NJTPA
NORTH JERSEY TRANSPORTATION PLANNING AUTHORITY

Bayonne/Greenville/Journal Square Bus Rapid Transit Study

Final Report

June 2013

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Consultant Team:

PARSONS BRINCKERHOFF

- Project management
- Transportation planning
- Concept design/alternatives evaluation
- Cost estimation

TranSystems

- Transit planning
- Ridership estimates

T&M Associates

- Traffic engineering
- Land use review

InGroup Inc.

- Public outreach
- Stakeholder communication
- Website/interactive media

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Executive Summary

Bus Rapid Transit (generally referred to as BRT) is an innovative public transportation mode that seeks to combine the flexibility and low cost of bus service with the greater speed and reliability of rapid transit, to create a system that is attractive to riders and that can bring new customers to public transit. BRT is one of the fastest growing modes of transportation, with successful projects implemented in a variety of locations within the United States and around the world. Within the New Jersey and New York region, there have been a number of studies of potential BRT corridors and services, while multiple corridors with BRT elements have been implemented in both New Jersey—NJ TRANSIT's GoBus service in Newark—and New York City—MTA New York City Transit's Select Bus Service. These services have shown consistently positive results in terms of speed, reliability, and ridership growth, and interest in BRT continues to grow around the region.

In 2011, Hudson County, working together with the City of Jersey City and the City of Bayonne, partnered with the North Jersey Transportation Planning Authority (NJTPA) to complete a study of BRT opportunities between Bayonne, the Greenville section of Jersey City, and Journal Square Transportation Center. In early 2012, Hudson County and its partners selected a consultant team to undertake this study, and this report presents the results and conclusions of that study. The Technical Advisory Committee (TAC) made up of representatives from public agencies, created the following goals and objectives for this study:

- Goal: Assess the need and opportunities for and impacts of BRT, including existing gaps in bus services for residents and workers in the study area:
  - Match mobility needs and proposed transit improvements.
  - Evaluate impacts (positive and negative) of BRT options to existing local bus services in Greenville.
  - Quantitatively contrast benefits and costs.
  - Balance short-term and longer-term improvements, and consider phasing of improvements.
  - Document supporting improvements and future steps.
  - Identify where inter-jurisdictional agreements are needed for right-of-way use and maintenance.
- Goal: Explore current and planned transit linkages:
  - Address relationship to Hudson-Bergen Light Rail, including the Route 440 extension.
  - Address relationships to existing bus routes.
  - Address relationships to jitney services.

    - Address relationship to PATH services.
- Goal: Address the full range of BRT infrastructure needs.
- Goal: Have a robust, two-way public process.
- Goal: Coordinate with other ongoing studies and be consistent with and/or supportive of existing local land use and transportation plans.

The study effort was divided into several tasks:

- Public outreach
- Data collection and analysis
- Needs and opportunities assessment
- Model development and screening of concepts
- Recommendations

Public outreach for the study was an ongoing effort including a project website, a Facebook page, regular communication with stakeholders, and updates for elected officials, punctuated by four public meetings. The first two public meetings took place at the outset of the study in June 2012 in Jersey City and Bayonne (one meeting in each municipality), and provided participants with an opportunity to learn about the study, provide feedback on potential BRT features, and express a future vision for their communities. In addition, a Technical Advisory Committee (TAC) convened to provide ongoing guidance to the study.

The study focused on analyzing and evaluating the potential for BRT on multiple north-south corridors connecting Bayonne, the Greenville section of Jersey City, and the Journal Square Transportation Center in Jersey City.

Primary Corridors Considered

Bayonne Corridors	Jersey City Corridors
Avenue C	Route 440
Kennedy Boulevard	West Side Avenue
	Kennedy Boulevard
	Bergen Avenue
	MLK Jr. Drive
	Ocean Avenue

Each of these corridors has unique characteristics in terms of existing transit service, traffic operations, land use, and surrounding context. The study team collected existing conditions data on each of the corridors, and carefully considered the potential for BRT on each one.

Characteristics considered included the width and configuration of the roadway, the presence of sidewalks, the quality of the existing transit service on the corridor, traffic volumes and traffic operations, and the surrounding land use, including accessibility employment centers and educational institutions. In addition to looking at these corridors individually, the consultant team also considered hybrid alignments that combined corridors in different locations, as well as the additional street segments required to connect these primary corridors to Journal Square at the northern end. For example, MLK Jr. Drive does not continue all the way to Journal Square, but, rather, requires use of Monticello Avenue and Fairmount Avenue to reach Bergen Avenue, which then continues to Journal Square.

Fairly early in the technical analysis and discussion with stakeholders, it became clear that the highest ranking corridor within Bayonne is Kennedy Boulevard, based on a number of key factors:

- Greater distance from the existing Hudson-Bergen Light Rail rapid transit service;
- Direct connection to the Jersey City street grid;
- Direct connection to two Jersey City institutions: New Jersey City University and St. Peter's University;
- Width and configuration of the roadway and the potential for improvement and adding BRT elements;
- Existing bus connections to Journal Square, as well as other Jersey City destinations; and
- Input from the first public meeting in Bayonne and from the City of Bayonne.

In Jersey City, the decision involved much greater discussion and consultation, including detailed review and analysis of the existing conditions data, collection of boarding and alighting (ridecheck) data, and analysis of origin-destination data provided by NJTPA. Based on this analysis, the consultant team developed a comparative ranking of the different corridors under consideration in Jersey City.

Jersey City Corridor Ratings by Characteristics (1=worst, 5=best)*

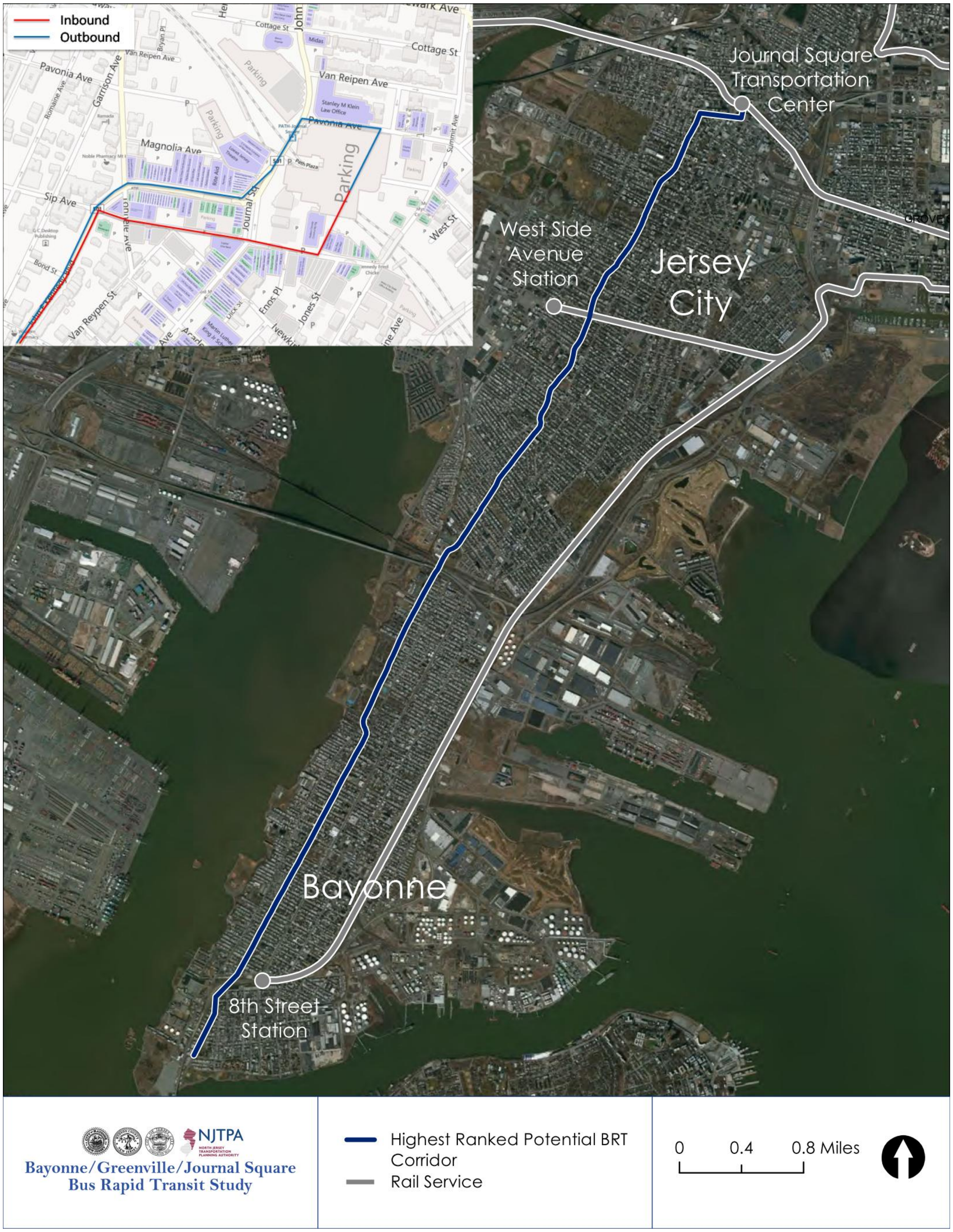
Primary Corridor	Characteristics					Potential for Improving or Adding			
	Dist. to Journal Sq.	Traffic Flow	Transit Demand	Ped. Cond.	Major Destin.	Bus Bulb	Queue Jump	Signal Priority	Transit Links
Route 440	2	4	3	1	2	1	3	2	2
West Side Ave	3	2	5	5	3	1	1	3	5
Kennedy Blvd	4	3	4	4	4	4	3	4	3
Bergen Ave	5	2	3	5	5	1	1	3	3
MLK Jr. Dr	4	1	5	5	4	1	1	3	5
Ocean Ave	3	2	4	5	4	1	1	3	3
Notes:	Distance from 56th St. to Journal Square	Estim. current bus speed.	Existing bus riders (may not all be in corridor).	Sidewalks, crosswalks, & vehicle speed.	Number of large institutions.	Need width to pass stopped bus at extended curb.	Use existing turn lane or create new from parking lane.	Works best w/ signals not saturated and queue jumpers.	Opport. to connect to other transit services.

** At this level of analysis, the ratings do not consider the impact of a BRT service on existing local bus service, and potential ridership from redevelopment.*

Based on this ranking, the list of corridors was narrowed down to the three corridors with the highest overall scores: Kennedy Boulevard, Bergen Avenue, and MLK Jr. Drive. To provide public and stakeholder input into selecting the single highest-ranked corridor, the third public meeting was held in March 2013 in Jersey City to review study progress to date and gather input on community preferences regarding the location of BRT service. The meeting included both an open house portion and a formal presentation, and a significant amount of input was provided by the public, including their views, which were supportive of the three corridors still under consideration at that point.

Based on the results of the public meeting, as well as additional consultation with the study TAC members and review of the technical analysis, several corridors within Jersey City remained viable alternatives; however, the highest-ranked corridor among these was determined to be Kennedy Boulevard in both Bayonne and Jersey City.

Kennedy Boulevard Corridor



The study then analyzed the Kennedy Boulevard corridor and the existing bus service in greater detail, including looking in more detail at the ridecheck data, conducting time-delay studies that detail the sources of delay along the route, and conducting traffic analysis. Based on the results of this analysis, the study identified a number of options for streamlining existing bus routes along JFK Boulevard to make them more BRT like, and for providing wholly new BRT service to supplement existing local service. All options require further study and feedback from the riding public prior to implementation.

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Chapter 1: Introduction

The Bayonne/Greenville/Journal Square (BGJS) Bus Rapid Transit (BRT) Study focused on improving transit access to Journal Square for the residents of Bayonne and southern Jersey City. The study aimed to develop recommendations for BRT that would increase access to employment centers, educational institutions, and the PATH Journal Square Transportation Center, as well as support quality of life through improved access to shopping, community centers and travel between neighborhoods.

As described in greater detail in this report, BRT is a series of measures intended to improve the speed, reliability, attractiveness, and ease of use of bus service, providing a new rapid transit service at a relatively low cost as compared to rail investments, such as the Hudson-Bergen Light Rail. BRT has been implemented in locations throughout the United States and around the world, and has proven very successful at improving mobility and access at a reasonable implementation cost. Locally, BRT elements have been implemented on the GoBus routes in and around the City of Newark, and on multiple Select Bus Service routes in New York City. There is significant additional interest in BRT throughout the region, with studies being conducted in other parts of New Jersey, as well as in Westchester and Suffolk Counties in New York. Slightly farther afield, the CT Fastrak project (formerly known as the Hartford-New Britain Busway) is scheduled to open in the near future, demonstrating the potential for BRT within railroad right-of-way.

The study reviewed existing conditions and the need for BRT services between Bayonne, Greenville, and Journal Square, including:

- Evaluation of origins and destinations;
- Identification and analysis of alternate routes within Jersey City and Bayonne; and,
- Development and refinement of alternatives, with an emphasis on improvements to bus service.

The study effort was divided into several tasks:

- Public outreach
- Data collection and analysis
- Needs and opportunities assessment
- Model development and screening of concepts
- Recommendations

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Chapter 2: Project Goals and Objectives

Overview

Chapter 2 summarizes the development of goals and objectives for this project, which helped guide the remainder of the study, including the identification of BRT opportunities along the long list of corridors, the selection of the highest ranked potential BRT corridor, and the development of the recommended package of BRT improvements along that corridor. These goals and objectives also guided the public outreach and helped to explain the intended outcomes of this study—both directly and with the future implementation of BRT service within the study area—to stakeholders and the general public.

Goals and Objectives Development

One of the study's first tasks was to develop project goals and objectives. This was done in close coordination with the project Technical Advisory Committee (TAC), which is made up of the public agencies that have an interest in the development and implementation of BRT within the study area. The first meeting of the TAC, at which the goals and objectives were discussed, took place on February 21, 2012. The agenda and minutes (including the list of attendees) from this meeting—as well as all TAC meetings—are included in the Outreach section of the Appendix, along with a copy of the TAC presentation.

To begin the discussion of project goals and objectives, the presentation at the first TAC meeting included a set of "typical" goals and objectives from other similar studies of BRT (in no order of significance):

- Improve speed
- Increase reliability
- Increase economic competitiveness
- Improve community connectivity
- Make buses more convenient and easier to use—increase system legibility
- Expand access to employment
- Reduce system operating costs
- Increase ridership/farebox recovery

From this starting point, the TAC engaged in a wide-ranging discussion of potential goals and objectives. Key points raised during this discussion included (in no order of significance):

- TAC members agreed with many of the typical goals and objectives.

- There was a desire to ensure that a BRT system serves the many educational institutions within the study area, both K-12 and post-secondary.
- The existing and future role of jitneys within the study area was discussed among TAC members as a consideration in the study process.
- TAC members considered safety to be a very important aspect of implementing BRT.
- Existing local service should be maintained.
- BRT service should be connected to planned development and redevelopment within the study area.
- BRT service should be connected to and coordinated with other transit services within the study area.

As this discussion progressed, the consultant team worked to record the brainstorming that took place, which is documented in the Outreach section of the Appendix. Based on this discussion and the collected notes, the consultant team compiled a proposed final list of project goals and objectives (in no order of significance):

- Goal: Assess the need and opportunities for and impacts of BRT, including existing gaps in bus services for residents and workers in the study area:
    - Match mobility needs and proposed transit improvements.
    - Evaluate impacts (positive and negative) of BRT options to existing local bus services in Greenville.
    - Quantitatively contrast benefits and costs.
    - Balance short-term and longer-term improvements, and consider phasing of improvements.
    - Document supporting improvements and future steps.
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- Goal: Coordinate with other ongoing studies and be consistent with and/or supportive of existing local land use and transportation plans.

The consultant team then distributed these goals and objectives back to the TAC members for review and comment. When no additional comments were received on the draft goals and objectives, they were finalized as the official goals and objectives for the study.

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Chapter 3: Potential BRT Features

Overview

Chapter 3 highlights the specific features of BRT that improve the speed, reliability, convenience, and attractiveness of bus service. When used in the proper combination, these features can result in substantial benefits to bus riders, meaningfully and noticeably improving their travel experience. Critical to developing the right package of BRT features on any given corridor is to understand the problems and issues with bus service in that corridor, and then develop solutions that are responsive to those problems—as opposed to simply implementing an arbitrary set of improvements that include features that do not solve identified problems.

BRT features can generally be classified as either improving the speed and reliability of bus service or making bus service more attractive and easier to use, although certain features can accomplish both. A portion of the first round of public meetings were dedicated to the discussion of potential BRT features to clarify the distinction between BRT and local bus service, and to later serve as a basis for understanding the potential components of the recommended package of BRT improvements.

Bus Lanes

Bus lanes create dedicated space for buses to travel, allowing them to bypass traffic congestion and other obstacles that can impact speed and reliability. Bus lanes can be integrated into existing streets, as shown in Figure 1, can be built as physically separated lanes within an existing street, or can be within a completely separate right-of-way. The effectiveness of these different types of bus lanes varies based on factors such as the level of separation from other traffic, the interference from other traffic, and the level of enforcement, but the basic concept is to allow buses to move more quickly than other road users by providing an exclusive right-of-way where they can circulate.

Bus lanes located within the existing roadway can exist in a range of different configurations:

- **Curb bus lanes** are located directly adjacent to the sidewalk or curb, typically in place of parking. In many cases, these lanes are only in effect during certain hours of the day (such as the peak periods), and may allow parking or loading during other times. Curb lanes typically have a minimal impact on travel capacity, but significantly impact parking and suffer from interference from illegally parked vehicles, as well as right-turning vehicles.

- **Offset or interior bus lanes** are located one lane away from the curb lane, typically in the first travel lane. These allow parking and loading at the curb to be maintained at all times, but have a greater impact on travel capacity. Offset bus lanes also pair well with bus bulbs, which are described in the Enhanced Stops section later in this report. Offset lanes also suffer from conflicts with right-turning vehicles, as well as vehicles entering the parking lane adjacent to the bus lane.

- **Center median bus lanes** are located in the center of a two-way street, occupying the space that would typically be used for a median on a wide boulevard. Center-median bus lanes benefit from reduced interference from turning and parking vehicles They also require customers to travel to the middle of the street to board the bus and require the creation of station platforms and protection from adjacent travel lanes (in contrast to curb or offset lanes, which use existing sidewalks for waiting and boarding areas). This configuration also requires careful control or left-turning vehicles; either through protected traffic signal phasing or turn restrictions.

Figure 1: Curb Bus Lane Located within a Street Right-of-Way in New York City

Bus lanes can be created by removing space from general traffic (either at all times or for limited hours), or where additional space is available, by widening roadways or creating fully exclusive rights-of-way. One of the challenges of creating bus lanes in existing street rights-of-way is that the locations where bus lanes are most needed are often where congestion is most intense and available street capacity is in highest demand. As a result, it can be difficult to reallocate space to buses—even if that may result in the most efficient or highest capacity street operations—because of the real and/or perceived need to preserve that space for other vehicles. Conversely, it is often much easier to reallocate space to buses in locations where congestion is minimal, but this is also where bus lanes are least necessary.

A variation of a bus lane is a so-called “queue jump” lane, which is a short segment of a bus lane located within or adjacent to a roadway, to allow buses to bypass short segments of congestion, usually approaching an intersection. Queue jumps are intended to provide much of the same benefit as bus lanes, by creating an exclusive right-of-way only at the locations where this type of priority is most critically needed.

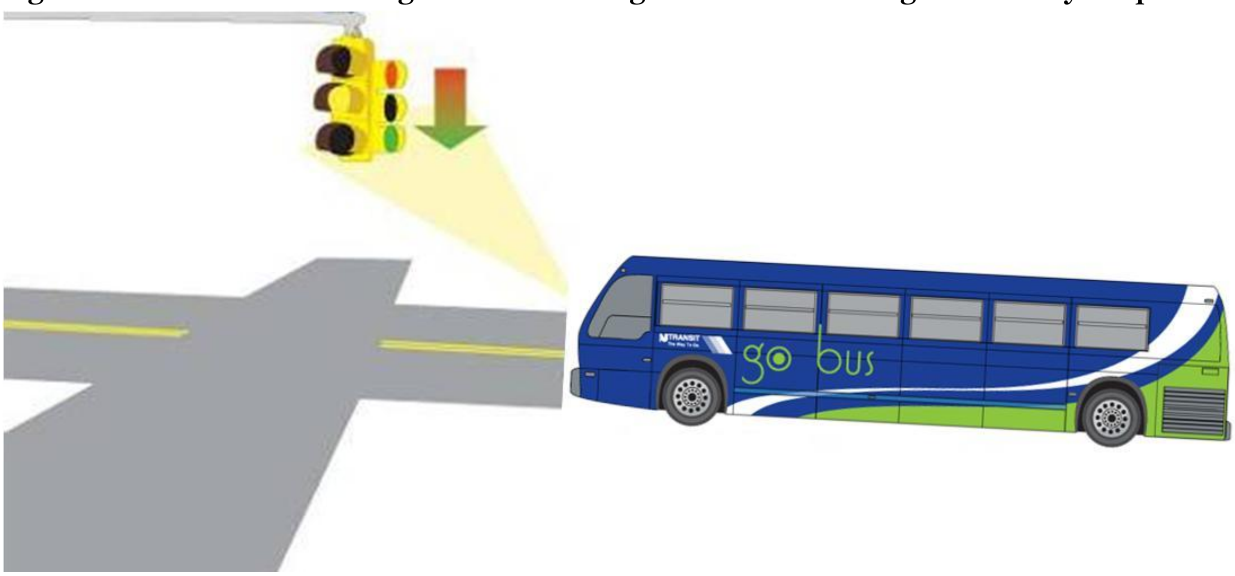
Bus lanes and queue jump lanes are generally intended to improve the speed and reliability of BRT service.

Signal Priority

Transit signal priority creates a mechanism for buses to communicate with the local traffic signal system to make adjustments to their operation to minimize the time that buses spend stopped at traffic signals. The most common forms of signal priority involve green extension (extending the length of the green signal phase by a limited amount of time to allow an approaching bus to avoid getting stopped at a traffic signal) and early green (activating the green phase of a signal early if a bus is stopped at a red signal and is ready to move forward). More exotic applications of signal priority can include phase rotation (changing the order in which the different street approaches are shown the green phase to more quickly bring up the green phase on an intersection approach where a bus is waiting) or phase skipping (completely skipping one or more phases of the signal to more quickly bring up the green phase on an intersection approach where a bus is waiting). Figure 2 illustrates how a bus would communicate directly with a local traffic signal controller to initiate a signal priority “call,” which the controller would then evaluate based on local conditions to make a decision as to whether to grant the request. While these types of local priority systems are the most common and provide the simplest operation, in recent years there has been increased interest in centralized signal priority systems, as communications speeds and bandwidths have grown and the technology at the signal controller and on board the bus has improved.

In all cases, signal priority maintains all the necessary safety features of normal traffic signal operations, including the required yellow and all-red clearance phases for vehicles, the required flashing don't walk clearance phase for pedestrians, and the avoidance of conflicting movements within the intersection. Signal priority is intended to improve the operation of buses by making relatively minor adjustments to traffic signal operations, and should not be confused with signal pre-emption (employed at railroad grade crossings and by emergency vehicles in some communities), which makes immediate (and sometimes drastic) adjustments to signal operations to allow these users to move through intersections unimpeded.

Figure 2: Bus Communicating with Traffic Signal to Initiate a Signal Priority Request



In addition to the type of "active" signal priority previously described, buses can also be helped by "passive" signal priority, where general adjustments are made to traffic signal timing to improve how the signal system operates for buses, without communication between the bus and the signal controller. Examples of passive signal priority can include a signal progression where signals turn green successively at intersections, moving in the direction of peak traffic flow (often referred to as a "green wave") and reducing the overall length of signal cycles, which often allow more consistent movement for buses. The passive signal priority approaches are simpler and require less technology, and can yield improvements in bus operations if implemented correctly.

> Transit signal priority is generally intended to improve the speed and reliability of BRT service.

Enhanced Stops

Implementation of BRT often involves the creation of enhanced stops—sometimes referred to as "stations" because of their greater size, complexity, and level of amenities. These enhanced stops can include amenities such as shelters (often larger and more attractive than typical bus shelters in a given system), benches and leaning rails, trash cans, system and neighborhood information, static and real-time schedule information displays, passenger safety intercoms, and improved lighting. In addition, the stations can include aspects of the overall system branding (discussed in greater detail in the branding section later in this report). Figure 3 shows an example of an enhanced stop on Kansas City MAX system including a larger shelter, seating, real-time and static information, and strong branding.

In addition to the passenger amenities associated with enhanced BRT stops or stations, in some cases the sidewalk is also widened to create a curb extension bus stop, or "bus bulb." Typically in this scenario, the sidewalk is widened into the adjacent parking lane, using the space that is typically restricted to allow buses to pull to the curb. As a result, rather than the bus pulling into the bus stop, the sidewalk is extended to meet the adjacent travel lane, with the bus stopping in that travel lane. In addition to creating additional space on the sidewalk, it also can improve bus operations, by avoiding the need for the bus to pull into the stop and then merge back into traffic. The bus bulb also physically reinforces the No Standing or No Parking regulation typically in effect at bus stops, since there is nowhere for vehicles to park or stand without blocking a travel lane. Bus bulbs can pair particularly well with offset bus lanes (described previously in the Bus Lane section), since the lane directly adjacent to the bus bulb is then a bus lane. Conversely, bus bulbs do not work with curb bus lanes, since they would be blocking the paths that buses travel.

> Enhanced stops are generally intended to improve the attractiveness and ease of use of BRT service.

Figure 3: Example of an Enhanced BRT Stop in the Kansas City (MO) MAX System

Level Boarding

A common goal of BRT is a more "rail-like" service, and one of the attributes of rail service is the ability to quickly enter and exit the vehicle because the floor is level with the boarding platform. Because buses typically board from existing sidewalks, level boarding is rare on bus service. Certain BRT systems have created raised boarding areas that permit level or "near-level" boarding (with near-level boarding, there is still a slight height difference between the bus floor and the boarding area, but one that is small enough to be easily bridged by a small ramp or navigated directly by users not in a wheelchair). Level boarding is most easily created where BRT is operating in a separate right-of-way and new boarding platforms must be constructed, but some systems have raised sidewalks at BRT stops, as illustrated on the Reno, NV system in Figure 4. This is particularly feasible where bus bulbs are being constructed, which can create the opportunity to change sidewalk heights where new sidewalk area is being built.

Figure 4: Level Boarding and Bus Bulb on the BRT System in Reno, NV

Level boarding improves the customer experience of getting on and off the bus by avoiding the need to climb steps, or even negotiate the single step required to board a low-floor bus. For users with minor mobility impairments, this can eliminate the need to deploy a ramp or lift to board the bus, while users in wheelchairs and scooters, or pushing strollers, can board using a simple ramp that quickly extends from the bus. Even for users without any mobility impairment, level boarding eases the process of boarding and alighting. Taken together, these improvements can result in a reduction in dwell time at stops, as users of all mobility levels are able to get off and on more quickly.

> Level boarding is intended to improve both the attractiveness and ease of use and the speed and reliability of BRT service.

Improved Fare Collection

One factor that often slows down busy bus services is the time spent paying fares on board buses, which typically have to be paid using exact change (or at least, no change will be provide upon overpayment) and in some cases without the use of any bills (although bills are accepted on NJ TRANSIT and A&C routes). As a result, many BRT projects make improvements to fare collection in a variety of ways:

- Implementation of advanced fare media in the form of **smart cards** that allow for fast payment by tapping the fare box, and in some cases can allow for boarding through multiple doors for those in possession of a smart card.
- Various forms of **proof of payment**, where customers pay in advance at a machine or by purchasing a daily, weekly, or monthly ticket, and can then board through any door. This requires some form of fare inspection and enforcement, typically in the form of roving inspectors who travel around the system and request that customers show proof that they have a valid paid fare.
- In a limited number of systems, **fare paid areas** have been created within the waiting areas, such that customers pay a fare at a barrier before entering the platform area (much like is done on most rapid transit systems), and then can board through any door from within this fare paid area. Although this creates the most efficient boarding process, it requires the construction of a physical enclosure and associated fare machinery, which can be both cost prohibitive and physically challenging within the type of dense urban environment found within this study area (and in most places where BRT has been implemented or is being considered).

