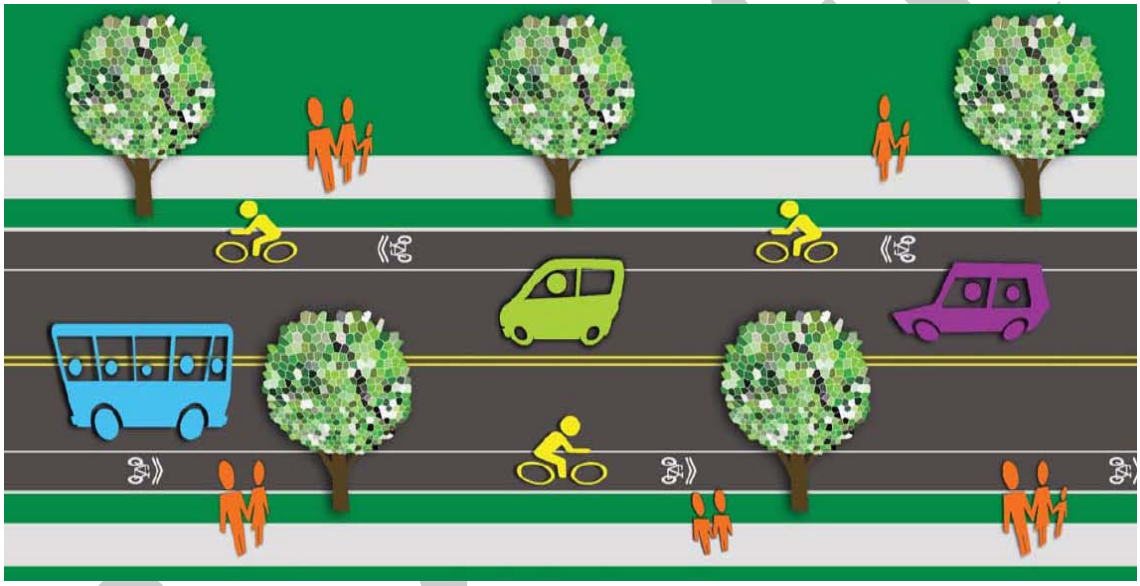
Health Impact Assessment

Town of Davidson Street Design Standards

A Health Impact Assessment detailing the potential health impacts of Davidson's existing street design standards and proposing recommendations to improve standards as part of the scheduled rewrite of the Town's Planning Ordinance in 2013.

October 2012



A project of Davidson: Design for Life in collaboration with a Regional Advisory Commission and funded by the Centers for Disease Control and Prevention: Healthy Community Design Initiative.

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Acknowledgements

Davidson: Design for Life would like to thank everyone who has participated in this Health Impact Assessment process including members of our community who provided information through surveys, the Davidson Design for Life Committee, and the Davidson Design for Life Regional Advisory Commission. We would especially like to recognize the contributions of Kristie Foley with Davidson College Department of Medical Humanities, Doug Wright with Davidson's Department of Public Works, Chief Jeanne Miller with Davidson's Police Department, and Lauren Blackburn with the North Carolina Department of Transportation. Collectively these individuals' knowledge of pedestrian, bicycle, and motorist safety in Davidson shaped the information we could provide to consultants, staff, Davidson residents, and decision makers as they work on the rewrite of Davidson's Planning Ordinance.

This project was supported by a grant from the Centers for Disease Control and Prevention: Healthy Community Design Initiative. The opinions are those of the authors and do not necessarily reflect the views of the Centers for Disease Control and Prevention or the Department of Health and Human Services.

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Executive Summary

The way our communities and streets are designed can have an immense impact on our physical, mental, and social health. The Town of Davidson, a small community located 20 miles north of Charlotte, has come to realize this fact and over the last 20 years has implemented health-promoting community design principles including complete streets, smart growth, main-street protection, form based code, and new urbanism.

