CHAPTER 8

SYSTEM PLANNING

Photo Credit: Boulder B-cycle

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To gauge the overall sentiment toward bike share and identify opportunities and challenges to implementing a bike share program in Wilmington, the project team requested feedback from the general public as well as influential stakeholders throughout the City.

Public feedback was received via a project website; an online crowdsourcing map; a public meeting; and targeted interviews with local stakeholders and agencies. Participants were asked about the opportunities, challenges, potential goals and objectives for a bike share system in the City. The following is a summary of common themes that emerged from the public engagement portion of the project and help frame the discussion of the feasibility of bike share in Wilmington.

PUBLIC AND STAKEHOLDER ENGAGEMENT

Public Meeting

A public meeting was held on September 21, 2015 at the Wilmington Public Library. The meeting was attended by eight community members, City representatives, and officials from the Delaware Department of Transportation. The project team gave a short presentation outlining the scope of the project, introducing bike share systems around the U.S., and a short summary of preliminary findings. Participants were invited to comment on the goals and objectives for a potential bike share program in Wilmington and suggest potential station locations on printed maps and via an online crowdsourcing map.

Open house attendees generally supported the concept

Figure 30: Boards at Public Meeting

Figure 31: Public Meeting Attendees

of bike share and understood its benefits. Their comments included:

- Interest in using the existing trail system to support the system.
- Concern about the scarcity of on-street bicycle facilities.
- Interest in a regional/statewide system that would include Wilmington, Dover and the beaches and its potential to strengthen the connections for residents and workers in all three jurisdictions.
- Concerns about the financial sustainability if the City were to bear the capital and operations costs of a bike share system.

Attendees also weighed in on the potential goals and objectives for the system. There was support for a program that would increase the number of people bicycling, increase personal mobility and connect residents to jobs. Social and geographic equity were also considered important, as well as implementing a regional system that would connect with existing transit service.

Crowdsourcing map

A crowdsourcing map was launched as a companion to the project website. The map was open from June through October 2015. It allowed users to suggest locations for possible bike share stations and provide comments on other people's suggestions. Forty nine unique station location suggestions and 125 comments on those forty nine station locations were received. **Table 5** provides a list of the top 10 most suggested station locations.

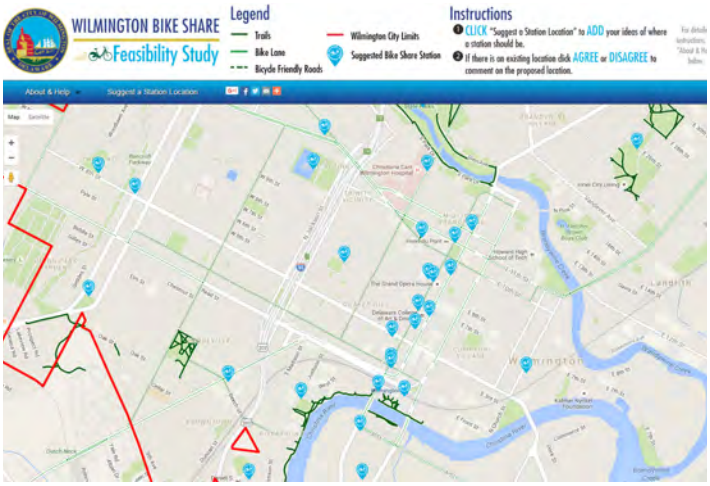

Figure 32: Screenshot of Crowdsourcing Map

Figure 33 shows the locations of suggested bike share stations weighted by the number of "likes" received for each station (a total of 125 likes were received). Most station location suggestions were located along existing trails, in Downtown, close to SEPTA/Amtrak station, and on the Market Street and Delaware Avenue corridors. This feedback will be used to finalize the list of proposed station locations.

