Nonmotorized Transportation Pilot Program

Summary of 2007, 2008, 2009, 2010 and 2011 Bicycle and Pedestrian Counts and Surveys

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1 Executive Summary

This report presents bicycling and walking data gathered through counts and surveys in the City of Columbia as part of the Non-motorized Transportation Pilot Program (NTPP) for the past five years. Pedestrian and cyclist counts took place at seven strategic locations during the second week of September (except for 2011 when counts and surveys were administered during the third week of September), measuring weekday activity during the afternoon peak period and weekend activity during the mid-day peak period. These counts have served as a benchmark for the NTPP project in Columbia, with counts taking place annually to track results from infrastructure and program improvements.

The NTPP is a federally funded project that allocated $25 million each to four communities in the U.S. to determine whether increased investments in programs and projects would result in more people walking and bicycling. Counts and surveys were a key element of this project and were conducted using the National Bicycle and Pedestrian Documentation Project (NBPD) methodology[1]. The NBPD aims to establish a consistent national bicycle and pedestrian count and survey methodology and to generate a national database of count information. This information will assist analyses and describe correlations between bicycle and pedestrian activity and a range of factors from land use to demographics to facility-type.

Usage Characteristics

Highlights from the 2011 counts include:

- **2011 Peak Hour Weekday Pedestrian Activity** – increased by approximately 56% over 2010 count volumes and 74% over 2007.
- **2011 peak hour Weekend Pedestrian activity** – was nearly identical to 2010 levels and 10% higher than 2007.
- **2011 peak hour Weekday Bicycle activity** – increased by approximately 46% over 2010 count volumes and 147% over 2007.
- **2011 peak hour Weekend Bicycle activity** – decreased by approximately 9% as compared to 2010, but was 20% greater than 2007.

MKT Nature and Fitness Trail

[1] *http://bikepeddocumentation.org/*

In 2011, locations in Columbia with the highest volumes of combined bicycle and pedestrian activity were:

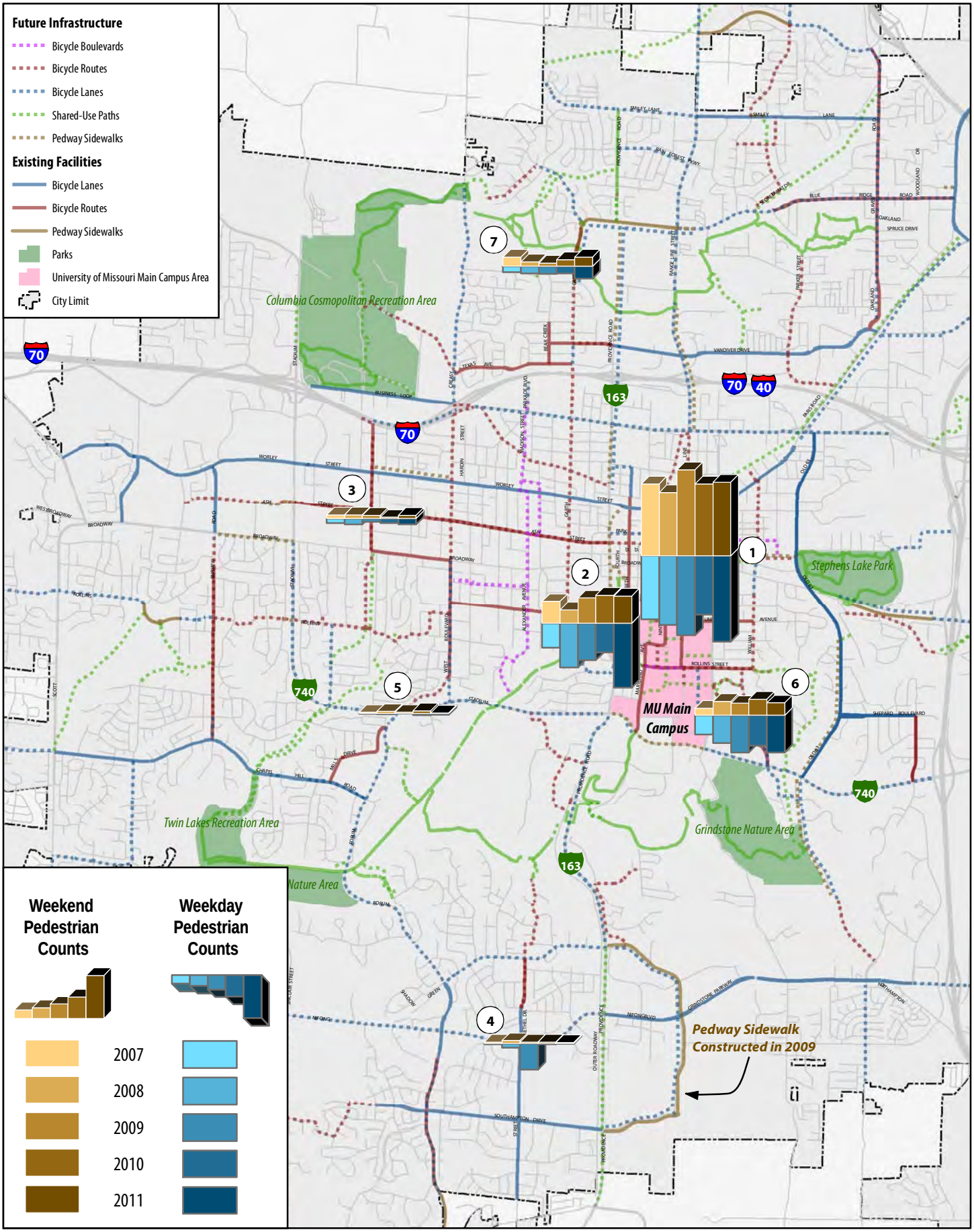
- Broadway between 8th & 9th
(680 pedestrians/bicyclists over a 2-hour period on a weekday and a 2-hour period on a weekend day)
- MKT Trail and Stewart Rd.
(545 pedestrians/bicyclists over a 2-hour period on a weekday and a 2-hour period on a weekend day)
- Ashland Rd. & Burch Rd.
(249 pedestrians/bicyclists over a 2-hour period on a weekday and a 2-hour period on a weekend day)

A series of maps on pages 3 and 4 present the results of this count program over time. Weekend peak hour volumes are presented above the x-axis while weekday volumes are presented below the axis. This technique of displaying the results clearly illustrates which locations experience more activity on weekends and which locations experience more activity on weekdays. The maps also illustrate the relative distribution of pedestrian and bicycle activity throughout Columbia. For example, walking is more prevalent in the vicinity of the University of Missouri campus, including at Broadway between 8th & 9th and the intersection of the MKT Trail and Stewart Rd. The intersection of the MKT Trail and Stewart Rd also has the highest bicycling activity.

User Characteristics

Baseline surveys conducted in 2007 compared to 2011 surveys revealed walking and bicycling for transportation-purposes increased 15% and 24% respectively. The survey results showed that about 41% of pedestrian trips and 33% of bicycle trips were transportation-related (school, work, utilitarian trips) in 2007, increasing to 47% and 41% in 2011. This indicates a continued proportional increase in walking and bicycling trips for transportation purposes.

Because of variables such as weather, the count and survey results can vary significantly from year to year. While these results indicate general trends in non-motorized transportation activity levels, it is valuable to measure shifts in transportation modes from multiple sources. Data collection should continue over time to increase the amount of available data for measuring changes in non-motorized transportation behavior.



Pedestrian Peak Hour Count Volumes

GetAbout Columbia
Columbia, MO

Source: Data obtained from the City of Columbia and Google Earth
Author: Tony Salomone
Date: 12/9/2011

0 0.5 1 Miles

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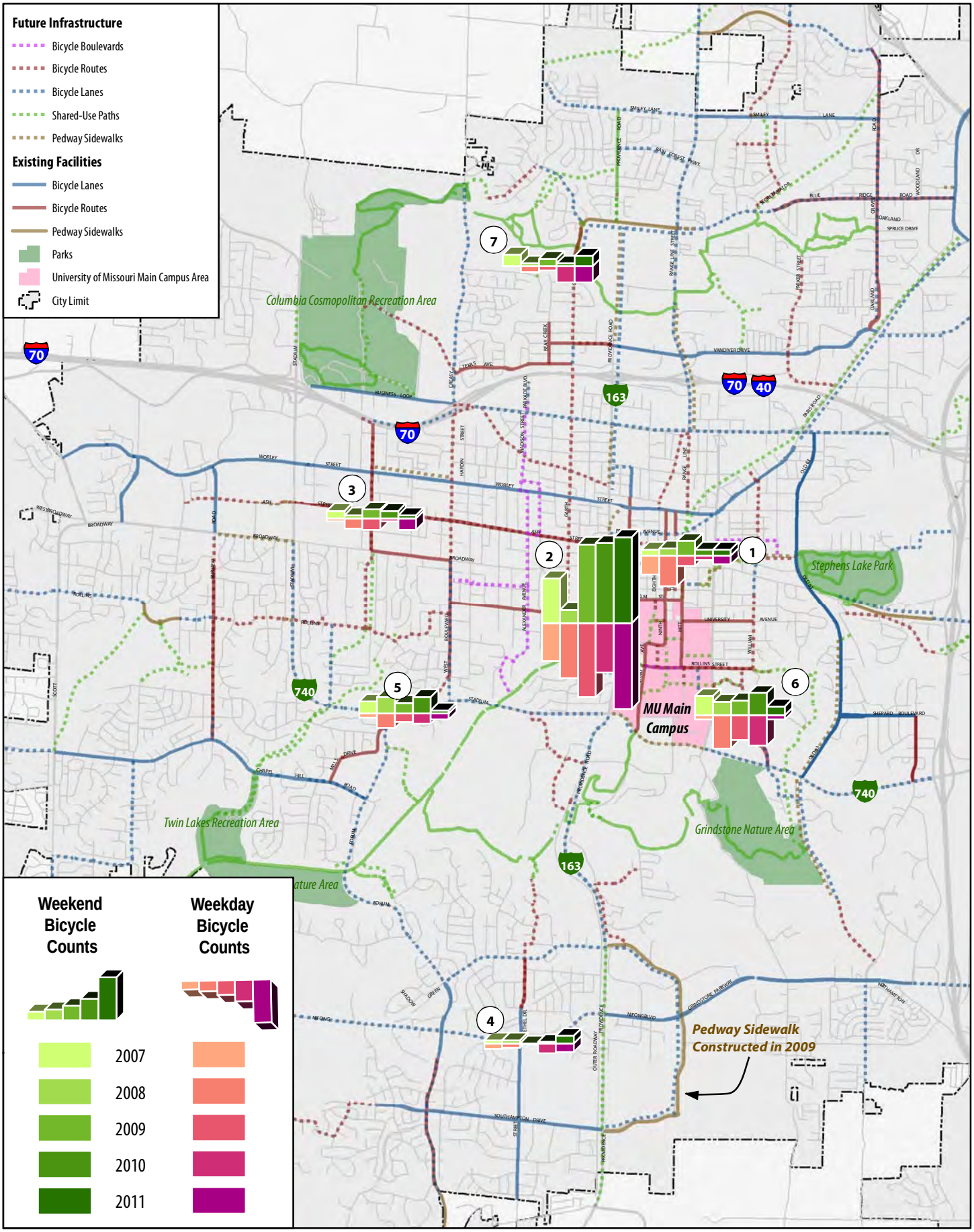

Bicycle Peak Hour Count Volumes

GetAbout Columbia
Columbia, MO

Source: Data obtained from the City of Columbia and Google Earth
Author: Tony Salomone
Date: 12/9/2011

0 0.5 1 Miles

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2 Summary of NTPP Count/Survey Objectives

The City of Columbia conducts regular counts and surveys of pedestrians and bicyclists to measure the effectiveness of investments in pedestrian and bicycle infrastructure and programs in increasing walking and bicycling. The count and survey effort began in 2007 and was repeated each year through 2010 as part of Columbia's participation as one of four communities in the Non-Motorized Transportation Pilot Program (NTPP). Since NTPP ended in 2010, the count efforts have continued with the objective of identifying shifts in bicycling and walking behavior that occur during and after on-going infrastructure and program improvements. This report summarizes the 2011 count and survey data results.

Columbia's count data is also included in the National Bicycle & Pedestrian Documentation Project (NBPD). The NBPD is a joint national effort of the Institute of Transportation Engineers' (ITE) Pedestrian & Bicycle Council, and Alta Planning + Design. The NBPD provides consistent count and survey methodology and count dates, collects independently conducted count and survey data from across the nation, and analyzes the data to identify walking and bicycling trends and patterns.

The count and survey data provide a detailed understanding of travel patterns. Information about bicycling and walking, trip purpose, trip length, travel frequency, mode choice and seasonal behavior can help identify correlations and causations of travel behavior, leading to more informed modeling and allows transportation planners to make strategic investments. Additionally, surveyed opinions regarding route choice, desires for infrastructure improvements and demographic data can help to develop facilities and programs that properly respond to community needs and conditions.

3 Summary of Methodology

The NTPP count and survey methodology is based on the NBPD methodology, which was created with input from ITE, transportation professionals and best practices nationwide. The core of the NBPD methodology is:

- Consistent count days and times
- Consistent count and survey methods and materials
- Centralized data storage and analysis
- Open access for all research professionals and public agencies

NTPP methodology and materials were further customized for the unique needs of Columbia.

3.1 Number of Count Locations

The Volpe National Transportation Systems Center, which is part of the U.S. Department of Transportation's Research and Innovative Technology Administration, was tasked by the four NTPP communities and the Federal Highway Administration (FHWA) to advise on the evaluation of the program, assist with data collection, and coordinate evaluation methods across the communities. Working with the Volpe Center, Alta Planning + Design was enlisted to customize the NBPD methodology for the four NTPP communities. One of the first steps was to provide guidance on the number of count locations. Alta estimated that, at a minimum, one count should be conducted per 15,000 people in the population. This was considered a reasonable balance between obtaining representative counts throughout a community and budget limitations. For the City of Columbia, this equated to seven count locations.

3.2 Count Location Criteria

Criteria for count and survey locations followed the rigorous standards developed through the NTPP data collection and analysis program. The number and locations of counts and surveys conducted as part of the pilot program from 2007 through 2010 will continue to be used annually, post-implementation of pilot infrastructure projects and programs.

The criteria for selecting the NTPP project-related count locations included:

- Pedestrian and bicycle activity areas or corridors (downtowns, near schools, parks, etc.)
- Locations near proposed major bicycle/pedestrian improvements
- Representative locations in the urbanized area
- Key corridors that can be used to gauge the impacts of future improvements
- Locations where counts have been conducted historically
- Locations where bicycle and pedestrian collision numbers are high

- Locations where other agencies are conducting ongoing counts through a variety of means, including videotaping gaps and pinch points for bicycling and walking

In Columbia, seven intercept survey locations were identified to measure the impact of selected proposed NTPP projects. Survey locations were chosen based on where the projects will ultimately be constructed and where potential users are likely to be traveling now. The same survey locations were used for the duration of the project. Table 1 lists these locations.

Table 1: NTPP Count and Survey Locations

#	Count Locations	Surveys
1	Broadway between 8th & 9th, south side	✓
2	MKT Trail and Stewart Rd.	✓
3	Clinkscales Rd.	✓
4	Nifong Blvd.	
5	S. Stadium Blvd & Forum Blvd.	✓
6	Ashland Rd. & Burch Dr.	✓
7	Bear Creek Trail	✓

3.3 Count Dates and Times

Following NBPD methodology, weekday counts occurred from 4-6 pm and weekend counts from 12-2 pm. Counts were performed on the following days:

Year	Weekday	Weekend
2007	November 7 (Wednesday)	November 11 (Sunday)
2008	September 16 (Tuesday)	September 13 (Saturday)
2009	September 15 (Tuesday)	September 13 (Sunday)
2010	September 13 (Week of)	September 12 (Sunday)
2011	September 20 (Tuesday)	September 25 (Sunday)

3.4 Count Methodology/Materials

Counts were manually tallied with standardized forms (see **Appendix A: Figure A-1**). Counters were trained and given maps showing exact screen lines for counts. Screen lines are imaginary lines drawn across the right-of-way whereby any non-motorized traffic that crosses that line is noted. Counters recorded volumes of bicyclists and pedestrians, along with information on gender and the participation of children. Additionally, counts also included wrong-way riding and helmet use for bicyclists.

