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4.1 Overview

The Bicycle Network Plan was created through a process involving past planning efforts, public input, field analysis, and technical review by a steering committee. This chapter provides some details about that process and includes an overview of the different sub-areas within the City and County of Durham (urban, suburban, rural, universities, and the Research Triangle Park). Finally, the chapter outlines the recommended bicycle facilities presented within the Network Plan, including bicycle corridors, greenway corridors, rail with trail projects, recommended bicycle stations, and transit interface. Together, these facilities will fulfill the goals of this Plan, creating a safe, accessible and comprehensive bicycle network. Ultimately, the Bicycle Network Plan provides the means to a viable form of alternative transportation that will provide a higher quality of life in Durham.

4.2 Bicycle Network Methodology

Input from the public was critical in developing the Network Plan. First, the previous planning efforts all involved their own levels of public input, and have in turn influenced the Network Plan. Second, public input gathered specifically for this plan included A) five public input maps gathered from several public meetings, B) guidance from a steering committee representing the public, and C) over 600 comment forms that each provided specific route preferences and recommendations for improvement. For a complete review of the public input process, please see Appendix A for detailed results from the Public Opinion Survey Results and Public Workshops.

The recommended networks from the existing plans were overlapped with current recommendations from the public input process. The combined results were then analyzed to see where the networks overlapped and what gaps were left to be filled.

Next, field analysis was used to evaluate the recommended Network and verify that recommended facility types were reasonable for each route segment. The field analysis was conducted by the project consultant team, which included regular bicycle commuters in Durham. The analysis consisted of both biking and driving the recommended routes, recording information about the preferred facility type, and, where necessary, measuring the road width for accuracy in making a facility recommendation. A complete Bicycle Level of Service (BLOS) study was originally recommended for this plan, but was not included due to insufficient funding. The field analysis, however, when combined with secondary data, such as GIS data, aerial photos, and existing studies, helped in making informed decisions regarding the facility types for each route. The total recommended Network breaks down as follows:

Recommended On-Road Facilities	=	622 miles
Recommended Greenways (2006 Bicycle Plan)	=	85 miles
Recommended Greenways (2001 Trails Plan)	=	145 miles
<i>Total Recommended Network</i>	=	<i>852 miles</i>

The total recommended Network represents an ideal bicycle transportation system in Durham, and serves as a long-range, visionary element of this plan. Clearly, the total Network is unattainable in the near future. Hence, the recommendations were broken down into groups, and then analyzed and prioritized to promote the most efficient use of resources possible with the greatest positive results for bicycling in Durham.

First, the most feasible opportunities for facility improvements, such as ‘re-stripes’ and signed shared roadways, were separated for short-term recommendations. Second, most of the paved shoulder recommendations, which serve far fewer residents in the rural areas, were separated as opportunity-based improvements. See Table B.2 in Appendix B for a detailed breakdown. This leaves approximately 515 miles:

<i>Total Recommended Network</i>	=	<i>852 miles</i>
Recommended Re-stripes/Signed Routes (Short term)	=	(30) miles
Recommended Shared Roads (Short term)	=	(30) miles
Recommended Paved Shoulders (Opportunity-based)	=	(277) miles
<i>Remaining Recommended Network (Med/Long Term)</i>	=	<i>515 miles</i>

Out of the remaining 515 miles of recommendations, the most significant were selected for prioritization. These include the most highly recommended routes from the 2030 LRTP Regional Priority List, the CORE Plan, top priority public recommendations and selected routes from the 2001 Durham Trails and Greenway Master Plan. The MPO’s recommendations were thoroughly analyzed using a review of traffic data, engineering guidelines, and field conditions to extract a new list of short-term recommendations. The Bicycle Plan Steering Committee advocated strongly for the inclusion of the CORE’s recommendations. See Chapter 3 for a review of these and other relevant existing planning efforts.

