LESSONS FROM THE GREEN LANES:
EVALUATING PROTECTED BIKE LANES IN THE U.S.

FINAL REPORT:
APPENDIX C
BICYCLIST ORIGIN AND DESTINATION ANALYSIS

NITC-RR-583

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DISCLAIMER

Memorandum

To: Dr. Chris Monsere and Nathan McNeil, Portland State University

From: Matt Berkow, Kim Voros and Dru van Hengel, Alta Planning + Design

Date: March 21, 2014

Re: Green Lane Research Project

This memorandum presents preliminary results for the Origin and Destination survey analyses as well as evaluation of activity at Capital Bikeshare Stations in the vicinity of the L Street cycle track.

1 Origin and Destination Survey Analysis

1.1 Methodology

Origin and destination point data were collected through user intercept surveys on cycle tracks in sample cities. In the absence of detailed route information, ESRI's Network Analyst tool was used to generate theoretical bicyclist travel routes, assuming that cyclists tend to minimize out-of-direction travel, but will detour when better infrastructure is available or when unfavorable maneuvers, such as unprotected left turns, can be eliminated.

Two sets of trips were run for each set of origin and destination points:

- Shortest Network Distance (Shortest Path) - A route solution that found the shortest network distance between each trip origin and destination. This simple network solve considered only distance and did not assign benefit to travel on local streets or punishment for travel on high speed arterials.
- Shortest Network Distance with Cycle Track (Assumed Path) - A route solution that required a cyclist to travel on the cycle track for at least one block. In this analysis each block of the cycle track was treated as a destination and a route was found between each trip origin and the closest destination on the cycle track. A second route solution found the distance between the cycle track midpoint and the ultimate trip destination. Trip legs were aggregated, summed, and then analyzed against the shortest network distance.

In some cases trips were excluded from the analysis. This occurred when an interview respondent reported identical origin and destination points, or multiple origin and destination points. Trips over 7 miles in length were also excluded to minimize the likelihood of including trips that were not exclusively taken by bicycle (e.g., to exclude combined bike and transit trips).

The following sections identify trends in the distance of the shortest and assumed paths, the difference between the shortest and assumed path, and the distance of trip origins and destinations from the cycle track.

1.2 Results

The key metrics for the analysis are proximity to the cycle track, shortest path, assumed path (shortest path by way of the cycle track), and the distance change between the shortest and assumed path.

Proximity to Cycle Track

Table 1 below identifies the distance of the trip origin and destination (whichever is closest) from the cycle track facility. There appears to be a split between the cycle tracks studied as to whether users had an origin or destination near the facility. For example, more than 80% of survey respondents reported either a trip origin or destination within ¼ mile of the L Street cycle track. Users of the Barton Springs cycle track in Austin and Dearborn in Chicago also tended to have an origin or destination relatively nearby. On Milwaukee Avenue in Chicago, by contrast, the closest trip origin or destination tended to be between 1-2 miles from the cycle track (75% of trips). Users of the Oak/Fell cycle track in San Francisco also tended not to have an origin or destination nearby. The differences across locations are likely indicative of the context of the given facility. For example, while L Street is located in downtown Washington DC, the Milwaukee Avenue cycle track is a connector route between downtown Chicago and neighborhoods to the northwest.

Table 1 - Distance of Origin or Destination to Cycle Track (Miles)

Location	0.00 - 0.25	0.25 - 0.50	0.50 - 0.75	0.75 – 1.00	1.00 – 1.50	1.50 – 2.00	2.00 – 2.50	> 2.50	Total
Barton Springs	20%	30%	0%	0%	10%	30%	10%	0%	100%
Rio Grande	30%	17%	26%	17%	4%	0%	0%	4%	100%
DC	80%	15%	2%	3%	0%	0%	0%	0%	100%
Dearborn	30%	25%	25%	12%	7%	2%	0%	0%	100%
Milwaukee	4%	1%	4%	8%	39%	37%	8%	0%	100%
Portland	13%	38%	13%	7%	18%	8%	3%	0%	100%
San Francisco	10%	4%	10%	11%	14%	21%	18%	12%	100%

Shortest Path and Assumed Path

Table 2 and Table 3 give a sense of the total trip length for users of cycle tracks in the various cities. With the exception of Rio Grande Street in Austin, there were relatively few trips less than 1 mile. Approximately half of trips passing through the DC and Portland cycle tracks were between 1-3 miles. Trips tended to be longer on Oak/Fell in San Francisco and Milwaukee Avenue in Chicago where nearly half of trips were between 3-5 miles. 60% of trips on the Barton Springs cycle track were 4 miles or more.

Table 2 - Trip Distance (Shortest Path)

Location	0.00 - 0.50	0.50 – 1.00	1.00 – 2.00	2.00 – 3.00	3.00 – 4.00	4.00 – 5.00	5.00 – 6.00	> 6.00	Total
Barton Springs	0%	0%	10%	20%	10%	50%	10%	0%	100%
Rio Grande	9%	22%	35%	9%	9%	9%	4%	4%	100%
DC	4%	10%	31%	23%	13%	7%	7%	5%	100%
Dearborn	2%	5%	21%	16%	16%	14%	12%	14%	100%
Milwaukee	0%	2%	3%	19%	30%	24%	16%	7%	100%
Portland	2%	3%	13%	38%	20%	20%	3%	2%	100%
San Francisco	1%	1%	10%	16%	30%	20%	16%	7%	100%

Table 3 - Trip Distance (Assumed Path via the Cycle Track)

Location	0.00 - 0.50	0.50 – 1.00	1.00 – 2.00	2.00 – 3.00	3.00 – 4.00	4.00 – 5.00	5.00 – 6.00	> 6.00	Total
Barton Springs	0%	0%	10%	20%	10%	50%	10%	0%	100%
Rio Grande	9%	17%	39%	9%	4%	13%	4%	4%	100%
DC	3%	9%	30%	22%	14%	7%	9%	6%	100%
Dearborn	2%	5%	19%	16%	16%	12%	16%	14%	100%
Milwaukee	0%	1%	3%	19%	30%	24%	14%	8%	100%
Portland	2%	3%	11%	39%	18%	16%	8%	2%	100%
San Francisco	1%	1%	8%	14%	24%	24%	17%	11%	100%

Distance Change

Table 4 indicates that the change between the shortest path (via the roadway network) and the assumed path (route through the cycle track) was less than 0.25 miles for the majority of trips. Given the short nature of many bicycle trips, 0.25 miles of out of direction travel can represent a sizable percentage of a trip. Table 5 illustrates the distance change between the shortest and assumed path as a percentage of the shortest path distance.

Out of direction travel was minimal for a large percentage of users on the Barton Springs and Milwaukee cycle tracks. Most trips on the Rio Grande, Dearborn, Portland, and San Francisco cycle tracks required up to 5% of out of direction travel. DC had the highest percentage of users with out of direction travel greater than 10% (42% of users), followed by San Francisco (30%), Dearborn (26%), and Portland (21%).

Table 4 - Distance Change between Shortest Path and Assumed Path

Location	0.00 - 0.25	0.25 - 0.50	0.50 - 0.75	0.75 – 1.00	1.00 – 1.50	1.50 – 2.00	2.00 – 2.50	> 2.50	Total
Barton Springs	90%	10%	0%	0%	0%	0%	0%	0%	100%
Rio Grande	100%	0%	0%	0%	0%	0%	0%	0%	100%
DC	82%	12%	5%	1%	0%	0%	0%	0%	100%
Dearborn	82%	12%	2%	4%	0%	0%	0%	0%	100%
Milwaukee	95%	5%	0%	0%	0%	0%	0%	0%	100%
Portland	84%	15%	0%	0%	2%	0%	0%	0%	100%
San Francisco	70%	10%	7%	10%	3%	0%	0%	0%	100%

Table 5 - Percent Change between Shortest Path and Assumed Path

Location	< 1%	1% - 5%	6%- 10%	11% - 15%	16% - 20%	21% - 25%	26% - 30%	>30%	Total
Barton Springs	70%	20%	10%	0%	0%	0%	0%	0%	100%
Rio Grande	48%	39%	13%	0%	0%	0%	0%	0%	100%
DC	19%	40%	19%	8%	9%	3%	2%	1%	100%
Dearborn	39%	35%	11%	7%	5%	0%	0%	4%	100%
Milwaukee	86%	9%	3%	0%	0%	0%	1%	2%	100%
Portland	51%	28%	18%	2%	0%	0%	0%	2%	100%
San Francisco	27%	43%	7%	7%	5%	4%	2%	4%	100%

1.2.1 Washington, DC

Key Findings:

- Distance of Origin or Destination to Cycle Track - The majority of surveyed users (80%) started or ended their trip within 0.25 miles of the cycle track. This likely reflects the facility's location in the core downtown area. The concentration of trip origins or destinations near the cycle track is illustrated in Figure 1 on the following page.

