CITY OF JERSEY CITY

A Vision for Smart Transit in Jersey City

Application to Smart City Challenge

2/4/2016

1. **Define your vision for your Smart City. Describe your city's challenges and how the proposed elements of this proposed project can be used to address those challenges. The vision should define your approach for implementing and operating the demonstration project, including your program management approach.**

Jersey City Challenges

Unprecedented expansion

Beginning in the late 1980s, Jersey City began a process of redevelopment which would reverse its decades-long decline and bring the City on a path to sustained growth. Development along the Hudson River waterfront led to the development of the "Wall Street West" financial district, one of the largest centers of banking and finance in the nation.

This economic revitalization has accelerated in recent years. Jersey City is now set to become the most populous city in New Jersey within two years, and the second-most populous city in New York metropolitan area. Since 2000, the city has experienced a population growth of approximately 17,000 residents.

Outdated infrastructure

The City must deal with outdated infrastructure and governance dating from a prior era. Much of the City's physical infrastructure, such as its sewers, roads, and traffic system, are relics from an older, industrial area. The City enjoys the second-highest rate of public transport utilization in the United States, and a street grid which emphasizes walkability.

As the city and the region continue to grow, traffic congestion will become increasingly severe. Projects to alleviate congestion by widening roads or otherwise altering automobile-centric infrastructure are both prohibitively expensive and counterproductive. An increasingly large volume of street closure and traffic modification permits are being issued as a result of the City's significant economic growth and simultaneous capital improvement projects to bolster an aging infrastructure. Allowable construction times, roadway closures, and roadway detours are traditionally informed by dated traffic data or case-by-case observations, which are costly and inefficient.

Pollution and global climate change are serious concerns for Jersey City, which suffers from comparatively poor air quality and contamination from its industrial past. The City's coastal location and combined-sewer system also renders the City vulnerable to storm damage and rising sea levels. Although the City itself cannot alter the pattern of global climate change, reducing carbon emissions is an important demonstration of our commitment to addressing this danger.

At present, the City suffers from a lack of “smart” infrastructure in several respects, including a lack of adaptive traffic control or significant collection of relevant real-time data. Improving the intelligence and technological sophistication of the City’s infrastructure and operations is a top priority.

As Jersey City moves into a new era of growth and development, enhancing the intelligence and technological sophistication of our existing infrastructure will be necessary to properly manage growth.

Unmet transit need

However, public transit is limited in many areas to bus service, which is less reliable than rail options such as the Hudson-Bergen Light Rail and PATH systems. Indeed, public transit utilization is much higher in areas served by PATH and HBLR than areas which are served only by bus. Generally, commuters prefer the dependability and speed of these options compared to buses which are subject to traffic delays and often unreliable.

As the following diagrams indicate, there is a significant unmet need for reliable and dependable public transit in many areas of the City, which results in increased reliance on private automobile usage in those areas. Going forward, the City’s development plan relies on transit-oriented development and increasing access to transit to underserved populations.

Ensuring equitable development

New development has not been even within the City: waterfront and downtown areas have experienced greater levels of economic development, while inner-city areas such as the West Side, Greenville, and Bergen-Lafayette remain comparatively underdeveloped. Jersey City is a richly diverse city, with high levels of economic and ethnic diversity, flourishing immigrant communities, and low levels of residential segregation, and the City is committed to ensuring new development does not disrupt our unique identity.

Equitable economic development and access to transit are intimately linked. Jersey City’s economic development has occurred disproportionately near transit hubs, which offer easier access to jobs and reduced reliance on automobiles in an era where driving is in decline. In addition, increasing access to transit helps reduce traffic congestion and pollution, increasing quality of life and property values.

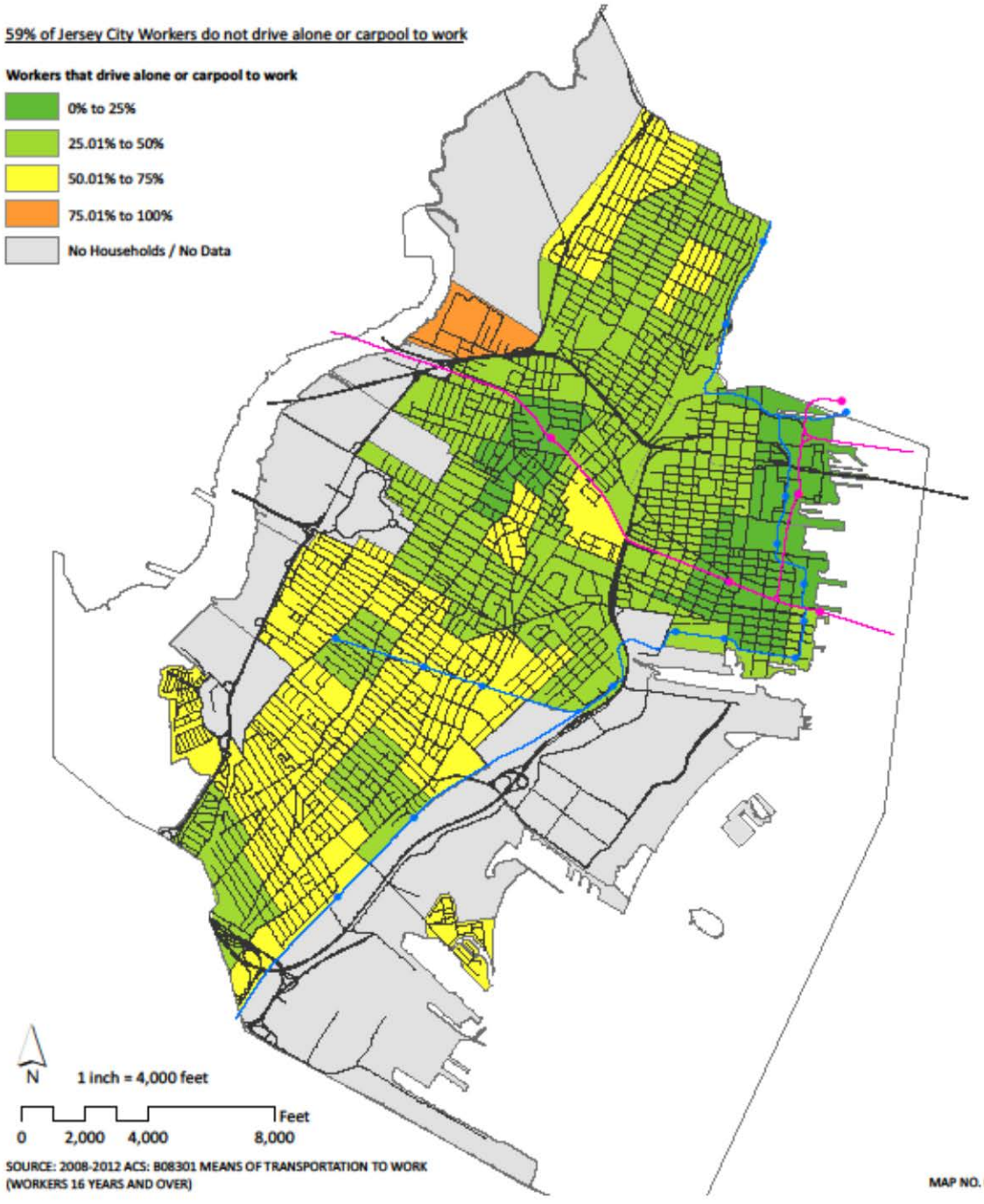
Other transit gaps

Nearly 40% (39.8%) of residents are foreign-born, and over half (52.5%) speak a language other than English at home (2014 American Community Survey). Nineteen percent of individuals live below the poverty level (2014 ACS). The Jersey City Housing Authority manages 19 public housing communities housing over 2,500 units. School-aged children (19 years old and younger) make up 23.7% of the population (2010 Census). The Jersey City Board of Education does not provide busing (except for special needs student); most students walk, take transit, or are dropped off to school. Nine percent (8.9%) of residents are seniors (65 years old and older) (2010 Census). There are significant segments of the population who do not drive. The BRT/jitneys would provide mobility options to those who cannot drive due to age or due to the high costs of car ownership.