For comparison’s sake, some approximate mileage statistics for Durham County are included below:

Total Miles of Roads in Durham City and County	=	~1842 miles
Total Miles of Roads in Durham City Limits	=	~1100 miles
Total Miles of Durham City Maintained Roads	=	~ 670 miles
Total Miles of NCDOT Maintained Roads	=	~ 960 miles
Total Miles of “Other/Private” Maintained Roads	=	~ 212 miles
Total Miles of Existing Bicycle Lanes	=	~ 13 miles

Therefore, the long term bicycle network is only 33.77% of the present day existing roadway mileage in Durham City/County. With 13.88 miles of existing bicycle lanes, presently the existing on-street bicycle network is only 0.75% of present day existing roadway mileage in Durham City/County.

4.3 Prioritization

The prioritization factors used were customized for the City and County of Durham by selecting and weighting the factors according to public input, the Bicycle Plan Steering Committee suggestions, and similar criteria used in alternative transportation planning in other communities.

A complete copy of the prioritization matrix is included as Table B.1 in Appendix B. If an opportunity arises (through programmed roadway projects, land development requirements, etc.) for the completion of a recommended facility improvement, that opportunity should be taken regardless of its rank in the priority index. See Appendix E for a list of NCDOT’s 2006-2012 TIP projects and the City of Durham’s CIP projects that could have bicycle improvements added into the design of the project.

The prioritization criteria were grouped into four categories: Proximity to Schools; Parks, Recreation, and Points of Interest; Transportation System Integration; and, Residential/Commercial/Employment Destinations.

Proximity to Schools

Direct Access to/from a School- Since the beginning of the planning process, safe routes to school has been a major concern. This factor gives high priority to recommended routes that provide direct access to all types of school.

Elementary and Middle School Proximity (1 mile radius)- In addition to the ‘direct access’ factor above, recommended routes that are in the proximity of schools are also given priority. A one-mile radius was used to judge proximity to elementary and middle schools.

High School, College & University Proximity (2 mile radius)- For schools populated by older students, a two-mile radius was used to take into account the likelihood of them traveling longer distances. While many students commute distances greater than two miles, a larger proximity radius for each institution would cover nearly the entire recommended network, nullifying the utility of the factor as a priority. The one- and two-mile proximity ensures that recommended routes near schools are factored into the network prioritization.

Parks, Recreation, and Points of Interest

Direct Access to/from a Greenway– Serving as an element of both transportation and recreation, connections to greenways are crucial to the prioritization of bicycle routes. This process factors only existing greenway facilities, and therefore should be updated as new facilities are completed.

Direct Access to/from a Park/Recreation Center/Playground- This factor includes over sixty City- and County-owned facilities, ranging anywhere from active recreation sites like ‘tot-lots’ and ball fields, to passive recreation areas, such as West Point on the Eno.

Direct Access to/from a Point of Interest- Points of interest include destinations such as cultural and historical sites, libraries, and museums.

Transportation System Integration

Connectivity to Existing Bike Facilities- Connecting new facilities to existing ones is perhaps the best way to strengthen the existing bicycle network. The existing network is currently fragmented into several bike lanes and greenways; filling the gaps, therefore takes a high priority.

Direct Access to/from Rail Transit- Currently this factor only includes the existing Amtrak Station in Downtown Durham. As the locations of future rail stations are confirmed, the process should be updated to reflect those changes by including ‘future transit stations’ as a high priority for connecting bicycle facilities.

Integrates with DATA and TTA Bus Route Network – Bike-Bus integration was a priority for the Bicycle Plan Steering Committee. The purpose of this factor is to give priority to those routes that intersect or parallel the DATA and TTA networks.

Regional Connection and/or Interstate Highway Crossings- This factor represents the recommended bicycle routes that provide links in and out of Durham County or across Interstate Highways. This factor was evident as a priority during public workshops in which participants consistently advocated for these types of connections. For more info on the public input process, see Appendix A.

Route with a Reported Bicycle Accident- This factor was included using information from the Durham Police GIS Crash Data. The Bicycle Plan Steering Committee questions the validity of such data since the crash-reporting methods are often inconsistent and incomplete. Therefore, this factor only received one point as weighted criteria. As reporting methods and the subsequent data improve, the weight of this factor should increase.

Residential/Commercial/Employment Destinations

Direct Access to/from Commercial Areas- Includes Commercial Neighborhoods (CN), as defined in the Unified Development Ordinance (UDO), and the Durham GIS Shopping Layer.

Direct Access to/from Employment Centers- Includes the Central Business District (CBD), as defined in the UDO, Duke University, and the RTP.

