

## Summary of Field Review of Dockless Bike Share

### Bicycle Transit Systems

December 4, 2017

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## Executive Summary

Dockless bike share is a relatively recent addition to the North American transportation landscape and launched in several U.S. cities in the summer of 2017. In Seattle, dockless bike share is regulated by the City's *Bike Share Permit* that phases its roll-out and stipulates requirements that the permit holder must meet. In Seattle, there are three bike share providers that are each currently allowed to have over 2,000 bikes. Based on a scan of the Transit app, there are likely more than 6,000 dockless bike share bikes available in the city - but this cannot be confirmed through publicly available information sources. In the District of Columbia, dockless bike share is a pilot project and permit holders are required to provide a minimum of 50 bikes and up to a maximum of 400 bikes. There are five providers operating in the District with approximately 1,000 bikes in total. In Montgomery County (part of the Washington D.C. Metro area), there are no caps on the number of bikes.

Currently, there is relatively little publicly available information about how these systems operate. To inform this study, the team conducted field observations on November 9, 2017 of 139 dockless bike share bikes in four neighborhoods in Seattle and 94 dockless bike share bikes in four neighborhoods in the Washington D.C. Metro area. This provided a snapshot of quantifiable information about how dockless bike share systems are operating – focusing on the number, availability, condition, and placement of bicycles in the system. Following are key findings from the field inventory:

- The app is accurate approximately 79% of the time. Bikes advertised in the Transit app were found in less than 80% of cases; or in other words, there is about a 20% chance that a bike share user would not find the advertised bike.
- There are more bikes available than advertised and the supply percentage varies significantly between locations. In all cases, there were more bikes found on the street than were advertised in the app. In Washington, D.C., there were 108% more bikes on the street than indicated in the app. This discrepancy in Seattle was 221%, or more than twice as many bikes as advertised.
- Approximately 12% of bikes had major defects. A major defect was defined as damage impacting the safety and rideability of the bike. The most common defects were missing lights or reflectors (38% of major defects observed) and damaged or non-functioning brakes (34%). Extrapolated to the potentially 6,000 or more bikes on the streets in Seattle, this could theoretically mean over 600 bikes have some sort of damage affecting safety and/or rideability.
- Most parked bikes were standing upright (94%). Almost all parked bikes were upright. Approximately six percent were found lying on their side.
- Approximately 70% of bikes were parked in the space between the sidewalk and the curb (often referred to as the amenity, landscape, or furniture zone). Approximately 88% of bikes were parked within the public right-of-way. However, 12% were parked on private property and some of these were unreachable (e.g. parked in a locked parking garage, etc.). The appropriate parking location is defined by each jurisdiction, but based on the

interpretation of Seattle's and the District of Columbia's bike share permits, approximately 27% of bikes were parked in incorrect locations.

- Approximately 8% of parked bikes caused some sort of obstruction. Examples of obstructions observed in the field included: blocking a door or other building access, obstructing a vehicle travel way, or blocking the pedestrian zone such that there was less than five feet of clearance available, which is the Americans with Disabilities Act (ADA) minimum requirements.

## 1. Introduction

Bicycle Transit Systems commissioned a consultant to conduct field work and analysis to provide quantifiable information about how dockless bike share systems are operating. The specific objective was to evaluate the number, availability, condition, and placement of bicycles in the system.

The consultant team conducted field observations in several neighborhoods in Seattle, WA and the Washington D.C. Metro area (Washington, D.C. and Montgomery County, MD) - two regions experimenting with dockless bike share programs. In Seattle, the City has established a *Bike Share Permit* that requires permit holders to launch and maintain 500 bicycles for the first month and then allows them to increase the fleet to 1,000 bikes in the second month and 2,000 bikes in the third month. After the third month, the fleet can be increased to more than 2,000 bikes so long as other requirements in the permit are met. At the time of the survey, all providers in Seattle were beyond the three-month period and subsequently allowed to operate with more than 2,000 bikes.<sup>1</sup> In the District of Columbia, the project is in a pilot phase and permit holders are required to provide between 50 and 400 bikes. In Montgomery County, MD (part of the Washington D.C. Metro area), there are no caps on the number of bikes.

In Seattle, field evaluators encountered bikes from the following vendors: Limebike, ofo, Spin. In the Washington D.C. Metro area, evaluators encountered bikes from Limebike, Mobike, ofo and Spin. Due to the relatively small sample size of bikes investigated in the field, most findings are presented as an aggregate of all vendors.

The team collected field data on these bike share systems following the methodology described below. Data was collected for an 8-hour period between 8 AM and 5 PM (local time) in the following locations (study areas) on Thursday November 9, 2017 and logged in a customized data collection application.

