decade 21,000 residential units have been planned, are in construction, or have been completed. Growth is projected to continue for several more years as employers recognize the location’s access to a skilled workforce. With such a significant concentration of activity, it is critically important that BQX make multiple connections in Downtown Brooklyn to the existing public transportation network and major trip generators.

The proposed alignment envisions BQX running from the Columbia Street Waterfront District along Atlantic Avenue—a vibrant neighborhood shopping street bordering Brooklyn Heights and Cobble Hill—to Court Street, where the streetcar will enter Downtown Brooklyn. This segment of the alignment will support existing residents of Brooklyn Heights and Cobble Hill, as well as store and restaurant owners on Atlantic Avenue.

BQX will run from Court Street along Joralemon Street to Willoughby Street, creating a direct link to the 2/3 and 4/5 subway lines at the MTA’s Borough Hall station. The line will then run along Willoughby Street to Ashland Place. This particular section of the neighborhood is expected to experience significant new development in the years ahead. BQX will create additional transit capacity to serve this growing population of users.

From Ashland Place, BQX will run north to Flushing Avenue and create a valuable transit link between Downtown Brooklyn and the south west corner of Brooklyn Navy Yard. The segment of BQX between Downtown Brooklyn and Brooklyn Navy Yard will connect NYCHA residents at Ingersoll Houses, Walt Whitman Houses and David Glasgow Farragut Houses to the transit system and employment opportunities in the corridor.

## MOBILITY CONNECTIONS

- MTA: Subway—2/3 4/5 R at Borough Hall and A/C/F/R at Jay Street-Metro Tech and local bus routes
- CitBike stations: 8

## NEIGHBORHOOD CONNECTIONS

- David Glasgow Farragut Houses
- Ingersoll Houses
- Walt Whitman Houses
- Cadman Plaza Park
- Columbus Park
- Fort Greene Park
- Commodore Barry Park
- Brooklyn Borough Hall
- Brooklyn Law School
- Fulton Mall
- St. Francis College
- NYU CUSP
- New York City College of Technology
- Long Island University, Brooklyn
- Metrotech Center



NO STANDING  
FIRE ZONE

# BROOKLYN NAVY YARD



In this segment of the route, BQX will run along Flushing Avenue, through Brooklyn Navy Yard (BNY) to Kent and Division Avenues in south Williamsburg.

BNY is a 300-acre industrial park that houses over 400 businesses and employs approximately 7,000 people. Located on the eastern edge of Brooklyn’s “Tech Triangle”, BNY is focused on creating jobs in the modern industrial sector that serve as pathways to the middle class. Recent new developments at BNY are expected to bring total employment to approximately 17,000 by 2020 and BNY’s recently released master plan sets out a vision for reaching 30,000 jobs.

Despite BNY’s success to date and projected growth, much of the yard is not close to subway stations. BQX will support BNY’s plan to grow to 17,000 jobs and beyond and provide the necessary transit linkage that will connect people to those jobs.

The City expects that BQX’s primary maintenance and storage facility will likely be located at BNY. The facility will be hardened against flooding and will be built to support a potential future manufacturing and industrial over-build. Additional details about the maintenance facility are discussed on page 46.

At Kent and Division Avenues, BQX will provide new transit linkages to NYCHA residents at Taylor Wythe Houses, Independence Houses, and Kent Village Housing.

## MOBILITY CONNECTIONS

- MTA: local bus routes
- NYC Ferry: South Williamsburg
- CitBike stations: 4

## NEIGHBORHOOD CONNECTIONS

- Taylor Wythe Houses
- Independence Houses
- Kent Village Housing
- Taylor Wythe Community Center
- Schaefer Landing
- Roberto Clemente Ballfield
- Jacob’s Ladder Playground



# WILLIAMSBURG



With a growing population and economic base, Williamsburg needs better public transportation options. The City proposes to run BQX through Williamsburg along Berry Street, between Division Avenue and Banker Street. The proposed design will transform Berry Street into a transit way. The transit way will give BQX priority by prohibiting through traffic. Vehicular traffic will be limited to short trips (approximately 3 to 5 blocks) to allow for resident pick-ups and drop-offs, some parking, and commercial deliveries.

## MOBILITY CONNECTIONS

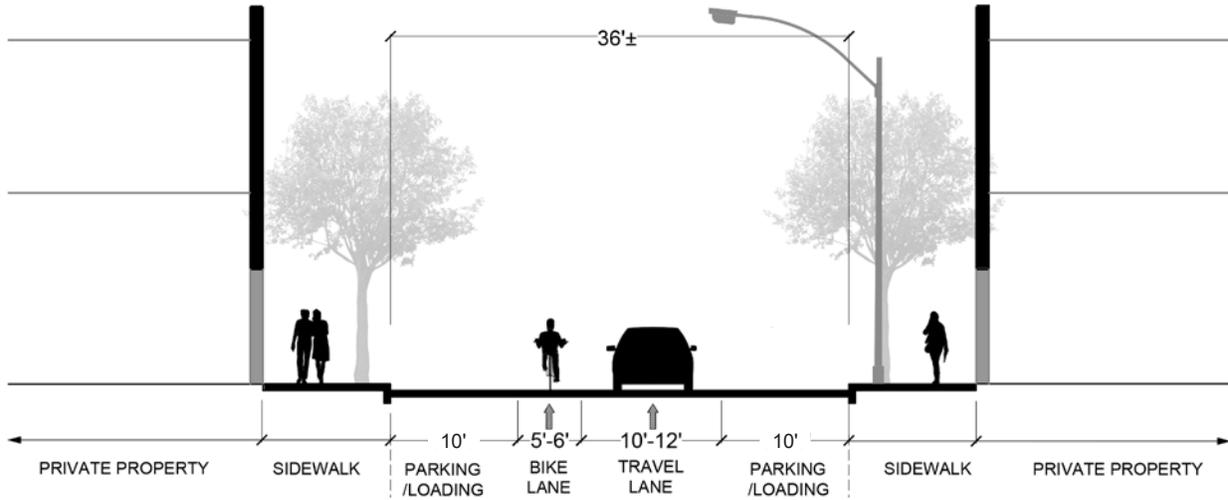
- MTA Subway: L at Bedford Avenue and proximity to Williamsburg Bridge Bus Terminal
- NYC Ferry: North Williamsburg
- CitBike stations: 2