Direct Access to/from Higher Density Residential Areas- Includes the following Residential Zoning Districts, as defined in the UDO: RS-M, RU-5, RU-5(2), RU-M, and RC.

Direct Access to/from Mixed-Use Areas- Includes the Mixed Use (MU) District, as defined in the UDO.

4.4 Recommended Bicycle Facilities

The Bicycle Network is composed of a wide range of bicycle facilities, ranging from on-street facilities to off-street greenway trails.

On-Street Facilities

On-street bicycle facilities include the following: Shared Roads/Sharrows, Edgelines, Striped Bicycle Lanes, Paved Shoulders, and Paved Sidepaths. A variety of bicycle facilities have been recommended due to the wide range of roadway conditions that exist in Durham. Please refer to Chapter 5 - Design Guidelines, for detailed descriptions and images of prescribed bicycle facilities.

“Rail-with-Trail”

After development of the on-street bicycle network, work began on integrating existing and proposed off-street greenway facilities, such as the American Tobacco Trail and Third Fork Creek Greenway into the overall bicycle transportation network. Additional greenways or greenway connections were also proposed where gaps and logical connections presented themselves in order to preserve the continuity of the recommended system. Many of the new non-connection greenways recommendations were “Rail with Trail” opportunities. Durham possesses a significant network of railroad lines, that present long range corridors of opportunity for bicycle transportation facilities that could connect the area to neighboring and regional destinations. “Rail with Trail” facilities have been implemented in Chicago,

Seattle, Pittsburgh, Colorado Springs, California, Wisconsin, Maine, New Jersey, Pennsylvania, Michigan, Massachusetts and many other municipalities in the US and abroad. The FHWA produced a lengthy report in 2002, titled “Rails-with-Trails: Lessons Learned” that examines the benefits, concerns and conclusions. (www.fhwa.dot.gov/environment/rectrails/rwt/toc.htm)

Bicycle Stations

A new and innovative component of the Bicycle Network is the ‘bicycle station’. Three locations have been proposed for bicycle stations in Durham, with encouragement to establish additional smaller scale bicycle stations at major employment centers, and as new development occurs in the area. Bicycle Stations have been proposed at both of Durham’s major college campuses, North Carolina Central University and Duke University. A large majority of college students and faculty rely on bicycles for transportation to their respective campuses, due to an ease of access, close proximity of residence to campus, a desire for alternative transportation and/or restricted automobile parking facilities on campus. Bicycle stations at each campus will aid students and faculty with issues related to bicycles, such as storage, repair, changing facilities and information. In addition to campus based bicycle stations, it is recommended that Durham create a central bicycle station in Downtown Durham. This bicycle station should be coordinated with efforts to develop the multmodal Durham Station transit facility (CIP# 0821-08-77-6603). This station would be located in the heart of Durham and along the East Coast Greenway.

Trail Access and Integration

The American Tobacco Trail is an excellent asset not only to Durham, but to the region. This marquee greenway trail in Durham is a component of the East Coast Greenway, a 2,950 mile corridor that extends from Maine to the Florida Keys. Completed portions of the American Tobacco Trail are utilized and enjoyed by bicyclists of all abilities from children to commuters and by closing existing gaps in the trail and improving access to this facility can and will reach even more users. Presently the American Tobacco Trail is separated by a significant gap between NC 54 and Massey Chapel Road. This gap contains numerous obstacles to safe bicycle travel, such as I-40, expansive suburban development in the Southpoint area and high traffic roadways. Paved portions of the trail extend north from NC 54 to Morehead Avenue, while an unpaved portion of the trail extends from Massey Chapel Road south to the Chatham County Line. Emphasis should be placed on completing the connection between these two sections, including the proposed bicycle/pedestrian bridge over I-40. Access points to the American Tobacco trail are often limited along certain portions of the trail. In order to better integrate the American Tobacco Trail with the on-street bicycle network, access point should be constructed at points such as Lakewood Avenue, Roxboro Street, in addition to establishing smaller neighborhood accessways illustrated in Chapter 5 - Design Guidelines.