Figure 5 shows an example of a fare machine in use on the VIVA system in York, Canada (outside Toronto), where users can purchase and validate a ticket, and then board through any door, using the system's proof of payment fare collection approach.

> Fare collection improvements are intended to improve both the attractiveness and ease of use and the speed and reliability of BRT service boarding is intended to improve both the attractiveness and ease of use and the speed and reliability of BRT service.

Figure 5: Fare Vending Machines on the York VIVA System outside Toronto, Canada

Branding

Branding of BRT involves not just creating logos and marketing materials, but rather developing an overall identity for the system, including associated brand values and associations, and then using that brand consistently throughout the service, including on vehicles, at stops, in marketing materials, and in all advertising. Figure 6 shows an example of the branding of the Kansas City MAX system, which is carried through in a variety of different venues and has successfully differentiated this BRT service from other bus services in Kansas City.

Conceptually, branding is intended to create a strong positive association with the service, make it easy for users to understand and use, and create some differentiation with other bus services operating in the same region. However, in creating a brand identity for BRT, it is important not to imply that the rest of the bus system is of sub-par quality, since this will result in an overall negative impact on the transit network, of which BRT is typically only a limited portion. As a result, the branding identity must be carefully thought out by professionals with branding and marketing experience, and must be crafted in coordination with the overall marketing and branding message of the entire system. In some cases, BRT has therefore led transit agencies to rethink their overall approach to marketing their services in order to properly brand BRT, while in other cases, the BRT brand has been developed to fit within the existing overall marketing approach. The branding for every BRT service will necessarily be unique to that transit system, although there is clearly some commonality of approach.

Branding is intended to improve the attractiveness and ease of use of BRT service.

Figure 6: Branding Identity on the Kansas City (MO) MAX System

Enhanced Service Plan

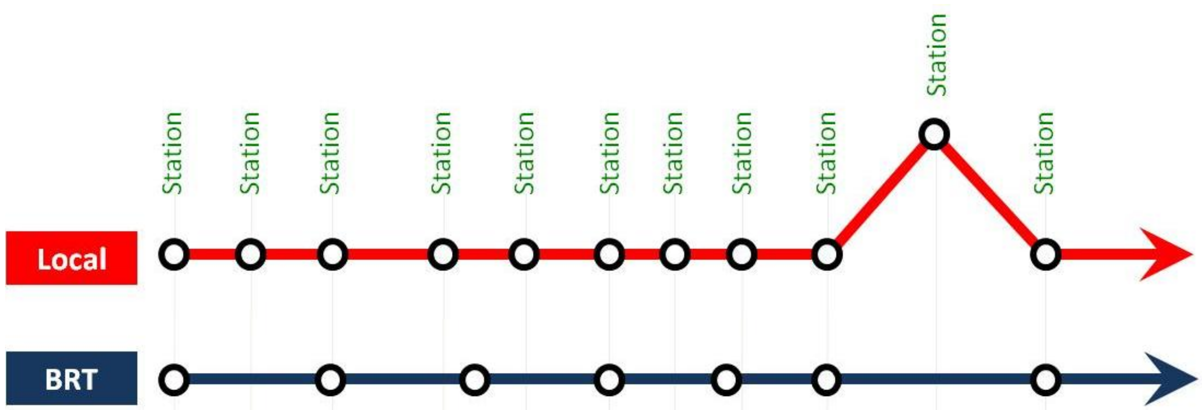
Implementation of BRT service often brings with it the opportunity to make improvements to the service plan within a corridor, particularly in areas where service may have been modified over the years based on community and political concerns, potentially resulting in sub-optimal service pattern. BRT provides an opportunity to rethink and enhance the service plan, in a variety of different ways:

- Streamlining the number of stops on a route, either for all service, or as an overlay on top of existing local service. Implementing an overlay service requires a high level of base service, since an overlay typically means that service and riders are split into local service and BRT (or limited stop) routes rather than by adding large amounts of new service. Reducing the number of stops has a direct impact on travel time and reliability by reducing the number of times the bus has to stop and start, merge into traffic, and perform other activities associated with serving stops. It is important to balance reductions in the number of stops against customer convenience and walking distance, to achieve the best tradeoff between the number of stops and how long it takes customers to access stops.

- Improving the directness of service by eliminating or reducing circuitous connections to off-corridor destinations, looking for general opportunities to reduce the length of the path that buses travel, and eliminating route variations. This can also potentially be implemented using an overlay on top of existing local service, with the BRT taking the more direct routing. Figure 7 shows a generic example of reducing the number of stops on the BRT route as either a stand-alone service or an overlay, along with limited reductions in route circuity.

- Increasing the frequency of service, as well as the span of service (the time the service starts in the morning and ends at night). Increased frequency is often aimed at providing customers with a service they can use without the need to consult a schedule, while increasing the span of service can make BRT service a more viable option for a wide variety of trips beyond the typical commute patterns.

Figure 7: Generic Example of Changes in the Service Plan between a Standard Local and a BRT Service



Service plan enhancements are intended to improve both the attractiveness and ease of use and the speed and reliability of BRT service.

Improved Vehicles

One of the most common features of BRT is the use of vehicles that are upgraded over the standard fleet, whether in terms of overall design, environmentally sustainable propulsion technology, accessibility, or overall appearance. Many BRT systems employ 60' (or longer) articulated buses for both capacity and appearance reasons, in some cases representing the only use of this type of bus in the entire system. Buses used in BRT service may also include features such as upgraded interior amenities, Wi-Fi service, enhanced passenger communications and safety monitoring, and a greater number of doors (particularly when boarding through multiple doors is a possibility). Figure 8 shows the Van Hool bus in use on the VIVA system in York, Canada. It is an articulated bus with a very modern design that fits well with the overall branding message of the VIVA system, illustrating the important role that vehicle design can also play in the branding of a BRT service.

Figure 8: Articulated Bus Operating on the York VIVA System outside Toronto, Canada

At the same time that they can provide additional amenities and features and help reinforce the system branding, the vehicles used in BRT service should also fit within the overall fleet management plan of the transit system. Although it is often desirable to have a special vehicle to differentiate BRT service, this approach can create significant operational and maintenance problems that hinder reliability or increase costs. As a result, specifying

> Improved vehicles are intended to improve the attractiveness and ease of use of BRT service.

and procuring vehicles for BRT must be done carefully to ensure compatibility with overall system operations.

Real-Time Information

Most transit systems are in some stage of providing real time information to their customers about the expected arrival time of buses, or where the nearest bus is currently located. This information reduces the uncertainty and confusion associated with not knowing when the next bus is arriving, improving customer service and allowing customers to make more informed decisions about travel and other activities (for example, deciding to purchase a cup of coffee while waiting for the bus). Figure 9 shows an example of real-time information available for the GoBus 28 in Newark, and NJ TRANSIT is working on expanding this type of real-time information to other routes.

Figure 9: Example of Real-Time Information Available on a Smart Phone for the GoBus 28 in Newark, NJ

Real-time information is intended to improve the attractiveness and ease of use of BRT service.

Initially, real-time information was provided at stops—usually major intramodal or intermodal transfer points—using electronic information displays. Although this is very easy to use for customers, the costs are significant and it becomes much more complicated to provide power and communication to these signs at outlying stops. As a result, there has been a trend to offer this service through mobile telephones, using text message service on feature phones and more complex applications on smart phones. Although this strategy depends on the availability of technology on the customer side, the penetration rate of these devices has reached a level where this is less of obstacle, and the reduced cost and complexity allows for a broader deployment across different services and locations. Real-time information can be a key BRT element, upgrading the service and providing an enhanced customer experience. As providing this type of information has become more ubiquitous in most transit systems, it has started to become an expected customer service offering, particularly on a premium service such as BRT.

Chapter 4: Project Visioning/Initial Outreach

Overview

Chapter 4 summarizes the planning and results of the first round of public meetings. In addition, this chapter summarizes the initial development of the project website.

Public Outreach Plan Summary

Public outreach for the BGJS BRT Study was divided into two sets of public meetings, with continuous and ongoing outreach taking place via the project website, press releases, newsletters, and other means throughout the course of the study. The first set of public meetings took place soon after the initiation of the study, while the second set of public meetings took place during and after the development of initial recommendations.

Key goals for both rounds of public meetings included:

- **First Round of Public Meetings**: Gather information from the public on their travel patterns, their views on BRT and other transit improvements, and their vision for the future of their community. These meetings also served to introduce the public to the study and its goals and objectives.
- **Second Round of Public Meetings**: Summarize progress on the study, describe the draft recommendations for BRT within the study area, and provide an opportunity for structured feedback on those recommendations.

In addition to these formal public meetings, project outreach was supported by a project website (www.bayonnejerseycitybrt.com), as well as a variety of other outreach tools such as press releases, newsletters, and informal outreach activities. The project also had a presence on Facebook to provide an additional venue for online outreach.

First Round of Public Meetings

As described previously, one of the key activities at the project's outset was to organize and conduct the first round of public meetings. Because the study was a partnership between Hudson County, Jersey City, and Bayonne, and also involved significant participation from NJ TRANSIT and the NJTPA, the planning and development of the public meetings was done in close coordination with these project partners. As a result, a sub-group composed of representatives from those agencies (along with staff from Hudson County) was consulted on a regular basis during the lead up to the public meetings and was provided an opportunity to review and comment on the format of the public meetings, the notification/invitation list, and the materials to be used in the public meetings.

Based on this input, one meeting was organized in each of the communities covered by this study:

- The Jersey City meeting took place on Tuesday, June 12, 2012 from 6:30 PM to 8:30 PM at the Mary McLeod Bethune Life Center at 140 Martin Luther, Jr. Drive.
- The Bayonne meeting took place on Wednesday, June 13, 2012 from 6:30 PM to 8:30 PM at Bayonne City Hall at 630 Avenue C.

Both meeting formats were the same:

1. Began with an initial open house to allow attendees to review information about the study area, examples of BRT, and features of BRT. This also provided an opportunity for informal discussions and Q&A with project staff.
2. The presentation covered the purpose, schedule, and scope for the study, the features of BRT, and the goals of the meeting.
3. Small group discussions covering attendees travel patterns, their views on the various BRT features, and their vision for the future of their community. As part of these group discussions, attendees worked with a moderator and a note taker to record information on these topics, using study area maps to indicate where they travel currently and where they would like to see service improvements.
4. Report back and presentation of a meeting summary, including a description of next steps.

Copies of the boards used in the open house and the PowerPoint presentation delivered to attendees are included in the Outreach section of the Appendix.

Results of First Round of Public Meetings

A number of common themes emerged from the group discussions of the first round of public meetings.

- **Where People Travel:**
  - While there is clearly a strong desire for travel to New York City from within the study area (particularly from Bayonne), there also appears to be strong travel demand within the study area and to other locations within Northern New Jersey, including Newark, Downtown Jersey City, the Newport Mall, and Hoboken.
  - Travelers use a wide variety of modes to travel within and to/from the study area, including bus, jitney, light rail, and ferry.

  - In addition to using transit for their travel, many of the participants also have access to private vehicles and are choosing to use transit for a variety of reasons (e.g. cost, congestion, convenience, etc.).

- **BRT Features of Interest:**
  - Participants appeared to be interested in station-related improvements, including widened sidewalks at stations, elevated boarding platforms, and fare prepayment. In the case of fare pre-payment, there was some skepticism and a desire for more information about how these would work specifically within the study area.
  - There were varying opinions about the idea of increasing bus stop spacing, with an understanding of the benefits combined with concerns about the impact on the elderly and disabled.
  - While participants understood the benefits of bus lanes and other forms of physical priority for transit, they were concerned about the impacts of these lanes and expressed skepticism about whether they would be feasible within this study area.
  - There appeared to be a general concern about the reliability of existing bus service within the study area, and a desire for BRT improvements to improve schedule adherence for customers.
  - Participants also expressed that there is a need for improved traveler information in terms of both static and real-time information.
  - Branding was also discussed as an important element to improve the image of bus service.

- **Future Vision:**
  - Some areas and types of destinations mentioned as seeing growth in the future included:
    - Liberty State Park;
    - Shopping destinations;
    - Education institutions located within and beyond the study area; and,
    - The Bayfront area in Jersey City, which is located to the west of Route 440.
  - Participants expressed a desire for improved service to non-work destinations such as churches, schools, and shopping.
  - There was a desire for projects that would support local economic development and result in local jobs for study area residents.

In addition to the previously described meeting materials, the Outreach section of the Appendix contains the more detailed minutes from the group discussions and photographs of the study area map marked up in the group discussions.

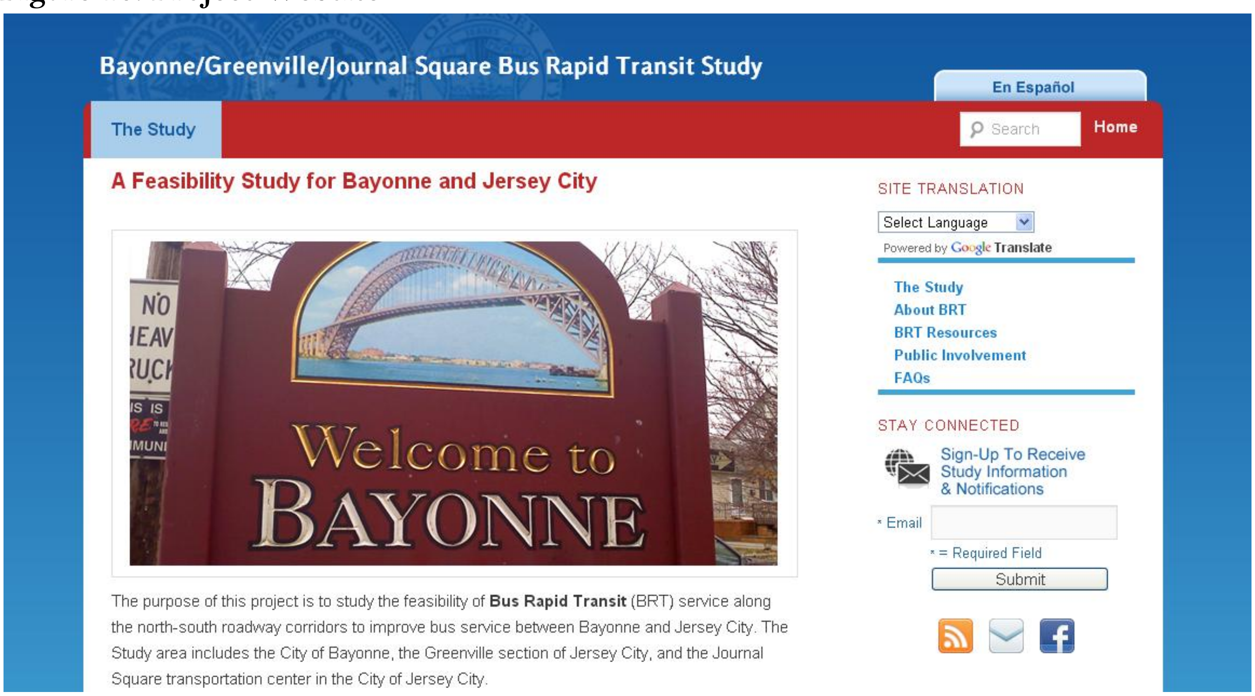
Information about the second round of public meetings (held in the spring of 2013) is presented later in this report, in the context of the analysis of potential BRT corridors and the project recommendations.

Website Development

In addition to organizing the public meetings, the consultant team also worked closely with the Hudson County Division of Planning and the sub-group of the TAC to develop the project website. Key features of the website included:

- General information about the study, including the goals and objectives, the study area, the study process, and the expected outcomes;
- Information about BRT, including examples of BRT in the region and around the country, the features of BRT, and the potential applications of BRT within the study area;
- Links to other sources of information about BRT;
- Comment/feedback form; and,
- Translation of certain key information into Spanish, as well as a machine translation feature through Google Translate to allow for translation of the entire site into different languages.

Figure 10: Project Website



Since going live to the public, the consultant team regularly updated the website to reflect new information about the project, including a study area map, the dates of the public meetings, and additional background information about BRT. In addition to the website, the study has a presence on Facebook, with a series of posts made to the project website in advance of the second round of public meetings to generate additional interest in the study.

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Chapter 5: Existing Conditions

Overview

Chapter 5 summarizes the traffic, transit, and land use data relevant to this project. The data outlined in this chapter is not primary data, but rather data that was readily available and has been collected, consolidated, and synthesized by the consultant team.

Primary Corridors

Eight primary corridors (Table 1) were considered for potential BRT improvements within the study area. These corridors were selected based on a number of factors:

- Locations of existing bus transit services within the study area;
- Primary corridors that provide connectivity within the transportation network in a relatively direct fashion;
- Primary corridors that provide connectivity to the Journal Square area;
- Feedback from the TAC and the results of the first round of public meetings; and,
- Discussions with staff from the Hudson County Division of Planning.

Table 1: Primary Corridors Considered

Bayonne Corridors	Jersey City Corridors
Avenue C	Route 440
Kennedy Boulevard	West Side Avenue
	Kennedy Boulevard
	Bergen Avenue
	MLK Jr. Drive
	Ocean Avenue

Study Area Traffic

The consultant team gathered traffic counts, straight line diagrams, and street configuration and characteristics for the corridors within the study area.

Traffic Counts

A number of traffic counts were collected and compiled for the eight corridors. Annual average daily traffic (AADT) counts were obtained from New Jersey Department of Transportation's

(NJDOT) Roadway Information and Traffic Counts online data warehouse for locations throughout the overall study area, with additional counts obtained from local sources. These counts can be found in the Traffic Analysis section of the Appendix.

In addition to traffic data for these corridors, the consultant team also obtained several recent AADT traffic counts for other locations throughout the overall study area (e.g. Danforth Avenue, Communipaw Avenue, Avenue A, etc.). These traffic counts were obtained from the NJDOT as well, and are provided in the Traffic Analysis section of the Appendix.

The consultant team used data about travel volumes along with information about roadway geometric features (e.g. traffic signals, number of lanes, etc.) to make qualitative assessments of routes with capacity constraints that may impede bus flow. An initial examination highlighted that the heaviest traveled routes include Route 440, Kennedy Boulevard, Ocean Avenue, and Bergen Avenue. Examining this data, along with existing bus routes and geometric data, allowed team discussions with the TAC on which of these facilities may have capacity for queue jumps, have limited capacity for BRT (i.e., no time benefit), or may be in need of minor improvements to provide improved BRT travel times, etc.

Straight Line Diagrams and Description of Routes

In addition to traffic counts, the consultant team reviewed NJDOT straight line diagrams and descriptions of routes for the following roadways:

- West Side Ave. (CR 605);
- Bergen Ave. (CR 607);
- Ocean Ave.;
- MLK Jr. Dr. (CR 609);
- NJ 440;
- Ave. C; and,
- Kennedy Blvd. (CR 501).

The straight line diagrams are included in the Traffic Analysis section of the Appendix. The consultant team's review of the straight line diagrams and aerial and street-view photographs noted the *typical* conditions described in Table 2.

Table 2: Key Characteristics of Potential BRT Corridors in the Study Area

Corridor	Lanes[1]	Speed Limit	Pavement Width	On-Street Parking[2]	Sidewalks
Avenue C	4	25 mph	60 ft	Yes	Yes
West Side Ave	2	25 mph	39 ft	Yes	Yes
Bergen Ave	2	25 mph	29 ft from mileposts 0.0 to 0.58, 35 ft otherwise, except 60 ft north of Montgomery	Yes	Yes
MLK Jr. Dr	2	25 mph	35 ft	Yes	Yes
Ocean Ave	2	25 mph	41 ft from mileposts 0.0 to 1.6, 35 ft otherwise	Yes	Yes
Kennedy Blvd	4[3]	25 mph	60 ft[3]	Yes	Yes
NJ 440	4	40 - 50 mph	24 ft in each direction[4]	No	No

Notes:

1. Counting travel lanes in both directions combined. All corridors are two-way roadways.
2. West Side Avenue has metered parking from Stegman Parkway to Audubon Avenue. Bergen Avenue has metered parking from Jewett Avenue to Sip Avenue. Kennedy Boulevard has metered parking from Sip Avenue to Bergen Avenue. More detailed information on parking regulations is provided in the Traffic Analysis section of the Appendix.
3. Turning lanes are added at some major intersections and width varies at underpasses and railroad crossings.
4. NJ 440 is a major highway with shoulders up to 14-feet in width and a median which varies in width throughout the Jersey City portions of the corridor.

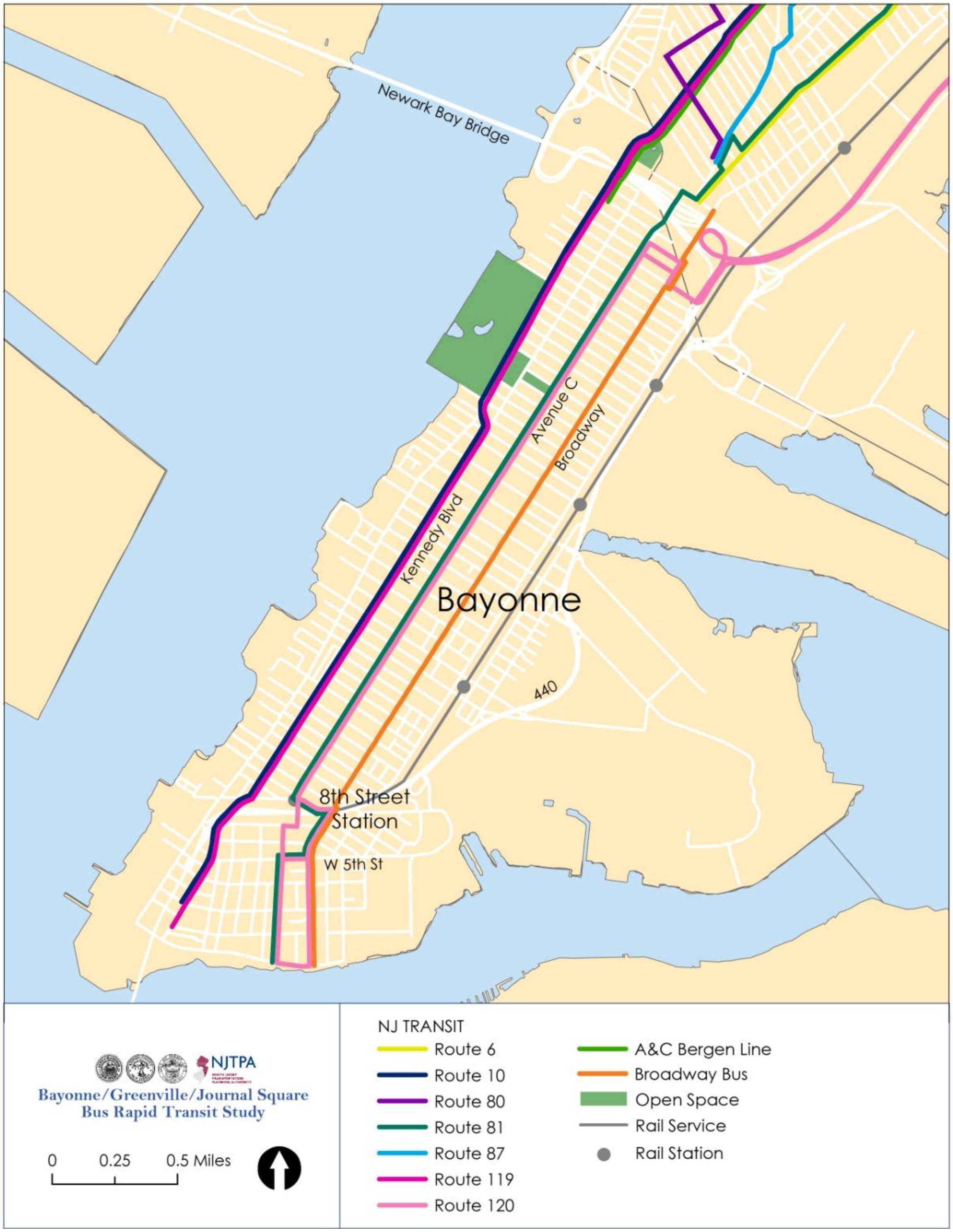
An initial examination of this data suggested that the best opportunities would be along the wider roadways that could perhaps have reduced lane widths and/or elimination of parking for BRT. Those could include Avenue C, West Side Avenue, Ocean Avenue, MLK Jr. Drive, and Kennedy Boulevard. Further analysis of each roadway, coupled with volumes and transit demand, was performed and is presented in Chapter 6.

Study Area Bus Routes

This section describes bus routes in the study area and includes, where available, a summary of fares, ridership, scheduled running time, and frequency. Figure 11 shows the Jersey City portion of the study area and Figure 12 shows the Bayonne portion. Tables 3 and 4 provide both ridership and headways for these routes. Hudson County has also collected ridecheck (boarding and alighting by stop) data for a number of these routes, which are described in greater detail in Chapter 6

Figure 11: Jersey City Bus Routes

Figure 12: Bayonne Bus Routes



NJ TRANSIT Route 1 (Newark, Kearny, and Jersey City)

Route 1 operates between Ivy Hill in Newark and Newark Penn Station. Some trips continue via Ferry Street and Route 1/9 to Kearny and Jersey City, where they terminate either at Journal Square or Exchange Place. The Journal Square variant, which uses West Side Avenue and Sip Avenue, operates roughly every 30 minutes during peak periods and every 60 minutes midday, evenings, and Saturdays. On Sundays, service on the Journal Square variant operates roughly every two hours. Since bus route 1 travels through as many as three fare zones, the one-way adult cash fare varies from $1.50 to $2.90. Bus route 1 had 15,506 riders on a typical weekday in September 2012. However, according to fare zone payment data, only 2,258, or 15 percent of these trips, involved Jersey City (714 were within Jersey City and 1,544 were between Jersey City and Newark). It is not possible from the data available to differentiate ridership data between the Journal Square and Exchange Place route variants. The scheduled running time between Journal Square and Newark Penn Station is 34 minutes.

