4. Needs Analysis

This chapter presents an overview of the needs of bicyclists in the City of Columbus.

4.1. Needs and Types of Bicyclists

The needs and preferences of bicyclists vary depending on the skill level of the cyclist and the type of trip the cyclist is taking. For example, bicyclists who bicycle for recreational purposes may prefer scenic, winding, off-street trails, while bicyclists who bicycle to work or for errands may prefer more direct on-street bicycle facilities. Child bicyclists, seniors, and adults new to bicycling may prefer shared-use paths, while adult bicyclists with many years of experience may prefer bicycle lanes. Cyclists also include utilitarian cyclists who choose to live with one less car, and people who ride because they have no other transportation option due to economic conditions. An effective bicycle network provided facilities for all user types. The following sections describe the different types of bicyclists, the different reasons for bicycling, and the respective needs of these categories of bicyclists.

4.1.1. Needs of Casual and Experienced Bicyclists

Bicyclists can be separated into two skill levels: casual and experienced. Casual bicyclists have limited bicycle-handling skills. This category includes youth and many infrequent adult riders. The majority of bicyclists are casual. Some casual bicyclists may be unfamiliar with operating a vehicle on roads and related laws. Experienced bicyclists are skilled in riding on streets with motor vehicles and vehicular operation of a bicycle. This group includes commuters, long-distance road bicyclists, racers, and many who use their bicycle as a primary means of transportation. A summary of the needs of the different types of bicyclists is provided below in **Table 4-1: Characteristics of Casual and Experienced Bicyclists**.

Table 4-1: Characteristics of Casual and Experienced Bicyclists

Casual Riders	Experienced Riders
Prefer off-street, shared-use paths or bike lanes along low-volume, low-speed streets.	Prefer on-street or bicycle-only facilities to multi-use paths.
May have difficulty gauging traffic and may be unfamiliar with rules of the road. May walk bike across intersections.	Comfortable riding with vehicles on streets. Negotiates streets like a motor vehicle, including "taking the lane" and using left-turn pockets.
May use less direct route to avoid arterials with heavy traffic volumes.	May prefer a more direct route.
May ride on sidewalks and ride the wrong way on streets and sidewalks.	Avoids riding on sidewalks or on multi-use paths. Rides with the flow of traffic on streets.
May ride at speeds comparable to walking, or slightly faster than walking.	Rides at speeds up to 20 mph on flat ground, up to 40 mph on steep descents.
Cycles shorter distances: up to 2 miles.	May cycle longer distances, sometimes more than 100 miles.

The casual bicyclist will benefit from route markers, multi-use paths, bike lanes on lower-volume streets, traffic calming, and share the road and educational programs. To encourage youth to ride, routes must be safe enough for their parents to allow them to ride.

Children bicycling in Columbus

The experienced bicyclist will benefit from a connected network of bike lanes on higher-volume arterials, wider curb lanes, and bicycle actuation at signals. The experienced bicyclist who is primarily interested in exercise will benefit from loop routes that lead back to the point of origin.

Both types of bicyclists will benefit from intersection improvements that make road crossings, easy, comfortable and quick.

An experienced bicyclist in traffic on Front Street

Columbus' shared-use paths offer many good opportunities for casual bicyclists. However, connections between paths and residential neighborhoods need to be created. Many experienced bicyclists, including those who bicycle long distances for exercise, also use the shared-use paths within the City. This combination of fast-moving bicyclists on training rides with slower-moving casual bicyclists and pedestrians results in user conflicts.

4.1.2. Characteristics of Recreational and Utilitarian Trips

Bicycle trips can be separated into two trip types: recreational and utilitarian. The majority of bicycle trips are recreational. Recreational trips can range from 50-mile weekend group rides along rural roads, to a family outing along the Alum Creek Trail, and all levels in between. Utilitarian trips include commuter bicyclists, which are a primary focus of state and federal bicycle funding, as well as bicyclists going to school, shopping, or running other errands. Utilitarian cyclists include those who choose to live with one less car, as well as those who cannot afford a car. Please see **Table 4-2: Characteristics of Recreational and Utilitarian Trips**.

Table 4-2: Characteristics of Recreational and Utilitarian Trips

Recreational Trips	Utilitarian Trips
Directness of route not as important as visual interest, shade, protection from wind.	Directness of route and connected, continuous facilities more important than visual interest, etc…
Loop trips may be preferred to backtracking.	Trips generally travel from residential to shopping or work areas and back.
Trips may range from under a mile to over 50 miles.	Trips generally are 1-5 miles in length.
Varied topography may be desired, depending on the skill level of the cyclist.	Flat topography is desired.
May be riding in a group.	Often ride alone.
May drive with their bicycles to the starting point of a ride.	Use bicycle as primary transportation mode for the trip; may transfer to public transportation; may or may not have access to a car for the trip.
Trips typically occur on the weekend or on weekdays before morning commute hours or after evening commute hours.	Trips typically occur during morning and evening commute hours (commute to school and work) and on weekends.
Type of facility varies, depending on the skill level of cyclist.	Generally use on-street facilities, may use pathways if they provide easier access to destinations than on-street facilities.

Recreational bicyclists' needs vary depending on their skill level. Road bicyclists out for a 100-mile weekend ride may prefer well-maintained roads with wide shoulders and few intersections, and few stop signs or stop lights. Casual bicyclists out for a family trip may prefer a quiet shared use path with adjacent parks, benches, and water fountains.