- Trip Length - Trips were more likely to be shorter (e.g., less than 2 miles) as compared to the other cities, though many respondents also made longer trips.

- Distance Change – The difference between the shortest path and the assumed path was between 0 and 0.2 miles for 77% of trips. As illustrated in Table 6, respondents with longer trips may have undertaken more out of direction travel.

Table 6 - Relationship between distance change (shortest path vs. assumed path) and trip distance (shortest path)

	Shortest Path Distance						
Distance Change	0-1 miles	1-2 miles	2-3 miles	3-5 miles	>5 miles	**Total**	Percent
0 - 0.2 miles	20	35	23	22	16	**116**	77%
0.2 - 0.4 miles	1	9	7	2	2	**21**	14%
0.4 - 0.6 miles	-	2	4	4	-	**10**	7%
0.6 - 0.8 miles	-	1	-	1	-	**2**	1%
> 0.8 miles	-	-	1	1	-	**2**	1%
Total	**21**	**47**	**35**	**30**	**18**	**151**	**100%**
Percent	14%	31%	23%	20%	12%	**100%**	

Table 7 - Relationship between distance change (shortest path vs. assumed path) and distance of origin or destination to cycle track

	O-D distance from Cycle Track						
Distance Change	0.00-0.25 miles	0.25-0.50 miles	0.50-1.00 miles	1.00-1.50 miles	> 1.50 miles	**Total**	Percent
0 - 0.2 miles	92	18	6	-	-	**116**	77%
0.2 - 0.4 miles	18	2	1	-	-	**21**	14%
0.4 - 0.6 miles	9	1	-	-	-	**10**	7%
0.6 - 0.8 miles	1	1	-	-	-	**2**	1%
> 0.8 miles	1	1	-	-	-	**2**	1%
Total	**121**	**23**	**7**	**-**	**-**	**151**	**100%**
Percent	80%	15%	5%	0%	0%	**100%**	

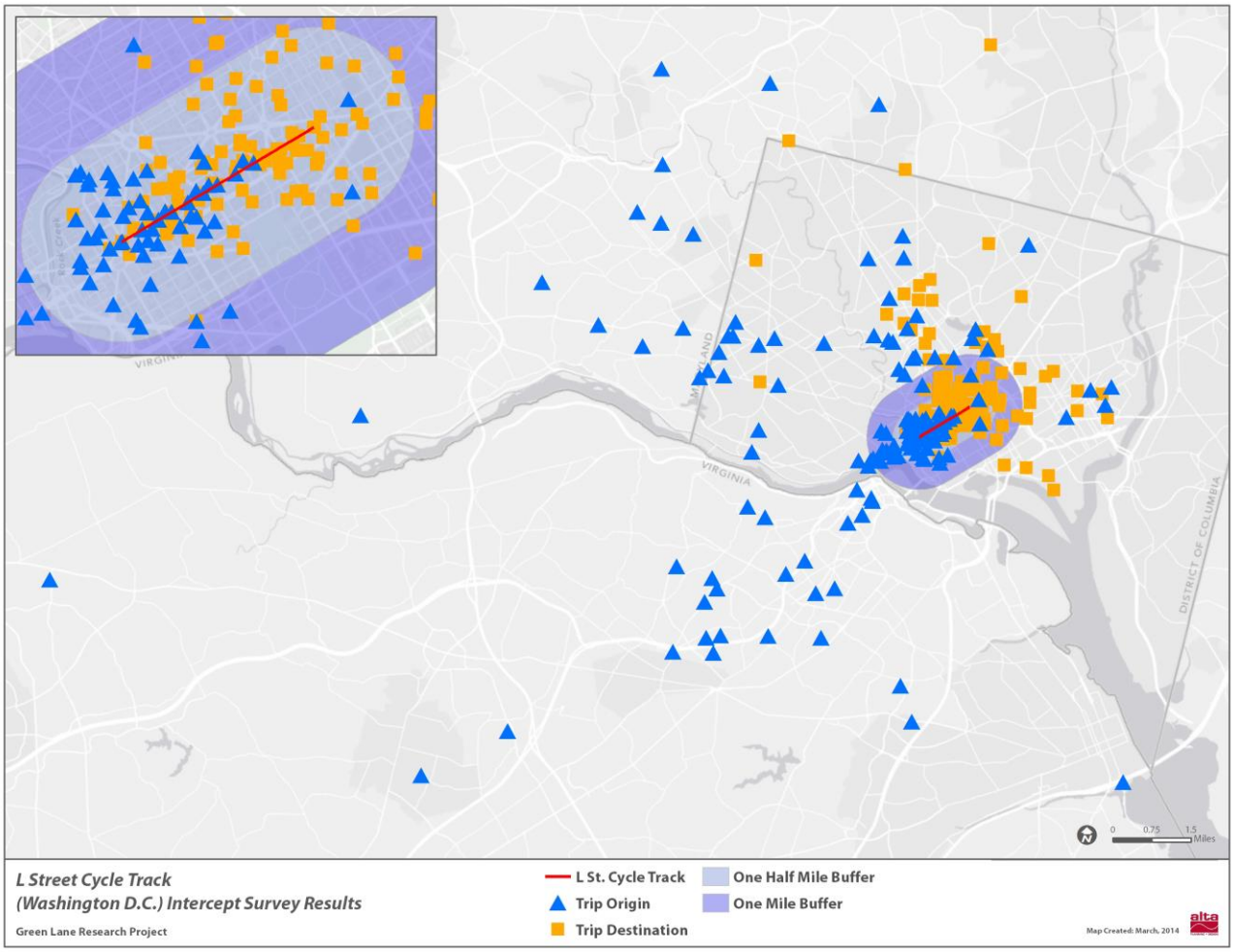

Figure 1 – L Street Cycle Track (Washington, DC)

1.2.2 Portland

Key Findings:

- Distance of Origin or Destination to Cycle Track – Half of surveyed users had a trip origin or destination greater than 0.5 miles from the cycle track; the other half of users had a trip origin or destination near the cycle track. This split, illustrated in Figure 2 on the following page, reflects the facility's location as part of a connector route providing access from neighborhoods to the central city, but also being located near employment and other destinations in the Lloyd District.

- Trip Length – Most reported trips were more than 2 miles in length, with 38% being between 2-3 miles and another 39% being between 3-5 miles.

- Distance Change – The difference between the shortest path and the assumed path was between 0 and 0.2 miles for 79% of trips, with another 20% between 0.2 and 0.4 miles. Users with longer trips did appear more likely to be in the latter category (0.2-0.4 miles) as compared to users making shorter trips.