NJ TRANSIT Route 6 (Jersey City)

Bus route 6 operates between Merritt Street and Ocean Avenue in Greenville to Journal Square via Ocean Avenue, Grand Street, and Baldwin Avenue. The main version of the route operates on a 20- to 30-minute headway in the weekday peak, a 35- to 60-minute headway in the weekday off-peak, and hourly on Saturdays and Sundays. There is a 6-I route variant which leaves Ocean Avenue at Communipaw Avenue to serve, in a one-way, figure-eight pattern, Hudson County Plaza and Liberty State Park, only on weekdays before 8:00 PM. Bus route 6-I operates every 30 minutes in the peak and 60 minutes in the off-peak. The adult cash fare on bus route 6 is $1.50 for all trips since the route (both versions) is entirely within one fare zone. Bus route 6 had about 1,800 riders on a typical weekday in September 2012. The scheduled running time from Merritt Street to Journal Square is 23-26 minutes in the off-peak and 30-31 minutes in the peak. http://www.njtransit.com/pdf/bus/T0006.pdf

NJ TRANSIT Route 10 (Bayonne, Greenville and Journal Square)

Bus route 10 operates between Bayonne and Journal Square via Kennedy Boulevard. Until April 8, 2012, service was provided on this route by Coach USA operating as Red and Tan Route 10. Route 10 currently operates every seven to 10 minutes during the peak period and every 20 minutes during the off-peak and on weekends. The scheduled peak-period, one-way running time is 44 minutes. The fare for trips within Bayonne or within Jersey City is $1.50. For travel between the two places, the cash fare is $2.35. September 2012 weekday ridership was 6,561. There is no information on how many of these trips were within compared to between Bayonne and Jersey City. http://www.njtransit.com/pdf/bus/T0010.pdf

NJ TRANSIT Route 80 (Greenville, Journal Square, and Exchange Place)

Bus route 80 operates between Bayonne and Exchange Place via West Side Avenue and Journal Square. The route currently operates every three to five minutes during the peak period, peak direction, every 10 to 20 minutes in the midday, every 25 to 30 minutes on Saturdays, and every 45 minutes on Sundays. The scheduled peak-period one-way running time is 47 minutes. The fare is $1.50 (the entire route is within one zone). September 2012 weekday ridership was 7,241. http://njtransit.com/pdf/bus/T0080.pdf

NJ TRANSIT Route 81 (Greenville – Exchange Place)

Bus route 81 operates between W. 1st Street and Avenue C in Bayonne and Exchange Place in Jersey City. In Bayonne it runs primarily on Avenue C and in the Greenville section of Jersey City it operates primarily on Ocean Avenue (and Old Bergen Rd in the portion of Ocean Avenue that is eastbound only). In Bayonne, it shares its alignment with bus route 120. The base headway is 30 minutes, Monday to Saturday. Additional peak-period service is provided by bus route 81X, which makes all stops in Bayonne and then enters the NJ Turnpike via E. 53rd Street and operates express to Christopher Columbus Drive in Jersey City, where it rejoins the local route. Sunday service operates every 90 minutes. Bus route 81 had 3,723 riders on a typical weekday in September 2012. The scheduled running time of the regular route is 41-45 minutes. http://www.njtransit.com/pdf/bus/T0081.pdf

NJ TRANSIT Route 87 (Jersey City – Hoboken)

Route 87 operates between the NJ TRANSIT Greenville Bus Garage and Journal Square via Old Bergen Road, Rose Street, Long Street, and MLK Jr. Drive. Early morning and supplemental peak-period trips terminate there; all others continue to Hoboken Terminal. The scheduled running time from the Bus Garage to Journal Square is 21-23 minutes in the off-peak and 25-27 minutes in the peak. The headway is two to six minutes in the peak, 12-15 minutes midday, 20 minutes Saturday, 35 minutes Sunday, and 30 to 60 minutes in the late evening. Bus route 6 had 12,435 riders on a typical weekday in September 2012. The route has two zones according to the schedule, but the zone boundary is not shown on map, and only one percent of the reported riders traveled outside of Zone 1 according to NJ TRANSIT statistics. http://njtransit.com/pdf/bus/T0087.pdf

NJ TRANSIT Route 119 (Bayonne, Jersey City, Hoboken, PABT)

Route 119 overlaps Route 10 exactly in Bayonne and Jersey City, but continues past Journal Square via Central Avenue, Hoboken, and the Lincoln Tunnel to the Port Authority Bus Terminal. Service is provided every 20-30 minutes in the peak period, peak direction and every 30 minutes in the reverse-peak direction. Off-peak service to New York consists of trips at 9:00 and 10:00 AM and at 3:00, 7:30 and 8:30 PM Off-peak service from New York consists of a trip at 9:20 AM, trips every half hour from 6:15 PM to 9:10 PM, and a final departure at 10:10 PM. Prior to November 7, 2011 the route was operated by Coach USA as Red and Tan bus route 99S. By NJ TRANSIT policy, this route is not to be used in place of bus route 10. There are no boardings permitted southbound at Journal Square or points south and no alightings are permitted northbound at Journal Square or points south. However, local travel is permitted in Jersey City north of Journal Square. The fare per trip varies from $1.50 to $5.50 depending on the number of zones traveled. The scheduled peak-period, one-way running time is 76 minutes. http://www.njtransit.com/pdf/bus/T0119.pdf

NJ TRANSIT Route 120 (Bayonne-Lower Manhattan)

Route 120 provides peak-only commuter express service between Bayonne and Lower Manhattan. The peak direction service consist of seven morning inbound and six evening outbound trips. (Prior to 2012, there was one additional morning trip.) There is no reverse peak service. The Bayonne portion of the route (to and from the NJ Turnpike) is identical to the 81X routing (which serves Exchange Place instead of Lower Manhattan). The one-way fare is $1.50 for trips within Bayonne and $4.25 for trips to and from New York. In September 2012, median weekday ridership was 359. This is down from 472 in January 2010. Farebox zone data shows that 96 percent of these trips were between Manhattan and Bayonne. The scheduled peak–period, one-way running time is 60 minutes. http://www.njtransit.com/pdf/bus/T0120.pdf

Kennedy Boulevard Jitney (Bayonne, Greenville and Journal Square)

The jitney buses on Kennedy Boulevard operate on a 20-minute headway between 5th Street in Bayonne and Journal Square following the alignment of NJT Route 10. There is no service on weekends. The Bayonne Route is almost entirely operated by Ride-Ex Transportation LLC (an observed 73 percent of trips) with some additional service provided by Community Lines, Inc. (an observed 27 percent of trips). The Bayonne route was formerly through-routed past Journal Square to the PABT in New York City (via Central Avenue), similar to the current NJT Route 119. The fare is $1.50 to $1.75. No ridership or running time information is available.

A & C Bus Company 4 Line (Greenville-Exchange Place-Newport Mall)

The 4 Line operates from Merritt Street and Old Bergen Road in Greenville through Jersey City via Ocean Avenue and Grand Street. It is very similar to the Jersey City portion of NJ TRANSIT bus route 81, except that it continues from Exchange Place to the Newport Mall. Prior to November 7, 2011 it was operated by Coach USA as Red and Tan Route 4. Headways are 15-20 minutes during the day and 25-35 minutes in the evening, Monday to Saturday. The headway is 35 minutes on Sunday. The adult cash fare is $1.50. NJ TRANSIT bus passes are accepted. Daily ridership on a September 2012 weekday was 2,817.
http://acbuscorp.com/4schedule.html

A & C Bus Company Bergen Avenue Line (Greenville-Journal Square)

The Bergen Avenue Line operates between 53rd Street in Bayonne and Journal Square via Bergen Avenue. Until March 12, 2011 the route was operated by the Bergen Avenue Bus Owners' Association and since March 16, 2011 has been operated by the A & C Bus Company. Headways are 10-20 minutes during the day and 30 minutes in the late evening, Monday to Sunday. The adult cash fare is $1.50. NJ TRANSIT bus passes are accepted. Daily ridership on a September 2012 weekday was 4,906. http://acbuscorp.com/bsced.html.

Broadway Bus Line (Bayonne)

This route operates between 1st Street and Avenue C and 54th St and Kennedy Boulevard, via Broadway (except for the few blocks near the eastern end of the route). This is the only route operated by the Broadway Bus Owners' Association. Service is generally provided every 12-20 minutes, Monday to Saturday, and every 30-55 minutes on Sundays. The cash adult fare is $1.65. NJ TRANSIT monthly bus and light rail passes are accepted. No ridership data is available. http://www.bayonnenj.org/pdf/bus.pdf

Table 3: Study Area Bus Route Ridership

Route	Operator	Total Daily Ridership		
		Weekday	Saturday	Sunday
1-Jersey City portion	NJ TRANSIT	2,258	1,455	1,089
6	NJ TRANSIT	1,797	583	493
10	NJ TRANSIT /Academy	6,561	3,848	3,249
80	NJ TRANSIT	7,241	2,161	1,405
81	NJ TRANSIT	3,273	1,343	429
87	NJ TRANSIT	12,435	5,342	3,301
88	NJ TRANSIT /Academy	4,574	1,673	1,146
119	NJ TRANSIT /Contractor	1,450	0	0
120	NJ TRANSIT	359	0	0
4	A&C Bus	2,817	1,559	1,244
Bergen	A&C Bus	4,906	2,361	1,088
Society Hill	A&C Bus	4,674	3,651	1,698
M&W-Newport / Exch. Pl.	A&C Bus	2,726	1,184	947
440 Shopper	A&C Bus	1,182	1,566	1,138
Broadway	BBOC	n/a	n/a	n/a
Total		**56,252**	**26,725**	**17,227**

Table 4: Study Area Bus Route Headways

Route	Operator	Weekday		Sat	Sun	Notes
		Peak	Off-Peak			
1	NJ TRANSIT	30	60	60	120	Headways are for Journal Square branch only.
6	NJ TRANSIT	20-30	35-60	60	60	Headways are for Merritt branch only.
10	NJ TRANSIT	7-10	20	20	20	
80	NJ TRANSIT	15	20	25	45	
81	NJ TRANSIT	30	30	30-40	90	
81X	NJ TRANSIT	10-20	-	-	-	
87	NJ TRANSIT	2-6	12-15	20	35	
88	NJ TRANSIT	20				
119	NJ TRANSIT	20	30	-	-	Limited reverse peak and off-peak service.
120	NJ TRANSIT	25-30	-	-	-	No reverse peak service.
4	A&C	15-20	15-20	15-20	35	
Bergen	A&C	10-20	10-20	10-20	10-20	Late evenings 30-minute headway.
Society Hill	A&C	8	13	17	20	
M&W-Newport/ Exch. Pl.	A&C	15	30	25-30	35	
440 Shopper	A&C	20	30	30	30	
Broadway	BBOC	12-20	12-20	12-20	30-55	
Kennedy Blvd South	Jitneys	20	20	-	-	

Bus Travel Time within Study Area

The following six corridors were under consideration for the Jersey City portion of the proposed BRT route (current NJ TRANSIT routes shown in parentheses):

1. Route 440 (none)
2. West Side Avenue (Route 80)
3. Kennedy Boulevard (Routes 10 and 119)
4. Bergen Avenue (none)
5. MLK Jr. Drive (Route 87)
6. Ocean Avenue (Route 6)

This analysis emphasized the bus routes in Jersey City because there was much greater discussion of the corridor options in the Greenville section of Jersey City than in Bayonne. As such, additional existing conditions analysis was developed to inform the ranking of these Jersey City corridors. As discussed in Chapter 6, the analysis in Bayonne fairly quickly focused on the Kennedy Boulevard corridor.

Each corridor, with the exception of Route 440 and Bergen Avenue, has NJ TRANSIT bus service. The travel time between timepoints within the study area for these routes was used to compare average bus travel speeds on these potential corridors. A&C Bus operates service on the remaining two corridors, but does not publish timepoints (only start times), which made it impossible to calculate scheduled running time on these routes.

Table 5 shows northbound calculated average bus running speeds within Jersey City for the bus routes serving the considered corridors. The Bayonne portions of Routes 10 and 119 are also shown for comparison. In addition, the table shows scheduled times for the portion of bus route 1 (Journal Square) branch that operates on West Side Avenue and Sip Avenue.

Table 6 contains the same information for the southbound direction. For all of the routes the slowest northbound travel times are in the AM peak, while the slowest southbound travel times are in the PM peak. Bus routes 10 and 119 have essentially the same scheduled time because they completely overlap in the shown segments. The largest difference between the two is that bus route 119 schedule provides an extra two minutes eastbound in the AM peak.

Within Jersey City, all of the routes average 10-13 mph in the off-peak and 8-9 mph in the peak. Bus Routes 10 and 119 operate somewhat faster in Bayonne. The average peak speed for bus routes 10/119 on Kennedy Boulevard is greater than the parallel routes (6 and 87), with the exception of bus route 80, which operates primarily on West Side Avenue. However, the distance traveled by Route 80 from the city line to Journal Square is about ¾ mile longer than bus routes 10 and 119. Thus, Kennedy Boulevard is the fastest route across Jersey City to Journal Square, given both its directness and the bus speeds currently achievable.

Table 5: Calculated NB Average Bus Speed Based on Published NJ TRANSIT Schedules

Route	10 (Bay.)	10 (Jer. City)	119	119	6	1 (Jour. Sq.)	80	87
From	Kennedy at 3rd St	Kennedy at 63rd	Kennedy at 3rd St	Kennedy at 63rd	Ocean Ave at Merritt	Comm. Ave at Mallory Ave	Old Bergen Rd at Gates	Old Bergen Rd at Gates
To	Kennedy at 63rd	Jour. Sq.	Kennedy at 63rd	Journal Square	Journal Square	Journal Square	Journal Square	Journal Square
Off-Peak Travel Time (minutes)	14	17	14	18	23	9	24	21
AM Peak Travel Time (minutes)	19	25	19	27	31	14	30	27
PM Peak Travel Time (minutes)	16	23	16	21	23	12	28	26
Distance (miles)	3.59	3.56	3.59	3.56	3.96	1.79	4.31	3.47
AM Peak Speed (mph)	11.3	8.5	11.3	7.9	7.7	7.7	8.6	7.7
Off-Peak Speed (mph)	15.4	12.6	15.4	11.9	10.3	13.4	11.3	9.9

Table 6: Calculated SB Average Bus Speed Based on Published NJ TRANSIT Schedules

Route	10 (Bay.)	10 (Jer. City)	119	119	6	1 (Jour. Sq.)	80	87
From	Kennedy at 63rd	Journal Square	Kennedy at 63rd	Journal Square	Journal Square	Journal Square	Journal Square	Journal Square
To	Kennedy at 3rd	Kennedy at 63rd	Kennedy at 3rd	Kennedy at 63rd	Ocean Ave at Merritt	Comm. Ave at Mallory Ave	Old Bergen Rd at Gates	Old Bergen Rd at Gates
Off-Peak Travel Time (minutes)	10	19	10	20	23	8	23	21
AM Peak Travel Time (minutes)	14	24	14	24	26	9	26	23
PM Peak Travel Time (minutes)	17	25	17	25	30	12	28	27
Distance (miles)	3.59	3.56	3.59	3.56	3.96	1.79	4.31	3.47
PM Peak Speed (mph)	12.7	8.5	12.7	8.5	7.9	8.9	9.2	7.7
Off-Peak Speed (mph)	21.6	11.2	21.6	10.7	10.3	13.4	11.3	9.9

Previous Studies of Transit Service

The consultant team reviewed previous studies of transit service in the study area. The *Jitney Study Final Report*, completed in 2011 by NJTPA, analyzes the use of "jitneys"— privately-operated minibus and vans operating on fixed routes—within Hudson County. The study evaluated the role of jitneys and provided recommendations for improving their integration into the broader transportation network. These recommendations included establishing a new regulatory framework for jitney service and improving jitney operations through the creation of distinct bus stops, training for local inspections, and coordination with the New York City Department of Transportation. The entire report is available online (http://www.njtpa.org/plan/Studies/documents/HudsonCountyJitneyStudyFinalReport.pdf).

The *Hudson County Bus Circulation and Infrastructure Study*, completed in 2007 by Hudson County, focused on engaging public stakeholders to achieve the following goals: identify bus-related issues, recommend improvements to existing infrastructure and service, better understand jitney operations, and identify opportunities to link Hudson County Plaza development to the existing transit network to maximize accessibility. The recommendations included enhancing transit and pedestrian access, operational alternatives, and potential service changes. The entire report in PDF form can be found at the following web address: http://www.hudsoncountynj.org/1bus-circulation-infrastructure-study.aspx.

Origin-Destination Travel Flows

In order to better understand public transit travel patterns in the study area, the consultant team examined the origin-destination data from the NJTPA's North Jersey Regional Transportation Model-Enhanced (NJRTM-E). The model data is based on household surveys and counts of transit and traffic. The model includes 2,553 traffic analysis zones, including 1,500 in the NJTPA region plus all of New York City and Long Island, portions of southern New Jersey, portions of southern New York State, and portions of eastern Pennsylvania.

The consultant team requested and received origin-destination matrices from the regional model for the 2011 base year and for 2014 forecasts, by mode (single-occupant vehicle, high-occupancy vehicle, public transit, and heavy trucks). The team identified the group of TAZs that represent the City of Bayonne. As part of the corridor selection process for Jersey City, the team divided Jersey City into four subareas from west to east plus the Journal Square area. These subareas are shown in Figure 13 and designated as Journal Square (shaded pink), West (orange), West Central (green), East Central (purple) and East (blue). Because they are composed of TAZs, the boundary lines of the corridors are jagged in some places.

Figure 13: Subareas of the Jersey City Portion of the Study Area

Next, the consultant team converted the 2,553 x 2,553 TAZ matrix into a much more manageable 11 x 11 matrix: these include the City of Bayonne, the five subareas of Jersey City, and other areas in New Jersey, Manhattan, Outer Boroughs, Other New York state, and Pennsylvania. Table 7 shows the matrix of public transit flows for these 11 regions. The rows represent origins and the columns represent destinations.

The table shows that the largest source (origin) of public transit trips in the study area is the Jersey City subarea labeled "West Central," with more than 20,000 daily trips. The next largest is the city of Bayonne with 17,000 trips, followed by the "East Central" area with 15,000 trips. The "West" part of Greenville has more than 9,000 daily trips, the Journal Square area with 5,900 trips, and the "East" portion about 4,600 trips. The most common destination for the 73,000 daily transit trips originating within the study area is Manhattan, accounting for 42 percent of all transit trips originating in the study area. The next most common is New Jersey outside the study area, accounting for 27 percent of transit trips. Another seven percent of transit trips have an Outer Borough destination. The remaining 25 percent of transit trips have both origin and destination within the study area.

Table 7: Public Transit O-D Flows in Bayonne, Jersey City, and Surrounding Areas

	Destination											
Origin	Journal Square	West	W Central	E Central	East	Bayonne	Other NJ	Manhattan	Outer Borough	Other NY	PA	Total
Journal Square	11	189	175	132	55	108	1,826	2,931	443	1	0	5,871
West	491	194	273	263	106	215	2,870	4,305	682	1	0	9,400
W Central	1,378	897	956	921	328	1,180	5,334	8,475	1,257	10	0	20,736
E Central	910	611	804	756	339	977	4,274	5,583	819	1	0	15,074
East	219	126	160	192	36	140	1,600	1,840	275	1	0	4,589
Bayonne	451	329	525	526	275	2,859	3,632	7,547	1,303	23	0	17,470
Other NJ	6,431	2,094	2,269	2,163	1,033	1,107	250,304	343,001	42,744	170	57	651,373
Manhatt.	2,250	568	632	730	407	815	36,948	0	0	43	0	42,393
Outer Borough	0	0	0	0	0	0	0	0	0	0	0	0
Other NY	40	3	23	8	5	355	750	47,553	7,586	25,407	0	81,730
PA	0	0	0	0	0	0	294	8,612	666	0	109	9,681
Total	12,181	5,011	5,817	5,691	2,584	7,756	307,832	429,847	55,775	25,657	166	858,317

Source: Calculations from North Jersey Regional Transportation Model-Enhanced base year (2011) estimates.

Table 8 shows the percentage of public transit mode share—that is, transit trips in the study area as a share of all daily trips. Between 72 to 84 percent of all trips from the study area destined to Manhattan are made by transit. Within the study area, public transit accounts for 10 to 15 percent of trips for most O-D pairs. This is a high rate by American standards. The exception is for trips within zones, where the share is generally much lower, because public transit generally cannot compete with the speed of walking for trips of one mile or less. Within Jersey City, the West Central subarea has the highest overall transit mode share at 22 percent, followed closely by the East Central, Journal Square, and East subareas in the 18- to 20-percent range. The overall mode share is lower in the West subarea (16 percent) and a bit lower still in Bayonne (14 percent).

Table 8: Public Transit Mode Share in Bayonne, Jersey City, and Surrounding Areas

	Destination											
Origin	Journal Square	West	W Central	E Central	East	Bayonne	Other NJ	Manhattan	Outer Borough	Other NY	PA	Total
Journal Square	0.3%	13.4%	11.3%	7.7%	10.7%	15.1%	11.2%	83.7%	56.0%	0.2%	0.0%	19.0%
West	12.3%	3.1%	5.2%	7.9%	11.0%	8.0%	10.6%	77.1%	61.6%	0.1%	0.0%	16.4%
W Centr.	25.3%	12.7%	6.6%	10.6%	13.8%	13.2%	15.3%	84.1%	77.9%	0.7%	0.0%	21.9%
E Centr.	19.4%	14.8%	9.4%	5.9%	11.3%	15.2%	15.6%	80.9%	69.7%	0.1%	0.0%	19.8%
East	13.0%	13.0%	10.1%	6.7%	1.3%	10.4%	15.1%	72.2%	52.0%	0.2%	0.0%	18.0%
Bayonne	24.8%	10.7%	10.3%	12.9%	13.0%	4.4%	11.8%	72.9%	63.0%	0.5%	0.0%	13.5%
Other NJ	14.2%	5.6%	6.0%	6.3%	6.5%	2.4%	1.2%	54.7%	39.5%	0.0%	0.0%	2.8%
Manh.	86.0%	56.2%	60.9%	62.6%	59.0%	53.1%	41.4%	-	-	0.2%	0.0%	10.6%
Outer Borough	-	-	-	-	-	-	-	-	-	-	-	-
Other NY	3.7%	0.3%	1.4%	0.7%	0.6%	3.5%	0.5%	39.9%	5.5%	0.9%	0.0%	2.6%
PA	-	-	-	-	-	-	0.1%	35.1%	18.3%	0.0%	0.0%	0.1%
Total	17.2%	8.0%	7.5%	8.1%	8.8%	5.4%	1.4%	39.4%	10.3%	0.8%	0.0%	2.5%

Source: Calculations from North Jersey Regional Transportation Model-Enhanced base year (2011) estimates.

The West and East Central subareas became logical areas of focus for BRT given that they have both the highest overall transit mode share and total transit trips in the study area.

Bicycle Infrastructure

Jersey City currently has plans for creating and maintaining improved on-street bicycle accommodations and additional bicycle parking racks. The changes to the road network include the addition of 35.2 miles of bike lane markings and 19.5 miles of shared lane markings (also called "sharrows") along key routes within the city. Figure 14 outlines the planned bike routes within Jersey City in order of priority. Bayonne currently has no planned bicycle infrastructure or amenity improvements.

Bicycle infrastructure was an important consideration when evaluating BRT alternatives. The lack of bicycle accessibility or secure bike storage can discourage potential transit riders. Additionally, it will be critical to identify locations where adding BRT amenities like bus pullouts, shoulder lanes utilization, and queue jumps would conflict with bike lanes or sharrows so as not to create safety concerns or limit service options.

Jersey City has planned for bike lanes on Bergen Avenue and Ocean Avenue and for sharrows on West Side Avenue. The consultant team considered the impacts to these planned facilities in identifying the highest-ranked corridor in the subsequent analysis.

Figure 14: Planned Bike Lanes and Sharrows in Jersey City by Priority

Source: City of Jersey City, Office of the Mayor

Zoning and Land Use

The consultant team collected zoning maps of Jersey City and Bayonne, a description and summation of redevelopment sites within and around the study area, and a description of land use within and around the study area.

Zoning

Zoning maps for both Jersey City and Bayonne were obtained and are attached in the Land Use section of the Appendix.

Redevelopment

Jersey City and Bayonne have experienced a significant amount of redevelopment activity in recent years. While this is particularly evident in the Hudson River waterfront areas of Jersey City and Bayonne, redevelopment has also occurred within the overall BRT study area. The significant (i.e., medium and large scale) redevelopment projects that are currently active and located within, or adjacent to, the BRT study area are shown in Figure 15. The distances between these redevelopment sites and the nearest corridor under consideration for BRT are also shown in Figure 15 (Note: a range is provided indicating both the shortest and longest distance from the nearest BRT corridor).

The map reveals that there are a number of active redevelopment projects within the study area. These projects will result in over 4,000 new dwelling units and 1.4 million sq. ft. of non-residential space in Jersey City, and over 2,000 new dwelling units and 725,000 sq. ft. of non-residential space in Bayonne. These numbers are likely to increase significantly as plans for additional projects (e.g. 900 Garfield Avenue, Canal Crossings, and Bayfront) are developed and finalized. The data examined includes all redevelopment activity within the entire study area, not just redevelopment activity adjacent to a corridor being considered for BRT, since medium and large scale redevelopment has the potential to affect travel within the entire study area.

One key redevelopment site lies within the Bayfront neighborhood of Jersey City, which was also identified as part of the public outreach. The community has created both a vision plan, developed in 2003, and a redevelopment plan. The plans emphasize smart growth principles, transit oriented development, and the development of a live/work/play neighborhood. The development plan is available online (http://www.bayfrontjerseycity.com/plan_description.html).

Redevelopment plans also exists for the study area's neighborhoods of Canal Crossing, Journal Square, Claremont, Morris Canal, Hackensack River Edge, McKinley Square, and Montgomery Street. These plans have been adopted by the Municipal Council of Jersey City.

Figure 15: Major Redevelopment Plan Areas within Jersey City

The demand forecasts considered these redevelopment areas. Sites for major new development within a quarter- to half-mile radius of a potential BRT corridor would increase the ridership potential. Initial examinations of the redevelopment sites show significant development within walking distance to Bergen Avenue, MLK Jr. Drive, and Ocean Avenue. Route 440 and West Side Avenue have some redevelopment within walking distance; however, it is farther away or less development is planned than along the other corridors. This review revealed that greater redevelopment potential exists on the east side of Jersey City. If this potential is realized, it will increase the need for improved bus service and/or BRT.

Land Use

The consultant team used digital geographic data from the New Jersey Department of Environmental Protection (NJDEP) to tabulate land use within the overall study area, as well as the individual corridors where BRT is being considered. The data used in this analysis were remotely sensed and date to 2007, and are the most recent data available at the state level. Land within the study area was divided into a wide array of 29 separate uses. Due to the urban nature of the study area, 53.7 percent (2,288.9 of 4,263.57 total acres) of the study area is classified as a residential, high density, or multiple dwelling usage.

Tables outlining the land use of the overall study area, as well as the individual corridors, are included in the Land Use section of the Appendix. These include an inventory of the land use within the study area, as well the land uses within a quarter-mile (i.e., a five-minute walk) from the roadway centerlines of the individual BRT corridors.

In addition to the land use information and maps provided in the Land Use section of the Appendix, the consultant team developed a list of the significant community features along each BRT corridor considered.

1) **Avenue C Corridor:**
   a) HBLR Station at Ave. C and 8th St.
   b) Downtown commercial district, including a Shoprite, a CVS, a public library, and other non-residential uses from 24th St. to 31st St.
   c) Bayonne Municipal Complex
2) **Kennedy Boulevard Corridor (Bayonne and Jersey City):**
   a) Bayonne Park
   b) Washington Elementary School
   c) Audubon Park
   d) New Jersey City University
   e) Henry Snyder High School
   f) Saint Peter's College
3) **NJ 440 Corridor:**

   a) Shopping Plaza near the intersection of 440 and US 1/9
4) **West Side Avenue Corridor:**
   a) Proximate to New Jersey City University (near Culver Ave.)
   b) HBLR Station near West Side Ave. and Claremont Ave.
   c) Downtown commercial district to the north of the HBLR
5) **Bergen Avenue Corridor:**
   a) Audubon Park
   b) Henry Snyder High School
   c) Jersey City Public Library
   d) Joseph H. Brensinger School
   e) Martin Luther King Jr. School
   f) Commercial area from McGinley Square to Journal Square
6) **MLK Jr. Drive Corridor:**
   a) Shopping center at Kearney Ave.
7) **Ocean Avenue Corridor:**
   a) Ezra L. Nolan Middle School
   b) Fred W. Martin Elementary School

Initial reviews of the land use suggested that each corridor, except Route 440, has potential for high demand due to high residential densities. Using the mapping in the Land Use section of the Appendix that highlights the land uses within a five-minute walk of the potential BRT corridors, one can visualize areas of potential demand. The consultant team assessed each corridor for BRT ridership potential using this data along with the origin-destination data and current ridership.

Study Area Demographics & Characteristics

Table 9 outlines key demographic, economic, commuter, and housing characteristics for both Bayonne and Jersey City. The data was taken from the US Census Bureau and is up to date as of 2011.

Household income is fairly similar in the two cities, although the poverty rate is significantly higher in Jersey City and its population is somewhat younger. The ethnic breakdown of the communities is also significantly different: Bayonne's population is more than 76 percent white, compared to only 35 percent in Jersey City. The four major ethnic groupings (Hispanic American, African American, Asian American, and European American) are all well represented in Jersey City. More information about environmental justice issues related to the corridor that ranked highest for BRT potential is provided in Chapter 7.

As previously noted in the regional model data, public transit use is higher in Jersey City than Bayonne, although both communities exhibit public transit use that is significantly above the national average, indicating a strong market for improvements to bus service (note that the mode shares in Table 9 are for *work* trips, whereas the lower transit mode shares previously cited in Table 8 are for *all* trip purposes)..