## NEIGHBORHOOD CONNECTIONS

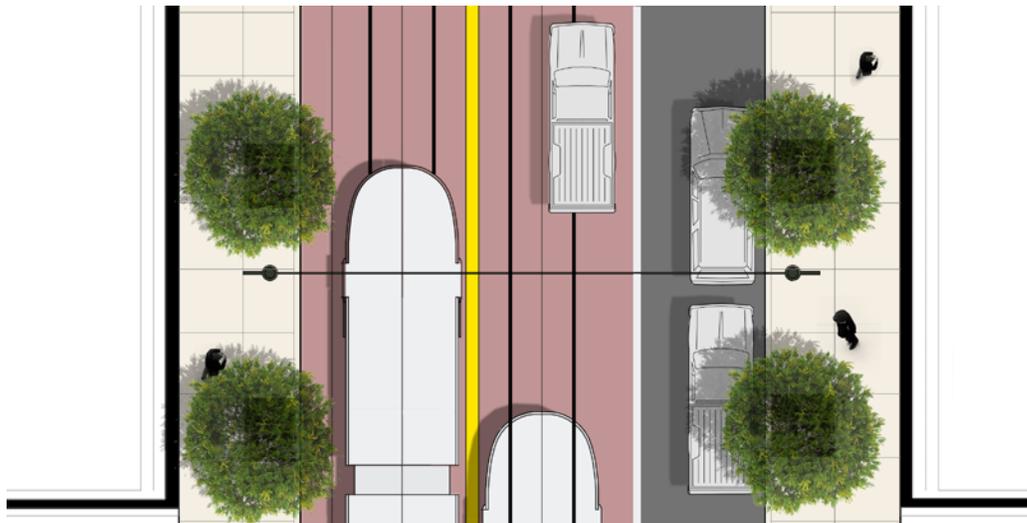
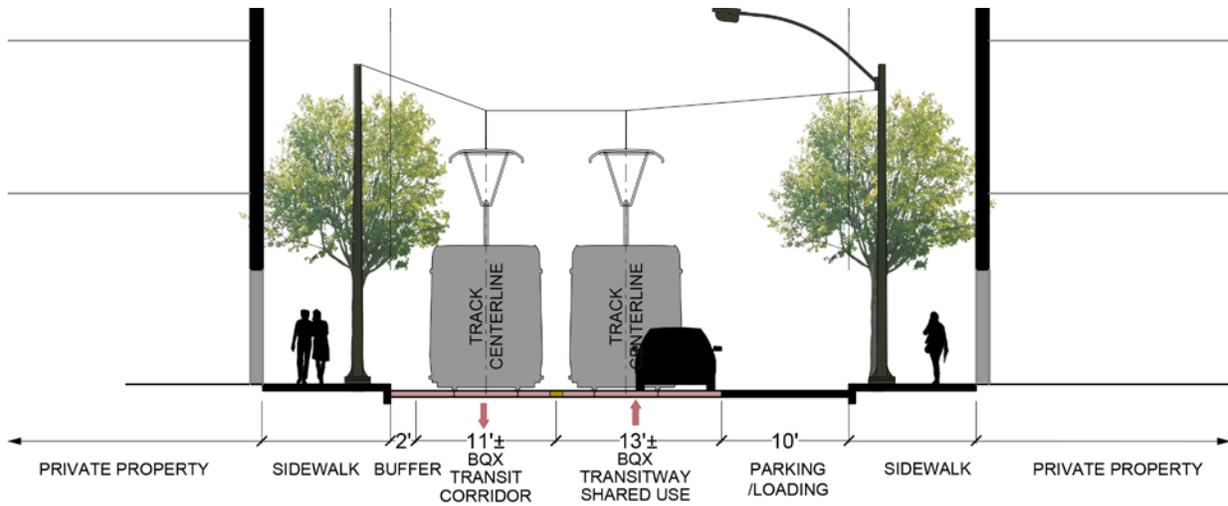
- Berry South 9th Houses
- North 5th Street Pier and Park
- Domino Park
- East River State Park
- Bushwick Inlet Park
- McCarren Park and Pool
- Francis Perkins Academy
- Automotive High School

# BERRY STREET, FROM NORTH 3RD TO NORTH 14TH

## EXISTING CONDITION



## PROPOSED CONDITION



# WILLIAMSBURG





DO NOT ENTER

LOCAL ACCESS ONLY

ONE WAY

# GREENPOINT



The route through Greenpoint will run from Berry Street to Franklin Street along Banker Street, followed by a section along Franklin Street to Greenpoint Avenue. The route will then run along Manhattan Avenue to a proposed bridge over Newtown Creek to Queens.

The proposed route will serve a community that has experienced considerable residential development in recent years with many more units on the way along the waterfront and along West Street. BQX will offer additional transit capacity to an area currently served by the G subway line and improve linkages to the other emerging communities and employment hubs along the waterfront. BQX stops will be closer together than G train subway stations, which will enhance access and expand mobility options in the neighborhood.

## NEWTOWN CREEK CROSSING

The proposed alignment contemplates crossing Newtown Creek at Vernon Boulevard in Queens and Manhattan Avenue in Brooklyn, with an approximately 1,700' long span needed to clear the LIRR railyard and Newtown Creek. Since the width of Newtown Creek is approximately 225 feet at the point of crossing, the bridge will include a drawbridge span over the creek. The bridge will also accommodate bicycle and pedestrian traffic along with the streetcars. Both approaches to the creek are on public right-of-way so no property acquisitions are expected for this bridge. There was a previous bridge at this location that was also a crossing for trolleys and pedestrians. That bridge was demolished in 1954 and replaced by the Pulaski Bridge one block to the east.