Sharrows

An innovative solution for incorporating and implementing bicycle facilities in Durham, is to use a relatively new facility called the sharrow or more widely known as a shared roadway. A sharrow is a roadway that is too narrow to incorporate a striped bicycle lane and generally has lower motorized vehicle traffic and speed. Sharrows are designated by a bicycle and arrow symbol painted on the roadway, alerting motorists that cyclists frequent this route. Additionally it illustrates to bicyclists the proper direction for bicycle travel on the roadway and encourage rules of the road to be followed. More details on placement and use of sharrows is explained in Chapter 5 - Design Guidelines.

Cities, such as Denver, San Francisco and Portland have been using sharrows for some time now. Los Angeles recently conducted a survey to identify and evaluate roads suitable for placing sharrows (http://www.labikecoalition.org/surveys/lacbc_sharrows_survey.html). The MUTCD does not yet formally recognize the sharrow, however it is under review. It is recommended that Durham initiate a pilot project by implementing sharrows on local, city owned roads to demonstrate to NCDOT the validity and usefulness of this facility. Recommended locations for sharrow pilot projects are Blackwell Street (see Figures 4.5 and 4.6), Markham Avenue, and Main Street inside the Downtown Loop.

(The following pages, 4-8 to 4-13, show what some of the recommended facilities would look like if implemented in Durham)

4.5 Short Term Bicycle Network

The Short Term Bicycle Network refers to Durham's complete network, once all Phase One projects and signed route projects are implemented. The Phase One projects are listed in Figure 4.7 and are shown in Figure 4.8 (on pages 4-14 and 4-15). These projects are comprised of roadways that are wide enough to accommodate striped bicycle lanes in their current form. Next, Map 4.1 illustrates the complete Short Term Bicycle Network, with Phase One, signed routes, and existing facilities included.

4.6 Long Range Bicycle Network

The Long Range Bicycle Network refers to Durham's complete network, once *all* project phases are implemented. A comprehensive project list, with all phases included, is provided in Appendix B, Table B.2. The Long Range Bicycle Network, with all projects included, is divided into six sub-section maps for legibility purposes (Maps 4.3 - 4.8). Map 4.2 is provided as an 'inset guide' to the six sub-section maps.