Table 5 - Top 10 Most Suggested Station Locations

Location	Likes
Trolley Square Shopping Center	10
SEPTA/AMTRAK Rail station	10
Delaware and Broom	10
Brandywine Park	10
Woodlawn Park/The Flats	10
Market Street and 11th Street	9
Riverfront (south)	6
Riverfront (north)	5
Rockford Park	5
Pennsylvania Ave and Delaware Ave	4

STAKEHOLDER MEETINGS

A series of interviews and targeted meetings were conducted in September 2015 with community and regional stakeholders. The purpose of these meetings was to explore the possible opportunities and challenges of implementing a bike share program in the City. A number of representatives from different agencies and corporations were invited to participate in the following stakeholder group meeting or interviewed individually:

- *Government Agencies/ Departments* – City of Wilmington Division of Public Health, Delaware DOT Traffic Division, City of Wilmington Law Department, City of Wilmington Mayor's Office, City of Wilmington Department of Public Works, City of Wilmington Planning Department, Delaware State Parks, Delaware DOT Planning, City of Wilmington Office of Economic Development, Delaware Transit Corporation (DART), Wilmington Area Planning Council (WILMAPCO).
- *Non-governmental organizations* – Committee of 100, Bike Delaware, Delaware Greenways, White Clay Bicycle Club, Urban Bike Project, BPG, Nature Conservancy, Riverfront Development Corporation of Delaware, Nemours, Delaware Bicycle Council, Greater Wilmington Convention and Visitors Bureau.
- *Large Employers* – Christiana Care Hospital, Delaware Technical Community College, University of Delaware, Blue Cross Blue Shield of Delaware.

FEEDBACK SUMMARY

Views from the public and stakeholders regarding implementation of a bike share program throughout the City were largely positive. A general summary of input about opportunities and challenges for bike share is presented below, followed by a summary of specific topics that were particularly important to both the general public and stakeholders.

Opportunities cited included:

- Bike share can be a means to further promote bicycling as a mode of transportation and act as a catalyst for further bicycle related infrastructure improvements.
- Bike share could help attract and retain a well-educated, mobile, and highly-competitive workforce and set the community apart from its peers around the region.
- Bike share could be an option for low-income households without access to an automobile,