- Seattle:
  - Downtown
  - South Seattle (Columbia/Hillman City)
  - Capitol Hill
  - U District
- Washington D.C. Metro Area:
  - Silver Spring (Montgomery County)
  - 14<sup>th</sup> Street corridor between Rhode Island Avenue and U Street
  - Capitol Hill and Georgetown
  - National Mall

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<sup>1</sup> Source: <https://www.seattle.gov/Documents/Departments/SDOT/BikeProgram/BicycleSharePermitRequirements.pdf>

Field data collection followed the following methodology:

1. During the study period, field staff used a smart phone and the Transit app to identify the advertised location of the nearest bike in the study area and walked towards the location indicated in the app to try and physically locate the bike.
2. If the observer saw another bike along the way that was not identified in the app, they recorded the location of that bike and took field observations for that bicycle (see Step 5 below).
3. When the observer came to the “advertised” location of the bike in the app, they checked if that location was still showing in the app and logged its location (this was labeled the “Advertised Location”). They then looked for the bike. If they could not find the bike in the advertised location, they recorded it as “Could not be Found”.
4. If they found the bike, they recorded the location where it was found (this was labeled the “Observed Location”). From these two data points, the distance between the advertised and observed locations could be calculated.
5. Once a bike was found, the observer recorded the following information:
  - a. They performed a visual inspection of the condition of the bike, squeezed the brakes to test that they were operational, and checked that the lock was engaged so that it did not allow the rear wheel to spin. Field staff noted any major or minor defects. Major defects were considered anything that impacted the safety or rideability of the bike, including non-functioning brakes, damaged or missing lights and reflectors, damaged or missing pedals, damaged or missing seat, or non-functioning wheel lock. Minor damage included defects that affected the appearance of bike, but did not significantly affect rideability such as damaged or missing baskets, chain guards, handle grips, kick stands, spokes, and signs, or fender distortion, graffiti, or dents and scratches.
  - b. They recorded the location of the bike in relation to the street and whether it was upright.
6. The field staff took photographs of all the bikes observed in the field to record their condition and parked location.
7. Once information for one bike was recorded, the observer used the app to search for the next nearest bike and the above process was repeated.

## 2. Results

The data collected in the field was analyzed using GIS software and spreadsheet tools. The results are summarized in the tables below and can be grouped into the following categories:

- App and Locational Accuracy
- Observed Bikes and Supply Percentage
- Bike Condition
- Parking Behavior

**Table 1: Summary of Dockless Bike Share Location Observations**

|                                    |  | Seattle |            | Washington D.C. |            | Total |            |
|------------------------------------|--|---------|------------|-----------------|------------|-------|------------|
| <b>App and Locational Accuracy</b> |  |         |            |                 |            |       |            |
| A                                  | Number of advertised bikes found in the field                        | 49      |            | 69              |            | 118   |            |
| B                                  | <b>App Accuracy (B = A / D)</b>                                      |         | <b>78%</b> |                 | <b>79%</b> |       | <b>79%</b> |
|                                    | <i>Distance between found bike location and advertised location:</i> |         |            |                 |            |       |            |
|                                    | <i>0 – 50 feet</i>   | 42      | 67%        | 55              | 63%        | 97    | 65%        |
|                                    | <i>51 – 100 feet</i>   | 6       | 9%         | 5               | 6%         | 11    | 7%         |
|                                    | <i>101 – 500 feet</i>  | 1       | 2%         | 9               | 10%        | 10    | 7%         |
| C                                  | Number of advertised bikes that could not be found in the field      | 14      | 22%        | 18              | 21%        | 32    | 21%        |
| D                                  | Total advertised bike locations                                      | 63      | 100%       | 87              | 100%       | 150   | 100%       |

**App and Locational Accuracy**

App Accuracy is a measure of reliability to the customer, i.e., whether a bike shown on the app can be found in the field. Of the 150 locations shown on the Transit app and searched for in the study areas, only 118 or 79% of these bikes could be found in the field. App accuracy information is included for each provider in Tables A-1 and A-2 of Appendix A.

In approximately 65% of cases, bikes were found within 50-feet of the advertised location; a further 7% were within 50-100 feet; and another 7% were 100-500 feet from the advertised location. Approximately 21% of bikes advertised in the app could not be found within 500 feet of the advertised location. This means that a bike share user could expect that two out of every ten times they look for a bike, they will not find it.

To make sure that the Transit App accurately reflects the native apps of the different bike share providers, TDG counted advertised locations in the various native apps (e.g. ofo, Spin, Limebike) in select areas in Seattle and throughout the District of Columbia. Unfortunately, Limebike’s app was not working properly during the evaluation period and the team was not able to accurately compare between native apps and the Transit App. Observations evaluators could collect are included in Appendix A.

**Table 2: Summary of Dockless Bike Share Supply Observations**

|  |   | Seattle     | Washington D.C. | Total       |
|--|---|-------------|-----------------|-------------|
| <b>Observed Bikes and Supply Percentages</b> |   |             |                 |             |
| E  | Number of bikes observed in the field   | 139         | 94              | 233         |
| F  | Additional bikes found in the field that were not advertised in the app             | 90          | 25              | 115         |
| G  | <b>Supply Percentage (G = E / D)</b>  | <b>221%</b> | <b>108%</b>     | <b>155%</b> |
| H  | Number of bikes allowed by permit at time of survey                                 | >6,000      | Up to 1,600     |             |
|  | Possible observed sample size as percentage of entire bike share fleet <sup>1</sup> | ~2.3%       | ~5.9%           |             |

Notes:

<sup>1</sup> Information on how many bicycles were deployed by each provider at the time of the survey is not public information. Therefore, the estimate of possible sample size is likely to be inaccurate but is very likely to be less than 10% of the fleet.