As part of the town's goal to promote the health of its residents, in 2011 Davidson applied for and received a grant from the Centers for Disease Control and Prevention: Healthy Community Design Initiative in order to develop a program to conduct health impact assessments (HIAs) and incorporate innovative design principles into its planning processes. Davidson Design for Life (DD4L) was created to carry out this initiative, with the mission **"to help Davidson be a community that is healthy today and even healthier tomorrow while serving as a model for other small towns by implementing healthy design."**

Key Findings

1. How streets are designed can impact the health of surrounding populations including:
   - injury and fatality rates due to motor vehicle accidents;
   - physical activity levels;
   - air pollution levels and respiratory/cardiovascular disease; and,
   - mobility and health equity.

2. Davidson's street design standards already have many health promoting components but could be improved to further promote health.

3. Facility designs from the Davidson Bicycle Transportation Plan (2008) could easily be incorporated into the Planning Ordinance rewrite.

4. Davidson residents display the expected driver, pedestrian, and bicyclist behavior and are mostly supportive of traffic calming measures and providing pedestrian and bicycle amenities.

During the 2013 fiscal year (July 2012-June 2013), the Town of Davidson is scheduled to rewrite its planning ordinance including the street design standards followed during the construction of new development. Prior to the rewrite, an HIA of the existing standards was completed to inform the rewrite process and to make recommendations to improve Davidson's street design standards to promote the health of all the Town's residents by supporting all modes of transportation- driving, walking, bicycling, and taking public transit. This report summarizes the findings and recommendations of the assessment and includes a number of the tools and forms of communication used during the HIA in order to serve as a model for what other organizations working on an HIA could use.

Funding for the HIA was provided by the Centers for Disease Control and Prevention: Healthy Community Design Initiative cooperative agreement number 1UE1EH000897-01.

Definition of Health Impact Assessment

The purpose of an HIA is to provide information about the potential health implications of a decision being made outside of the health sector to decision makers, stakeholders, and the community affected in the hopes that health will be taken into consideration.

According to the National Research Council HIA is a "systematic process that uses an array of data sources and analytic methods and considers input from stakeholders to determine the potential effects of a proposed policy, plan, program, or project on the health of a population and the distribution of those effects within the population. HIA provides recommendations on monitoring and managing those effects."

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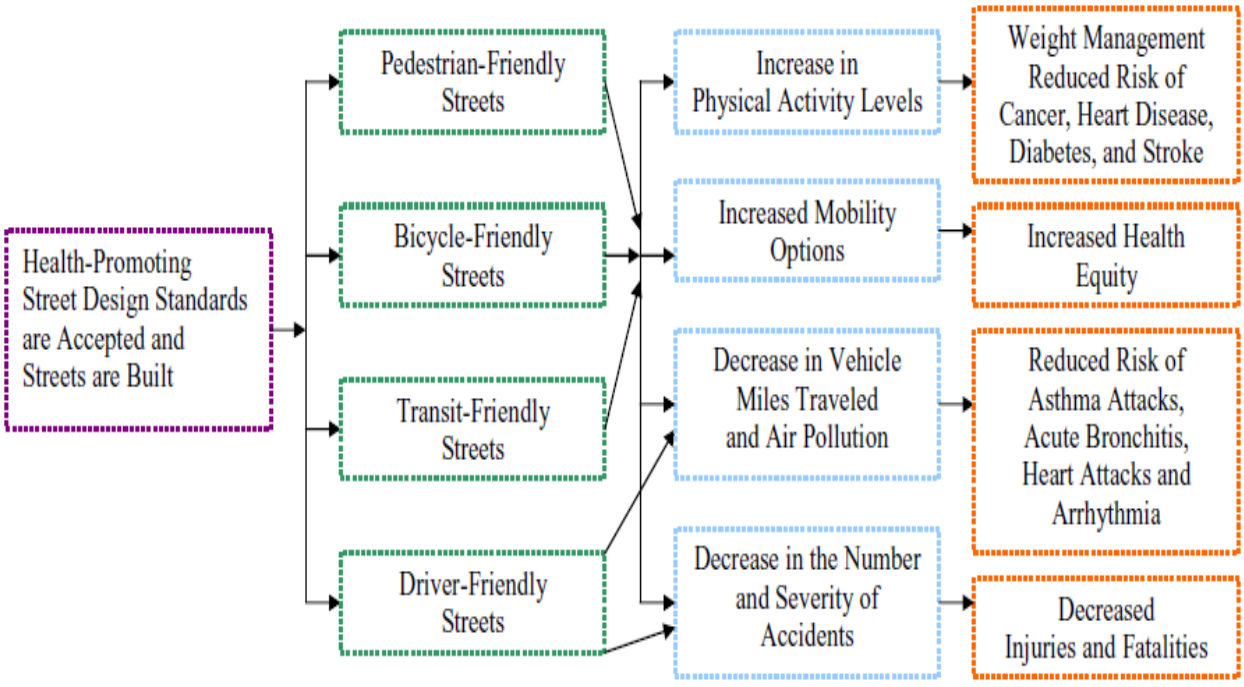