Existing Conditions on Blackwell Street



Figure 4.5 - Blackwell Street

Introduction of Sharrow



Figure 4.6 - Blackwell Street

Existing Conditions in Downtown Durham



Figure 4.1 - West Morgan Street

Introduction of Striped Bicycle Lane



Figure 4.2 - West Morgan Street

Existing Conditions on East Main Street



Figure 4.3 - East Main Street

Introduction of Striped Bicycle Lane

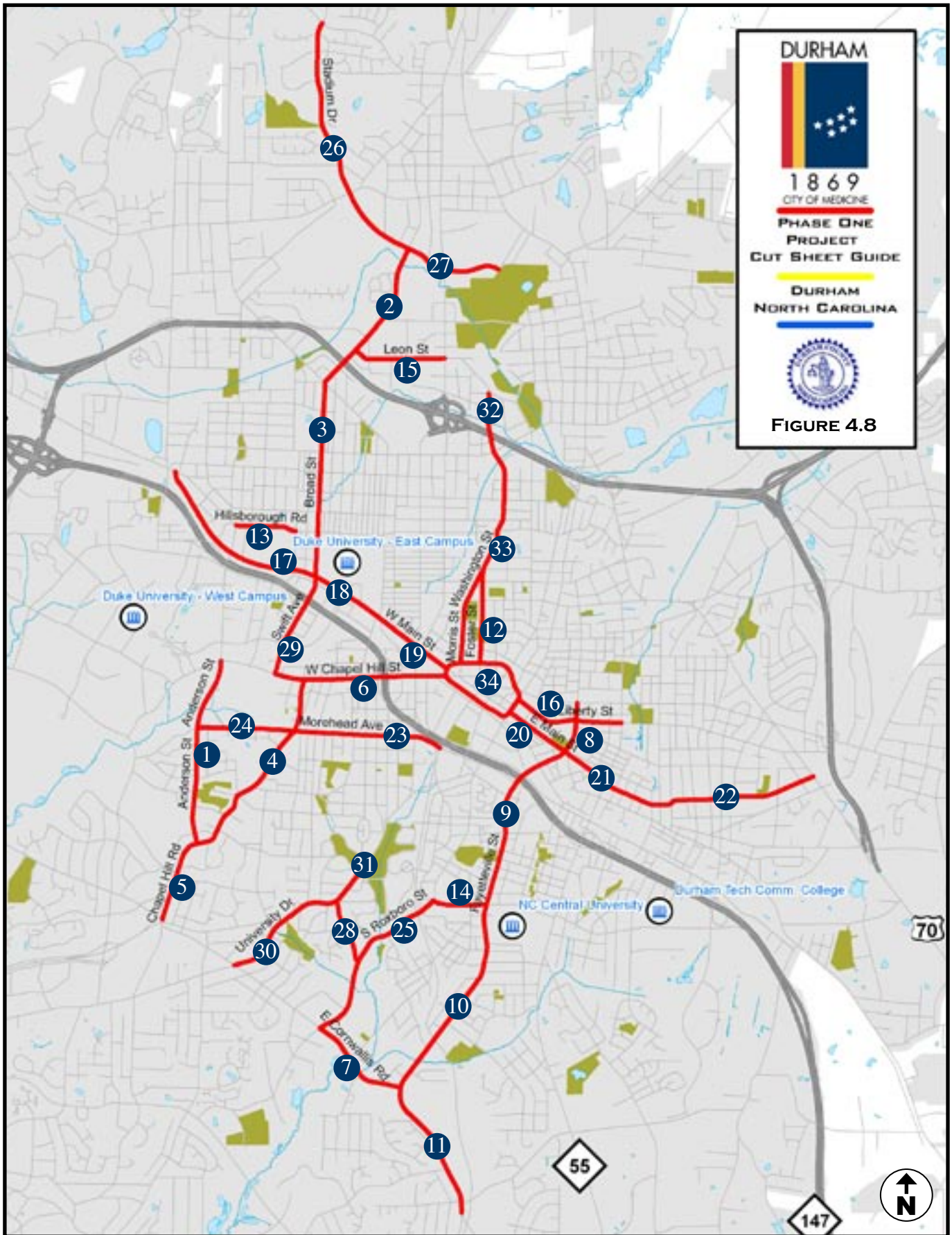


Figure 4.4 - East Main Street

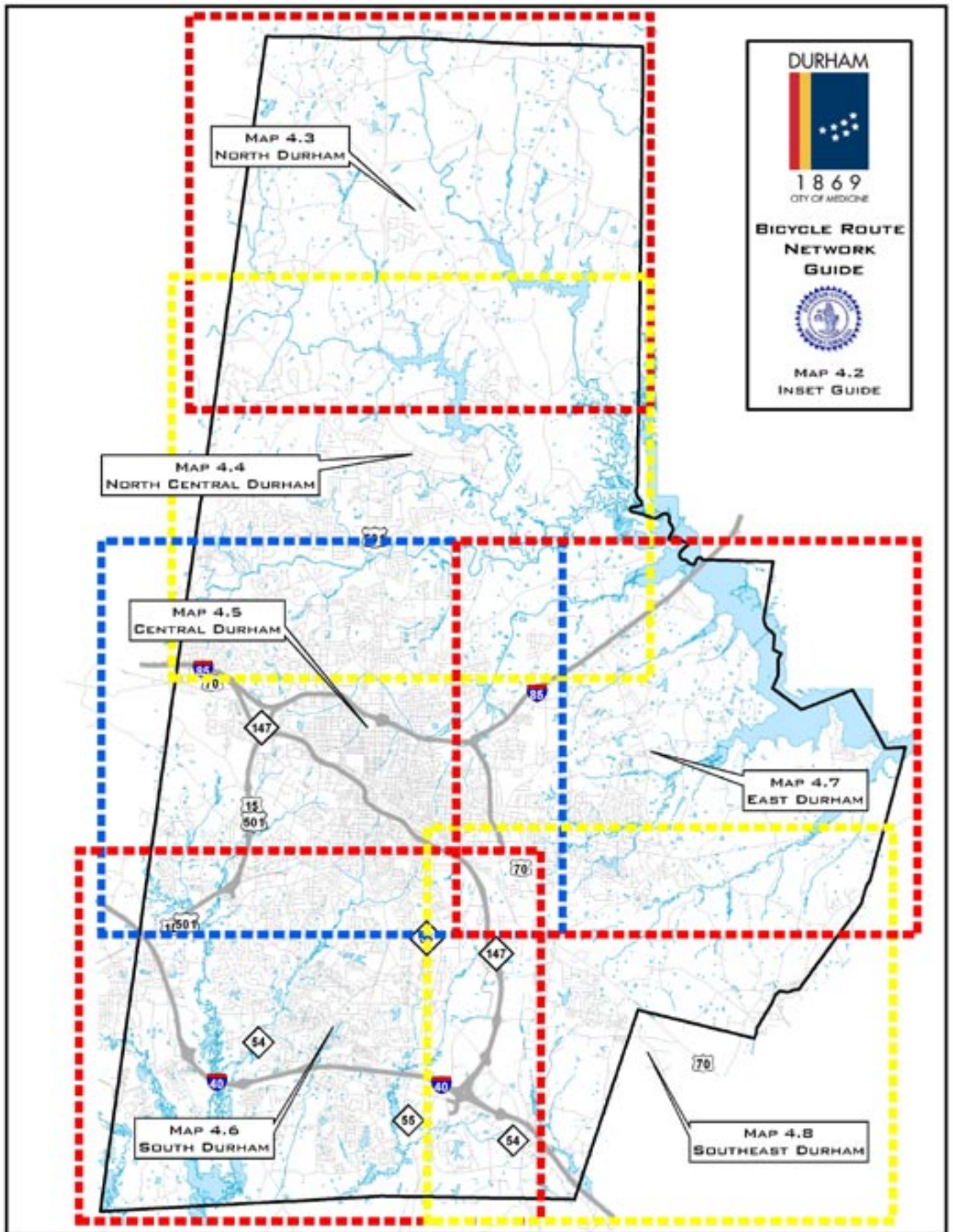
Phase One Project List (see the complete project list with phasing in Table B.2)

#	Project Name	From	To
1	Anderson Street	Chapel Hill Road	Duke University Road
2	Broad Street	Guess Road	Stadium Drive
3	Broad Street	Main Street	Guess Road
4	Chapel Hill Road	Chapel Hill Street	Ward Street
5	Chapel Hill Road	Ward Street	Cornwallis Road
6	Chapel Hill Street	Downtown Loop	Duke University Road
7	Cornwallis Road	Roxboro Road	Fayetteville Street
8	Elizabeth Street	Main Street	Geer Street
9	Fayetteville Street	Main Street	Lawson Street
10	Fayetteville Street	Lawson Street	Cornwallis Road
11	Fayetteville Street	W. Cornwallis Road	E. Cornwallis Road
12	Foster Street	Morgan Street	Washington Street
