

Exploration Of A Public Bike Share Program In Hudson County

Final Report

2015



TOGETHER
**NORTH
JERSEY.**

**Sam
Schwartz
Engineering
D.P.C.**





Exploration Of A Public Bike Share Program In Hudson County

Prepared for
Together North Jersey
Local Government Capacity Grant Program

Hudson County

North Jersey
Transportation Planning Authority

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The report reflects the best available information as of June 2014. It does not reflect local bike share developments subsequent to that date, such as Jersey City's decision to pursue bike share independently of Hoboken and Weehawken and changes to New York City's Citi Bike program.



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EXECUTIVE SUMMARY

In 2012, the Hudson County Division of Planning and the Hudson Transportation Management Association conducted a preliminary bike share feasibility study. The present study, funded under the Local Government Capacity Grant Program of Together North Jersey—a consortium led by Rutgers Edward J. Bloustein School of Planning and Public Policy and the North Jersey Transportation Planning Authority (NJTPA)—builds on and enhances the 2012 study with technical details and analyses.

The primary objective of this study is as follows:

- Determine goals, objectives, and performance measures for a bike share system.
- Identify geographical boundaries of a phased service area.
- Calculate the ridership and membership forecasts on the basis of statistics from four other U.S. cities with active bike share systems.
- Quantitative summary of the financial benefits, costs, and risks of a bike share system.
- Equity recommendations for a low or no-cost bike share membership model.
- Location suggestions of bike share system stations for all the phases of service area.

The recommendations that evolved out of this study are applicable for implementation of a bike share system throughout northern New Jersey, particularly multi-jurisdictional urban and suburban areas.



Outreach Efforts and System Goals

The project team collected information from both the general public and, via the Technical Advisory Committee (TAC), stakeholders to help define the direction of a bike share system for Hudson County. The outreach was undertaken in a series of key meetings with stakeholders, through an online survey and interactive map on the project website, and in a public meeting, to ensure the greatest participation and diversity of viewpoints. Public feedback was used to gauge support for bike sharing in the county and assist with determining the bike share service area station locations.

With the help of information and opinion gathered from stakeholders and the TAC, goals, objectives and performance measures were established for a bike share system in Hudson County. The goals, in order of priority, are as follows:

- Increase accessibility to jobs, recreation, and other locations
- Create positive user experiences to maintain customers and attract new users
- Maximize both membership and ridership, while balancing financial objectives of the program
- Provide a system that is accessible to a broad cross-section of people living in and visiting Hudson County
- Create a system that is financially sustainable, transparently operated, and accountable to the public
- Develop an innovative transportation system that improves Hudson County's livability and economic competitiveness
- Provide Hudson County residents and visitors a safe mode of transportation that promotes active and healthy living

Analysis of Service Area

A three-phase bike share system area was defined based on spatial analysis of commonly applied metrics used to predict bike share system demand and refined through consultation with Hudson County, NJTPA, and the TAC as well as feedback from the public. Some metrics that were used included residential population density, the number of carless households, the location of colleges and universities, and the location of transit stations. Certain equity metrics, such as the location of public/subsized housing and the identification of areas where there is lower median household income, were also included in order to achieve a system area that is socially equitable, and fair. The service area, which is represented in phases (I, II, and III) of implementation, is shown in Figure ES 1.



Ridership Forecast

Data from four comparison bike share systems (Washington, D.C.'s Capital Bikeshare, Boston's Hubway, New York City's Citi Bike, and Minneapolis's Nice Ride Minnesota) was used to forecast ridership over five years for a future Hudson County bike share system. The forecast shows that the proposed system could achieve over 600,000 rides after two years, and then one million rides per year in the third year, growing to almost 1.6 million riders per year in later years. Early on, each bike is ridden approximately two times per day. Later, each bike gets ridden approximately 2.5 times per day, similar to Boston and Washington, D.C. In the early years, the model predicts that approximately 2.2% of the system population has an annual membership, increasing to over 5% in later years.

Financial Analysis of BNR Proposal

During the course of this project, the municipalities of Jersey City, Hoboken, and Weehawken issued a request for proposals and awarded a contract for bike share implementation and operation in the three municipalities with the condition of using no public funding. The contract was awarded to a collaboration of the companies Bike N Roll (BNR), E3Think, nextbike, and P3 Global Management (the "BNR proposal").¹

Comparing the BNR proposal to ridership and membership metrics from other systems show that the proposed system has reasonable, if not conservative, assumptions compared with similar bike share systems around the country. Both annual and casual member assumptions could be higher.

Depending on the operating costs that can be achieved by BNR, extrapolated financial projections based on existing systems' figures, show a system that may break even on membership and usage fees if operating costs (and therefore service levels) are kept to a bare minimum. If operating costs are higher, then the system will be in deficit of approximately \$1,100,000 during the first year using the proposal's membership estimates. Either surpassing the membership estimates or bringing in sponsorship and advertising may close any deficit. However, as mentioned above, the annual and casual membership projections are conservative when compared to the performance of the comparison cities, potentially improving the financial outlook for the system.

¹ The report reflects the best available information as of June 2014. It does not reflect local bike share developments subsequent to that date, such as Jersey City's decision to pursue bike share independently of Hoboken and Weehawken and changes to New York City's Citi Bike program.



Equity Strategies

Bike sharing represents a great opportunity for an affordable transportation option for lower income and minority communities that historically have been marked by low automobile ownership rates and high transit dependency. Creating an equitable system was identified as an important goal for the system and a major topic of discussion during stakeholder outreach. Equity strategies regarding system area determination, station siting, membership cost and structure, per-ride pricing, credit card access, marketing and outreach, and funding are recommended for Hudson County.

Bike Share Station Density and Siting

The recommended bike share station density is 10 stations per square mile in Phase II and five stations per square mile in Phase III. The recommended station density for Phase III is lower than for Phase II, as this area was projected to have a lower bike share demand than Phase II. (While a station density recommendation is not provided for Phase I, as station density for this area will be determined by planners of the BNR system, a review of the proposed BNR station density and placement is provided in Chapter 5.)

Based on this density model, 65 stations were sited in the Phase II system area and 19 stations in Phase III. Stations were sited based on the locations of likely bicycling origins and destinations and based on suggestions provided via the project website, the public meeting, and the final TAC meeting. The proposed bike share station locations for phases II and III are shown in Figure ES 1.



Figure ES 1. Proposed Bike Share System Area and Station Locations (Phases I, II, and III)



Source: Sam Schwartz Engineering and Toole Design Group, 2014



Recommendations for the Regional Plan for Sustainable Development

This study is a part of the larger planning effort that is developing Together North Jersey's Regional Plan for Sustainable Development. The recommendations and methodologies of this study are applicable throughout the northern New Jersey region and are particularly suited to the multi-jurisdictional planning environment in urban and suburban settings. The recommendations for the plan from this study are as follows:

- The Hudson County Division of Planning should take lead on forming a Hudson County Bike Share Task Force to advance bike sharing in the county, consistent with the findings of this study.
- The task force should ensure that the Hudson County bike share system best meets the identified goals and objectives for a system in Hudson County, as described in this report and determined in consultation with the TAC and the public.
- The task force will help ensure that the performance measures proposed in this report are used by the three urban municipalities to evaluate success of the BNR system.
- The task force should encourage and support the municipalities to undertake a range of equity strategies to support low/no-cost bike share memberships and address barriers to use of the system by low-income populations who may be without access to credit or debit cards or banking accounts.
- The task force should encourage the adoption of Complete Streets policies by the county's municipalities and create a county-wide bicycle master plan.
- The County and the municipalities should install robust bikeways designed to attract a diverse range of potential bicyclists and bike share users.



INTRODUCTION

Introduction

Background

What Is Bike Sharing?

Factors Supporting A Bike Share
System In Hudson County





INTRODUCTION

In 2012, the Hudson Transportation Management Association (TMA) and Hudson County Division of Planning conducted a bike share system feasibility study for Hudson County. By comparing the physical, demographic, infrastructural, and socio-economic conditions of the county to four other areas within U.S. (Washington D.C., Boston, Boward County, Florida, and New York City), the study depicts the suitability and usefulness of a bike share system in the county. However, it does not include technical details such as spatial analysis of recommended service area, station locations, an operational model, and detailed financial recommendations for implementation of a successful bike share system. To improve the bike share system feasibility study with the above mentioned technical details, Together` North Jersey, via the Local Government Capacity Grant Program, provided Hudson County with financial assistance to conduct the present study, *Exploration of a Public Bike Share Program in Hudson County*.

Together North Jersey is a consortium led by Rutgers' Edward J. Bloustein School of Planning and Public Policy that was formed with several partnering organizations, including the North Jersey Transportation Planning Authority (NJTPA), that was awarded a Sustainable Communities Regional Planning Grant from the U.S. Department of Housing and Urban Development. The Local Government Capacity Program was funded through this program with additional funding assistance for this project provided by the U.S. Department of Transportation.

During the course of this project, the municipalities of Jersey City, Hoboken and Weehawken issued a request for proposals and awarded a contract for bike share implementation and operation in those three municipalities with the condition of using no public funding. The contract was awarded to a collaboration of the companies E3Think, Bike N Roll (BNR), nextbike, and P3 Global Management.² As a result, the original project tasks were modified based on this new bike share environment and consist of the following:

- Working with the County³, NJTPA, and the project's Technical Advisory Committee (TAC), define the goals, objectives, and performance measures for a Hudson County bike share system.
- Solicit public feedback via the project website (including an interactive, crowd-sourcing map ("WikiMap") and online survey) and a public meeting and incorporate that feedback into the project's findings and recommendations.
- Propose a bike share service area, including phasing, based on a spatial analysis of known indicators of bike share demand and equity variables, determined and refined by consultation with the County, NJTPA, the TAC, and the public.
- Forecast bike share ridership using a best-practices model.
- Compare the model for Hudson County bike share system with case studies of four existing bike share systems.
- Provide a quantitative summary of the feasibility, partnering opportunities, benefits, costs, and risks of a Hudson County bike share system, including a limited review of the BNR proposal.
- Provide equity recommendations for a low or no-cost bike share membership model.
- Recommend bike share station density and locations, including a review of the BNR proposal's service area and station siting.

² This report references the proposed Jersey City/Hoboken/Weehawken bike share system as the "BNR proposal"

³ This report references the government of Hudson County as "Hudson County" or "the County;" "county" is used for non-governmental references.



BACKGROUND

Study Area: Hudson County

Hudson County is New Jersey's smallest and most densely populated county, as well as the densest multi-jurisdictional county in the U.S. It is a complex community of 12 municipalities, with diverse populations, housing types, industries, and topography. The county's geography varies considerably, with East Newark, Harrison, Kearny, and Secaucus located in the relatively low-lying area adjacent to the Hackensack and Passaic rivers. Most of the county's population is concentrated on the peninsula between the Hackensack and Hudson rivers. The northern portion of the county on the peninsula includes the municipalities of Guttenberg, North Bergen, Union City, Weehawken, and West New York. Hoboken and Jersey City are centrally located on the peninsula, and Bayonne is located on the southern tip. The peninsula is divided by the north-south running Palisade land formation, creating a major physical boundary between the areas above and below the cliffs (as shown in Figure 1.1, including the study area). Employment is most densely clustered east of the cliffs in downtown Jersey City and Hoboken and west of the cliffs in Union City and West New York. The county has an extensive public transportation network, including light- and heavy-rail, buses, jitneys, taxis, and passenger ferries.



Figure 1.1 Study Area and Topography



Source: United States Geological Survey, 2013



WHAT IS BIKE SHARING?

Bike sharing is a fast-growing, non-motorized transportation option for urban and suburban environments. Bike share systems make bicycles available for public use at strategically placed stations. By offering bicycle rental plans at varied annual, monthly, and daily rates, bike share can be used by everyday commuters, recreational users, and visiting tourists at affordable rates. Bike share systems have proven particularly effective in urban environments as bicycles are considered the most efficient mode of transportation for short trips, require relatively less in terms of new infrastructure construction, promote a healthy community, and take the burden of safely storing a bicycle off of the user. By making bicycles available at transit stations, bike sharing has also proven to be a great complementary system to public transportation networks, extending the transit system catchment area and helping with the “first and last mile” of trips.