Figure ES1: Logic model of health impacts examined

Health Profile for Davidson, Mecklenburg County, and NC

Motor Vehicle Accidents: Injuries and Fatalities

- From January 2009 to April 2012, there were 32 injury-causing accidents in Davidson including 4 accidents involving pedestrians (including a fatality) and 11 accidents involving bicyclists.
- On average, Mecklenburg County experiences 322 pedestrian crashes and 63 bicycle crashes each year including 14 pedestrian fatalities and 1 cyclist fatality.
- Overall, motor vehicle injuries are the 10th leading cause of death in North Carolina and the leading cause of death for those aged 5 to 24 years old.

Physical Activity: Chronic Disease Prevention

- Achieving the recommended physical activity levels can help with weight management and decrease the risk of many chronic diseases including heart disease, cancer, and diabetes.
- In Mecklenburg County, only 46% of adults reported participating in moderate physical activity on a regular basis.
- Forty-three percent of Mecklenburg teens report being physically active for an hour or more, 5 or more days a week.
- In Mecklenburg County, 64% of adults and 29% of teens are overweight or obese.
- In 2008, cancer, heart disease, and diabetes were responsible for 2,235 deaths in Mecklenburg County with estimated hospitalization expenses of $338 million.

Air Pollution: Respiratory and Cardiovascular Disease

- Air pollution can trigger asthma attacks, acute bronchitis, heart attacks, and heart arrhythmias.
- In 2008, an estimated 76,100 adults within Mecklenburg County had asthma.
- In 2009, 19% of Mecklenburg students had asthma and missed on average 8.8 days of school.
- In 2010, heart disease was the second leading cause of death in Mecklenburg (954 deaths) and North Carolina (17,133 deaths).

Mobility: Health Equity

- If a community is designed solely for vehicular access, then the mobility of those who cannot afford a car or drive due to age or circumstance will be greatly limited.
- 78 households in Davidson (roughly 2%) do not own a vehicle.
- Nine percent of Davidson's population is below the poverty level. Single mothers with young children make up a large proportion of this percentage.
- Twenty-three percent of the Davidson's population is either too young or old (over the age of 75) to drive.

Summary of Recommendations

- Overall Recommendations
  - Include reasoning or goals behind the standards especially when they are health-related.
  - Add a glossary of terms and drawings whenever possible to make the standards clear and understandable for developers as well as committees and the interested public.
  - Be sure that the cross sections match up with the description of the road types.