4 Summary of Count Data

Tables referenced in this section can be found in Appendix A.

4.1 Pedestrian Count Data

Tables A-1 and A-2 show weekday and weekend pedestrian counts over time compared with September 2011 count data. It is useful to note that previous studies have shown that activity levels of bicyclists and pedestrians may vary as much as 30% or more on a daily basis at the same location (even on sequential days). As indicated in Figure 1 below, the total number of weekday and weekend pedestrians counted during peak hours at the seven count locations between 2007 and 2011 have generally been increasing.

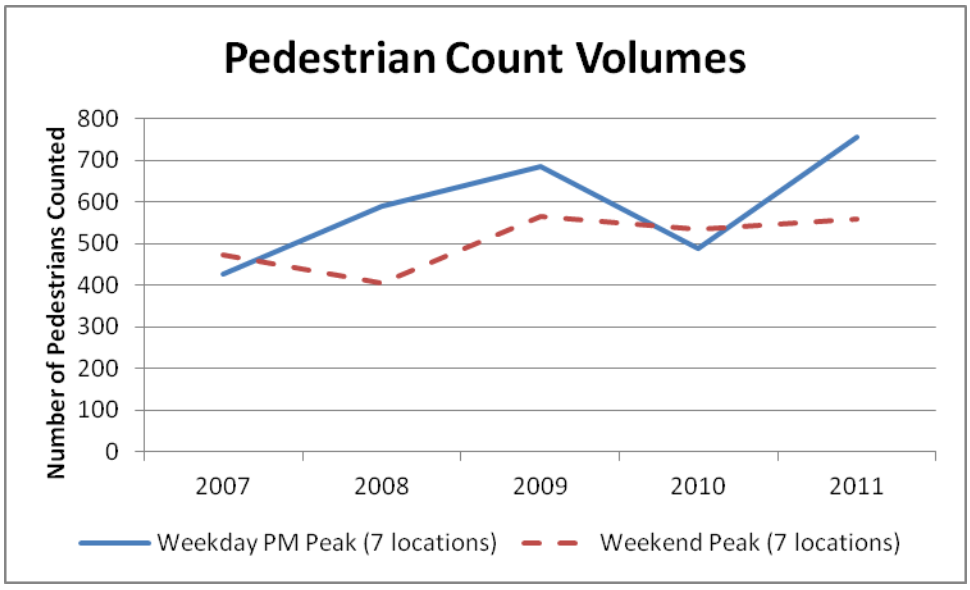

Figure 1 – Total Peak Hour Pedestrian Volumes 2007-2011

Average Weekday Pedestrian Peak Hour Volumes

The weekday count figures reflect commuting and utilitarian trip making by foot. These counts show a steady increase in the average number of pedestrians, with the 2011 weekday peak hour pedestrian volume 56% higher than in 2007.

- 2007 to 2011: 74% increase (from an average of 36 to 62 pedestrians/hour)
- 2008 to 2011: 30% increase (from an average of 48 to 62 pedestrians/hour)
- 2009 to 2011: 9% increase (from an average of 57 to 62 pedestrians/hour)
- 2010 to 2011: 56% increase (from an average of 40 to 62 pedestrians/hour)

Average Weekend Pedestrian Peak Hour Volumes

Weekend pedestrian peak hour volumes are on average higher than weekday volumes. Overall, the 2009, 2010 and 2011 count volumes are higher than those recorded in 2007 and 2008. The weekend average peak hour pedestrian volume remained unchanged between 2010 and 2011.

- 2007 to 2011: 10% increase (from an average of 43 to 47 pedestrians/hour)
- 2008 to 2011: 23% increase (from an average of 38 to 47 pedestrians/hour)
- 2009 to 2011: 4% decrease (from an average of 49 to 47 pedestrians/hour)
- 2010 to 2011: unchanged (from an average of 47 to 47 pedestrians/hour)

Highest Volume Pedestrian Count Locations

The location with the highest pedestrian volumes on both weekdays and weekends is Broadway between 8th & 9th, followed by MKT Trail & Stewart Rd. and Ashland Rd. & Burch Rd.

4.2 Bicycle Count Data

Tables A-3 and A-4 show weekday and weekend bicycle counts over time compared with September 2011 count data. At the seven count locations surveyed between 2007 and 2011, the total number of bicyclists during peak hours on both weekends and weekdays have increased. Note that the decrease in weekend peak hour bicycle counts in 2008 was likely due to poor weather.

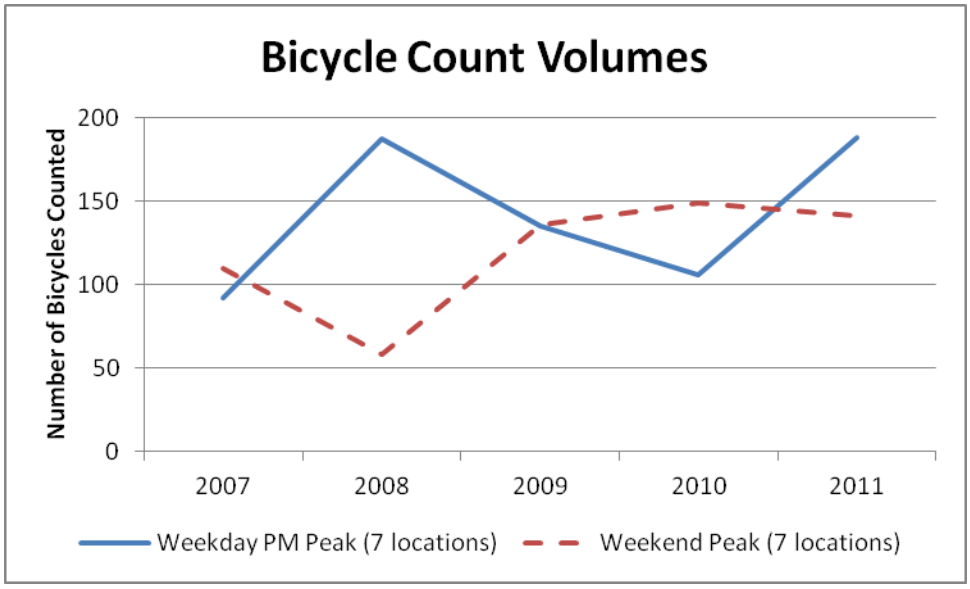

Figure 2 – Total Peak Hour Bicycle Volumes 2007-2011

Average Weekday Bicycle Peak Hour Volumes

Weekday peak hour bicycle data seem to indicate an increase in bicycling to and from work and school trips over the base year of 2007. Peak hour volumes increased by 147% from 2007 to 2011. Average weekday bicycle peak hour volumes in 2011 were the highest of all five-count years.

- 2007 to 2011: 147% increase (from an average of 7 to 18 bicyclists/hour)
- 2008 to 2011: 19% increase (from an average of 15 to 18 bicyclists/hour)
- 2009 to 2011: 36% increase (from an average of 13 to 18 bicyclists/hour)
- 2010 to 2011: 48% increase (from an average of 12 to 18 bicyclists/hour)

Average Weekend Bicycle Peak Hour Volumes

Weekend peak hour bicycle data show an increase in recreational bicycle trips on weekends, though average count volumes have been relatively steady since 2009. Peak hour volumes increased by 20% from 2007 to 2011. There were fewer bicycles counted in 2008 (likely due to weather), which explains the large 110% increase in the average weekend peak hour volume between 2008 and 2011.

- 2007 to 2011: 20% increase (from an average of 10 to 12 bicyclists/hour)
- 2008 to 2011: 110% increase (from an average of 6 to 12 bicyclists/hour)
- 2009 to 2011: 8% decrease (from an average of 13 to 12 bicyclists/hour)
- 2010 to 2011: 9% decrease (from an average of 13 to 12 bicyclists/hour)

Largest Bicycle Count Increase

The largest absolute increase in bicycling has occurred at MKT and Stewart. Thirty weekend peak hour bicyclists were counted in 2007 and 58 in 2011, an increase of 28 bicyclists. At the same location, the weekday peak hour bicycle volume increased from 26 in 2007 to 59 in 2011.

4.3 Combined Count Results

A summary of 2007, 2008, 2009, 2010 and 2011 pedestrian and bicycle counts is provided in **Tables A-5, A-7, A9, A-11 and A-13: Walking and Bicycling 2-Hour Count Volumes for Weekdays and Weekends**.

Key findings include:

1. Bicycling on weekdays is occurring throughout the city, with activity levels ranging from a low of five bicyclists over two hours (Stadium & Forum) to 101 bicyclists (MKT and Stuart), with an average of 27 bicyclists per location during the two-hour count period in 2011.
2. Walking on weekdays also occurs throughout the city, with an average of 108 pedestrians per location over the two–hour count period in 2011. Activity levels ranged from one person over two hours (Nifong) to 331 people (Broadway between 8th and 9th).
3. The busiest weekday locations in Columbia for combined walking/bicycling are (1) Broadway between 8th and 9th, (2) MKT Trail & Stewart Rd., and (3) Ashland Rd. & Birch Rd.
4. Walking and bicycling volumes were higher on weekdays (average of 135 bicycles and pedestrians per location) as compared with weekends (average of 100 bicycle and pedestrians per location) in 2011, though in other years weekend rates have been higher. In general, there is consistent bicycle and pedestrian activity on both weekends and weekdays.

Tables A-6, A-8, A-10, A-12 and A-14: Two-Hour Bicyclist and Pedestrian Volumes & Attributes provides a breakdown of bicyclist and pedestrian attributes for each of the count years, including gender, whether a person was a child (under 14) and whether bicyclists wore a helmet. Key findings include:

1. Over the five count years, males made up from 58% to 77% of bicyclists, which is consistent with other surveys conducted around the country (Thunderhead Alliance, 2007). The highest percentage of female riders was recorded in 2010 (42%).
2. Based on visual observation, children 14 years or younger ranged from 3 to 8% of all counted bicyclists.
3. The number of bicyclists not wearing helmets decreased from 63% in 2007 to 51% in 2011.
4. The male-female split of pedestrians is relatively consistent from year to year, with just over 50% females, consistent with the city's population.
5. The number of 'children 14 years or younger' ranged from 5% to 7% of all pedestrians, depending on the year. According to the American Community Survey (2007-2009), children between the ages of 5 and 14 account for 10.2% of the population in Columbia. This indicates that proportionally, fewer children are walking or bicycling on average than adults at the seven count locations.

5 Design of Survey Questions

The survey questions developed for the NTPP and the City of Columbia were customized from the NBPD methodology by the four pilot communities and the Volpe National Transportation Systems Center. The surveys were designed to be conducted in the field as intercept surveys, to maximize the statistical validity of the results. Mail-in, phone, and other surveys have shown to be heavily biased in past survey efforts. The surveys were conducted at most of the count locations, during, immediately before or immediately after the count periods. Surveyors were trained to deliver interview questions and wore yellow jerseys and nametags to identify themselves.

Copies of the survey forms are included **(See Appendix B: Forms B-1 and B-2)**. Over 200 surveys were collected during each of the count periods in 2007 and 2010.

Results of the surveys are included in Appendix B. Key findings are discussed below:

5.1 Pedestrians

Trip Purpose: The number of pedestrian trips that were transportation-related (i.e., work, school, shopping/errands, personal business) increased from 41% in 2007 to 47% in 2011. The Transportation Model Appendices quantifies the transportation benefit of these trips.

Walking Frequency: In 2007, the average walking frequency was 14 days/month, with 28% of the respondents walking daily. In 2011, the average walking frequency increased to 15 days/month, with 31% of the respondents walking daily.

Alternative Mode for this Trip: In 2007, 36% of respondents indicated they would have driven if they were not able to walk, while 12% would have bicycled, 3% would have carpooled, and 6% would have taken transit. In 2011, 50% of respondents reported they would have driven if they were unable to walk, while 18% would have bicycled, 11% would have carpooled, and 6% would have taken transit. A much lower percentage of respondents reported that they would not have made this trip (43% in 2007 as compared to 11% in 2011). Instead, 2011 survey respondents indicated a greater likelihood of utilizing alternate modes such as bicycling, carpooling or taking transit.

Improvement Preference: Respondents selected a number of desired pedestrian improvements for both their route and their community in general, including more shade trees, benches, better street crossings, more sidewalks, better surface, wider sidewalks, drivers obeying traffic laws, and better lighting.

Walking Trips that Included Transit: The number of people reporting that their walking trip included transit increased from 2% in 2007 to 5% in 2011.

Reasons for Route Choice: In both 2007 and 2011, respondents reported that directness of the route, scenic qualities and accessibility/proximity were the top reasons they selected their route. A flat route and less traffic were other top responses.

Ethnicity: The ethnic breakdown appeared roughly equivalent to the ethnicity of the city in 2007. The 2011 survey had a greater percentage of non-Caucasian respondents as compared to the population.

5.2 Bicyclists

Trip Purpose: The number of bicycle trips that were transportation-related (i.e., work, school, shopping/errands, personal business) increased from 33% in 2007 to 41% in 2011. The Transportation Model Appendices quantifies the transportation benefit of these trips.

Frequency: In 2007, the average bicycling frequency was 14 days/month, with 28% of the respondents bicycling daily. In 2011, the average bicycling frequency was similar at 14 days/month, with 27% of the respondents bicycling daily.

Alternative Mode for this Trip: In 2007, if respondents were not able to bicycle, 17% would have driven, 17% would have walked and 67% would not have made this trip. In 2011, 46% reported they would have driven, 9% would have walked, 3% would have taken transit and 40% would not have made this trip.

Improvement Preference: In 2007, respondents identified bicycle lanes, less traffic, better street crossings and wider shoulders as their top four (4) improvements. In addition to these items, better maintenance, better surface, signs/stencils and drivers obeying traffic laws were frequent responses in 2011.

Bicycling Trips that Included Transit: The number of people reporting their bicycling trip included transit increased from 0% in 2007 to 3% in 2010.

Reasons for Route Choice: While there were some differences in the relative percentages between 2007 and 2011, five factors received the most responses in both years: scenic qualities, separation from traffic, less traffic, access, and directness. Bike lanes became a prominent reason in 2011, with 11% reporting bike lanes as the reason for their route choice as compared with 4% in 2007.

Ethnicity: The ethnic breakdown appeared roughly equivalent to the ethnicity of the city in both survey years.

6 Accuracy and Calibration of the Data

The 7 count locations and 200+ surveys collected each year as part of the Columbia NTPP Count/Survey program provide an invaluable snapshot into walking and bicycling in the City of Columbia. This data also serves as a benchmark measurement for the NTPP program as the count and survey effort continues.