Table 9: Demographics of Jersey City and Bayonne

Measure	Jersey City	Bayonne
Demographics		
Total Population	247,876	63,120
Male	122,435	30,127
Female	125,441	32,993
Median Age	32.9	39.3
Percent Hispanic or Latino	27.8%	19.8%
Percent Black or African American	25.8%	9.2%
Percent Asian	24%	7.2%
Percent White	35%	76.4%
Economic Characteristics		
Unemployment	10.3%	8.6%
Median Household Income	$57,520	$55,714
Mean Household Income	$80,702	$71,001
Percent of Families below Poverty Level	13.9%	10.2%
Commuter Characteristics		
Drive Alone	33.1%	56.4%
Carpool	7.9%	9.1%
Public Transportation	46.2%	22.8%
Walk	8.3%	8.5%
Housing Characteristics		
Number of Housing Units	110,000	28,000
Percent Vacant	13%	9%
Percent Single-unit Structures	15.6%	22.8%
Percent In Multi-Unit Structures	84.3%	76.8%
Percent Mobile Homes	0.1%	0.4%

Source: U.S Census Bureau, 2011

Chapter 6: Corridor Analysis and Ranking

Overview

Chapter 6 documents the process used to evaluate the highest ranking BRT corridors in the study area. This analysis builds on information presented in Chapter 5, which summarized and analyzed existing conditions from traffic, transit, and land use perspectives. Following a summary of the potential BRT corridors that were considered and evaluated, this chapter then presents the corridor screening evaluation, the results of a public meeting held in Jersey City and an online survey, and the identification of the highest ranking corridors for which a more detailed BRT plan is presented in Chapter 8.

Potential Bus Rapid Transit Corridors

As noted in Chapter 5, the list of potential BRT corridors includes two in Bayonne and six in Jersey City (Table 10).

Table 10: Primary Corridors Considered

Bayonne Corridors	Jersey City Corridors
Avenue C	Route 440
Kennedy Boulevard	West Side Avenue
	Kennedy Boulevard
	Bergen Avenue
	MLK Jr. Drive
	Ocean Avenue

As discussed in Chapter 5, each corridor has unique characteristics in terms of width, traffic, transit service, and other factors. In addition, corridors are not mutually exclusive of each other and interact in various key ways.

Other than Kennedy Boulevard operating as a continuous corridor from Bayonne to Jersey City (and beyond), there is a discontinuity in the street network roughly at the boundary between the two cities, in the vicinity of where Route 440 and the Newark Bay Extension of the NJ Turnpike (I-78) cross the study area from east to west. As a result, the actual BRT route to be pursued would need to connect the two communities along a logical path, which could require the use of different connecting streets depending on the routing that is selected.

A number of the Jersey City corridors do not continue all the way to the municipal boundary between Bayonne and Jersey City, and would therefore require the use of one or more connecting streets to access the potential corridors in Bayonne. As examples, West Side Avenue in Jersey City would likely require the use of a connection along Danforth Avenue and Kennedy Boulevard in order to access either of the Bayonne corridors, while use of the Ocean Avenue or MLK Jr. Drive corridors would require a connection on either Kennedy Boulevard or Avenue C using one of a number of potential options. Similarly, Bergen Avenue splits off from Kennedy Boulevard in the Greenville section of Jersey City, so any Bergen Avenue alignment would presumably require using a portion of Kennedy Boulevard.

In the same manner, at the northern end of the study area, not all of these alignments connect directly to Journal Square, other than Kennedy Boulevard and Bergen Avenue (which reconnect at the northern end to form Journal Square). Route 440 and West Side would likely require the use of Sip Avenue to connect to Journal Square, while Ocean Avenue requires the use of Grand Street and Summit Avenue, and MLK Jr. Drive connects to Bergen Avenue via Monticello Avenue and Fairmount Avenue. In addition, the existing bus services along these corridors do not all currently connect to Journal Square, although the assumption for this study is that a BRT service would provide a connection to Journal Square, either by rerouting existing service or by adding new service.

Finally, it is easy to envision a BRT route that uses multiple corridors even within one municipality. As an example, a service could operate along MLK Boulevard for a segment in the southern portion of Jersey City (for example, to access the Hudson-Bergen Light Rail system which does not stop at either Bergen Avenue or Kennedy Boulevard), and then shift over to Bergen Avenue to continue north into Journal Square. Additional “hybrid” options of this type were also viable and were given due consideration during the development and evaluation of the list of potential corridors.

Online Survey

Through the course of this study, the consultant team developed an electronic survey that was posted on the study web-site to gather information from a larger group of the traveling public. The team also developed a media advisory to publicize the survey and worked with members of the TAC to get the word out to community groups, educational institutions, and other stakeholders regarding the survey and encourage them to complete a response. Over 400 responses were received, representing a diverse range of locations, travels modes, and general opinions on bus service and other transportation issues. 83% of the respondents to the survey work or attend school within Hudson County, indicating a more local set of responses as compared to the overall commuter market within the study area. Respondents had the option of indicating their residence location, but since only half of the respondents provided this information, it is difficult to draw any definitive conclusions about where survey respondents live overall.

Survey respondents were generally transit users, both for commuting travel to work and school and for overall travel. Of those who work or attend school within Hudson County, 35% of respondents travel to work or school by bus and 17% travel by rail, which together are significantly higher than the overall mode split for the study area (29% of respondents in this group travel by car). The mode split is similar among respondents who work outside Hudson County—30% use the bus, 19% travel by rail, and 25% travel by car—and for general travel—30% travel by bus, 17% by rail, and 29% by car.

The survey also asked respondents to identify where they travel to most frequently in their daily lives, regardless of travel mode. Some of the most common answers include:

- Journal Square, both as a destination and to transfer to PATH service.
- Downtown Jersey City.
- The post-secondary institutions located within the study area, including NJCU, St. Peter's University, and Hudson County Community College.
- Public and private high schools within the study area in both Jersey City and Bayonne.
- Jersey City Heights.
- New York City.
- Shopping destinations, including the Newport Mall, Secaucus outlets and malls, McGinley Square, and various grocery stores.

Beyond these specific destinations that appear many times, there are a large number of other destinations that appear once or twice in the survey, which is consistent with the information received during the first round of public meetings that there is tremendous variety in the destinations that study area stakeholders are trying to reach.

Respondents were also asked what problems they experience with bus service within the study area. The most common responses were that service is slow (reported by 29% if respondents) and unreliable (reported by 24% of respondents).In written comments, respondents also expressed concerns about safety and frequency of service, and the responses to this question also revealed that a number of the respondents do not currently use the bus, indicating that the survey reached a wide range of travelers. When asked about the improvements that they would like to see to bus service in the future, 24% asked for faster service and 22% asked for more reliable service, with additional requests for better customer information (15%) and improved local connections (14%).

Respondents were also given the opportunity to learn more about the potential features of BRT and indicated which ones they believe are most important within the study area. The most popular improvements were real-time arrival information, bus priority treatments that reduce delays, and providing limited-stop or express service. Overall, respondents appeared to believe that all BRT improvements are relatively important, although they were least enthusiastic about off-board fare collection/fare prepayment (which may also indicate a lack of familiarity with that BRT feature).

The full results of the online survey are attached in the Outreach section of the Appendix.

Bayonne Corridor Analysis

In Bayonne, Kennedy Boulevard was selected as the highest ranking corridor early in the stakeholder discussions, based on the following factors:

- Greater separation from existing Hudson-Bergen Light Rail rapid transit service, which runs along the eastern edge of Bayonne's residential areas;
- Direct, continuous connection to the Jersey City street grid, which simplifies the service pattern;
- Existing bus service that connects to Journal Square, as well as other Jersey City destinations that are important to travelers from Bayonne (e.g. New Jersey City University);
- Input from the first public meeting in Bayonne, which indicated greater interest in improving travel along Kennedy Boulevard than on Avenue C; and,
- Strong preference expressed by the City of Bayonne.

Jersey City Corridor Analysis

The six Jersey City corridors were more formally analyzed and compared. It was assumed that the westbound service would originate in Bayonne and continue on Kennedy Boulevard until at least 56th Street in Bayonne, in the general vicinity of the Bayonne-Jersey City municipal boundary. Figure 16 shows the existing bus routes in Jersey City, while Figure 17 shows the conceptual BRT routings that use the most direct alignment to connect from Bayonne to Journal Square via each trunk corridor, as described in Table 11.

.

Table 11: Jersey City Corridor Routing Options

Trunk Corridor	Southern Connection to 56th Street and Kennedy Boulevard	Northern Connection to Journal Square
Route 440	Kennedy Boulevard to W. 63rd ramp to Route 440	Route 440 to Sip Avenue to Journal Square
West Side Avenue	Kennedy Boulevard to Danforth Avenue to West Side Avenue	West Side Avenue to Sip Avenue to Journal Square
Kennedy Boulevard	Continue on Kennedy Boulevard	
Bergen Avenue	Kennedy Boulevard to Bergen Avenue	Bergen Avenue to Journal Square
MLK Jr. Drive	Kennedy Boulevard to McAdoo Avenue to MLK Jr. Drive	MLK Jr. Drive to Monticello Avenue to Fairmount Avenue to Bergen Avenue to Journal Square
Ocean Avenue	56th Street to Avenue C to Merritt Street to Ocean Avenue	Ocean Avenue to Grand Street to Summit Avenue to Sip Avenue to Journal Square

Figure 16: Jersey City Bus Routes

Figure 17: Direct Connections from Bayonne to Journal Square via Trunk Corridors

Demand Patterns

As presented in Chapter 5, the O-D data from the NJRTM-E model showed that the largest number of transit trip origins within the Greenville section of Jersey City was in the west central subarea (about 20,700 daily trips) followed by the East Central subarea (about 15,000 daily trips). The west subarea was third highest (9,400) and the east subarea was the lowest with 4,600 trips. Table 12 shows the subareas that are served by each bus corridor. It was assumed that a subarea is "served" if a route alignment is located within one block of the *boundary* of the subarea. All of the subareas, except for the East subarea of Jersey City's Greenville section, are served by more than one corridor. West Central and East Central subareas of Jersey City's Greenville section and the Jersey City subarea are clearly served *better* by some of the corridors than by others. Refer to the analysis in Chapter 5.for the map showing the subareas.

Table 12: Transit Trip Origins Served by Each Corridor

Area Name	West	West Central	East Central	East	Journal Square
Daily transit trip origins	9,400	20,700	15,000	4,600	5,900
Route 440	✓				✓
West Side Ave	✓	✓			✓
Kennedy Blvd		✓	✓		✓
Bergen Ave		✓	✓		✓
MLK Jr. Drive		✓	✓		✓
Ocean Ave			✓	✓	✓

Note: ✓ indicates that a corridor serves that area

The three central corridors—Kennedy Boulevard, Bergen Avenue, and MLK Jr. Drive—would best serve the West Central and East Central subareas, which together have the large majority of transit trip origins within the Jersey City portion of the study area.

In addition to looking at the origin-destination data, the consultant team worked closely with Hudson County to conduct a limited number of boarding and alighting counts on key routes in the study area, including bus route 10 and bus route 119 on Kennedy Boulevard, bus route 87 on MLK Jr. Drive, bus route 6, which serves portions of Ocean Avenue, and bus route 80 on West Side Avenue. These counts provided basic information about demand patterns within the Jersey City portion of the study area, as well as direct validation of the travel times previously calculated from the schedule time points. This data is analyzed in greater detail in Chapter 7, for the highest ranked corridor. Before identifying the highest ranked corridor, however, the data was considered in an overall sense to better understand how demand is spread along the corridor (as opposed to the overall ridership figures available from NJ TRANSIT). One important conclusion from reviewing the collected data was the relatively limited bus ridership within each corridor—most customers travel to or from Journal Square or beyond, with relatively limited mid-route alighting or boardings. The main exception to this is at the post-secondary institutions located within the study area, principally at New Jersey City University and secondarily at St. Peter's University.

The boarding and alighting data collected on these routes is shown in the Transit Data section of the Appendix in the raw form as collected onboard the buses.

Physical Configuration

Table 13 shows the key roadway configuration of the primary section in each corridor. Route 440 is distinctly different from the remaining corridors in that it was designed for high-speed traffic. Pedestrians are not well accommodated on Route 440 because there are no sidewalks and few places where it is possible to cross. Most abutting land uses are a long walk from the roadway. Of the remaining corridors, Kennedy Boulevard is the only other corridor with two travel lanes in each direction for its entire length. Bergen Avenue also has two travel lanes, but only in the section between Montgomery Street and Journal Square. Several of the BRT routings could use parts of Kennedy Boulevard and Bergen Avenue. However, they would also have large stretches with a single travel lane, which limits travel speeds and the ability to pass other vehicles, as well as the potential for improvements such as curb extensions at bus stops.

Table 13: Roadway Configuration of Primary Corridors in Jersey City

Primary Corridor	Curb to Curb Width (ft)	Parking Lanes	Travel Lanes per Direction	Turning Lanes	Posted Speed Limit (mph)	Crosswalks & Sidewalks
Route 440	94	0	2	Yes	40 - 50	Few crosswalks & no sidewalks
West Side Ave	39	2	1	No	25	Yes
Kennedy Blvd	60-65	2	2	Yes[1]	25	Yes
Bergen Ave	36-39[2]	2[2]	1	No	25	Yes
MLK Jr. Drive	35	2	1	No	25	Yes
Ocean Ave	35-41	2	1	No	25	Yes

Notes:

1. Kennedy Boulevard has left turn lanes at some major intersections.
2. West of Clinton Street, the roadway width is 30 ft with parking on one side only; east of Montgomery Street it is 60 feet with two travel lanes in each direction.

Table 14 describes the transit characteristics of each of the corridors. The figures for "weekday bus riders" are approximate, representing the sum of the best available data for the bus routes that use the corridor (note that these do not include data from the boarding and alighting counts, since these are small samples of the total ridership). In the case of Route 1, the ridership figure only includes riders going to Jersey City. The distance from 56th Street and Kennedy Boulevard to Journal Square was measured based on the route described previously. These represent the most direct routes to Journal Square using the primary corridor. As noted in Chapter 5, bus speeds are based on NJ TRANSIT published schedules from time points along the primary roadway, while travel time or speed information for A&C was unavailable.

Table 14: Transit Service and Travel Time on Primary Corridors in Jersey City

Primary Corridor	Bus Route(s)		Weekday Bus Riders	56th & Kennedy to Journal Sq. (mi)	Bus Speed (mph)[1]		Peak Bus Time (min)[2]	Transit Connec.[3]
	Private	NJT			Peak	Off-Peak		
Route 440	440 Shop., Society Hill (A&C)	-	5,856	4.6	n/a	n/a	17	-
W. Side Ave	M&W (A&C)	1, 80	12,225	4.2	8.6	11.3	32-45	HBLR, NJT 1
Kennedy Blvd	Jitneys	10, 119	8,013	3.8	8.5	12.6	27-34	NJT 1
Bergen Ave	Bergen Ave (A&C)	-	4,906	3.7	n/a	n/a	n/a	NJT 1
MLK Jr. Dr	-	87	12,435	3.8	7.7	9.9	26-38	HBLR, NJT 1
Ocean Ave	Rt. 4 (A&C)	6, 81	7,887	4.4	7.7	10.3	30-33	HBLR, NJT 1

Notes:

1. Based on scheduled running time between the Greenville section and Journal Square, as nearly as possible as permitted by the location of time points on the published service schedule.
2. For existing bus service, based on a limited number of ride checks. For Route 440, the estimate is based on the peak-period driving time plus an average of five stops with a delay of 30 seconds per stop.
3. All corridors have existing bus routes that serve Journal Square where connections can be made to PATH and many bus routes.

The corridors were reviewed in terms of major destinations served (Table 15). Not all of the destinations were equally important during this review. The post-secondary schools were particularly important because they can be major transit trip generators, and they are not interchangeable (that is, potential transit customers might substitute among parks, libraries, or shopping opportunities, but not among universities).

Table 15: Major Destinations Served

Primary Corridor	Destination										
	New Jersey Comm. Univ.	St. Peter's Univ.	Hudson County Comm. College	Shopping District	Lincoln Park	Audubon Park	Columbia Park	Arlington Park	McGinley Square	High Schools	Library
Route 440			✓	✓	✓						
West Side Ave	✓	✓	✓		✓		✓				
Kennedy Blvd	✓	✓	✓			✓				✓	✓
Bergen Ave	✓		✓	✓		✓			✓	✓	✓
MLK Jr. Dr			✓	✓					✓	✓	✓
Ocean Ave			✓					✓			

Based on the characteristics presented in Table 13 through Table 15, the consultant team developed relative ratings of each of the corridors on a scale of one to five, with one being the worst and five the best (Table 16). The specific factors considered in the ratings are shown in the notes to the table. These ratings were reviewed with the TAC and were presented to the general public at an outreach meeting, which is detailed in the following pages.

Table 16: Corridor Ratings by Characteristics (1=worst, 5=best)*

	Characteristics					Potential for Improving or Adding			
Primary Corridor	Distance to J. S.	Traffic Flow	Transit Demand	Ped. Cond.	Major Destin.	Bus Bulb	Queue Jump	Signal Priority	Transit Links
Route 440	2	4	3	1	2	1	3	2	2
West Side Ave	3	2	5	5	3	1	1	3	5
Kennedy Blvd	4	3	4	4	4	4	3	4	3
Bergen Ave	5	2	3	5	5	1	1	3	3
MLK Jr. Dr	4	1	5	5	4	1	1	3	5
Ocean Ave	3	2	4	5	4	1	1	3	3
Notes:	Distance from 56th St. to Journal Square	Estim. current bus speed.	Existing bus riders (may not all be in corridor).	Sidewks., crosswks., & vehicle speed.	Number of large institutions.	Need width to pass stopped bus at extended curb.	Use existing turn lane or create new from parking lane.	Works best w/ signals not saturated and queue jumpers.	Opport. to connect to other transit services.

** At this level of analysis, the ratings do not consider the impact of a BRT service on existing local bus service, and potential ridership from redevelopment.*

Corridor Selection

Based on the corridor analysis and discussion with the TAC, the consultant team narrowed the corridor choices to Kennedy Boulevard, Bergen Avenue, and MLK Jr. Drive for the following reasons:

- They are the three highest scoring corridors within the Jersey City study area, based on the evaluation matrix in Table 16.
- They represent the most direct routes to Journal Square.
- They serve most major destinations.
- They serve the largest areas of transit trip demand within Jersey City.
- Although the Route 440 corridor could provide a faster trip, it does not serve many destinations, bypasses most residential areas, and does not accommodate pedestrians well.

Advantages

Qualitatively, there are advantages present on each of the three corridors.

- **Kennedy Boulevard** has the greatest width and thus the largest potential for BRT-type physical improvements, and is the only one of the three that serves both New Jersey City University (NJCU) and St. Peter's University.
- **MLK Jr. Drive** has the greatest existing transit ridership and most frequent existing bus service, as well as a direct connection to the Hudson-Bergen Light Rail.
- **Bergen Avenue** is the most direct route, directly serves McGinley Square, and is also served by high frequency bus service that is viewed positively by customers.

Disadvantages

There are some disadvantages that make the three corridors less suitable for BRT.

- While **Kennedy Boulevard** has a wider right-of-way, traffic volumes are higher and the corridor is widely seen as a through travel route within and beyond Hudson County, leading to heavier and more regional use. Although current bus service is frequent on weekdays, it is less frequent on weekends, partly because NJ TRANSIT only recently started providing service on this corridor after a private operator ceased service.
- **MLK Jr. Drive** is the narrowest corridor of the three, with very limited space even for queue jumps, much less continuous segments of bus lane. This corridor also does not serve NJCU and St. Peter's University, which have been identified as key local and regional destinations.
- **Bergen Avenue** is also fairly narrow (other than the segment north of McGinley Square), creating challenges in establishing physical priority measures. In addition, service on Bergen Avenue is operated by a private bus company (A&C), which could significantly increase the complexity of planning and implementing a BRT service.

Jersey City Outreach Meeting

After consulting with the Technical Advisory Committee, the decision was made to advance the public meeting in Jersey City—originally scheduled to take place once final recommendations had been developed—to an earlier date to allow the public to provide greater input into the corridor decision making. At this meeting, the three potential corridors were presented to the public as part of both an open house and a formal presentation to receive direct feedback from corridor stakeholders.

On March 12, 2013, Hudson County hosted a public meeting at the Mary McLeod Bethune Life Center in Jersey City, in partnership with the City of Jersey City. The meeting format included an initial open house where members of the public reviewed the three corridors under consideration, discussed the project goals, learned about BRT features and examples, and interacted informally with members of the consultant team. This was followed by a formal presentation that covered the project background and goals, the features of BRT, and the corridors under consideration, including the scoring table shown in Table 16. Following the presentation, attendees had another opportunity to ask further questions or discuss aspects of the presentation in an open house format. The meeting was attended by approximately 15-20 people, including elected officials, municipal representatives, and community members, with the largest attendance during the formal presentation and immediately afterward.

The minutes from this outreach session are attached in the Outreach section of the Appendix, along with the presentation delivered by the consultant team (which includes the same graphics that were used for the open house displays). The feedback received from the general public covered all three corridors under consideration, including the following key points:

- There is clearly an overall desire to improve the quality of bus service in the study area, whether through BRT or other improvements. Members of the public indicated that they hope to see overall improvements to the bus system on multiple corridors. Although this study is focused on studying BRT on a single corridor, supporting recommendations that address the need for broader transit service improvements can be proposed for further analysis in subsequent study.
- The current service on the Bergen Avenue bus line (operated by A&C coach) is seen positively by the community, with frequent service that riders feel they can depend on. Although this could be seen as an argument for BRT improvements, there was also some sentiment to not make changes to a service that is already operating successfully.
- There is clearly strong demand for bus service on the MLK Jr. Drive corridor, which is currently the busiest bus corridor in the study area.
- Kennedy Boulevard was considered to be a strong corridor for bus service within Jersey City, but there was also some sentiment that traffic congestion on this corridor is inhibiting the speed and reliability of bus service.

Overall, the feedback from the public meeting did not indicate a tremendously strong preference for a BRT corridor, although there was support and concern regarding each of the three corridors still under consideration. There was clear agreement about the need for improved bus service within the study area, and an indication that there is likely support for BRT, as long as it is developed in the proper manner with input from the community.

The consultant team also explained that this study represents an initial feasibility analysis of BRT within the study area, but will not produce a final plan or implementation program. There will be additional opportunities for public engagement, if the decision is made to move forward with further development of BRT service within the study area based on the results of this study.

Final Corridor Evaluation

While the public meeting in Jersey City provided valuable input into the study and confirmed that there is clear interest in and desire for enhancements to bus service, including BRT, it did not indicate a strong preference between the corridors under consideration. Based on this general input, the decision regarding corridor selection returned to input from the TAC, the analysis of existing transit, road, and travel data, and the technical expertise of the consultant team.

As previously noted, there are advantages and disadvantages to each of the corridors under consideration, and it is certainly possible that a successful BRT service could be developed on any of these corridors. However, based on the results of the corridor screening evaluation, the feedback from the public meeting, and input from the TAC, the Kennedy Boulevard corridor was highest ranked as the most feasible corridor for the possible development of BRT service, based on the evaluation measures presented in Table 16 and the following factors:

- **Physical Right-of-Way:** Of the urban arterials within the study area (excluding Route 440, which is configured and operates like a suburban arterial), Kennedy Boulevard has the widest right-of-way, providing the clearest opportunity for meaningful physical BRT improvements such as bus lanes, queue jumps, and bus bulbs (which also create greater opportunities for raised boarding areas).

- **Destinations Served:** Members of the public and of the TAC repeatedly mentioned the importance of serving certain key destinations along the corridor, with a particular emphasis on the post-secondary institutions such as St. Peter's University and New Jersey City University. Kennedy Boulevard provides the most direct access to these destinations, as well as key high school destinations.

- **Service Simplicity:** One of the important goals of BRT is to provide a simple service that is easily understood by customers, including those who do not regularly use bus service. Given the strong preference expressed by the City of Bayonne for service along Kennedy Boulevard, there are benefits to continuing that service all the way north to Journal Square along Kennedy Boulevard, particularly since Kennedy Boulevard is generally well recognized as a critical intra- and inter-county arterial.

- **Origin-Destination Patterns:** Based on the analysis of the origin-destination data provided by the NJTPA, the West-Central subarea has the highest transit use within the study area, followed by the East-Central subarea. The Kennedy Boulevard corridor travels through the middle of the West-Central corridor, and portions are directly adjacent to the East-Central subarea. As a result, Kennedy Boulevard appears to serve a high demand transit market in the Jersey City portion of the study area. Although there are both arguments for and against expanding transit service in locations with existing high demand as opposed to locations where there may be latent demand, given that this will be Hudson County's first experience with BRT service, it is advisable to start where demand is high (as has been done with GoBus in Greater Newark and Select Bus Service in New York City) to prove the concept. If the initial corridor is successful, then it may subsequently make sense to expand to less mature transit markets.

Hybrid Corridor Analysis

In discussions with the TAC and at the public meeting, the idea of hybrid corridors was raised, particularly some form of hybrid combining portions of Kennedy Boulevard and Bergen Avenue. In concert with the selection of Kennedy Boulevard as the primary BRT corridor, the consultant team also analyzed a limited number of potential hybrid corridors within Jersey City, particularly a routing that follows Kennedy Boulevard from Bayonne into Jersey City, passes New Jersey City University, and then uses Montgomery Street to transition from Kennedy Boulevard over to Bergen Avenue, passing through McGinley Square at the intersection of Montgomery Street and Bergen Avenue. After serving McGinley Square, the route would travel along Bergen Avenue to Sip Avenue to enter the bus terminal at Journal Square. While this alternative would provide direct service to McGinley Square and commercial portions of Bergen Avenue, after consideration of bus circulation, transit demand, and service simplicity, the consultant team determined that this hybrid route was **not currently desirable** for the following key reasons:

- **Route Location:** Throughout this portion of the study area, Kennedy Boulevard and Bergen Avenue are located in relative proximity to each other, less than a quarter mile apart. This is generally considered to be a reasonable walking distance for transit customers, so a BRT service along Kennedy Boulevard would also serve this section of Bergen Avenue, particularly for the retail/commercial areas in and around McGinley Square.