Table 8 - Relationship between distance change (shortest path vs. assumed path) and trip distance (shortest path)

	Shortest Path Distance						
Distance Change	0-1 miles	1-2 miles	2-3 miles	3-5 miles	>5 miles	**Total**	Percent
0 - 0.2 miles	3	7	21	15	2	**48**	79%
0.2 - 0.4 miles	-	1	2	8	1	**12**	20%
0.4 - 0.6 miles	-	-	-	-	-	**-**	0%
0.6 - 0.8 miles	-	-	-	-	-	**-**	0%
> 0.8 miles	-	-	-	1	-	**1**	2%
Total	**3**	**8**	**23**	**24**	**3**	**61**	**100%**
Percent	5%	13%	38%	39%	5%	**100%**	

Table 9 - Relationship between distance change (shortest path vs. assumed path) and distance of origin or destination to cycle track

	O-D distance from Cycle Track						
Distance Change	0.00-0.25 miles	0.25-0.50 miles	0.50-1.00 miles	1.00-1.50 miles	> 1.50 miles	**Total**	Percent
0 - 0.2 miles	7	21	11	5	4	**48**	79%
0.2 - 0.4 miles	1	2	1	5	3	**12**	20%
0.4 - 0.6 miles	-	-	-	-	-	**-**	0%
0.6 - 0.8 miles	-	-	-	-	-	**-**	0%
> 0.8 miles	-	-	-	1	-	**1**	2%
Total	**8**	**23**	**12**	**11**	**7**	**61**	**100%**
Percent	13%	38%	20%	18%	11%	**100%**	

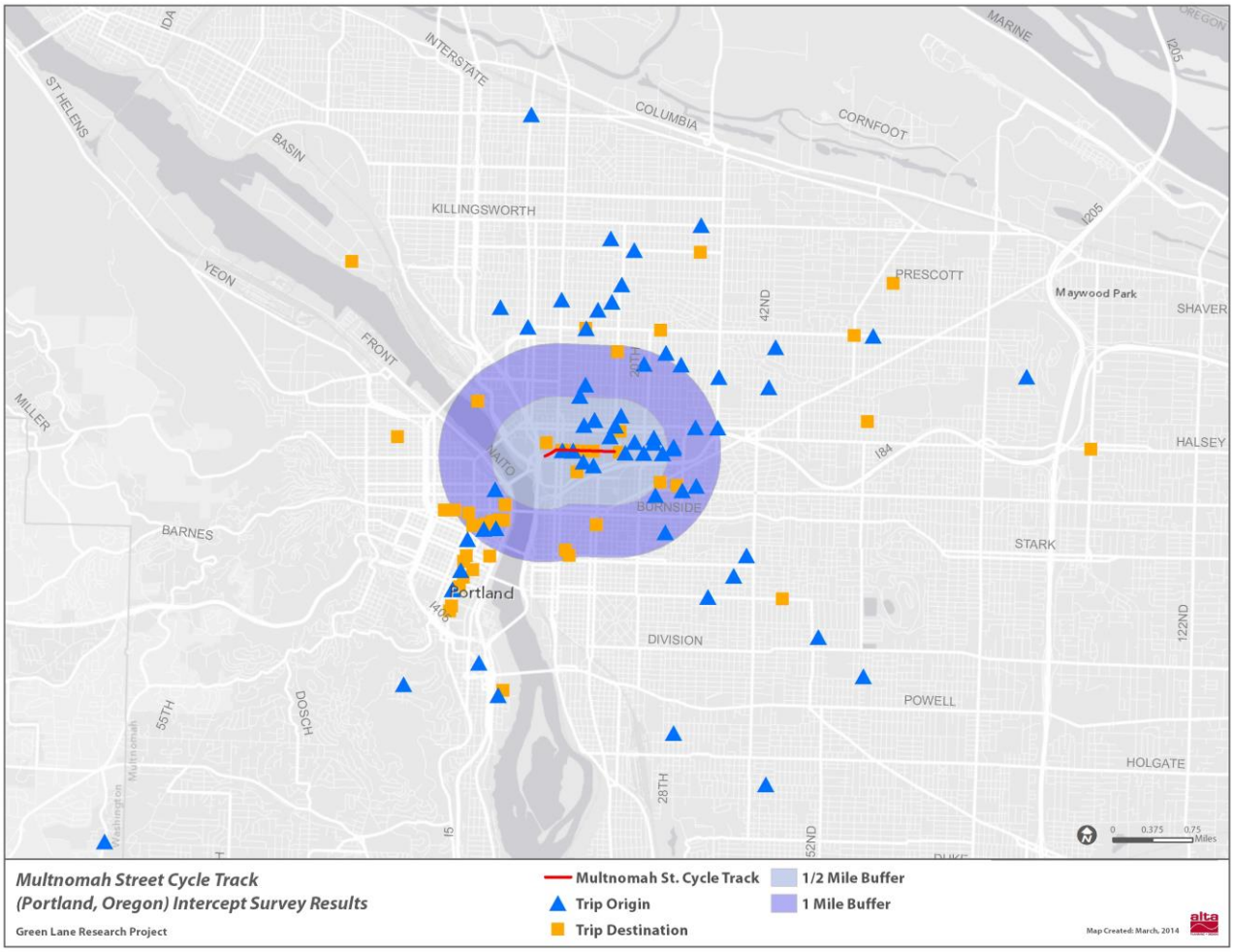

Figure 2 – Multnomah Street Cycle Track (Portland, OR)

1.2.3 Austin

Rio Grande Street

Key Findings:

- Note the relatively small sample size for this cycle track.
- Distance of Origin or Destination to Cycle Track – Approximately half of surveyed users had a trip origin or destination within 0.5 miles of the cycle track.
- Trip Length – Most reported trips were less than 2 miles in length, with 30% being less than one mile in length.
- Distance Change – The difference between the shortest path and the assumed path was between 0 and 0.2 miles for 96% of trips.

Table 10 - Relationship between distance change (shortest path vs. assumed path) and trip distance (shortest path)

	Shortest Path Distance						
Distance Change	0-1 miles	1-2 miles	2-3 miles	3-5 miles	>5 miles	**Total**	Percent
0 - 0.2 miles	7	8	2	3	2	**22**	96%
0.2 - 0.4 miles	-	-	-	1	-	**1**	4%
0.4 - 0.6 miles	-	-	-	-	-	**-**	0%
0.6 - 0.8 miles	-	-	-	-	-	**-**	0%
> 0.8 miles	-	-	-	-	-	**-**	0%
Total	**7**	**8**	**2**	**4**	**2**	**23**	**100%**
Percent	30%	35%	9%	17%	9%	**100%**	

Table 11 - Relationship between distance change (shortest path vs. assumed path) and distance of origin or destination to cycle track

	O-D distance from Cycle Track						
Distance Change	0.00-0.25 miles	0.25-0.50 miles	0.50-1.00 miles	1.00-1.50 miles	> 1.50 miles	**Total**	Percent
0 - 0.2 miles	7	4	9	1	1	**22**	96%
0.2 - 0.4 miles	-	-	1	-	-	**1**	4%
0.4 - 0.6 miles	-	-	-	-	-	**-**	0%
0.6 - 0.8 miles	-	-	-	-	-	**-**	0%
> 0.8 miles	-	-	-	-	-	**-**	0%
Total	**7**	**4**	**10**	**1**	**1**	**23**	**100%**
Percent	30%	17%	43%	4%	4%	**100%**	

Figure 3 - Rio Grande Street Cycle Track (Austin, TX)

Barton Springs

- Note the relatively small sample size for this cycle track.
- Distance of Origin or Destination to Cycle Track – Approximately half of surveyed users had an origin or destination within 0.5 miles of the cycle track.
- Trip Length –Trips reported on this facility were longer than 1 mile, with the majority being longer than 3 miles.
- Distance Change – The difference between the shortest path and the assumed path was between 0 and 0.2 miles for 90% of trips, with another 10% between 0.2 and 0.4 miles. This metric did not appear to be influenced by trip length.

Table 12 - Relationship between distance change (shortest path vs. assumed path) and trip distance (shortest path)

	Shortest Path Distance						
Distance Change	0-1 miles	1-2 miles	2-3 miles	3-5 miles	>5 miles	**Total**	Percent
0 - 0.2 miles	-	1	2	5	1	**9**	90%
0.2 - 0.4 miles	-	-	-	1	-	**1**	10%
0.4 - 0.6 miles	-	-	-	-	-	**-**	0%
0.6 - 0.8 miles	-	-	-	-	-	**-**	0%
> 0.8 miles	-	-	-	-	-	**-**	0%
Total	**-**	**1**	**2**	**6**	**1**	**10**	**100%**
Percent	0%	10%	20%	60%	10%	**100%**	

Table 13 - Relationship between distance change (shortest path vs. assumed path) and distance of origin or destination to cycle track

	O-D distance from Cycle Track						
Distance Change	0.00-0.25 miles	0.25-0.50 miles	0.50-1.00 miles	1.00-1.50 miles	> 1.50 miles	**Total**	Percent
0 - 0.2 miles	2	3	-	1	3	**9**	90%
0.2 - 0.4 miles	-	-	-	-	1	**1**	10%
0.4 - 0.6 miles	-	-	-	-	-	**-**	0%
0.6 - 0.8 miles	-	-	-	-	-	**-**	0%
> 0.8 miles	-	-	-	-	-	**-**	0%
Total	**2**	**3**	**-**	**1**	**4**	**10**	**100%**
Percent	20%	30%	0%	10%	40%	**100%**	

Figure 4 – Barton Springs Road Cycle Track (Austin, TX)

1.2.4 San Francisco

Key Findings:

- Distance of Origin or Destination to Cycle Track – Relatively few surveyed users had a trip origin or destination within 0.5 miles of the cycle track (14%). In fact, the nearest origin or destination was more than 1.5 miles from the cycle track for nearly 50% of users. This pattern likely reflects this section of Oak/Fell as a through route rather than a destination area, as illustrated by Figure 5 on the following page.