Appendix A: Count Data Tables and Forms

Table A-1

Weekday Peak-Hour Pedestrian Counts and Percent Change, 2007-2011

		Counts					Percent Change Between Count Year and 2011			
Location	**Streets**	**2007**	**2008**	**2009**	**2010**	**2011**	**2007**	**2008**	**2009**	**2010**
1	Broadway between 8th & 9th, south side	133	145	167	123	180	35.3	24.1	7.8	46.3
2	MKT and Stewart	52	93	78	62	135	159.6	45.2	73.1	117.7
3	Clinkscales	10	13	7	10	13	30.0	0.0	85.7	30.0
4	Nifong	2	9	55	2	1	(50.0)	(88.9)	(98.2)	(50.0)
5	Stadium & Forum	1	2	0	4	3	200.0	50.0	-	(25.0)
6	Ashland & Burch	40	58	78	64	78	95.0	34.5	0.0	21.9
7	Bear Creek	12	15	16	15	26	116.7	73.3	62.5	73.3
	Average count per location/ Average Percent Change	35.7	47.9	57.3	40.0	62.3	74.4%	30.1%	8.7%	55.7%

Table A-2

Weekend Peak-Hour Pedestrian Counts and Percent Change, 2007-2011

		Counts					Percent Change Between Count Year and 2011			
Location	**Streets**	**2007**	**2008**	**2009**	**2010**	**2011**	**2007**	**2008**	**2009**	**2010**
1	Broadway between 8th & 9th, south side	186	164	223	186	191	2.7	16.5	(14.3)	2.7
2	MKT and Stewart	56	34	65	72	70	25.0	105.9	7.7	(2.8)
3	Clinkscales	9	9	8	3	8	(11.1)	(11.1)	0.0	166.7
4	Nifong	3	7	3	3	2	(33.3)	(71.4)	(33.3)	(33.3)
5	Stadium & Forum	3	5	3	7	1	(66.7)	(80.0)	(66.7)	(85.7)
6	Ashland & Burch	18	36	31	42	32	77.8	(11.1)	3.2	(23.8)
7	Bear Creek	24	12	8	17	24	0.0	100.0	200.0	41.2
	Average count per location/ Average Percent Change	42.7	38.1	48.7	47.1	46.9	9.7%	22.8%	-3.8%	-0.6%

Table A-3
Weekday Peak-Hour Bicycle Counts and Percent Change, 2007-2011

		Counts					Percent Change Between Count Year and 2011			
Location	**Streets**	**2007**	**2008**	**2009**	**2010**	**2011**	**2007**	**2008**	**2009**	**2010**
1	Broadway between 8th & 9th, south side	13	21	7	3	6	(53.8)	(71.4)	(14.3)	100.0
2	MKT and Stewart	26	38	51	34	59	126.9	55.3	15.7	73.5
3	Clinkscales	2	7	8	2	8	300.0	14.3	0.0	300.0
4	Nifong	4	3	1	7	6	50.0	100.0	500.0	(14.3)
5	Stadium & Forum	3	10	6	7	4	33.3	(60.0)	(33.3)	(42.9)
6	Ashland & Burch	3	23	17	21	32	966.7	39.1	88.2	52.4
7	Bear Creek	0	4	3	11	11	N/A	175.0	266.7	0.0
	Average count per location/ Average Percent Change	7.3	15.1	13.3	12.1	18.0	147.1%	18.9%	35.5%	48.2%

Table A-4
Weekend Peak-Hour Bicycle Counts and Percent Change, 2007-2011

		Counts					Percent Change Between Count Year and 2011			
Location	**Streets**	**2007**	**2008**	**2009**	**2010**	**2011**	**2007**	**2008**	**2009**	**2010**
1	Broadway between 8th & 9th, south side	4	5	10	4	4	0.0	(20.0)	(60.0)	0.0
2	MKT and Stewart	30	9	53	54	58	93.3	544.4	9.4	7.4
3	Clinkscales	5	2	6	5	2	(60.0)	0.0	(66.7)	(60.0)
4	Nifong	2	2	0	1	5	150.0	150.0	-	400.0
5	Stadium & Forum	8	11	7	11	2	(75.0)	(81.8)	(71.4)	(81.8)
6	Ashland & Burch	13	9	10	15	6	(53.8)	(33.3)	(40.0)	(60.0)
7	Bear Creek	8	2	5	2	7	(12.5)	250.0	40.0	250.0
	Average count per location/ Average Percent Change	10.0	5.7	13.0	13.1	12.0	20.0%	110.0%	-7.7%	-8.7%

Table A-5
2007 Walking and Bicycling 2-Hour Count Volumes for Weekdays and Weekends

		Weekend (12-2pm)			Weekday (4-6pm)		
Loc #	**Streets**	**Bicyclists**	**Pedestrians**	**Total**	**Bicyclists**	**Pedestrians**	**Total**
1	Broadway between 8th & 9th, south side	6	305	311	22	244	266
2	MKT and Stewart	55	83	138	43	83	126
3	Clinkscales	7	10	17	3	14	17
4	Nifong	2	4	6	4	3	7
5	Stadium & Forum	11	3	14	5	2	7
6	Ashland & Burch	17	31	48	15	66	81
7	Bear Creek	12	37	49	0	15	15
	Average per location	15.7	67.6	83.3	13.1	61.0	74.1
	Total	110	473	583	92	427	519

Table A-6
2007 Two-Hour Bicyclist and Pedestrian Volumes & Attributes: Gender, Age and Helmet Use

		Bicyclists						Pedestrians			
Loc #	**Streets**	**Male**	**Female**	**Total**	**Children**	**No Helmet**	**Wrong Way**	**Male**	**Female**	**Total**	**Children**
1	Broadway between 8th & 9th, south side	19	9	28	0	24	5	247	302	549	36
2	MKT and Stewart	65	33	98	5	59	0	76	90	166	2
3	Clinkscales	8	2	10	1	7	6	13	11	24	7
4	Nifong	4	2	6	3	2	3	4	3	7	1
5	Stadium & Forum	12	4	16	0	5	0	4	1	5	1
6	Ashland & Burch	23	9	32	0	27	5	51	46	97	1
7	Bear Creek	5	7	12	0	3	0	21	31	52	0
	Total	136	66	202	9	127	19	416	484	900	48
	Percent	67.3%	32.7%	100.0%	4.5%	62.9%	9.4%	46.2%	53.8%	100.0%	5.3%

Table A-7
2008 Walking and Bicycling 2-Hour Count Volumes for Weekdays and Weekends

		Weekend (12-2pm)			Weekday (4-6pm)		
Loc #	**Streets**	**Bicyclists**	**Pedestrians**	**Total**	**Bicyclists**	**Pedestrians**	**Total**
1	Broadway between 8th & 9th, south side	7	249	256	31	266	297
2	MKT and Stewart	16	55	71	80	167	247
3	Clinkscales	2	11	13	12	21	33
4	Nifong	3	9	12	5	15	20
5	Stadium & Forum	16	8	24	17	2	19
6	Ashland & Burch	12	54	66	36	94	130
7	Bear Creek	2	18	20	6	24	30
	Average per location	8.3	57.7	66.0	26.7	84.1	110.9
	Total	58	404	462	187	589	776

Table A-8
2008 Two-Hour Bicyclist and Pedestrian Volumes & Attributes: Gender, Age and Helmet Use

		Bicyclists						Pedestrians			
Loc #	**Streets**	**Male**	**Female**	**Total**	**Children**	**No Helmet**	**Wrong Way**	**Male**	**Female**	**Total**	**Children**
1	Broadway between 8th & 9th, south side	32	6	38	0	26	5	197	318	515	45
2	MKT and Stewart	68	28	96	0	53	1	112	110	222	5
3	Clinkscales	13	1	14	5	10	4	18	14	32	11
4	Nifong	8	0	8	0	4	2	17	7	24	0
5	Stadium & Forum	24	9	33	2	6	0	4	6	10	0
6	Ashland & Burch	38	10	48	1	39	1	69	79	148	3
7	Bear Creek	6	2	8	0	6	0	23	19	42	2
	Total	189	56	245	8	144	13	440	553	993	66
	Percent	77.1%	22.9%	100.0%	3.3%	58.8%	5.3%	44.3%	55.7%	100.0%	6.6%

Table A-9

2009 Walking and Bicycling 2-Hour Count Volumes for Weekdays and Weekends

		Weekend (12-2pm)			Weekday (4-6pm)		
Loc #	**Streets**	**Bicyclists**	**Pedestrians**	**Total**	**Bicyclists**	**Pedestrians**	**Total**
1	Broadway between 8th & 9th, south side	14	388	402	9	319	328
2	MKT and Stewart	85	98	183	79	143	222
3	Clinkscales	7	9	16	10	11	21
4	Nifong	0	6	6	1	57	58
5	Stadium & Forum	11	4	15	8	0	8
6	Ashland & Burch	14	51	65	25	125	150
7	Bear Creek	5	9	14	3	29	32
	Average per location	19.4	80.7	100.1	19.3	97.7	117.0
	Total	136	565	701	135	684	819

Table A-10

2009 Two-Hour Bicyclist and Pedestrian Volumes & Attributes: Gender, Age and Helmet Use

		Bicyclists						Pedestrians			
Loc #	**Streets**	**Male**	**Female**	**Total**	**Children**	**No Helmet**	**Wrong Way**	**Male**	**Female**	**Total**	**Children**
1	Broadway between 8th & 9th, south side	16	7	23	0	17	8	309	398	707	82
2	MKT and Stewart	105	59	164	17	85	0	141	100	241	0
3	Clinkscales	13	4	17	5	4	3	9	11	20	5
4	Nifong	0	1	1	0	0	0	38	25	63	0
5	Stadium & Forum	14	5	19	0	4	0	2	2	4	0
6	Ashland & Burch	31	8	39	0	30	0	81	95	176	1
7	Bear Creek	4	4	8	0	4	0	17	21	38	1
	Total	183	88	271	22	144	11	597	652	1249	89
	Percent	67.5%	32.5%	100.0%	7.5%	53.1%	4.1%	47.8%	52.2%	100.0%	7.1%

Table A-11

2010 Walking and Bicycling 2-Hour Count Volumes for Weekdays and Weekends

		Weekend (12-2pm)			Weekday (4-6pm)		
Loc #	**Streets**	**Bicyclists**	**Pedestrians**	**Total**	**Bicyclists**	**Pedestrians**	**Total**
1	Broadway between 8th & 9th, south side	4	320	324	6	222	228
2	MKT and Stewart	94	106	200	51	103	154
3	Clinkscales	9	3	12	3	20	23
4	Nifong	1	6	7	11	2	13
5	Stadium & Forum	17	8	25	8	5	13
6	Ashland & Burch	22	73	95	15	113	128
7	Bear Creek	2	19	21	12	24	36
	Average per location	21.3	76.4	97.7	15.1	69.9	85.0
	Total	149	535	684	106	489	595

Table A-12

2010 Two-Hour Bicyclist and Pedestrian Volumes & Attributes: Gender, Age and Helmet Use

		Bicyclists						Pedestrians			
Loc #	**Streets**	**Male**	**Female**	**Total**	**Children**	**No Helmet**	**Wrong Way**	**Male**	**Female**	**Total**	**Children**
1	Broadway between 8th & 9th, south side	4	6	10	0	9	5	252	290	542	30
2	MKT and Stewart	97	48	145	3	52	0	103	106	209	2
3	Clinkscales	7	5	12	2	8	3	13	10	23	1
4	Nifong	4	8	12	0	0	0	6	2	8	0
5	Stadium & Forum	15	10	25	4	9	0	9	4	13	4
6	Ashland & Burch	16	21	37	0	54	41	99	87	186	4
7	Bear Creek	6	8	14	3	9	0	18	25	43	5
	Total	149	106	255	12	141	49	500	524	1024	46
	Percent	58.4%	41.6%	100.0%	4.5%	55.3%	19.2%	48.8%	51.2%	100.0%	4.5%

Table A-13
2011 Walking and Bicycling 2-Hour Count Volumes for Weekdays and Weekends

		Weekend (12-2pm)			Weekday (4-6pm)		
Loc #	**Streets**	**Bicyclists**	**Pedestrians**	**Total**	**Bicyclists**	**Pedestrians**	**Total**
1	Broadway between 8th & 9th, south side	7	334	341	8	331	339
2	MKT and Stewart	102	118	220	101	224	325
3	Clinkscales	2	14	16	9	19	28
4	Nifong	8	3	11	9	1	10
5	Stadium & Forum	2	1	3	5	5	10
6	Ashland & Burch	9	54	63	42	144	186
7	Bear Creek	11	34	45	14	33	47
	Average per location	20.1	79.7	99.9	26.9	108.1	135.0
	Total	141	558	699	188	757	945

Table A-14
2011 Two-Hour Bicyclist and Pedestrian Volumes & Attributes: Gender, Age and Helmet Use

		Bicyclists						Pedestrians			
Loc #	**Streets**	**Male**	**Female**	**Total**	**Children**	**No Helmet**	**Wrong Way**	**Male**	**Female**	**Total**	**Children**
1	Broadway between 8th & 9th, south side	7	8	15	0	11	13	291	374	665	57
2	MKT and Stewart	140	63	203	12	99	0	169	173	342	18
3	Clinkscales	9	2	11	8	9	4	13	20	33	3
4	Nifong	13	4	17	0	3	0	3	1	4	0
5	Stadium & Forum	3	4	7	1	3	0	2	4	6	0
6	Ashland & Burch	42	9	51	0	35	22	106	92	198	4
7	Bear Creek	14	11	25	1	9	0	26	41	67	0
	Total	228	101	329	22	169	39	610	705	1315	82
	Percent	69.3%	30.7%	100.0%	6.3%	51.4%	11.9%	46.4%	53.6%	100.0%	6.2%

Figure A-1

NTPP Count Form

STANDARDIZED COUNT FORM

Name: _____ Location: _____ # _____
Date: _____ Time Period: _____ Weather Conditions: _____

Instructions: Please fill in your name, count location, date, time period, and weather conditions (fair, rainy, very cold). Count all bicyclists and pedestrians crossing your screen line under the male or female categories: the no helmet and wrong way categories are in addition to the male/female categories for bicycles; child category is in addition to male/female for pedestrians.

Time Period	Bicycles		Child	No Helmets	Wrong Way	Pedestrians		Child
	Male	*Female*				*Male*	*Female*	
00-:15								
:15-:30								
:30-:45								
:45-1:00								
1:00-1:15								
1:15-1:30								
1:30-1:45								
1:45-2:00								
Total								