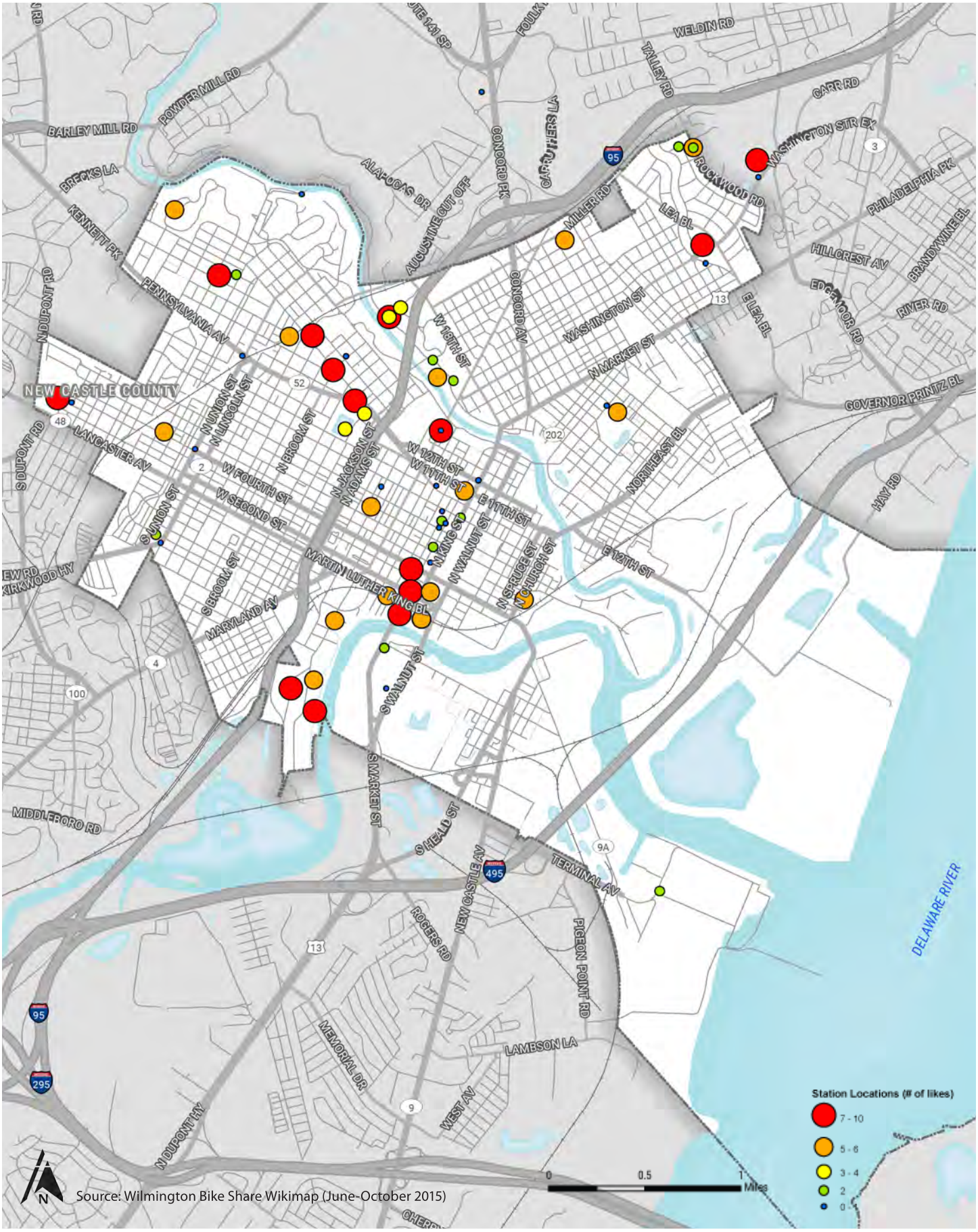

Figure 33: Publicly suggested bike share station locations by number of "likes"

connecting them jobs, services, and retail they otherwise could not reach.

- Bike share could provide a last-mile connection to transit, taking commuters to and from regional and local transit, destinations and work places.

Challenges cited were:

- As driving is considered the most convenient way to get around in Wilmington, there is less incentive to adopt bike share as a means of travel compared to places like Philadelphia.
- Although the City has a several existing separated trails, it has only a few marked on-street bicycling facilities. Furthermore, the lack of bicycle oriented wayfinding makes it hard to navigate, even for longtime residents.
- There are existing sign regulations which currently prohibit off-premise advertising. As advertising can be a potential source of operating revenue, this existing covenant may make it difficult for a bike share system to be financially self-sustaining.
- Shared right-of-way ownership with DelDOT may make it difficult to locate stations on DelDOT property.
- High crime rates in some parts of the City may deter people from bicycling or checking out bike share bicycles in station locations in those areas.

Regional Integration

As Wilmington is located close to Philadelphia and many Wilmingtonians work in Philadelphia or vice versa, the stakeholder group was asked whether there was interest in regional integration with the existing Indego system. Participants noted that while reciprocal integration (i.e., the ability for a user in either system to use one key to access both systems) would be valuable, it would be more important for the City work with the Delaware Department of Transportation (DelDOT) and other Delaware jurisdictions to promote a regional bike share system. Participants felt it would be valuable to implement a system throughout Wilmington, Dover, Newark and the beach towns of Bethany and Rehoboth as it would help promote bicycling as a viable form of transportation throughout these areas. Furthermore, participants were enthusiastic about making Delaware the first state in the union to implement a statewide bike share program.

Private-Sector Funding Opportunities

Stakeholders identified a number of potential funding partners in the community which could help support a bike share system. Major institutions including Christiana Care and Delaware Tech would make excellent partners as they have existing transportation needs that bike share could address. In addition, the City has a strong employer base that might be interested in sponsoring in bike share including its three largest employers: Capital One, Chase, and Barclays (see Employment section). With increased redevelopment of the City's waterfront area, developers may also be interested in funding bike share as a way to offer additional amenities to their residents and possibly reduce the amount of required parking.

Governance

As many stakeholders and community members were enthusiastic about the potential for a regional system, when asked about possible facilitating and implementing agencies, many pointed to regional or statewide organizations including DART, DelDOT or WILMAPCO. At the time of the meetings, these organizations demonstrated openness to the idea but were not sure that they currently have the organizational or financial capacity for implementation and day to day oversight of a bike share program. Further conversations with these organizations are recommended.