Areas of Jersey City within .25 miles of fixed-rail transit:

WORKERS THAT DRIVE TO WORK
JERSEY CITY, NJ

JANUARY 5, 2015



SOURCE: 2008-2012 ACS: B08301 MEANS OF TRANSPORTATION TO WORK (WORKERS 16 YEARS AND OVER)

MAP NO. 633

Jersey City’s Smart City vision

Jersey City's Smart City vision expands access to transit and reduces unmet transit need, while increasing the reliability and flexibility of transit and reducing traffic congestion. Our vision for a Smart City leverages lessons learned from the sharing economy and partnerships with the private-sector actors to promote smart land use and citizen-focused, data-driven connected transit.

On demand jitneys

As part of its Smart City vision, Jersey City will contract with private actors to deploy a fleet of short “jitney” buses, equipped with GPS and connected vehicle technology to allow for the operation of an on-demand jitney network. The City will contract with private actors to construct small “jitney stops” around the City, which will consist of a small shelter, kiosk, and display. The kiosk will allow riders to request a ride to any other jitney stop in the City, and view real-time information about their wait and travel times. The City will develop and deploy a mobile application with the same functionality as the kiosk and display at stops, allowing riders to request rides before walking to stations and reducing crowding at kiosks and stations.

The rise of on-demand taxi services such as Uber and Lyft are a source of valuable lessons for how to improve travel experiences for riders and increase ridership on transit services. Jersey City’s Smart City vision draws on these lessons in its on-demand jitney vision.

Real-time information has a significant impact on rider perceptions of transit value and consequently their utilization of transit systems. Uber and Lyft benefit significantly from the fact that riders are aware of the distance between them and their ride, as opposed to the uncertainty of hailing or ordering a traditional taxi. In addition, riders are able to access real-time information about their estimated travel time. Providing riders with certainty regarding wait and travel times increases their willingness to wait and utilize transit.

Jersey City’s vision for sensor-equipped jitneys will allow for real-time wait and travel time information to be communicated to riders directly, through a mobile app and screens at stations. Screens at stations would provide valuable information to bus riders without requiring a smartphone.

Sensor-equipped jitneys as well as stops and data received from the smartphone app will be connected to a central management system, which will use an algorithm to dynamically route jitneys to serve rider demand. Because this system will be based on a limited number of stops, rather than a point-to-point model such as Uber, ensuring low wait times and sufficient circulation will be significantly easier and cheaper.

The on-demand jitney service will connect to a number of key points, including educational institutions, existing transit networks, and employment centers. For example, on-demand stations will allow passengers in underserved areas to travel to PATH stations in order to commute to New York, connect to the developing business hub on Martin Luther King Drive, connect to universities within the City, and also to eliminate traffic congestion resulting from the use of cars to drop off and pick up students and elementary and secondary schools.

The underlying elements of this system, including the routing algorithm and traffic management system, can be used to expand the system further in the future. For example, additional non-fixed stops or pickup points can be added, or special services serving schools and other institutions, depending on rider input and system performance. As data is collected on route demand, predictive analysis can allow for the establishment of routes along high-frequency corridors without waiting for rider requests, and dynamic, data-based adjustments based on demand patterns.

While the City envisions jitneys in this system to ultimately be electric, retrofitting conventional jitney vehicles to serve in the on-demand system would be possible in the initial stages of the program to ensure quick deployment. The on-demand jitney system outlined here does not rely on any type of sophisticated hardware, and requires essentially only a display, GPS, and data connection. A conventional smartphone, for example, contains all of the hardware necessary.

Bus rapid transit

Along with the on-demand jitney service, the City will also implement a Bus Rapid Transit corridor along John F Kennedy Boulevard, from a stop near the southern of Jersey City, in the Greenville neighborhood, through Journal Square and to the northern border of the city in the Heights. We will explore partnering with NJ Transit and Hudson County in order to expand this BRT concept beyond Jersey City into other Hudson County municipalities, with the ultimate goal of upgrading existing service to provide for a BRT corridor from Hudson County to Port Authority, which will provide rapid one-seat transit into Manhattan.

Bus rapid transit merges the advantages of fixed-rail, such as speed, visibility, and predictability, with the cost advantages of bus services. Corridor-based bus rapid transit has much lower capital costs than fixed rail services while providing many of same advantages. In Jersey City, the proportion of commuters using public transit is highly concentrated around fixed-rail systems such as PATH and HBLR, while areas served only by bus routes have much lower percentages of public transit commuters.

Market priced on-street parking

One third of Jersey City's land area is streets and sidewalks. Roughly a third of these public rights-of-way are currently utilized for on-street private vehicle parking. Thus, a significant percentage of Jersey City's most valuable infrastructure is currently allocated to the long term storage of privately owned vehicles for a nominal fee, producing little value and minimal revenue, in essence subsidizing private automobile use and promoting inefficient land use. Better use of valuable public land and right-of-way can be easily achieved by reallocating the use of public right-of-way to support shared economy services such as car share programs, BRT, parklets, outdoor dining areas, and other valued facilities.

One way to revalue public right-of-way is to implement market-priced, on-street parking. Market-priced, on-street parking will adjust parking fees to minimize the amount of time needed to find an open on-street parking space. This dynamic pricing scheme will be implemented along commercial corridors to encourage turnover and reduce the time spent looking for an available space. The system would deploy smart parking meters to enable collection of variable parking fees and sensors in parking spaces to monitor usage. An app would be developed so users can find open parking spaces and look up parking fees. By allowing the market to determine parking fees, the price will better reflect the true value of on-street parking.

In addition, market-priced parking will significantly reduce traffic congestion. Searching for parking has been estimated to account for up to 30% of traffic in cities. An evaluation of San Francisco’s market-priced parking pilot, SFpark, found that it reduced parking search times by 43% and vehicle miles traveled by approximately 30%.

Adaptive traffic management

The City will install an adaptive traffic management system at locations across the City to improve traffic flow and provide for signal priority for the proposed BRT system, with the option to add signaling priority for on-demand jitneys if feasible.