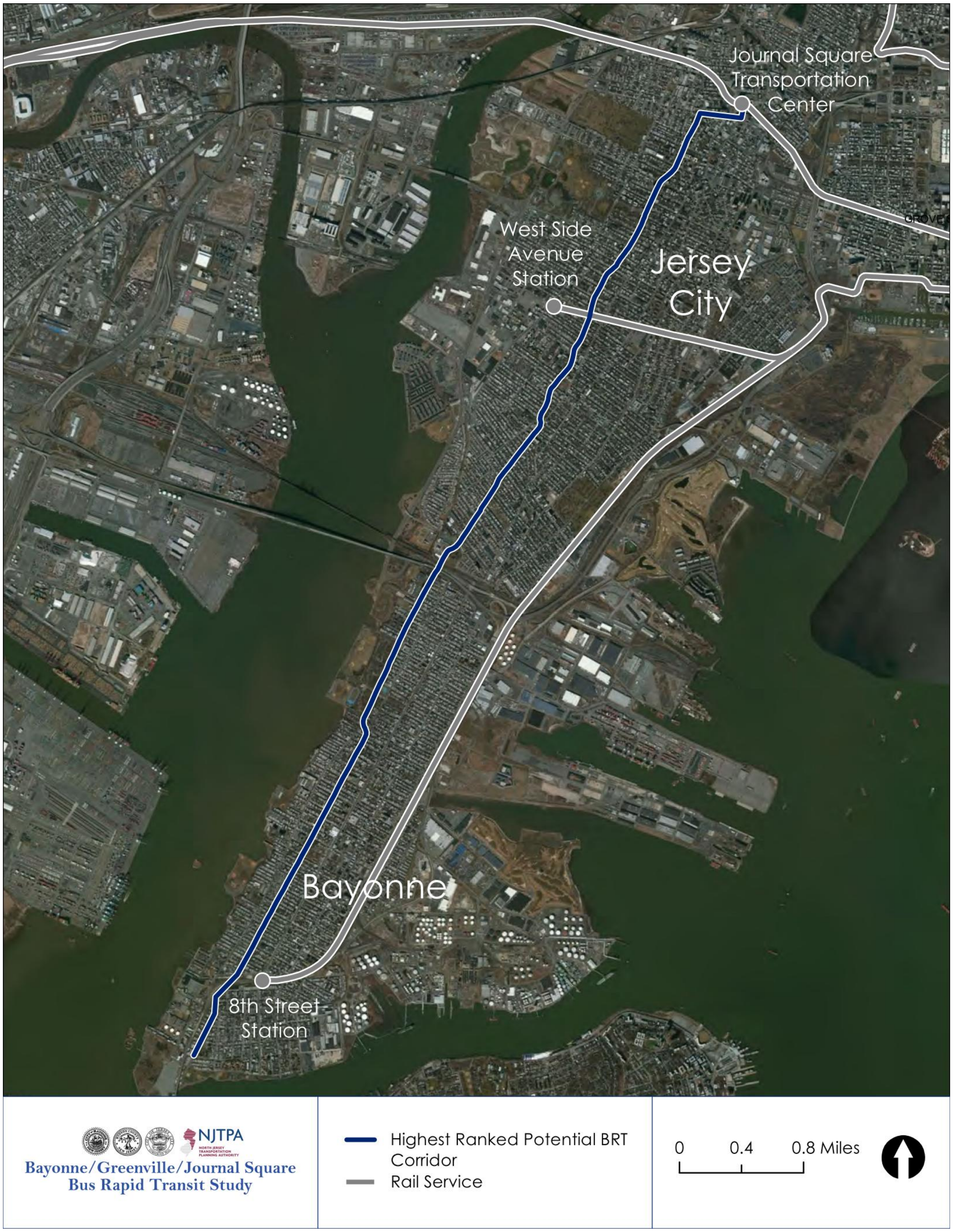
- **Circulation Patterns:** Although Bergen Avenue provides a slightly more direct access to the Journal Square bus terminal via Sip Avenue, moving from Kennedy Boulevard to Bergen Avenue via Montgomery Street would require two additional turns. Although this is far from being a fatal flaw, these additional turns will add some delay as compared to a direct routing. In addition, this does raise a potential adjustment to the current routings of bus route 10 and bus route 119 that could be implemented as part of a BRT project. Currently, bus route 10 continues on Kennedy Boulevard past Sip Avenue to where the northbound routes must turn south onto Bergen Avenue for a block to access Sip Avenue and the entrance to the bus terminal, creating a circuitous routing. Under a BRT proposal, the northbound bus route 10 could be modified to turn from Kennedy Boulevard directly onto Sip Avenue to access the Journal Square bus terminal.

Highest Ranked Corridor

Figure 18 shows the potential BRT routing along Kennedy Boulevard, which has been selected to progress into more detailed planning and development because it is the highest ranked corridor. It is important to note that this represents a general routing based on current service, local terminal points, and the results of the corridor screening. Minor adjustments may be made to this corridor going forward, but this represents the basic structure of the suggested routing.

Beginning from the south this routing starts in southern Bayonne at 1st Street, then travels north on Kennedy Boulevard through Bayonne and into Jersey City, staying on Kennedy Boulevard until Sip Avenue. At Sip Avenue, the route turns east towards Journal Square, entering the Journal Square bus terminal from the Sip Avenue entrance. The southbound route would be a mirror image, traveling from the Journal Square bus terminal to 8th Street Station along the same set of streets

Figure 18: Kennedy Boulevard – Highest Ranked Potential Bus Rapid Transit Corridor



Chapter 7: Analysis of Highest Ranked Corridor

Overview

As detailed in Chapter 6, Kennedy Boulevard is the highest ranked corridor based on the comparative analysis of the other viable BRT corridors identified in the early stages of the study. This chapter analyzes this corridor in greater detail, as a basis for developing the recommended package of improvements, for further future analyses, presented in Chapter 8.

Corridor Description

The corridor begins at the far southern end of Bayonne, adjacent to Mayor Dennis Collins Park that abuts the Kill Van Kull. This recommended package involves adding BRT service that overlays the existing bus route 10, which follows Kennedy Boulevard from this point north to Journal Square in Jersey City. Moving northbound, Kennedy Boulevard passes under Route 440 and the access ramps to the Bayonne Bridge, through the central part of Bayonne. Through this area, the land use is primarily residential, with ground floor retail and commercial uses in a number of locations, particularly at corners and key intersections. At approximately 36th Street, Kennedy Boulevard transitions to the west, taking over the alignment used by Avenue A south of that point, with Avenue B more or less taking over the prior alignment of Kennedy Boulevard. The alignment then passes adjacent to Bayonne Park, a large open space that abuts Newark Bay, and then continues northward through primarily residential areas. After passing underneath both the Newark Bay Extension of the New Jersey Turnpike and Route 440, the corridor reaches the Jersey City municipal boundary at 63rd Street, which is also a major access point to Route 440.

The alignment continues north into the Greenville section of Jersey City, crossing Danforth Avenue. At Van Nostrand Avenue, Kennedy Boulevard moves slightly to the west, with Bergen Avenue splitting off to the east. The corridor then passes adjacent to the campus of New Jersey City University and then crosses over the alignment of the Hudson-Bergen Light Rail West Side Avenue Branch, although there is no station at this location due to the grade differential. Farther north, Kennedy Boulevard then crosses Communipaw Avenue, which serves as one of the few east-west roadways that crosses both the Hackensack and Passaic Rivers and provides connection farther inland. The corridor then passes through the campus of St. Peter'sUniversity, and then within a block of McGinley Square, before proceeding into Journal Square to connect to the Journal Square Transportation Center via the integrated bus terminal.

Throughout its length, Kennedy Boulevard is generally 60 feet wide, other than some minor variations where it is wider to accommodate turning movements. The speed limit throughout the corridor is 25 miles per hours, and traffic signals are located at a majority of the intersections.

The stops on the NJ TRANSIT Route 10 vary in location, but are generally located two blocks apart, with some cases where stops are located on adjacent blocks and other cases where the separation is greater than two blocks. In general, bus stops are paired on either side of the street, but in some locations, stops are offset or a stop in one direction does not have a pair in the other direction. As noted in Chapter 5, bus route 10 operates on a 7- to 10-minute headway during the weekday peak periods and a 20-minute headway at other times. In addition to bus route 10, Kennedy Boulevard is also served by NJ TRANSIT Route 119, which provides service all the way to the Port Authority Bus Terminal in New York City, but only during the peak period. Because it is intended to operate as more of an express service to New York, the route has policies in place to minimize use for local travel. Specifically, riders who board northbound within the study area are not allowed to exit the bus before or at Journal Square, while riders are not allowed to board the southbound bus at or south of Journal Square. Bus priority measures in the JFK Boulevard corridor would have benefits not only to a new service, but also to the existing 10 and 119 routes.

Boarding and Alighting Analysis

Ride checkers rode four northbound and four southbound trips, all in the morning, two of the southbound and one of the northbound trips were in the base period (20-minute headways) and the rest were in the peak period (10-minute or better headways). The checks took place on Wednesday, January 30, and Thursday, January 31, 2013. Checkers tallied all boardings and alightings and also recorded beginning and end times and many time points. A detailed listing of boardings and alightings by individual stop for these trips combined is shown in the Transit Data section of the Appendix.

A summary of passenger activity grouped by major area (Bayonne, Greenville, and Journal Square) is shown in Table 17. As compiled for the table, Journal Square includes activity at three stops: Kennedy Boulevard at Sip Avenue, Kennedy Boulevard midblock between Tonnelle Avenue and Bergen Avenue, and Journal Square Transportation Center. More than half the riders are going to or coming from Journal Square (including Sip Avenue). Although only about 1/6 of the riders are traveling within Bayonne (i.e., have Bayonne as *both* an origin and a destination), about half the total riders are coming to or going from Bayonne (i.e., have Bayonne as *either* an origin or a destination).

Table 17: Summary of Passenger Activity on Bus Route 10 by Location

Area	On	% On	Off	% Offs
Inbound to Journal Square				
Bayonne	89	50%	24	14%
Greenville	88	50%	42	24%
Journal Square*	0	0%	110	63%
Grand Total	177	100%	176	100%
Outbound to Bayonne				
Bayonne	34	17%	93	46%
Greenville	72	36%	107	54%
Journal Square*	95	47%	0	0%
Grand Total	201	100%	200	100%

*Includes three stops: Kennedy Boulevard at Sip Avenue, Kennedy Boulevard midblock between Tonnelle Avenue and Bergen Avenue, and Journal Square Transportation Center.

The most heavily used bus stops, other than the Journal Square terminus, were, in descending order:

1. Audubon-NJCU[1]
2. 30th Street
3. Sip Avenue
4. Pamrapo/63rd Street
5. 57th Street
6. Communipaw Avenue

The maximum load point northbound to Journal Square was at Duncan Avenue, while the maximum load point southbound to Bayonne was at Ege Avenue.

Table 18 summarizes key statistics for each of the eight trips checked. There was a wide variation in the number of stops made and the maximum load among the different trips checked. Although only two trips departed late, every trip checked took longer than the scheduled time (although not necessarily than the allowed time, when end-of-route recovery time is included). This ridecheck data was also used as part of the running time analysis.

[1] There is a midblock stop in both directions near the NJCU campus. There is also a stop at the edge of the campus on Audubon Avenue. The midblock stop, although clearly marked, was not included in the official NJT stop listing, and thus it was not on the checker sheets (nor on the stop announcement). Therefore data for this stop includes activity at both of those stops; it was not possible to disaggregate the location based on the data collected.

Table 18: Summary of Trips Checked

Date	Departure		Arrival	Running Time		Minutes Late	Stops Made	Max Load	Sched.
	Sched.	Act.	Actual	Actual	Sched.				
Northbound									
1/30/2013	6:38	6:38	7:20	0:42	0:38	0:04	23	24	Peak
1/31/2013	7:45	7:44	8:43	0:59	0:44	0:15	36	56	Peak
1/30/2013	8:30	8:30	9:18	0:48	0:44	0:04	26	19	Peak
1/31/2013	10:00	10:00	10:45	0:45	0:37	0:08	33	26	Base
Southbound									
1/31/2013	6:30	6:32	7:06	0:34	0:29	0:05	27	11	Peak
1/30/2013	7:25	7:32	8:23	0:51	0:38	0:13	43	42	Peak
1/31/2013	9:00	9:01	9:43	0:42	0:36	0:06	38	43	base
1/31/2013	9:20	9:27	10:12	0:45	0:38	0:07	26	32	base

Time-Delay Analysis

Additional ridechecks were conducted to estimate the sources of bus delay. Checkers rode seven southbound and seven northbound trips with a laptop computer running a macro-enabled spreadsheet that permits easy recording of different types of time stamps such as door open, door close, bus depart stop, bus stopped for signal, and bus stopped for other reason. Table 19 summarizes the data recorded for each trip, which is made up of the following components:

- Running time is the time from door closed at the start point to door open at the end point.
- Dwell time is the time between door open and bus departure summed for all stops on the trip.
- Merging time is the portion of dwell time that is between door close and bus departure, summed for all trips on the route.
- Signal delay is the sum of each time period in which the bus decelerates for a signal and when it begins to move again.
- Other potential sources of delay include double-parked cars, emergency vehicles, and construction, but these were minimal on these trips, to the point where that delay is not reported.

Table 19: Time and Delay Trip Results

Date	Scheduled		Actual Running Time	Dwell Time	Merging Time	Signal Delay	Stops Made	Delay Events
	Departure	Running Time						
Southbound								
5/15/2013	6:55	36	0:40:39	0:04:52	0:01:08	0:12:14	26	27
5/23/2013	7:50	38	0:47:59	0:10:28	0:02:03	0:13:58	32	33
5/15/2013	10:40	36	0:45:06	0:08:33	0:01:26	0:11:29	29	32
5/14/2013	15:40	42	0:56:27	0:12:55	0:01:19	0:13:36	37	37
5/23/2013	15:50	42	0:46:12	0:08:31	0:00:58	0:09:51	34	24
5/23/2013	17:23	42	0:35:47	0:04:09	0:00:20	0:10:48	18	22
5/14/2013	17:45	42	0:42:14					
Northbound								
5/23/2013	7:00	44	0:39:41	0:07:54	0:01:40	0:11:01	24	26
5/15/2013	7:38	44	0:57:34	0:12:23	0:02:15	0:18:02	42	48
5/23/2013	8:50	44	0:34:08	*				
5/15/2013	11:40	37	0:48:07	0:06:45	0:01:14	0:18:39	20	36
5/23/2013	16:40	39	0:35:03	0:04:04	0:00:29	0:11:22	18	23
5/14/2013	16:40	39	0:36:48	0:04:16	0:00:54	0:08:40	24	25
5/14/2013	18:40	39	0:37:33	*			22	

* Incomplete data collected for these trips

All but two of the southbound trips required more time than scheduled to complete. However, only two of the northbound trips needed more time than scheduled. The trips that took more than 40 minutes to complete generally made more than 25 stops and often more than 30. The one exception was the 11:40 trip on May 15, 2013; this trip had several less common delays, including a wheelchair passenger.

Table 20 provides calculated data based on the summary statistics for each trip, to further break down the activities on the route. Time in motion is actual running time minus dwell time and signal delay. Speed in motion is the route length of 7.3 miles divided by time in motion. Average speed is the route length of 7.3 miles divided by actual running time. Acceleration/ deceleration is the number of stops made multiplied by an assumed delay of 20 seconds per stop, based on published estimates of the time lost to deceleration and acceleration using detailed data on an urban route of similar length.[2] This figure is based on the time lost to decelerate before and then accelerate following each bus stop. There is also a fixed delay per

[2] Tri-Met Route 14. Robert L. Bertini and Ahmed M. El-Geneidy, "Modeling Transit Trip Time Using Archived Bus Dispatch System Data." Journal of Transportation Engineering. January/February 2004 DOI: 10.1061/~ASCE!0733-947X~2004!130:1~56!

stop consisting of the time needed to open and close doors and to merge into the travel lane (if necessary), independent of passenger boarding and alighting time. This fixed delay is included in dwell time in this calculation. Cruising time is time in motion minus the estimated acceleration/deceleration time. Cruising speed is the route length divided by cruising time; these estimated speeds are all in the range of 26 to 34 mph. This is a reasonable estimate, given that neither buses nor other motorized traffic observe the posted speed limit of 25 mph in this corridor.

Table 20: Time and Delay Calculated Statistics

Date	Scheduled Departure	Time in Motion	Speed in Motion (mph)	Average Speed (mph)	Acceleration/ Deceleration Time	Cruising Time	Cruising Speed (mph)
5/15/2013	6:55	0:22:23	19.6	10.8	0:08:00	0:14:23	30.5
5/23/2013	7:50	0:23:33	18.6	9.1	0:10:00	0:13:33	32.3
5/15/2013	10:40	0:23:17	18.8	9.7	0:09:00	0:14:17	30.7
5/14/2013	15:40	0:27:50	15.7	7.8	0:12:00	0:15:50	27.7
5/23/2013	15:50	0:27:50	15.7	9.5	0:11:00	0:16:50	26.0
5/23/2013	17:23	0:20:50	21.0	12.2	0:06:00	0:14:50	29.5
5/14/2013	17:45			10.4			
5/23/2013	7:00	0:20:46	21.1	11.0	0:08:00	0:12:46	34.3
5/15/2013	7:38	0:27:09	16.1	7.6	0:14:00	0:13:09	33.3
5/23/2013	8:50						
5/15/2013	11:40	0:22:43	19.3	9.1	0:06:00	0:16:43	26.2
5/23/2013	16:40	0:19:37	22.3	12.5	0:06:00	0:13:37	32.2
5/14/2013	16:40	0:23:52	18.4	11.9	0:08:00	0:15:52	27.6
5/14/2013	18:40						

Running Time Analysis

The peak-period operating plan on bus route 10 calls for eight buses per hour (headway of 7.5 minutes) with a cycle time of 105 minutes and a requirement of 14 buses. The base-period plan has three buses per hour (headway of 20 minutes) with a cycle time of 120 minutes and a requirement of six buses.

Table 21 incorporates running time data from both the January ridechecks and the May time and delay study. Although most trips exceeded their scheduled running time, only four of the 19 trips checked exceeded the allowed time—the time available before the bus is needed to start the next trip, which is equivalent to scheduled running time plus recovery time. (The 7:38 northbound departure that required 57 minutes of running time did not actually exceed its allowed time because that trip is scheduled to return to the depot. However, adjacent scheduled departures have an allowed time of 55 minutes, which it would have exceeded.) These four trips all made more than 30 stops, and two of them made more than 40 stops. All the other peak-period trips checked made fewer than 30 stops. None of the base-period trips came close to exceeding their allowed time of 60 minutes, with the exception of the 3:40 PM southbound departure, which had a running time of 57 minutes.

Based on the limited amount of data collected, it seems that the allowed time is insufficient during the peak period, but too generous in the off-peak period.

Table 21: Running Time Analysis

Date	Scheduled Dept	Stops Made*	Actual Running Time	Scheduled Running Time	Allowed Time
Northbound					
1/30/2013	6:38	23	0:42	38	55
5/23/2013	7:00	24	0:39	44	60
5/15/2013	7:38	42	0:57	44	55**
1/31/2013	7:45	36	0:59	44	55
1/30/2013	8:30	26	0:48	44	50
1/31/2013	10:00	33	0:45	37	60
5/15/2013	11:40	20	0:48	37	60
5/23/2013	16:40	18	0:35	39	50
5/14/2013	16:40	24	0:37	39	50
Southbound					
1/31/2013	6:30	27	0:34	29	45
5/15/2013	6:55	26	0:40	36	42
1/30/2013	7:25	43	0:51	38	50
5/23/2013	7:50	32	0:48	38	43
1/31/2013	9:00	38	0:42	36	60
1/31/2013	9:20	26	0:45	38	60
5/15/2013	10:40	29	0:45	36	60
5/14/2013	15:40	37	0:56	42	60
5/23/2013	15:50	34	0:46	42	60
5/23/2013	17:23	18	0:36	42	55**

*Excluding Journal Square.
**Bus goes out of service, but adjacent trips have an allowed time of 55 minutes.

Analysis of Service Options

Several service strategies were considered for Kennedy Boulevard corridor bus service. The two basic options are an overlay service, where there is a limited-stop express on top of base local service, and stop streamlining, which reduces the number of designated stops in order to improve reliability for all trips and amenities at all stops. These strategies are described in greater detail below. At this feasibility level of analysis, these service options are meant to illustrate standard approaches to implementing BRT and are not recommendations. Development and implementation of a specific service option would be led by the operating agency, involve public and stakeholder outreach, and occur at a future stage of planning.

Scenario 1 Overlay Service

An overlay service option would provide a new layer of express or super-express service along the corridor in addition to the existing service, which would remain unchanged. This type of service would skip most stops along the corridor, and could be set up to stop at a particular interval of stops (such as every fifth stop) or to only stop at key activity centers, destinations, and transfer points with other bus lines. Following the model of GoBus25, four trips per hour would be provided (15-minute headway) in the peak period only, with no limited stop service middays, evenings, or weekends. An additional service would require six new buses, which would cost $3 million, as shown in **Table 22**.

The service would operate for six peak hours per weekday, 252 days per year, which would increase annual operating costs by $635,000, based on the current loaded hourly rate for the contract to provide bus routes 10 and 119, operated by Academy Bus.

Table 22: Sample Cost of a 20-Stop Overlay Service

Service Characteristic	Value	Units
Headway	15	Minutes
One-way running time	40	Minutes
Recovery	5	Minutes
Cycle time	90	Minutes
Bus requirement	6	Buses
Hours of service per weekday	6	Hours/weekday
Vehicle hours per weekday	36	Vehicle hours/weekday
Annualized	9,072	Vehicle hours/year
Operating cost at $70/contract hour	$635,040	Dollars/year

In addition, the six buses required to operate the route would have a capital cost of approximately $3 million.

Scenario 2 Stop Streamlining

The other basic option for converting an existing bus corridor into BRT operation is to streamline the existing service by reducing very closely spaced designated stops. Four streamlining options were considered:

- 2A: Reorganize stops to meet a target average of 1,200 feet between stops, reducing the number of stops from 56 to 32.
- 2B: Provide the same streamlining plan as in option 2A, but permit additional stops for the southwestern two miles of the route.
- 2C: Limited Stop Bus Route 119 and Maintain Current Bus Route 10 Local Service
- 2D: Limited Stop Bus Route 10 (Maintain Some Local Route 10 Peak Trips and all Off-Peak trips)

Option 2A:

Option2A streamlines both bus routes 10 and 119 by consolidating designated stops. The goal in this option is to reduce the average spacing from the existing 7.5 per mile (700 feet) to about 4.4 per mile (1,200 feet). This would reduce the number of stops in each direction (excluding the end points) from 54 to 30, a 44-percent reduction. The final stop selection would be made following stakeholder participation. Passenger amenities would be provided at all of the stops following consolidation. Traffic signal priority would also be used, as in the previous concepts.

The proposal would rationalize the existing inconsistent stop spacing. There are currently many places where there is an additional stop between two stops in one direction with no counterpart in the other direction, specifically:

- 14th Street (northbound only)
- Andrew Street (northbound only)
- 21st Street (northbound only)
- 25th Street (southbound only)
- 46th St (southbound only)
- 50th St (northbound only)
- Fowler Avenue (northbound only)
- Stegman Parkway (southbound only)
- Oxford Ave (southbound only)

- Clinton Ave (northbound only)
- Jewett Ave (northbound only)

Although there are numerous BRT projects that consist of long-distance limited stop service overlaid on existing local routes (Metro Rapid in Los Angeles, GoBus 28 in Newark, certain Select Bus Service routes in New York City), there are also examples of BRT that consist of streamlining of local bus service. The major examples of these, Cleveland, Boston, and Kansas City, are listed in Table 23.

Table 23: Examples of BRT Streamlining Projects

Name	Healthline - Euclid Ave	Main Street MAX - Orange Line	Silver Line, Washington St	Kennedy Blvd (Proposed)
Location	Cleveland	Kansas City	Boston	Jersey City & Bayonne
Route Length (miles)	7.1	5.5	2.5	7.3
Stops per Direction, Including Terminals	33	18	12	32
Average Spacing (feet)	1,172	1,708	1,200	1,200
Before Running Time (minutes)	46	24	18-20	30-60
After Running Time (minutes)	36	18	15-18	
Percent Reduction in Running Time	21.7%	25.0%		
Before Main Route Daily Boardings	8,900	3,200	7,600	6,561
Before Corridor Daily Boardings	14,300		7,600	8,013
After Main Route Daily Boardings	16,200	6,000	14,900	
After Corridor Daily Boardings	21,200		14,900	
Change in Riders	48%	88%	96%	
Change in Service Hours (After vs. Before)*	2%		40%	
Intermediate Timepoints	2	4	0	
Signal Priority	Yes	Yes	Yes	

* Silver Line: service miles, weekdays

In all of these cases, the BRT service is the only bus service in the corridor; there is no local service (other than routes overlapping for a few blocks). The Euclid Avenue corridor in Cleveland had more than 100 local bus stops previous to the BRT project, which was similar to the 113 stops on the existing bus route 10 service. In Boston, the previous local bus service had stops spaced every other block—about 600 feet between on average. Despite the increase in stop spacing, ridership increased strongly following implementation of all of these projects. There were other project elements that were instrumental to these realized ridership gains, including bus lanes, new vehicles, increased frequency and span of service, signal priority, and improved stops and amenities—but the increased walking time due to fewer stops did not prevent the very dramatic growth in ridership.

Option 2B:

A second streamlining option modifies option 2A by having more closely spaced stops on the least used part of the route. Reducing the number of bus stops available reduces travel time for all those on board the bus, but may increase walking time for those getting on or off. In areas where demand is light, such as the southern end of bus route 10, the average load on board is much lower than on the northern end. In addition, with fewer people getting on and off, there is a greater likelihood that a stop is made to serve only one customer at a time, even after reducing the number of available stops. In that case, the bus might as well stop at the place preferred by that single customer.

The ridecheck data revealed a significant drop-off in passengers south of 30th Street in Bayonne. Therefore it may be appropriate to provide closer stop spacing, and fewer amenities per stop, on the two miles of the route south of 30th Street. A similar plan is used for the Main Street MAX in Kansas City. Half of the buses continue in local service, with closely spaced stops, for an additional 3.5 miles beyond the southern end of the 5.5-mile trunk portion of the route.

Option 2C:
Currently bus route 119 operates on the same alignment as the bus route 10 south of Sip Avenue, making the same stops. Per NJ TRANSIT policy, only passengers intending to travel beyond Journal Square are permitted to use the route.[3] This policy on average reduces the number of stops made in the overlapping portion of the route because passengers not going beyond Journal Square are not supposed to cause the bus to stop. In this proposed option, the following changes would be made:

- Leave bus route 10 unchanged to provide local bus service at all times.
- Identify express stops and restrict bus route 119 to only these stops. It is necessary to limit the number of stops to an average of about three per mile in order to consistently provide significantly faster running time than the local service and therefore to attract new riders. This is similar to the spacing used on MTA New York City Transit limited-stop routes in New York City Transit, such as the M5 and M101.

[3] Northbound, the rule is “Passengers in Bayonne and in Jersey City along Kennedy Blvd. south of Journal Square must travel either to New York or points north of Journal Square.” Southbound, the rule is “Passengers may not board bus at Journal Square or points south towards Bayonne.”

- Change the service policy so that bus route 119 may be used for trips that do not extend beyond Journal Square.
- Maintain the same bus route 119 service plan (headways of 20 to 30 minutes), no midday or weekend service.
- Provide improved passenger amenities, only at the 20 limited stops.
- Provide active and passive traffic signal priority for all buses in the corridor.

This service concept is similar to the NJ TRANSIT Route 25/GoBus25 service, in which the former provides local service and the latter provides limited-stop service in the peak period only.

Option 2D:
Convert some of the existing peak-period bus route 10 trips into limited-stop trips that would have stop spacing of three per mile. Bus route 119 would remain unchanged. The base bus route 10 service of three trips per hour (20-minute headway) would be maintained during the peak period. The additional peak trips, beyond three per hour, would be converted into limited stop trips. During the shoulder of the peak there are currently six trips per hour, so three would become limited stop trips and three would remain locals, each service on a 20-minute headway. During the peak of the peak, currently there are eight bus route 10 trips per hour: five would become limited stop trips (12-minute headway) and three would remain locals. Stop spacing will be three per mile to make the limited significantly faster than the local. In addition, improved passenger amenities would be provided at the 20 limited stops, and there would be traffic signal priority for all buses in the corridor.

As a point of comparison, New York City Transit (NYCT) operates many limited-stop routes, but typically these routes, considering both local and limited service, have 10 to 13 trips per hour or more. Similarly, the NJ TRANSIT GoBus 25 corridor has more frequent service. During the 7:00 to 8:00 AM peak hour there are 13 scheduled trips, four of which are GoBus 25 and the remaining nine of which are regular bus route 25 local service. (During the 8:00 to 9:00 AM hour, there are 19 trips, four of which are GoBus.)

In addition, NJ TRANSIT could adopt a late-night “request a stop” policy. For example, NYCT currently permits riders to request a stop at any location where it can be made safely from 10:00 PM to 5:00 AM. Following an analysis of ridership and stops made, it is possible that this policy could be permitted on bus route 10 earlier (9:00 PM or even 8:00 PM) without negatively impacting service quality.

In summary, this concept would consist of:

- Target bus stop spacing averaging 1,200 feet between 30th Street and Journal Square (5.3 miles);
- Target bus stop spacing averaging 700 feet between 1st Street and 30th Street (two miles).
- Late night stops at any safe location, all along the route.

Late night stops could be implemented as part of option 2A as well.