### Observed Bikes and Supply Percentage

Field observers documented every dockless bike share bike encountered in the field. This was compared to the number of advertised locations to determine the Supply Percentage. The supply percentage indicates if there are more or fewer bikes on the ground than advertised in the app. If the percentage of bikes encountered is less than 100%, then there are fewer bikes than advertised; and if greater than 100%, there are more bikes than advertised.

The supply percentage varied significantly by region. In Seattle 139 bikes were observed in the field versus 63 bikes advertised in the app – meaning 76 additional bikes were observed that were not advertised in the app. This resulted in a supply percentage of 221% - meaning that there was a significant oversupply of bikes encountered in the field versus advertised in the app.

In the Washington D.C. Metro area, 94 bikes were observed in the field, versus 87 advertised in the app, resulting in a supply percentage of 108%. On December 1, 2017, Toole Design Group counted 1,010 advertised bike locations in the Transit App. Extrapolating the 108% oversupply to the number of advertised bike locations means that potentially up to 1,090 bikes were available in the field.

### Parking Condition and Location Observations

This section contains information about several different aspects of the bikes observed in the field. The findings are documented in Table 3 and Table 4, and highlights are noted in the accompanying narrative.

**Table 3: Summary of Key Dockless Bike Share Condition Observations**

|                       |  | Seattle |      | Washington D.C. |      | Total |      |
|-----------------------|--|---------|------|-----------------|------|-------|------|
| <b>Bike Condition</b> |  |         |      |                 |      |       |      |
| A                     | Number of bikes with no major defects  | 125     | 90%  | 81              | 86%  | 206   | 88%  |
| B                     | Number of bikes with one or more major defects <sup>1</sup><br><b>Defective Percentage</b> | 14      | 10%  | 13              | 14%  | 27    | 12%  |
| C                     | Total observed bikes   | 139     | 100% | 94              | 100% | 233   | 100% |
|                       | Instances of major defects <sup>2</sup>  |         |      |                 |      |       |      |
|                       | Damaged or missing lights/reflectors   | 7       | 50%  | 4               | 26%  | 11    | 38%  |
|                       | Damaged or non-functioning brakes  | 1       | 7%   | 9               | 60%  | 10    | 34%  |
|                       | Damaged or missing seat  | 3       | 22%  | 1               | 7%   | 4     | 15%  |
|                       | Non-functioning wheel lock   | 2       | 14%  | 1               | 7%   | 3     | 10%  |
|                       | Damaged or missing pedals  | 1       | 7%   | 0               | 0%   | 1     | 3%   |
|                       | Total instances of major defects   | 14      | 100% | 15              | 100% | 29    | 100% |

Notes:

<sup>1</sup> Major defects are defined as damaged or non-functioning brakes, a non-functioning wheel lock, and damaged or missing lights, reflectors, pedals, or seat. Minor defects were recorded but are not reported above. These include damaged or missing baskets, chain guards, handle grips, signs, spokes or kick stands, as well as fender distortion, graffiti, dents, and scratches.

<sup>2</sup> Note that bikes may have more than one major defect. In this case, one bike in Washington D.C. had three major defects; all other bikes had only one major defect.

### Bike Condition

The percentage of observed bikes with major defects was generally consistent in both study areas (note: a major defect was defined as a defect impacting safety or rideability of the bike). The defective percentage was approximately 12% of all bikes observed, with 10% of bikes in Seattle and 14% in the Washington, D.C. area having major defects. The most common issues were damaged or missing lights or reflectors (encountered on 38% of bikes with major defects) and damaged or non-functioning brakes (encountered on 34% of bikes with major defects).

These figures could have significant implications if extrapolated over an entire system. In Seattle for example, if 10% of observed bikes have a major defect, then this could represent 600 or more bikes assuming each provider has the permitted number of bikes on the street – resulting in over 6,000 bikes. In the District of Columbia, extrapolating the

14% defective bike figure over 1,000 bikes believed to be on the street would result in approximately 140 defective bikes in the system. A breakdown of damage by bike share provider is included in Appendix A.

**Table 4: Summary of Key Dockless Bike Share Parking Location Observations**

|                                 |  | Seattle |            | Washington D.C. |            | Total |            |
|---------------------------------|--|---------|------------|-----------------|------------|-------|------------|
| <b>Parking Behavior</b>         |  |         |            |                 |            |       |            |
|                                 | Bikes Parked Upright   | 129     | 93%        | 89              | 95%        | 218   | 94%        |
|                                 | Total Observed Bikes   | 139     |            | 94              |            | 233   |            |
| <b>Parking Location</b>         |  |         |            |                 |            |       |            |
|                                 | Amenity/Landscape/Furniture Zone   | 103     | 74%        | 60              | 63%        | 163   | 70%        |
|                                 | Frontage Zone  | 11      | 8%         | 10              | 11%        | 21    | 9%         |
|                                 | Pedestrian Zone  | 10      | 7%         | 9               | 10%        | 19    | 8%         |
|                                 | On-Street Bike Corral  | 2       | 1%         | 0               | 0%         | 2     | 1%         |
|                                 | Off-street <sup>1</sup>  | 10      | 7%         | 13              | 14%        | 23    | 10%        |
|                                 | Unreachable <sup>2</sup>   | 3       | 2%         | 2               | 2%         | 5     | 2%         |
|                                 | Total Observed Bikes   | 139     |            | 94              |            | 233   |            |
|                                 | <b>Incorrect Parking Location</b>  |         | <b>24%</b> |                 | <b>33%</b> |       | <b>27%</b> |
| <b>Obstructions<sup>3</sup></b> |  |         |            |                 |            |       |            |
|                                 | <b>Bikes Causing Obstruction</b>   | 8       | <b>6%</b>  | 10              | <b>11%</b> | 18    | <b>8%</b>  |
|                                 | <i>Pedestrian obstructions (encroaching on 5-foot minimum ped travelway)</i> | 4       | 3%         | 6               |            | 10    |            |
|                                 | <i>Doorway / access obstructions</i>   | 3       | 2%         | 3               |            | 6     |            |
|                                 | <i>Vehicle obstructions</i>  | 1       | 1%         | 1               |            | 2     |            |
|                                 | Total observed bikes   | 139     |            | 94              |            | 233   |            |