Today, bike sharing systems can be found in almost all parts of the world including North America, Europe, South America, Australia, and Asia. In the U.S., contemporary bike sharing systems were developed in the second half of 2000, with majority of them starting operation in 2011. As of the end of 2013, there were 22 bike sharing systems in the U.S.—about 75% of all the systems in North America.⁴ The major bike sharing systems are concentrated in the large urban areas of the East Coast and Midwest, as shown in the map below.

Figure 1.2 Bikesharing Systems in the U.S. 2013



Source: Public Bikesharing in North America During a Period of Rapid Expansion: Understanding Business Models, Industry Trends and User Impacts

⁴ Shaheen, S. A., Martin, E. W., Chan, N. D., Cohen, A. P., & Pogodzinski, M. (2014). Public Bikesharing in North America During a Period of Rapid Expansion: Understanding Business Models, Industry Trends and User Impacts. San Jose: Mineta Transportation Institute.



FACTORS SUPPORTING A BIKE SHARE SYSTEM IN HUDSON COUNTY

The initial bike share feasibility study indicated the potential suitability of a bike share system in Hudson County due to presence of certain physical, demographic, socio-economic, and infrastructure conditions:

- The climate and moderate elevations in a large section of the county - particularly in the economic core - are suitable for bicycling at least nine months in a year.
- Bike sharing would address the problem of safe and secure bicycle storage for the county's many space-challenged residents of apartments and condominiums.
- Relatively low car ownership in much of the county is conducive to bike sharing.
- Hudson County has a dense public transportation network, and most people live and work relatively near transit stops, thus a bike share system would help solve the problem of covering the "first and last" mile trips.
- Bike share would be useful to many commuters using the Port Authority Trans-Hudson (PATH) train, which does not allow bicycles on board during peak commuting hours.
- About half of the users of bike share systems in the U.S. are tourists. As Hudson County has numerous tourist destinations, bike sharing could be an important mode of transport serving them.



Outreach Efforts And System Goals

Stakeholder Outreach

Public Outreach

Definition Of Goals And Objectives
And Performance Measures

A large, stylized graphic of a wheel with orange spokes and a thick orange rim is positioned in the bottom left corner, partially overlapping the text.



This task of the project focuses on collecting information from both the general public and stakeholders to help define the direction of a bike share system for Hudson County. Outreach was undertaken in a series of key meetings with the stakeholders, through an online survey and WikiMap on the project website, and in a public meeting to ensure the greatest participation and diversity of viewpoints. Below is a summary of outreach efforts and results from it.



STAKEHOLDER OUTREACH

The team worked with a diverse and robust group of stakeholders to form the TAC for the project. Numerous organizations, including all 12 Hudson County municipalities, five not-for-profit organizations, and four government agencies, were invited to play an active role in the development of this study. Of those invited, the following participated as members of the TAC or offered input otherwise:

- Bike JC
- City of Hoboken
- City of Jersey City
- City of Union City
- Hudson County
- Hudson TMA
- New Jersey Bike and Walk Coalition
- New Jersey Bicycle and Pedestrian Resource Center
- Jersey State Park Service - Liberty State Park
- New York City Department of Transportation
- NYC Bicycle Share (operators of Citi Bike)
- NJ TRANSIT
- Port Authority of New York and New Jersey
- Tri-State Transportation Campaign

One-on-One Meetings' Summary

In November 2013, the team met with key stakeholders for one-on-one meetings to discuss the exploration of a public bike share program in Hudson County. One-on-one meetings were held with the City of Hoboken, Hudson TMA, City of Jersey City, NJ Transit, NYC Bike Share (New York Citi Bike operator), Port Authority Trans-Hudson (PATH), and New York City Department of Transportation.



Overall, all stakeholders were supportive of bike share and saw potential for it to help meet different goals of their respective organizations. Some highlights include the following:

- Many stakeholders were concerned about the need for more bicycle infrastructure in Hudson County, such as bike lanes.
- Public transit stakeholders were concerned with space at, around, or near public transit stations, and potential responsibility to maintain bike share stations as well as bicycle racks.
- Hudson TMA indicated that they could provide support for a bike share system through education and outreach.
- Advertising on bike share stations at public transit properties would be subject to review and approval.
- Several stakeholders thought that bike share needed to be revenue neutral at a minimum or, ideally profitable.
- The Citi Bike bike share operator thought that it would be difficult to have a system that supported itself from membership revenues alone, and also thought that obtaining a sponsor would be difficult. The operator also indicated that station density is very important for success of the system.
- Hoboken and Jersey City are interested in implementing bike share soon.
- Some level of integration or compatibility with Citi Bike is desirable.
- Tri-State Transportation Campaign provided significant feedback at the initial stages of the project. For example, the online survey (described below) was modified and improved based on their feedback.
- Mana Contemporary and New Jersey City University expressed positive interest in bike sharing in the county and emphasized that the system can be of immense importance to their activities and transactions. Their comments were taken into consideration relative to the service area analysis and station siting.
- Redstone Townhomes Neighborhood Association provided specific comments on service area analysis and as a result the Phase II service area boundary was extended southward.



Technical Advisory Committee (TAC) Meetings

The initial TAC meeting was held on December 11, 2013. The purpose of the meeting was to provide a background of the project; present an overview of the project tasks and deliverables; showcase the draft website; discuss service area analysis factors; and discuss the draft goals and objectives of the project. A question and answer session and open discussion were held after the presentation. Some topics discussed include equity and social justice, infrastructure concerns, and education on bike safety. The team also conducted an exercise where TAC members were asked to vote for different service area analysis metrics to help determine the service area for the project (as listed in Table 2.3).

The final TAC meeting was held on May 20, 2014. The presentation and discussions addressed modifications to the project scope, an overview of outreach efforts, general findings, equity considerations and recommendations, case studies, and ridership forecasts. As a result of discussions at the meeting, modifications were made to the proposed bike share station locations.



PUBLIC OUTREACH

The team has engaged the community about the Hudson County Bike Share system via a number of different methods. Public outreach methods included public meetings, a project website to educate the general public about bike sharing, a WikiMap to suggest station locations, and an online public survey.

Public Meeting

The project team hosted a public open house meeting on February 4, 2014, from 6:00 pm to 8:00 pm at the Hudson County Freeholders Chambers in Jersey City, which was attended by 26 members of the public. The project team conducted an extensive outreach effort to publicize the Hudson County Bike Share Feasibility Study Public Meeting. Outreach efforts included the following:

- Fliers in English and Spanish distributed to TAC and email listservs
- Newspaper and Newsletters:
 - *Jersey Journal* (January 31, 2014)
 - *The Hudson Reporter* (February 2, 2014) – circulation throughout the county in eight different editions
 - Together North Jersey newsletter
- Facebook account: NJTPA
- Twitter account:
 - Hudson County
 - NJTPA
 - Bike JC
 - City of Hoboken
 - Sam Schwartz Engineering
 - Gridlock Sam (a service of Sam Schwartz Engineering)
 - Toole Design Group
- Websites:
 - Flier posted on home page and input page of the project website
 - Hudson County Division of Planning
 - Hudson TMA
 - NJTPA



- Emails:
 - Technical Advisory Committee (including fliers)
 - All County employees
 - Mayors of the 12 municipalities
 - Hudson County Comprehensive Economic Development Strategy Committee
 - Housing authorities' directors
 - All municipal school superintendents
 - Hudson County Open Space listserv (Includes Open Space Advisory Board, stakeholders from non-profits and other municipal employees)
 - Hudson County Planning Board members
 - Various block groups and churches, primarily in Jersey City and Bayonne

All materials at public meetings were presented in both English and Spanish. The following topics were covered:

- Overview of bike share
- Feasibility study
- Efforts to date in the region
- System area
- Station locations

The final version of the presentations can be found on the project website.

Following the presentation and an open discussion, the team also provided three boards with different maps of areas in Hudson County for attendees to suggest station locations by placing stickers at their preferred station locations (see Figure 2.1). Additionally, consultant staff invited attendees to take the online survey, provide comments on the comment board, and ask questions.



Figure 2.1 Public Meeting Attendees Suggesting Station Locations



Source: Hudson County Division of Planning

Participants also provided feedback on the draft service area. Several comments focused on the importance of including New Jersey City University, St. Peter's University, and the Heights (Jersey City) in Phase I and that Bayonne should be included in Phase II or III.



Project Website

The project website (hudcobikeshare.com) branding and content were developed with the help of the Hudson County Division of Planning prior to the first TAC Meeting. The draft website was then presented to all TAC members for review, and comments were incorporated and the website was then launched to the public. The website includes information about the project, educational information about bike share system, a bike share survey, and a WikiMap where users could propose potential station locations and “like” stations that have been proposed by others. The website was visited 2,710 times during the study.

Bike Share Survey

The project website’s survey and WikiMap were designed to collect input from the public. The online survey, launched in January 2014, was designed to address the following overarching issues:

- What role could bike share play in Hudson County and how would it be used?
- What kind of support (or opposition) is there for a possible bike share program?
- How much would people use and be willing to pay for the system?

The survey responses were incorporated along with TAC feedback and comparable system data for information to define system service area, station locations, system pricing, and identify any potential obstacles to implementation. The survey included 20 questions, asking respondents about their demographic and employment information, current bicycling habits, and opinions on bike share implementation in Hudson County. Additional questions were asked regarding integration with New York Citi Bike bike share, and how existing bicycle infrastructure would influence bike share use. Refer to Appendix 1 for a summary of the survey responses received.



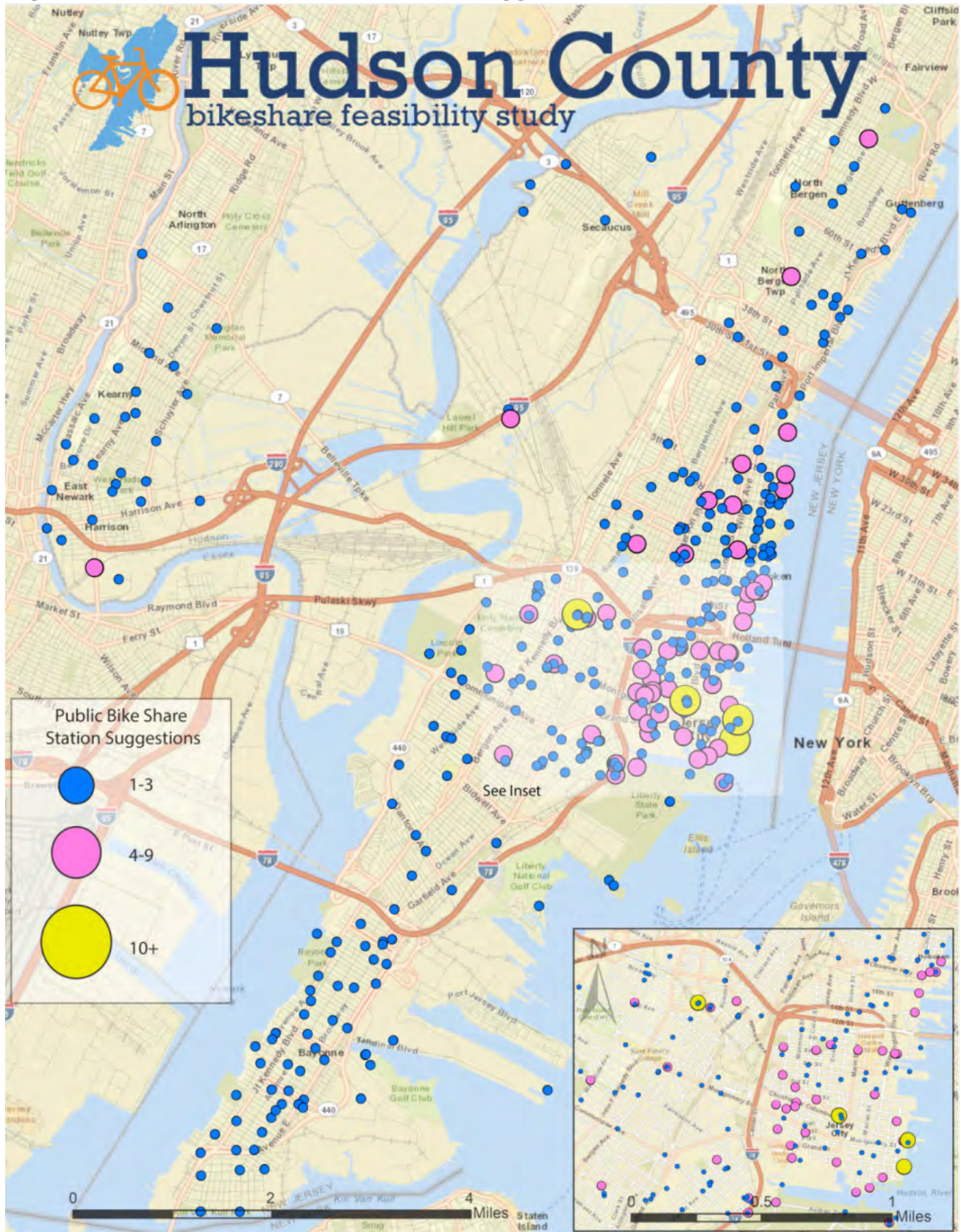
Interactive Web-Based Mapping Tool

The project website included a link to a WikiMap that provided an opportunity for the public to suggest possible bike share station locations. The WikiMap was opened for public comment in early January 2014 to April 1, 2014. During this time, 405 station suggestions were submitted, with many of these locations being preferred (“liked”) by multiple users. Station suggestions submitted during the public meeting were also entered into the WikiMap by the consulting team.