Utilitarian bicyclists have needs that are more straightforward:

- Bike routes should be direct, continuous, and connected.
- Wayfinding signage that includes destinations and distance are useful.
- Intersections should accommodate bicyclists through improvements such as bicycle actuated signals, turn pockets, advance bicycle boxes, and advance bike signals.
- Bicycle commuters must have secure places to store their bicycles at their destinations.
- Bicycle facilities should be provided on arterials.

Columbus' trail system provides excellent access to the downtown core and to The Ohio State University from neighborhoods along the Olentangy River Trail. However, not all neighborhoods have easy bicycle access to employment centers, schools and shopping. For the casual recreational rider, this may not be a serious deterrent, since they would be willing and able to drive their bicycle to a trailhead. However, this may not be an option for the experienced recreational rider or the commuter, as they generally would like to use their bicycle for the whole trip.

To increase the number of people who ride their bike for everyday activities, a continuous network of low-speed, bicycle-friendly streets should be developed.

4.2. Demand Analysis

This section uses a variety of demand models to estimate the usage of Columbus' existing bicycle facilities, and to estimate the potential usage of new facilities. The models used for this study incorporate information from bicycle research as well as data from the U.S. Census. Data assumptions and sources are footnoted in the tables. These models give an estimate of existing bicycle activity levels and geographic distribution of bicycling.

The model results are used to plan bicycle facilities that serve high-demand and high-activity-level areas and to prioritize the implementation of bicycle facilities.

4.2.1. Existing Bicycle Demand

The City of Columbus bicycle demand model uses bicycle mode share, student population and transit ridership to estimate the total number of daily bicycle trips in Columbus. The study area includes all residents within the City of Columbus and is calculated using 2005 data. Data regarding the existing labor force (including number of workers and percentage of bicycle commuters) was obtained from the 2005 Census and American Community Survey. **Figure 4-1: 2005 Journey to Work Data, City of Columbus, Ohio** shows estimated commuter patterns in Columbus for 2005.

Subject	Total	Margin of Error	Male	Margin of Error	Female	Margin of Error
Workers 16 years and over	336,964	+/-6,918	174,097	+/-4,783	162,867	+/-4,513
MEANS OF TRANSPORTATION TO WORK						
Car, truck, or van	91.6%	+/-0.7	91.3%	+/-1.0	92.0%	+/-1.0
Drove alone	82.7%	+/-1.1	81.8%	+/-1.4	83.8%	+/-1.4
Carpooled	8.9%	+/-0.9	9.5%	+/-1.2	8.2%	+/-1.1
In 2-person carpool	6.7%	+/-0.7	6.6%	+/-0.8	6.9%	+/-1.0
In 3-person carpool	1.1%	+/-0.4	1.3%	+/-0.6	0.8%	+/-0.4
In 4-or-more person carpool	1.1%	+/-0.4	1.6%	+/-0.7	0.5%	+/-0.3
Workers per car, truck, or van	1.15	+/-0.01	1.16	+/-0.02	1.14	+/-0.01
Public transportation (excluding taxicab)	2.9%	+/-0.4	3.1%	+/-0.6	2.8%	+/-0.6
Walked	1.6%	+/-0.4	1.8%	+/-0.5	1.5%	+/-0.4
Bicycle	0.6%	+/-0.2	0.9%	+/-0.4	0.3%	+/-0.2
Taxicab, motorcycle, or other means	0.4%	+/-0.1	0.5%	+/-0.2	0.3%	+/-0.2
Worked at home	2.8%	+/-0.4	2.4%	+/-0.6	3.1%	+/-0.6

Figure 4-1: 2005 Journey to Work Data, City of Columbus, Ohio

Source: US Census, American Community Survey, 2005

Journey to work trends from the U.S. Census (**Table 4-3: Journey to Work Trends, Columbus, OH**) show that the percentage of people primarily commuting to work by bicycle has slightly increased since 1990. This is notable, since nationwide trends show that bicycle commute mode share has decreased in most areas. The slight increase in bicycle mode share in Columbus may be a result of the number of shared use paths the City built in the 1990's, and may also be attributed to COTA placing bike racks on its buses.

Table 4-3: Journey to Work Trends, Columbus, OH

City of Columbus, Ohio					
Means of Transportation to Work	**2005 Estimate**			**2000**	**1990**
Bicycle	0.6%	+/-	0.2%	0.3%	0.4%
Walked	1.6%	+/-	0.4%	3.2%	4.2%
Worked at home	2.8%	+/-	0.4%	2.3%	1.8%
Transit	2.9%	+/-	0.4%	3.9%	4.6%
Percentage of Commute Trips not in Private Vehicles	8.0%	+/-	1.4%	9.8%	11.0%

Source: U.S. Census Bureau, American Fact Finder, 2000 Summary File 3and 1990 Summary Tape File, and American Community Survey, 2005 Summary Tables, Generated by Alta Planning + Design.

Table 4-4: Aggregate Estimate of Existing Daily Bicycling Activity in Columbus, OH summarizes the estimated number of bicycle trips made each day in Columbus. The table indicates that over 126,000 trips are made on a daily basis. The model also shows that non-commuting trips comprise the vast majority of existing bicycle demand.