Installation of adaptive traffic controls at intersections across the City, matched with connected and sensor-equipped vehicles, will allow for signaling priority and real-time traffic analysis throughout the City. In addition to adaptive changes increasing the speed and efficiency of the new jitney service, the collection of real-time traffic data will allow for smarter routing and continual improvements to the efficiency of the service.

One major component of a more advanced traffic signal system with a centralized Traffic Control Center is widespread, real-time traffic data collection. The breadth of this data collection is not possible with traditional traffic count and monitoring methodologies. By utilizing this detailed, widespread traffic data,

better decisions can be made by the City when approving modifications to traffic flow to accommodate increasing construction in the City.

Project management approach

The City will develop and issue an RFP to create the necessary ITS and data collection infrastructure to support its Smart Cities vision, including the development of a data platform which will connect market-priced parking, adaptive traffic management, and jitney data to a central data collection system, according to federal and regional ITS standards and best practices.

For its on-demand jitney network, the City will develop a set of design, safety, environmental, and operational standards for the operation of the jitney system, including standards for the vehicles and stops. Jersey City will design a set of policies to encourage private operators to construct jitney stops and operate jitney vehicles, according to the standards created by the City. The City will then issue an RFP to design and maintain the routing and dispatch system and develop the mobile application and associated software to support the jitney system.

To encourage the construction of jitney stops, the City will explore a mix of incentives, subsidies, and innovative zoning policies to encourage the construction of these stops in key areas, as outlined by our preliminary site map. For stops located at public transit areas, the City can partner with the Port Authority and NJ Transit to share the cost of constructing these stations. The City may subsidize or share costs for the initial construction of stops in key areas.

For vehicle operators, the City will issue an RFP for private vehicle operators to contract with the City to establish an initial jitney fleet in the first phase of the project. The goal of this RFP will be to incentivize the establishment of an initial fleet and explore methods for make the network self-sustaining in future, including establishing low-emission standards for jitney vehicles. The City will establish standards, fare policies and oversight mechanisms, in this phase.

Following the initial RFP and utilizing lessons learned from the first phase of the project, the City will create a licensing and regulatory framework which will allow any private vehicle operator to join the jitney network, as long as they meet licensing standards. The goal is for this phase of the system to be entirely self-sustaining, without City operating support to the jitney network.

The establishment by the City of a common on-demand jitney network will create an economic incentive for drivers and vehicle operators to enter the system, much in the same way the ride-sharing service Uber operates. As the jitney network grows in ridership, the incentive for private operators to join the network will also grow as the network represents a larger market. The City will use the

powerful incentive of joining the jitney network to implement forward-looking standards for its jitney fleet vehicles, including requiring the phase-in of low-emission or electric vehicles.

The City will use a similar approach to contract out the design and maintenance of its market-priced parking system. The City will issue an RFP outlining the operation of its system and designating key areas for market-priced parking, and contract with a private-sector actor to design and deploy relevant infrastructure.

In creating corridor-based BRT, Jersey City will partner with Hudson County Planning and NJ Transit to develop a viable BRT corridor. Because NJ Transit operates a number of bus routes within Jersey City, partnering with NJ Transit to establish BRT will be essential.

To install and develop its adaptive traffic management system, Jersey City will work with relevant partners, including NJDOT, the North Jersey Transportation Planning Authority, and Hudson County to ensure an adaptive traffic management system conforms with relevant State and regional standards, and adaptive traffic management is integrated with existing traffic management systems at the State and regional levels.

2. **Describe the population characteristics of your city and show how it aligns with the USDOT's characteristics for a Smart City, including:**

Mid-size city with population between approximately 200,000 and 850,000 people in the city limits;

Jersey City's 2010 Census population was 247,597.

Dense urban population; and

Jersey City has a population of 16,736.3 people per square mile according to 2010 Census figures, one of the highest densities in the United States.

Represents a significant portion (preferably more than 15%) of the population of your local urbanized area.

Jersey City is in the New York--Newark, NY--NJ--CT urbanized area, which is dominated by New York City's population of approximately 8 million. Jersey City's 2010 Census population was 247,597.

According to the 2010 Census, Jersey City is the third most populous city in its urbanized area. However, within one year Jersey City is set to overtake Newark as the largest city in New Jersey and the second-largest city in its urbanized area. Furthermore, Jersey City and Newark are the only two cities within the New York--Newark, NY--NJ--CT urbanized area with a population between 200,000 and 800,000.

While Jersey City's actual portion of its urban area is fairly small, this is largely a consequence of being located within a the nation's most populous urbanized area, containing the nation's most populous city. Within its urbanized area, Jersey City is one of the largest and fastest-growing population centers in relative terms.

3. **Describe other characteristics of your city and show how it aligns with the USDOT's characteristics for a Smart City, including:**

   1. **Existing public transportation system;**

      Jersey City is served by the Port Authority Trans-Hudson rapid rail system, with four stations in Jersey City: Journal Square, Grove Street, Newport, and Exchange Place. The PATH connects to NJ Transit commuter rail service in Newark and Hoboken as well as Manhattan and the NYC Subway. In 2014, approximately 23 million riders used PATH stations in Jersey City.

      In addition, the Hudson-Bergen Light Rail, operated by NJ Transit, has 13 stations within Jersey City. In 2014, there were 24,311 average weekday boardings at Hudson-Bergen Light Rail stations in Jersey City. The Hudson-Bergen Light Rail has linkages with PATH, and NJ Transit rail and bus lines, and connects Jersey City to other cities in Hudson County, including Bayonne and Hoboken. Connections to buses and PATH connect HBLR to Manhattan.

      There are a total of 23 bus routes serving Jersey City, including NJ Transit and private bus lines running both local and regional services. There are 19 local routes, 15 operated by NJ Transit and four operated by the A&C Bus Corporation; and four regional services, three operated by NJ Transit and one operated by Trans-Bridge Bus Lines. In 2008, there were approximately 22 million annual trips on bus routes in Jersey City. Bus routes connect Jersey City with Newark, Hudson County, and Manhattan.

      There are six ferry terminals in Jersey City which provide privately-operated service to Manhattan: Newport, Paulus Hook, Liberty Harbor, Liberty Landing Marina, and Port Liberte. There are seven ferry routes operated by BillyBey ferry service, as well as the Liberty Park Water Taxi service.

      According to 2014 ACS 5-year estimates, approximately 47.4% of Jersey City commuters relied on public transportation, the second-highest percentage of any city in the United States, after New York City.

   2. **Environment that is conducive to demonstrating proposed strategies;**

The economic and growth boom in Jersey City has been matched by a revitalization of Jersey City's governance and planning. New development combined with Jersey City's aging infrastructure have created a recognition that new and innovative thinking is necessary to manage Jersey City's growth, and in recent years Jersey City has been a regional leader in embracing bold and innovative thinking in city design. Bloomberg Philanthropies, recognizing Jersey City's potential for innovation, awarded the City a grant of up to $2.25 million to establish a City Office of Innovation. The Office of Innovation has been working since its establishment to find 21st century solutions to increasing economic development in underdeveloped commercial corridors, enhance the City's collection of data and establish an open data portal, and find other ways to leverage new thinking and improve quality of life for Jersey City residents.