Suggested station locations are shown in Figure 2.2 (with each station weighted by the number of “likes”).



Figure 2.2 Bike Share Station Location Suggestions





DEFINITION OF GOALS AND OBJECTIVES AND PERFORMANCE MEASURES

An important component in planning for a bike share program is to understand the program's role in the community, decide what benefits are considered most valuable, and determine what will be considered a successful system. To this end, the project team developed a set of system goals and objectives based on meetings with Hudson County Division of Planning and NJTPA and then sought feedback from the TAC.

These initial goals and objectives were sent to the TAC through an online survey, where members were asked to identify priorities for a potential bike share system in Hudson County. The goals and objectives survey was sent to the TAC on December 13, 2013, via email and remained open until January 10, 2014. Survey participants were asked to provide feedback on which goals and objectives the County should focus on by ranking them from "very important" to "not important." The project team used the weighted results of the survey ranking process to develop the final prioritized program goals and objectives. Performance measures to track the progress of these goals and objectives were also developed.

Final Goals, Objectives, and Performance Measures

The resulting goals envision a bike share system that is focused on connecting Hudson County residents to transit and increasing the prevalence of bicycling in Hudson County. Additional goals were identified, including that the system must be well maintained, provide equal access to people of different income levels, and be financially sustainable. The final goals and objectives are shown in Table 2.2 below.

In addition, performance measures were developed to measure the impact of the system relative to the system goals. Effective performance measures must be detailed enough to give meaningful indications about system performance, yet simple enough to collect and report on a regular basis. The measurements proposed for Hudson County can be developed using three different input sources: automatically generated system data, a proposed annual user survey, and figures that the program administrative and marketing staff can track internally over time. If any of the proposed performance measurements fall under the responsibility of an outside vendor, the vendor should be contractually required to track these measurements. While many of these figures can be tracked in real-time, the full set of performance measures should generally be reported on an annual basis by the managing agency. Performance measures are also shown in Table 2.2 below.

**Table 2.2. Goals, Objectives, and Performance Measures**

Rank	Category	Goals	Objectives	Performance Measures
1	Mobility and Transportation Efficiency	Increase accessibility to jobs, recreation, and other locations	<ul style="list-style-type: none"> Integrate bike share as an extension of Hudson County's public transit network and consequently increase opportunities to efficiently utilize other modes of transportation. Provide mobility through bicycle and transit connections to residents, employees, and visitors to and between CBDs and mixed-use corridors. Increase bicycle and transit mode share for a variety of trips. 	<ul style="list-style-type: none"> Percentage of bike share stations within a quarter mile of a public transit stop/ station. Number of trip origins and destinations at stations with direct proximity to transit stations and bus stops. Percentage of rides coupled with public transit as reported through survey. Measure of bicycle and transit mode share through planning study.
2	Operational Excellence	Create positive user experiences to maintain customers and attract new users	<ul style="list-style-type: none"> Identify system performance targets based on community objectives and develop measures to hold system operators accountable. Identify usage-based performance measures independent of user revenue targets to emphasize consumer satisfaction in addition to financial sustainability. Provide a system that integrates well with other bike share systems in the areas surrounding Hudson County. Engage local communities at the initial stages of planning station locations and promote the potential benefits that bike share will bring to the communities. 	<ul style="list-style-type: none"> Performance metrics in an operator contract reported on a monthly and annual basis that include operations service levels (rebalancing, bike maintenance, station maintenance), as well as membership, ridership and customer satisfaction. Efforts to integrate and/ or cross-promote between Hudson County bike share and other bike share systems in adjacent areas. Number and type of community engagement efforts in system planning. Number and type of comments received from general public and business owners about station locations.



Rank	Category	Goals	Objectives	Performance Measures
3	Membership and Ridership	Maximize both membership and ridership, while balancing financial objectives of program	<ul style="list-style-type: none"> • Create a system with stations located to serve the largest cross-section of the included communities, while ensuring the economic feasibility of those stations • Maximize both local and visitor membership • Encourage high ridership by members 	<ul style="list-style-type: none"> • Population and employment within a quarter mile of a bike share station. • Number of annual memberships. • Number of visitor memberships. • Number of rides per (a) annual member and (b) resident. • Annual member rides from each station. • Casual member rides from each station. • Revenue generated for each station, measured by casual memberships purchased, usage fees accrued from each station, and pro-rated for annual member rides. • Number of rides per bike share bike. • Average distance bicycled per trip.
4	Social and Geographic Equity	Provide a system that is accessible to a broad cross-section of people living in and visiting Hudson County	<ul style="list-style-type: none"> • Ensure that bike share is cost-competitive and financially accessible to users of all economic strata and is an affordable alternative to other modes of transportation. • Provide station locations not only in Downtown CBD areas but also in neighboring residential areas; eventually expand the geographic coverage across Hudson County. • Develop a system that engages and serves users in minority and low-income communities and improves their access to key destinations. 	<ul style="list-style-type: none"> • Average cost per trip per user. • Average annual travel savings among bike share users. • Percent of bike share trips originating or ending in low-income census tracts. • Percent of stations in low-income census tracts. • Tracking demographic user profiles through registration and user surveys for age, race, gender, income, and language. • Track subsidized memberships and ridership for low income individuals through partnerships with social service organizations.



Rank	Category	Goals	Objectives	Performance Measures
5	Finances and Transparency	Create a system that is financially sustainable, transparently operated, and accountable to the public	<ul style="list-style-type: none"> Plan for and ensure sustainable capital funding for system growth and ongoing equipment replacement. Clearly communicate program performance and effectiveness to stakeholders and the public. Cover all operating expenses without public assistance. Create a funding structure and/or contract incentives to support non-financial objectives. 	<ul style="list-style-type: none"> Number of reports per month of defective or damaged equipment. Set and track aggressive fundraising goals for capital budget. Number of visits to the bike share service's website per month. Average revenue per station over the whole system. Annual reporting of the state of bike share that details to the members and public the progress on all bike share performance measures. Membership, ridership, and equity performance measures in operator contract. Percentage of operations paid through sponsorship, user and membership fees.
6	Livability and Economic Competitiveness	Develop an innovative transportation system that improves Hudson County's livability and economic competitiveness.	<ul style="list-style-type: none"> Optimize the number of origins and destinations that can be served by a bike sharing system serving as many neighborhoods and destinations as possible. Create the "first mile/last mile" solution for residents and employees to get to and from public transit stations such as PATH stations, NJ Transit stations, and ferry landings. Provide an alternative means of transportation for tourists, particularly to access Liberty State Park. 	<ul style="list-style-type: none"> Population and employment within a quarter mile of a bike share station. Number of distinct neighborhoods served by bike share system Number of people who use bike share to get to public transit for their daily commute Average number of rides per annual member per year Number of active corporate memberships. Proportion of surveyed bike share users who are visiting the city for leisure or business. Number of casual users. Usage reports of stations located in Liberty State Park, including casual and member usage.



Rank	Category	Goals	Objectives	Performance Measures
7	Health and Safety	Provide Hudson County residents and visitors a safe mode of transportation that promotes active and healthy living.	<ul style="list-style-type: none"> Educate the public about safe biking practices and rules of the road. Foster an active lifestyle by increasing bicycle, walking, and transit mode shares and promote a culture of safety among bike share system users. 	<ul style="list-style-type: none"> Number of reported bike share crashes per 1,000,000 bike share trips. Observing bike share user use of helmets during annual bicycle counts. Survey users about use of helmets and other bicycling safety habits while using bike share. Total calories burned per year.



FULL ANALYSIS OF SERVICE AREA

Overview

Bike Share Demand Metrics

Weighting Of Metrics

Bike Share Demand Heat Map

Bicycle Route Infrastructure



OVERVIEW

This task of the project focuses on defining a phased bike share system area based on GIS analysis of common metrics (described on page 30) used to predict bike share demand and refined through consultation with Hudson County, NJTPA, and the TAC as well as feedback from the public. To form an effective service area, the phases are contiguous and discrete areas with logical boundaries. The proposed bike share system area is shown below in Figure 3.1, followed by the GIS analysis.

Prime areas for Phase I that performed well in the GIS analysis, relative to other areas of the county, on the basis of the common metrics (described on page 40) of bike share demand, and have good existing or planned bike infrastructure were identified. This includes the following areas:

- Hoboken
- Jersey City east of the New Jersey Turnpike Extension/ Interstate 78, including Liberty State Park
- Journal Square area
- Weehawken waterfront

Phase II consists of areas that performed as well or nearly as well in the GIS analysis as Phase I and would be logical extensions of the bike share network, assuming that Phase I is successful. (While Union City is included in Phase II, its existing or planned bike infrastructure is minimal; such infrastructure would improve the comfort of bicyclists and increase the viability of bike share.) Phase II consists of the following areas:

- Union City
- Jersey City north of Audubon Avenue/Wegman Parkway (excluding certain areas adjacent to the Hackensack River and the Meadowlands)
- The remainder of Weehawken
- The waterfront of West New York, Guttenberg, and North Bergen (south of 79th Street)
- Small areas of North Bergen adjacent to Union City



Phase III consists of areas that performed well enough in the GIS analysis to be considered quite suitable for bike share, but did not perform as well as Phases I and II. Phase III consists of the following areas:

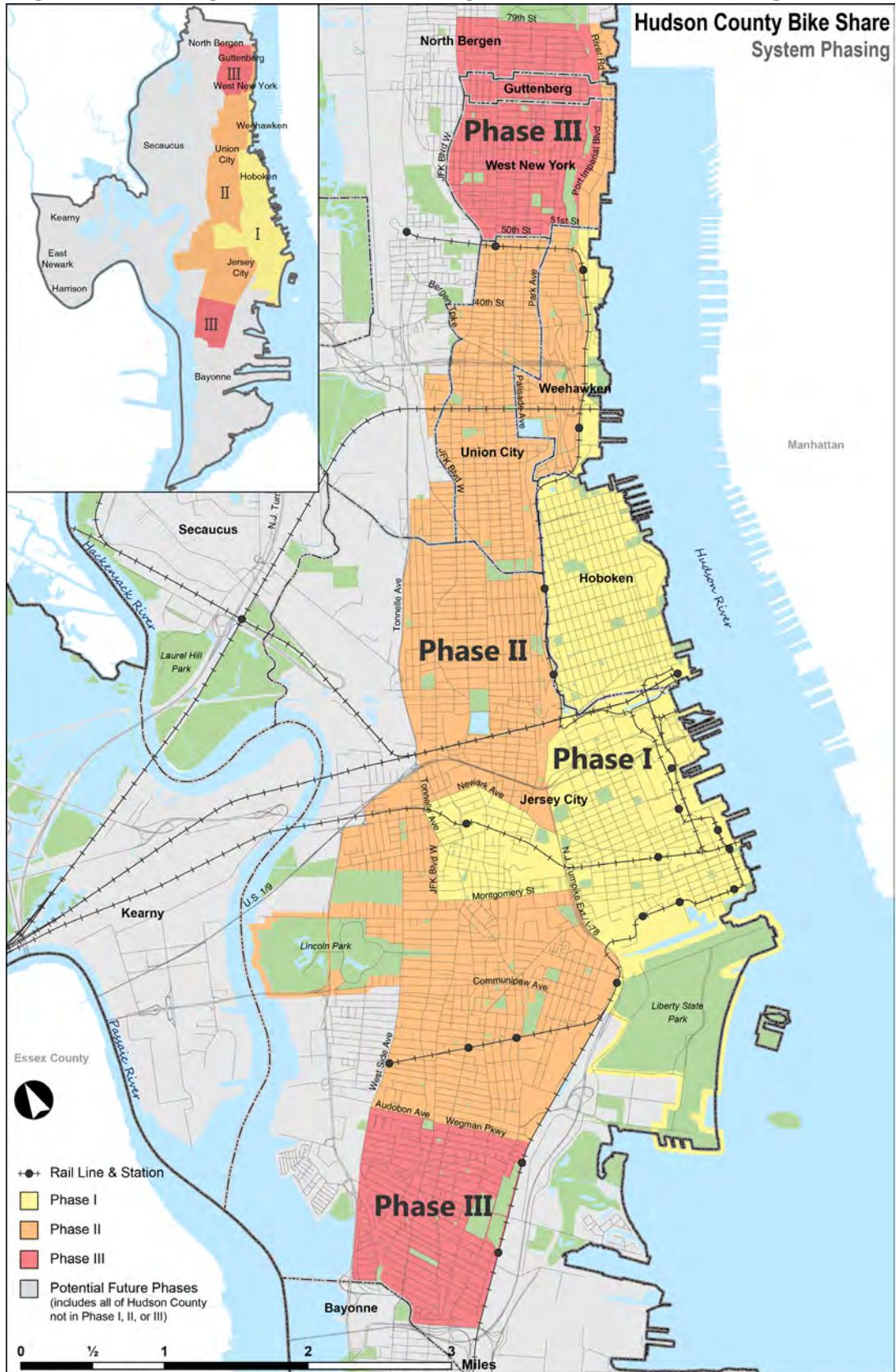
- Jersey City south to I-78/Bayonne
- The remainder of West New York and Guttenberg
- North Bergen between Guttenberg and 79th Street

Central Bayonne and a smaller area of central Harrison performed as well as Phase III, but these areas were excluded as they would result in a less viable service area that would not represent a connected, contiguous network.

The remainder of the county that is not in the first three phases is considered to be part of potential future phases, dependent on the success of earlier phases.



Figure 3.1. Proposed Bike Share System Area and Phasing



Source: Sam Schwartz Engineering, Toole Design Group, 2014



BIKE SHARE DEMAND METRICS

A combination of demographic and non-demographic data/metrics was used to aid in determining the preferred bike share service area for Hudson County. Demographic data represents characteristics of the population of the county. Non-demographic data generally represents geographic features that are part of the county's landscape, such as the locations of colleges and public transit.

The following metrics were initially selected for analysis. These metrics were determined based on a combination of common predictors of bike share demand and usage⁵ and based on methodology used by other U.S. cities, including Chicago, Denver, New York, Philadelphia, San Francisco, and Seattle.

- **Residential Population Density (Figure 3.2):**
This data reflects the density of the county's residential population. The majority of the county's population resides between the Hudson River and the Meadowlands, with Hoboken, Union City, West New York, and Guttenberg being the densest cities. Source: U.S. Census, American Community Survey, 5-year estimates, 2011.
- **Daytime Population (Figure 3.3):** Daytime population is the number of people who live in a census tract plus the number of people who work in that census tract minus the number of employed people who live in that census tract (it is assumed that residents do not work in the census tract in which they live). Daytime population mirrors residential population closely with the addition of a high concentration of workers along the Jersey City and Hoboken waterfronts. Source: Census Transportation Planning Product, American Community Survey, 5-year estimate, 2010.
- **Pedestrian and Bicycle Commuters (Figure 3.4):**
These two data points (pedestrian commuters and bicycle commuters) are summed into a single metric that represents those who commute by walking or bicycling (workers 16 years and older). There are high concentrations of pedestrian and bicycle commuters near the stations and in West New York and Guttenberg. Source: U.S. Census, American Community Survey, 5-year estimates, 2011.

⁵ Several of these common metrics, including population density, proximity to colleges, tourist destinations, and transit, were highlighted in the "Bike Sharing in the United States: State of the Practice and Guide to Implementation", a guide that was prepared by the Toole Design Group and Pedestrian and Bicycle Information Center with the sponsorship of USDOT Federal Highway Administration (FHWA).



- **Carless Households (Figure 3.5):** This data represents the number of households without access to a car. Carless households are most concentrated in Guttenberg, West New York, Union City, Hoboken, and in areas of Jersey City (Journal Square, the Heights, and the waterfront). Source: U.S. Census, American Community Survey, 5-year estimates, 2011.
- **Colleges and Universities (Figure 3.6):** This metric reflects the locations of colleges and universities. There are three campuses in Jersey City, one in Hoboken, and one in Union City near the border with West New York. Source: Websites of respective institutions, 2014.
- **Tourist Destinations (Figure 3.7):** This metric reflects the locations of the major tourist destinations, most of which are located along the waterfront. Source: Hudson County Tourism, 2014.
- **Hotels (Figure 3.8):** Hotels are a proxy for tourist origins and destinations. This metric represents the locations of hotels by size (number of rooms). Most hotel rooms in the county are located along the Jersey City waterfront and in Secaucus. Source: Hudson County Tourism and individual hotel websites, 2013.
- **Transit (Figure 3.9):** This metric is a combination of rail ridership by stations (PATH, Hudson-Bergen Light Rail, and NJ Transit) and the locations of bus stops and ferry terminals, based on available data. While the county has relatively good access to transit, much of it is focused towards travel to and from Manhattan. Source: NJTPA, 2013.
- **Businesses (Figure 3.10):** Storefront-type businesses, such as restaurants, bars, and retail stores, were used as a proxy for commercial/customer origins and destinations. Source: NJTPA “Selectory” dataset (North American Industry Classification System codes 44-45xxxx (retail), 71xxxx (arts and entertainment), 721xxx (food and drink), and 81xxx (other services)), 2013.
- **Parks and Open Space (Figure 3.11):** Parks are a proxy for recreational origins and destinations. Parks and open space of at least five acres were included in the analysis; other areas were deemed too small to generate notable bike share activity. The county has medium and large parks spread throughout. Source: Hudson County Division of Planning, 2013.

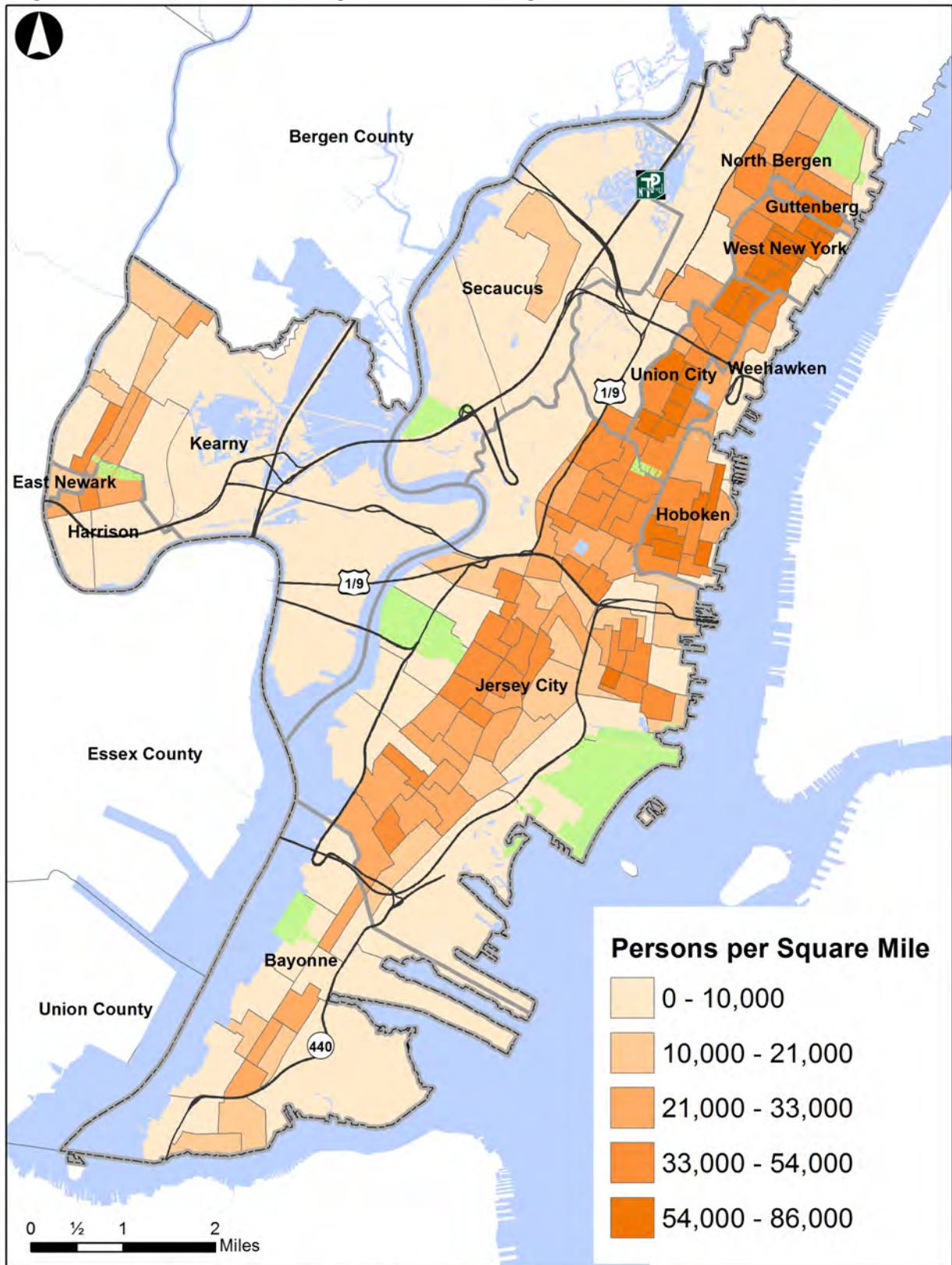


Based on the project's goals and objectives, a number of additional metrics were considered to achieve a system area that is socially equitable, fair, and just. Of those considered, the following metrics were selected based on the vote of the TAC (discussed below):

- **Median Household Income (Figure 3.12):** The analysis was structured to support lower income areas over higher income areas. Higher income areas are concentrated along the waterfront, while lower income areas are generally between the Palisades and the Meadowlands. Source: U.S. Census, American Community Survey, 5-year estimates, 2011.
- **Public/Subsidized Housing (Figure 3.13):** The analysis was structured to favor locations of public and subsidized housing. Public and subsidized housing can be found throughout the county. Source: State of New Jersey, Division of Community Affairs, 2012.