- Trip Length – Most reported trips were more than 3 miles in length, with 50% being between 3-5 miles and another 23% being more than 5 miles.

- Distance Change – The difference between the shortest path and the assumed path was between 0 and 0.2 miles for 68% of trips, with another 10% between 0.2 and 0.4 miles. Greater distances between a user's trip origin or destination and the cycle track tended to increase the out of direction travel distance.

Table 14 - Relationship between distance change (shortest path vs. assumed path) and trip distance (shortest path)

	Shortest Path Distance						
Distance Change	0-1 miles	1-2 miles	2-3 miles	3-5 miles	>5 miles	**Total**	Percent
0 - 0.2 miles	2	11	16	46	17	**92**	68%
0.2 - 0.4 miles	-	-	3	5	6	**14**	10%
0.4 - 0.6 miles	-	1	1	4	1	**7**	5%
0.6 - 0.8 miles	-	-	-	4	2	**6**	4%
> 0.8 miles	-	1	2	8	5	**16**	12%
Total	**2**	**13**	**22**	**67**	**31**	**135**	**100%**
Percent	1%	10%	16%	50%	23%	**100%**	

Table 15 - Relationship between distance change (shortest path vs. assumed path) and distance of origin or destination to cycle track

	O-D distance from Cycle Track						
Distance Change	0.00-0.25 miles	0.25-0.50 miles	0.50-1.00 miles	1.00-1.50 miles	> 1.50 miles	**Total**	Percent
0 - 0.2 miles	13	5	24	12	38	**92**	68%
0.2 - 0.4 miles	-	-	4	2	8	**14**	10%
0.4 - 0.6 miles	-	-	1	2	4	**7**	5%
0.6 - 0.8 miles	-	-	-	-	6	**6**	4%
> 0.8 miles	-	-	-	3	13	**16**	12%
Total	**13**	**5**	**29**	**19**	**69**	**135**	**100%**
Percent	10%	4%	21%	14%	51%	**100%**	

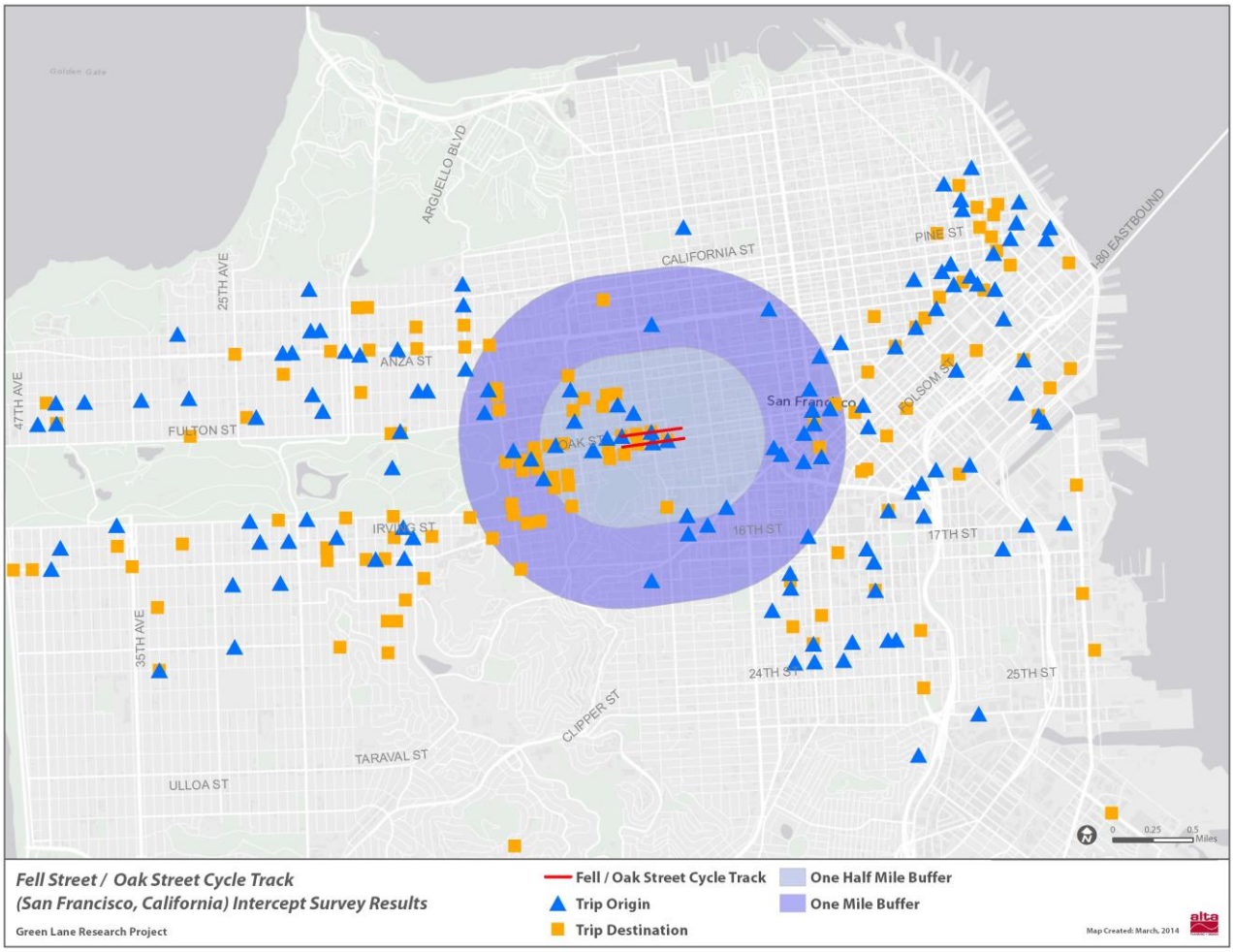

Figure 5 – Fell and Oak Street Cycle Track (San Francisco, CA)

1.2.5 Chicago

Milwaukee Avenue

Key Findings:

- Distance of Origin or Destination to Cycle Track – Relatively few surveyed users had a trip origin or destination within 0.5 miles of the cycle track (5%). The nearest origin or destination was more than 1.5 miles from the cycle track for nearly 45% of users. This pattern likely reflects Milwaukee Avenue as a key commuter route rather than a destination area.

- Trip Length – Most reported trips were more than 3 miles in length, with 54% being between 3-5 miles and another 23% being more than 5 miles. The longer trip length reported on this facility again likely reflects this facility being part of a commuter route.

- Distance Change – The difference between the shortest path and the assumed path was between 0 and 0.2 miles for 94% of trips. Figure 6 on the following page indicates that this route is being used primarily to connect downtown and areas to the northwest.