Table 4-4: Aggregate Estimate of Existing Daily Bicycling Activity in Columbus, OH

Variable	Figure	Calculations
Employed Adults, 16 Years and Older		
a. Study Area Population (1)	730,657	
b. Employed Persons (2)	336,964	
c. Bicycle Commute Mode Share (2)	0.60%	
d. Bicycle Commuters	2,022	(b*c)
e. Work-at-Home Percentage (2)	2.80%	
f. Work-at-Home Bicycle Commuters (3)	4,717	[(b*e)/2]
School Children		
g. Population, ages 6-14 (4)	92,063	
h. Estimated School Bicycle Commute Mode Share (5)	2%	
i. School Bicycle Commuters	1,841	(g*h)
College Students		
j. Full-Time College Students (6)	82,102	
k. Bicycle Commute Mode Share (7)	10%	
l. College Bicycle Commuters	8,210	(j*k)
Work and School Commute Trips Sub-Total		
m. Daily Bicycle Commuters Sub-Total	16,790	(d+f+i+l)
n. Bike on Bus Boardings (Average Daily) (8)	213	(m+i)
o. Daily Bicycle Commute Trips Sub-Total	34,006	((m+n)*2)
Other Utilitarian and Discretionary Trips		
p. Ratio of "Other" Trips in Relation to Commute Trips (9)	2.73	ratio
q. Estimated Non-Commute Trips	92,837	(o*p)
Total Estimated Daily Bicycle Trips	**126,844**	(o+q)

Notes:

Census data collected from 2005 U.S. Census, American Community Survey for City of Columbus, OH.

(1) 2005 U.S. Census, American Community Survey STF3, P1.
(2) 2005 U.S. Census, American Community Survey S0801. Full time workers over age 16.
(3) Assumes 50% of population working at home makes at least 1 daily bicycle trip.
(4) 2005 U.S. Census, American Community Survey S0101
(5) Estimated share of school children who commute by bicycle, as of 2000 (source: National Safe Routes to School Surveys, 2003).
(6) Fall 2006 full-time enrollment (The Ohio State University, Franklin University, Columbus State)
(7) Review of bicycle commute mode share in 7 university communities (source: National Bicycling & Walking Study, FHWA, Case Study #1, 1995).
(8) Average Number of Daily Bike Boardings on COTA Transit for the Period of May 1, 2004 through April 30, 2007 – 0.25% of all boardings Source: Central Ohio Transit Authority
(9) 27% of all trips are commute trips (source: National Household Transportation Survey, 2001).

In addition to people commuting to the workplace via bicycle, the model incorporates a portion of the labor force working from home. It was assumed that half of those working from home would make at least one bicycling or walking trip during the workday. Data from the 2005 American Community Survey was used to estimate the number of children in Columbus. This figure was combined with data from National Safe Routes to School surveys to estimate the proportion of children riding bicycles to and from school. Enrollments from The Ohio State University, Franklin State University and Columbus State were used to estimate college populations. Data from the Federal Highway Administration regarding bicycle mode share in university communities was used to estimate the number of students bicycling to and from these campuses. Bicycle trips associated with transit were estimated from COTA's bicycle boarding surveys. Finally, data regarding non-commute trips was obtained from the 2001 National Household Transportation Survey to estimate bicycle trips not associated with traveling to and from school or work.

4.2.2. Geographic Distribution of Bicycle Demand

To guide route selection and prioritization process, we looked at the geographic distribution of bicycle demand. Two maps were generated: **Figure 4-2: Areas with Potential for High Bicycling in Columbus**, which uses 2000 Census data to indicate locations that have populations that are likely to bike, and **Figure 4-3: Destination Density**, which indicates the areas that are likely to attract bicyclists. These maps are representative of current conditions, and may change based on changes in demographics, land use, and destinations.

The variables used to generate Figure 4-2 are listed in **Table 4-5: Factors used to Estimate Areas with High Potential for Bicycling.** Census data was used to calculate population density (population per block group), household density (number of dwelling units per acre), and socio-economic factors that may affect bicycle ridership (density of college students and density of zero-car households, percentage of commute trips under nine minutes, percentage of people who bike to work).

To develop Figure 4-3, regional land use data was used and weighted by trip percentages established from a 2000 MORPC travel survey. Factors that were included in the map are: density of shopping centers, parks, recreational areas, employment areas, schools, and places of worship. The characteristics are indicated below in **Table 4-6: Factors Used to Calculate Destination Density**.

Table 4-5: Factors used to Estimate Areas with High Potential for Bicycling

Factor	Source	Calculation	Rational for Calculation
Estimated number of bicycles from Households with No Vehicles (Block Group)	US Census 2000	Number of no Vehicle Households * 10% * Average people per HH	"About 10% of households that don't own a motorized vehicle make bike trips in a given day, compared to 4% of vehicle-owning households." From University of MN fact page[1]
Housing Units Per Acre (block group)	US Census 2000	0 to 5 hh/acre = -5 5.1 to 9.9 HH/acre = 0 10 to 13.9 hh/acre= 5 points 14 to 28 hh/acre=10 points	Walking rates only start to increase at residential densities over 14 households per acre.
Estimated number of people with commute under nine minutes that convert to biking (block group)	US Census 2000	number of people * 0.1	9 minute car ride at 32 mph (national average per NHTS) is equal to 4.6 mile bike ride. Assuming 10% can be captured to bike
Estimated number of adults who bicycle every day (block group)	US Census 2000	Population over 18 *(0.3% + 1.5*bicycle commute mode share)	Based on formula derived from University of Minnesota Study (Barnes & Krizek)