SUITABILITY ANALYSIS AND METHODOLOGY

Based on the review of existing conditions, a suitability analysis (or "heat mapping" analysis) was performed using GIS data provided by the City of Wilmington, State of Delaware, and from publicly available sources including U.S. Census. Bike share is most successful where there are a variety and density of land uses. Therefore, the bike share suitability analysis was created by aggregating various data, including: population density, employment density, community and visitor attractions (e.g., libraries, community centers, sports venues, etc.), transit and regional transportation, bicycle mode share, equity, and topography.

The methodology includes a point-scoring system where points are allocated for an area based on its performance in each of the above categories. The weight given to each characteristic was aligned with the goals and objectives of the system (see **Table 2**). These scores were then summed to give a total "suitability" score. The weighting and methodology used for each variable is described in **Table 6**. The results of the analysis are shown as a heat map in **Figure 35.**

As expected, the most suitable locations are in the downtown business district, the residential area immediately to the east, and the Hilltop neighborhood across Interstate 95. These outputs will be combined with public and stakeholder input to define a bike share service area and develop a phasing plan as part of a future element of this project.

Table 6 – Demand Map Variable Weighting

Data Item	Factor Weight
Employment Density	19.5%
Population Density	19.5%
Attractions (includes tourist destinations, schools, exisiting comercial zoning and parks)*	12%
Bicycle Modeshare	4%
Transit Stops Density*	10%
Regional transit stops (includes AMTRAK)*	10%
Existing bike infrastructure (includes on-and off-road facilities)	10%
Topography	3%
Equity (includes concentration of minority populations other than white and population under $30,000 for a family of 4)	12%
TOTAL	**100%**

* factors have been weighted based on proximity (1/4 mile and 1/2 mile

Figure 34: Capital Bikeshare (Washington, DC)