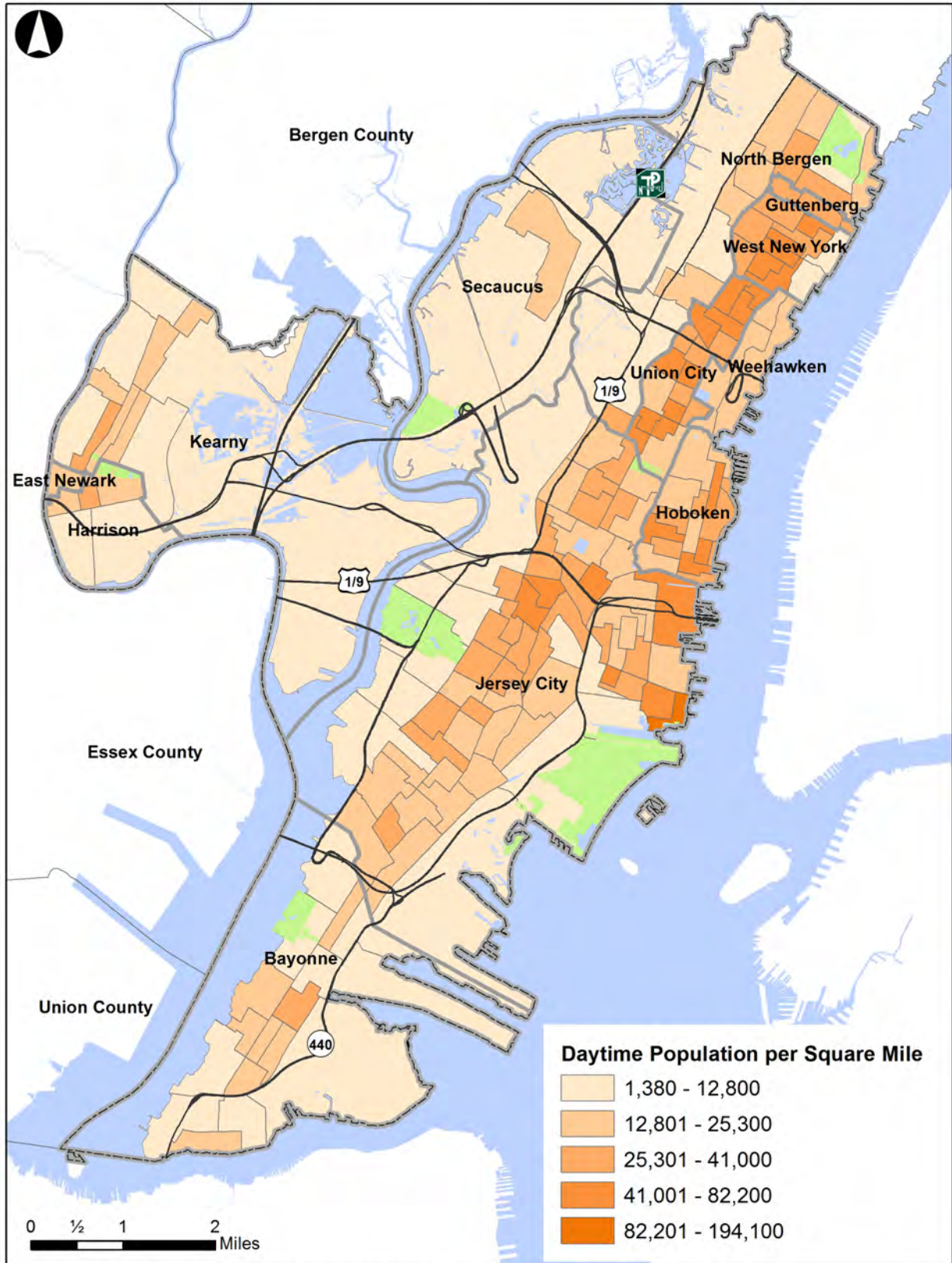
Figure 3.2. Residential Population Density



Source: U.S. Census, American Community Survey five-year estimate, 2011



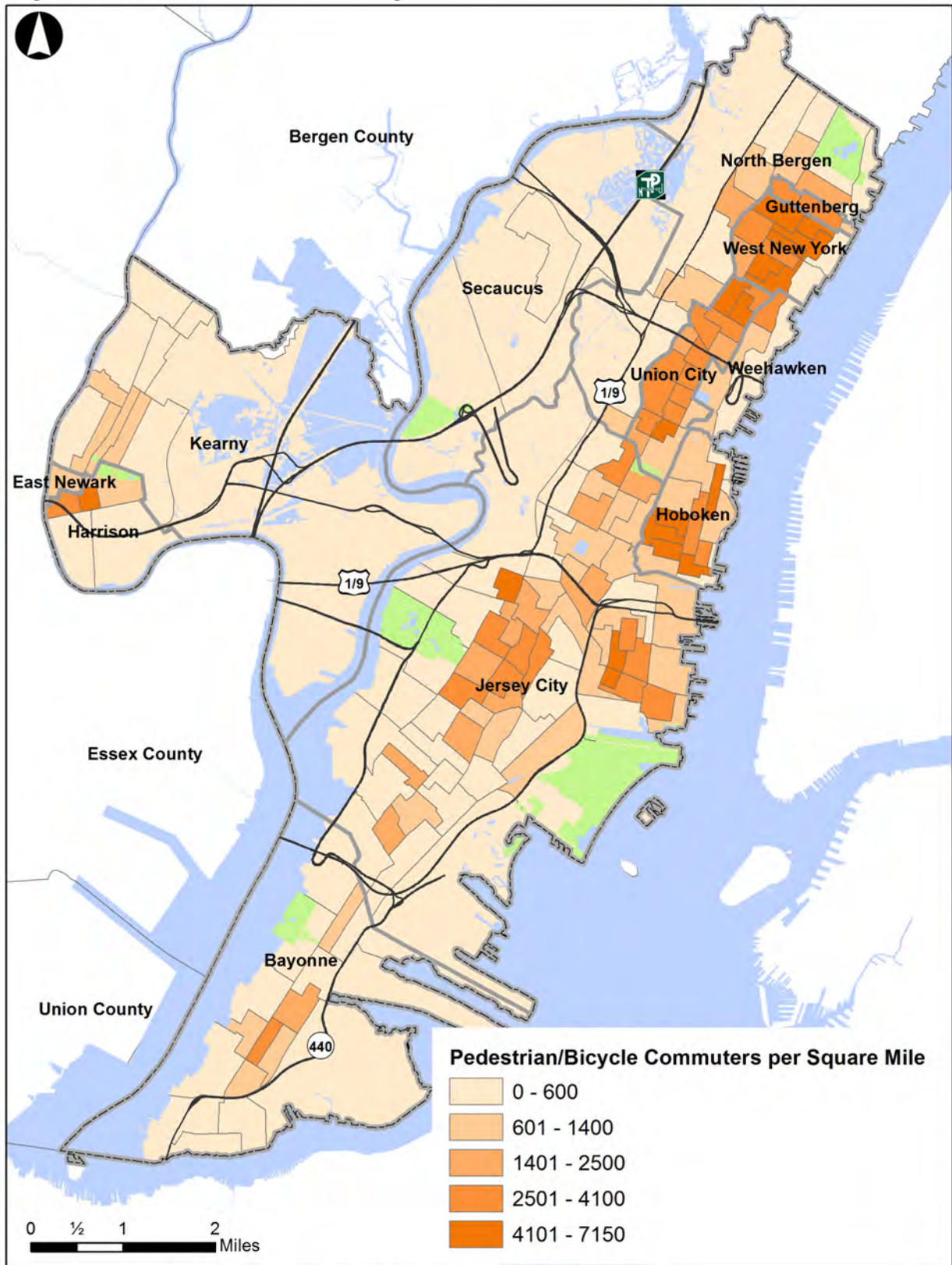
Figure 3.3. Daytime Population



Source: Census Transportation Planning Product, American Community Survey five-year estimate, 2010



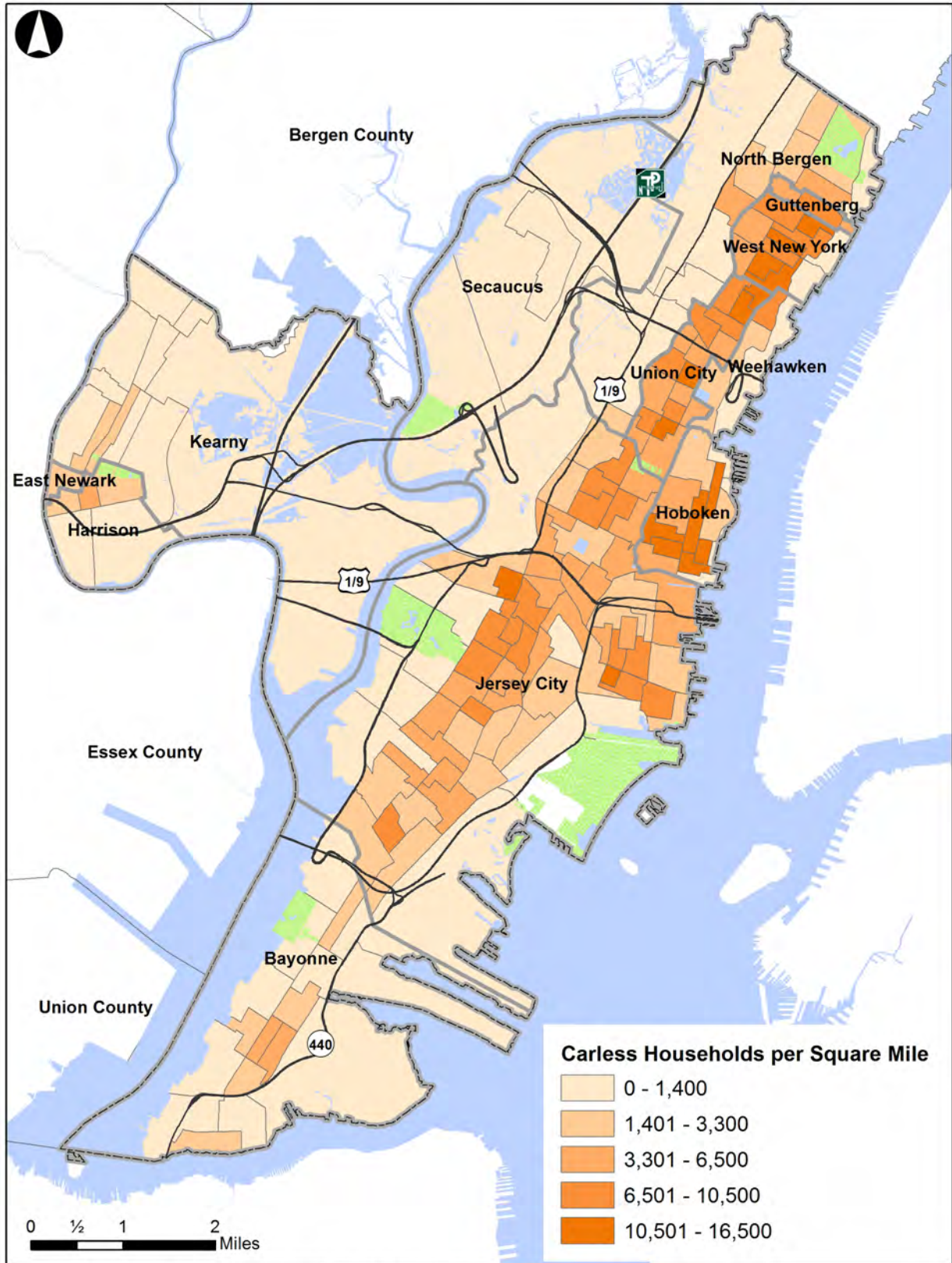
Figure 3.4. Pedestrian and Bicycle Commuters