/1 http://www.hhh.umn.edu/centers/slp/bike_basicfacts.html accessed July 8, 2007

Table 4-6: Factors Used to Calculate Destination Density

Type of Attractor	Land Uses	Source	Weight (percent of trips)
Family & Personal Business	Public Services Shopping Centers	Franklin Co. Auditor	0.54
Social & Recreational	Cultural Sites Fairgrounds Museums Music & Sports Venues Parks and Rec (weighted .5)	MORPC MORPC MORPC MORPC MORPC	0.12
Work and Work Related	Government Bldgs Office Parks Office Towers	MORPC MORPC MORPC	0.22
School & Church	Schools Places of Worship	Franklin Co. Auditor Franklin Co. Auditor	0.12

Weights of each location are calculated based on the MORPC trip percentages from the 2000 Travel Survey. The MORPC survey found that all trips in the region could be broken down into the following percentages:

36%	Family & Personal Business
33%	Home
12%	To work
8%	School and Church
8%	Social and Recreational
3%	Work related

To calculate the weighting factors in the destination density model, the home trips were removed (this model focuses on non-home activity centers), work and work-related were combined, and the relative weights of the locations were adjusted to account for the fact that home trips were removed.

The results of these models were used as one of several criteria used to prioritize proposed bicycle facilities. A full discussion of the prioritization is included in Chapter 7.

4.3. Benefits Analysis

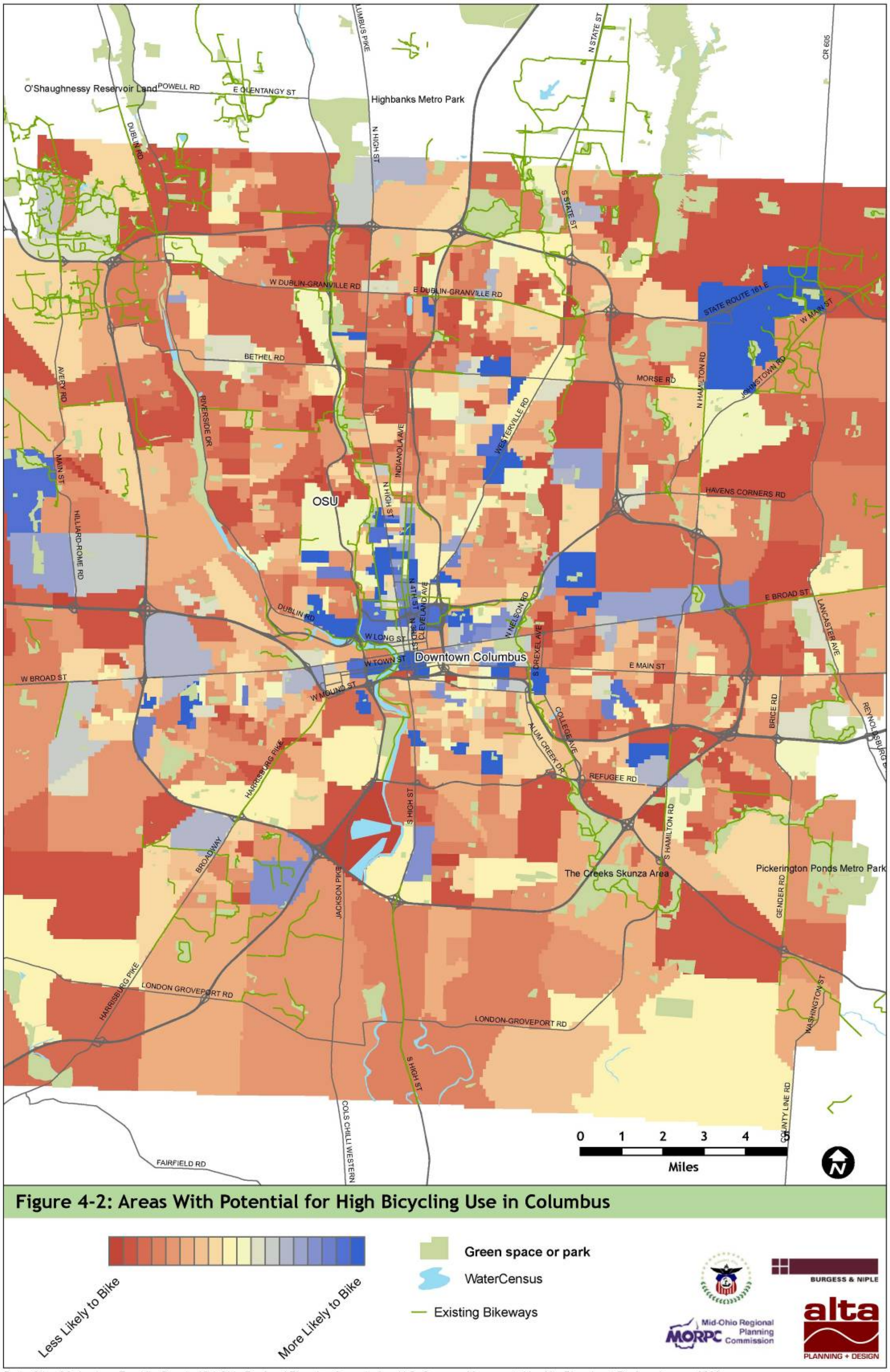
4.3.1. Air Quality Benefits

Non-motorized travel directly and indirectly translates into fewer vehicle trips, and an associated reduction in vehicle miles traveled and auto emissions. Working from the estimate of existing daily bicycle trips described in table 4-4, we can calculate the estimated benefits of bicycle riding in Columbus.