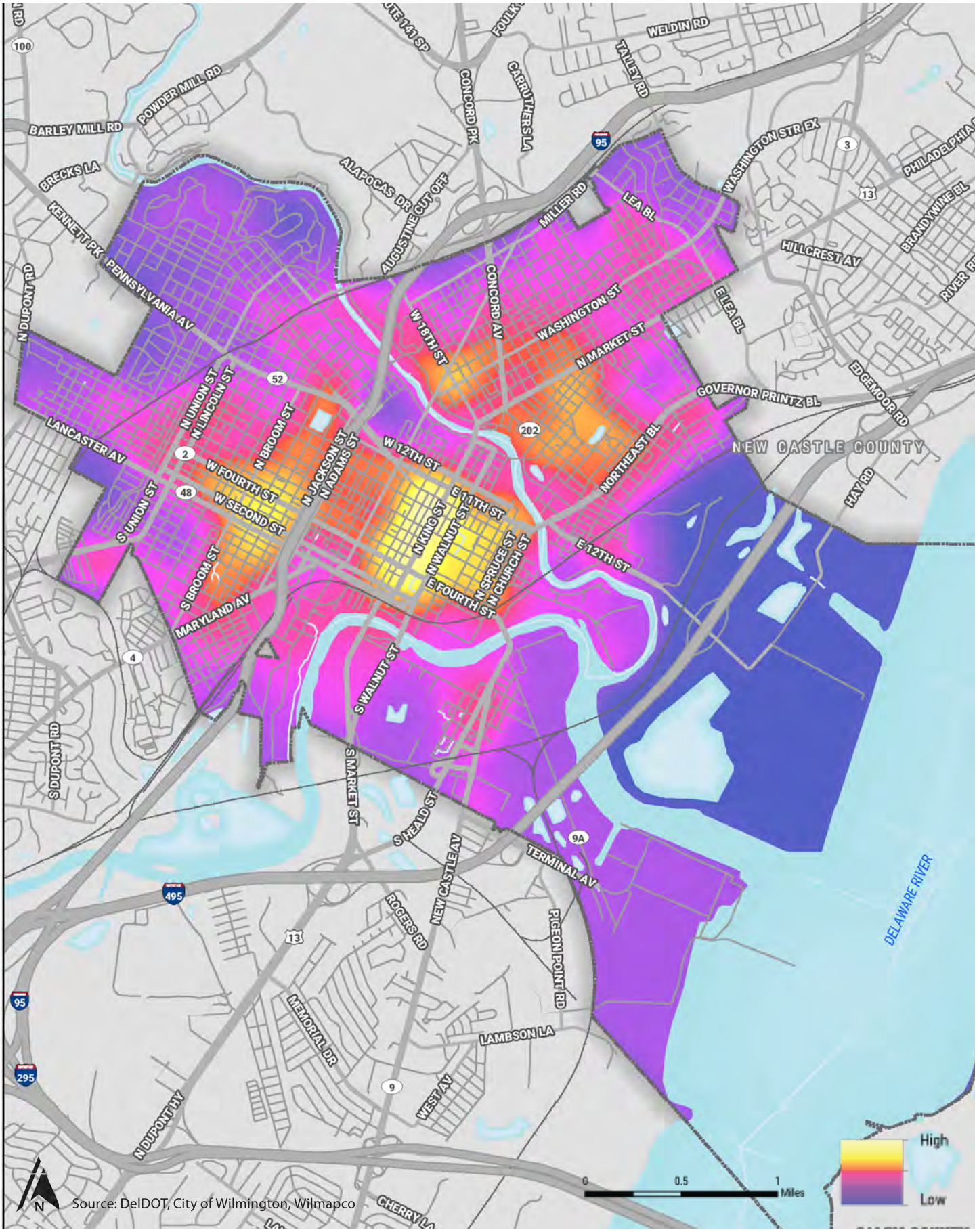

Figure 35: Potential Bike Share Demand

PRELIMINARY SYSTEM PLAN

This section summarizes the proposed service area, size, and phasing of a potential bike share system in the City of Wilmington. The recommendations take into consideration system planning principles developed from industry best practices and experience in peer cities, the goals and objectives proposed in **Chapter 5**, and the findings of the existing conditions review which showed that the downtown business district, the neighborhoods of LOMA, Quaker Hill, East Side, Hilltop, Hedgeville and Cool Springs have the highest potential demands for bike share (as shown on **Figure 35**). The proposed phasing plan is supported by feedback received during stakeholder engagement.

DENSITY AND EXTENT OF COVERAGE

A key decision for bike share implementation is to determine the balance between breadth of coverage and station density. Some jurisdictions have chosen to launch their initial system with a high density of stations in smaller more densely populated areas (e.g., City of Philadelphia, City of Chattanooga, Salt Lake City, etc.), whereas others have chosen to spread out the stations at lower densities and cover a larger service area (e.g., City of Charlotte, Washington, D.C., etc.). There are a number of aspects to consider in making this decision:

- Providing bike share stations (or hubs) at high densities maximizes the visibility and convenience of the system by providing users with a reasonable expectation that there will be a station within walking distance from anywhere in the system area. This may also provide redundancy so that if a station/hub is empty or full, a user can go to a nearby station/hub and find an available bicycle or an empty dock.
- If stations/hubs are provided at high densities but the coverage area is too small, then the system may not serve a sufficient range of destinations and may not be an effective alternative to walking. For stations at the edges of the system, it is important to make sure that there is additional capacity available (i.e., more docking points/racks) so that users are not faced with empty or full stations. A system that provides too few stations will be limited in the number of destinations it serves and therefore have less utility and be less attractive to potential users. However, cities generally must take a measured approach due to funding and other constraints and may not initially launch with the full system.
- Most systems are generally contiguous. Providing a contiguous system offers a larger number of connections between stations than if the same resources were split into several smaller (disconnected) systems.

DOCK-TO-BIKE RATIOS

To properly serve its customers, a bike share system should maintain enough bicycles for users to check out and enough open docks/racks for users to return bicycles. Bike share operators employ a variety of methods to balance bicycle and dock/rack availability at stations, including physically moving bicycles or offering incentives for users to move them from full stations to empty stations. Providing a high ratio of bicycles to docks helps minimize rebalancing efforts and operating costs, however comes with higher upfront capital cost. Active bike share systems employ dock-to-bike ratios ranging from 1.5 to over 2.0. A ratio of 1.7 docks-per-bike balances capital and operating cost objectives and is consistent with the peer cities considered.