Source: U.S. Census, American Community Survey five-year estimate, 2011



Figure 3.5. Carless Households



Source: U.S. Census, American Community Survey five-year estimate, 2011



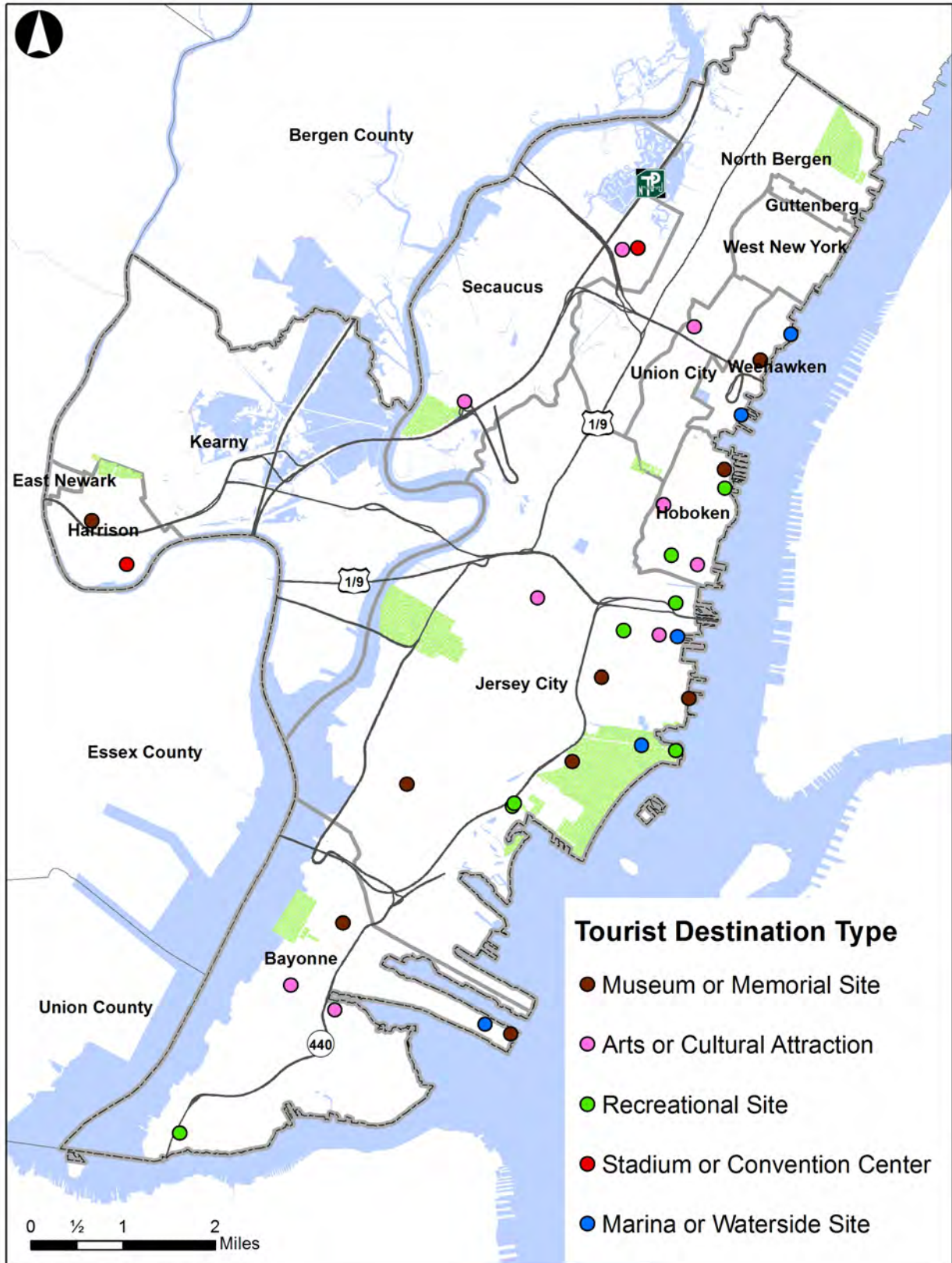
Figure 3.6. Colleges and Universities



Source: Websites of the respective institutions, 2014



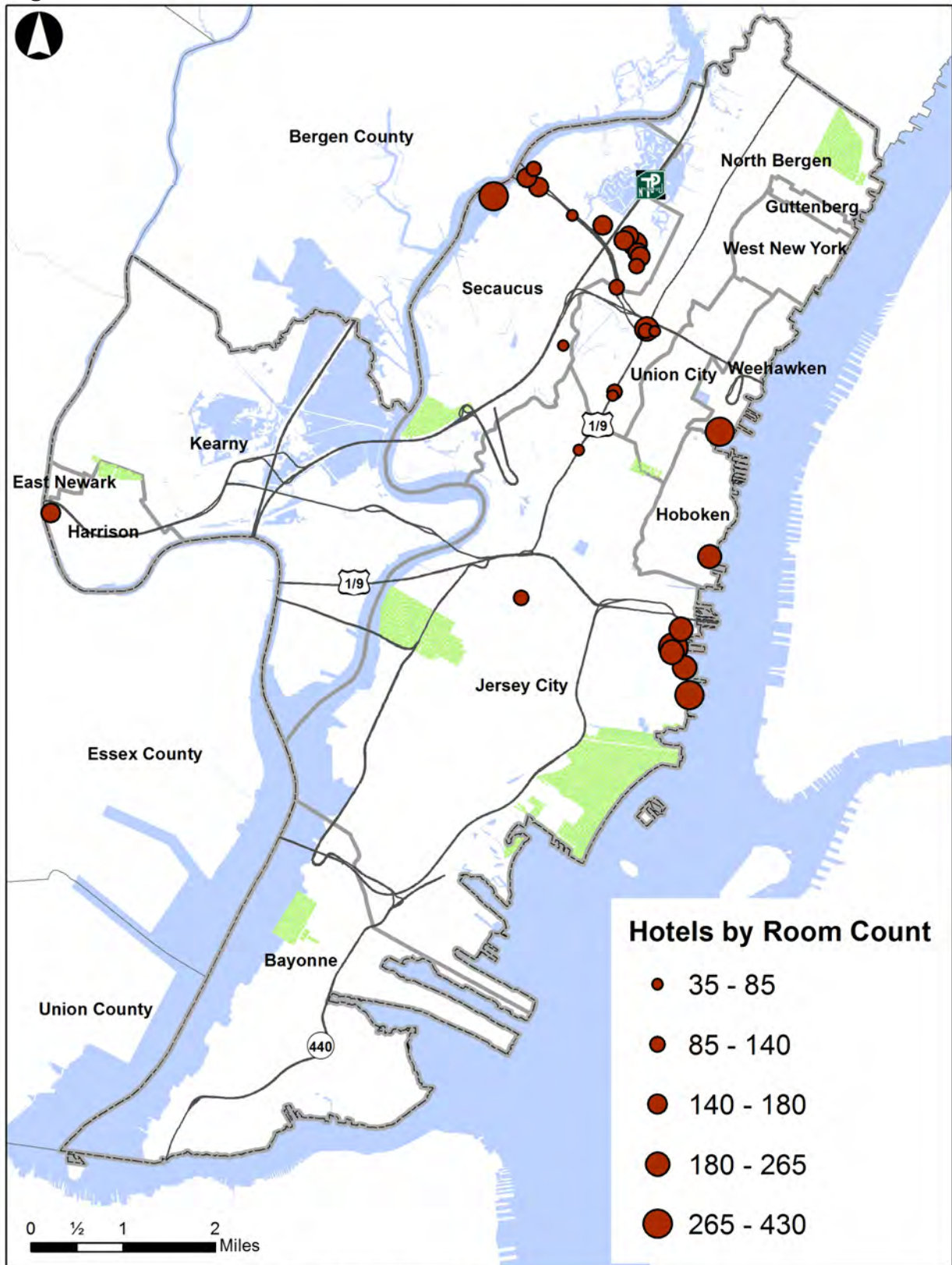
Figure 3.7. Tourist Destinations



Source: Hudson County Tourism, 2014



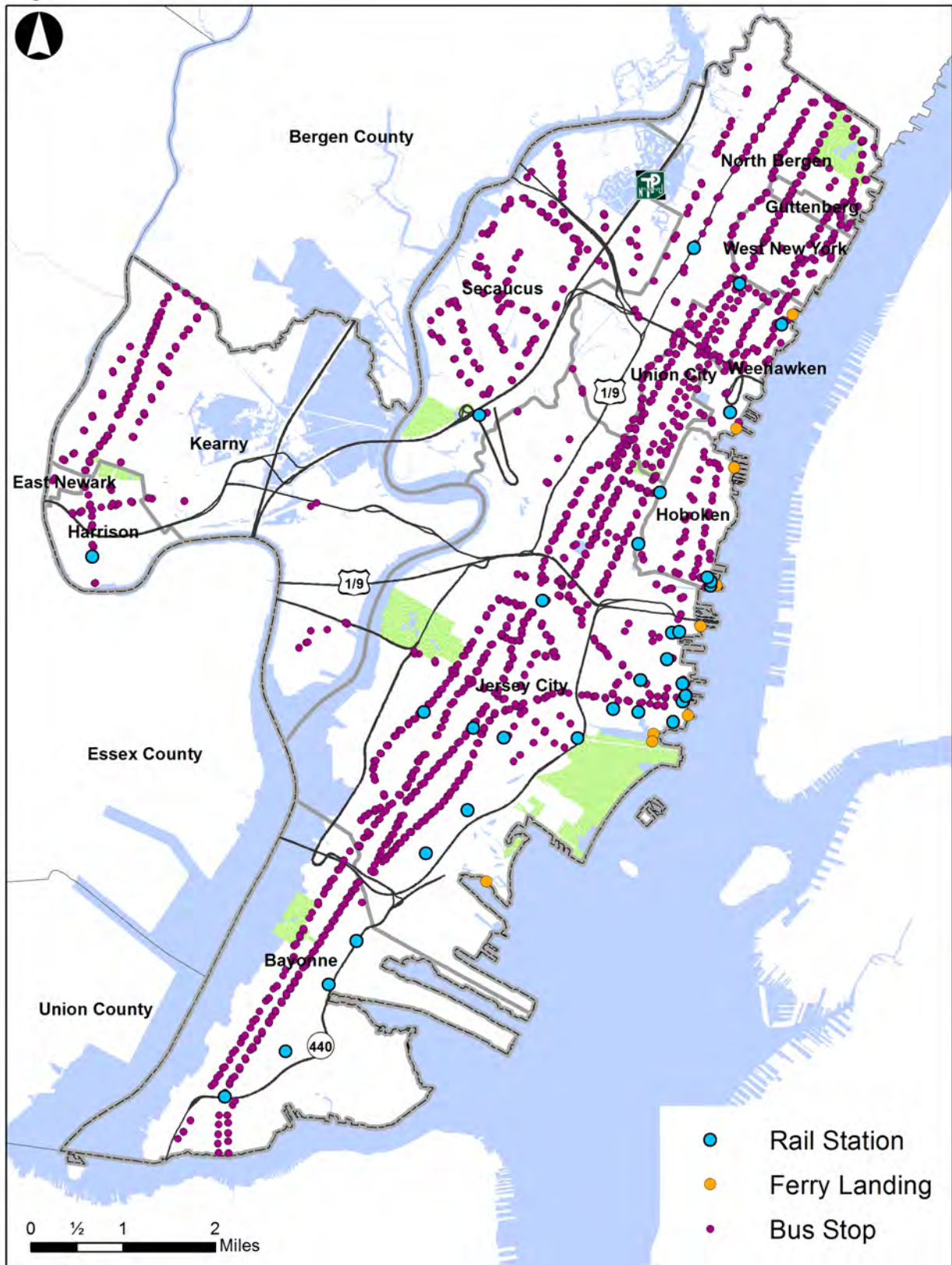