## MOBILITY CONNECTIONS

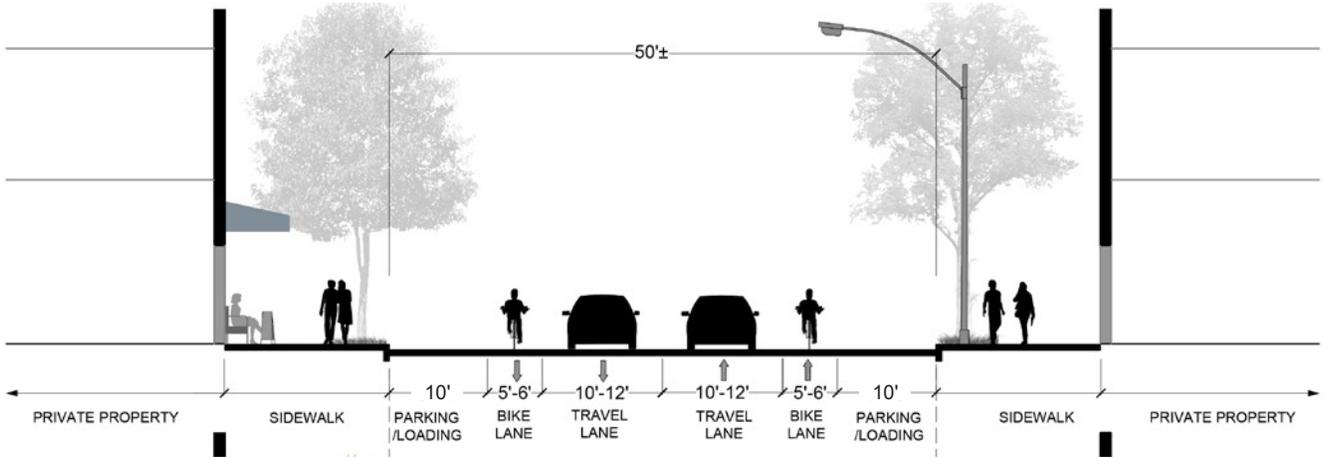
- MTA: Subway G at Greenpoint Av and local bus routes
- NYC Ferry: Greenpoint at India Street
- CitiBike stations: 4

## NEIGHBORHOOD CONNECTIONS

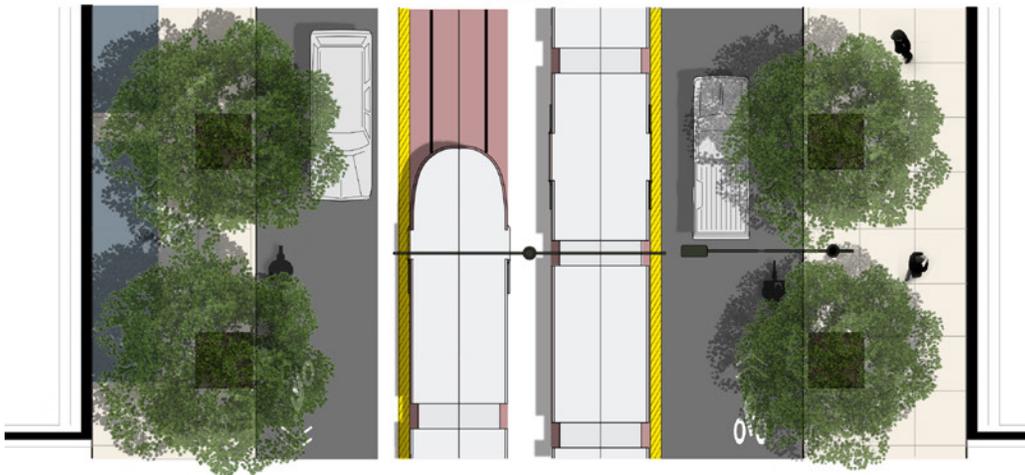
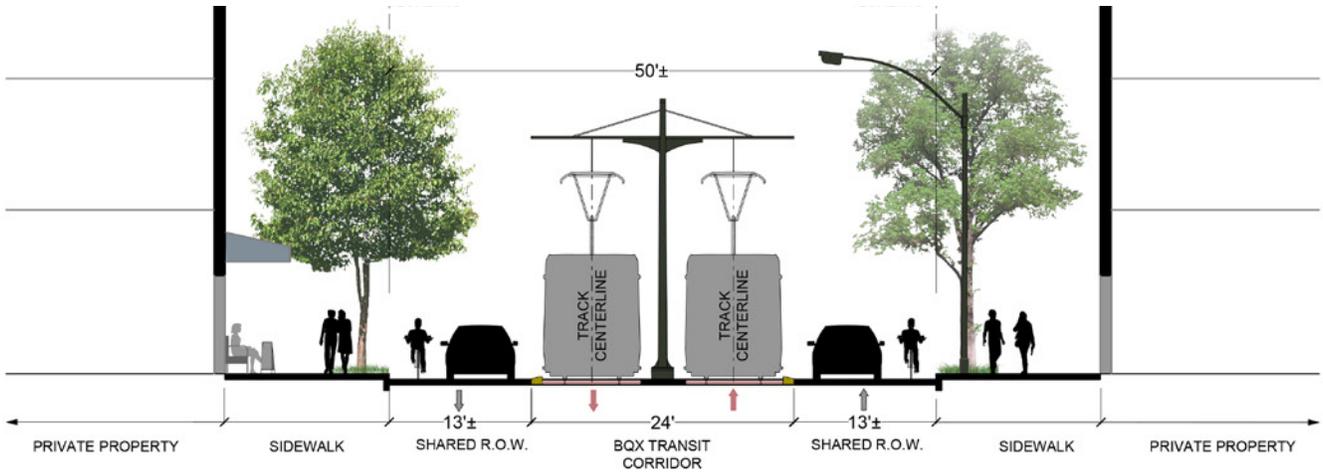
- Manhattan Avenue Park
- American Playground
- Franklin Street Community Garden

# MANHATTAN AVE, BETWEEN GREENPOINT AVE AND ASH STREET

## EXISTING CONDITION



## PROPOSED CONDITION



# LONG ISLAND CITY



Long Island City (LIC) is an important business district with over 6,000 businesses and 106,000 workers. Similar to Downtown Brooklyn, LIC has experienced rapid growth and significant development of residential and commercial space in recent years. 8,000 new housing units to be completed by the end of 2018 and over 11,000 in the pipeline for 2019 and beyond. The City's investments in affordable housing and park space along Hunter's Point South are transforming the waterfront with 5,000 residential units. The City also expects the ongoing development of Cornell Tech on nearby Roosevelt Island to catalyze additional commercial and residential development in LIC.