Notes:

<sup>1</sup> Off-street locations included bikes parked on the National Mall, in alleys and laneways, on private property, in driveways, in a parking lot, and at the foot of a stairway.

<sup>2</sup> Unreachable bikes were visible to data collectors, but were parked in locations that were not immediately accessible (e.g. behind a locked gate or in a locked parking structure).

<sup>3</sup> An obstruction is defined as a bike blocking a door or accessway, in a vehicle travelway, or blocking the pedestrian zone such that it leaves less than five feet of clearance (ADA minimum standard). This does not include bikes that were unreachable.

### Parking Behavior and Location

Generally, bikes observed in the field were parked in a manner that did not impact other modes of travel or the local environment.

The clear majority of bikes (94%) observed in the field were standing upright. Approximately 6% of parked bikes were found lying on the ground.

Allowable parking locations vary by jurisdiction:

- In Seattle, the City's permit requires bikes to be parked "in the landscape/furniture zone of the sidewalk ... or at an SDOT bike rack". Approximately 24% of observed bikes did not meet one or both criteria.
- In the District of Columbia, bikes must be parked "on a public sidewalk, in the public right-of-way between the sidewalk and the curb (i.e., the amenity zone), or at a bike rack located in the public right-of-way".

There are further requirements that

parked bikes do not impede entrances or driveways, Capital Bikeshare stations, or vehicle travel areas.

Furthermore, parked bikes must be outside of any tree planting or landscaped area, and must leave a pathway at least five feet in width in compliance with the Americans with Disability Act. Approximately 33% of parked bikes observed in the Washington D.C. Metro area did not meet one or more of these criteria.

In both regions, parked bikes were found in many locations. Approximately 70% of bikes observed were parked in the amenity / landscape / furniture zone. However, bikes were also commonly found in the frontage zone of a building (9%) or the pedestrian zone (8%), potentially blocking pedestrian travel.

Approximately 10% of bikes were found in off-street locations. These locations included alleys and driveways, public or private parking lots, in doorways and stairwells, and other locations. Some bikes were also found on the National Mall in Washington, DC which is technically not allowed per the conditions of the bike share permit. An additional 2% of bikes were visually located by field observers, but could not be evaluated because they were inaccessible due to being in a locked structure or behind a locked gate.

Field evaluators also recorded whether the bike was causing an obstruction. This is distinct from the parking location as an obstruction was defined as a bike blocking a door or accessway, in a travelway blocking the movement of a vehicle, or blocking the pedestrian zone such that it leaves less than 5-feet of clearance (ADA minimum standards). Approximately 8% of parked bikes created an obstruction per one or more of these criteria.

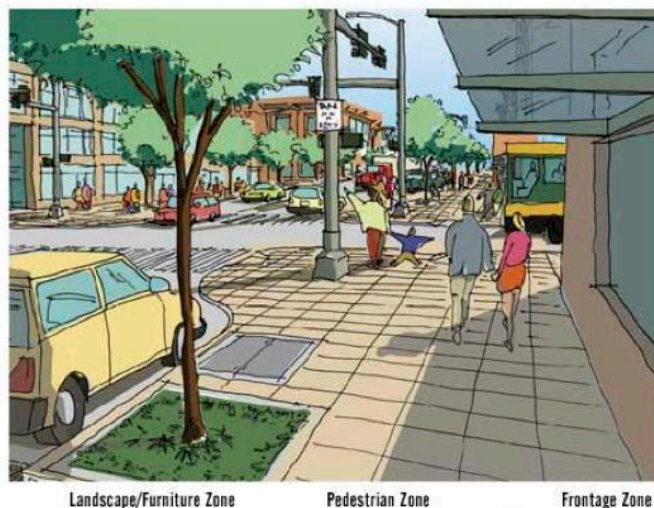


Figure 1: Definition of sidewalk zones included in the Seattle Department of Transportation's Bike Share Permit.