- Specific Design Components
  - Bike Facilities
    - Add sharrows, painted pavement, bike boulevards, and protected bike lanes in addition to bike lane standards in place.
    - Refer to the most recent version of the Bike Plan instead of listing specific sections of road on schedule for improvement.
  - Pedestrian Facilities
    - Include standards and drawings of potential crosswalk designs that could be used including designs for historic areas, signage, different crosswalk types and potential areas where diagonal crosswalks may be used.
    - Consider requiring wider planting strips to allow for a greater diversity of trees to provide shade and serve as a buffer from traffic.
    - Include the width and materials of sidewalks most applicable to different land uses or areas such as in neighborhoods, historic areas, or the business/ mixed use centers.
  - Public Transportation Facilities
    - There is no mention of public transportation facilities within the existing ordinance.
    - Standards for bus shelters, crosswalk location next to bus stops, and inlets for a bus to pull over would reduce accidents and promote health.
    - Reference to pedestrian and bicycle facilities around transit stops (both bus and rail) would be good to include.
  - Intersection Design
    - Include potential intersection designs including roundabouts, lights, bulbouts and other traffic calming devices, signage, turning lanes, etc.
    - Consider the differences between the actual turning radi and the effective turning radi created by items such as bulbouts, on-street parking, and bicycle lanes.

- Educational and Recognition Programs
  - Mention of signage or public education with unusual traffic management measures to promote proper usage would be beneficial.
  - Consider including a Level of Quality or Level of Service rankings for bicycle and pedestrian facilities and recognizing developers for achievements beyond the required standards.

1. Introduction

1.1 Brief History of Planning in Davidson

The Town of Davidson has a long history of progressive planning which spans over forty years from the adoption of its original plans and zoning ordinances in the 1970s to the rewrite of its planning ordinance scheduled for FY 2013. These planning processes are guided by the Town's overall vision, mission, and core values as well as the planning principles adopted by the Board of Commissioners in 2001. Highlights of planning initiatives in Davidson's history include the dual, two lane roundabouts commonly referred to as the Circles at 30, designation as a walking-friendly and biking-friendly community, and its award winning Planning Ordinance of 2001.

Town of Davidson Vision, Mission, and Core Values

Every decision that the Town of Davidson makes is based on promoting its vision, mission, and core values. Pedestrian orientation is specifically mentioned within the Town's vision as a fundamental principle that contributes to the town's sense of community. Four of the town's ten core values specifically relate to creating a safe, environmentally sustainable, and walkable community:

- Citizens need to move easily throughout the Town and region, so government will provide a variety of options, such as sidewalks, bike paths, greenways, connected streets, and transit.
- Davidson's traditional character is that of a small town, so land planning will reflect its historic patterns of village-centered growth, with connection of neighborhoods, reservation of rural area, and provision of public spaces.
- Davidson must be a safe place to live, work, and raise a family, so the Town will work in partnership with the community to prevent crime and protect lives, property, and the public realm.
- Citizens must live in a healthy environment, so town government will protect watersheds, trees, air quality, and other elements of the town's ecology.[1]

Figure 1: Aspects of a healthy Davidson

Town of Davidson Planning Principles

The Town of Davidson has eight planning principles that guide its growth and planning processes. Although none of these principles specifically relate to mobility, all eight of them influence land use development patterns that subsequently influence mobility.

- We must preserve Davidson's status as a small town.
- We must preserve and enhance Davidson's unique downtown.
- Growth must be sustainable.
- We must preserve substantial amounts of open space.
- We must re-establish our historic diversity of people.
- Development must proceed no faster than the Town can provide public facilities.
- In Davidson we rely on a unique combination of private property rights and the health of the community as a whole.
- Architecture and planning can either enhance or deteriorate the quality of life.[2]

Within the more in depth description of each of these principles found in the Planning Ordinance, there is language about: avoiding totally automobile-dependent development; enhancing downtown with a new transit system; encouraging alternatives to the automobile such as bicycling, walking, and riding public transit; developing walkable, mixed use communities; connecting old neighborhoods through a network of streets and greenways; and a focus on design over density as the guide for decisions. Specifically under the last principle concerning architecture and planning is a section on town streets:

> Town streets are a critical element of a successful town. Streets are the arteries that tie our town together. Streets are important public spaces along with parks and, as such, create a sense of place that can either enhance community life or detract from it. So this ordinance deals extensively with the way streets must develop in the Town. It requires that neighborhoods be connected with streets and walkways; it requires that buildings front on streets; and it specifies street constructions which acknowledge that cars, pedestrians, transit, and cyclists share the road. [2]