The proposed BQX route will run from Newtown Creek to 44th Drive along Vernon Boulevard, ideally situated to support the expected growth on the waterfront and the commercial corridor. The right-of-way will be designed and built to be resilient against flooding, which will allow service to quickly resume once floodwaters recede and the alignment has been cleared of debris.

## MOBILITY CONNECTIONS

- MTA: Subway—7 at Vernon Boulevard—Jackson Avenue and E/G/M at Court Square—23rd Street Station and local bus routes
- NYC Ferry: Hunter's Point South and Long Island City
- CitBike stations: 4

## NEIGHBORHOOD CONNECTIONS

- Hunter's Point South Park
- Gantry State Plaza Park
- MoMA PS1
- LaGuardia Community College
- City University of New York (CUNY) Law School



# QUEENSBRIDGE TO ASTORIA



The northern portion of BQX will run along 21st Street from 44th Drive in Long Island City to a terminus at 21st Street and Astoria Boulevard.

This segment will provide transit equity to three NYCHA developments—Ravenswood Houses, Queensbridge Houses, and Astoria Houses—that are isolated in their location near the waterfront from the robust transit infrastructure at Hunters Point and Long Island City. The F train station adjacent to Queensbridge Houses and the N/W line along 31st Street offer east-west service to Manhattan and eastern Queens, however getting to points north along the waterfront and south, to Brooklyn is difficult. The proposed BQX alignment along 21st street will provide a north-south connection not only for the robust existing residential development in Astoria but also for communities planned and under construction at Halletts Point and Astoria Cove.

## MOBILITY CONNECTIONS

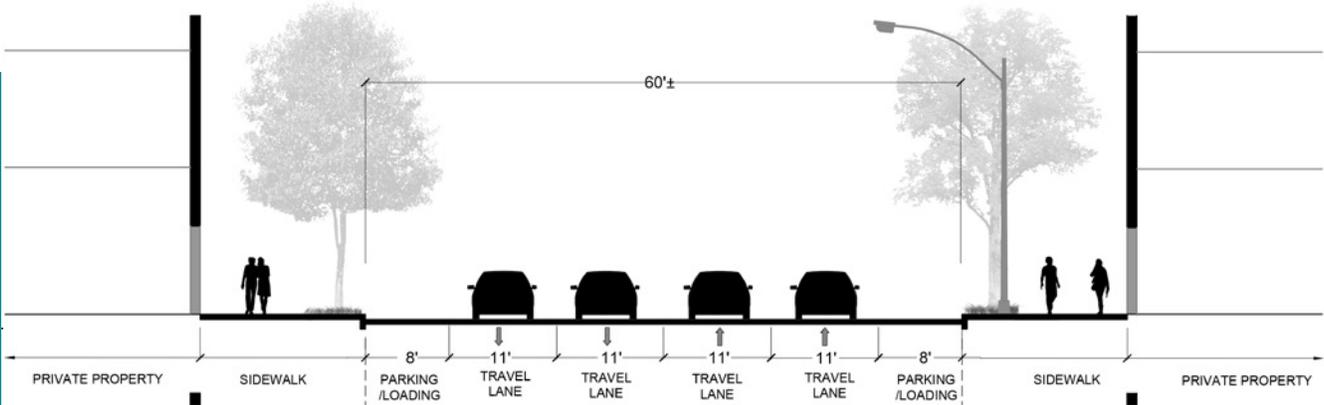
- MTA: Subway F at 21st Street—Queensbridge and local bus routes
- CitBike stations: 8

## NEIGHBORHOOD CONNECTIONS

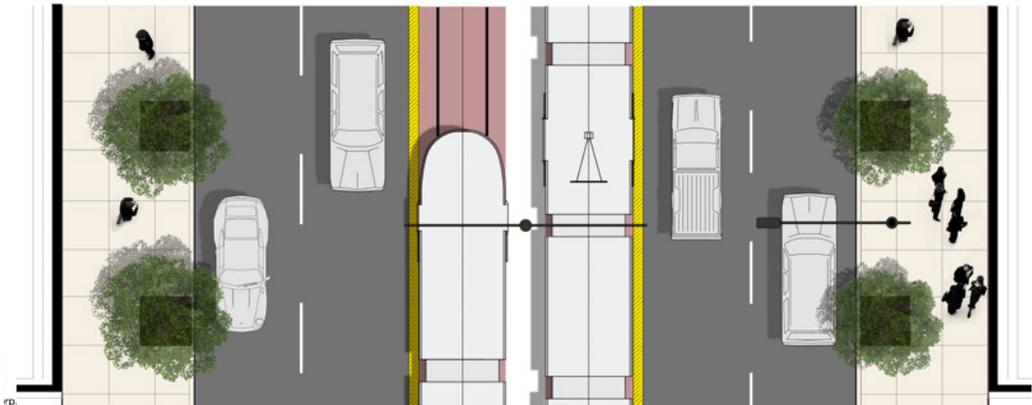
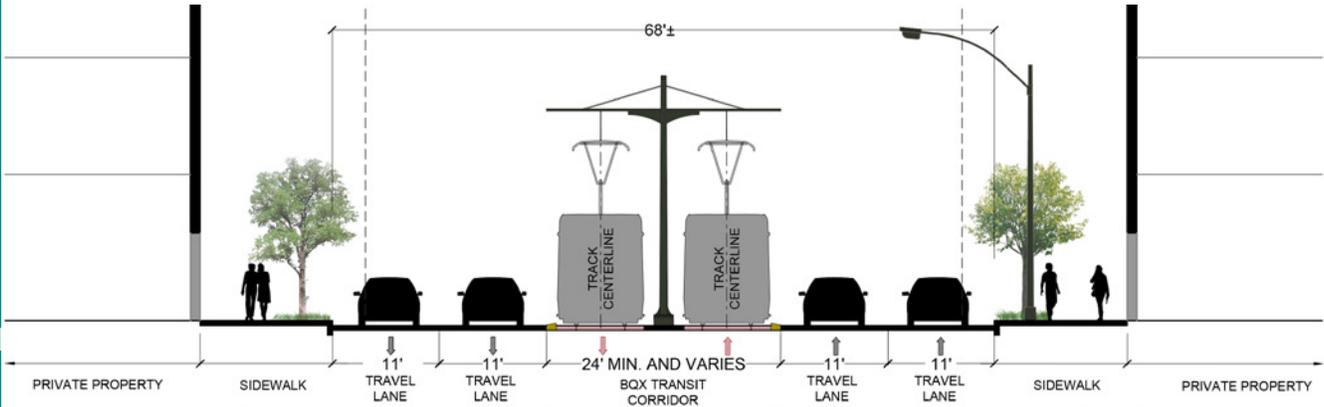
- Queensbridge Houses
- Ravenswood Houses
- Astoria Houses
- Noguchi Museum
- Rainey Park
- Dutch Kills Playground
- Queens Library
- Museum of the Moving Image
- Socrates Sculpture Park
- Astoria Park and Tennis Courts