Figure 3.8. Hotels



Source: Hudson County Tourism and individual hotel websites, 2013



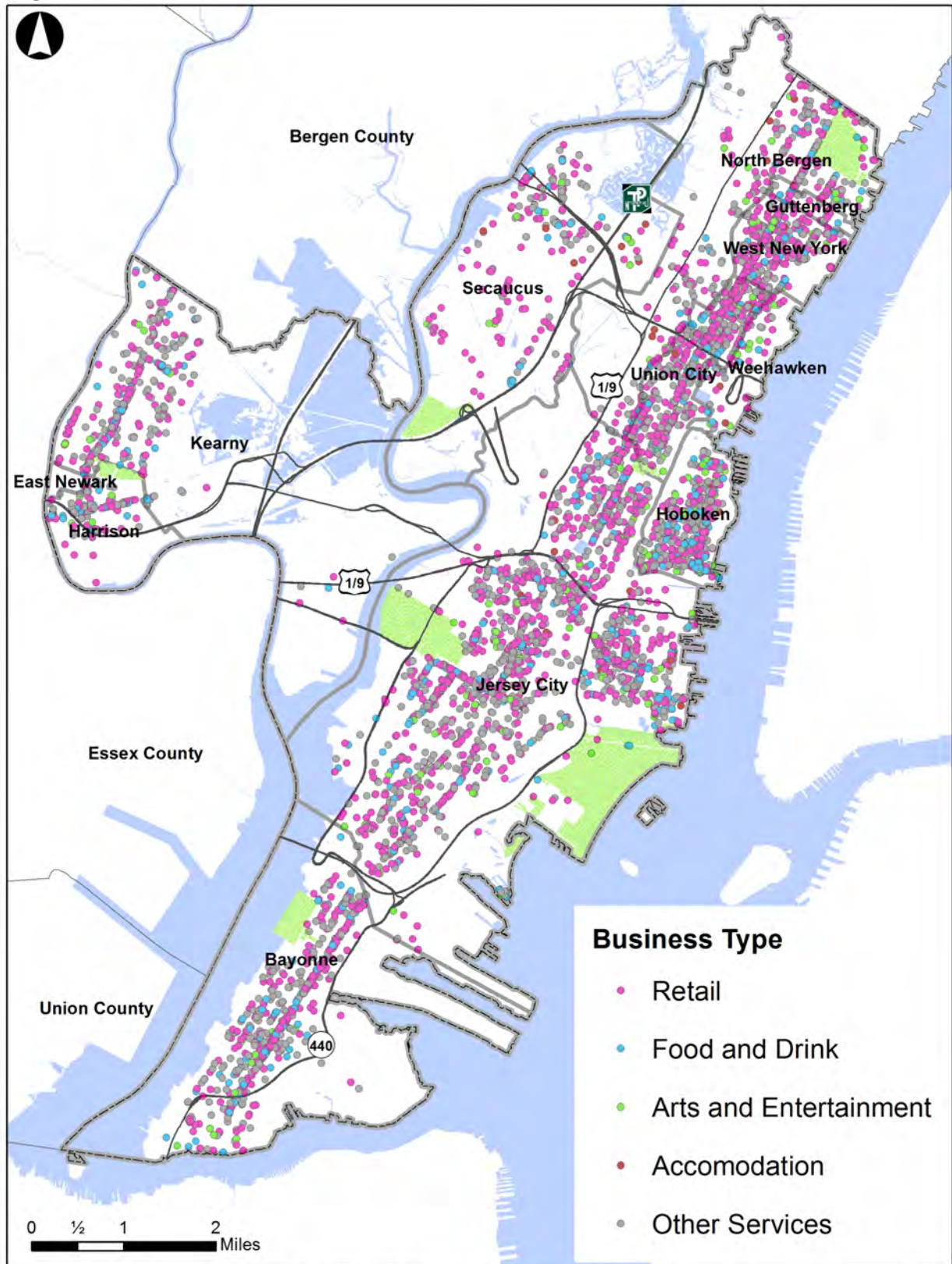
Figure 3.9. Transit



Source: NJTPA, 2013



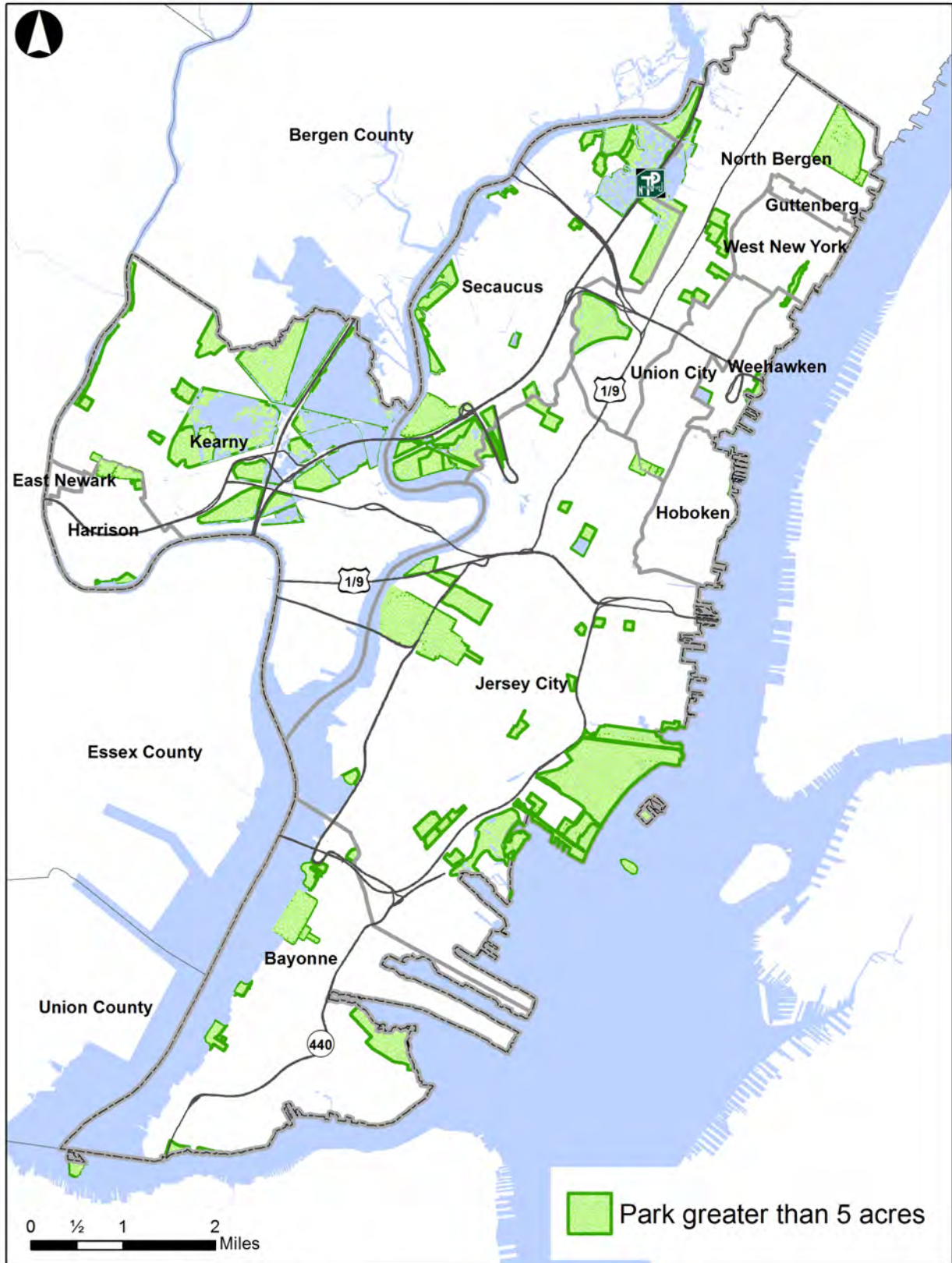
Figure 3.10. Businesses



Source: NJTPA "Selectory" dataset (North American Industry Classification System codes 44-45xxxx (retail), 71xxxx (arts and entertainment), 721xxx (accommodation), 722xxx (food and drink), and 81xxxx (other services)), 2013