Assumptions were used to estimate the number of reduced vehicle trips and vehicle miles traveled, as well as vehicle emissions reductions. In terms of reducing vehicle trips, it was assumed that 73 percent of bicycle trips taken by adults and college students would replace vehicle trips, and 53 percent of bicycle trips taken by schoolchildren would replace vehicle trips. To estimate the reduction of existing and future vehicle miles traveled, a bicycle roundtrip distance of eight miles was used for adults and college students; and one mile for schoolchildren. For pedestrian trips, a roundtrip distance of 1.2 miles was used for adults and college students, and a 0.5 mile distance was used for children.

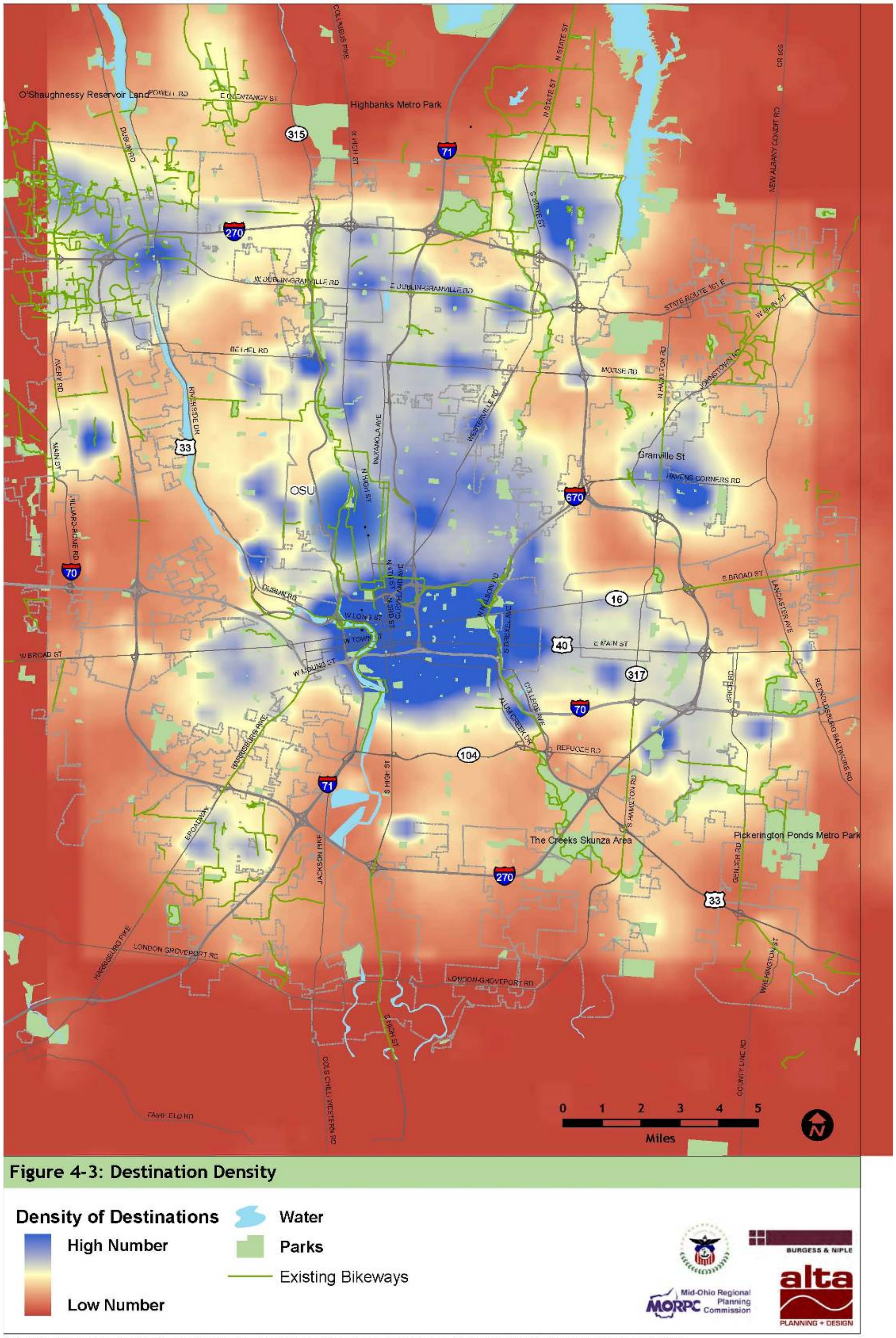
Estimating future benefits requires assumptions regarding the City of Columbus' population and anticipated commuting patterns. According to the U.S. Census, approximately 336,967 people are currently employed in the City. A future workforce population of 400,000 was used to reflect current overall population growth trends. In terms of commuting patterns, the walking and bicycling mode shares were increased to address higher use potentially generated by the addition of new bikeway facilities and enhancements to the existing system. The estimated proportion of residents working from home was also grown slightly.