**APPENDIX A: SUPPORTING TABLES**

**Table A-1: Number of Advertised Dockless Bike Share Locations Checked in the Field, by Provider (as per Transit App on November 9, 2017)**

|                           | Seattle         |             | Washington D.C. |             |
|---------------------------|-----------------|-------------|-----------------|-------------|
|                           | Number of Bikes | Percentage  | Number of Bikes | Percentage  |
| <b>Bikeshare Provider</b> |                 |             |                 |             |
| Limebike                  | 32              | 51%         | 34              | 39%         |
| Mobike                    | n/a             | n/a         | 29              | 33%         |
| Ofo                       | 14              | 22%         | 19              | 22%         |
| Spin                      | 14              | 22%         | 4               | 5%          |
| Not Defined               | 3               | 5%          | 1               | 1%          |
| <b>Total</b>              | <b>63</b>       | <b>100%</b> | <b>87</b>       | <b>100%</b> |

**Table A-2: Number of Dockless Bike Share Bikes Observed in the Field, by Provider (November 9, 2017)**

|                           | Seattle         |             | Washington D.C. |             |
|---------------------------|-----------------|-------------|-----------------|-------------|
|                           | Number of Bikes | Percentage  | Number of Bikes | Percentage  |
| <b>Bikeshare Provider</b> |                 |             |                 |             |
| Limebike                  | 85              | 61%         | 35              | 37%         |
| Mobike                    | n/a             | n/a         | 36              | 38%         |
| Ofo                       | 25              | 18%         | 20              | 22%         |
| Spin                      | 29              | 21%         | 3               | 3%          |
| <b>Total</b>              | <b>139</b>      | <b>100%</b> | <b>94</b>       | <b>100%</b> |

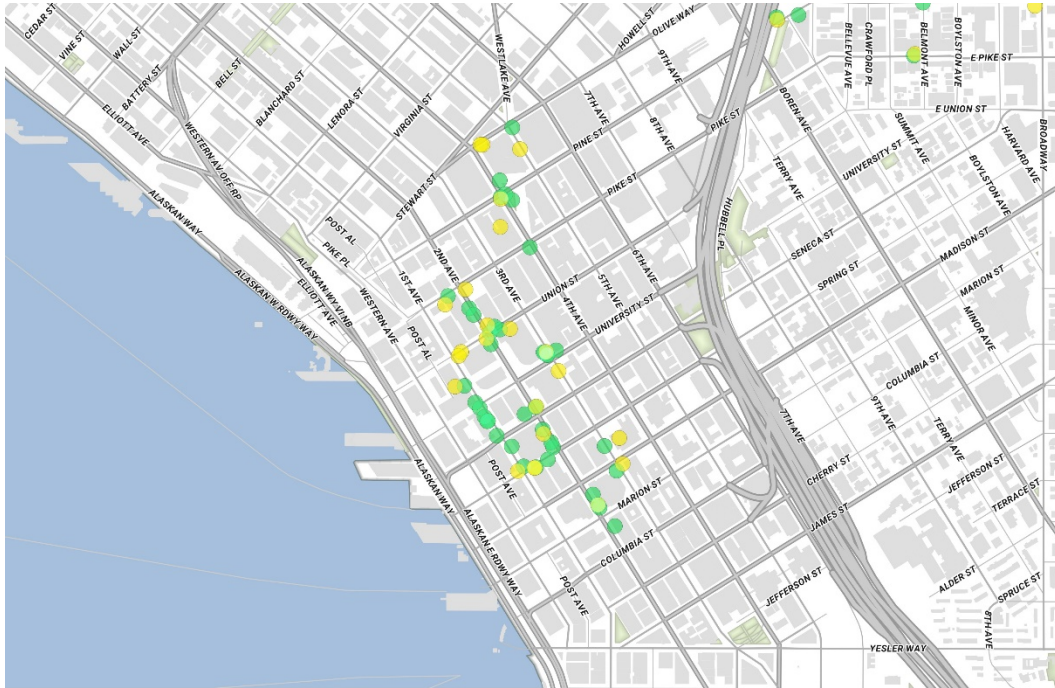
**Table A-3: Number of Advertised Dockless Bike Share Locations in the District of Columbia, by Provider (as per Transit App on December 1, 2017)**

|                           | District of Columbia |             |
|---------------------------|----------------------|-------------|
|                           | Number of Bikes      | Percentage  |
| <b>Bikeshare Provider</b> |                      |             |
| Limebike                  | 254                  | 26%         |
| Mobike                    | 408                  | 41%         |
| Ofo                       | 219                  | 22%         |
| Spin                      | 103                  | 10%         |
| <b>Total</b>              | <b>94</b>            | <b>100%</b> |