Table 16 - Relationship between distance change (shortest path vs. assumed path) and trip distance (shortest path)

	Shortest Path Distance						
Distance Change	0-1 miles	1-2 miles	2-3 miles	3-5 miles	>5 miles	**Total**	Percent
0 - 0.2 miles	-	2	23	61	27	113	94%
0.2 - 0.4 miles	2	1	-	4	-	7	6%
0.4 - 0.6 miles	-	-	-	-	-	-	0%
0.6 - 0.8 miles	-	-	-	-	-	-	0%
> 0.8 miles	-	-	-	-	-	-	0%
Total	2	3	23	65	27	120	100%
Percent	2%	3%	19%	54%	23%	100%	

Table 17 - Relationship between distance change (shortest path vs. assumed path) and distance of origin or destination to cycle track

	O-D distance from Cycle Track						
Distance Change	0.00-0.25 miles	0.25-0.50 miles	0.50-1.00 miles	1.00-1.50 miles	> 1.50 miles	**Total**	Percent
0 - 0.2 miles	2	1	13	46	51	113	94%
0.2 - 0.4 miles	3	-	1	1	2	7	6%
0.4 - 0.6 miles	-	-	-	-	-	-	0%
0.6 - 0.8 miles	-	-	-	-	-	-	0%
> 0.8 miles	-	-	-	-	-	-	0%
Total	5	1	14	47	53	120	100%

Percent	4%	1%	12%	39%	44%	100%	

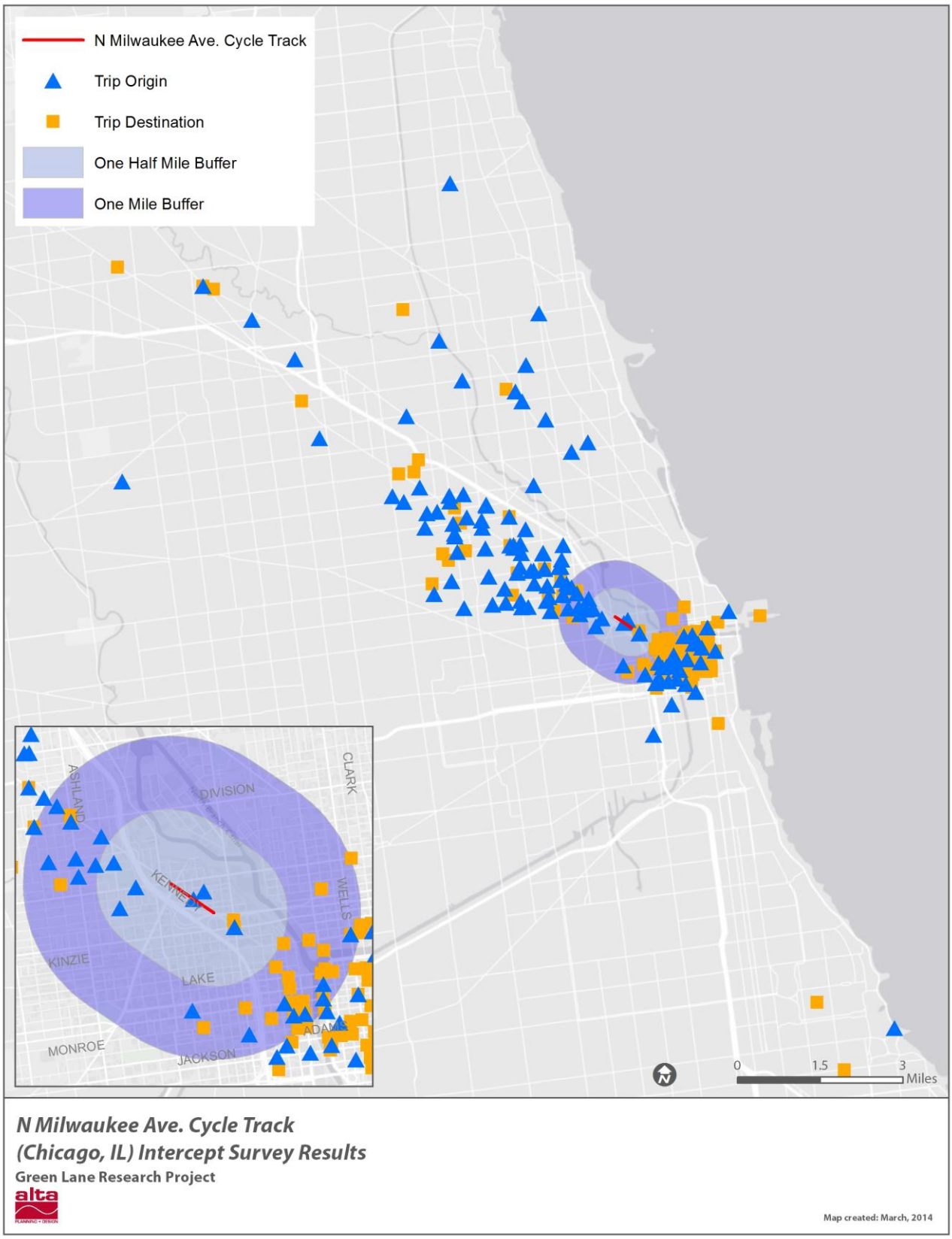

Figure 6 - N Milwaukee Avenue Cycle Track (Chicago, IL)

Dearborn Street

Key Findings:

- Distance of Origin or Destination to Cycle Track – Most surveyed users had a trip origin or destination within 1 mile of the cycle track (91%); more than half of users had one less than 0.5 miles from the cycle track. This pattern likely reflects the location of this cycle track in the downtown core of Chicago.
- Trip Length – More than half of reported trips (56%) were more than 3 miles in length, though 28% of trips were less than 2 miles. This facility appears to serve shorter trips and longer commute trips.
- Distance Change – The difference between the shortest path and the assumed path was between 0 and 0.2 miles for 74% of trips. Longer trip lengths and greater distances between a user's trip origin or destination and the cycle track tended to increase this metric.

Table 18 - Relationship between distance change (shortest path vs. assumed path) and trip distance (shortest path)

	Shortest Path Distance						
Distance Change	0-1 miles	1-2 miles	2-3 miles	3-5 miles	>5 miles	**Total**	Percent
0 - 0.2 miles	4	10	5	12	11	42	74%
0.2 - 0.4 miles	-	-	4	3	3	10	18%
0.4 - 0.6 miles	-	2	-	1	-	3	5%
0.6 - 0.8 miles	-	-	-	1	1	2	4%
> 0.8 miles	-	-	-	-	-	-	0%
Total	4	12	9	17	15	57	100%
Percent	7%	21%	16%	30%	26%	100%	

Table 19 - Relationship between distance change (shortest path vs. assumed path) and distance of origin or destination to cycle track

	O-D distance from Cycle Track						
Distance Change	0.00-0.25 miles	0.25-0.50 miles	0.50-1.00 miles	1.00-1.50 miles	> 1.50 miles	**Total**	Percent
0 - 0.2 miles	14	12	14	2	-	42	74%
0.2 - 0.4 miles	3	1	5	1	-	10	18%
0.4 - 0.6 miles	-	1	1	-	1	3	5%
0.6 - 0.8 miles	-	-	1	1	-	2	4%
> 0.8 miles	-	-	-	-	-	-	0%
Total	17	14	21	4	1	57	100%
Percent	30%	25%	37%	7%	2%	100%	