Appendix B: Survey Charts and Materials

Pedestrian Survey Data Charts

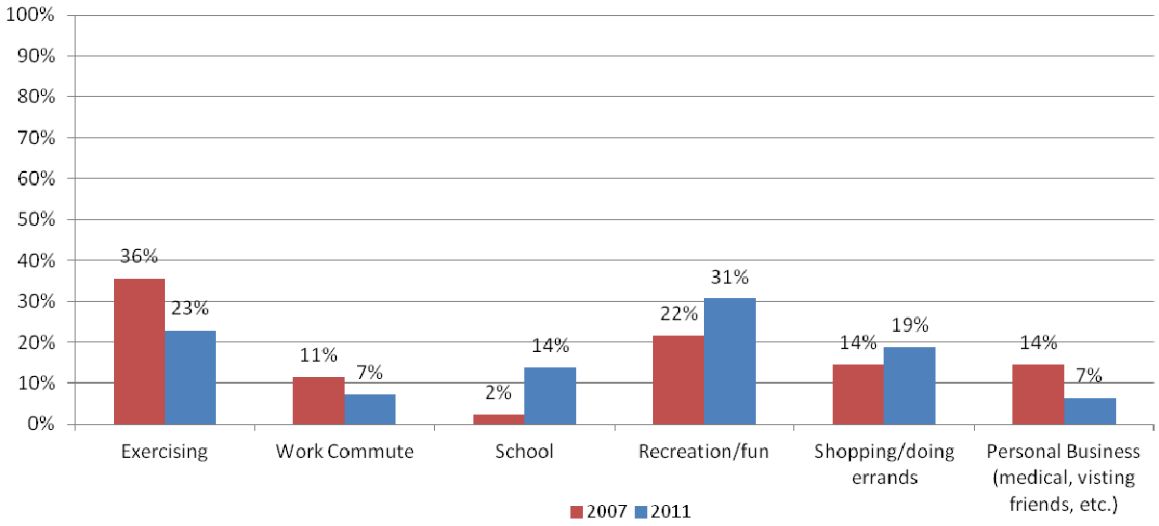

Figure B.1-1 Pedestrian Trip Purpose

Question 2

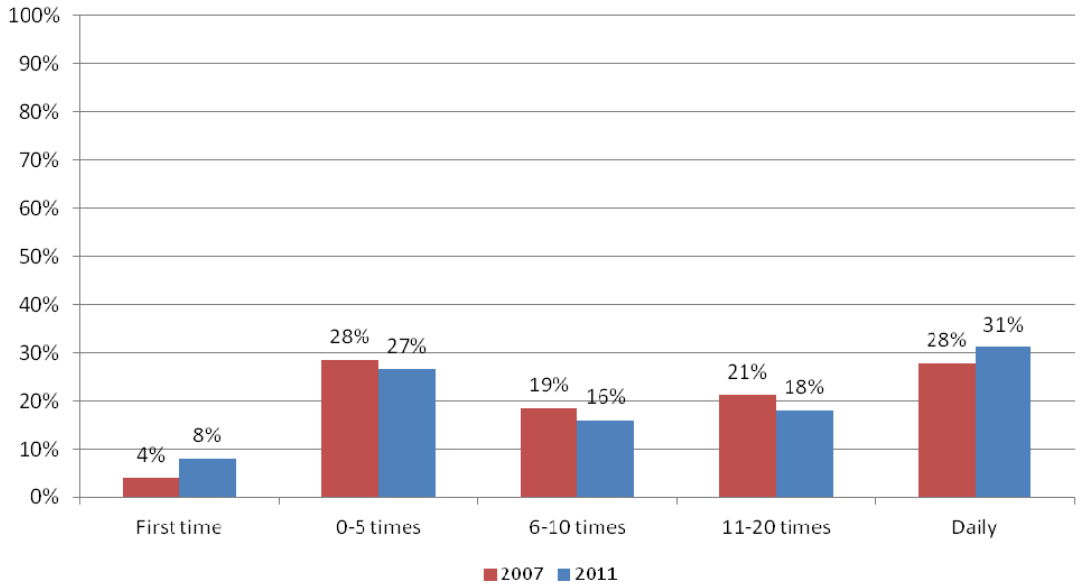

Figure B.1-2 Pedestrian Walking Frequency

Question 3

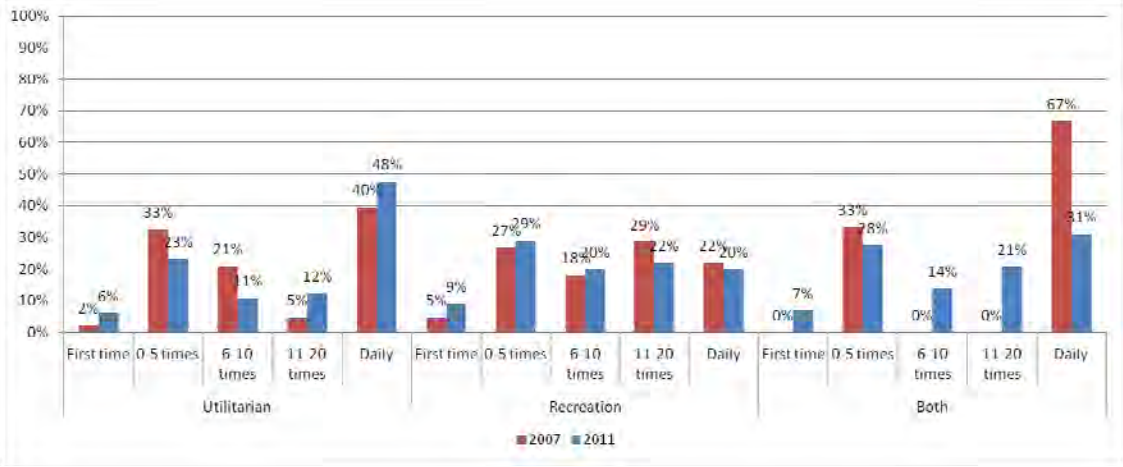

Figure B.1-3 Pedestrian Walking Frequency by Trip Purpose

Question 2 and 3

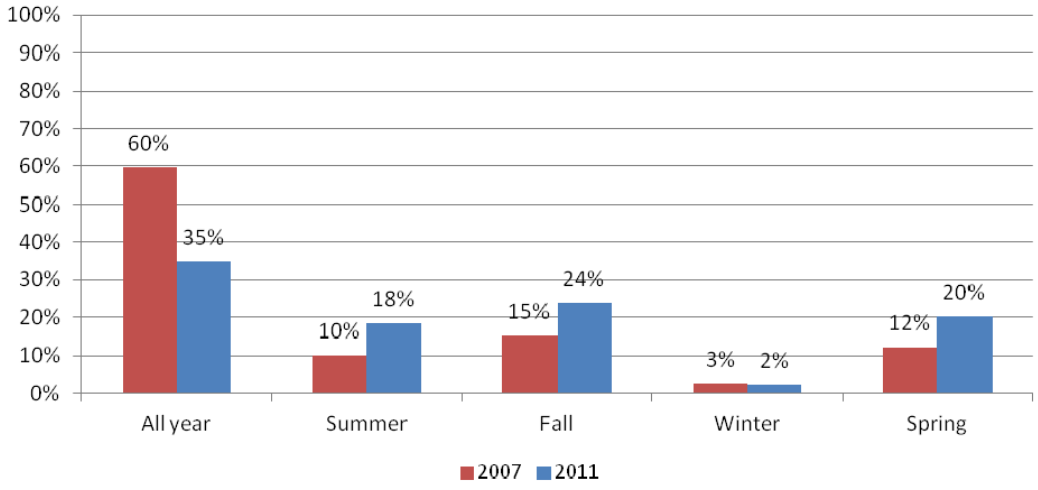

Figure B.1-4 Seasons in Which People Walk

Question 4

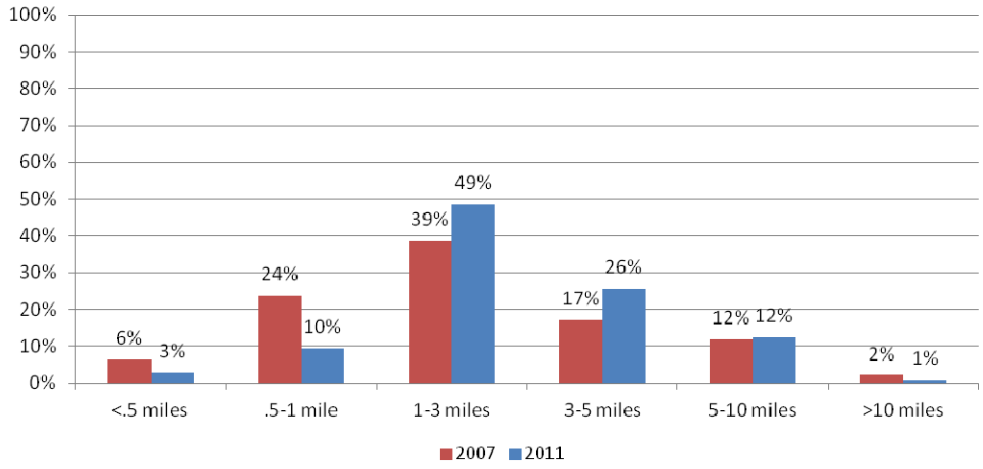

Figure B.1-5 Distance of Pedestrian Trips

Question 5

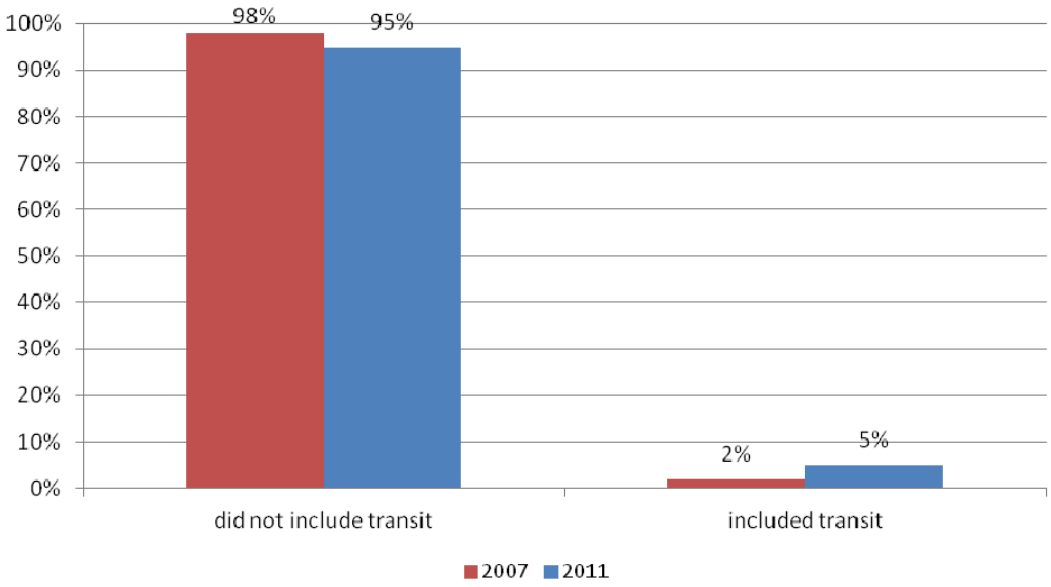

Figure B.1-6 Walking Trips that Included Transit

Question 6

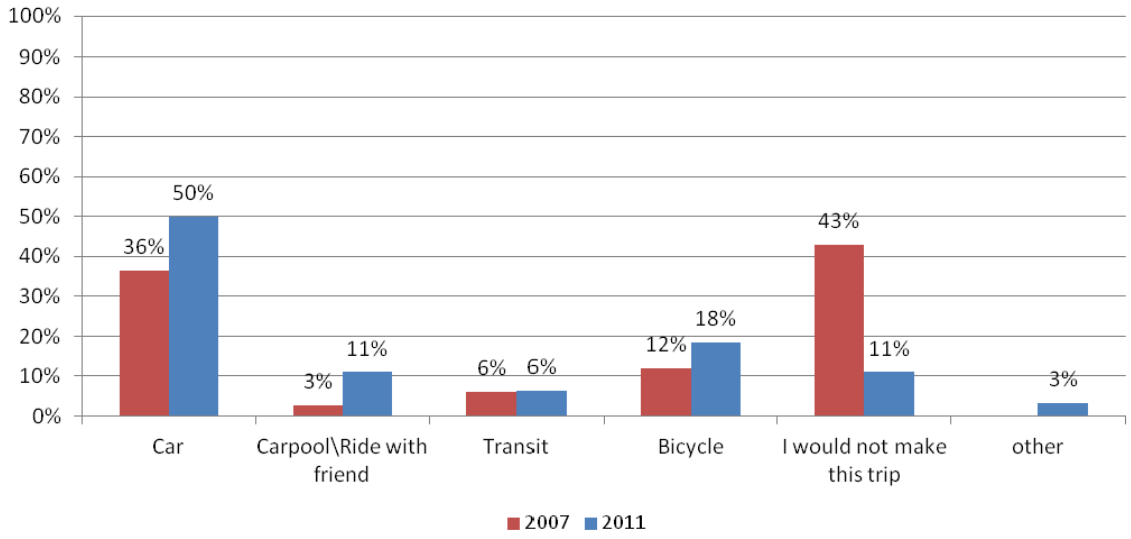

Figure B.1-7 Alternate Mode to Walking

Question 7

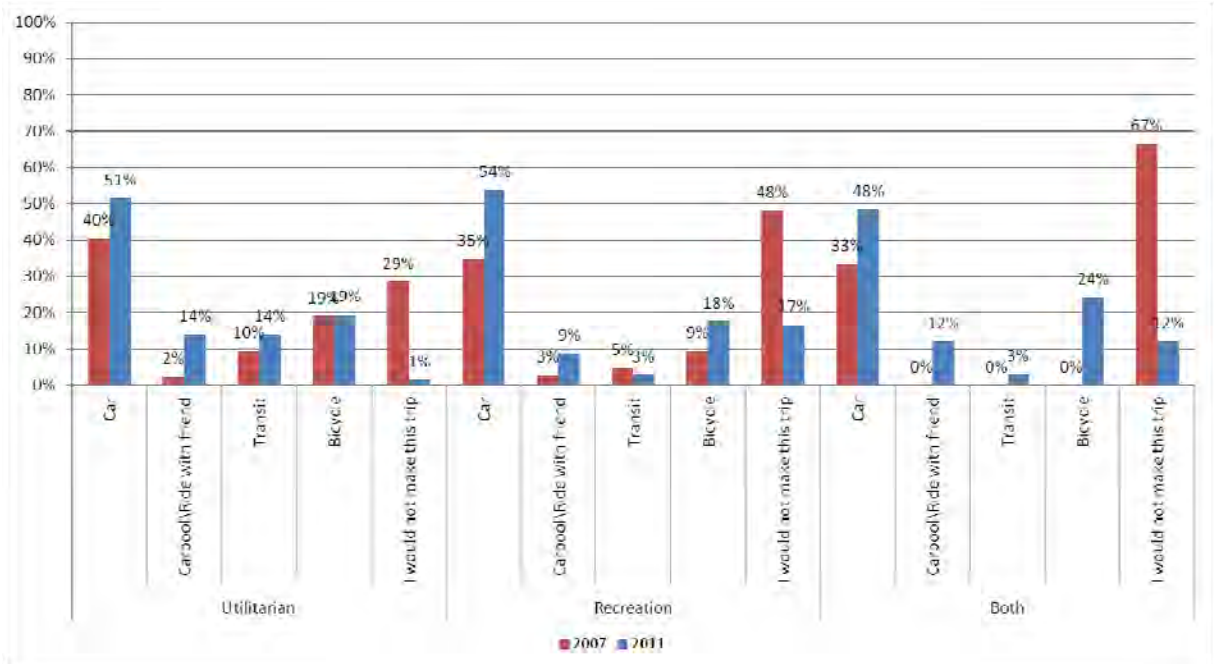

Figure B.1-8 Alternate Mode to Walking by Trip Purpose

Question 2 and 7

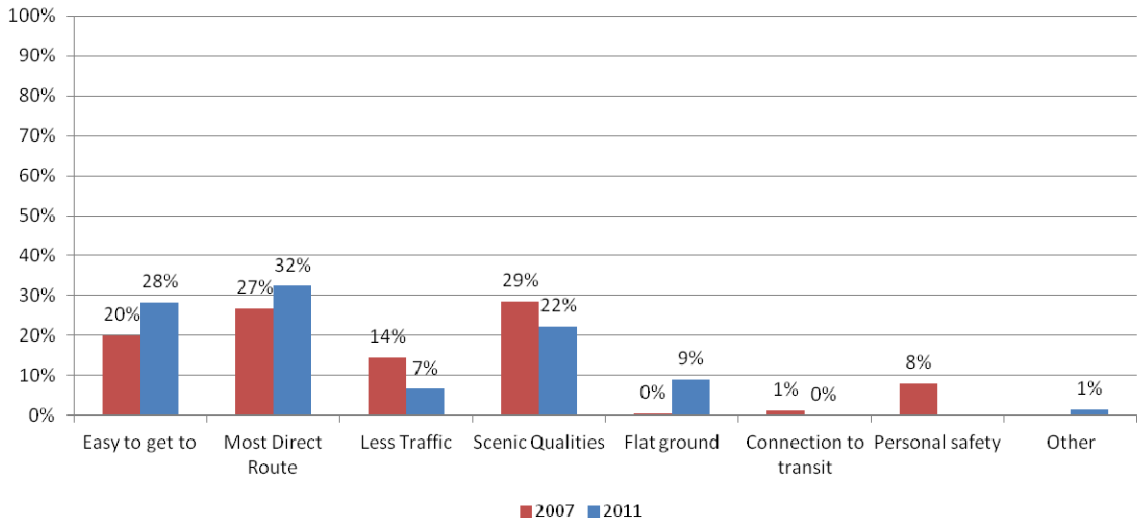

Figure B.1-9 Pedestrian Reasons for Route Choice

Question 8

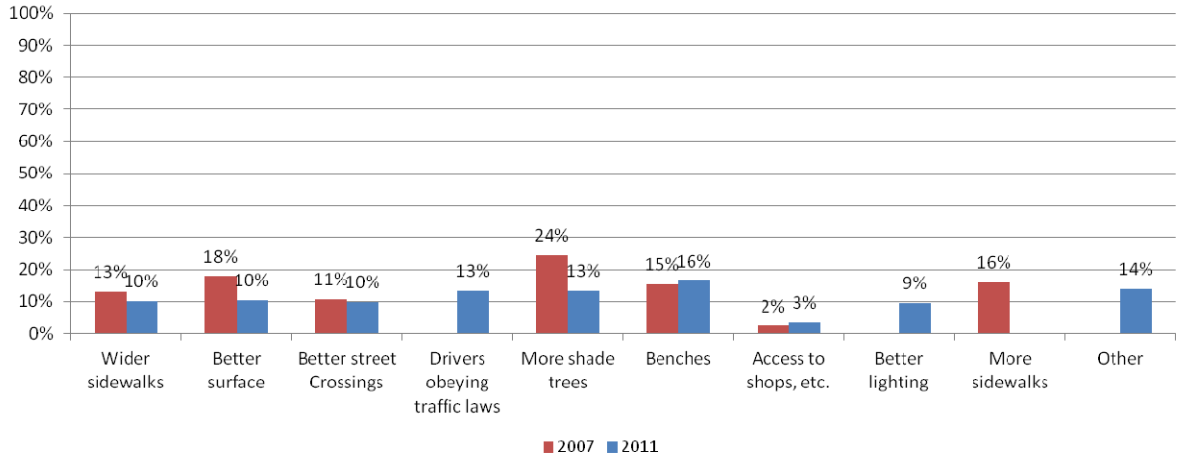

Figure B.1-10 Pedestrians Stated Preference for Improvements along Their Route

Question 9

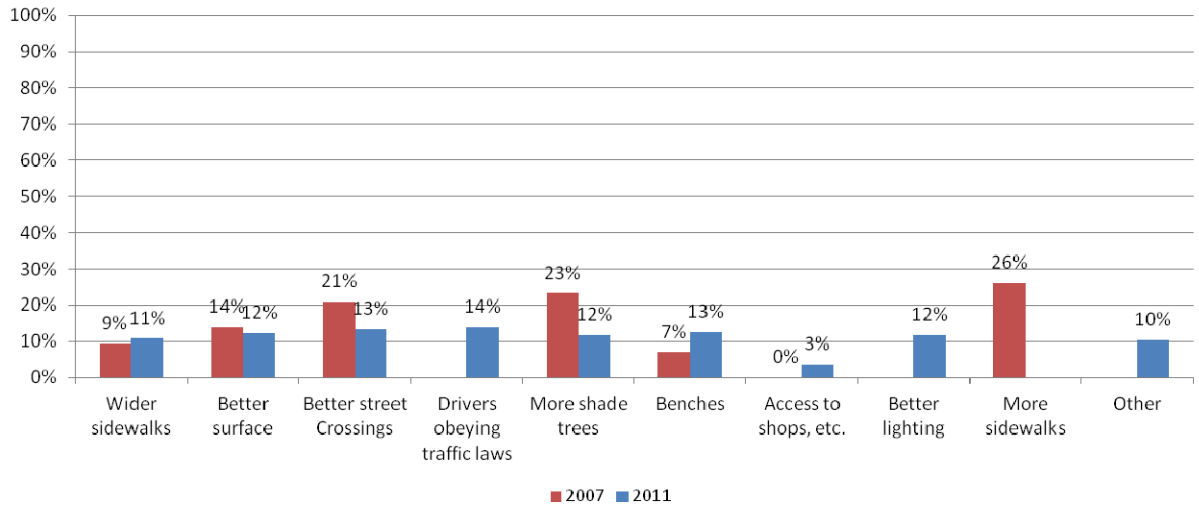

Figure B.1-11 Pedestrian Stated Preference for General Improvements

Question 10

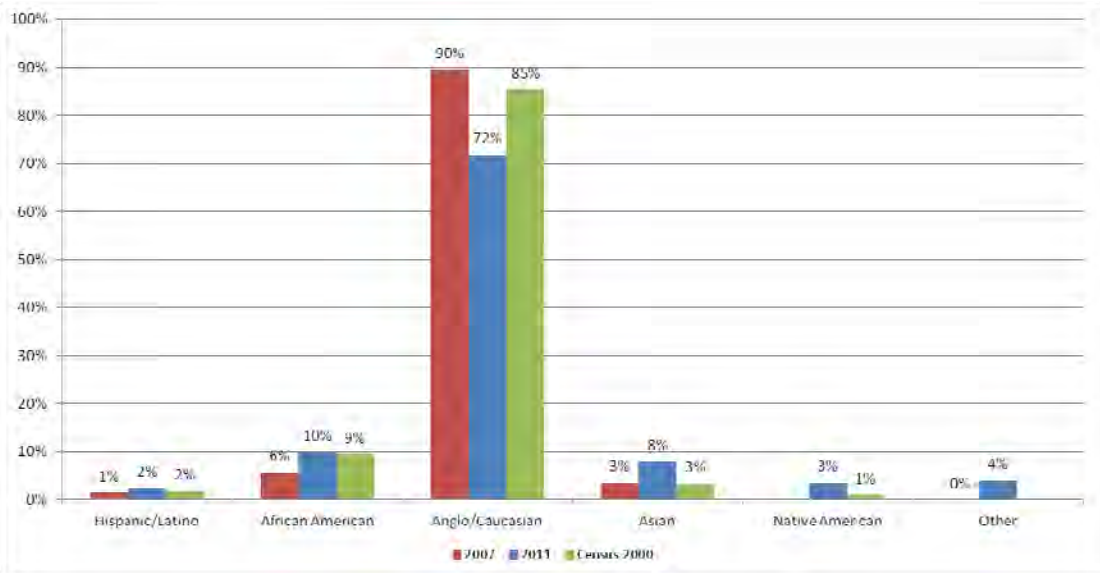

Figure B.1-11 Pedestrian Ethnicity

Question 11

Form B-1

Pedestrian Survey Data Form

Columbia NTPP: Pedestrian Survey

This survey will provide valuable information on bicycling behavior and preferences. It will take about two minutes to complete.

1. What is your home zip code? _____

2. What best describes the purpose of this walking trip?

☐ Exercise (a) ☐ Work commute (b) ☐ School (c)
☐ Recreation/fun (d) ☐ Shopping/doing errands (e) ☐ Personal business (medical, visiting friends, etc.)(f)

3. In the past month (30 days), about how often have you walked here?