Jersey City has a long track record over many mayoral administrations of leveraging our mass transit infrastructure to encourage transit usage and walkability. Jersey City has four PATH rail stations operating 24/7 and has aggressively promoted development in their vicinity. Billions of dollars have been invested in development projects near Jersey City's fixed-rail transit stations. Currently, 6,000 residential units are under construction, and an additional 17,000 units have development approvals. Many of these units are located in high-rise towers within a 10-minute walk of a mass transit station. There are a wide range of housing options in Jersey City, including one- and two-family houses; townhomes; low-, mid-, and high-rise apartment buildings; and five local historic districts covering approximately 2,500 properties.

One key example of this commitment to transit-oriented development is the City's Journal Square 2060 Redevelopment Plan, which outlines the City's strategy for redeveloping the area around the Journal Square PATH station.The Plan replaces customary parking minimums with parking maximums, reducing the incentive for developers to build parking spaces and encourage private automobile use. Sites adjacent to the station have no building height limit and no maximum density standards, as the City concluded there was no reason to limit housing opportunity in one of the nation's most transit rich neighborhoods.Only a few years after the adoption of the redevelopment plan, the first 54 story residential tower has topped off and several more towers exceeding 40 stories have received planning approval.

Other station areas have also had their development regulations revised to permit greater densities and reduced parking requirements to prepare for a new generation of workers and households that will walk more, use transit more, and makes less use of private auto ownership. Jersey City's planning and development policies demonstrate a real commitment towards a city that does not rely on private automobile usage.

Jersey City has also aggressively encouraged bicycling as an alternative to automobile transport. There are 24 miles (and counting) of on-street bike lanes and nearly 8 miles of off-road bike paths, which is the most bike route mileage of all municipalities in New Jersey. Jersey City was the first (and, so far, only) municipality outside New York City to join the CitiBike bike share system, facilitating bicycling on both sides of the Hudson River. The City's zoning ordinance requires the provision of bicycle parking for new development citywide. The City recently installed 200 bike racks throughout the City to support increased bicycling.

Enhancing the pedestrian realm is also key to Jersey City's vibrant neighborhoods. Jersey City's WalkScore is 84, which is considered "very walkable." The City passed a Complete Streets policy in 2011 and is a participant in the on-going StreetSmart NJ Pedestrian Safety Education Campaign spearheaded by the North Jersey Transportation Planning Authority. The City has been successful in preserving and expanding its network of sidewalks and encouraging ground-floor retail, which has resulted in animated commercial corridors lined with restaurants, cafes, services, and shops with high foot traffic. Increasingly, Jersey City streets and public plazas are becoming the locus of social interaction, as the venues for food trucks, farmers markets, street fairs, and concerts. In addition, the City has created a pedestrian mall on Newark Avenue near the Grove Street PATH Station, where the City took the bold step of converting two blocks into a car-free zone, save for deliveries and emergency vehicles. The Newark Avenue pedestrian mall has quickly become a popular destination in Downtown Jersey City.

3. Continuity of committed leadership and capacity to carry out the demonstration throughout the period of performance;

This initiative is strongly supported by Mayor Steven Fulop and the entire Fulop Administration. As a result, the Mayor's Office and the Mayor's Office of Innovation will provide direct guidance and oversight throughout the process and will also coordinate allocation of any Jersey City resources and manpower required to ensure the success of this initiative. The Mayor's Office and the Mayor's Office of Innovation will collaborate with a variety of key stakeholders and leverage the many positive working relationships enjoyed by the administration, including the Jersey City Division of Planning, the Jersey City Division of Architecture, the Jersey City Division of Traffic and Engineering, NJTransit, The Port Authority of New York and New Jersey, the New Jersey Transportation Planning Authority, the New Jersey Department of Transportation, Hudson County Division of Planning, and any private entities and/or companies providing specific services or products.

4. A commitment to integrating with the sharing economy; and

Jersey City's growing population of young and professional workers has also brought an increased use of sharing-economy services to the city. In 2015, an estimated 15,000 trips per week on the ride-sharing app Uber originated in Jersey City, according to the Jersey Journal. A current search of listings on the room-sharing service Airbnb returns approximately 300 listings in Jersey City. As Jersey City has embraced new modes of economic and governmental thinking, it has embraced these sharing economy services and resisted political pressure in favor of anticompetitive regulation.

In October 2015, Jersey City took action to legalize and regulate short-term room-sharing services such as Airbnb and Homeaway. Jersey City worked with Airbnb to ensure the company would pay Jersey City's 6% hotel tax, and additionally ensured that the company, not individual hosts, would be responsible for administering and paying the tax. Jersey City's embrace of the new opportunities afforded by the sharing economy stands in contrast to neighboring municipalities, who have not sought to integrate sharing-economy services into the economic and regulatory systems of the city. In New York City, for example, Airbnb is not legal despite generating millions of dollars of economic activity per year for the city. Jersey City's approach in this area integrates the sharing economy into the broader regulatory framework, allowing the City to raise revenue and regulate this service without limiting its growth.

As the sharing economy continues to grow, Jersey City is fully committed to finding ways to integrate the sharing economy into its regulatory framework which increase rather than restrain innovation in this sector.

5. A clear commitment to making open, machine-readable data accessible, discoverable and usable by the public to fuel entrepreneurship and innovation.

Beginning in 2013, Jersey City began an ambitious effort to build a robust open data portal. At the beginning of this project, Jersey City's data collection and governance processes were seriously antiquated, with important data often collected manually and in antiquated or conflicting formats by City departments and staff. In many cases, data was still being kept on paper records.