# 21 STREET, BETWEEN 38TH AVE AND 39TH AVE

## EXISTING CONDITION



## PROPOSED CONDITION



# QUEENSBRIDGE TO ASTORIA





**THE NEW INFRASTRUCTURE WILL RESULT IN CREATION OF TRAFFIC CALMING FEATURES, SUCH AS PEDESTRIAN ISLANDS IN THE CENTER OF THE STREETS, WHICH WILL IMPROVE SAFETY EVEN FOR PEDESTRIANS NOT USING THE BQX**

**THE EXCLUSIVE RIGHT-OF-WAY MAY ALSO RESULT IN A REDUCTION OF CURRENT TRAVEL LANES AND ON-STREET PARKING**

## MAINTENANCE FACILITY AND YARD

The streetcars will need maintenance facilities and yards to store and service the vehicles while they are not running. Based on the proposed route from Red Hook to Astoria, and desired headways, maintenance facilities will need to house at least 40 vehicles. This includes space for cleaning, inspection and maintenance of the vehicles as well as employee and administrative space.

The study concluded that BQX will likely require two maintenance facilities. At present, the City expects that the primary maintenance facility will be located at the Brooklyn Navy Yard. The City is considering other publicly-owned sites along the corridor to provide a smaller, secondary facility.

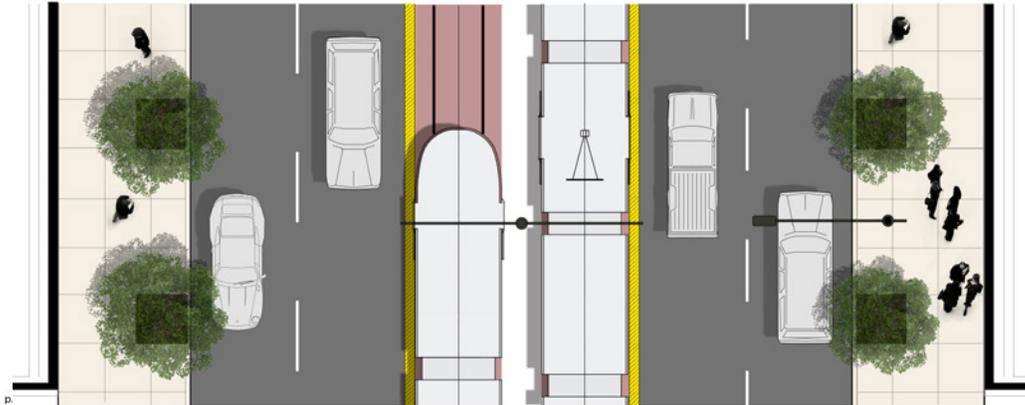
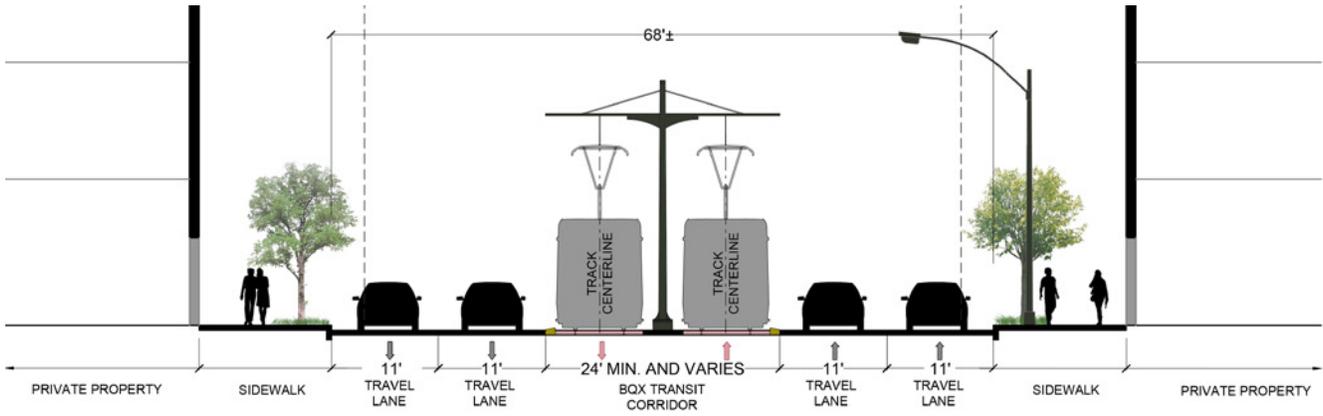
## STREET DESIGN