☐ First time (a) ☐ 0 – 5 times (b) ☐ 6 – 10 times (c) ☐ 11 – 20 times (d) ☐ Daily (e)

4. When do you walk? (check all that apply)

☐ Summer (b) ☐ Fall (c) ☐ Winter (d) ☐ Spring (e)

5. What is the length of this trip? _____ **(blocks) OR** _____ **(miles)**

How long will it take you to complete this walking trip? _____(hours/min)

Where did you begin the trip: _____ Address, intersection, or landmark?

6. Will any part of this current trip be taken on public transit (bus or train)?

☐ Yes (a) ☐ No (b)

7. If you were not walking for this trip, how would you be traveling?

☐ Car (a) ☐ Ride with friend or family (b) ☐ Transit (bus or train) (c) ☐ Bicycle (d)
☐ I would not make this trip (e) ☐ other (f)

8. Why are you using this route and not a different route to your destination? (check all that apply)

☐ Easy to get to (a) ☐ Most direct route to my destination (b) ☐ Less traffic (c) ☐ Scenic qualities (d)
☐ Flat ground (e) ☐ Connection to transit (bus or train) (f)

9. What would you like to see improved along this route in general? (check all that apply)

☐ Wider sidewalks (a) ☐ Better surface (b) ☐ Better street crossings (c) ☐ Drivers obeying traffic Laws (d)
☐ More shade trees (e) ☐ Benches (f) ☐ Access to shops, etc. (g) ☐ Better lighting (h)
☐ Other _____ (i)

10. What would you like to see improved in the community in general? (check all that apply)

☐ Wider sidewalks (a) ☐ Better surface (b) ☐ Better street crossings (c) ☐ Drivers obeying traffic Laws (d)
☐ More shade trees (e) ☐ Benches (f) ☐ Access to shops, etc. (g) ☐ Better lighting (h)
☐ Other _____ (i)

11. What ethnic group do you belong to? (check all that apply)

☐ Hispanic/Latino (a) ☐ African American (b) ☐ Anglo/Caucasian (d) ☐ Asian (c)
☐ Native American (e) ☐ Hmong (f) ☐ Somali (g) ☐ Other (h): _____