**Table A-4: Major Defects Observed on Dockless Bike Share Bikes, by Provider (November 9, 2017)**

|   | Seattle           |             | Washington D.C.   |             | Total             |             |
|---|-------------------|-------------|-------------------|-------------|-------------------|-------------|
|   | Number of Defects | %           | Number of Defects | %           | Number of Defects | %           |
| <b>Limebike</b>                                 |                   |             |                   |             |                   |             |
| Damaged or missing seat                         | 2                 | 33%         | 1                 | 25%         | 3                 | 30%         |
| Damaged or missing pedals                       | 1                 | 17%         | 0                 | 0%          | 1                 | 10%         |
| Damaged or missing lights/reflectors            | 1                 | 17%         | 2                 | 50%         | 3                 | 30%         |
| Damaged or non-functioning brakes               | 0                 | 0.0%        | 1                 | 25%         | 1                 | 10%         |
| Non-functioning wheel lock                      | 2                 | 33%         | 0                 | 0%          | 2                 | 20%         |
| <i>Total number of bikes with major defects</i> | <i>6</i>          | <i>100%</i> | <i>4</i>          | <i>100%</i> | <i>10</i>         | <i>100%</i> |
| <b>Mobike</b>                                   |                   |             |                   |             |                   |             |
| Damaged or missing seat                         | n/a               | n/a         | 0                 | 0%          | 0                 | 0%          |
| Damaged or missing pedals                       | n/a               | n/a         | 0                 | 0%          | 0                 | 0%          |
| Damaged or missing lights/reflectors            | n/a               | n/a         | 1                 | 14%         | 1                 | 14%         |
| Damaged or non-functioning brakes               | n/a               | n/a         | 5                 | 72%         | 5                 | 72%         |
| Non-functioning wheel lock                      | n/a               | n/a         | 1                 | 14%         | 1                 | 14%         |
| <i>Total number of bikes with major defects</i> | <i>n/a</i>        | <i>n/a</i>  | <i>7</i>          | <i>100%</i> | <i>7</i>          | <i>100%</i> |
| <b>Ofo</b>                                      |                   |             |                   |             |                   |             |
| Damaged or missing seat                         | 1                 | 33%         | 0                 | 0%          | 1                 | 25%         |
| Damaged or missing pedals                       | 0                 | 0%          | 0                 | 0%          | 0                 | 0%          |
| Damaged or missing lights/reflectors            | 2                 | 67%         | 1                 | 100%        | 3                 | 75%         |
| Damaged or non-functioning brakes               | 0                 | 0%          | 0                 | 0%          | 0                 | 0%          |
| Non-functioning wheel lock                      | 0                 | 0%          | 0                 | 0%          | 0                 | 0%          |
| <i>Total number of bikes with major defects</i> | <i>3</i>          | <i>100%</i> | <i>1</i>          | <i>100%</i> | <i>4</i>          | <i>100%</i> |
| <b>Spin</b>                                     |                   |             |                   |             |                   |             |
| Damaged or missing seat                         | 0                 | 0%          | 0                 | 0%          | 0                 | 0%          |
| Damaged or missing pedals                       | 0                 | 0%          | 0                 | 0%          | 0                 | 0%          |
| Damaged or missing lights/reflectors            | 4                 | 80%         | 0                 | 0%          | 4                 | 50%         |
| Damaged or non-functioning brakes               | 1                 | 20%         | 3                 | 100%        | 4                 | 50%         |
| Non-functioning wheel lock                      | 0                 | 0%          | 0                 | 0%          | 0                 | 0%          |
| <i>Total number of bikes with major defects</i> | <i>5</i>          | <i>100%</i> | <i>3</i>          | <i>100%</i> | <i>8</i>          |             |
| <b>Totals</b>                                   |                   |             |                   |             |                   |             |
| Damaged or missing seat                         | 3                 | 22%         | 1                 | 7%          | 4                 | 14%         |
| Damaged or missing pedals                       | 1                 | 7%          | 0                 | 0%          | 1                 | 3%          |
| Damaged or missing lights/reflectors            | 7                 | 50%         | 4                 | 26%         | 11                | 38%         |
| Damaged or non-functioning brakes               | 1                 | 7%          | 9                 | 60%         | 10                | 35%         |
| Non-functioning wheel lock                      | 2                 | 14%         | 1                 | 7%          | 3                 | 10%         |
| <i>Total number of bikes with major defects</i> | <i>14</i>         | <i>100%</i> | <i>15</i>         | <i>100%</i> | <i>29</i>         | <i>100%</i> |