Review of Options

A summary of the major features of the overlay options compared to the streamlining options is shown in

Table 24. The overlay option preserves local stops at all times, but only provides faster, improved service during the weekday peak hours. For most of the service week (middays, evenings, and weekends), the streamlining option would provide improved frequency. In the overlay option, stop amenities would only be improved for the subset of riders who use designated limited stops, whereas in the streamlining option, all riders would see stop improvements such as shelters and benches. The average walk time to or from a stop would increase just over one minute from 1.9 minutes to 3.3 minutes in the streamlining options. In the overlay option, customers who chose to walk an average of almost five minutes to a limited stop would have improved amenities, but those who used other stops would have no improvements. The overlay option has the following additional issues:

- Except in the peak period, there would be few improvements to bus route 10, which operates seven days a week and which can experience service quality problems outside of the peak period.
- The large number of local bus stops (more than 100) would make improvements to all of them an inefficient use of resources.

Table 24: Overlay Compared to Streamlining

Option	Designated Stops		Running Time (Minutes)		Stop Improv.	Average/ Maximum Walk Time (Minutes)		Midday, Evening, Weekend Service
	Express (Peak Only)	Local	Peak (Ltd.)	Local		Peak Express	Off Peak	
Overlay Service and Streamlining Option 2C and 2D	22	56	35-40	40-55	Express stops only	4.7/6.1	1.9/4.4	No change
Streamlining Option 2A and 2B	32	32	40-45	35-45	All stops	3.3/4.4	3.3/4.4	Increased frequency

* Along Kennedy Boulevard, at three feet per second. Walk times are estimated calculations from JFK Boulevard and do not represent walk times from adjoining neighborhoods.

The service frequency in the peak period for the overlay option and streamlining option 2C and 2D varies, as shown in Table 25. The limited stop headways would be 20 minutes in the peak direction in option 2C; and also 20 minutes in 2D, improving to 12 minutes in the single peak hour. In the overlay service, the limited stop headway could be 15 minutes, depending on the number of stops selected. In the overlay service and option 2C, the time savings of the limited stop service would have to outweigh the combined disadvantages of additional walking time and lower service frequency. Riders whose closest stop was a limited stop would probably simply take the first bus to come. Riders who would have to walk an additional distance to a limited stop would risk missing a local trip while walking to the stop. However, waiting at the local stop would risk missing a limited stop trip that happens to arrive before the local trip.

Moreover, if more riders prefer the local bus option, local bus trips could become overcrowded. Some additional concerns with option 2C's Limited Stop Bus Route 119 service are:

- There would be a significant increase in walk time for existing New York-bound riders not living near the limited stops. The primary market for bus route119 is commuters heading to Manhattan, and they may live anywhere along the route. Riders tend to be spread out rather than concentrated in a few key stops, particularly for peak-period and peak-direction service.
- Permitting local riders to use the New York bus will complicate fare collection, since there will be increased variations in zone options. Because the New York buses do not require exact change, it could also slow down fare collection.
- Because there would be no additional service added, to the extent that existing riders switch from bus route 10 to bus route 119, there could be crowding on the latter. Adding additional buses to route 119 would be inefficient, given that they operate all the way to PABT.

For option 2D, the limited-stop service is more attractive because it is as frequent, or more so, than the local. However, for many riders there would be the same dilemma in that walking to a limited stop could mean missing a local trip and therefore waiting longer.

Table 25: Comparison of Sub-options

Option		Headway (Minutes)			Annual Operating Cost Increase	Potential Problems
		Express (Peak Only)	Local Peak	Off Peak		
Overlay Service Scenario 1	Additional limited stop service	15	7.5-10	20	$635,000	Additional expense; dilemma of walking to express or not
2A & 2B	Stop streamlining	n/a	7.5-10	15	No change	Additional walk time
2C	Route 119 limited stop	20-30	7.5-10	20	No change	Negative impacts on NYC customers
2D	Convert some peak route 10 to limited	12-20	20	20	No change	Dilemma of walking to express stop or not; overcrowded peak local
All Options	All Options	n/a	n/a	n/a		Potential diversion of riders from parallel routes (Routes 80/81/87/88/1/A+C

						Bus/HBLR). Those routes may require analysis for cost effectiveness.

Overlay Service Scenario 1 has the potential to have fewer operating challenges than Scenarios 2C and 2D, since it adds new service. However, it still provides a limited-stop route that is less frequent than the local service. In addition, Overlay Service Scenario 1 would require a significant increase in operating costs.

The major disadvantage of the streamlining options is increased walking times for some passengers. The proposed spacing would average 1,200 feet between stops but range from 800 to 1,600 feet between stops. Thus on average the maximum walk (from a point evenly between stops) would be 600 feet, with a range of 400 to 800 feet. At a walking time of four feet per second, this means that the *maximum* walk from any point on Kennedy Boulevard to the nearest bus stop would take 2.4 minutes in a typical location and in the worst case (only at a few places along the route) 3.5 minutes. At a slower walking speed of three feet per second, the average maximum walk would be 3.2 minutes and the worst case would be 4.6 minutes. Almost all points on Kennedy Boulevard would be within a three-minute walk. Note that walk times are estimated calculations from the transit stops (in this case, JFK Boulevard) and do not represent walk times from specific points within adjoining neighborhoods.

Nevertheless, a potential barrier for implementation of a streamlined service is the potential for some customers to see a bus stop right near their house, or destination, disappear and who would thus be required to walk two or three blocks to the nearest stop. These customers are likely to notice this additional walk more than they would notice the potential benefits of less waiting and faster travel once they are on the bus. Moreover, they may view these additional benefits as more theoretical and the loss of a bus stop as more certain. Targeted outreach and easy-to-understand outreach media are critical to addressing the concerns of riders who would be required to walk further to a stop in any service option. The operators listed in Table 23 have successfully implemented such a service and could provide useful guidance on this subject. However, even with this increase in walking time there are the following benefits of the streamlining options:

- Improve the reliability of service (and/or improve efficiency) by reducing the variability of trip times. The time and delay studies described above identified the variation in the number of trips made as a major source of the variability in running time.
- Reduce the amount of signal delay, which will decrease with fewer stops made.

- Concentrate customers sufficiently to justify the deployment of key passenger amenities at all stops such as shelters, benches, lighting, information panels, and variable message displays.
- Improve the ride quality by reducing the jerkiness—and frustration—associated with frequent stopping.

The choice of a streamlining stops option needs to be further vetted with existing and potential riders in Bayonne, Greenville, and elsewhere through a series of public meetings. The pros and cons to the elimination of stops for bus route 10 or bus route 119 requires further study and feedback from existing and potential future riders in the study area.

Traffic Operations Analysis

The analysis of traffic operating conditions along the Kennedy Boulevard corridor within the project limits included several steps. Jersey City and Bayonne were consulted to determine which intersections along the corridor most contributed to traffic delay. It was determined that the intersections in Table 26 would provide a representative snapshot of the more critical and congested intersections within the Kennedy Boulevard corridor.

Table 26: Kennedy Boulevard Intersections for Traffic Operations Analysis

Bayonne	Jersey City
North Street	Danforth Avenue
W. 32nd Street	Communipaw Avenue
W. 63rd Street	Montgomery Street
	Slip Avenue

Within the City of Bayonne, Kennedy Boulevard experiences less traffic than within Jersey City, and many of the cross streets are one-way. As a result, it was concluded that the key intersections within Bayonne should be at the beginning, middle and end of the City limits, with two-way cross streets. The study intersections were also chosen due to their relatively high traffic volumes, geometric complexity, and signalized operation.

Existing Traffic Volumes

Once the study locations were identified, a traffic counting program was commissioned. The counting program included conducting new manual turning movement counts at all study locations. The traffic count data is provided in the Traffic Analysis section of the Appendix. Traffic volume counts from June 2012 at the Montgomery Street intersection were available from Hudson County Engineering because this location was part of a recent traffic signal upgrade design. All other locations were counted in May 2013. The results of these traffic counts for the AM and PM peak hours are in the Traffic Analysis section of the Appendix. During the AM peak hour, traffic is heavier in the northbound direction, while in the PM peak traffic is heavier in the southbound direction. Eastbound traffic is heaviest in the AM peak hour at Communipaw Avenue and Sip Avenue.

Future Traffic Volumes

Once the existing traffic volumes were established, a background growth factor was applied to project future traffic conditions when the proposed BRT system would potentially be operational. It was determined that a five-year horizon would be appropriate for the purposes of this study. This does not suggest that the BRT system needs to be fully operational within that time frame for the results of this analysis to be valid; it just establishes a future traffic condition that could be expected when the BRT system is running. The NJDOT background growth rate table was consulted to determine the appropriate factor. (The table provides traffic annual traffic growth rates for rural and urban conditions of each roadway functional classification (e.g. Interstate, minor arterial, local street, etc.) for each New Jersey county to help forecast baseline future traffic conditions.) Based on this table, a one percent per year growth rate was applied to the existing traffic volumes to establish the future 2018 conditions. The Traffic Analysis section of the Appendix identifies the associated traffic volumes for the 2018 AM and PM peak hours, respectively.

Highway Capacity Analyses

The methods contained in the Highway Capacity Manual were used to provide the resultant traffic assessment. The results are expressed in terms of Level of Service (LOS) and average vehicle delay, with LOS A having a minimal delay and LOS F having a significant delay. Highway capacity analyses were performed using the Synchro Version 7 software in accordance with the procedures contained in the current Highway Capacity Manual.

Key factors that dictate traffic flow were identified at the study locations. Some of these factors include roadway geometry and lane configurations, traffic controls, traffic volume characteristics, and traffic signal operation. Within the Jersey City portion of the study area, the traffic signals along Kennedy Boulevard are generally sequenced such that there are defined bandwidths of green intervals resulting in adjacent signals to all turn red at the same time. According to Jersey City staff, this allows for mid-block cross traffic and pedestrians to cross Kennedy Boulevard more easily.

The following describes each intersection and the results of the associated capacity analysis. Kennedy Boulevard is considered the major roadway and is oriented in a north-south direction; all intersecting roadways are considered to run in an east-west orientation. Table 27 at the end of this section illustrates the results of the capacity analyses. Additionally, the Traffic Analysis section of the Appendix includes a Google Earth image and capacity worksheets for each intersection.

1. **Kennedy Boulevard and North Street:** At this intersection, Kennedy Boulevard provides two lanes in each direction with no dedicated turn lanes. North Street provides one lane in each direction with a dedicated left-turn lane along the westbound approach. The traffic signal operates on a three-phase, 90-second background cycle, with a lead westbound advance phase that provides a protected/permitted left-turn movement on North Street. The results of the analysis reveal no significant operational problems along either roadway.

2. **Kennedy Boulevard and West 32nd Street:** At this intersection, Kennedy Boulevard provides two lanes in each direction with no dedicated turn lanes. West 32nd Street forms the stem of this T-intersection and provides one lane in each direction. The traffic signal operates on a two-phase, 90-second background cycle. The signal remains on pedestrian recall during the weekday, 7:00 AM to 7:00 PM time period. The results of the analysis reveal no significant operational problems along either roadway.

3. **Kennedy Boulevard and West 63rd Street:** At this intersection, Kennedy Boulevard provides two lanes in each direction with a double-left turn bay in the northbound direction. West 63rd Street forms the stem of this T-intersection and provides a dedicated left-turn lane with a double right-turn bay. The traffic signal operates on a three-phase, 100-second background cycle, with a lead northbound advance phase that provides a protected only left-turn movement on Kennedy Boulevard. The results of the analysis reveal no significant operational problems along either roadway. The northbound double-left lane is heavily traveled as it provides access to Route 440, but appears to have ample green time to service the vehicular demand.

4. **Kennedy Boulevard and Danforth Avenue:** At this intersection, Kennedy Boulevard provides two lanes in each direction with dedicated left-turn lanes along both approaches. Danforth Avenue provides one lane in each direction, where all movements can be made. The traffic signal operates on a three-phase, 100-second background cycle, with protect/permitted left-turn phasing for Kennedy Boulevard. The signal remains on pedestrian recall during the weekday, 7:00 AM to 7:00 PM time period (this forces the signal into a pre-timed operation, where pedestrians do not need to push a button to receive a walk indication). The results of the analysis reveal no significant operational

problems along either roadway.

5. **Kennedy Boulevard and Communipaw Avenue**: At this intersection, Kennedy Boulevard provides two lanes in each direction with dedicated left-turn lanes along both approaches. Communipaw Avenue provides two lanes in each direction with no dedicated turn lanes. The traffic signal operates on a four-phase, 100-second background cycle, with protect/permitted left-turn phasing for Kennedy Boulevard and an eastbound lead advance along Communipaw Avenue. The signal remains on pedestrian recall during the weekday, 7:00 AM to 7:00 PM time period. The results of the analysis reveal several noteworthy issues:
    a. During the AM peak hour, the northbound through lanes operate at LOS C, with 30 seconds of average delay and the calculated 95th percentile queue is 350 feet. At the same time, the eastbound and westbound approaches are operating at LOS D, with 95th percentile queues approaching 300 feet.
    b. During the PM peak hour, the southbound through lanes operate at LOS C, with almost 35 seconds of average delay and the calculated 95th percentile queue is 375 feet. At the same time, the northbound left-turn lane and westbound approach are operating at LOS E and LOS D, respectively.
    c. It would be difficult to improve the operating conditions with signal timing adjustments that favor northbound traffic during the AM peak hour and southbound traffic during the PM peak hour because the signal timing is already configured to favor Kennedy Boulevard.

6. **Kennedy Boulevard and Montgomery Street**: At this intersection, Kennedy Boulevard provides two lanes in each direction with dedicated left-turn lanes along both approaches. Montgomery Street provides one lane in each direction with dedicated left-turn lanes along both approaches. The traffic signal operates on a four-phase, 100-second background cycle, with protected left-turn phasing for both roadways. The signal remains on pedestrian recall during the weekday, 7:00 AM to 7:00 PM time period. The results of the analysis reveal several noteworthy issues:
    a. During the AM peak hour, the northbound through lanes operate at LOS D, with 43 seconds of average delay and the calculated 95th percentile queue is 375 feet. At the same time, the westbound left-turn lane operates at LOS E.
    b. During the PM peak hour, the southbound through lanes operate at LOS C, with 31 seconds of average delay and the calculated 95th percentile queue is 325 feet. At the same time, the westbound left-turn lane operates at LOS F.
    c. It would be difficult to improve the operating conditions with signal timing adjustments that favor northbound traffic during the AM peak hour and

southbound traffic during the PM peak hour because the signal timing is already configured to favor Kennedy Boulevard.

7. **Kennedy Boulevard and Sip Avenue**: At this intersection, Kennedy Boulevard provides two lanes in each direction with dedicated left-turn lanes along both approaches. Sip Avenue provides one lane in each direction with dedicated left-turn lanes along both approaches. The traffic signal operates on a four-phase, 100-second background cycle, with protect/permitted left-turn phasing for both roadways. The signal remains on pedestrian recall during the weekday, 7:00 AM to 7:00 PM time period. The results of the analysis reveal several noteworthy issues:
    a. During the AM peak hour, the northbound through lanes operate at LOS B (almost C), with 19.9 seconds of average delay and the calculated 95th percentile queue is 221 feet. At the same time, the eastbound through lane operates at LOS F.
    b. During the PM peak hour, the westbound left-turn lane (travel lane for buses) operates at LOS C, with 26 seconds of average delay and the calculated 95th percentile queue is 80 feet. It is noted however that the adjacent through lane operates at LOS D, with 39 seconds of average delay and the calculated 95th percentile queue is 270 feet.
    c. It would be difficult to improve the AM operating conditions with signal timing adjustments that favor northbound approach because the signal timing is already configured to favor Kennedy Boulevard. However, it may be possible to reduce delay associated with the westbound left-turn movement during the PM peak period by shifting some green time to that approach.

Table 27: Level of Service and Average Vehicle Delay

Intersection	Future Conditions with BRT								
	Lane Group	AM Peak				PM Peak			
		V/C Ratio	Delay	LOS	95th Percentile Queue	V/C Ratio	Delay	LOS	95th Percentile Queue
North St & Kennedy Blvd *(Signalized)*	EB-LTR	0.51	42.7	D	112	0.54	41.8	D	120
	WB-L	0.28	27.9	C	65	0.45	31.1	C	98
	WB-TR	0.14	17.2	B	42	0.13	25.1	C	55
	NB-TR	0.16	5.6	A	57	0.14	6.3	A	51
	SB-LTR	0.11	6.0	A	37	0.16	6.6	A	56
W. 32nd St & Kennedy Blvd *(Signalized)*	EB-LTR	0.23	25.3	C	80	0.13	23.6	C	51
	WB-LTR	0.16	18.9	B	49	0.32	23.5	C	94
	NB-LTR	0.39	6.4	A	105	0.27	5.2	A	61
	SB-LTR	0.23	6.5	A	67	0.35	7.5	A	111
W. 63rd St & Kennedy Blvd *(Signalized)*	EB-L	0.59	50.3	D	138	0.72	50.7	D	210
	EB-R	0.07	13.1	B	13	0.01	19.7	B	3
	NB-L	0.69	45.1	D	170	0.64	48.0	D	133
	NB-T	0.18	4.8	A	71	0.16	6.6	A	70
	SB-TR	0.29	17.5	B	125	0.53	19.6	B	214
Danforth Ave & Kennedy Blvd *(Signalized)*	EB-LTR	0.59	34.5	C	253	0.66	36.4	D	277
	WB-LTR	0.49	32.1	C	177	0.65	38.3	D	237
	NB-L	0.21	8.0	A	44	0.26	7.7	A	35
	NB-TR	0.60	21.0	C	323	0.36	16.6	B	141
	SB-L	0.14	10.0	A	18	0.16	11.8	B	33
	SB-TR	0.35	17.2	B	119	0.53	21.9	C	217
Comminipaw Ave & Kennedy Blvd *(Signalized)*	EB-LTR	0.86	40.3	D	300	0.49	26.2	C	154
	WB-LTR	0.77	42.6	D	230	0.83	45.5	D	280
	NB-L	0.42	18.7	B	73	0.89	66.3	E	188
	NB-TR	0.86	30.1	C	344	0.75	20.3	C	259
	SB-L	0.20	18.6	B	30	0.18	17.2	B	25
	SB-TR	0.65	27.4	C	269	0.84	34.7	C	377
Montgomery St & Kennedy Blvd *(Signalized)*	EB-L	0.53	53.3	D	110	0.48	51.4	D	97
	EB-TR	0.59	43.4	D	204	0.58	42.5	D	199
	WB-L	0.81	72.3	E	213	1.01	109.8	F	288
	WB-TR	0.41	35.1	D	163	0.69	45.1	D	338
	NB-L	0.11	38.6	D	11	0.22	41.7	D	24
	NB-TR	0.78	42.7	D	372	0.71	39.1	D	356
	SB-L	0.64	67.4	E	116	0.55	57.2	E	74

Intersection	Future Conditions with BRT								
	Lane Group	AM Peak				PM Peak			
		V/C Ratio	Delay	LOS	95th Percentile Queue	V/C Ratio	Delay	LOS	95th Percentile Queue
	SB-TR	0.55	20.3	C	256	0.72	30.4	C	321
Sip Ave & Kennedy Blvd *(Signalized)*	EB-L	0.42	25.8	C	112	0.48	27.7	C	105
	EB-TR	1.01	80.2	F	544	0.74	42.8	D	317
	WB-L	0.33	24.9	C	52	0.41	25.9	C	79
	WB-T	0.46	33.8	C	197	0.63	38.6	D	270
	NB-L	0.24	13.4	B	28	0.38	20.9	C	40
	NB-TR	0.70	19.9	B	221	0.54	16.7	B	165
	SB-L	0.70	29.6	C	98	0.51	17.2	B	79
	SB-TR	0.57	20.9	C	264	0.72	24.7	C	366

Conclusions

The following conclusions are based on the traffic data and analysis conducted for this project:

- The existing signal timing generally favors Kennedy Boulevard since it is the major street.
- The majority of locations that were studied have no significant operational deficiencies.
- As Kennedy Boulevard gets closer to the Journal Square area, specifically Communipaw Avenue northward, some delays along Kennedy Boulevard were identified. However, these delays are not unreasonable (LOS D at worst).
- Since the study locations were chosen specifically as the most critical locations, it is concluded that the remaining intersections within the project corridor should be less congested.
- The coordination of traffic signals through Jersey City provides green bands that allow "blocks" of traffic to proceed during that time. Although this strategy does serve pedestrians and cross traffic reasonably well, it encourages speeding because the faster a vehicle travels, the more intersections can be crossed before reaching a red signal. Additionally, both directions of Kennedy Boulevard receive approximately the same green bands. In the future development of BRT plans for Kennedy Boulevard, consideration should be given to whether this signal coordination strategy is most effective, both for buses and for other roadways users.

Environmental Justice Analysis

To understand the context for the highest ranked corridor in terms of Environmental Justice (EJ), the consultant team analyzed US Census data to identify EJ populations within the study area and adjacent to Kennedy Boulevard. This analysis was done based on the Environmental Protection Agency's Region 2 (which includes New Jersey) guidelines for identifying Community of Concern (COC) demographics that indicate EJ areas that should be given additional consideration. Based on these guidelines, if demographic analysis indicates areas with minority or low-income populations above these cutoffs, then the COC is considered to be a potential EJ area:

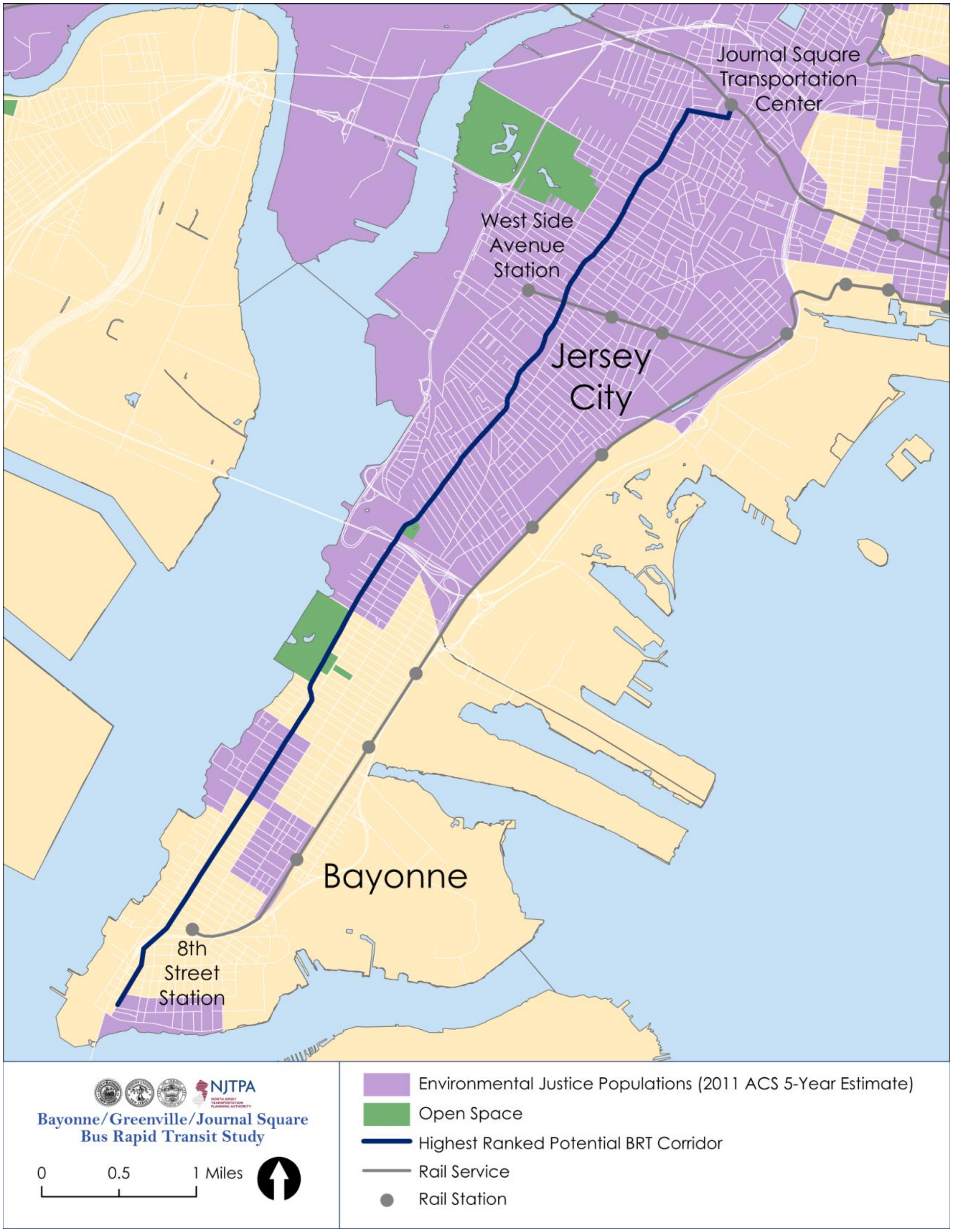
- Cutoff for minority population [4] (urban area): 48.52 percent minority
- Cutoff for low-income populations [5] (urban area): 18.58 percent low-income

The consultant team identified tract-level minority and poverty data using 2011 American Community Survey (ACS) five-year estimates, the most recent available from the Census Bureau. Figure 19 shows the EJ populations in Jersey City and Bayonne, including both minority and low-income populations. This figure shows pockets of EJ populations in Bayonne but a greater coverage throughout Jersey City. Note that ACS data is presented at the Census tract level. Census tracts cover larger geographic areas than Census blocks. While block-level data is preferred to tract-level data for EJ population analysis, the most recently available minority and poverty block-level data is from the 2000 Census and is considerably out of date.

This high-level analysis clearly indicates that there are EJ populations within the study area, and the impact of BRT on these areas will need to be considered carefully during future phases of project planning. Although arterial BRT projects of the type being analyzed in this study generally have limited impacts on local communities and are considered beneficial to low-income and minority populations that tend to be regular users of public transportation, these questions and issues will need to be analyzed in greater detail in future planning and design to better understand the specific impacts and benefits.

[4] EPA's Office of Environmental Justice has defined the term "minority" for EJ purposes to include Hispanics, Asian-Americans and Pacific Islanders, African-Americans, and American Indians and Alaskan Natives.
[5] This term is used interchangeably with "poverty," indicating households living below the defined poverty level within their community.

Figure 19: 2011 Environmental Justice Populations (Minority and Low-Income)



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Chapter 8: Recommendations

Overview

Chapter 8 presents the recommendations for implementing BRT on the Kennedy Boulevard corridor, describing the BRT features recommended for the highest ranked corridor, along with the next steps that could lead to project implementation. The recommended package is presented in terms of the features that are highly recommended for implementation, but it is important to acknowledge that certain other features may be worthy of inclusion based on more detailed project planning and design. In addition, development and implementation of specific service options would be led by the operating agency, involve additional public and stakeholder outreach, and occur at a future stage of planning. As a result, the designation of the recommended package is intended to provide guidance as to which features and elements are most likely to have the greatest impact on the bus operations problems that have been identified on the corridor, but is not intended to completely preclude those features that received a ranking of medium or low.

Initial Priority Ranking of Potential Bus Rapid Transit Features

Based on the results of the analysis of the Kennedy Boulevard corridor presented in Chapter 7 and the range of potential BRT features described in Chapter 3, the consultant team developed a priority ranking of these features into High, Medium, and Low priority recommendations. At this point, the recommendations do not completely preclude the future implementation of any specific measure, but the priorities shown in Table 28 are intended to highlight those BRT features that are likely to have the biggest impact on the bus service issues identified in Chapter 7.