12. What is your age? ☐ **under 18 years** (a) ☐ **18 - 40** (b) ☐ **41 - 60** (c) ☐ **61 and over** (d)

13. What is your gender? ☐ **Male** (a) ☐ **Female** (b)

----------Office use only below this line----------

Location: _____ Date: _____ Time: _____

Surveyor: _____ Weather: _____

Bicycling Survey Data Charts

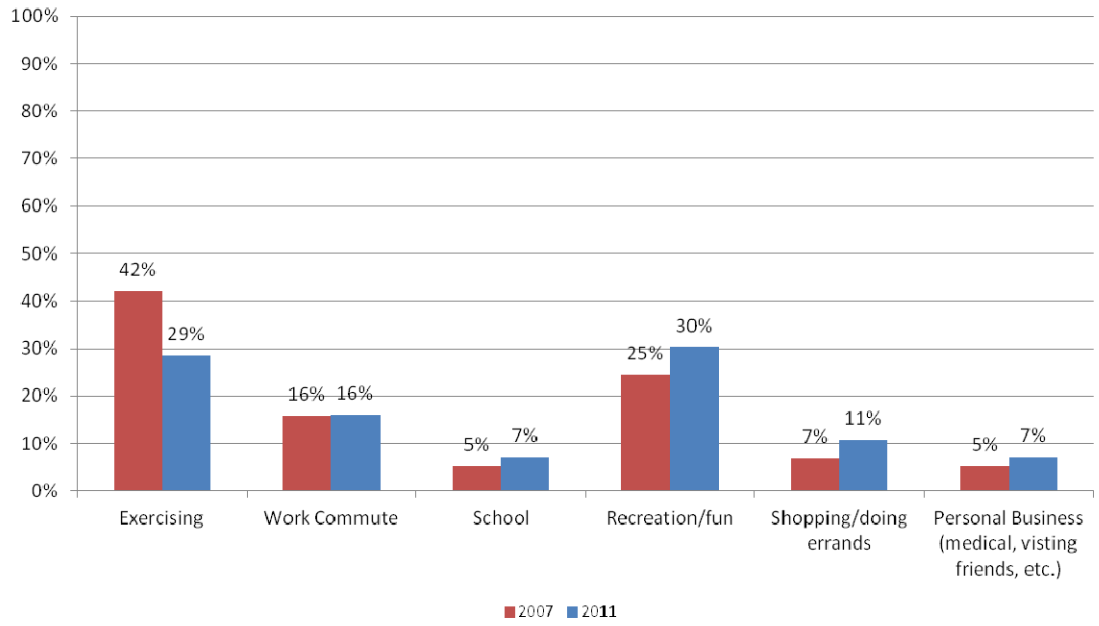

Figure B.2-1 Bicycling Trip Purpose
Question 2

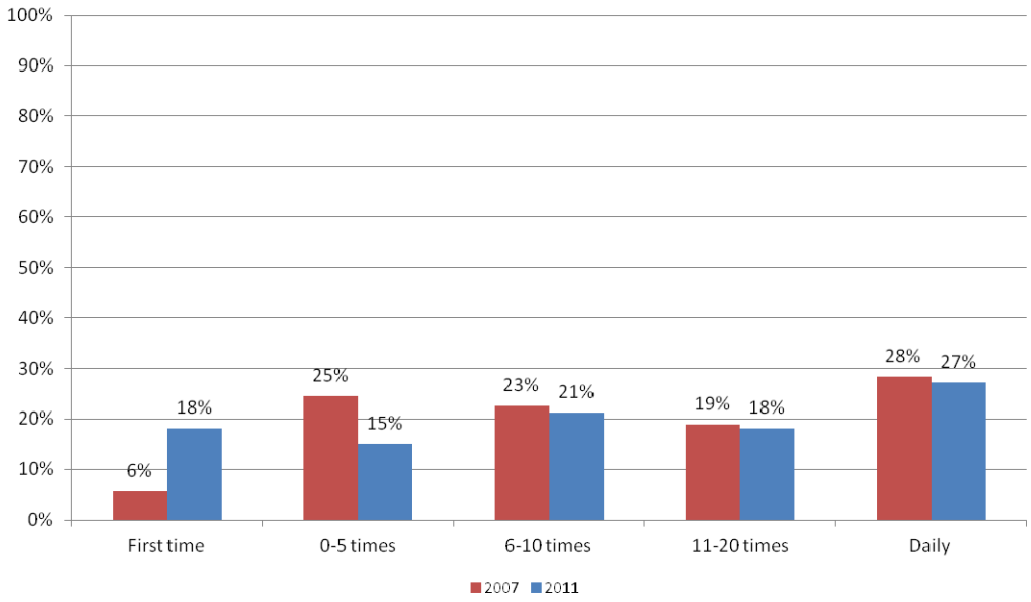

Figure B.2-2 Bicyclist Riding Frequency

Question 3

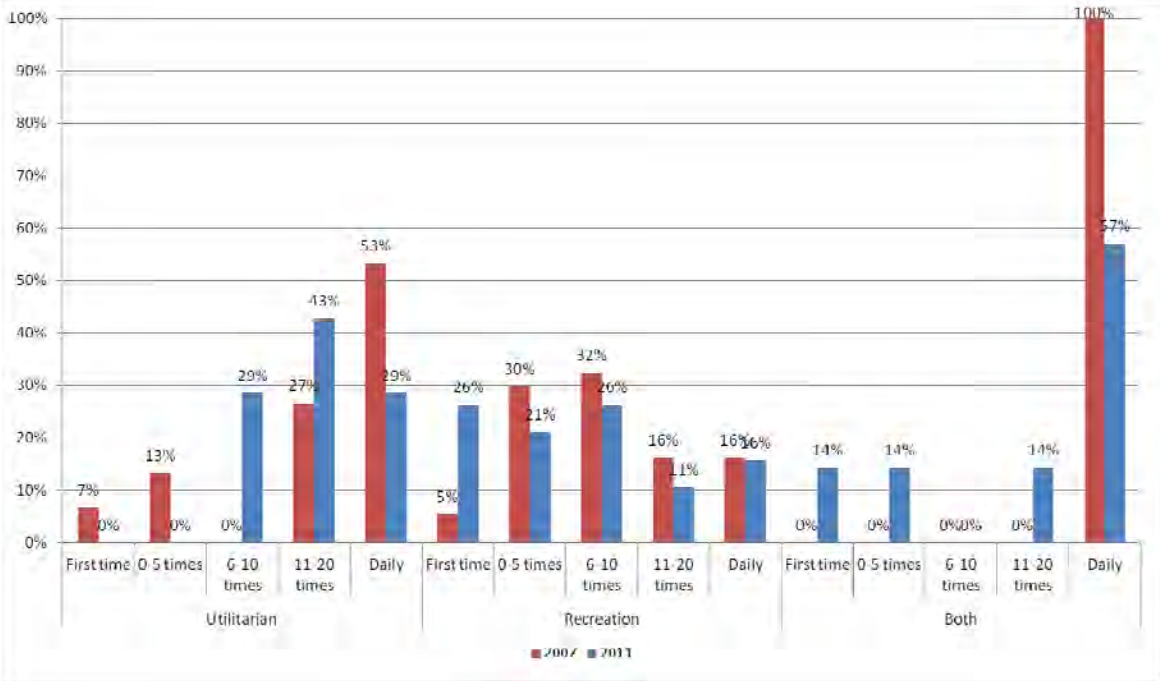

Figure B.2-3 Bicyclist Riding Frequency by Trip Purpose in One Month

Questions 2 and 3

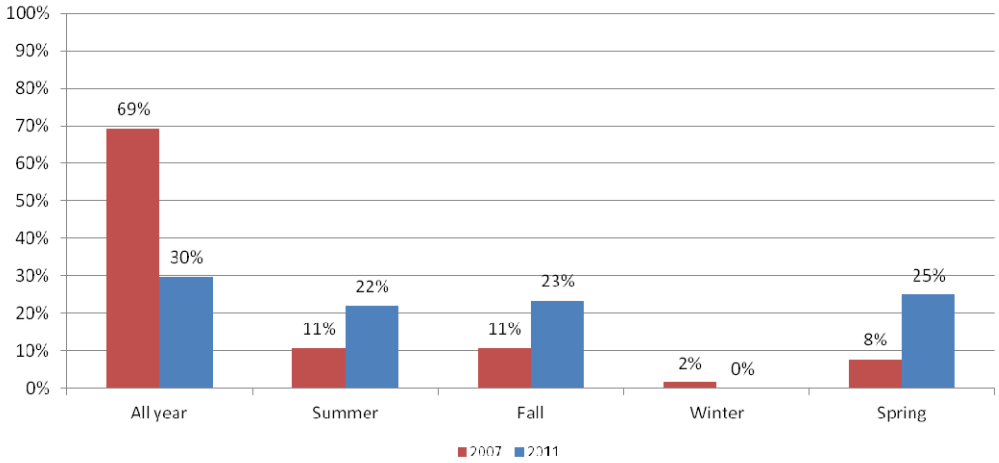

Figure B.2-4 Seasons in Which People Bicycle

Question 4

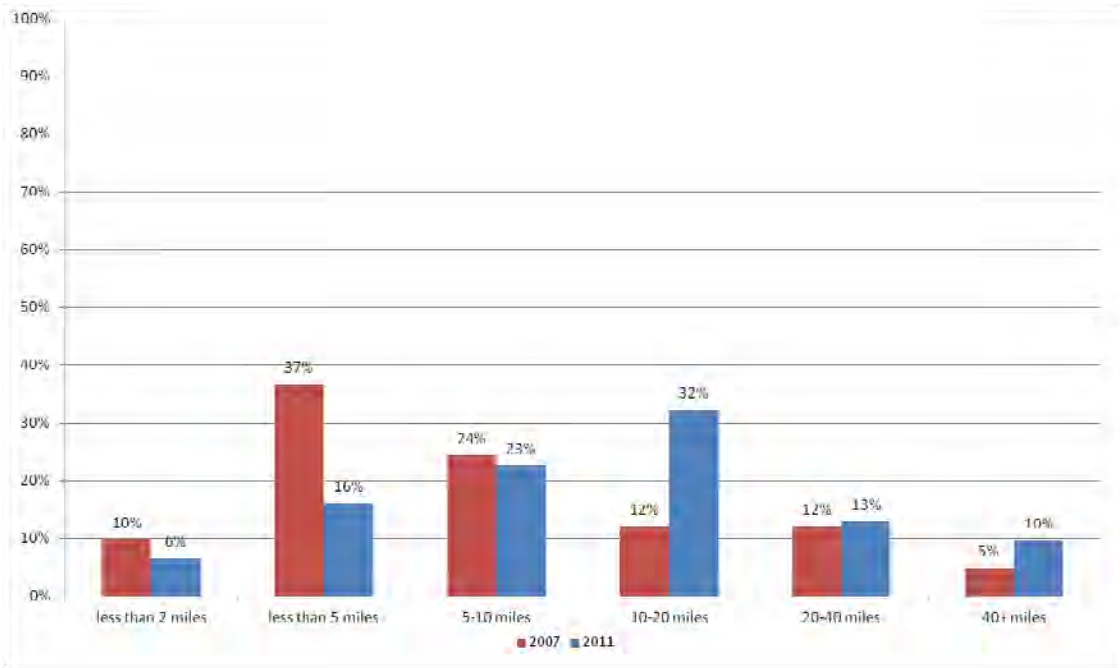

Figure B.2-5 Distance of Bicycling Trips

Question 5

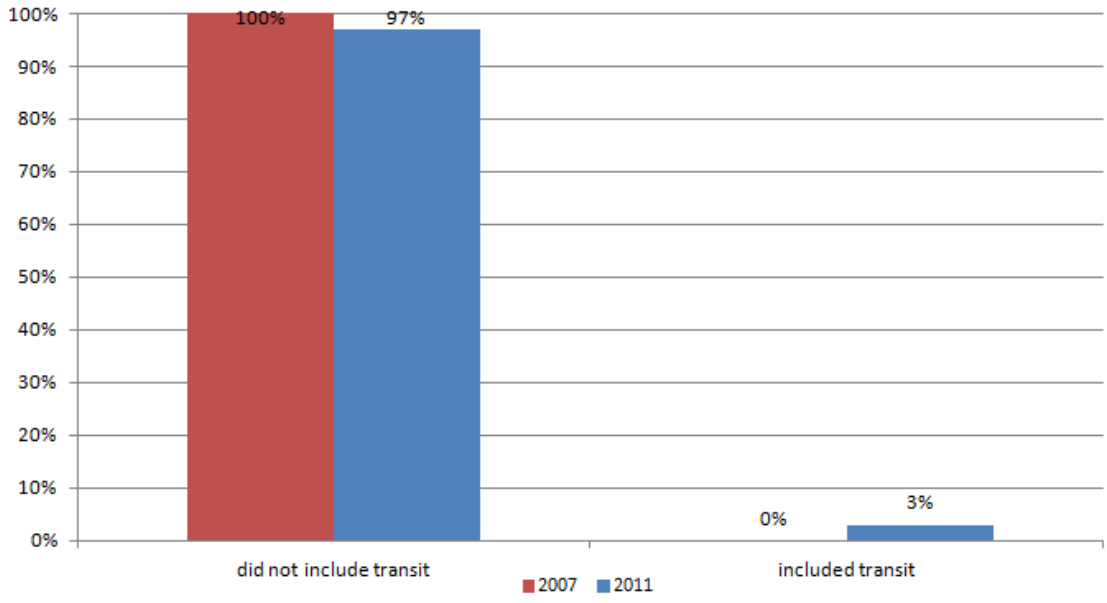

Figure B.2-6 Bicycling Trips that Included Transit

Question 6

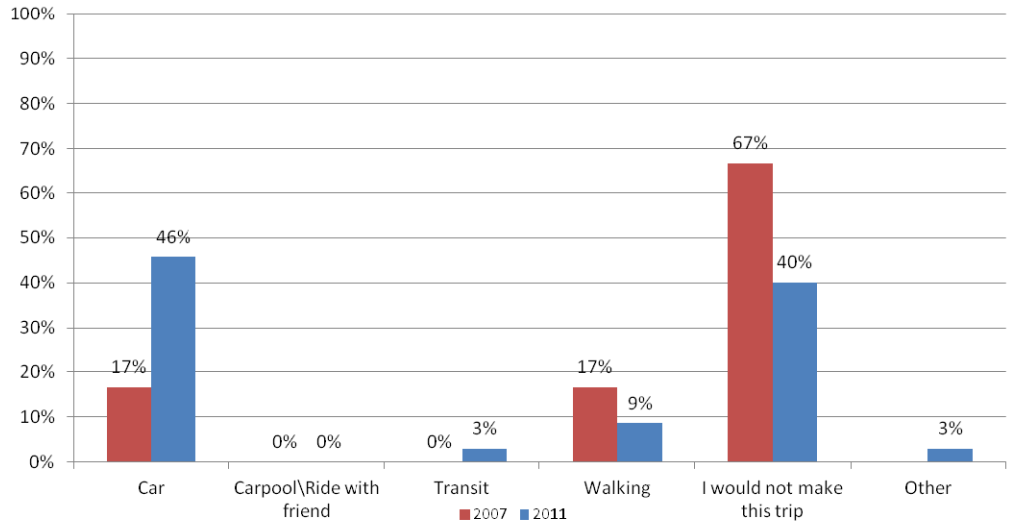

Figure B.2-7 Alternate Mode to Bicycling

Question 7

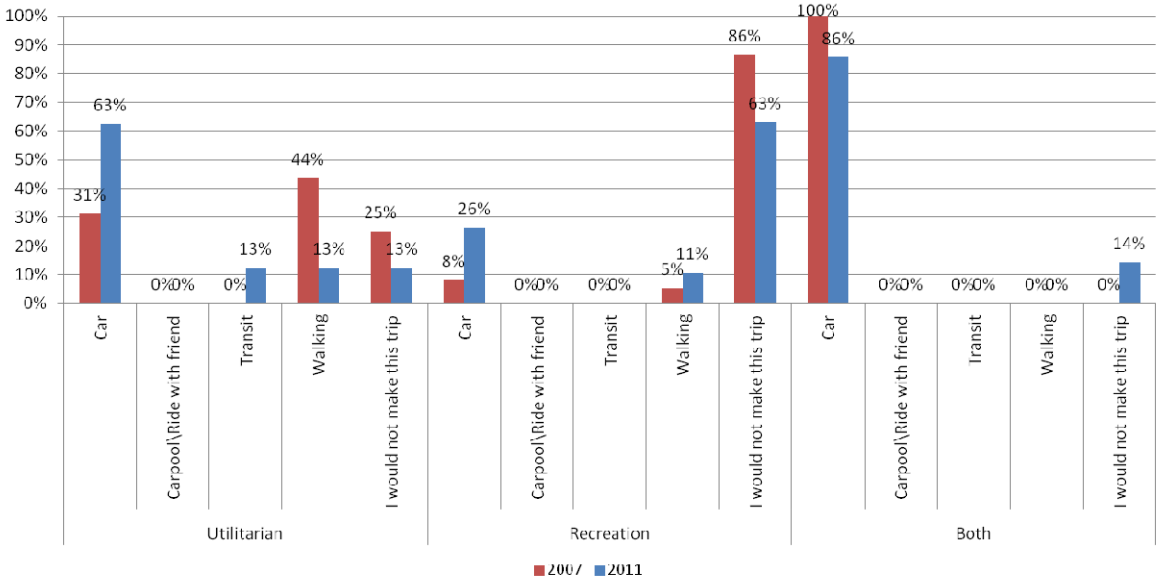

Figure B.2-8 Alternate Mode to Bicycling by Trip Purpose

Question 2 and 7

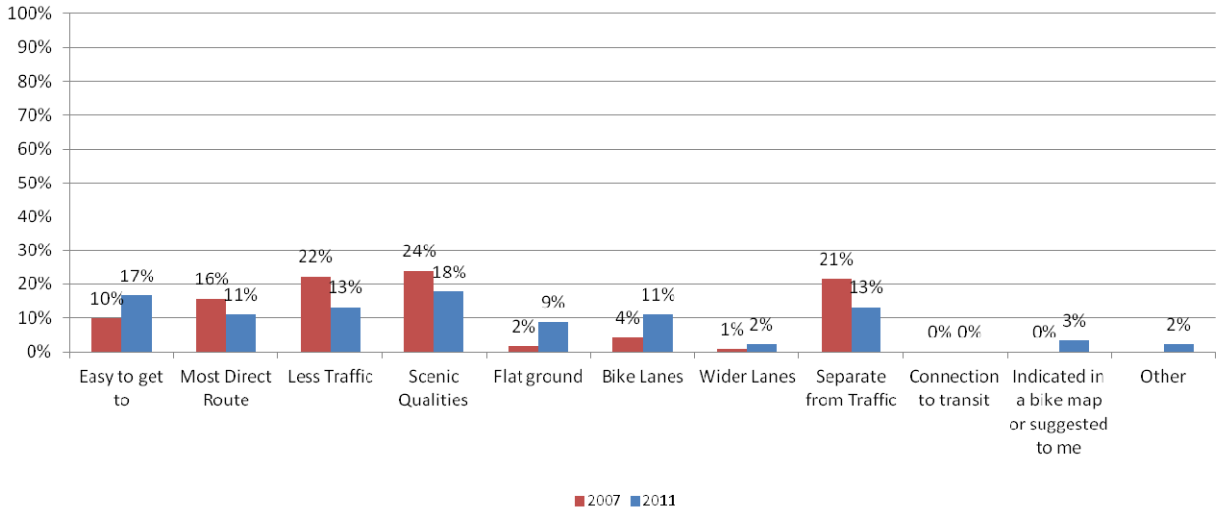

Figure B.2-9 Bicycling Route Choice

Question 8

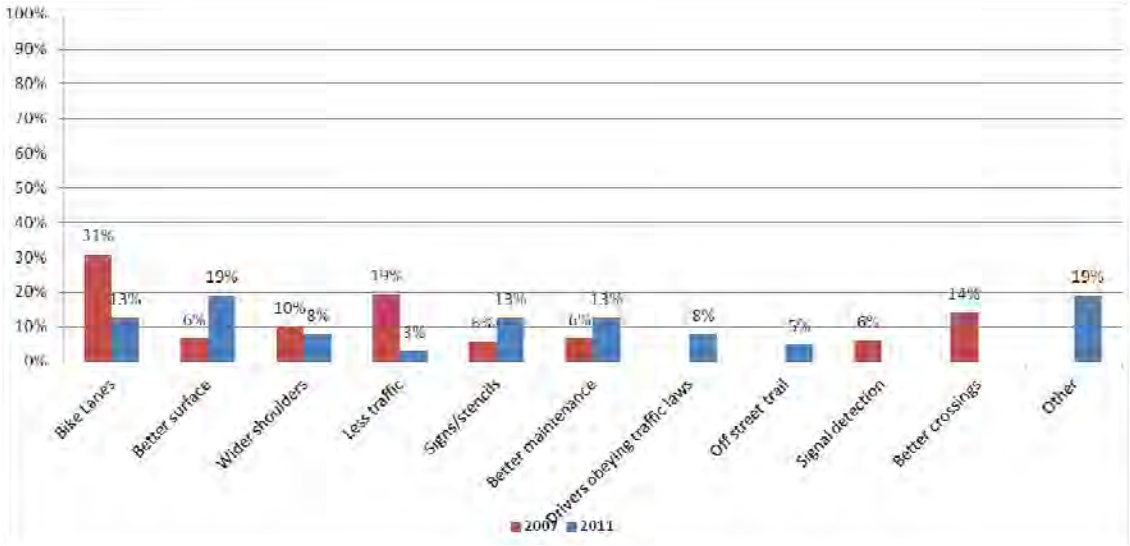

Figure B.2-10 Bicyclists Preference for Improvements along Their Route

Question 9

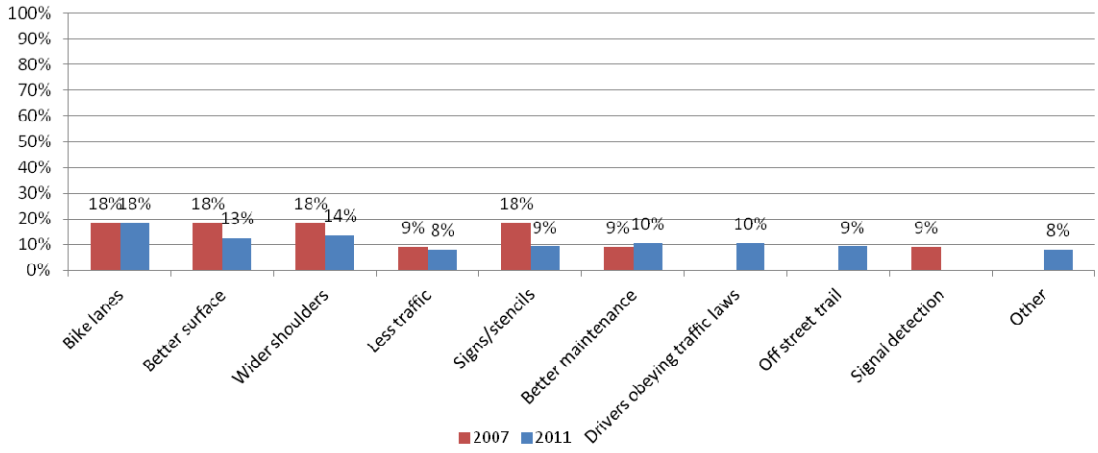

Figure B.2-11 Bicyclists Preferences for General Community Improvements

Question 10

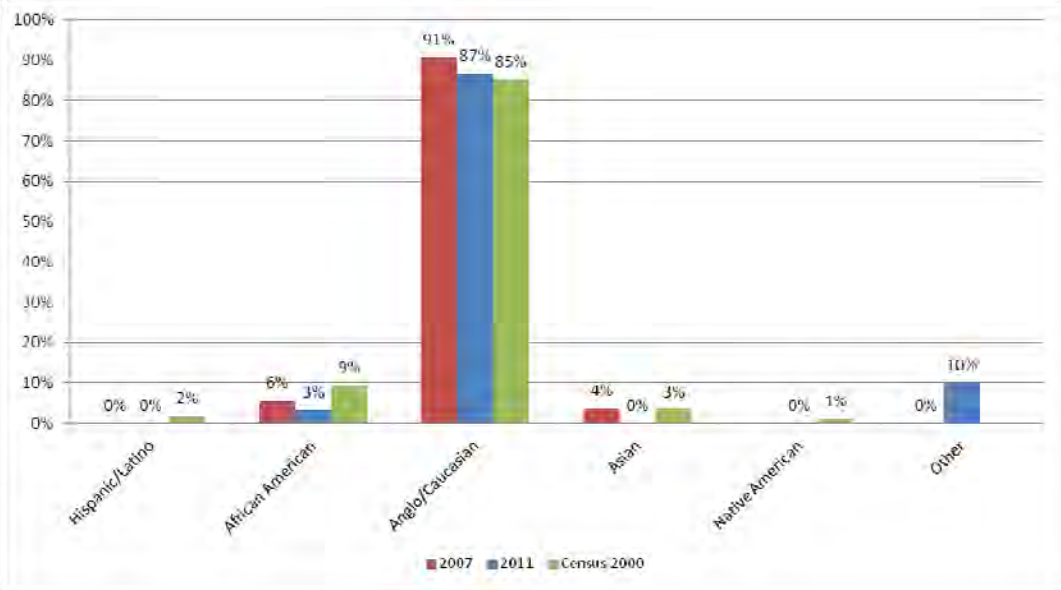

Figure B.2-11 Ethnicity of Bicyclists

Question 11

Form B-2

Bicyclist Survey Data Form

Columbia NTPP: Bicyclist Survey

This survey will provide valuable information on bicycling behavior and preferences. It will take about two minutes to complete.