**APPENDIX B: COMPARISON OF ADVERTISED AND OBSERVED BIKE LOCATIONS**



**Seattle**

**Study Area: Downtown**

**Dockless Bikeshare Locations**

- Observed Locations
- Advertised Location
- ● Overlapping Points

- Water
- Parks



**Seattle**

**Study Area: Capitol Hill**

**Dockless Bikeshare Locations**

- Observed Locations
- Advertised Location
- ● Overlapping Points

- Water
- Parks

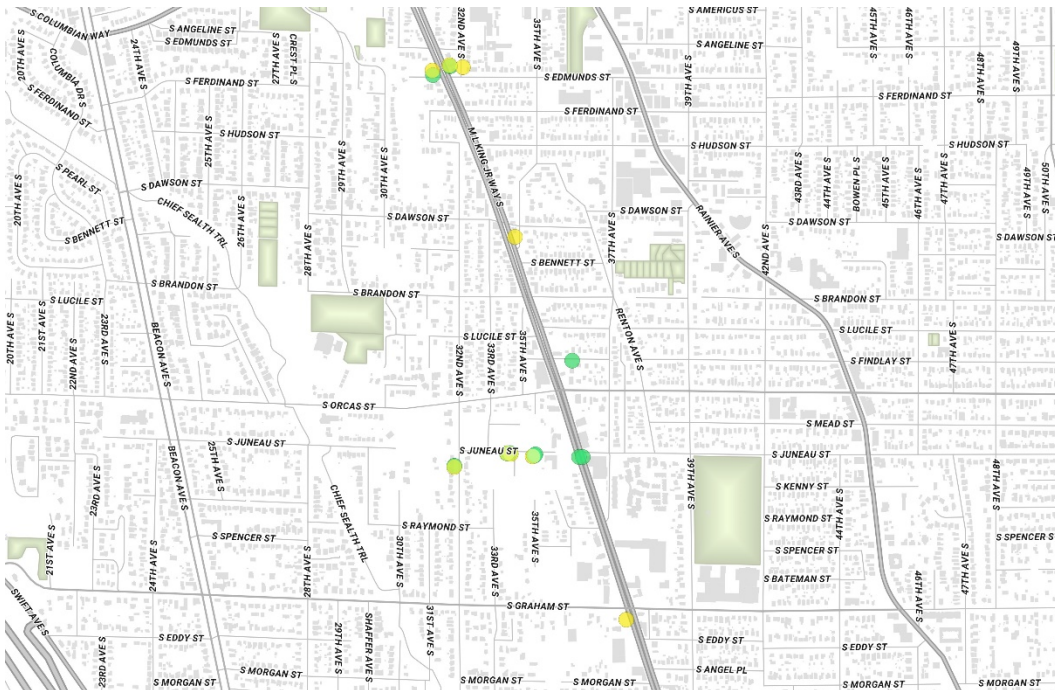
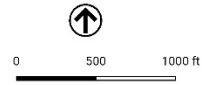