Figure 4-2: Areas with Potential for High Bicycling Use in Columbus, OH



Data: City of Columbus, Franklin County, Mid-Ohio Regional Planning Commission, U.S. Census. Map created by Alta Planning + Design. January 2008.

Figure 4-3: Destination Density



Data: City of Columbus, Franklin County, Mid-Ohio Regional Planning Commission, U.S. Census. Map created by Alta Planning + Design. July 2007.

Table 4-7: Existing and Potential Future Air Quality Benefits summarizes existing and potential future air quality improvements associated with bicycling and walking in Columbus. Combined, bicycling and walking currently replace about 100,900 weekday vehicle trips, eliminating over 160,500 vehicle miles traveled. Bicycling and walking also save nearly 95,000 tons of vehicle emissions from entering the atmosphere each weekday.

It should be noted that this model only addresses commute-related trips. Unlike the demand models, this model does not account for air quality improvements associated with recreational non-motorized travel. If we consider recreational biking and walking, it is likely that the benefits are higher than those indicated in Table 4-7.

Table 4-7: Existing and Potential Future Air Quality Benefits

	Bicycle		Pedestrian	
Vehicle Travel Reductions	**Existing**	**Future**	**Existing**	**Future**
Reduced Vehicle Trips per Weekday (1)	19,357	173,611	81,586	111,241
Reduced Vehicle Trips per Year (2)	5,052,048	8,543,082	21,294,051	29,033,815
Reduced VMT per Weekday (3)	97,210	179,775	63,298	97,002
Reduced VMT per Year (2)	25,371,783	46,921,356	16,520,746	25,317,507

	Bicycle		Pedestrian	
Vehicle Emissions Reductions	**Existing**	**Future**	**Existing**	**Future**
Reduced PM_{10} (tons per weekday) (4)	1,789	3,308	1,165	1,785
Reduced NO_X (tons per weekday) (5)	48,488	89,672	31,573	48,385
Reduced ROG (tons per weekday) (6)	7,057	13,052	4,595	7,042
Reduced PM_{10} (tons per year) (7)	466,841	863,353	303,982	465,842
Reduced NO_X (tons per year) (7)	12,655,445	23,404,372	8,240,548	12,628,372
Reduced ROG (tons per year) (7)	1,841,991	3,406,490	1,199,406	1,838,051

Note: VMT means Vehicle Miles Traveled

(1) Assumes 73% of bicycle trips replace vehicle trips for adults/college students; 53% reduction for school children.
(2) Weekday trip reduction multiplied by 261 weekdays per year.
(3) Bicycle trips: assumes average roundtrip of 8 miles for adults/college students; 1 mile for school children. Pedestrian trips: assumes average roundtrip of 1.2 miles for adults/college students; 0.5 mile for school children.

(4) PM_{10} reduction of 0.0184 tons per mile.
(5) NO_X reduction of 0.4988 tons per mile.
(6) ROG reduction of 0.0726 tons per mile.
(7) Weekday emission reduction multiplied by 261 weekdays per year.

4.3.2. Other Benefits

Bicycling and walking generate benefits beyond air quality improvements. Non-motorized transportation can also serve recreational purposes, improve mobility and improve health. The National Pedestrian and Bicycle Information Center's "*BikeCost*" model quantifies these benefits. Though focused primarily on bicycling, the model provides a starting point for identifying the potential cost savings of improving and expanding Columbus' bikeway facilities.

Several modeling assumptions should be discussed. First, the *BikeCost* model is project-specific, requiring specific information regarding project type, facility length and year of construction. Because this study focuses on a larger study area, several variables were used. The model is based on an addition of 100 miles of bikeway improvements with an expected 2016 "mid year" of construction. The model requires data from the 2005 U.S. Census, including bicycle commute mode share, average population density, and average household size.

Based on the variables described above, the *BikeCost* model estimates annual recreational, mobility and health benefits listed in Table 4-8.

Table 4-8: Estimated Aggregate Annual Benefits of an Enhanced Bikeway Network

Recreational Benefits (1)	**Low Estimate**	**Mid Estimate**	**High Estimate**
	$21,232,138	$203,918,870	$312,157,597
Mobility Benefits (2)	**Per-Trip**	**Daily**	**Annually**
	$3.17	$32,290	$7,588,157
Health Benefits (3)	**Low Estimate**	**Mid Estimate**	**High Estimate**
	$1,093,105	$7,499,654	$11,295,423
Decreased Auto Use	**Urban**	**Suburban**	**Rural**
	$16,633,132	$10,235,774	n/a

Source: Benefit-Cost Analysis of Bicycle Facilities ("*BikeCost*") Model, Pedestrian and Bicycle Information Center.

(1) Recreational benefit estimated at $10 per hour (based on previous studies). Assumes one hour of recreation per adult. $10 value multiplied by the number of new cyclists minus the number of new commuters. This value multiplied by 365 days to estimate annual benefit.
(2) Assumes an hourly time value of $12. This value multiplied by 20.38 minutes (the amount of extra time bicycle commuters are willing to travel on an off-street path). Per-trip benefit was then multiplied by the daily number of existing and induced commuters. This value then doubled to account for roundtrips, to reach daily mobility benefit. Daily benefit then multiplied by 50 weeks per year and 5 days per week.
(3) Annual per-capita cost savings from physical activity of $128 based on previous studies. This value then multiplied by total number of new cyclists.