1. What is your home zip code? _____

2. What best describes the purpose for this bicycle trip?

☐ Exercising (a) ☐ Work commute (b) ☐ School (c)
☐ Recreation/fun (d) ☐ Shopping/doing errands (e) ☐ Personal business (medical, visiting friends, etc.) (f)

3. In the past month (30 days), about how often have you ridden a bicycle here?

☐ First time (a) ☐ 0 – 5 times (b) ☐ 6 – 10 times (c) ☐ 11 – 20 times (d) ☐ Daily (e)

4. When do you bicycle? (check all that apply)

☐ Summer (b) ☐ Fall (c) ☐ Winter (d) ☐ Spring (e)

5. What is the length of this trip? _____ **(blocks) OR** _____ **(miles)**

How long will it take you to complete this bicycle trip? _____(hours/minutes)

Where did you begin the trip: _____ Address, intersection, or landmark?

6. Will any part of this current trip be taken on public transit (bus or train)?

☐ Yes (a) ☐ No (b)

7. If you were not biking for this trip, how would you be traveling?

☐ Car (a) ☐ Get ride from friend/family (b) ☐ Transit (bus or train) (c) ☐ Walking (d)
☐ I would not make this trip (e) ☐ Other _____ (f)

8. Why are you using this route and not a different route to your destination? (check all that apply)

☐ Easy to get to (a) ☐ Most direct route to my destination (b) ☐ Less traffic (c) ☐ Scenic qualities (d)
☐ Flat ground (e) ☐ Bike lanes (f) ☐ Wider lanes (g) ☐ Separated from traffic (h)
☐ Connection to transit (i) ☐ Indicated on a bike map or suggested to me (j)

9. What would you like to see improved <u>along this route</u> in general? (check all that apply)

☐ Painted bike lanes on the street (a) ☐ Better surface (b) ☐ Wider shoulders (c) ☐ Less traffic (d)
☐ Signs/stencils on the road to identify bicycle use (e) ☐ Better maintenance (sweeping, pothole repair, etc) (f)
☐ Drivers obeying traffic laws (g) ☐ Off-street trail (h) ☐ Other_____ (i)

10. What would you like to see improved <u>in the community</u> in general? (check all that apply)

☐ Painted bike lanes on the street (a) ☐ Better surface (b) ☐ Wider shoulders (c) ☐ Less traffic (d)
☐ Signs/stencils on the road to identify bicycle use (e) ☐ Better maintenance (sweeping, pothole repair, etc) (f)
☐ Drivers obeying traffic laws (g) ☐ Off-street trail (h) ☐ Other_____ (i)

11. What ethnic group do you belong to? ***(check all that apply)***

☐ Hispanic/Latino (a) ☐ African American (b) ☐ Anglo/Caucasian (d) ☐ Asian (c)
☐ Native American (e) ☐ Hmong (f) ☐ Somali (g) ☐ Other (h): _____

12. What is your age? ☐ **under 18 years** (a) ☐ **18 - 40** (b) ☐ **41 - 60** (c) ☐ **61 and over** (d)

13. What is your gender? ☐ **Male** (a) ☐ **Female** (b)

----------Office use only below this line----------

Location: _____ Date: _____ Time: _____

Surveyor: _____ Weather: _____

Appendix C: Pedestrian and Bicycle Demand Models

The following models provide an overview of the demand and benefits of bicycling and walking in Columbia. It is estimated that current levels of bicycling and walking replace 4,044 and 33,204 daily vehicle trips, respectively, which reduces CO_2 emissions by a combined 9,388,254 lbs per year.

The models used for the Non-Motorized Transportation Pilot Project study incorporate information from existing publications, the U.S. Census American Community Survey (ACS) and NTPP survey results for Columbia. All data assumptions and sources are noted in the tables. Variables used in the NTPP pedestrian and bicycle demand models include commuting patterns of working adults and predicted travel behaviors of area college students and school children. The primary model inputs are described below:

- **Work Commute Trips** - Population data for the existing labor force over 16 years of age (including the number of workers and percentage of pedestrian and bicycle commuters) were obtained from the ACS estimate for Columbia.
- **School Commute Trips** - ACS data was combined with data from National Safe Routes to School surveys (2003), which found that approximately 11 percent of school children walk to and from school every day while approximately 2 percent of school children bike to and from school each day.
- **College Commute Trips** – The number of people enrolled in undergraduate college, graduate or professional school was obtained from ACS data. The report assumes that college students walk and bike at the same rate as the working population. Data from the Federal Highway Administration indicate that this is a conservative estimate; nationally, 60 % of college students walk to school.
- **Transit Linked Trips** – Transit trips typically begin and end with a walking trip. The estimated number of walking trips linked with transit is derived from multiplying the working age population by the public transportation commute rate, both obtained from ACS data.
- **Utilitarian (non work or school) Trips** - The 2001 National Household Transportation Survey found that commute trips (including work and school trips) comprise only approximately a third of total trips; trips for shopping, recreation and socializing are a significantly greater proportion of total trips. Data from the NTPP surveys were used to estimate the ratio of utilitarian trips that are not for work or school as compared to work commute trips. This ratio was used to develop an estimate of utilitarian trips based on the work commute trip estimate calculated above.
- **Recreational/Discretionary Trips** – Similar to the above, NTPP survey data were used to estimate the ratio of recreational/discretionary trips to work commute trips. This ratio was used to develop an estimate of recreational/discretionary trips based on the work commute trip estimate calculated above.
- **Total Estimated Daily Bike or Walk Trips** – Calculated as the sum of the types of trips described above.

Table C-1
Pedestrian Demand Model Results

		Input	Calculated Totals	Source(s)
Work Commute Trips				
a. 2009 Population		100,898		American Community Survey 2007-2009
b. 2009 Employed Persons		54,203		American Community Survey 2007-2009
c. 2009 Pedestrian Commute Share		6.0%		American Community Survey 2007-2009
d. 2009 Pedestrian Commuters	commuters x2 = trips	3,252	6,504	
School Commute Trips				
e. 2009 Population, Ages 6-14		10,340		American Community Survey 2007-2009
f. 2009 Est. Pedestrian Commute Share		11%		National Safe Routes to School surveys, 2003
g. 2009 Pedestrian School Commuters	commuters x2 = trips	1,137	2,275	
College Commute Trips				
h. 2009 College Population		25,851		American Community Survey 2007-2009
i. 2009 Pedestrian Commute Share		6.0%		Identical to c.
j.2009 Pedestrian College Commuters	commuters x2 = trips	1,551	3,102	
Transit-Linked Trips				
k. Average daily transit trips			976	American Community Survey 2009
Utilitarian (non work or school) Trips				
l. percent of work walk trips		349%		Columbia NTPP Counts and Surveys*
m. estimated utility walkers			22,674	
Recreational/Discretionary Trips				
n. ratio of recreation/discretionary trips to work trips		568%		Columbia NTPP Counts and Surveys*
o. estimated rec/disc walkers			36,927	
p. Total Estimated Daily Walking Trips			72,459	
q. Average One-Way Travel Length (Miles)				
q1. Adults/College Students		1		Columbia NTPP Counts and Surveys
q2. School Children		0.25		Alice Tibbets MN assumptions of "walk zone"
r. Replaced vehicle trips				Columbia NTPP Counts and Surveys
r1. Utilitarian/work/school		48%		
r2. Nonutilitarian (recreation, personal business)		45%		
s. Reduced Daily Vehicle Trips			33,204	
t. Reduced Daily Vehicle Miles			32,385	Columbia NTPP Counts and Surveys

* Based on the average of 2007-2010 survey results

Table C-2
Bicycle Demand Model Results

		Input	Calculated Totals	Source(s)
Work Commute Trips				
a. 2009 Population		100,898		American Community Survey 2007-2009
b. 2009 Employed Persons		54,203		American Community Survey 2007-2009
c. 2009 Bicycle Commute Share		1.7%		American Community Survey 2007-2009
d. 2009 Bicycle Commuters	commuters x2 = trips	921	1,843	
School Commute Trips				
e. 2009 Population, Ages 6-14		10,340		American Community Survey 2007-2009
f. 2009 Est. Bicycle Commute Share		2%		National Safe Routes to School surveys, 2003
g. 2009 Bicycle School Commuters	commuters x2 = trips	207	414	
College Commute Trips				
h. 2009 College Population		25,851		American Community Survey 2007-2009
i. 2009 Bicycle Commute Share		1.7%		Identical to c.
j. 2009 Bicycle College Commuters	commuters x2 = trips	439	879	
Utilitarian (non work or school) Trips				
k. percent of work bicycle trips		92%		Columbia NTPP Counts and Surveys
l. estimated bicycle utility trips			1,689	
Recreational/Discretionary Trips				
m. ratio of recreational/discretionary trips to work trips		193%	350%	
n. estimated bicycle rec/disc trips			6,450	
o. Total Estimated Daily Bicycle Trips			11,275	
p. Average One-Way Travel Length (Miles)				
p1. Adults/College Students		3		Columbia NTPP Counts and Surveys
p2. School Children		0.5		
q. Replaced vehicle trips				Columbia NTPP Counts and Surveys
q1. Utilitarian/work/school		29%		
q2. Nonutilitarian (recreation, personal business)		41%		
r. Reduced Daily Vehicle Trips			4,044	
s. Reduced Daily Vehicle Miles			11,831	Columbia NTPP Counts and Surveys

Air Quality Benefits

The expected number of walking and biking trips in Columbia can be directly translated into reduced vehicle trips, as the current rates of walking and bicycling represent both residents and visitors using alternatives to driving. This number can be used to determine approximate reduction in vehicle miles traveled (VMT), which has the direct effect of reducing vehicular emissions. The number of reduced vehicle trips, VMT and the ensuing vehicle emissions reduction were estimated from the results of the demand models described above. The following tables illustrate the results of the vehicle trips, miles reduction and air quality benefits for pedestrian and bicycle trips, respectively.

Table C-3
Air Quality Benefits from Pedestrian Trips

Variable	Value	Source
Reduced Hydrocarbons (pounds/weekday)	97	Daily mileage reduction multiplied by 1.36 grams per reduced mile
Reduced PM10 (pounds/weekday)	0	Daily mileage reduction multiplied by 0.0052 grams per reduced mile
Reduced PM2.5 (pounds/weekday)	0	Daily mileage reduction multiplied by 0.0049 grams per reduced mile
Reduced NOX (pounds/weekday)	68	Daily mileage reduction multiplied by 0.95 grams per reduced mile
Reduced CO (pounds/weekday)	885	Daily mileage reduction multiplied by 12.4 grams per reduced mile
Reduced C02 (pounds/weekday)	26,345	Daily mileage reduction multiplied by 369 grams per reduced mile
Reduced Hydrocarbons (pounds/year)	25,343	Yearly mileage reduction multiplied by 1.36 grams per reduced mile
Reduced PM10 (pounds/year)	97	Yearly mileage reduction multiplied by 0.0052 grams per reduced mile
Reduced PM2.5 (pounds/year)	91	Yearly mileage reduction multiplied by 0.0049 grams per reduced mile
Reduced NOX (pounds/year)	17,703	Yearly mileage reduction multiplied by 0.95 grams per reduced mile
Reduced CO (pounds/year)	231,069	Yearly mileage reduction multiplied by 12.4 grams per reduced mile
Reduced C02 (pounds/year)	6,876,157	Yearly mileage reduction multiplied by 369 grams per reduced mile

* Annual benefits are calculated by multiplying the daily benefits by 261, the number of weekdays in a typical year.

Table C-4
Air Quality Benefits from Bicycle Trips

Variable	Value	Source
Reduced Hydrocarbons (pounds/weekday)	35	Daily mileage reduction multiplied by 1.36 grams per reduced mile
Reduced PM10 (pounds/weekday)	0	Daily mileage reduction multiplied by 0.0052 grams per reduced mile
Reduced PM2.5 (pounds/weekday)	0	Daily mileage reduction multiplied by 0.0049 grams per reduced mile
Reduced NOX (pounds/weekday)	25	Daily mileage reduction multiplied by 0.95 grams per reduced mile
Reduced CO (pounds/weekday)	323	Daily mileage reduction multiplied by 12.4 grams per reduced mile
Reduced C02 (pounds/weekday)	9,625	Daily mileage reduction multiplied by 369 grams per reduced mile
Reduced Hydrocarbons (pounds/year)	9,259	Yearly mileage reduction multiplied by 1.36 grams per reduced mile
Reduced PM10 (pounds/year)	35	Yearly mileage reduction multiplied by 0.0052 grams per reduced mile
Reduced PM2.5 (pounds/year)	33	Yearly mileage reduction multiplied by 0.0049 grams per reduced mile
Reduced NOX (pounds/year)	6,467	Yearly mileage reduction multiplied by 0.95 grams per reduced mile
Reduced CO (pounds/year)	84,417	Yearly mileage reduction multiplied by 12.4 grams per reduced mile
Reduced C02 (pounds/year)	2,512,097	Yearly mileage reduction multiplied by 369 grams per reduced mile

* Annual benefits are calculated by multiplying the daily benefits by 261, the number of weekdays in a typical year.

Emissions rates are from EPA report 420-F-05-022 "Emission Facts: Average Annual Emissions and Fuel Consumption for Gasoline-Fueled Passenger Cars and Light Trucks." 2005.

Appendix D: Maps and Photos of Count and Survey Locations

Location 1: Broadway, between 8th and 9th St.