SYSTEM PHASING PLAN

Boundaries for the first phases of the program were developed to capture contiguous areas with the highest potential for bike share (see **Figure 36**). Based on typical station densities in peer cities, shown in **Table 7** to be an average of 5.3

Table 7 - Peer Cities Comparison

Peer City	Bicycles	Stations	Docks	Dock to Bike Ratio	Stations per square mile
Charlotte	200	20	280	1.4	4.8
CoGo	225	30	446	2.0	4.8
Washington	3,041	208	3,906	1.6	6.3
Average	1,155	86	1,544	1.7	5.3

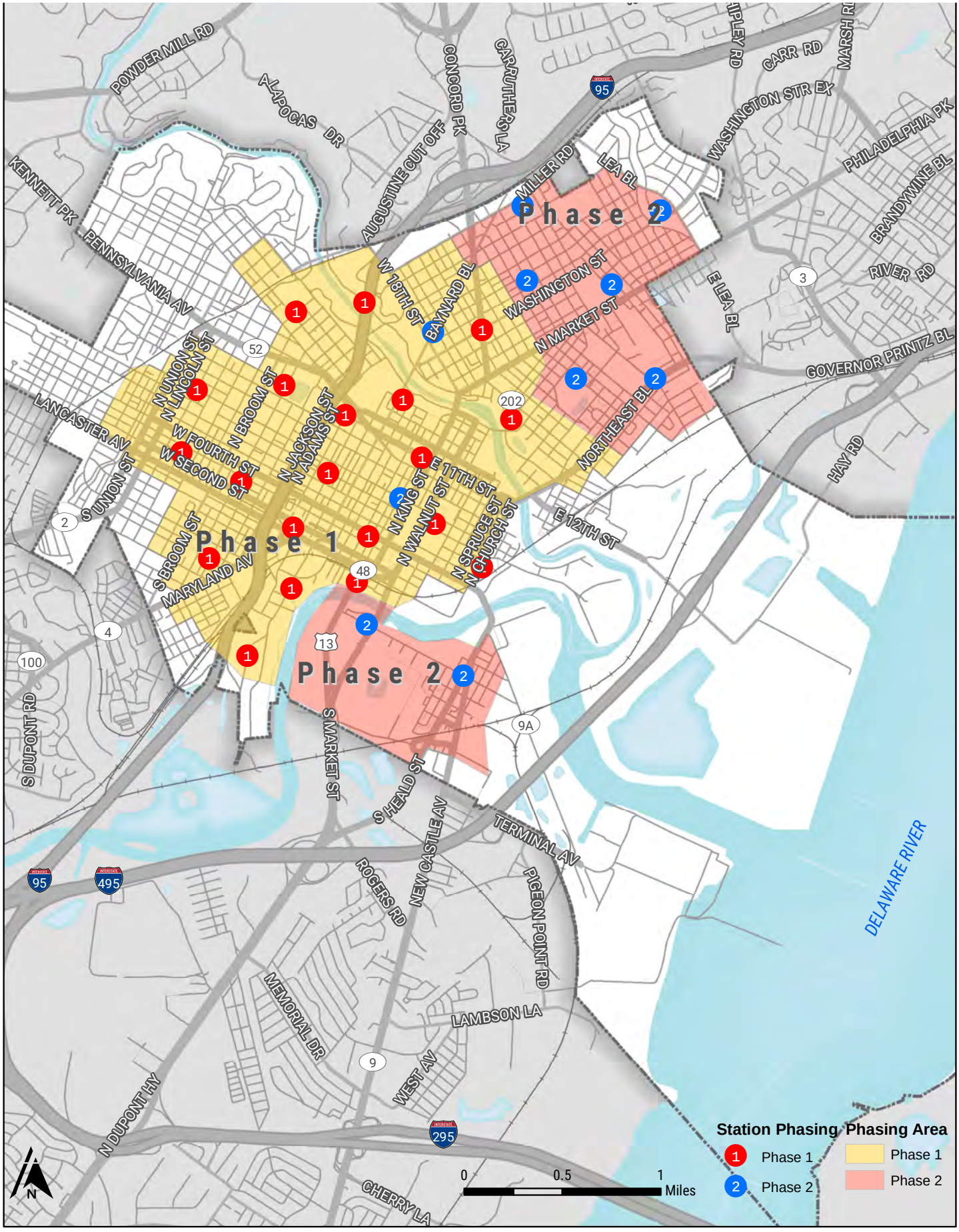

Figure 36: Wilmington Bike Share Proposed System Phasing and Station Locations

Table 8: Proposed System Phasing

Phase	Stations	Bicycles	Docks	Stations per sq. mi.	Percentage of City Residents within ¼ mile of a bike share station	Goals/Objectives met
1	20	200	340	6.7	63%	Livability and Economic Competitiveness • Optimize the number of destinations served • Attract and retain talent Improve Quality of Life through Bicycling • Relieve traffic congestion • Increase bicycling throughout the City • Provide residents a safe active transportation option
2	10	100	170	5.0	8%	Social and Geographic Equity • Serve various communities throughout the City • Engage low income and minority communities • Increase access to jobs Improve Quality of Life through Bicycling • Relieve traffic congestion • Increase bicycling throughout the City • Provide residents a safe active transportation option
TOTAL	30	300	510	5.8	71%	Livability and Economic Competitiveness Social and Geographic Equity Improve Quality of Life through Bicycling

stations per square mile,[94,95] the number of stations needed to cover this area was calculated and then divided into phases to represent realistic capital funding capacity (so as not to plan a system that was too large to realistically be funded).

The goals established by the City for the proposed bike share system focus on reaching a large portion of the local population, and providing additional transportation options for its residents. Providing a reasonable density of stations was therefore balanced with coverage of resident population to build out a system that would start denser in the downtown and urban core and spread further at lower densities in subsequent phases as land use and population densities decrease away from the city center. The proposed phasing plan is shown on **Figure 36** and summarized in **Table 8**.

- *Phase 1* represents 20 stations, 200 bicycles and 340 docks. This initial rollout would provide service to the neighborhoods located in the central part of the City including Downtown, Upper East Side, East Side, LOMA, Quaker Hill, Riverfront, West Center City, Trinity Vicinity, Midtown Brandywine, Brandywine Village, Southeast 9th Ward, Triangle, Delaware Avenue, Cool Spring, West Hill, Hill Top,

94 In most bike share systems, station densities are higher in the core of the system and get progressively lower at the edges.

95 Washington figures only include those related to the Washington DC portion of Capital Bikeshare.