### CONCEPTUAL LAYOUTS

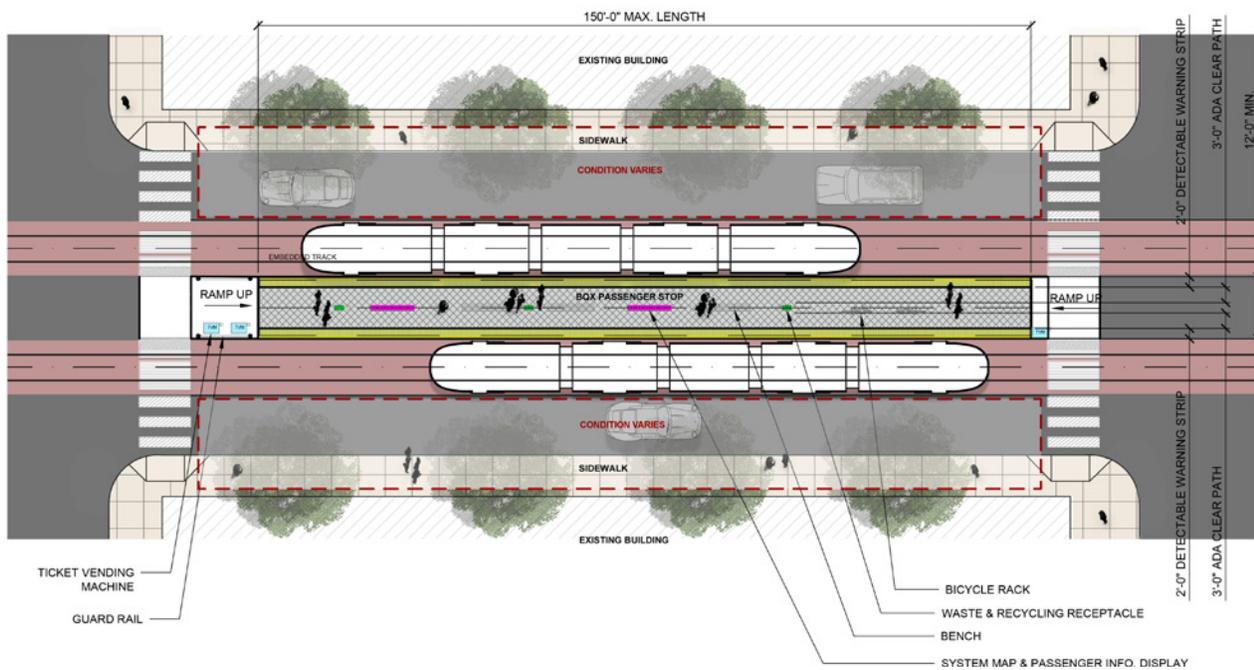
BQX is currently designed to run in an exclusive physically separated right-of-way and feature platforms located in the middle of existing streets for the most part or in the curb lane in some short sections. The new infrastructure will include creation of traffic calming features, such as pedestrian islands in the center of the streets, which will improve safety even for pedestrians not using the BQX. The exclusive right-of-way may also result in a reduction of current travel lanes and on-street parking. An overview of some of the design choices is highlighted in this section.

The primary elements of a streetcar system in the street right-of-way include track beds, stops and catenary poles. A streetcar system requires a minimum of 22-24 feet of street width for center running tracks in both directions which includes space for catenary poles. This configuration is shown on the next page.

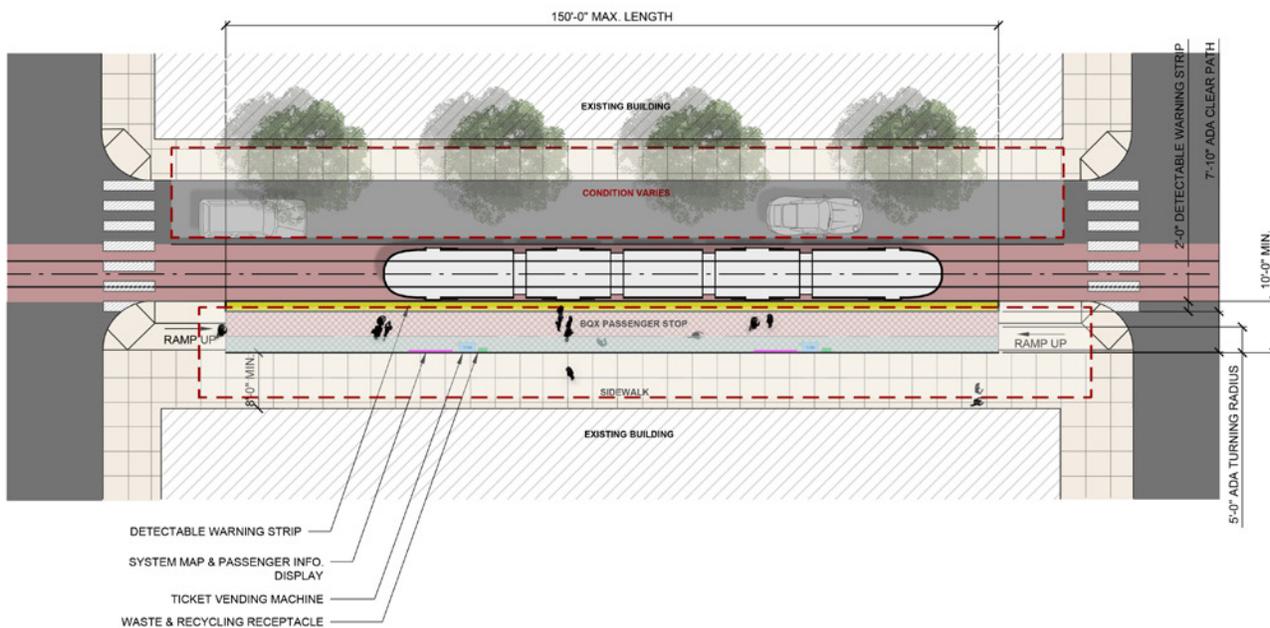
# PROPOSED CONDITION



# CENTER PASSENGER STOP



# SIDE PASSENGER STOP



SIDE PASSENGER STOP – 8' MINIMUM SIDEWALK BETWEEN STOP AND BUILDING LINE

Some sections of the route are expected to feature curb running streetcars, which means the streetcars will run immediately next to the curb line. In the case of curb running streetcars each direction will require 10-11 feet with the catenary poles located on the sidewalks.

In choosing the alignment and making the space necessary for the dedicated streetcar tracks, the City developed a general hierarchy of street uses. This hierarchy sought to preserve pedestrian traffic, street trees, bicycle traffic and then private vehicular capacity in that order. This means sidewalks and street trees will only be reduced when absolutely necessary. Some portions of bicycle lanes may be either moved to a shared street or replaced on a parallel route. The BQX is being conceived in such a way as to improve cycling connections in its corridor.

## STOPS

BQX stops are situated approximately every ½ mile for planning and analysis purposes. While the proposed stop spacing is twice that of local buses and requires a slightly longer walk to a BQX stop, the further distance between stops will allow for faster travel and more reliability. The locations of stops may change as the planning process continues, based on community input and further design. Typical layouts of center passenger stops and side passenger stops are depicted in the images to the left.

From a design standpoint, the stops will be barrier-free, and fully integrated with the street and pedestrian rights-of-way. To support safe, easy access for all riders, boarding areas will be constructed to match the vehicle floor height and allow level boarding. The boarding areas and adjacent sidewalks will be fully compliant with the Americans with Disabilities Act (ADA) guidelines. Stops will have other safety design features such as tactile warning strips at boarding areas corresponding to the dynamic envelope of the streetcar.