Table 28: Initial Priority Ranking of Potential Bus Rapid Transit Features

Potential BRT Feature	Speed & Reliability	Attractiveness & Ease of Use	Priority of Recommendation		
			High	Medium	Low
Stop Spacing Changes	●		✓		
Enhanced Frequency	●	●		✓	
Routing Adjustments	●		✓		
Continuous Bus Lanes	●				✓
Queue Jumps	●			✓	
Signal Priority	●		✓		
Improved Fare Collection	●	●		✓	

Potential BRT Feature	Speed & Reliability	Attractiveness & Ease of Use	Priority of Recommendation		
			High	Medium	Low
Bus Bulbs / Curb Extensions	●	●		✓	
Level Boarding	●	●			✓
Enhanced Stations		●	✓		
Real-Time Information		●	✓		
New Vehicles	●	●		✓	
System Branding		●	✓		

Among the key conclusions that led to the recommendations shown in Table 28 are the following:

- Buses currently spend more than 50 percent of their time in motion, which tends to indicate that the service is operating reasonably well, since most underperforming bus routes tend to spend less than half their time in motion. When combined with the results of the traffic analysis, it appears that traffic congestion is not a significant issue on this corridor, except in the immediate vicinity of Journal Square.
  Similarly, the amount of time that buses are spending at bus stops is not excessive, indicating that there is not a strong need to improve the boarding and alighting process.
- Buses spend close to 30 percent of their time stopped at traffic signals, which indicates a potential for reducing signal delay. In addition, because of the "green block" signal timing in place on Kennedy Boulevard, it is likely that a portion of the signal delay is related to the number of stops, since each time the bus serves a stop, it is more likely to encounter a red signal once it is done at that stop, even though it could have traveled farther had it not needed to stop.

Those BRT features that are categorized as "highly recommended" are therefore included in the final recommended packages, for purposes of analyzing ridership and cost impacts. This recommended package is described in greater detail in the next section.

Recommended Improvement Package

Stop Spacing Changes and Station Enhancements

It is recommended that the BRT service that is implemented should make fewer stops than the current local service, using one of the options described in Chapter 7. The plan would include:

- Reduction in the number of stops made by the BRT service, through either an overlay BRT service or stop streamlining on bus route 10. Exact stop locations would be determined in an inclusive and collaborative service planning phase, to be led by the transit provider with input from the public. Figure 20 (Jersey City) and Figure 21 (Bayonne) show a conceptual stopping pattern for an overlay BRT service. For reference, current stop locations are shown in **Figure** (Jersey City) and Figure 23 (Bayonne).

- Lengthen BRT stops to permit two buses to stop at the same time. Investigation into impacts to on-street parking will require further analyses.
- Provide amenities at all BRT stops.
- The choice of a streamlining option needs to be further vetted with the municipalities and existing and potential riders in Bayonne, Greenville, and elsewhere. The pros and cons to the elimination of stops for bus route 10 or bus route 119 requires further study and feedback from the host municipalities and existing and potential future riders in the study area.

Figure 20: Potential BRT Overlay Service Illustrating Stop Spacing Concept (Jersey City)

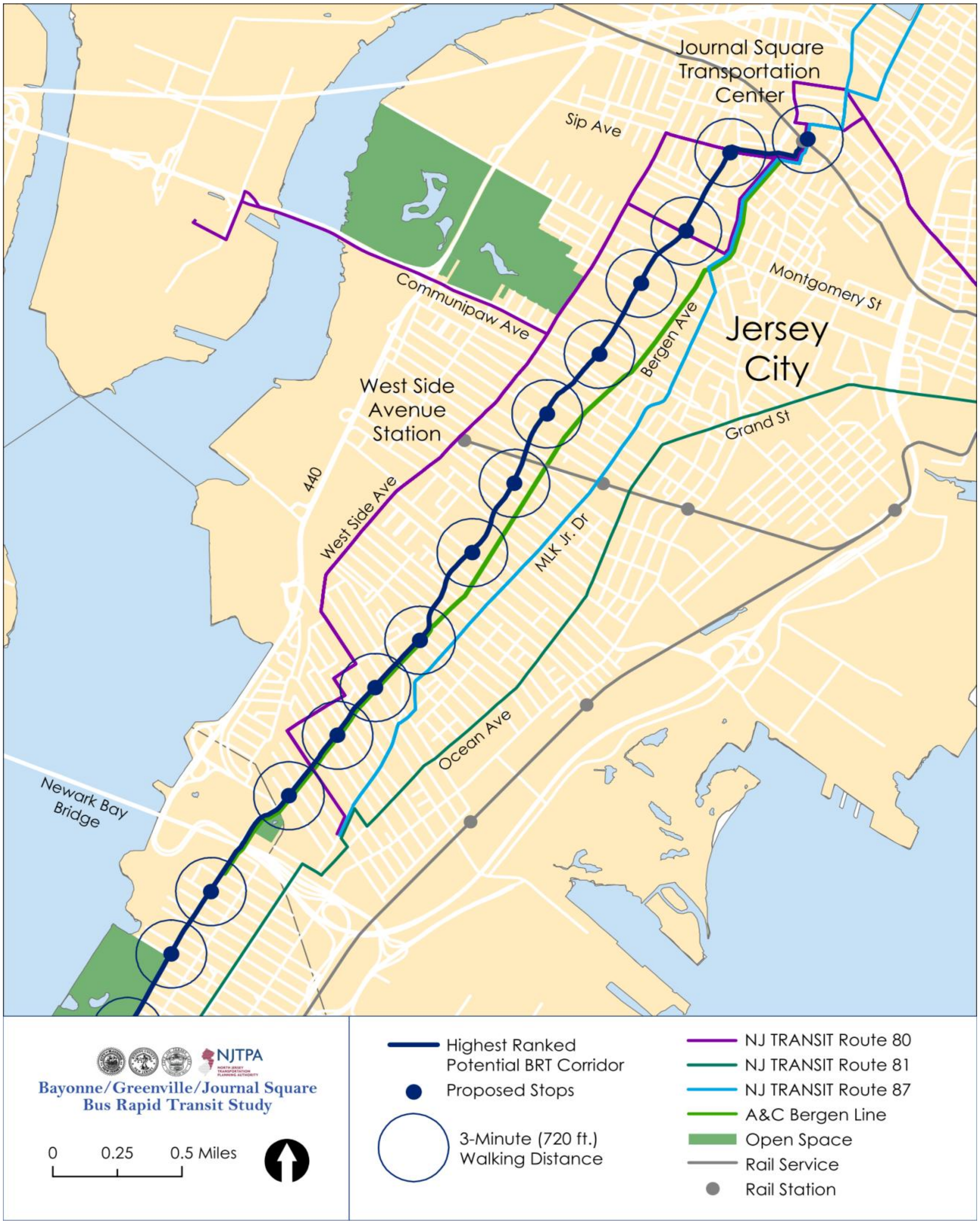


Figure 21: Potential BRT Overlay Service Illustrating Stop Spacing Concept (Bayonne)

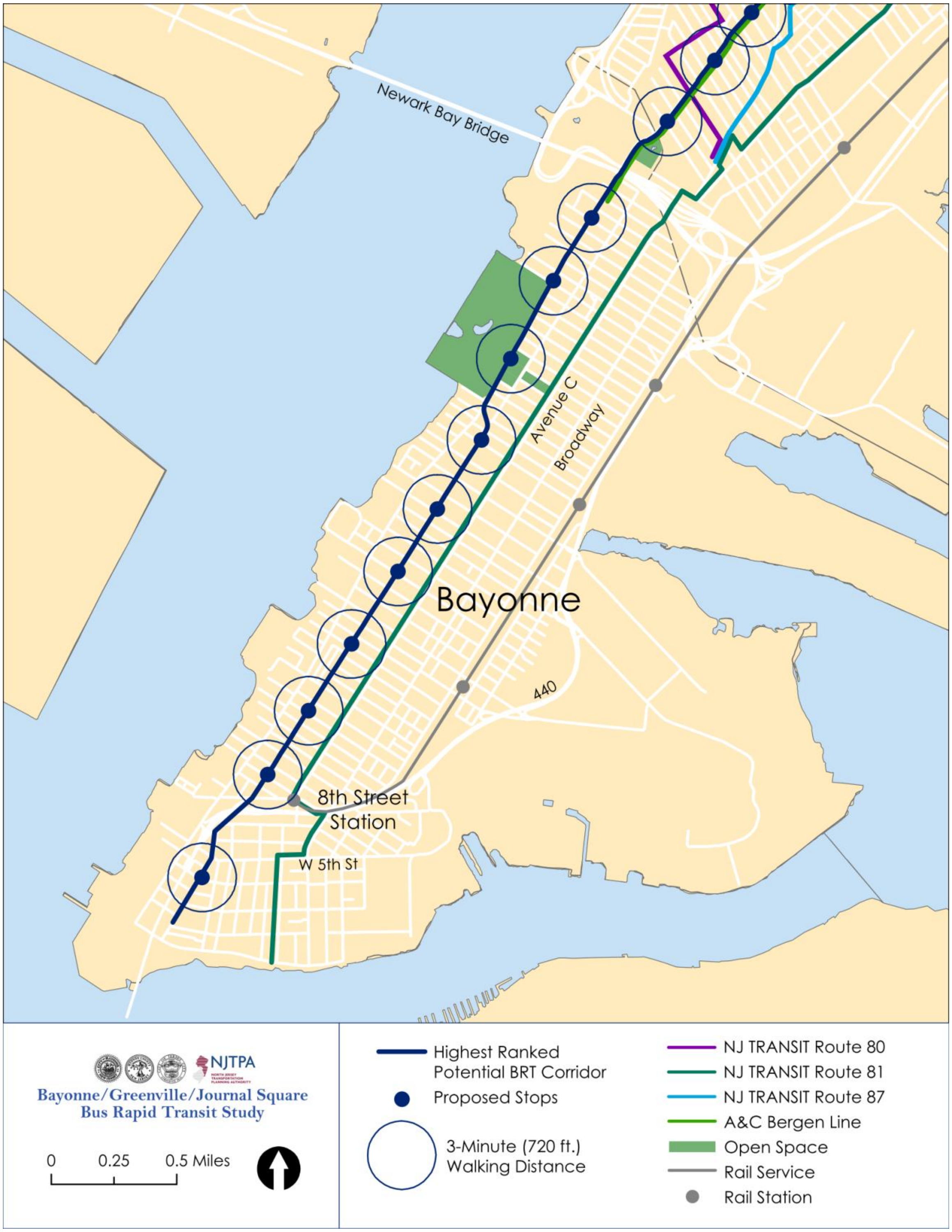
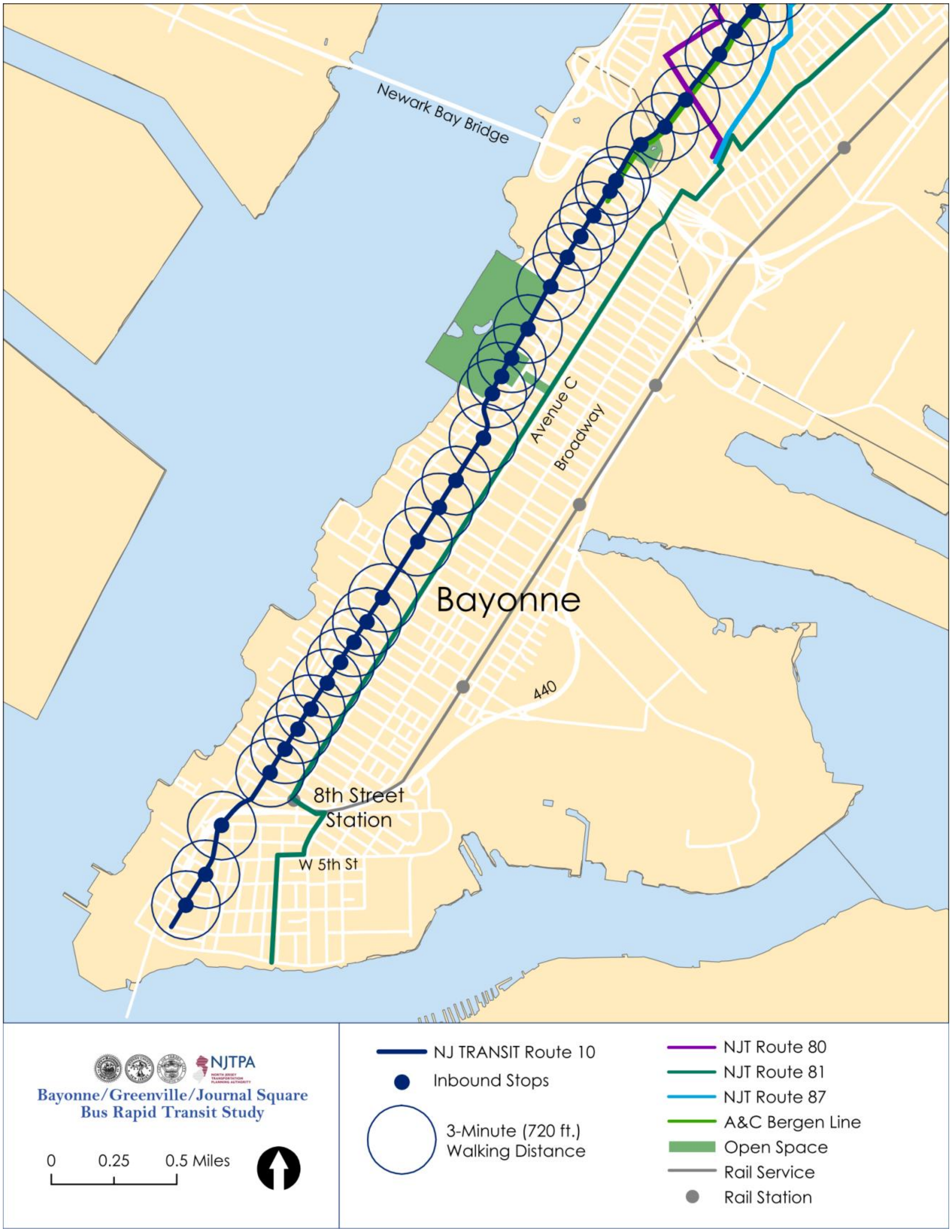


Figure 22: Current Route 10 Stops (Jersey City)

Figure 23: Current Route 10 Stops (Bayonne)



Service Frequency Improvements

Under a BRT scenario, service on Kennedy Boulevard should operate more frequently—whether with an overlay service or a single service with reduced stop frequency—because of the reduction in travel time on the route. As described in the Analysis of Service Options section of Chapter 6, the specific costs and benefits associated with increasing frequency will depend on how BRT service is implemented. The current base period concept has three buses per hour (headway of 20 minutes) with a cycle time of 120 minutes and a requirement of six buses. With the proposed travel time improvements, it is highly likely that the cycle time for the BRT service could be reduced to 100 minutes (given that the peak-period cycle times vary from 100 to 110 minutes currently), enabling the same service to be operated with only 5 buses, thus reducing operating costs. Even if an overlay service led to additional service being operated along the corridor, this reduction in cycle time will still decrease the net operating cost of that service.

Operating the off-peak BRT service with four trips per hour (15-minute headway) would significantly improve service. This level of service is the minimum threshold for BRT service and for qualification in the FTA's Small Starts program (for projects that do not operate in at least 51 percent fixed guideway). A 15-minute headway is generally considered the minimum for walk-up service—where there is no need to consult the schedule.

It is recommended that an increase in off-peak frequency be deferred until after changes in stop locations have been made, and possibly also until after signal priority improvements are completed. At that point AVL (automatic vehicle locator, which uses GPS to track bus movement) or APC (automatic passenger counter, which uses sensors at doors to count passengers) data could be used to determine the minimum cycle time necessary to provide a 95-percent likelihood of starting the following trip on time. Depending on the results, service could be improved either with or without increasing the off-peak bus requirement.

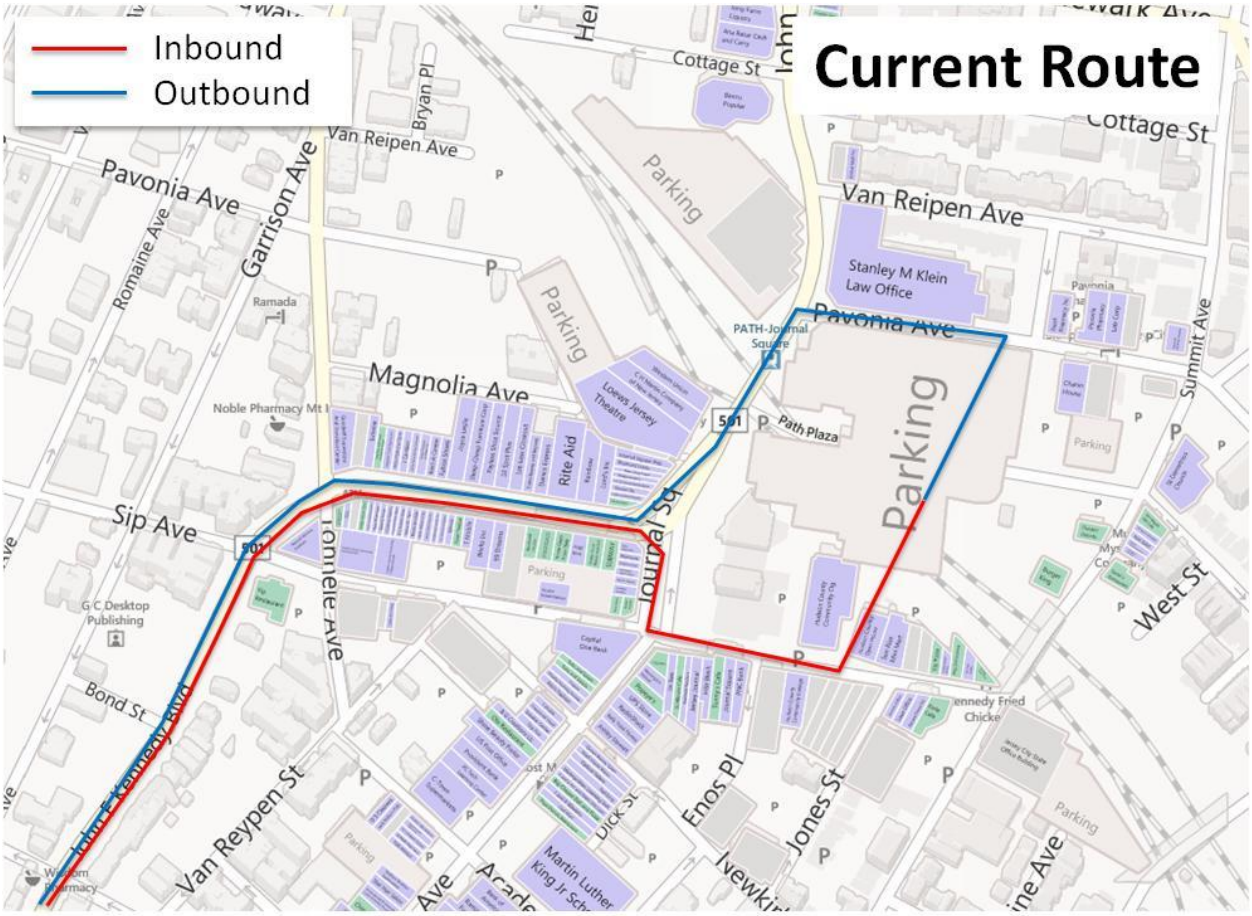
The peak-period operating plan on route 10 calls for eight buses per hour (headway of 7.5 minutes) with a cycle time of 105 minutes and a requirement of 14 buses. Based on the analysis of the data collected, this cycle time may be insufficient, resulting in buses not completing the route in the time allotted and then leaving late for their next trip. Therefore it is expected that the major benefit of the proposed improvements during the peak period will be to improve reliability on the BRT route. As discussed, this will reduce wait time and crush loads associated with bunched service and large gaps, as well as reduce the frequency of delays propagating to subsequent trips. As with the off-peak service, the specific operating cost impacts associated with BRT improvements will depend on whether the service is operated as an overlay or as a single service with streamlined stops.

Journal Square Rerouting

Another element of improving a service plan for Kennedy Boulevard BRT service is to consider ways in which the route path could be changed to improve operating efficiency and reduce travel times. In general, bus route 10 follows a simple and straightforward route path, traveling along Kennedy Boulevard from southern Bayonne all the way to Journal Square, leaving relatively little opportunity to change the route path while maintaining full service on Kennedy Boulevard. However, at the northern end of the route, approaching Journal Square, there is a slightly circuitous routing that the consultant team recommends improving for the BRT service.

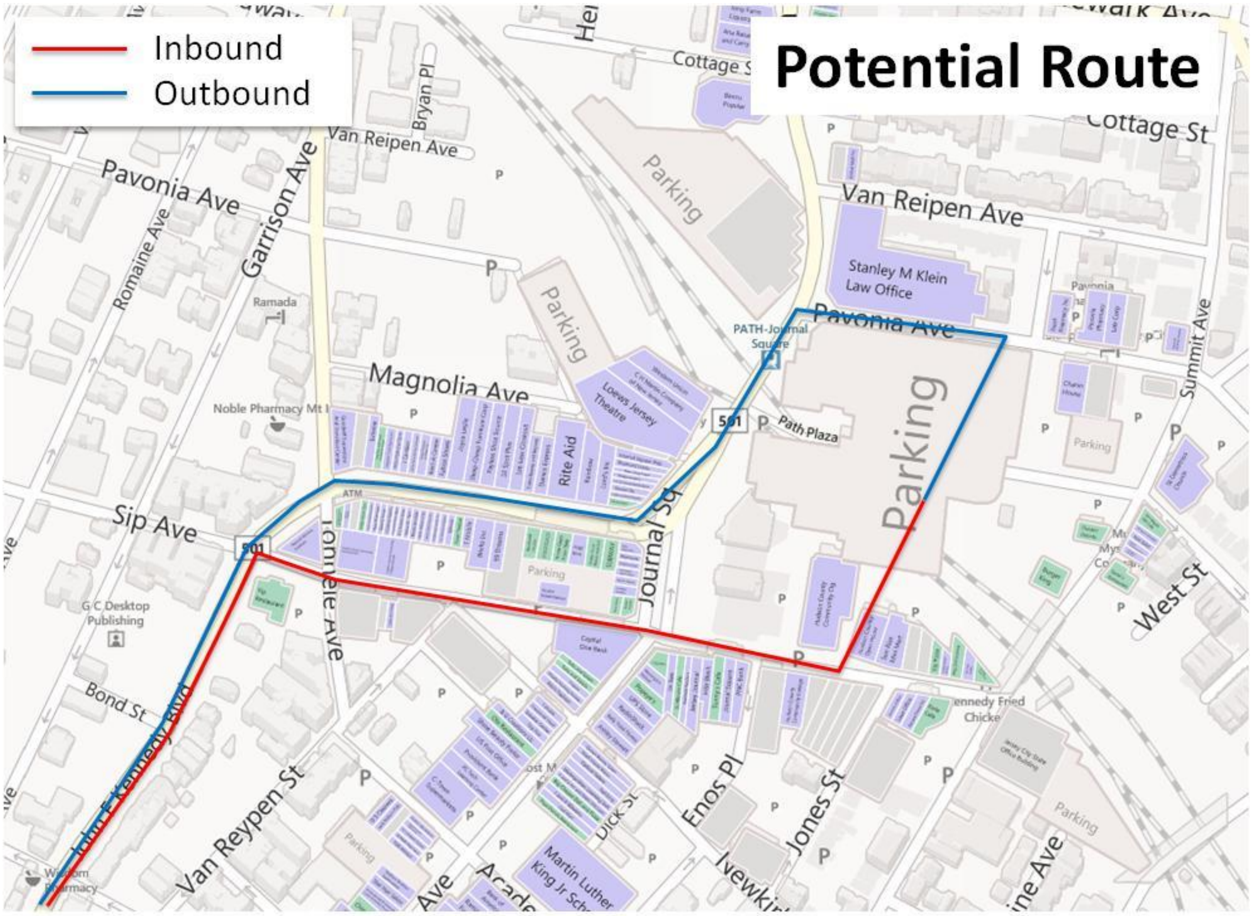
As shown in Figure 4, the current route path follows Kennedy Boulevard all the way to where it intersects with Bergen Avenue at Journal Square. At this point, the bus then takes a right turn onto Bergen Avenue, and then a left turn onto Sip Avenue, to access the entrance to the Journal Square bus terminal off Sip Avenue. After circulating through and laying over at the bus terminal, bus route 10 exits left onto Pavonia Avenue, then turns left onto Kennedy Boulevard to return south towards Bayonne. On the inbound route, the right turn onto Bergen Avenue followed quickly by the left turn onto Sip Avenue can create substantial delay when the left turn lane on Bergen Avenue (leading to Sip Avenue) is full, and buses are not able to turn on to Bergen Avenue. In this case it may take several signal cycles, and thus several minutes for the bus to travel the 350 feet from Kennedy Boulevard at Bergen Avenue to Sip Avenue. (In one observed case, it took seven minutes to travel from the last bus stop on Kennedy Boulevard to the last stop at the Transportation Center, representing 19 percent of the scheduled route travel time to go from one stop to another.) Based on the results of the boarding and alighting surveys and observations during the time-delay studies, passengers on bus route 10 appear to be voting with their feet, with a significant number exiting the bus one stop early and then walking to the PATH station.

Figure 24: Current Route 10 Path through Journal Square



The consultant team recommends a minor alteration to this route, as shown in Figure , such that a BRT service would turn right from Kennedy Boulevard to Sip Avenue, and then proceed directly along Sip Avenue to the entrance to the bus terminal (the routing currently used by bus route 119). This routing would provide a more direct route from Kennedy Boulevard to the bus terminal, and would eliminate the turns on and off of Bergen Avenue in a fairly congested location. This change in routing could potentially be paired with bus priority improvements on Sip Avenue, such as a queue jump approaching Bergen Avenue eastbound, or active signal priority improvements in the Journal Square area (as discussed in the Signal Priority section). Economic and convenience impacts to customers and businesses in Journal Square due to the rerouting and potential elimination of stops would need to be evaluated prior to implementation of such a service pattern.

Figure 25: Potential BRT Path through Journal Square



Outbound from Journal Square towards Bayonne, the consultant team does not recommend any changes in routing, as the Pavonia Avenue to Kennedy Boulevard routing represents the most direct option available, given the configuration of the Journal Square bus terminal.

Transit Signal Priority

A prior NJDOT study (*Transit Signal Priority Systems Application and Technology Investigation*, completed in March 2009) indicated that Kennedy Boulevard has a good potential for implementing transit signal priority, given the characteristics of the corridor. Based on this initial recommendation, the consultant team considered the potential role for signal priority within the corridor, particularly in relation to the results of the time-delay studies presented in Chapter 7, which provide a more detailed understanding of what is causing delays for the current bus service. Given the percentage of time that buses are currently spending delayed at traffic signals, the time-delay studies also suggest that there is a role for signal priority as part of a BRT plan for Kennedy Boulevard.