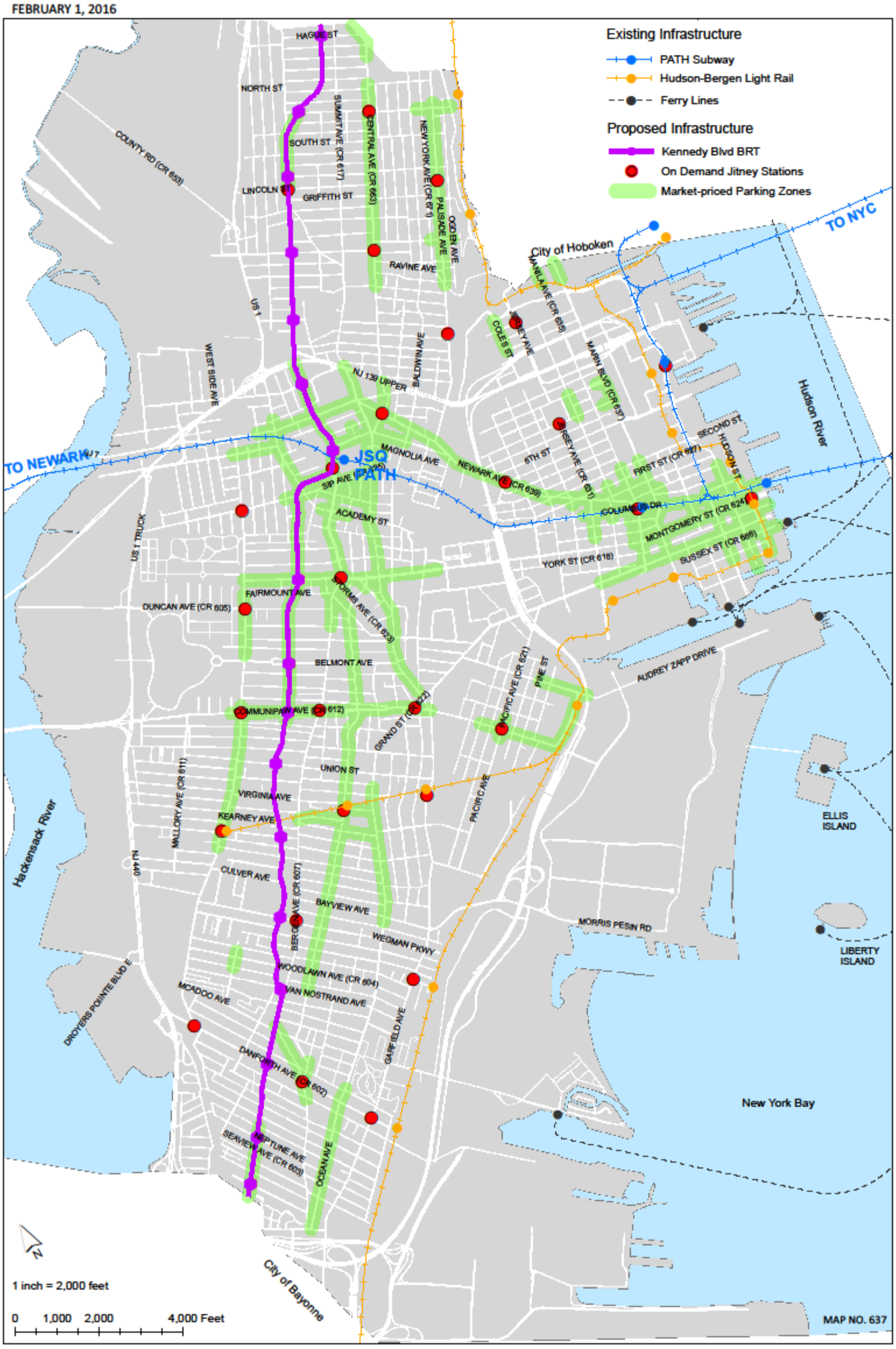
Since then, Jersey City has worked to launch a fully-featured open data portal which provides the public with both raw data and visualization tools. Jersey City's open data platform gives the public access to a wealth of raw data as well as a set of readable dashboards on key subjects, such as economic and demographic indicators, and mapping tools for data such as volume of 911 calls, abandoned properties, and bike lanes.

Jersey City began its open data platform from a starting point of close to zero, and has already made significant strides to make large amounts of data available and readable to the public. Going forward, the City plans to continue adding additional sources of data and analysis tools to its data portal, including a dashboard visualization of the City's affordable housing units.

4. Provide an Annotated Preliminary Site Map. The map shall identify the specific geographic location being proposed for the Challenge and indicate locations related to key issues, proposed roadside technology locations, connected automated vehicle operations, and other explanatory features to support strategies that align with the USDOT vision elements. The map shall be no larger than one page (up to 11 inches by 17 inches is acceptable for this item only) when printed

ANNOTATED PRELIMINARY SITE MAP
JERSEY CITY, NJ
FEBRUARY 1, 2016

USDOT SMART CITY CHALLENGE



5. Describe how your holistic, integrated approach aligns to the twelve USDOT vision elements described in this solicitation. For each vision element, describe your approach including the technology solutions proposed. Illustrate how the proposed technology solutions can synergistically combine to create measurable impact while reducing costs associated with both deployment and operations.

TECHNOLOGY ELEMENTS - HIGHEST PRIORITY

Vision Element #1: Urban Automation.

Under Jersey City's vision for a smart city, vehicles connected to a centralized traffic and route management system will have automated navigation and route-setting. On-demand jitney services in the new system will be connected into a system which dynamically collects real-time data on riders requesting a ride and their desired destination. An algorithm will then automatically compute, based on the position of available jitneys, optimal routing for jitney services. This automated process adds flexibility to the jitney system without relying on dispatchers and route selection by drivers.

Automated routing of on-demand jitneys will have a number of benefits, most notably reduction of congestion and undersupply of jitney services. A study of Hudson County's jitney services undertaken by the North Jersey Transportation Planning Authority found that jitney routes were not well optimized, with significant oversupply along some routes and undersupply on others. This means that jitneys contribute to congestion in traffic-prone areas without providing coverage in areas that lack transit. In part, this is due to jitneys being operated by a set of private operators who do not coordinate their services, leading to excessive competition in key routes.

Vision Element #2: Connected Vehicles.

Jersey City envisions outfitting on-demand jitneys and rapid buses with sensors to provide location and capacity data. This data, collected on a real-time basis, will provide dynamic information about bus and jitney capacity, location, speed, and demand. A centralized management system will collect and analyze this data to enable smooth, responsive on-demand transit and rapid buses.

Connected vehicles will allow for a series of transportation improvements central to our vision for a Smart City. Connected jitneys will transmit location data, allowing a central management system to assign routes depending on customer demand. Location data on buses and jitneys will allow for real-time monitoring of vehicle speed and traffic congestion. The collection and analysis of this data will allow for smart, dynamic routing of available jitneys in a manner which avoids creating areas of congestion and undersupply.

In addition, data collected by connected vehicles will allow for real-time updates to riders, increasing predictability and accessibility in the transit system.

Connected transit vehicles will allow riders to know exactly when a ride is available and its anticipated time of arrival.

Vision Element #3: Intelligent, Sensor-Based Infrastructure.

Jersey City's vision for a Smart City will involve creating an adaptive traffic management system and sensor-equipped smart bus stops throughout the city. Smart bus stops will allow for the collection of data on origin and destination demand at all stops. In coordination with connected vehicles, this will allow for efficient and dynamic routing of on-demand jitneys throughout the City, and provide data which will allow regular analysis of system volume and traffic patterns.

In addition, the City will implement a new traffic management system with adaptive traffic signals. These signals will be able to monitor traffic flows at key intersections and dynamically adjust traffic flows to compensate. Adaptive traffic signals will also allow for signal priority for buses and on-demand jitneys to increase transit speed and efficiency.

INNOVATIVE APPROACHES TO URBAN TRANSPORTATION ELEMENTS - HIGH PRIORITY

Vision Element #4: Urban Analytics.

Data gathered from the adaptive traffic management system and sensor-equipped jitneys and stops will enable ongoing analysis and assessment of a variety of transit system metrics, including ridership data, traffic flow and congestion, vehicle miles traveled, and average vehicle speed.

For example, data collected by the connected vehicle and infrastructure components of our vision will enable analysis of average travel times, key areas of demand, and the impact of the system on traffic congestion. From these metrics, further analysis can be conducted to determine the impact of the system on other priorities, such as safety, economic opportunity, and pollution. Increases in transit ridership across various modes in the City combined with lower traffic congestion will enable the City to estimate decreases in vehicle miles traveled due to the project, and therefore estimate a reduction in vehicle emissions.