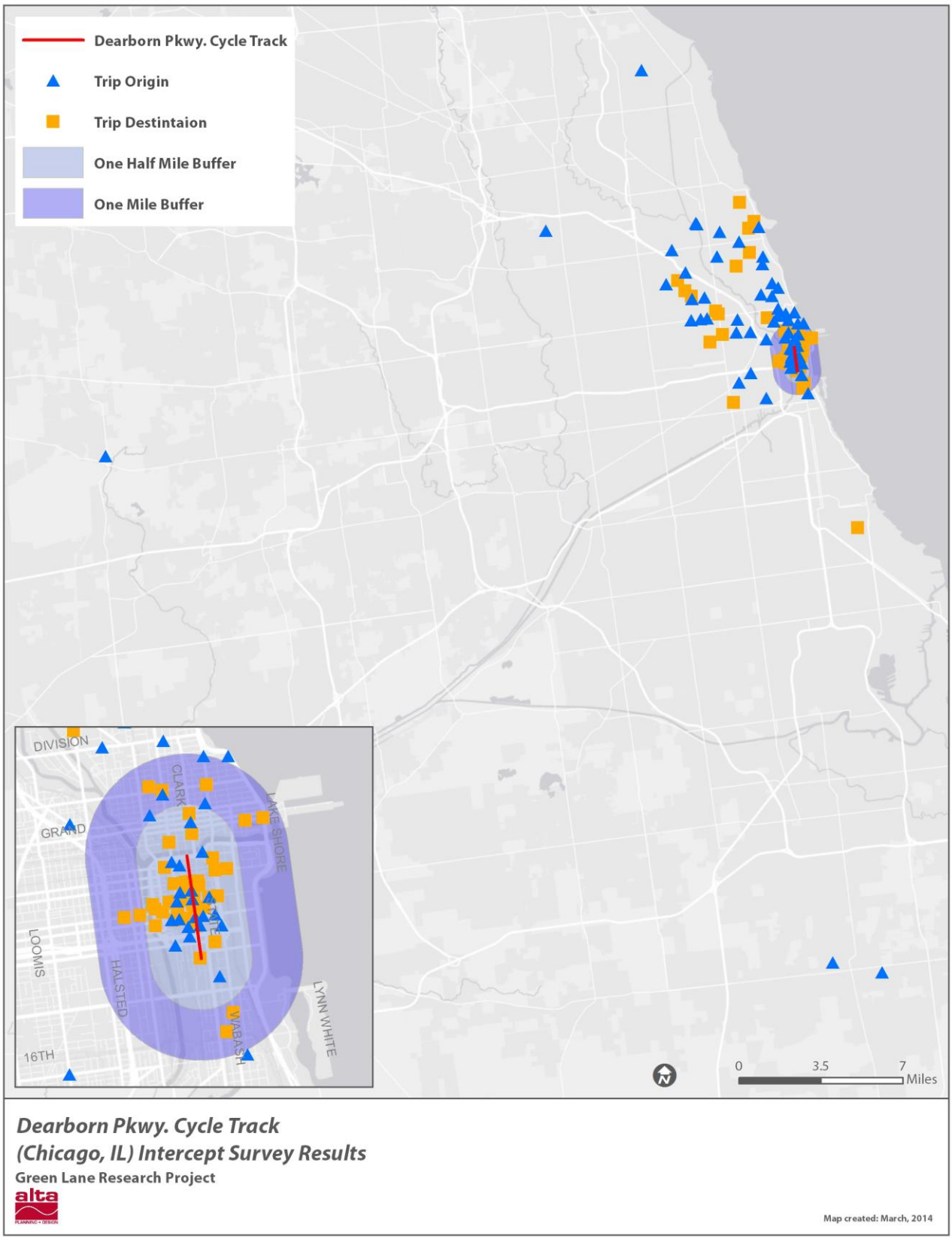

Figure 7 - Dearborn Street Cycle Track (Chicago, IL)

2 Capital Bikeshare and the L Street Cycle Track

2.1 Methodology

The purpose of this analysis is to attempt to detect any increases in Capital Bikeshare ridership at stations near the L Street cycle track. The cycle track was installed in October of 2012. This analysis compared data on the total number of trips by station for September 2011, September 2012 and September 2013.

Measuring the impact of the completion of the L Street cycle track on usage at surrounding stations is not straightforward, as stations may see increased use for a number of reasons. For example, station use can increase as a result of increasing the number of nearby stations or of the total number of stations in the system. Indeed, a key challenge in detecting the effect of the L Street cycle track is that the Capital Bikeshare system has grown each year since its launch in September 2010.

As illustrated in Table 20, there were 115 stations in September of 2011[1], 188 stations in September 2012, and 261 stations in September 2013. The average number of trips per station per month has remained relatively constant at approximately 2,200 trips per station in September. However, this does not indicate that newer stations have experienced the same usage levels as stations from prior years. Instead, the system has grown to include greater coverage, with newer stations generating trips in new areas but also at stations in the core of the system.

Table 20 - Capital Bikeshare Summary

	Stations	Trips	Trips/Station
September 2011	**115**	**254,562**	**2,214**
September 2012	**188**	**416,744**	**2,217**
September 2013	**261**	**570,657**	**2,186**

Figure 8 shows the distribution of stations in the Capital Bikeshare service area as of September 2013, and indicates which stations were present in each of the three years examined in this study. To evaluate changes in trips at stations in the vicinity of the L Street cycle track, buffers of ¼ mile, ½ mile, ¾ mile and 1 mile were placed around the cycle track. Stations were then flagged as being within each of these buffers.

[1] Note that one station present in 2011 and 2012 was removed from the system in 2013. This low use station (‹30 trips in September) was removed from this analysis.

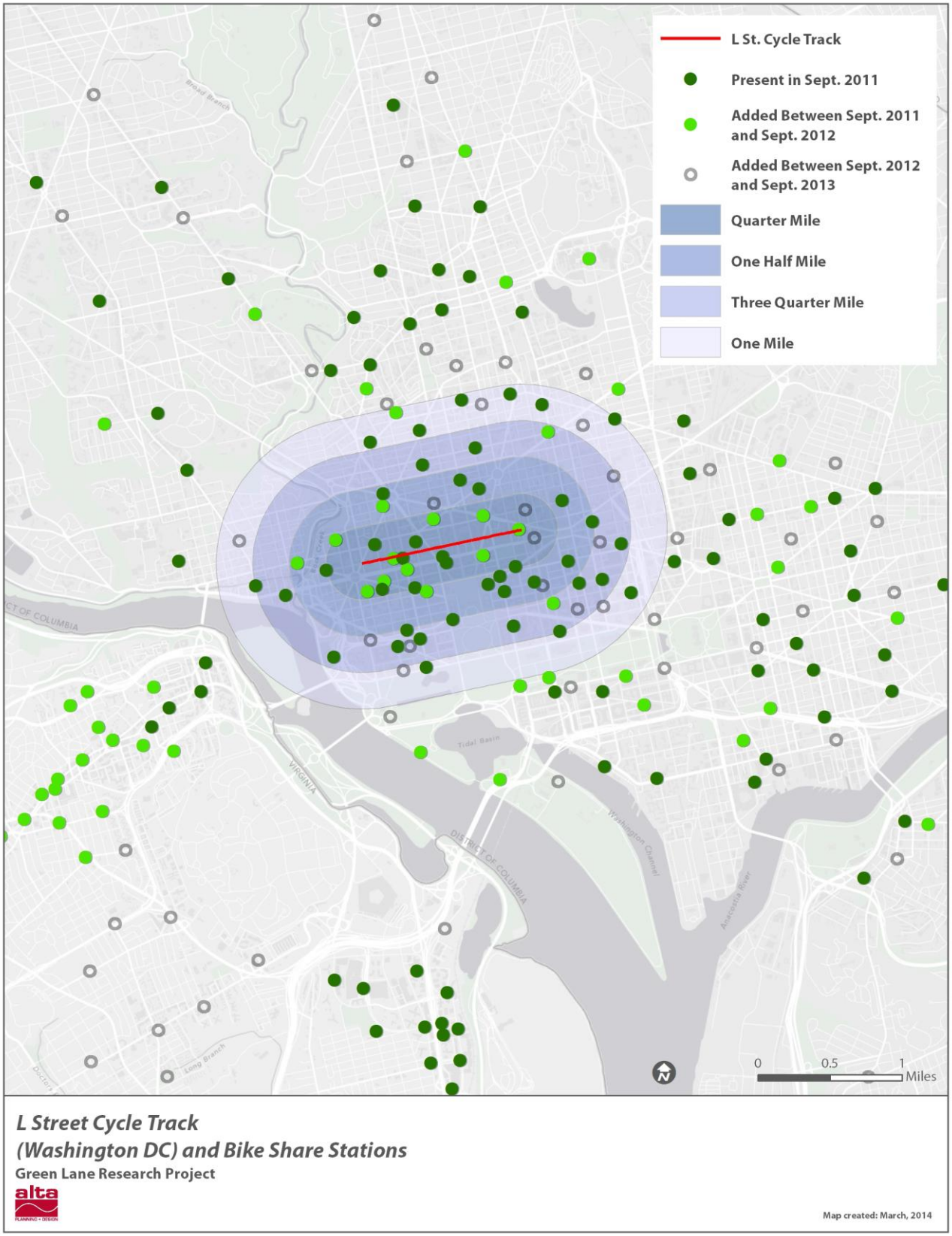

Figure 8 – Capital Bikeshare Station Existing Locations

2.2 Results

System-wide Changes in Stations and Trips

As illustrated in Table 21 below, the percentage increase in trips each year closely mirrored the percentage increase in the total number of stations in the system. From 2011 to 2012, there was a 63% increase in the number of stations and 64% increase in trips recorded in September. From 2012-2013, there was a 39% increase in the number of stations and a 37% increase in trips recorded in September.

Note that from 2011 to 2012, the percent increase in the number of trips at stations within ¼ of the future cycle track also closely matched the percent increase in the number of stations. From 2012 to 2013, the percentage trip increase within ¼ of the cycle track outpaced the increase in the number of stations in this area (34% vs. 11%).