13	Hillsborough Road	Fifteenth Street	Ninth Street
14	Lawson Street	Roxboro Road	Fayetteville Street
15	Leon Street	Broad Street	Duke Street
16	Liberty Street	Roxboro Road	Alston Avenue
17	Main Street	Hillsborough Road	Ninth Street
18	Main Street	Ninth Street	Buchanan Boulevard
19	Main Street	Buchanan Boulevard	Corcoran Street
20	Main Street	Corcoran Street	Fayetteville Street
21	Main Street	Fayetteville Street	Driver Street
22	Main Street	Driver Street	Miami Boulevard
23	Morehead Avenue	Blackwell Street	Kent Street
24	Morehead Avenue	Kent Street	Anderson Street
25	Roxboro Road	Lawson Street	Cornwallis Road
26	Stadium Drive	Horton Road	Carver Street
27	Stadium Drive	Carver Street	Olympic Avenue
28	Summit Street	University Drive	Roxboro Road
29	Swift Avenue	Duke University Drive	Main Street
30	University Drive	Cornwallis Road	Summit Street
31	University Drive	Summit Street	Forest Hills Boulevard
32	Washington Street	Leon Street	Markham Avenue
33	Washington Street	Markham Avenue	Morris Street
34	Downtown Loop	Start	Finish

*Figures 4.7 and 4.8 - Phase One Projects in alphabetical order
(See Appendix D for Details and Cut Sheets)*



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