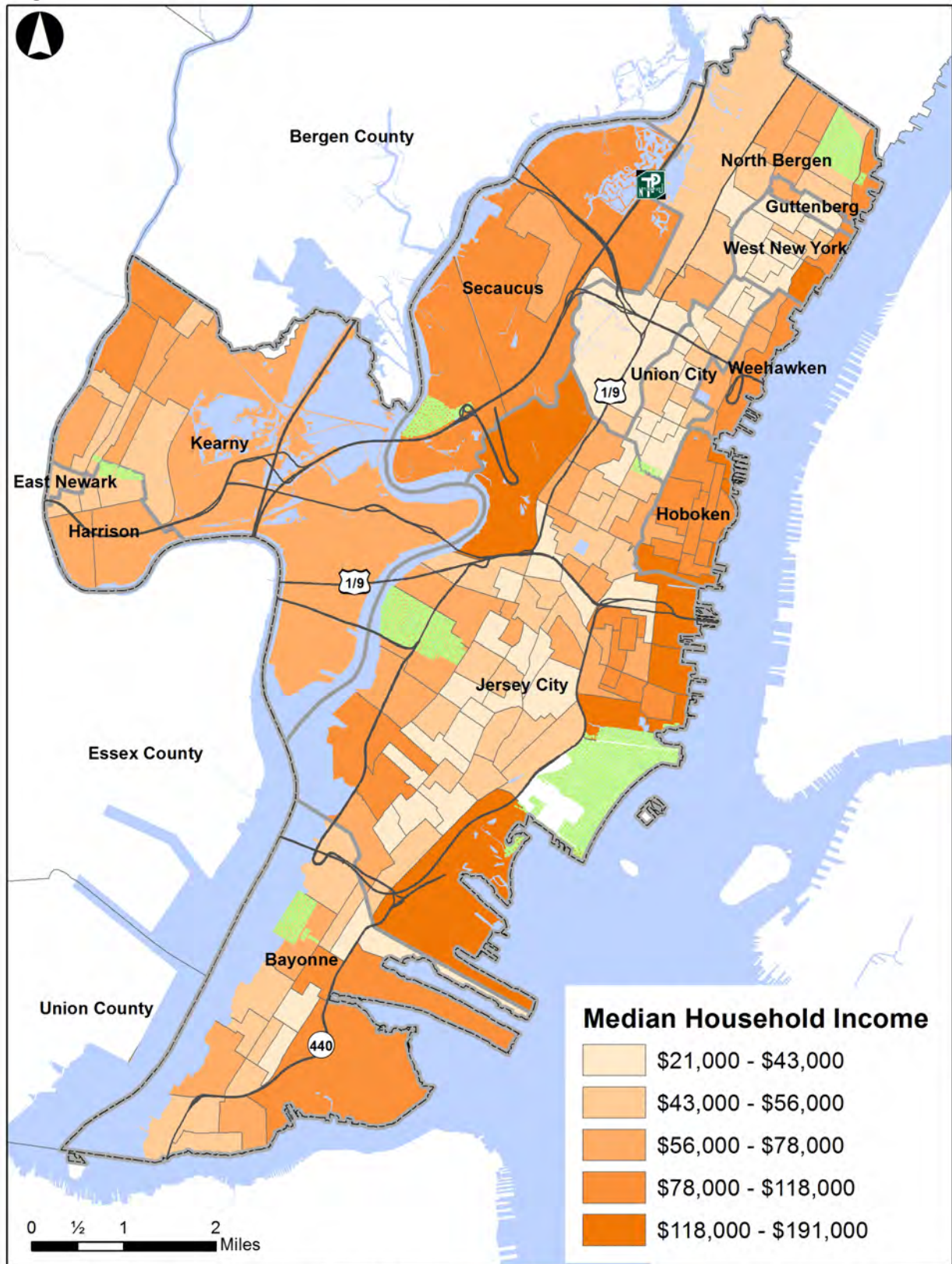
Figure 3.11. Parks and Open Space



Source: Hudson County Division of Planning, 2013



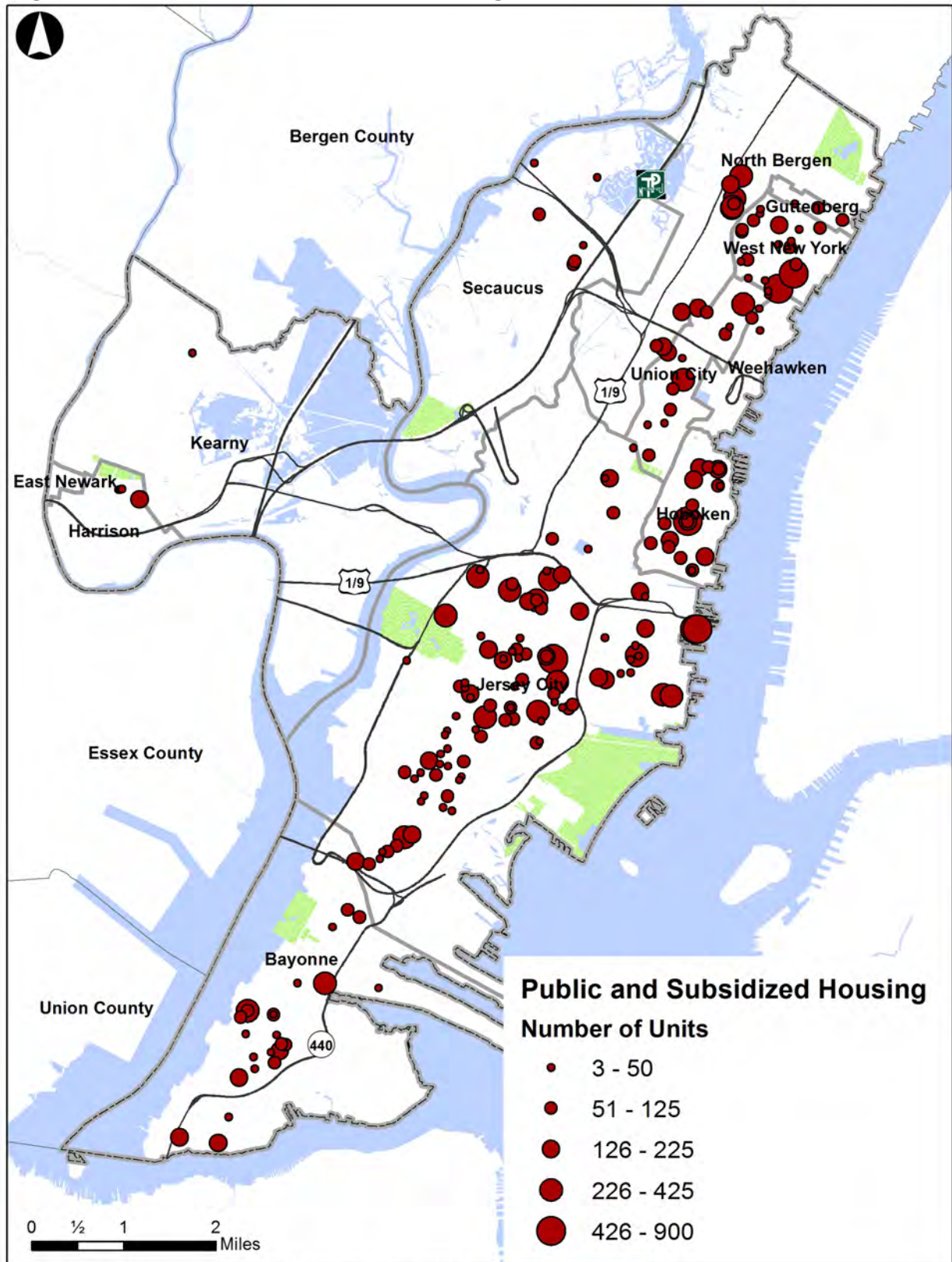
Figure 3.12. Median Household Income



Source: U.S. Census, American Community Survey five-year estimate, 2011



Figure 3.13. Public/Subsidized Housing



Source: State of New Jersey, Division of Community Affairs, 2012



WEIGHTING OF DEMAND METRICS

Certain metrics are better predictors of bike share demand than others, and the importance of individual metrics should be aligned with project goals and objectives. During the first TAC meeting, the TAC members were asked to prioritize the metrics via a vote. Votes by metric are listed in Table 3.1.

Each metric was assigned a weight (1.00, 1.33, or 1.66) based on the TAC vote (see Figure 3.14), consultation with Hudson County Division of Planning and NJTPA, and professional judgment. The final weights are listed in Table 3.1. The relatively narrow, 1.00 to 1.66 scale balances the overall importance of each metric. Metrics receiving one to three votes were assigned the weight of 1.00; six to 10 votes the weight of 1.33; 11 to 18 votes the weight of 1.66. The higher the weight value for a given metric, the greater relative importance of the metric. (While daytime population did not receive any votes by TAC members, it is one of the most significant predictors of bike share demand and was thus assigned a weight of 1.33.)

Figure 3.14. TAC Member Voting on Metrics



Source: Sam Schwartz Engineering

**Table 3.1. Service Area Metrics: TAC Votes and Weighting**

	TAC Votes	Weighting
Residential Population Density	6	1.33
Daytime Population	0	1.33
Ped/bike Commuters	8	1.33
Carless Households	15	1.66
Colleges and Universities	7	1.33
Tourist Destinations	6	1.33
Hotels	1	1.00
Transit	18	1.66
Businesses	3	1.00
Parks and Open Space	6	1.33
Median Household Income	11	1.66
Public/Subsidized Housing	10	1.33



BIKE SHARE DEMAND HEAT MAP

A heat map was created to visualize and quantify suitable locations for bike share based on the metrics described above via the following process:

1. **Rasterization:** The data associated with each metric was rasterized and scaled from zero to 100 based on the range of the data to create a unit-less metric. For example, population density ranges from zero to 86,000 people per square mile; it was converted to a zero to 100 scale, with 100 representing the maximum value of 86,000 persons per square mile. The extent for each raster was set to be the boundaries of the county. A cell size of 260 feet was used to approximate the length of a small city block in the county.

Point data was rasterized using a kernel density over a given zone of influence. With a kernel density, influence is inversely proportionate to distance (in other words, influence diminishes over distance). Distances were determined using what is considered the typical maximum distance people are willing to travel to certain destination points by bicycle. For example, a person traveling to a rail station is generally willing to travel up to 10 minutes to reach the station. If that journey is made via bike share, assuming the rider starts at a bike share station near his or her origin (for instance, his or her home), at an average bicycling speed of eight miles per hour, a 10-minute bicycling distance to a rail station is 1.33 miles. Thus the catchment area (or zone of influence/kernel size) of a rail station for those traveling to/from the station via bicycle is 1.33 miles. The zones of influence for the point data are listed below in Table 3.2.

	Zone of Influence (kernel size, in miles)
Colleges and Universities	1.33
Tourist Destinations	1.33
Hotels	1.33
Transit: Rail Stations/Ferry Terminals	1.33
Transit: Bus Stops	0.66
Businesses	0.25
Parks and Open Space	1.33
Public/Subsidized Housing	0.66

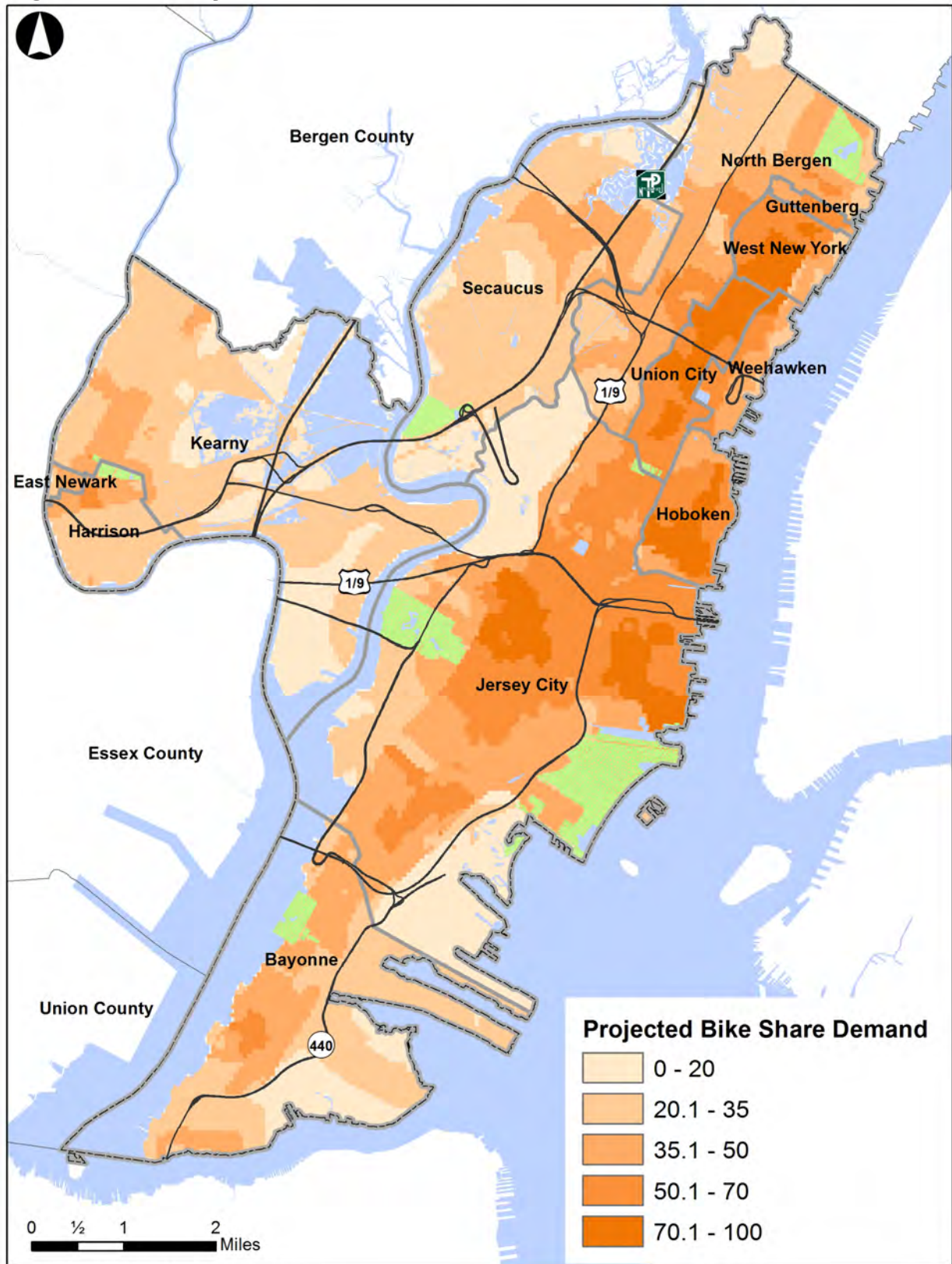


For features that have an associated attribute (such as number of hotel rooms), the density of that attribute was used to assign a scaled value over the zone of influence, ranging from zero to 100. Otherwise, just the density of the feature itself (such as number of businesses) was used to determine the scaled value of the raster.

2. **Map Algebra:** Once rasterized and scaled, the metrics were combined using the weighting described above and map algebra.
3. **Heat Map:** The combined metric was rescaled from zero to 100, with higher values corresponding to the areas of highest projected bike share demand. These areas are shown in darker orange in Figure 3.15 and form the basis for the bike share phasing recommendations described above.



Figure 3.15. Projected Bike Share Demand



Source: Sam Schwartz Engineering, 2014

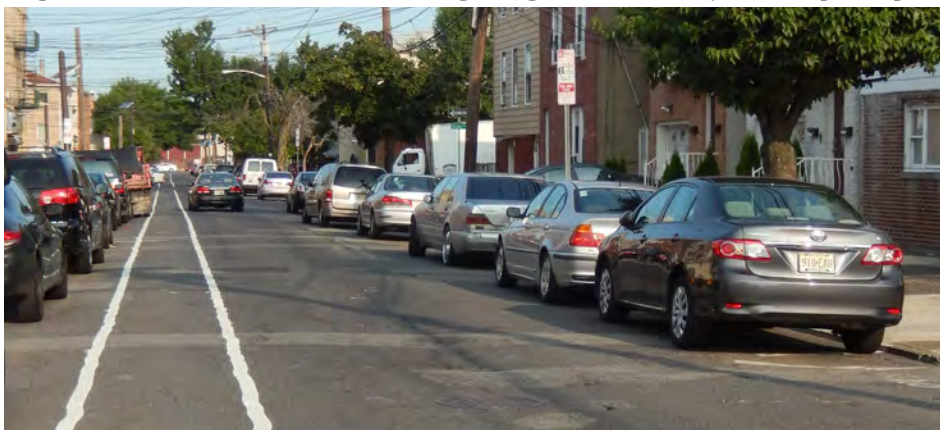


BICYCLE ROUTE INFRASTRUCTURE

Adequate bicycle route infrastructure is necessary for a bike share system to meet its potential. A network of bike routes – standard bike lanes, buffered bike lanes, protected bike lanes (also known as cycle tracks), and greenways – spaced at regular intervals (approximately every ½- to ¼-mile) improves bicycling safety and comfort and has been shown to attract a wide range of bicyclists of all ages and abilities. In communities with few existing bicyclists and little in the way of bike routes, bike sharing will attract an insufficient number of customers to sustain it. Bicycle route infrastructure should, ideally, be in place prior to implementing a bike share system, or at least be implemented in conjunction with bike share.

Hoboken and Jersey City have an adequate bike lane network to support bike share, and Jersey City is actively implementing additional routes (see Figure 3.16). Figure 3.17 below shows Hudson County’s network of existing, planned, and proposed bike routes (as of December 2013). The bike route network in the rest of the county is insufficient to support a bike share system. However, as many cities – such as New York, Hoboken, and, more recently, Jersey City – have shown, a network of bike lanes can be implemented fairly rapidly and at minimal cost relative to total transportation and public works expenditures. These cities have found the political will necessary to reconfigure many of their streets to accommodate and encourage bicycling.

Figure 3.16. Bike Lane along Logan Avenue, Jersey City



Source: Sam Schwartz Engineering

Prior to or in conjunction with Phase II and III expansion of bike sharing in Hudson County, additional bicycle route infrastructure is needed in Guttenberg, North Bergen, Union City, and West New York. The County could help facilitate this process by creating a County bicycle master plan and encouraging the cities to implement bike routes (as discussed in Chapter 4).



Figure 3.17. Existing, Planned, and Proposed Bike Routes



Source: City of Jersey City and City of Hoboken - Department of Transportation and Parking, 2013