## SIGNAL PRIORITIZATION & EXCLUSIVE RIGHT-OF-WAY

Signal prioritization and exclusive right-of-way for streetcar service is essential to the success of BQX as without these features, streetcars will be stuck in traffic and not be able to achieve the travel times needed to gain ridership. Streetcars will be given traffic signal priority at intersections to improve streetcar speed and service reliability. Additionally, the design will maximize exclusive streetcar travel lanes. Current street design contemplates achieving approximately 70% exclusive streetcar travel lanes throughout the length of the alignment. This may result in fewer travel lanes for other vehicles and restrictions on left turns. However, an efficient and effective streetcar system may reduce vehicle miles traveled along the corridor.

## ON-STREET PARKING

Today streets in the corridor are primarily automobile-oriented, both in terms of the amount of space dedicated to cars traversing the corridor and on-street parking. BQX represents an opportunity to reset the use of streets in the corridor to prioritize overall mobility, minimize congestion, and move as many people as possible. Businesses and residents will benefit from greater throughput of people.

In order to introduce BQX with a dedicated right-of-way into the corridor and avoid major road widenings—which will reduce valuable sidewalk space and the number of street trees—some on-street parking space will be eliminated. The amount of affected parking varies by area and the final number of spaces reduced will be determined by the final alignment and design selected. At the current level of design, the City estimates that approximately 2,000 on-street spaces will be removed along the length of the corridor.

## AGENCY OPERATIONS

New York City's operational agencies—namely the Department of Sanitation (DSNY), Department of Transportation (DOT), Department of Environmental Protection (DEP), New York City Police Department (NYPD), New York City Fire Department (FDNY)—generally utilize standard procedures and equipment to provide their respective services. The introduction of a streetcar right-of-way may require modifications to some of the agencies' procedures and equipment. The project team has initiated planning discussions with the relevant agencies and will include their input as BQX design advances.

**TO SUPPORT  
SAFE, EASY  
ACCESS FOR ALL  
RIDERS, BOARDING  
AREAS WILL BE  
CONSTRUCTED  
TO MATCH THE  
VEHICLE FLOOR  
HEIGHT AND ALLOW  
LEVEL BOARDING**

# POWER

## PROPULSION SYSTEM

A number of streetcar systems around the world have started using off-wire propulsion systems to provide power to run the streetcars. Such systems can power streetcars through a range of technologies including: a) onboard solutions, such as lithium batteries and supercapacitors; and b) ground source induction systems. After meeting with manufacturers and examining all of the potential technologies, the City concluded that off-wire technologies were not sufficiently advanced to reliably power the expected BQX ridership demands and frequency of service. In addition, ground source technologies may not be able to perform well during New York City's winter weather due to salt corrosion. As a result, plans for BQX currently contemplate an overhead contact system (OCS), though designs will preserve flexibility to switch to off-wire solutions as the technology evolves.

The OCS is the complete system necessary to deliver power from the traction power substations to the streetcar. At a high level, OCS typically consists of overhead wires, support poles and substations. Overhead wire design has improved to the point that some types are so unobtrusive that they are barely visible. As project design advances the City will select a type of OCS that limits visual clutter and best blends in with the communities along the corridor.

## TRACTION POWER

A traction power substation (TPSS) is an electrical facility that converts electric power from the high voltage provided by the electrical power provider to an appropriate voltage (750 volts) to supply the streetcar. The traction power supply and distribution system consists of traction power substations located along the system route and the wiring needed to distribute power from the substations to the operating vehicles. All components, from the power utility supply to the vehicle point-of-contact with the overhead wire, are included in this system.

Based on preliminary analysis, the City concluded that spacing of power substations on the alignment will be generally one 1-megawatt unit per mile. The TPSS must be located within a half mile of the streetcar tracks and can be hidden in buildings to blend in with neighborhood character. The City expects to locate the majority of these units on City-owned properties along the corridor and elevate them to appropriate heights to protect against flooding and sea level rise.

# REAL ESTATE ACQUISITIONS

The City intends to fit BQX within existing public rights of way and to use as much publicly-owned property as possible for maintenance facilities, and TPSS facilities. Final design and track geometry will determine the extent to which the City needs to acquire small portions of property to accommodate the right-of-way. Similarly, the final locations of all TPSS and any secondary maintenance facilities will be determined by the final design. The City has built property acquisitions into its overall cost estimate, which may be found on page 53.





# PROJECT

# FINANCIALS

- 1 Capital Cost Estimate
- 2 Economic Benefit

# CAPITAL COST ESTIMATE

The project cost estimate was created using the Federal Transit Administration's cost estimate guidelines for public transit projects. New York City area construction prices were surveyed to ensure that accurate local construction costs were incorporated into the cost estimate. Subject matter experts on streetcars, bridges, utilities, maintenance facilities and power systems helped develop this preliminary estimate. The table to the right summarizes the capital cost estimate for the proposed Red Hook to Astoria route. The estimate is broken into construction costs, soft costs, and real estate acquisition costs.

The overall construction contingency of 23% is an aggregate of various line item contingencies that vary from 10 to 30% depending on the risk of that item and the stage of development. Professional services represent design, engineering, and construction management of the project and typically represents between 15–20% of the costs for most city capital projects. The design contingency of 5% represents the early stage of this project as much of the project still requires design. The City also included significant escalation costs which represent the cost of inflation as much of this work will be executed several years from now.

The City expects that costs of different line items will vary depending on the method of project delivery selected.

<b>CONSTRUCTION</b>	\$1,415,000,000
Trackbed, Guideway, Catenary (OCS), Controls and Power Systems	\$453,000,000
Utilities	\$398,000,000
Stops	\$7,000,000
Maintenance Yard	\$136,000,000
Newtown Creek Bridge	\$241,000,000
Hazardous Materials and Special Conditions	\$35,000,000
Vehicles	\$145,000,000
<b>SOFT COSTS</b>	\$1,176,000,000
Construction Contingency (23% of Construction Items)	\$326,000,000
Professional Services (15% of above Items)	\$261,000,000
Design Contingency (5% of above Items)	\$100,000,000
Escalation (Applied up to 2026)	\$489,000,000
<b>REAL ESTATE ACQUISITION</b>	\$136,000,000
<b>TOTAL COSTS</b>	\$2,727,000,000

Total cost of utilities is \$531M. For work related to the private utilities, we anticipate that the utilities and BQX project will share these costs evenly



## ECONOMIC BENEFIT

BQX is projected to generate significant economic benefit. The City examined two dimensions to economic benefit: economic impact and value capture.