Table 4-8: Estimated Aggregate Annual Benefits of an Enhanced Bikeway Network summarizes the estimated benefits of an enhanced bikeways system in the City of Columbus. Except for mobility benefits, the model outputs are represented on an aggregate basis. Potential annual recreational benefits range from a low estimate of about $21 million to a high estimate of over $312 million. Annual health benefits range from about $1 million to over $11 million. Mobility benefits were estimated on a per-trip, daily and annual basis. The roughly $3 per-trip benefit of off-street trails could translate to an annual benefit of over $7 million. Decreased auto usage could also generate monetary benefits. The enhanced network could generate nearly $27 million in annual savings from reduced vehicle trips.

4.4. Collision Analysis

Safety is a major concern for bicyclists and is commonly cited as one of the most compelling reasons not to bicycle.

Nationwide, the total number of reported cyclist fatalities has dropped dramatically since 1994, with 802 fatalities reported in 1994 and 725 fatalities reported in 2004[15]. In comparison, total traffic fatalities have increased by 5% over this ten-year period.[16]

The same study shows that in 2004, of all Ohio traffic fatalities, 1.5% were cyclist fatalities. This is lower than the nationwide average of 2%. Bicyclist fatalities in Ohio represent a fatality rate of 1.66 per million people.

According to a 1990 study of 3,000 bicycle crashes, the most common type of bicycle-vehicle crash was one where the motorist failed to yield right-of-way at a junction (22% of all crashes)[17]. More than a third of these involved a motorist violating the sign or signal and driving into the crosswalk or intersection and striking the bicyclist. The next most common types of vehicle-bicycle crash were where the bicyclist failed to yield right-of-way at an intersection (17%), a motorist turning or merging into the path of a cyclist (12%), and a bicyclist failing to yield right-of-way at a midblock location.

These data suggest that a bicycle safety plan should address intersection improvements and education about the rights and responsibilities of cyclists and motorists, especially regarding right-of-

[15] Cyclist crash data is produced from Police reports. It is likely that the true number of crashes that result in injury or fatality is significantly higher.
[16] Traffic Safety Facts, 2004 Data. "Pedalcyclists" NHTSA, DOT # HS 809 912
[17] Pedestrian and Bicycle Crash Types of the Early 1990's, Publication No. FHWA-RD-95-163, W.H. Hunter, J.C. Stutts, W.E. Pein, and C.L. Cox, Federal Highway Administration, Washington, DC, June, 1996.

way laws. Intersection improvements are especially important where driveways and roadways cross parallel bicycle paths

4.4.1. Regional Bicycle Master Plan Collision Analysis

An extensive collision analysis for the years 2000-2004 was conducted by MORPC for the *2006 Regional Bicycle Transportation Facilities Plan.* The majority of bicycle crashes within Franklin and Delaware Counties occurred in Columbus, with concentrations near the downtown areas. Specific corridors of high collision rates were identified for the region. The top ten bicycle crash streets are identified in **Table 4-9: The Top 10 Bicycle Crash Streets (2000-2004).** Maps of the top ten crash locations are provided in **Appendix B**.

Table 4-9: The Top 10 Bicycle Crash Streets (2000-2004)

Road	Bike Crashes	Mileage	Crash Per Linear Mile	Annual Crash Per Linear Mile	Functional Classification
High St – Downtown to Morse Rd	105	7.15	14.7	2.9	Urban Principal Arterial
Parsons Ave – Groveport Rd to Livingston Ave	29	2.33	12.4	2.5	Urban Minor Arterial
Broad St – I-270 (West) to Ohio Ave	67	7.98	8.4	1.7	Urban Principal Arterial
Sullivant Ave – Georgesville Rd to Davis Ave	35	4.95	7.1	1.4	Urban Minor Arterial
Cleveland Ave - Downtown to Morse Rd	39	7.02	5.6	1.1	Urban Principal Arterial
Main St – Ohio Ave to Reynoldsburg	49	9.34	5.2	1.0	Urban Principal Arterial
Livingston Ave – Downtown to Hamilton Rd	30	6.18	4.9	1.0	Urban Principal Arterial
Mound St – Hague Ave to Souder Ave	12	2.95	4.1	0.8	Urban Minor Arterial
Champion Ave – Marion Rd to Leonard Ave	15	3.86	3.9	0.8	Urban Principal Arterial
5th Ave – US 33 to I-71	14	4.41	3.2	0.6	Urban Minor Arterial

Source: MORPC 2006 *Regional Bicycle Transportation Facilities Plan,* April 2007, page 31.

4.4.2. Common Causes of Bicycle Crashes in Columbus

Bicycle crashes in Columbus, Ohio were reviewed using data provided by the Ohio Department of Public Safety. The data consisted of 1,053 bicycle reports in Columbus from 2000 through 2004. Every crash analyzed involved an instance where a bicyclist interacted with some type of motor vehicle. It is important to note that crash data is usually based on accident reports from a reporting municipality police agency. Crash data does not include collisions that were not reported to the police department, and are therefore likely to undercount crashes and to over-represent severe crashes.

Overall, the number of bicycle crashes in Columbus has been decreasing. In 2000, 216, or 20% of all collisions, involved bicyclists, while in 2004, 185 collisions, or 18% of all collisions involved bicyclists. According to a 2004 National Highway and Traffic Safety Administration study, national crash rates for bicyclists are 140 per million population injured and 2.47 per million population killed.[18] Columbus' crash rate for 2000 through 2004 is 368 per million injured and 1.75 per million killed.