Table 21 - Summary of increased stations and trips

	September 2011-2012			September 2012-2013	
	Percent Increase in Stations	**Percent Increase in Trips**		**Percent Increase in Stations**	**Percent Increase in Trips**
Total System	**63%**	**64%**		**39%**	**37%**
Within 1/4 mile	100%	91%		11%	34%
1/4 to 1/2 mile	30%	43%		15%	28%
1/2 to 3/4 mile	14%	38%		25%	27%
3/4 to 1 mile	13%	38%		56%	43%
More than 1 mile	78%	81%		45%	42%

2.3 Results

System-wide Stations and Trips

Table 22 below illustrates the number of stations, trips and average trips per station in September in each of the three study years, segmented by the distance of stations from the cycle track. The number of stations within ¼ mile of the cycle track grew from 9 in 2011 to 20 in 2013. The number of stations within ½ mile grew from 19 in 2013 to 35 in 2013. In 2013, 69 of the 261 bike share stations were within one mile of the L Street cycle track.

Table 22 - Summary of stations and trips in September for 2011, 2012 and 2013

	2011			2012			2013		
Distance from Cycle Track	**Stations (Sep 2011)**	**Trips (Sep 2011)**	**Trips/Station (Sep 2011)**	**Stations (Sep 2012)**	**Trips (Sep 2012)**	**Trips/Station (Sep 2012)**	**Stations (Sep 2013)**	**Trips (Sep 2013)**	**Trips/Station (Sep 2013)**
Within 1/4 mile	9	30,318	3,369	18	57,867	3,215	20	77,341	3,867
1/4 to 1/2 mile	10	46,417	4,642	13	66,180	5,091	15	84,893	5,660
1/2 to 3/4 mile	14	38,408	2,743	16	52,961	3,310	20	67,323	3,366
3/4 to 1 mile	8	28,337	3,542	9	39,132	4,348	14	55,802	3,986
More than 1 mile	74	111,082	1,501	132	200,604	1,520	192	285,298	1,486
Total System	**115**	**254,562**	**2,214**	**188**	**416,744**	**2,217**	**261**	**570,657**	**2,186**

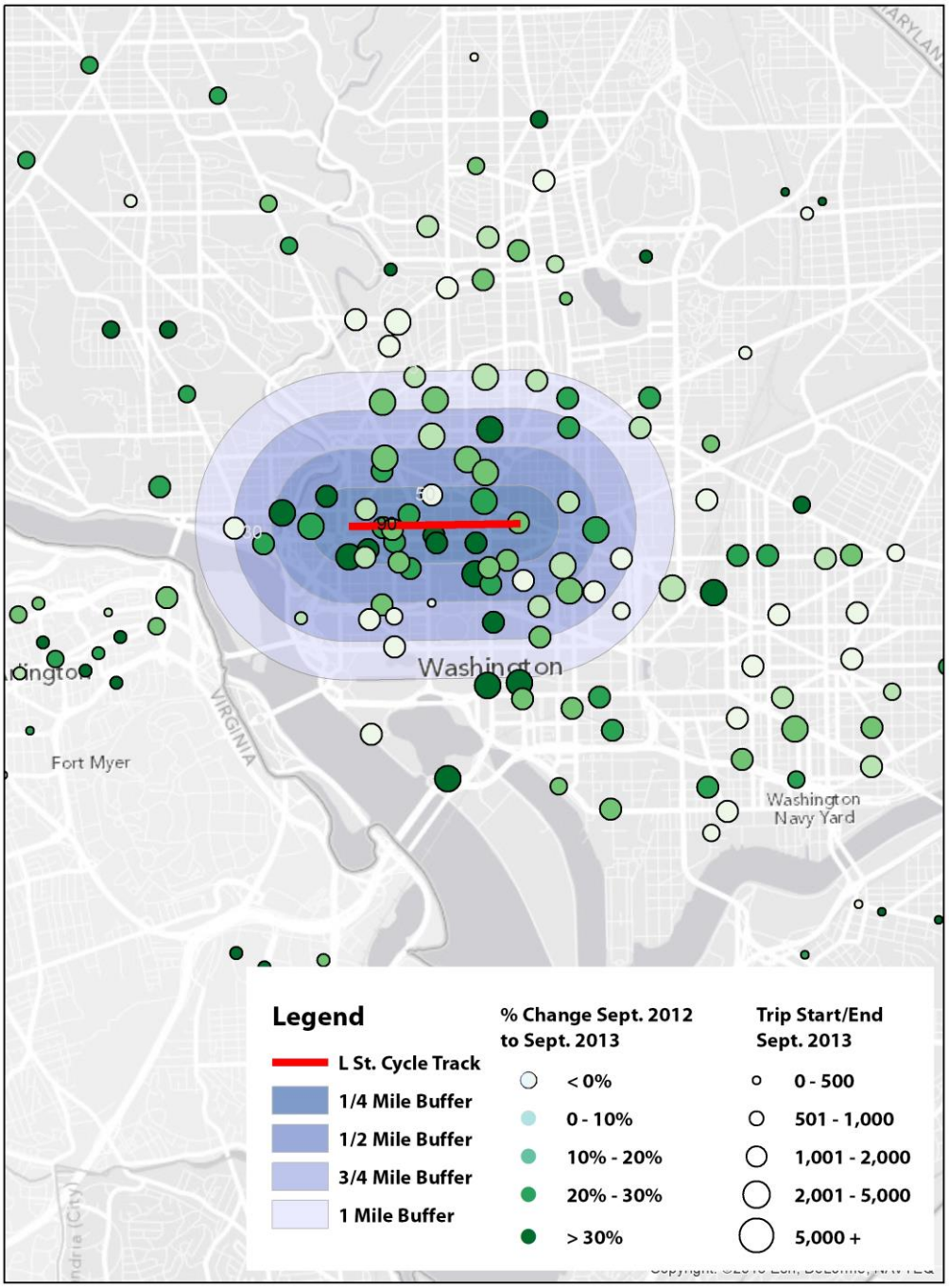

Figure 9). It might have been expected that larger stations would not have grown as much in percentage terms, but these larger stations did experience greater percentage growth from September 2012-2013 than the average station already present in the previous year. However, it should again be noted that this growth cannot be directly attributed to the implementation of the L Street cycle track.

Figure 10 focuses on stations within one mile of the L Street cycle track to measure percent change in activity by station (between September 2012 and September 2013) relative to the average (mean of 13% increase in trips) for

all stations within this area. This figure illustrates that stations closest to the cycle track experienced a greater percentage increase in activity relative to the more distant stations within this area between these two two study years.