**Seattle**  
**Study Area: U District**

**Dockless Bikeshare Locations**  
● Observed Locations  
● Advertised Location  
● Overlapping Points

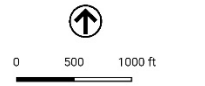
Water  
Parks

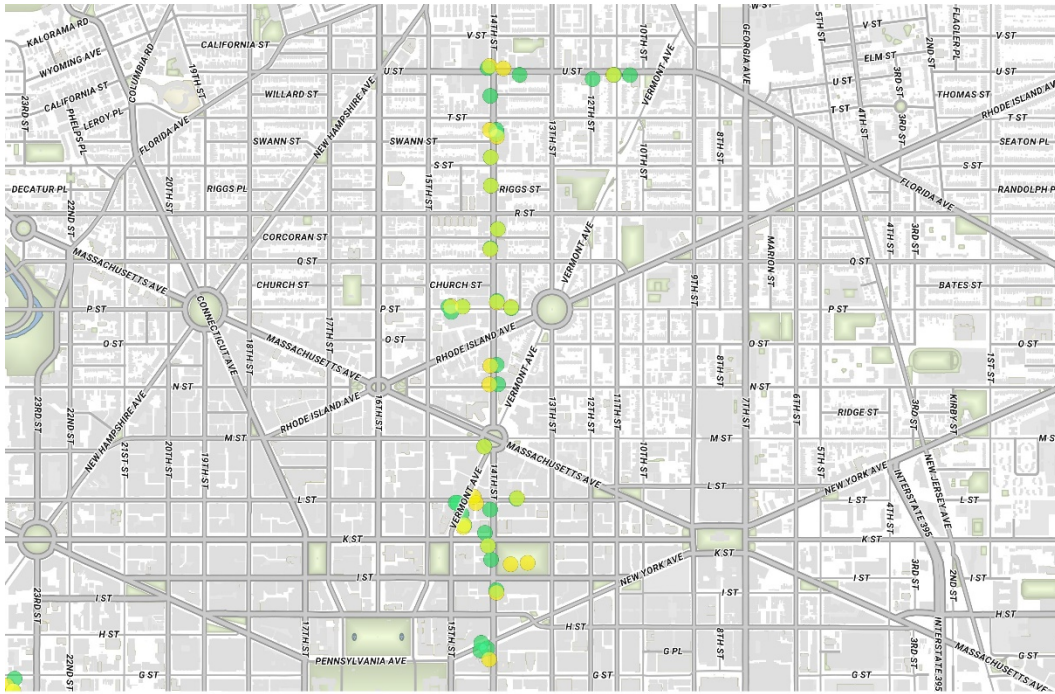


**Seattle**  
**Study Area: South Seattle**

**Dockless Bikeshare Locations**  
● Observed Locations  
● Advertised Location  
● Overlapping Points

Water  
Parks

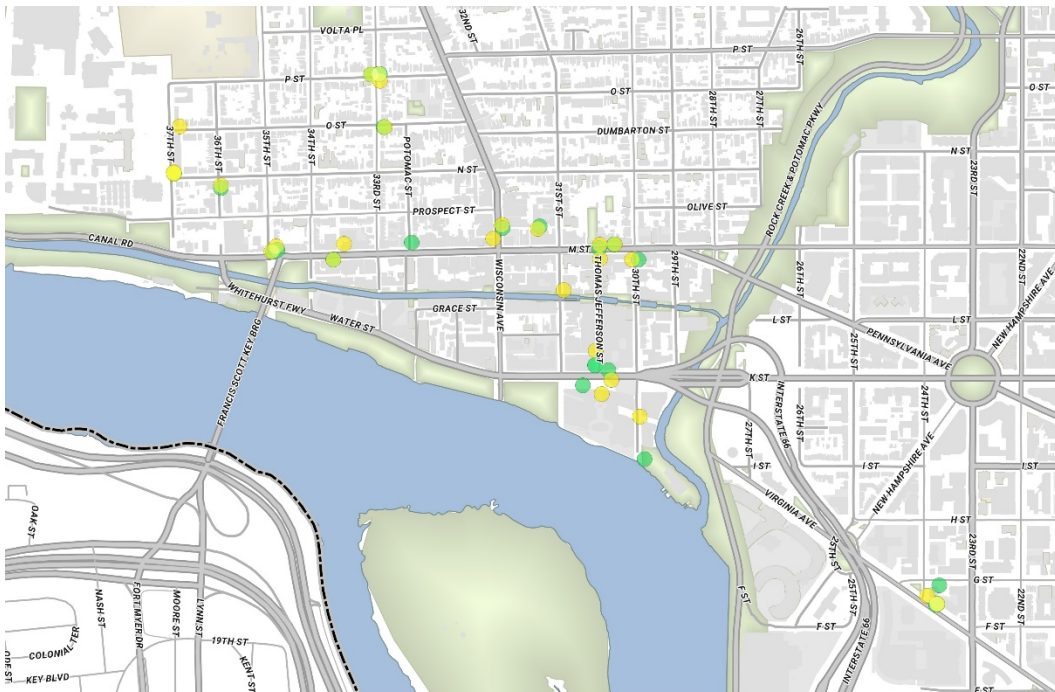




**Washington, D.C.**  
**Study Area: 14th Street Corridor**

**Dockless Bikeshare Locations**

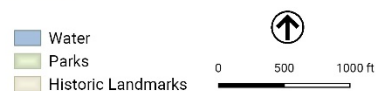
- Observed Location
- Advertised Location
- Overlapping Points

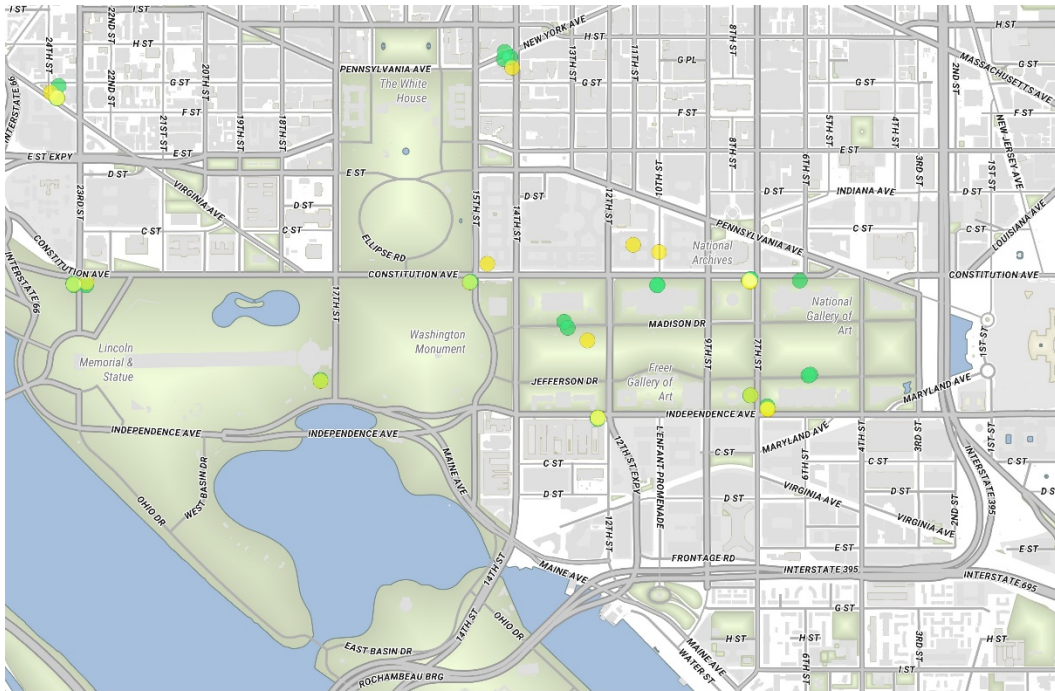


**Washington, D.C.**  
**Study Area: Georgetown**

**Dockless Bikeshare Locations**

- Observed Location
- Advertised Location
- Overlapping Points





**Washington, D.C.**  
**Study Area: National Mall**

**Dockless Bikeshare Locations**

- Observed Location
- Advertised Location
- Overlapping Points

- Water
- Parks
- Historic Landmarks



**Washington, D.C.**  
**Study Area: Silver Spring**

**Dockless Bikeshare Locations**

- Observed Location
- Advertised Location
- Overlapping Points

- Water
- Parks
- Historic Landmarks



**APPENDIX C: PHOTO SAMPLE OF OBSERVED BIKES**



Examples of bikes parked in required locations: amenity zone (top), at bike racks (bottom).



Examples of bikes not parked in required locations: pedestrian zone (top), bike on its side (bottom).





Examples of damaged bikes: missing seat (top), deformed fender (bottom left), missing rear light (bottom right).



Examples of bikes causing obstructions: blocking fire exit (top), blocking doorway (bottom).