Based on the consultant team's review of existing bus and traffic operations, the recommendation is to consider two types of signal priority in two different geographic areas of the corridor:

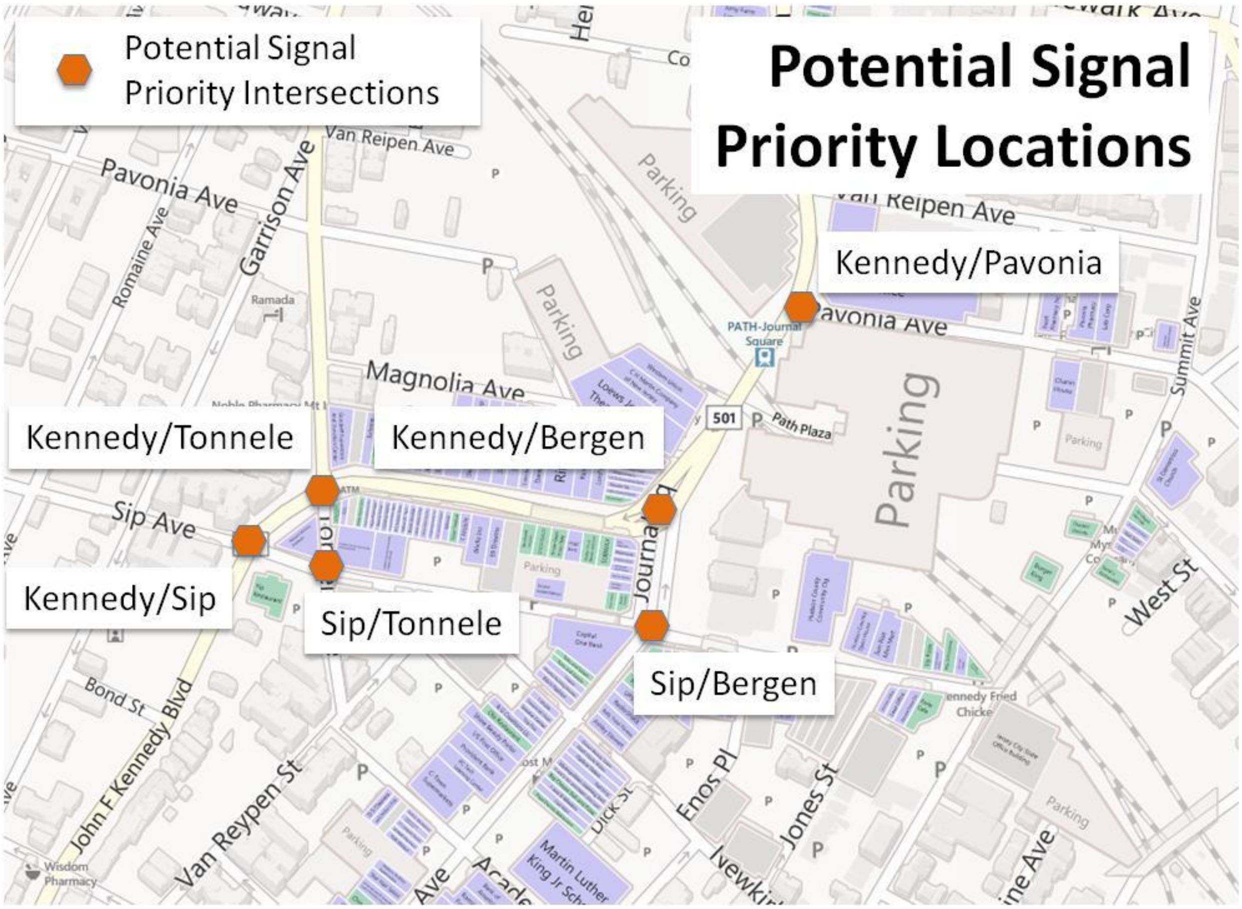
- Active signal priority at the traffic signals located in the immediate Journal Square area, including Kennedy Boulevard at Sip Avenue, Tonnele Avenue, Bergen Avenue and Pavonia Avenue, as well as Sip Avenue at Tonnele Avenue and Bergen Avenue. Figure shows a map of the potential locations for active transit signal priority. At these locations, the consultant team recommends an active priority system whereby the buses communicate directly with the traffic signals to provide priority for buses operating on the BRT route along Kennedy Boulevard, following the revised Journal Square routing previously described. Because of the high density of buses circulating within the Journal Square area, this system will need to be carefully designed and operated to avoid negatively impacting other bus service while improving service on Kennedy Boulevard. If the system proves successful, it could be expanded to cover other bus routes within the Journal Square area.

- Based on the level of service analysis presented in Chapter 7, traffic operations on Kennedy Boulevard are relatively good—particularly outside the immediate vicinity of Journal Square—with a very small number of intersection approaches operating below LOS D. As a result, the consultant team does not see an immediate need for active signal priority along the length of Kennedy Boulevard, particularly given the expense and complexity associated with designing and implementing such a system.

  However, the consultant team recommends studying and potentially implementing passive signal priority measures for the Kennedy Boulevard corridor south of Journal Square, through the Greenville section of Jersey City and down to southern Bayonne on Kennedy Boulevard. This would involve looking closely at the existing signal timing to determine if there are improvements that can be made to move buses more quickly. Currently, the signals on Kennedy Boulevard operate in a "green block" mode, where all of the signals change to green (and yellow and red) at approximately the same time, subject to minor variations based on local conditions such as left-turn phases and multi-leg intersections. More detailed study is required to determine whether this is an effective approach for corridor signal operations, or whether the corridor would function better with a signal progression that moves in the peak-period direction (which benefits those traveling in the peak direction, but can harm the level of service for those traveling in the reverse peak direction).

Overall, the goal of passive signal priority should be to allow buses to move smoothly between stops without encountering any unnecessary red signals. Stop streamlining can work together with signal timings that take into consideration bus operations. Given the current green time available on the corridor, buses cruising at 30 mph will be able to travel the longest distance between any two bus stops if starting on a new green. In other words, a bus making every stop would frequently face no red signals between stops and would never have more than one between stops. Ideally, buses can move the distance necessary to reach their next stop during the green phase of the signal, and then the boarding and alighting at the stop can occur during the red phase, such that the bus will be ready to move again once the signal turns green. This is possible if either the bus stop is on the near side of the signal, or if the active signal priority system makes it unlikely that a bus gets a red signal just before approaching a far side bus stop. Given the closely-spaced signals and the relatively straightforward signal operations on the corridor, this appears to be a relatively achievable goal, particularly with the proposed increase in stop spacing.

Figure 26: Potential Locations for Active Transit Signal Priority



Real-Time Information

As described earlier, real-time information is an important component of most BRT services, and is critical to making the service dependable and user-friendly. NJ TRANSIT is currently moving forward with the deployment of the MyBus system, which provides customers with information about bus arrival times via text message. Currently, the system generally provides scheduled bus arrival information, but as the technology to provide real-time arrival information is deployed, the system will switch to provide up to the minute information.

In the context of implementing BRT service on Kennedy Boulevard, the consultant team recommends focusing the enhancements to the MyBus system to ensure that the real-time information component is functional on Kennedy Boulevard, if that milestone has not already been reached prior to BRT service being implemented. The basic system could also be enhanced by installing screens that provide real-time arrival information at key bus stops, such as Journal Square, St. Peter's University and New Jersey City University, and other high ridership locations. Because of the costs associated with installing these screens at every stop, it is not recommended that this technology be installed at all stops, particularly as the use of mobile phones to access this information is growing.

Branding

The consultant team recommends that the BRT service on Kennedy Boulevard be clearly identified with a consistent brand identity that is appropriate to the local context and customers existing experiences with bus service in the study area. Although this brand identity could build on NJ TRANSIT's current GoBus BRT service that operates in and around Newark, there may also be benefits to considering a separate brand identity that reflects the unique character of the cities and neighborhoods in the study area, as well as the specific characteristics and benefits of the BRT service on Kennedy Boulevard. In addition, a separate brand identity may help reduce confusion about the service, given that GoBus is more closely associated with service in Newark.

Regardless of the branding identity that is selected, it should be reflected consistently throughout the system, as described earlier in the general description of branding. In addition, the service should become part of the "rapid transit" system within this portion of Hudson County—along with the Hudson-Bergen Light Rail line and the PATH system—including being shown on major transit maps and being referred to in on-board announcements on connecting services. The overall goal should be to develop and implement a brand that signals improvements for existing customers while also attracting new customers, including those who might not have considered using bus service before.

Summary of Benefits

The benefits to bus riders of this package of improvements, including reducing the number of stops on the BRT service, include:

- Reduced average travel time while on board due to signal priority, reduction in stops, and rerouting at Journal Square.
- Reduced waiting time and reduced crowding due to greater reliability of service.
- Improved waiting experience due to shelters, benches, and information at stops.
- Improved accessibility of bus stops. All proposed stops are at signalized intersections with pedestrian signals.
- Improved ride quality by reducing the jerkiness—and resulting frustration—associated with frequent stopping.
- Increased off-peak frequency enabled by reduction in recovery time due to less variation in travel time.

Bayonne and Jersey City Outreach Meetings

As noted in Chapter 4: Project Visioning/Initial Outreach, four public meetings were held through-out the Study process. The final public meeting for this study was hosted by the City of Bayonne on May 29, 2013, at Bayonne City Hall, at the point when the recommended package of improvements had been developed by the consultant team. At this meeting, the team presented the proposed recommendations from the study, as described earlier. The meeting format included an initial open house where members of the public reviewed the study progress and the selection of the highest ranked corridor. This was followed by a formal presentation that covered the project background and goals, the features of BRT, the corridors that were considered, the selection of Kennedy Boulevard as the highest ranking corridor, and the recommended package of improvements described earlier (including the high, medium, and low recommendations shown in Table 28). Following the presentation, attendees had another opportunity to ask further questions. The meeting was attended by approximately 10 to 15 people, including elected officials, municipal representatives, and community members.

The minutes from this meeting are attached in the Outreach section of the Appendix, along with the presentation delivered by the consultant team (which includes the same graphics that were used for the open house displays). There was general support for the implementation of BRT along Kennedy Boulevard, with specific concerns about the impact of bus stop streamlining and a request that an overlay BRT be considered, in addition to the proposed overall bus stop streamlining for all service. Attendees noted that this type of service has been operating successfully on bus route 81 for years and indicated that this model should be studied for Kennedy Boulevard. Comments were also noted about providing a service that makes all stops in Bayonne and then travels express to Journal Square, coupled with an all stops service in Jersey City. The consultant team noted that many people had expressed a desire to be able to travel locally between Bayonne and Jersey City, particularly to the post-secondary institutions, which would be difficult under such a type of "zone express" service. General questions were also received about signal priority impacts and the history of bus service along the corridor, but the overall feedback was positive, with an understanding that the specific details of future project planning and design must be carefully discussed with the community.

Ridership Estimates

This section provides a brief summary of the ridership forecasting methodology used to estimate ridership for the proposed BRT like system in Hudson County. This includes a description of the ridership forecasting tool used, and the modeling assumptions (i.e., headway and running time) used as input for the modeled BRT scenarios.

Modeling Tool

The North Jersey Regional Travel Model-Enhanced (NJRTME) was initially selected as the modeling tool to forecast the proposed BRT ridership. The model is developed and maintained by the North Jersey Transportation Planning Authority (NJTPA). It comprises 2,545 traffic analysis zones and no external stations, including all of New York City and Long Island, portions of southern New Jersey, portions of southern New York State, and portions of eastern Pennsylvania. Within the NJTPA region, the highway network includes most arterials (major and minor) including most 500 level and 600 level county roads but does not include some collector or local roads. Outside the NJTPA region, the highway network is more schematic, representing major regional roadways. The transit network includes NJ TRANSIT's rail and bus network, including ferry services.

The consultant team reached out to NJTPA requesting authorization to use this tool, and to request the latest information available. NJTPA expressed concern using this tool for the BRT study. The NJRTM-E model is not able to accurately forecast boardings on a stop-by-stop basis, and lacks level of detail (in its transit component) for the Hudson County Area. Thus, NJTPA strongly recommended seeking advice from NJ TRANSIT directly. NJ TRANSIT was consulted and suggested the use of the North Jersey Transit Demand Forecasting Model (NJTDFM); their tool used for ridership forecasting. This model presents better zone definition and has been validated with transit surveys for Hudson County. Moreover, NJ TRANSIT has successfully used this tool for ridership forecasting for BRT systems (i.e. GO28 BRT in Newark). For the GO28 BRT project, NJ TRANSIT conducted ridership surveys before and after the implementation of the project, and then compared it against the tool's initial ridership forecasts. The comparison showed the NJTDFM effectiveness for ridership forecasting for BRT systems. As a result, this model was used to estimate ridership changes.

Modeling Methodology

The 2020 transit network was used for the Hudson County BRT study based on the most likely state of transit service. This includes service frequencies based on predicted headways and running times for bus route 10 and bus route 119, and committed projects that will be completed by the forecast year. These changes were fed into the NJTDFM to reflect the trip patterns that would be implemented with the BRT system. Three scenarios were developed:

A. Base / Existing Conditions
B. Bus Stop Reductions for BRT and Signal Priority Enhancements
C. Bus Stops Reductions for BRT, Signal Priority Enhancements, and Increased Off-Peak Frequency.

The running times used for the existing conditions are based on checks of 14 peak trips and four off-peak trips. Instead of the mean value, the 85th-percentile time is used for peak and 75th-percentile for off-peak, being the highest available. These higher percentiles reflect, more accurately than the mean or median, the amount of time customers have to budget to make their trip (which could end up being either waiting time, in-vehicle time, or early arrival time).

The frequency used in the model is based on the existing conditions, except for the proposed shift from 20 to 15 minutes in the off-peak in scenario C.

The forecast running times in scenarios B and C (as described in Chapter 7) are based on the assumption that the proposed improvements will reduce running time variability, and thus bring the 85th-percentile running time closer to the mean running time today and bring the mean running time a bit below that level. The mean running time for all 18 trips checked was 45 minutes. This figure was used for the bus route 10 running time in scenarios B and C and represents a savings of 12 minutes or 21 percent compared to the existing conditions. It was assumed that the off-peak running time would be slightly less, 42 minutes, a reduction of six minutes or 13 percent compared to the existing conditions (actual mean of the four observed off-peak trips was 45 minutes, but this was based on a very small sample). These expected peak-period time savings are within the range of previous similar BRT projects, which have reduced running time between 18 percent and 25 percent.

For bus route 119, the current schedule allows 46 minutes in the peak from Bayonne to Journal Square and 30 minutes from Journal Square to Port Authority Bus Terminal. No ridecheck data was available for this route. It was assumed that running time for Route 119 in the portion where it overlaps bus route 10 is faster than route 10—50 minutes instead of 56 minutes— due to less chance of bunching and stops made only for customers going beyond Journal Square. It was further assumed that following the improvements in both of the two scenarios the bus route 119 running time would be slightly less than bus route 10, or 44 minutes, a six-minute savings compared to existing conditions. No changes were forecast for the running time of 30 minutes between Journal Square and PABT. Thus the total bus route 119 running time is expected to be reduced from 80 minutes currently to 74 minutes. Table 29 summarizes the headway and running times inputs for the ridership analysis scenarios.

Table 29: Bus Route Headways and Run Times by Model Run (in Minutes)

Scenario	NJ TRANSIT 10 (Bayonne to Journal Square)				NJ TRANSIT 119 (Bayonne to Port Authority)			
	Peak		Off-Peak		Peak		Off-Peak	
	Headway	Runtime	Headway	Runtime	Headway	Runtime	Headway	Runtime
Scenario A (Baseline)	7.5	57	20	48	20	80	-	-
Scenario B	7.5	45	20	42	20	74	-	-
Scenario C	7.5	45	15	42	20	74	-	-

Ridership Results

It is important to note that the NJ TRANSIT ridership model is not calibrated specifically in this corridor, nor is it calibrated to differentiate ridership between specific buses in the corridor. Therefore, ridership totals for specific bus routes calculated in the model are likely to vary from actual ridership, and are not to be used as projections for specific bus routes. However, the percentage change in ridership between the baseline and the build alternatives can be used for planning purposes when compared to actual farebox data.

Model ridership results are presented in **Table** , which shows the number of round-trip riders (production-attraction format) on the BRT route from the three model runs by bus direction and time period. The BRT was coded as time and headway improvements to two bus routes in the model (bus routes 10 and 119); however, the results were combined into one route for simplicity.

Model projections show significant increase in ridership in the build alternatives. Upon examination of mode change in the model as a result of the BRT service, it was found that the majority of new ridership on the BRT route was diverted from other bus routes. With regard to the NJ TRANSIT demand forecasts, the base data has a ridership of 2,363. Scenario B has a ridership of 3,341, an increase of 1,078 riders, with only 328 new transit riders on the buses. Scenario C has 3,521 riders, an increase of 1,542 riders with 386 new transit riders. This means Scenario B diverts 750 riders and Scenario 2, 1156 riders from existing bus and light rail routes in the Jersey City and Bayonne area.

In the NJ TRANSIT demand forecasts, the peak base data has a ridership of 1,681. Both Scenario B and C have ridership of 2,244, an increase of 563 riders, of that 262 are new transit riders on the buses. These figures indicate a potential need for additional buses during the peak period (2-3 to handle new peak riders and an additional number to handle diversions from other routes).

Table 30: Model Ridership Results

Area	Northbound						Southbound						Total	
	Peak		Off Peak		Daily		Peak		Off-Peak		Daily			
	On	Off	On	Off	On	Off	On	Off	On	Off	On	Off	On	Off
Scenario A (Baseline)														
Bayonne	190	36	42	15	231	51	63	128	26	51	89	179	320	230
Southern JC thru JSQ	593	447	101	127	694	574	126	188	45	76	171	263	899	802
Beyond JSQ - PABT	898	1,198	0	0	898	1,198	97	284	0	0	97	284	1,145	1,332
Total		**1,681**		**142**		**1,823**		**443**		**98**		**541**		**2,363**
Scenario B														
Bayonne	430	48	113	19	543	66	71	343	30	96	101	439	643	505
Southern JC thru JSQ	916	955	122	215	1,037	1,170	260	367	64	112	323	479	1,548	1,460
Beyond JSQ - PABT	898	1,243	0	0	898	1,243	102	285	0	0	102	285	1,151	1,377
Total		**2,244**		**234**		**2,478**		**714**		**151**		**864**		**3,342**
% Change from Baseline		34%		65%		36%		61%		54%		60%		41%
Scenario C														
Bayonne	430	48	163	28	593	76	71	343	39	139	109	482	702	558
Southern JC thru JSQ	916	955	187	322	1,102	1,276	260	367	95	158	355	524	1,669	1,588
Beyond JSQ - PABT	898	1,243	0	0	898	1,243	102	285	0	0	102	285	1,151	1,377
Total		**2,244**		**350**		**2,593**		**714**		**215**		**928**		**3,521**
% Change from Baseline		34%		146%		42%		61%		119%		72%		49%

While the BRT proposal does not increase overall transit ridership in a significant manner, the substantial increase in ridership on the route shows that the proposed service provides significant utility for existing transit riders, and may improve their overall experience while reducing travel times. However, as discussed previously, this model is not calibrated specifically for this corridor or for specific bus routes. Additionally, the model's highway network is not finely detailed enough to accurately represent passengers' additional walk access and egress times due to consolidation of bus stops. A more detailed analysis and validation will be required during later phases of planning and design, including off-model adjustments to estimate route-specific ridership on these routes.

Estimated Capital and O&M Costs

As discussed above, the change in vehicle operating costs expected as a result of the BRT improvements will depend on the type of BRT service that is implemented.

There will be increased operating costs associated with the maintenance of new stop amenities, especially shelters. It is possible that a company such as CEMUSA or JC Decaux would be willing to provide and maintain shelters in exchange for advertising revenues. This option should be explored however Jersey City currently has a billboard ordinance that would preclude this option. If not, a shelter maintenance contract should be procured.

A concept-level capital cost estimate was developed using general unit costs for the proposed improvements, as shown in Table 30.

Table 30: Capital Cost Estimate

BRT Element	Description	Units	Unit Cost	Total Cost
Enhanced Stations-Large	Install shelter, bench, real-time information display, and additional amenities	20	$70,000	$1,400,000
Enhanced Stations-Regular	Install shelter, bench, and information panel	40	$50,000	$2,000,000
Active Signal Priority-Signals	Retrofit controller and install priority equipment on signals	6	$6,000	$36,000
Active Signal Priority-Buses	Install priority transmitter equipment on buses	16	$7,500	$120,000
Branding-Stations	Branding at shelters	40	$1,000	$40,000
Branding-Buses	Branding on buses	16	$2,000	$32,000
Branding-Materials	Other branding materials	1	Lump Sum	$50,000
				$3,678,000

Notes on the capital cost estimate:

- Costs for an overlay BRT service, would include a cost of $500,000 per new bus.
- Costs for additional storage facilities associated with additional vehicles are not included, but it is important to note that existing NJ TRANSIT bus depots within the study area already operate at capacity, so additional facilities costs will be incurred if new buses are required under an overlay BRT service proposal.
- Additional capital costs include utility supply and relocation from bus stop improvements. Utility drops were needed for lighted shelters and information boards for the NJ TRANSIT Newark Go28 bus, which has elements of BRT. The costs per stop ranged from $5,000 to $50,000.

- Municipalities should be aware that additional municipal costs have not been factored in Table 31: Capital Cost Estimate but are often needed for BRT elements within their community.
- Because NJ TRANSIT is installing real-time information fleet-wide, no costs are assumed for real-time information other than the installation of displays at major stations.
- Signal controller changes are assumed to include upgrades to existing solid-state controllers to handle signal priority, not complete replacement of the signal controller or other signal equipment.
- The proposed branding of buses consists of repainting.
- This cost estimate assumes that there will be a sub-fleet of buses assigned to this route, in order to consistently deploy branded buses on the service.

Costs are order of magnitude based on experience in other locations.

Impacts on Other Modes

No major impacts are expected on the bus network. If the projected improvements result in higher quality service, some riders using adjacent routes on Avenue C, West Side Avenue, and Bergen Avenue may shift to Kennedy Boulevard service. Some existing riders who live between the two corridors, and who have a longer walk access trip due to stop consolidation, may shift to one of those other routes.

The proposal could positively impact bicyclists using Kennedy Boulevard because there will be fewer instances of buses merging back into traffic from a bus stop. On the other hand, faster bus travel times may mean that bicyclists will have to pass buses more frequently (rather than passing and never being caught). Currently, neither Jersey City nor Bayonne is proposing formal bicycle improvements on Kennedy Boulevard.

The proposal would benefit pedestrians chiefly through the curbside improvements made in association with improved bus stops. These modifications will include new concrete cement sidewalk in most cases, and new ADA-compliant curb ramps, except where ramps have been recently upgraded (as in Bayonne). Currently several bus stops are not located at signalized intersections and are thus not adjacent to crosswalks across Kennedy Boulevard, tempting bus passengers to cross where it is unsafe. All proposed stops will be at signalized intersections.

Monitoring and Evaluation

This study represents the first analysis of BRT potential within Hudson County, and if a project is implemented based on the results of this study (and future planning and analysis), it would represent the first BRT route in Hudson County (although there are other BRT services operating nearby in Newark and New York City). A thorough evaluation of any project implemented can determine the effectiveness of the improvements and whether additional BRT services could be feasible within Bayonne, Jersey City, or Hudson County. While this study will not lead directly to the implementation of BRT on Kennedy Boulevard, it is important to begin thinking about monitoring and evaluation of an eventual BRT project. If the correct data is not collected *prior* to the initiation of BRT service, it will not be possible to perform a thorough and meaningful evaluation of the service improvements.

Table 23 in Chapter 7 compares the stop spacing and other characteristics and outcomes of similar BRT service at other locations throughout the country. It also provides a good example of the overall types of monitoring and evaluation metrics that are typically collected for BRT projects. NJ TRANSIT is in the process of deploying an AVL/APC system. Once functional, this system should be used to monitor ridership and running time on Kennedy Boulevard BRT route. Based on the experience of the consultant team and other evaluations of BRT projects that have been conducted, it is important to consider some or all of the following factors:

- Changes in ridership represent the ultimate outcome of any transit improvement; if ridership increases in response to BRT improvements, this is a key indicator of success. NJ TRANSIT can provide basic ridership information based on farebox data, but more detailed before and after ridership data should be collected, potentially at the stop level as was done by Hudson County staff in support of this study. NJ TRANSIT's planned APC deployment will enable collection of a large sample or ridership data at the stop level.

- Reductions in running time and improvements in reliability represent an important measure of success. These changes can be measured by collecting end-to-end travel times, preferably using the planned AVL/APC system, and comparing both the average travel time (representing increases in travel speed) and the distribution of those travel times (representing improvements in service reliability). It may also be desirable to conduct additional time-delay studies to provide details about the specific components of running time.

- Customer satisfaction surveys to determine customer's attitudes towards the BRT service, as well as more specific issues such as new customers attracted to BRT, the reasons why customers are reacting to BRT in certain ways, and other improvements that could make the service better.

- Impacts on other modes, particularly private vehicles traveling in the same corridor, especially if physical priority measures are implemented.

In addition to providing a meaningful evaluation of the success or failure of a BRT service, making a strong commitment to monitoring and evaluation can sometimes allay community concerns about service changes, if it is evident that the implementing agencies have a commitment to monitoring and evaluating the service and to making necessary adjustments. For example, if the stop streamlining recommendation is implemented, it is possible to add back a limited number of bus stops if the data suggests that there would be minimal impact on the distribution of running time.

Phasing and Next Steps

One of the most critical elements of BRT implementation is the phasing of system implementation. As described earlier in this report, BRT systems benefit from the flexibility inherent in the mode, in terms of both the package of improvements available and the order and priority in which they are implemented. Phasing improvements can be critical to the success of BRT. It is necessary to implement an initial package of improvements that results in a meaningful improvement in customers' travel experience. At the same time, the timing of improvements is dependent on funding and community support.

The package of recommended improvements defined previously is made up of a series of BRT features that can exist more or less independent from one another (with the exception of the branding, which must be implemented as an integrated approach across the entire BRT system). As a result, it is possible to imagine each of these elements proceeding semi-independently, particularly based on the availability of funding:

- The proposed stop changes and rerouting on the inbound route between Sip Avenue and Journal Square Transportation Center could be implemented quickly, following review and public input. NJ TRANSIT could work in partnership with the two municipalities to implement these changes at a relatively small cost and in a relatively short timeframe.

- The proposed stop enhancements will likely require designated project funding. However, the planning and public review process for their design and proposed stop locations could be initiated in short order in conjunction with an effort to identify a funding source.

- Changes in service frequency can be implemented very quickly (i.e., within less than six months), subject to the availability of operating funds (if needed) to support these changes. While NJ TRANSIT's current fiscal situation makes it challenging to consider service expansion in the immediate future, as the economy continues to recover and additional operating funds become available, the focus provided by upgrading Kennedy Boulevard's bus service to BRT should help to make the case for using those funds to enhance service levels on this route. With the availability of AVL data, it will be possible to determine if it is feasible to change the scheduled cycle time during the midday, which appears to be excessive for the scheduled frequency of service.

- Signal priority and signal timing changes will require additional study and design, as well as funding to implement (particularly for active signal priority which typically requires at a minimum the replacement of portions of the signal control hardware). Working together, Hudson County, the City of Jersey City, and the City of Bayonne could pursue the signal priority improvements as another semi-independent project, subject to the availability of funding.

- As noted earlier, NJ TRANSIT is currently moving forward with the expansion and enhancement of the MyBus passenger information system, and it should be possible to take advantage of this expansion to make this service available on the Kennedy Boulevard BRT route. NJ TRANSIT's passenger information program may be able to fund the installation of real-time information displays at high ridership locations such as Journal Square Transportation Center. Alternatively, this enhancement could be implemented at a later point using other funding.

- As previously noted, the branding is the key cross-cutting element, and this should only be implemented once most of the other elements of the recommended package have been put in place. Alternatively, if the recommended package of improvements is implemented over a longer period of time due to funding constraints or community concerns that need to be resolved, it may become desirable to forgo branding Kennedy Boulevard as BRT to avoid creating unfulfilled expectations. Although the branding can be a powerful tool, both in attracting new customers to the service and in obtaining community support for the overall package of improvements, it also needs to be implemented in a coordinated and thoughtful manner that is consistent with the service improvements that are being delivered.

The consultant team recommends the following next steps to continue pursuing BRT within this study area:

- The study Technical Advisory Committee (or a sub-group of the TAC made up of the agencies with direct operational responsibility for the recommended package of improvements) should reconvene as a Kennedy Boulevard BRT Steering Committee, which will provide ongoing coordination to promote the recommended improvements and secure funding. This group can also consider if additional integrated analysis of BRT is required, and whether they wish to revisit any of the BRT features that were given a medium or low priority ranking and were therefore not included in the recommended package of improvements.

- Begin developing recommended improvements as discrete projects, including moving into the next phases of planning and design, developing detailed scopes, and determining implementation responsibilities.

- Continue discussions with community groups, officials, and other stakeholders to build support for BRT improvements within the study area and on Kennedy Boulevard.

- Work with the NJTPA, NJ TRANSIT, and NJDOT to identify potential funding sources for the various components of the recommended package of improvements.

Following a range of technical analyses, outreach, and consultation with the TAC and other stakeholders, the final conclusion of this report is that arterial bus rapid transit is feasible within this study area, and that the corridor that ranked highest in terms of BRT potential is Kennedy Boulevard in both Jersey City and Bayonne. The consultant team has identified a package of improvements that are likely to significantly improve service and lead to increased ridership, but also acknowledges that as additional planning and design are performed, certain BRT features may be added or deleted from this package based on technical analyses and public outreach to the surrounding communities. From this point, Hudson County, the City of Jersey City, the City of Bayonne, the North Jersey Transportation Planning Authority, and NJ TRANSIT must together decide how they wish to move forward with BRT on Kennedy Boulevard.

Appendices

Transit Data

Traffic Analysis

Outreach

Land Use