### ECONOMIC IMPACT

BQX is projected to generate \$30 billion in gross economic impact over 40 years. This includes the creation of approximately 16,000 temporary construction jobs and almost 4,000 permanent jobs.

### VALUE CAPTURE

Value capture is a mechanism governments utilize to finance the capital costs of new infrastructure. The basic concept behind value capture is that public investment in infrastructure benefits the community and increases the value of private property. Governments can use various tools to harness a portion of the increased property value—including property taxes and special assessments—to repay bonds issued to fund the initial infrastructure investment.

In the case of BQX, the City conducted an in-depth assessment of the potential impact of BQX on property taxes for properties within ½ mile of the route over a 40-year period. The City also assumed no major rezonings over the same time period. The property tax based value capture due to BQX from Red Hook to Astoria is estimated at \$1.3–1.4 billion. This includes planned projects along the corridor.

**BQX IS  
PROJECTED  
TO GENERATE  
\$30 BILLION  
IN GROSS  
ECONOMIC  
IMPACT OVER  
40 YEARS**



# NEXT

# STEPS

- 1 EIS and Design
- 2 Operations Planning
- 3 Project Funding
- 4 Project Delivery Methods and Governance
- 5 Approval Process
- 6 Project Timeline

## EIS AND DESIGN

The City intends to initiate procurement for an EIS and design team in the fall of 2018. The design work will support the EIS and continue to advance the project's design beyond the current 5% level. Additional public outreach and information sharing will occur in advance of the public scoping meeting.

## OPERATIONS PLANNING

The City's feasibility and planning efforts to date have largely focused on testing engineering feasibility, alignment selection and street design, understanding subsurface conditions, developing a robust cost estimate, and calculating potential economic impact. The City conducted a high level operations planning exercise, and will do an in-depth study in the next phase of work.

## PROJECT FUNDING

The estimated capital cost to build BQX of \$2.7 billion exceeds projected value capture of \$1.3–1.4 billion. However, the City's analysis indicates BQX will generate significant economic benefit for the City, valued at \$30 billion, and the City believes the project is worth the investment.

As the City works to refine the project through EIS and Preliminary Engineering, it will continue to consider a cost effective funding strategy.

## PROJECT DELIVERY METHODS AND GOVERNANCE

Major public infrastructure projects in the United States are often delivered through a method known as "design-bid-build". While this approach means the project sponsor retains complete control, it places considerable schedule and budget risk on the owner. In an effort to transfer risk to parties best able to mitigate risk and gain greater certainty over project schedules and budgets, as well as ongoing operations, a number of innovative alternative delivery methods have been developed. Jurisdictions around the world have successfully used such methods for a number of years, to achieve projects that are on budget and on time.

The BQX project team conducted preliminary work to assess, and compare and contrast a range of delivery methods against the traditional "design-bid-build" method. Further work on design and operations planning must occur before the City can make final determinations regarding specific delivery and governance methods.

**THE CITY INTENDS TO  
INITIATE PROCUREMENT  
FOR AN EIS AND DESIGN  
TEAM IN THE FALL  
OF 2018.**

## APPROVAL PROCESS

The construction and operation of BQX will require a number of regulatory approvals and permits. These discretionary approvals (e.g., funding decisions, changes to the City's street network, site selection for key facilities) are subject to the City's Environmental Quality Review (CEQR), the process by which City agencies determine what effect, if any, their actions may have upon the built and natural environment. Projects with a federal funding component, which is being contemplated for BQX, are also subject to the National Environmental Policy Act (NEPA) and a number of other federal regulations related to the environment.

The approvals process will begin with an analysis of the potential environmental impacts of constructing the BQX alignment and support facilities (e.g., yards and substations) and operating the service. The Environmental Impact Statement (EIS) will evaluate potential impacts to elements of the built and natural environment, including (but not limited to) traffic, hazardous materials, historic resources, greenhouse gas emissions, resiliency, visual resources and urban design, socioeconomic impacts, noise, and air quality. The EIS process will include several points where the public provides input into the content and results of the technical analyses. The first formal opportunity comes at the scoping phase, when the purpose and need for the project is defined, alternatives are considered, and the scope of the EIS analysis methodologies is delineated. The next formal public input point comes with the release of the Draft EIS (DEIS), which discloses the draft technical analyses and solicits public comments.

The release of the DEIS will coincide with the certification of the BQX project into the City's Uniform Land Use Review Procedure (ULURP), a process where projects affecting the land use of the city are publicly reviewed and approved. This process is separate but connected to the environmental review process. A number of discretionary actions needed for the construction and operation of BQX are subject to ULURP, including changes to the City's official adopted map, acquisition of real property and easements, revocable consents and franchises, and site selection for capital projects.

ULURP for the BQX project will take 7 to 9 months and will include phases of review by the Community Boards and City Council members along the BQX alignment, the Borough Presidents of Brooklyn and Queens City Planning Commission, and the City Council.

## PROJECT TIMELINE

	START	FINISH
<b>EIS</b>	January 2019	September 2020
<b>ULURP</b>	April 2020	December 2020
<b>Preliminary Design</b>	January 2021	December 2022
<b>Delivery Method Procurement</b>	January 2022	January 2023
<b>Final Design</b>	January 2023	June 2024
<b>Construction</b>	January 2024	June 2029
<b>Operations</b>	June 2029	



## BQX REPORT

All images, unless otherwise noted, belong to  
Photographer/Mayoral Photography Office,  
City of New York

Photography by Alex Lopez  
Page 31

Photography by Tagger Yancey  
Page 6

Photography by Marley White  
Page 11

Photography by Kate Glicksberg  
Page 21

Photos provided by Getty Images  
Pages 19, 23, 24, 50–51, 54

Report design by  
Bellweather Agency  
[www.bellweather.agency](http://www.bellweather.agency)



B

Q

X