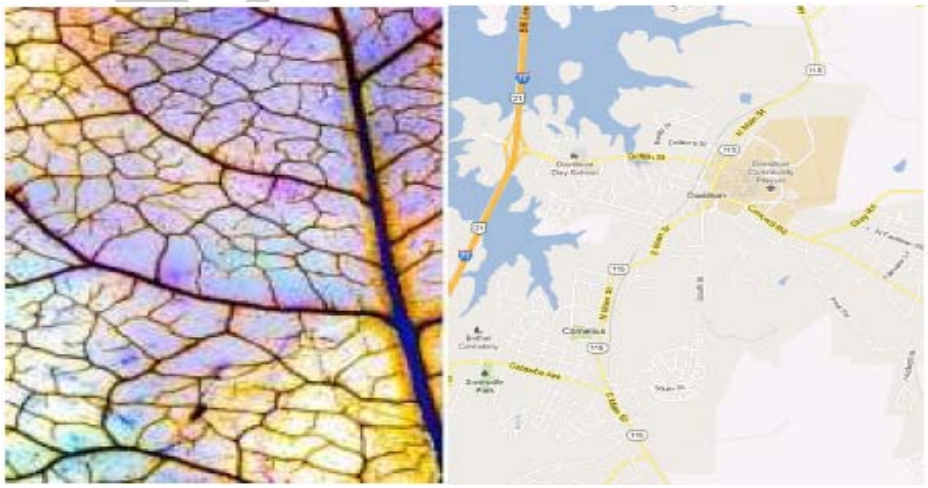

Figure 2: Streets are the arteries that tie our town together

Planning Highlights

Circles at 30

Circles at 30 is the development surrounding two roundabouts found off of Exit 30 from Interstate 77 which serves as the main entranceway to the Town of Davidson. Having two roundabouts in close proximity to each other is unique, but having two roundabouts with two lanes positioned within a quarter mile of a major exit is extremely rare in the United States. The fact that development surrounding the circles includes two schools, various retail, restaurants, housing, a hotel, business offices, and a nature preserve make the planning area a showcase for mixed use development. In 2008, Davidson received the International Making Cities Livable Award for Mixed Use Design and in 2004 and 2011, Davidson received the North Carolina Marvin Collins Outstanding Planning Award for the planning and implementation of the development around the Circles at 30.[3]

Figure 3: Plans and pictures of the Circles at 30

Designation as Walking and Bicycle Friendly Community

In 2011, Davidson was recognized as a bronze level Walk Friendly Community by *Walk Friendly Communities*, a national recognition program developed to encourage towns and cities across the U.S. to establish safer walking environments as a priority. Davidson received this award in recognition of its commitment to complete street guidelines as expressed within the Planning Ordinance as well as its implementation of certain street design standards included within the ordinance including smaller curb radii and median crossing islands.[4]

Figure 4: Davidson is a pedestrian and bicycle friendly community

In 2010, Davidson was recognized as a bronze level Bicycle Friendly Community by the *League of American Bicyclists*, a national organization dedicated to promoting bicycling for fun, fitness and transportation. Other Bicycle Friendly Communities in North Carolina include Wilmington, Raleigh, Greensboro, Durham, Charlotte, Chapel Hill, Cary, Carborro, and Asheville. [5]

The Town of Davidson Planning Ordinance (2001)

The Davidson Planning Ordinance was adopted in 2001 and was last amended in September of 2009. The planning ordinance sets the standards to be followed by all new development within the Town's jurisdiction. It consists of the written ordinance as well as a planning ordinance map that shows the Town's corporate limits, extraterritorial jurisdiction, and various zoning districts. Items mentioned within the Ordinance include permitted uses, building design regulations, parking requirements, street and greenway design, signs, lighting, as well as conservation and environmental protection measures.[6]