Browntown, St. Elizabeth Area, Bayard Square and Little Italy.

- Phase 2 would extend the system northward and southward into the neighborhoods of Riverside, 11th Street Bridge, Eastlake, 9th Ward, Eastlawn, Harlan, Price's Run, and Southbridge. This second phase would also provide infill station locations for a total of 10 stations, 100 bicycles and 170 docks.

When fully implemented, the proposed system would incorporate an area of around five square miles which represents around 45 percent of the City's total land area. This proposed phasing plan does not preclude future expansion into other areas or accelerated expansion into areas identified in a later phase. Expansion should be considered after an initial operating period of six to twelve months when operation of the system (i.e., ridership patterns) is better understood and funding commitments for expansion are in place.

The recommended station locations are shown as generalized areas where bike share stations could be installed. Final station placements will require additional public outreach and fieldwork to ensure the following guidelines are met.

STATION SITING GUIDELINES

Bike share stations/hubs are modular and their capacity can be expanded or decreased over time in response to demand and other needs. Stations/hubs should generally be placed in safe, convenient, and visible locations and can include installations in-street, on sidewalks, in parks and other public lands, or on private property through the use of a license agreement with the property owner. Stations/hubs sited on public right-of-way (ROW) may need to obtain a revocable permit from the City or State (depending on who owns and maintains the ROW). In all instances, stations/hubs should be available at all times to the public and to the operator for the purposes of maintenance, snow clearance, and bicycle redistribution.

Bike share stations/hubs should be placed on a hard, level, paved surface, in addition to meeting the solar exposure and cellular signal needs specific to the type of equipment (smart bike vs smart dock). In cases where stations/hubs do not meet solar or connectivity requirements, hard wiring may be necessary. Where possible, sites should make use of existing lighting to provide a secure environment for users.

The footprint of the station/hub will depend on the type of equipment selected, and the proposed number of docks/racks. Many vendors offer different configurations for where space is constrained. The space considerations should include the length of the station, the width of the station and the bicycles, any clearances required to utilities or other street furniture, and space behind the back of the bicycle to allow users to comfortably pull a bicycle out of the dock. The latter distance may vary depending on the constraint behind the bicycle and for on-street stations the presence of a bike lane or buffer spaces and the speed and volume of traffic on the adjacent street.