Data analysis of on-demand jitney routing will allow for the development of semi-fixed routes which anticipate rider demand and streamline jitney routing. In addition, analysis of data can create optimal fixed routes to enhance the resilience of the system. In the event of any system failure which impedes the ability of the system to dynamically route jitneys, jitneys can be instead circulated along fixed routes determined by analysis of ridership data.

Vision Element #5: User-Focused Mobility Services and Choices.

Jersey City's Smart City vision places on-demand mobility as a central principle in transit for the 21st century. In our vision, users will be to request a ride between any two jitney stations across the City, allowing user demand to drive routing and transit volume instead of relying on fixed-route systems. In addition, displays at stops and a smartphone app will display the location of available jitneys and real-time information about expected waits and travel times.

Jersey City intends to ensure that all aspects of its Smart City vision are accessible to all citizens. Rides will be both requestable by smartphone app and kiosks installed at stations. Jersey City will also ensure that all stations and vehicles are compliant with the Americans with Disabilities Act (ADA).

Vision Element #6: Urban Delivery and Logistics.

A significant amount of commercial and freight traffic moves through Hudson County, and Jersey City, much of it attributable to cargo movement through the Port of New York and New Jersey, which is the busiest port on the East Coast. In 2003, approximately 10 million tons of cargo was trucked through Hudson County, with an estimated value of some $82 billion.

Jersey City's vision for a Smart City involves installing an intelligent, adaptive traffic management system and building intelligent transportation systems to support opportunities for smarter routing of freight and commercial goods. In addition, the City's Smart City vision will reduce the number of cars used for personal travel, alleviating freight and commercial traffic within the City. Routing and dispatch algorithms developed for our on-demand jitney system can be repurposed to provide intelligent routing of freight in the future.

Vision Element #7: Strategic Business Models and Partnering Opportunities.

Jersey City envisions partnering with the private sector within its Smart City vision to develop and deploy the necessary ITS infrastructure, user-facing software, and hardware to create the dispatch network of on-demand jitney stations throughout the City.

Our focus on finding innovative financing mechanisms for our transit vision will involve finding ways to work with the private sector and the business community to share the cost of public transit. For example, the City can explore cost-sharing arrangements by which development that benefits from the installation of new jitney stations pays some of the cost, or the City can partner with private developers to install and maintain jitney stops where business and developers request them, replacing paratransit or shuttle services currently operated by institutions such as universities, luxury real estate developments, medical facilities, and senior living facilities.

The City's vision for its on-demand jitney network relies on contracting with private operators to run and maintain the jitney fleet, and a private operator to design and maintain software and dispatch elements of the system. This partnering model will leverage market forces and private investment and innovation to provide transit and assets for the system.

Vision Element #8: Smart Grid, Roadway Electrification, and Electric Vehicles.

Jersey City currently lacks smart grid infrastructure, and implementing smart grid and microgrid technology in the City is a key recommendation of the City's Sandy Recovery Strategic Planning Report, and the City is committed to implementing smart grid technology going forward.

Jersey City ultimately envisions using a fleet of electric vehicles in its on-demand jitney system, with rapid charging occurring either at specified locations or at stations themselves. Use of electric vehicles in the on-demand jitney fleet will be phased in as system ridership grows, existing vehicles retire, and incentives can be offered to private operators to transition to electric and low-emission vehicles.

Vision Element #9: Connected, Involved Citizens.

Creating open and dynamic channels of communication between citizens and government is key to Jersey City's Smart City vision. On-demand jitneys, by design, use crowdsourced data on rider demand to and from stops to provide for routing which will algorithmically match actual transit demand.

In addition, the implementation of a mobile application for transit will allow for the City to have a constant feedback channel for service issues and possible improvements to the system.

SMART CITY ELEMENTS - PRIORITY

Vision Element #10: Architecture and Standards.

Jersey City currently does not have a developed ITS or data-collection system on the municipal level, which will allow us to develop new ITS architectures based on regional and federal best practices and standards. Because the City will begin its ITS development process through its Smart City vision, the implementation of these best practices will serve as a basis for implementing robust data collection architectures and standards for future projects.

The Connected Corridor is the NJ Statewide and Regional Intelligent Transportation Systems (ITS) Architecture and Deployment Plan. It serve as a shared vision by New Jersey's transportation agencies of how the various information technology systems work together to provide a safer, more efficient and more effective transportation system for travelers.

The National ITS Architecture defines functions (e.g., gather traffic information or request a route) that are required for ITS; the physical entities or subsystems where these functions reside (e.g., the field or the vehicle); the information flows and data flows that connect these functions and physical subsystems together into an integrated system.

Our Smart City initiative will implement and integrate with these existing national and regional architectures, allowing us to leverage lessons learned and best practices from these existing systems.

Vision Element #11: Low-Cost, Efficient, Secure, and Resilient Information and Communications Technology (ICT).

Jersey City's Smart City vision will rely on existing regional and national ICT standards and best practices to implement robust ICT across all City data platforms. As our proposal relies on existing, proven technology and does not include development of untested software, ICT development will be low-cost. ICT to support the City's vision is largely available off the shelf and will not require extensive modification.

To ensure the City's ICT platform can support the collection of personally identifiable information in a secure and privacy-sensitive manner, should such collection become necessary in future, the City will cooperate with USDOT to implement a security credential management system (SCMS).

Each element of the City's Smart City vision - adaptive traffic, on-demand jitney routing, and market-priced parking, will be connected on a single ICT platform which will allow for further connections with future data collection projects by the City.

Vision Element #12: Smart Land Use.

Smart Land Use is nothing new in Jersey City. A historic, compact street grid, established before the rise of the automobile, serves the majority of the City and underpins present day development. The renaissance that has taken place over the last 30 years – and that continues today - was possible because the City requires that redevelopment embody Smart Land Use principles: mixed-use, transit-oriented, walkable, and bicycle-friendly. The most sustainable way to grow is to provide alternatives to the private automobile and prioritize pedestrians, transit users, and bicyclists. The City recognizes the value of investment in mass transit; zoning around station areas is highly flexible and allows the highest intensity of uses.
The BRT/on-demand jitney system will only enhance Jersey City's opportunities to implement smart land use policies. Fixed-rail mass transit led to major redevelopment near the Hudson-Bergen Light Rail and even higher-density

redevelopment near PATH stations. The BRT would provide many of the benefits of rail transit at a much lower cost. The existing bus service is often overcrowded and slow, especially during peak travel times, resulting in unreliable service and frustrated passengers. BRT/on-demand jitney service would reduce travel times, increase reliability, and increase system flexibility. BRT/jitneys will connect to the PATH train and Hudson-Bergen Light Rail, enhancing access to employment centers within Jersey City, as well as in Newark and New York City. Investment in BRT/on-demand jitneys will unlock redevelopment potential in the inner city.

Jersey City's Smart City vision involves implementing financing mechanisms which connect funding for our proposed smart transit system with increases in land and real estate value. The City could, for example, levy a special assessment for properties served by new transit improvements to fund new transit development through increases in land value.