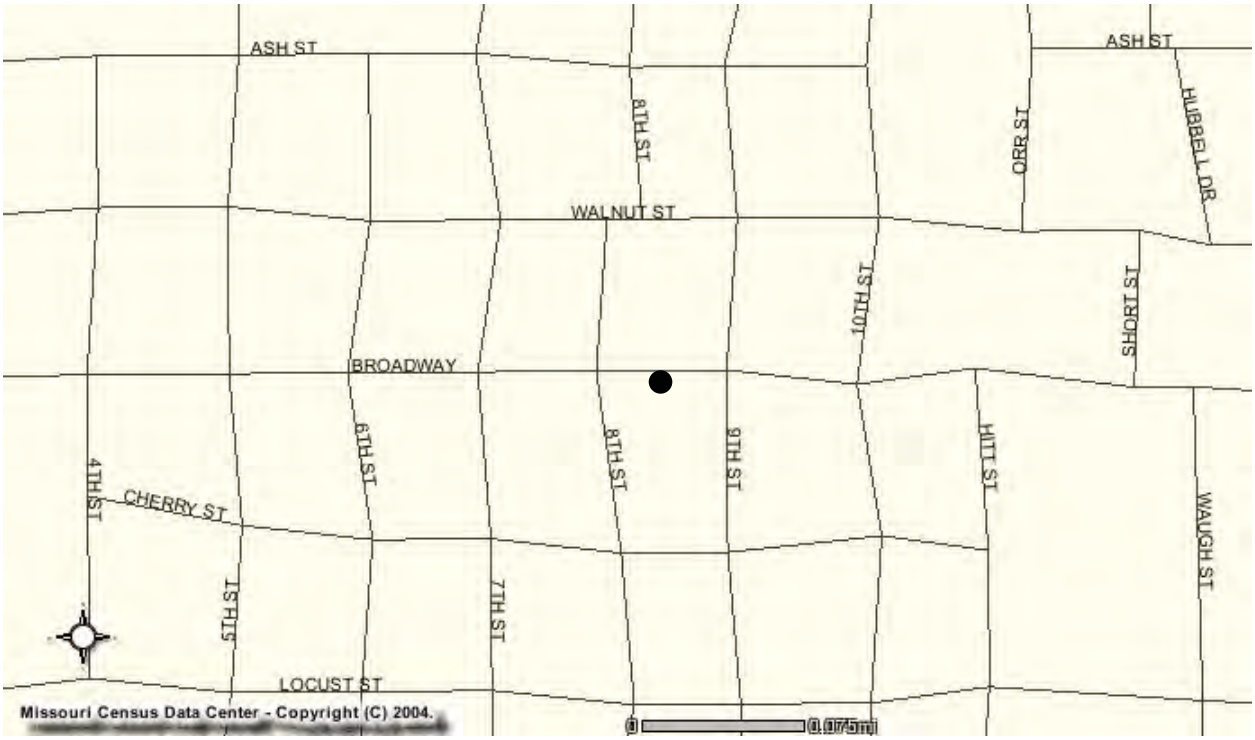

Fig. D-1. Map of Location 1

Fig. D-2. Photograph of Location 1

Location 2: MKT Trailhead

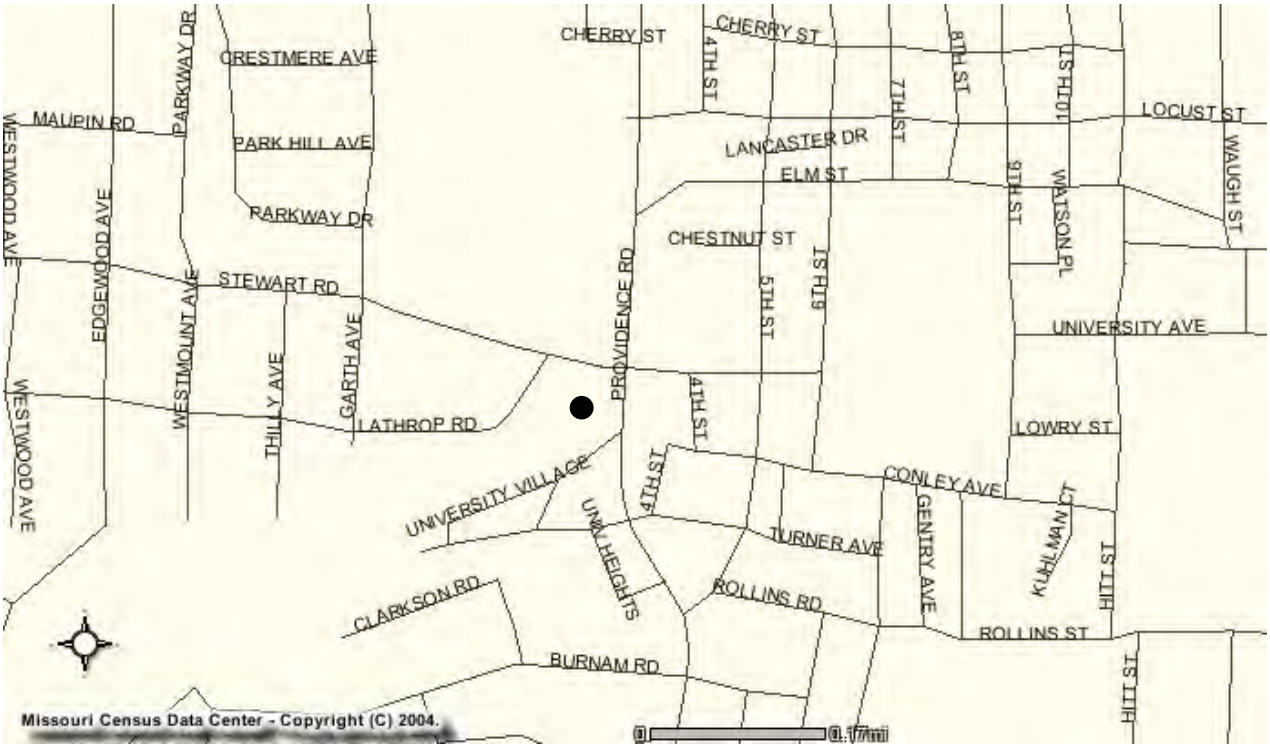

Fig. D-3. Map of Location 2

Fig. D-4. Photograph of Location 2

Location 3: Clinkscales

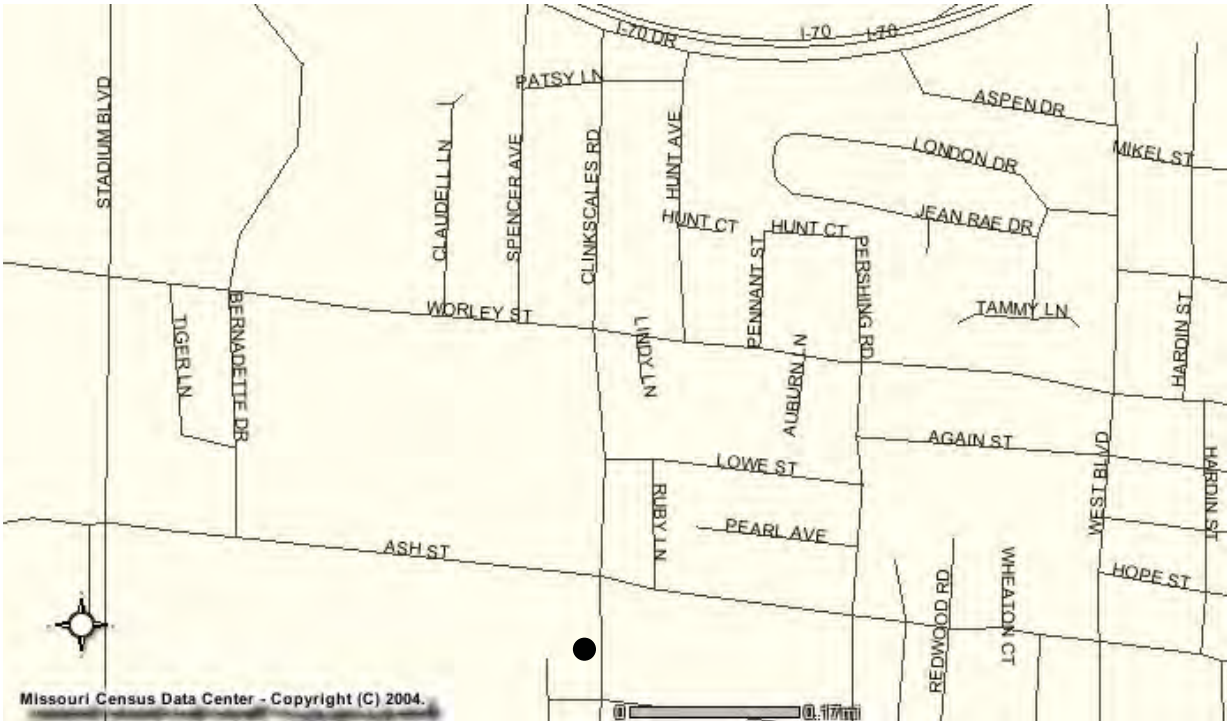

Fig. D-5. Map of Location 3

Fig. D-6. Photograph of Location 3

Location 4: Nifong

Fig. D-7. Map of Location 4

Fig. D-8. Photograph of Location 4

Location 5: Stadium-Forum Connector

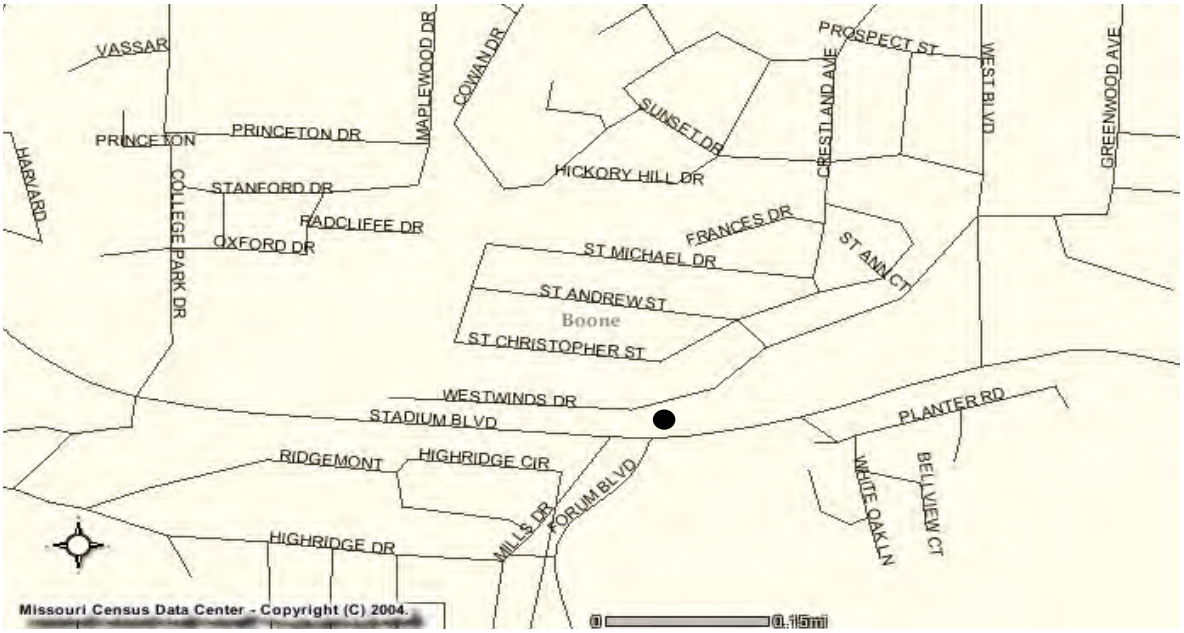

Fig. D-9. Map of Location 5

Fig. D-10. Photograph of Location 5

Location 6: Ashland Road at Burch

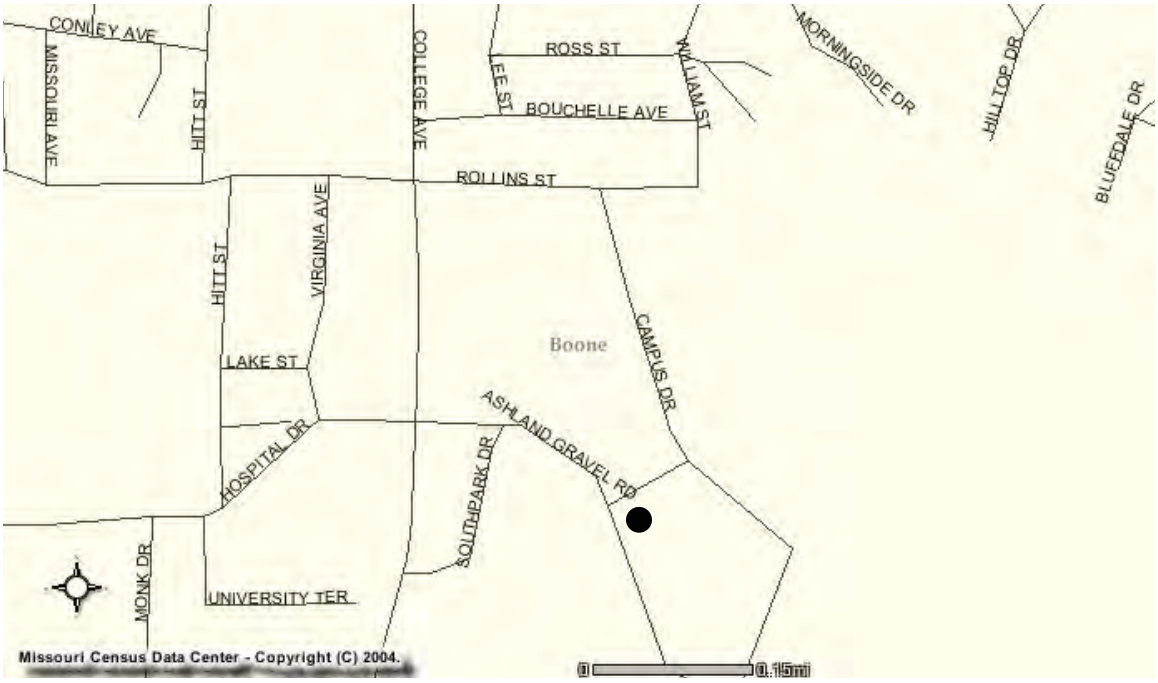

Fig. D-11. Map of Location 6

Fig. D-12. Photograph of Location 6

Location 7: Bear Creek Trail

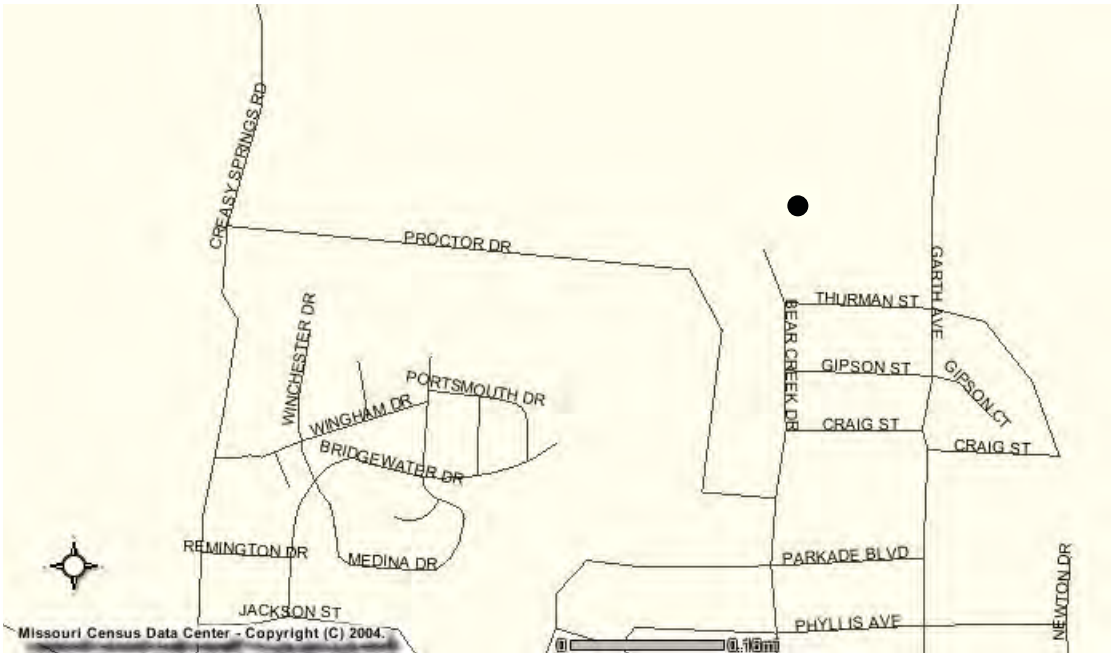

Fig. D-13. Map of Location 7

Fig. D-14. Photograph of Location 7