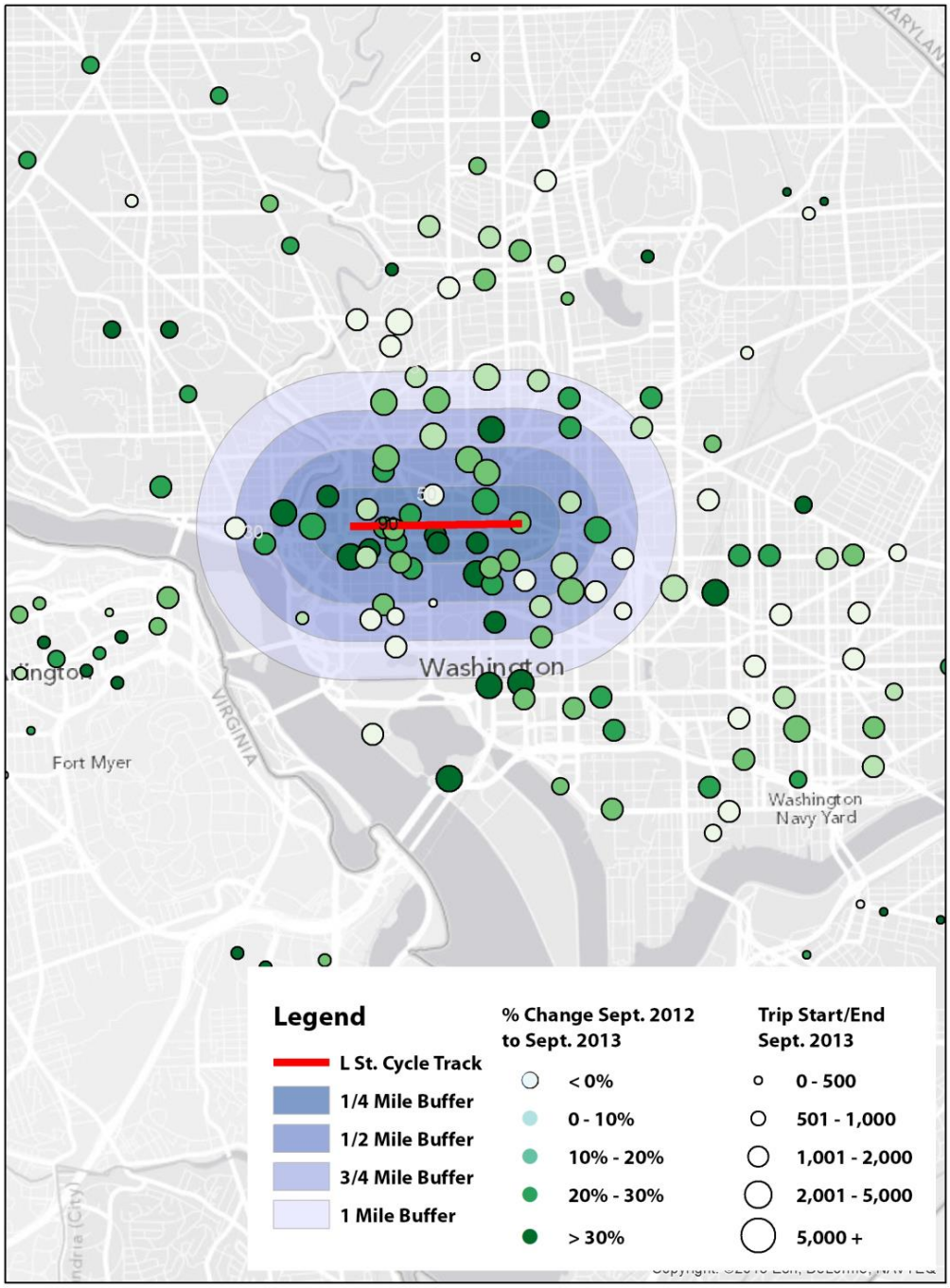

Figure 9 – Change in Trips Starts and Ends By Station, Sept 2012 vs. Sept 2013

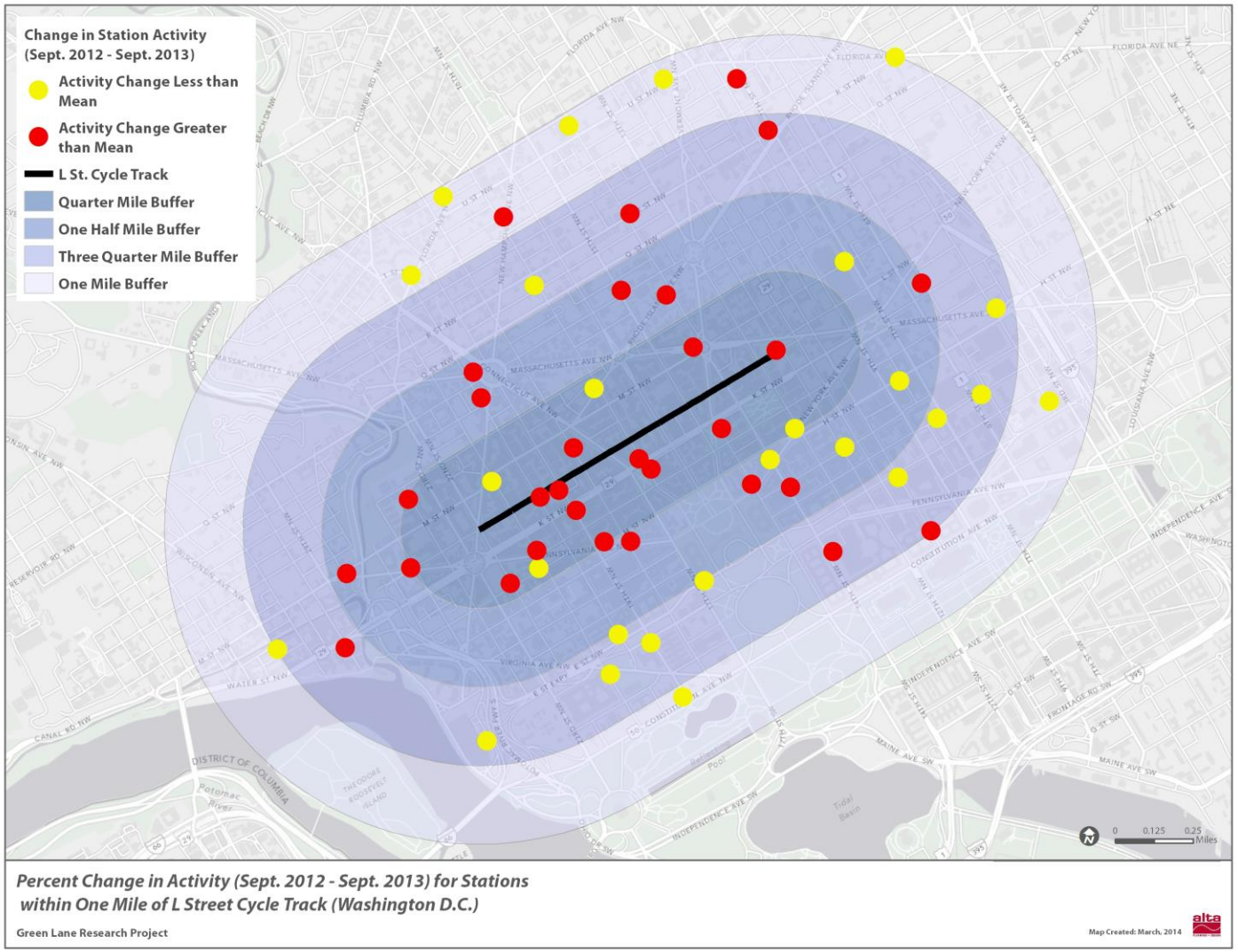

Figure 10 – Percent change in Trips Starts and Ends for stations within 1 mile of L Street Cycle Track, Sept 2012 vs. Sept 2013

3 Appendix

Table 24 - Trip summary for the 115 stations present in 2011

		2011			2012			2013		2011-2012	2012-2013
Distance from Cycle Track	**Stations**	**Trips (Sep 2011)**	**Trips/Station (Sep 2011)**		**Trips (Sep 2012)**	**Trips/Station (Sept 2012)**		**Trips (Sep 2013)**	**Trips/Station (Sep 2013)**	**Percent Increase in Trips**	**Percent Increase in Trips**
Within 1/4 mile	9	30,318	3,369		29,249	3,250		34,406	3,823	-4%	18%
1/4 to 1/2 mile	10	46,417	4,642		55,417	5,542		64,407	6,441	19%	16%
1/2 to 3/4 mile	14	38,408	2,743		46,931	3,352		50,478	3,606	22%	8%
3/4 to 1 mile	8	28,337	3,542		35,153	4,394		36,383	4,548	24%	3%
More than 1 mile	74	111,082	1,501		133,647	1,806		148,871	2,012	20%	11%
Total System	**115**	**254,562**	**2,214**		**300,397**	**2,612**		**334,545**	**2,909**	**18%**	**11%**

Table 25 - Trip summary for the 188 stations present in 2012

		2011			2012			2013		2011-2012	2012-2013
Distance from Cycle Track	**Stations**	**Trips (Sep 2011)**	**Trips/Station (Sep 2011)**		**Trips (Sep 2012)**	**Trips/Station (Sept 2012)**		**Trips (Sep 2013)**	**Trips/Station (Sep 2013)**	**Percent Increase in Trips**	**Percent Increase in Trips**
Within 1/4 mile	18	N/A	N/A		57,867	3,215		69,686	3,871	N/A	20%
1/4 to 1/2 mile	13	N/A	N/A		66,180	5,091		78,137	6,011	N/A	18%
1/2 to 3/4 mile	16	N/A	N/A		52,961	3,310		57,416	3,589	N/A	8%
3/4 to 1 mile	9	N/A	N/A		39,132	4,348		40,504	4,500	N/A	4%
More than 1 mile	132	N/A	N/A		200,604	1,520		233,801	1,771	N/A	17%
Total System	**188**	N/A	N/A		**416,744**	**2,217**		**479,544**	**2,551**	N/A	**15%**