Jersey City will also review all zoning regulations around new bus rapid transit stations to encourage new development where new transportation infrastructure has been provided. By coordinating land use regulations with transportation infrastructure, Jersey City will guide new development towards high walk and transit score areas, allowing Jersey City to grow with the least possible strain on existing infrastructure and lowest possible environmental impact. Furthermore, redevelopment along the BRT on higher ground in the inner city will be located away from the low-lying waterfront areas prone to flooding, encouraging resilient development.

6. Identify and rate key technical, policy, and institutional risks associated with the deployment vision and discuss plans for mitigating those risks.

Key risks to Jersey City's Smart City vision include securing stakeholder support and cooperation, ensuring community support for and awareness of the project, and ensuring full utilization of the proposed transit system and its economic viability.

Jersey City may need to cooperate with Hudson County, NJ Transit, the New Jersey Department of Transportation, the Port Authority of New York and New Jersey, and the North Jersey Transportation Planning Authority, as well as private partners and contractors in order to implement its Smart City vision. Because of the large number of potential partners, our Smart City vision could be compromised by insufficient cooperation from these entities.

Jersey City plans to mitigate this risk by involving relevant actors early and maintaining frequent and ongoing consultation with these entities. In addition, aspects of the proposal, such as BRT routes and jitney stop locations, can be altered based on cooperation from other agencies.

Community support will be necessary to implement Jersey City's Smart City vision, as the establishment of BRT and jitney stops may involve tradeoffs in terms of

parking and sidewalk space. Implementing market-priced on-street parking will also require community support.

In order to assure support for our Smart City vision, Jersey City will implement an aggressive community outreach and marketing strategy to fully explain the elements of the proposal and its benefits. Greater awareness of the significant benefits of the program, such as reduced traffic and increased access to transit, will reduce the risk of significant community opposition.

Because a main component of our Smart City vision is a network of on-demand vehicles, the system must reach a healthy utilization rate to ensure low wait times, dependability, and achieve expected transit benefits. If the system fails to attract a significant number of riders, insufficient vehicle circulation will increase wait times and lead to vehicles left idling or unused.

Ensuring sufficient rider demand is possible through an aggressive marketing approach outlined above, as well as through branding and system design elements which will make the system more attractive to riders. Incorporating comfortable and attractive shelters, branded vehicles, and quality-of-life improvements such as real-time wait information, a mobile application, and internet connectivity at stations will increase the attractiveness of the system to riders and thus ridership.

Jersey City's Smart City proposal significantly reduces the risks of technical failure and ensures economic viability by relying on a mixture of proven technologies and policies. Every element of our vision involves hardware and software which has a demonstrated record of success and relies on "off the shelf" technology. Dynamic routing of on-demand transit has already been demonstrated as viable by companies such as Uber and similar innovations elsewhere, such as the Kutsuplus on-demand bus system in Helsinki.

7. Outline team partners, key stakeholders, and demonstration governance processes. Describe existing and future public and/or private partnerships, including university research partnerships.

Internally, the project will be managed by the Jersey City Office of Innovation, which will coordinate efforts between the Mayor's Office, Department of Public Works, City Planning Division, Division of Engineering, Traffic & Transportation, and the Jersey City Redevelopment Agency.

Jersey City will seek a wide variety of external partners for this project. The City will partner with the Port Authority of New York and New Jersey, Hudson County Planning Department, North Jersey Transportation Planning Authority, and the New Jersey Department of Transportation to ensure the success of the project and its integration with existing transportation systems.

The City will partner with a New Jersey university with a transportation or technology focus, such as the New Jersey Institute of Technology or Rutgers

University to fully develop our vision into a detailed proposal, including program design specifications and performance metrics.

8. Describe existing transportation infrastructure and system features in your city, including:

1. Arterial miles:

Jersey City has 46.4 miles of roads classified as “principal arterial” or “minor arterial” by the NJDOT.

There are five “principal arterial” roads with a total of 12.15 miles in Jersey City, including State-owned Routes 1, Route 1 Truck, 440, 7, 139, and Hudson County-owned Route 501 (Kennedy Boulevard).

There are 38 “minor arterial” roads with a total of 34.25 miles in the City, all of which are owned by the City except for Paterson Plank Road.

2. Freeway miles:

NJDOT classifies only one road in Jersey City as a freeway/expressway, Route 1, which has 3.2 miles in Jersey City.

3. Transit services

Jersey City is served by the Port Authority Trans-Hudson rail system, with four stations in Jersey City: Journal Square, Grove Street, Newport, and Exchange Place. The PATH connects to NJ Transit commuter rail service in Newark and Hoboken as well as Manhattan and the NYC Subway. In 2014, approximately 23 million riders used PATH stations in Jersey City.

In addition, the Hudson-Bergen Light Rail, operated by NJ Transit, has 13 stations within Jersey City. In 2014, there were 24,311 average weekday boardings at Hudson-Bergen Light Rail stations in Jersey City. The Hudson-Bergen Light Rail has linkages with PATH, and NJ Transit rail and bus lines, and connects Jersey City to other cities in Hudson County, including Bayonne and Hoboken. Connections to buses and PATH connect HBLR to Manhattan.

There are a total of 23 bus routes serving Jersey City, including NJ Transit and private bus lines running both local and regional services. There are 19 local routes, 15 operated by NJ Transit and four operated by the A&C Bus Corporation; and four regional services, three operated by NJ Transit and one operated by Trans-Bridge Bus Lines. In 2008, there were approximately 22 million annual trips on bus routes in Jersey City. Bus routes connect Jersey City with Newark, Hudson County, and Manhattan.

There are six ferry terminals in Jersey City which provide privately-operated service to Manhattan: Newport, Paulus Hook, Liberty Harbor, Liberty Landing Marina, and Port Liberte. There are seven ferry routes operated by BillyBey ferry service, as well as the Liberty Park Water Taxi service.

According to 2014 ACS 5-year estimates, approximately 47.4% of Jersey City commuters relied on public transportation, the second-highest percentage of any city in the United States, after New York City.

4. Shared-use mobility services

Jersey City is home to 35 CitiBike stations and a number of Zipcar car-sharing vehicles. There are a number of private shuttles operated by residential property owners and universities, as well as paratransit options provided by the County, medical centers, and senior living facilities.

5. Information and communication technology (ICT)

Jersey City has invested over a $1 million digitizing legacy map products such as Mylar tax maps and had them digitally conformed to high resolution aerial orthophotography base map layers. Photographic base maps were also utilized in digitizing full planimetric features of the city such as curb lines, manhole covers, catch basins, light poles, driveway areas, street trees, and other important physical features. These digital mapping datasets have permitted Jersey City to advance its long range planning activities, assisted in resiliency planning for storm surge events such as Hurricane Sandy, as well as 911 call center dispatch and facility management. All city departments have now converged on a common digital mapping standard which facilitates the cross sharing of information between all City departments and agencies.

6. Intelligent Transportation Systems (ITS) including transportation management centers and field equipment

The City does not operate any significant

7. Smart Grid Infrastructure including electric vehicle charging infrastructure

Jersey City is committed to upgrading its infrastructure to encourage the use of low-emission electric vehicles. The City is currently in the process of implementing a pilot electric vehicle charging station along public on-street parking at 160 First Street, in the Powerhouse Arts District, partnering with a private developer to offer charging stations for 20 cars along the public right of way.