Actual station dimensions will need to be confirmed once an equipment vendor is selected. However, approximate station sizes are shown in **Table 9**.[96] For example, a 17 dock/rack, single sided station is approximately 45 feet long and around six feet deep (the footprint is approximately the size of a single DART transit bus).

Final bike share station locations will require additional public outreach and field work to confirm the availability of space, identify right-of-way and property ownership, meet the specific needs of the equipment vendor (such as solar exposure requirements), gauge reactions to potential sponsorship agreements, and identify the interests of the adjacent property and business owners.

Table 9: Approximate Station Dimensions

Characteristic	Dimensions
Dock height	2′-6″
Kiosk/map panel height	6′-6″ – 7′-0″
Height to top of solar panel	9′-0″ – 11′-6″
Base plate with dock	<3′-0″
Station with bicycle	<6′-0″
13 docks + kiosk	35′-0″
15 docks + kiosk	40′-0″
17 docks + kiosk	45′-0″
Additional docks	2′-6″

96 Based on average station dimensions from B-cycle, PBSC, Social Bicycles and Next Bike equipment.

Below are some additional considerations for bike share stations located on sidewalks, on-street locations, parks and plazas, and on private property.

SIDEWALK SITE REQUIREMENTS

Generally, sidewalk sites should not interfere with existing pedestrian travel patterns and must maintain sufficient clearance to fixed objects and utilities. Sidewalk sites should not impede access to and from buildings especially with relation to emergency services. Sites should be placed in line with other street furniture wherever possible. Clearances to utilities and other street furniture and street uses will need to be developed with the relevant agency staff, but in other cities, these clearance requirements call for stations not being placed:

- Within 5 feet of a crosswalk.
- Within 10 feet of driveways.
- Within 15 feet of fire hydrants.
- Within 5 feet of stand pipes.
- Within 2 feet of fixed objects such as lamp posts.
- Within 15 feet of a bus stop and ensuring sufficient distance from rear bus egress doors (if the station is placed on the curbside). Stations can be closer if placed away from the curb/along the building frontage.

Stations/hubs should have a 2 foot minimum setback from the curb when adjacent to on-street parking to allow for the opening of automobile doors. A minimum of 12- to 18-inches may be acceptable where parking is not allowed. An example of a bike share station located on a sidewalk is shown on **Figure 37**.

ON-STREET SITE REQUIREMENTS

Generally, on-street stations should first consider low traffic volume streets. However, higher traffic volume streets can be considered where there is sufficient width for a user to pull a bike from the station without encroaching into the traffic lane, or where there is a buffer provided between the station and moving traffic, e.g., a bike lane or painted buffer. An example of an on-street station in Arlington County, VA is shown on **Figure 38**.

On-street sites typically make use of converted parking spaces, though restricted parking areas may also be

Figure 37: Sidewalk Station in Hamilton, Ontario (Credit: Social Bicycles)

Figure 38: On-Street Bike Share Station in Arlington, VA (wikimedia.org)

considered where these sites do not impact sight lines or emergency access. Agency staff and the City's Transportation and Planning Departments as well as DelDOT staff should be consulted to confirm where conversion of metered and non-metered parking would be acceptable.

Standard safety treatments should be developed for on-street stations in consultation with the City's Traffic Engineering Department as well as representatives from DelDOT. These safety treatments may include street markings, flexible delineators, or other safety equipment.

PARKS AND OTHER PUBLIC PROPERTY

Stations may be placed in parks or on other City property at the discretion of the relevant agency. In general, the same guidelines as for sidewalk sites would apply. An example of a bike share station on public property in Birmingham, AL is shown on **Figure 39.** Please note that this is one of Birmingham's recharging stations which require additional space for the solar panels and kiosk.

PRIVATE PROPERTY

Stations may be placed on private property at the discretion of the property owner. In these cases, the operator usually secures a license agreement to establish the terms of use, to transfer liability, and to ensure the site is accessible to the public at all times. Generally, sidewalk siting guidelines apply to these sites. An example of a bike share station located on private property in a shopping center in Boulder, CO is shown on **Figure 40**.

Figure 39: Zyp Bikeshare station located in a public park (Credit: Zyp Bikeshare)

Figure 40: Boulder B-cycle station located on private property (Credit: Boulder B-cycle)

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