Overall, the location of the bicyclist when struck was not indicated or was listed as "unknown" in 610 of the 1,053 bicycle crashes in Columbus during the study period. Of the known locations, 249, or 24 percent of the crashes, were classified simply as "In roadway" accidents. Crashes classified as "Marked crosswalk at intersection" numbered 72 crashes, or 6.8 percent. Crashes classified as "At intersection, but no crosswalk" numbered 69 crashes, or 6.5 percent.

"Failure to yield" by motorist was the most common contributing factor for motorist-fault determined crashes (12 percent or 125 crashes). For crashes determined to be the fault of the bicyclist, "Improper crossing" was listed in 111 crashes, followed by bicyclist failure to yield in 99 crashes. In over 30 percent of the crashes, the bicyclist contributing factor was listed as "unknown". Drug and alcohol use was listed as a separate factor in the crash reports, and was a factor in about 2 percent of the overall crashes for bicyclists.

Injury, and in some cases death, resulted from motor vehicle-bicyclist crashes. Eighty percent of the bicycle-related crashes resulted in some type of injury and the percentage of "incapacitating" crashes was 8%. Throughout the four-year period, 5 cyclists were killed in crashes.

Most of the crashes occurred under ideal conditions; roads were straight and level, dry, and well lit if the crash occurred at night. Specific routes, such as High and Broad Streets were common crash locations. **Appendix C: Bicycle Crash Breakdown 2000 through 2004** contains collision tables.

In addition to these crashes, anecdotal evidence has indicated that there have been several incidents of assault on bicyclists. These assaults are generally not reported in collision reports, but should be tracked.

4.5. Public Outreach and Surveys

The primary outreach methods employed to gather information regarding existing bicycle use within in City of Columbus were public meetings, manual bicycle counts, and an on-line survey. These are

[18] NHTSA *Traffic Safety Facts, 2004 Data, Pedalcyclists*

described below. Appendix D summarizes the public outreach process, lists the most common comments received, and provides a summary of the count and survey results.

4.5.1. Public Outreach

Public outreach for this plan included press releases, news articles, a ride with Mayor Coleman, two well-attended public meetings and an open stakeholders meeting. People were also invited to comment on the draft versions of this plan. Public input received from the meetings and the survey were used to develop a list of roadways requested for bicycle facilities. This list was used in developing the recommended bikeway network and as a criteria in the facility prioritization.

Several public meetings were held during the development of this plan:

June 7, 2007 – First public meeting is held, stakeholder meeting is held.

June 26, 2007— Mayor Coleman announces the launch of the Columbus Bicentennial Bikeway Master Plan.

September 26, 2007 – Second public meeting held.

December 14, 2007 – Open stakeholder meeting is held.

The public was able to comment on the Draft Plan through January 11, 2008.

4.5.2. Bicycle Counts

The City of Columbus conducted bicycle counts at several locations in July 2007. Bicycle count methodology was based on the Bicycle and Pedestrian National Documentation research initiated by Institute of Transportation Engineers Pedestrian and Bicycle Council. Weekday counts were collected between 7 am and 9 am and between 11 am and 1 pm. Counts were primarily conducted on on-street facilities, but included one location on the Olentangy River Trail. A total of 124 bicyclists and 1,123 pedestrians were counted during the morning peak period, and 121 bicyclists and 3,376 pedestrians counted during the mid-day period. A summary of counts at each location is included as **Appendix D.**

4.5.3. On-Line Survey

An on-line survey was developed in combination with the City of Columbus & MORPC and was launched in conjunction with the first day of the bicycle counts. The purpose of the survey was to gather more detailed information on bicycling within the City of Columbus.

The City of Columbus Bikeways survey was open from May 11th, 2007 through August 17th, 2007. In that time period, 917 people either completed the on-line survey or filled out and returned a paper copy of the survey. The survey asked questions about where bicyclists are from, how much they ride, reasons that they ride, where they like to ride, where they don’t like to ride, and suggestions for improving bicycling within the City.

General Trends of Survey

Of the 917 survey respondents, the dominant age group is 26-69 (72%). When asked why they bike, most cited for recreation (88%) or for exercise (87%). There is a discrepancy between why respondents currently bike and where they would like to bike. For example, although about half of the respondents indicated that they bike to get to work, 73% responded that they would like to bike to work. Similarly, 9.9% ride to connect to transit, while 25.1% indicated they would like to bike to connect to a transit stop.

When asked how often they bike, half of the respondents indicated that they ride their bikes several times a week, while 21% indicated that they ride everyday. The range for the average distance of bike rides varies considerably: 28% ride 3-5 miles, 23% ride 11-24 miles, and 21% ride 6-10 miles. The most frequently cited reasons that prevents bikers from biking more often are lack of bike facilities near their residences (67%) and too many cars/motorists drive too fast (67%).

The top three most cited projects that respondents would like to see included in the City of Columbus Bicycle Master plan are: 1. on-road bike lanes or paved shoulders (85%), 2. new paved shared-use paths (76%), and 3. bicycle parking (59%). Similarly, when asked to rank their preference for bicycle facilities, respondents cited paved, shared-use paths and on-street bike lanes as their most preferred.

Finally, when asked if their school has a Safe Routes to School Program, only 5% responded "yes," while 30% responded "no" and 65% responded "n/a."

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