9. Define the data your city currently collects. Describe how transportation data could integrate with other functions or services in a city (such as public safety, human services, transit, and public works) to improve the management and operations of the city. Likewise, describe how other data could be integrated with transportation data to improve transportation operations. Describe any existing policies and identify their sources (local executive order or policy, local ordinance or state legislation, etc.) applicable to the proposed data to be collected and shared as part of the proposed project. Identify candidate data that is expected to be shared, used, and used for other purposes by the participating project partners or with the public. Describe the terms and conditions that exist or will be established and managed in partnership agreements, data or information sharing agreements, agency specific policies and operating procedures to establish and maintain the systems and interfaces to maintain the integrity of the data and share the information identified in the proposal.

Jersey City currently does not collect any significant amount of real-time data, although the City is actively working towards collecting, unifying, and making accessible real time and machine readable data.

Jersey City's Smart City vision will create a platform and architecture which will enable collection of great forms and amounts of data in the future. Transportation and traffic data, for example, can be combined with incident reporting to dynamically route traffic around obstacles such as construction, public safety emergencies, or severe weather events. Public safety data regarding traffic and pedestrian accidents can be similarly leveraged.

As data collection becomes more granular and sophisticated, the City can even overlay land value, traffic patterns, commuting behavior, employment, poverty and public health data to create strategies which maximize economic opportunity and public health through strategic use of transit. For example, data on cases of respiratory illness could be used to pinpoint areas of high pollution and compared to traffic congestion. Access to transit can be compared to land values to assess the impact of transit on development and develop strategies to maximize that impact.

10. Describe your approach for using existing standards, architectures, and certification processes for ITS and connected vehicle based technologies and plans for documenting experiences and cooperating with architecture and standards developers to improve the quality of these products based on lessons learned in deployment.

Jersey City currently does not have any significant ITS in place, which serves as an advantage. Because ITS is new to the City, our Smart City vision avoids conflicts between pre-existing, patchwork systems and allows us to begin to process of building robust ITS without addressing any obsolete existing system.

Jersey City will incorporate lessons learned at the federal and state level and integrate with existing architectures and standards. We intend to closely follow existing federal ITS standards and architectures, and also integrated into the State of New Jersey's ITS architecture. We envision regular collaboration with ITS experts in the private and academic sectors in order to fully implement ITS which draws on existing standards, architectures, and certification processes.

11. Provide measurable goals and objectives for your vision and describe your approach for monitoring the impact of the demonstration on mobility, safety, efficiency, sustainability, and climate change

Jersey City will measure the success of its vision through increased transit ridership, alterations in commuting behavior, improved transit system performance, reductions in automobile traffic and traffic congestion, reductions in parking search times and occupancy rates, and increases in land value and economic activity in areas with improved access to transit.

System ridership

Jersey City will compile a baseline transit ridership estimate and forecast across all public transit systems, such as PATH, HBLR, and bus service. As the jitney system is designed to link into other transit systems across the City, the system should drive more transit ridership into existing transit networks. The City will compare this baseline forecast of ridership against actual ridership increases after the implementation of its Smart City vision, creating an estimate of transit ridership induced by the program.

Based on the final budget for the project, the City will create cost-effective ridership targets for the jitney system and BRT. Ridership data collected from these systems can then be compared to these targets to assess the success of the system. Both ridership targets and actual ridership data can be broken down on a geographic basis, allowing the City to assess whether the system is increasing transit service to currently underserved areas.

Commuting behavior

Jersey City will use commuting by automobile percentages as measured by the American Community Survey on a census-tract basis as its baseline for commuter behavior. The City will conduct an analysis of whether commuting behavior in targeted census tracts can be measured more accurately by a City-administered survey, as opposed to ACS data, and if the City should then conduct its own survey of commuting patterns in targeted underserved areas to more rigorously assess commuting behavior.

Based on a detailed technical analysis, the City will establish performance targets for reductions in commutes by automobile and measure these against the established baseline, whether through ACS data or by a City-administered survey.

System performance

Sensor-equipped BRT and jitney vehicles will allow for real-time collection of travel times, on-time performance, and average speed. The City will set a defined target for these metrics for both BRT and jitney systems and compare actual performance to these targets on a regular basis.

Reduced automobile traffic

Jersey City will establish a baseline estimate of automobile traffic prior to the implementation of the project. Establishment of an adaptive traffic control system will allow for accurate, real-time collection of traffic data, which can then be compared against the baseline to assess reductions in traffic congestion due to the reduced reliance on automobiles and reduced parking wait times.

In addition to traffic congestion, the City will estimate vehicle miles traveled within the City and conduct yearly follow up estimates to determine reductions in vehicle miles traveled to determine the impact of its Smart City program.

Parking search efficiency

The installation of sensors for market-priced street parking will allow for a brief pilot period in which parking occupancy can be measured. Parking occupancy meters will then provide real-time occupancy data, which will allow the City to assess the impact of its market-priced parking program on parking congestion.

The City will assess the cost of surveying average parking search times in areas in which market-based street pricing will be implemented, and depending on that cost, also provide a baseline and annual assessment of average parking search times to determine the success of the project in reducing driving due to parking congestion.

Increased economic activity

The City will establish a baseline projection for land values in areas affected by the program and compare this baseline against actual land values in targeted areas close to the new BRT system and jitney stops, especially areas with below-average land values and economic activity. Increases in land values will then be regularly assessed to determine the economic impact of the program.

In addition, the City will measure baseline economic activity in commercial corridors which will be subject to the market-priced parking initiative and measure increases in business traffic and economic activity through regular surveys of businesses in these areas and tax data.

12. Provide evidence that establishes your capacity to take on a project of this magnitude, including executive commitment, workforce capacity, degree of infrastructure readiness, data and performance management capabilities.

The Office of Innovation, a department within the Mayor's Office, acts as an in-house consulting team addressing hard to solve quality of life issues. As the coordinating agent of this grant, the Office of Innovation would organize the effort between all relevant parties, namely: Mayor's Office, Department of Public Works, City Planning Division, Division of Engineering, Traffic & Transportation, and the Jersey City Redevelopment Agency; internally to ensure that personnel is adequately appropriated.

Reporting directly to the Mayor, the team will manage workforce capacity, data management, and performance management.

13. Describe any opportunities to leverage Federal resources through cost share, in-kind donations, and partnering.

Jersey City envisions partnering with a wide array of actors to share costs and attract investment in its Smart City proposal. Cooperation with relevant transit agencies, such as NJ Transit, can leverage already-existing investments by these bodies to increase the efficiency of the proposed system. For example, depending on induced demand to HBLR and PATH, Jersey City could explore cost-sharing mechanisms with NJ Transit and Port Authority due to the jitney system serving as a feeder mechanism for NJ Transit and Port Authority services.

Jersey City's on-demand jitney system relies on partnering with private actors to significantly share both the capital and operating costs of its Smart City vision, which will leverage Federal resources with private investment to increase the reach of Jersey City's Smart City vision.