In 2004, Davidson's Planning Ordinance was recognized by the *National Environmental Protection Agency* with their Overall Excellence in Smart Growth Award. Only five communities (Davidson, NC; Greensboro, NC; Santa Cruz, CA; Sacramento Region, CA; and San Juan Pueblo, NM) in the nation were recognized by the EPA in the categories of built projects, policies and regulations, community outreach and education, and small communities.[7]

1.2 Description of the Planning Ordinance Rewrite

A rewrite of the Davidson Planning Ordinance is schedule for FY 2013 (July 2012-June 2013). The Lawrence Group, a building design, development, and project delivery firm with offices in Davidson, has been hired to oversee the re-write. The Town of Davidson has worked with the Lawrence Group before on multiple plans including the Downtown Master Plan and Davidson Wood Neighborhood Plan.[8] The HIA is intended to inform the rewrite process, especially of the current health status of Davidson and the potential health impacts the street design standards section may have on the residents of Davidson. It will also make recommendations regarding aspects of the street design standards within the existing ordinance that promote public health and therefore should be kept as well as suggesting additional measures to include to further enhance the built environment and promote public health.

1.3 A Health Impact Assessment of Davidson's Street Design Standards

The *National Research Council's Committee on Health Impact Assessment* defines HIA as:

> a systematic process that uses an array of data sources and analytic methods and considers input from stakeholders to determine the potential effects of a proposed policy, plan, program, or project on the health of a population and the distribution of those effects within the population. HIA provides recommendations on monitoring and managing those effects.[9]

HIA is typically done prospectively or prior to the decision being made. It is used to inform the decision and provide recommendations to mitigate negative health outcomes and encourage health promoting aspects of the decision. Health outcomes are changes in the health status of an individual, group or population, which are attributable to a planned intervention or series of interventions (as opposed to incidental exposure to risk), regardless of whether such an intervention was intended to change health status.[10] This HIA uses a broad definition of health as defined by the *World Health Organization* and considers the social determinants of health and health inequities that may be impacted by the rewrite of Davidson's street design standards.

The primary goal of this HIA is to inform those involved with the rewriting process of Davidson's planning ordinance of the potential long-term health impacts of how streets in Davidson are designed and constructed. This HIA seeks to add multiple dimensions of public health to the discussion currently being had surrounding street design which has primarily been one of promoting active forms of transportation while reducing traffic congestion and accidents. The HIA will elevate this discussion to include baseline health data and innovative recommendations to balance the needs of all street users.

Davidson Design for Life (DD4L) received a grant from the Centers for Disease Control and Prevention: Healthy Community Design Initiative in August 2011 to conduct this HIA. The screening stage of this HIA took place from October to November 2011. Originally this HIA included looking at Senate Bill 731, which if passed would have significant impacts on housing design standards, and considering the overall public realm associated with neighborhood design. However, due to the different geographic scales and decision-makers associated with the two topics of SB731 and Davidson's Street Design Standards, it was decided that two separate HIAs would be more appropriate.

Sections 2 through 7 of this report document the six-step process and findings of the HIA. Relevant research data and resources are listed in the Appendices; see Appendix 1 for the existing standards as adopted by the Davidson Board of Commissioners in June 2001 and updated through June 2012.

Glossary of Terms

Health: A state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity.

Social Determinants of Health: The circumstances, in which people are born, grow up, live, work and age, and the systems put in place to deal with illness. These circumstances are in turn shaped by a wider set of forces: economics, social policies, and politics.

Health Inequities: Avoidable inequalities in health between groups of people within countries and between countries. These inequities arise from inequalities within and between societies. Social and economic conditions and their effects on people's lives determine their risk of illness and the actions taken to prevent them becoming ill or treat illness when it occurs.

Health in All Policies: An innovative approach to address complex health challenges and improve population health through designing healthier communities, integrating public health actions with primary care, and by pursuing healthy public policies across sectors.[10]

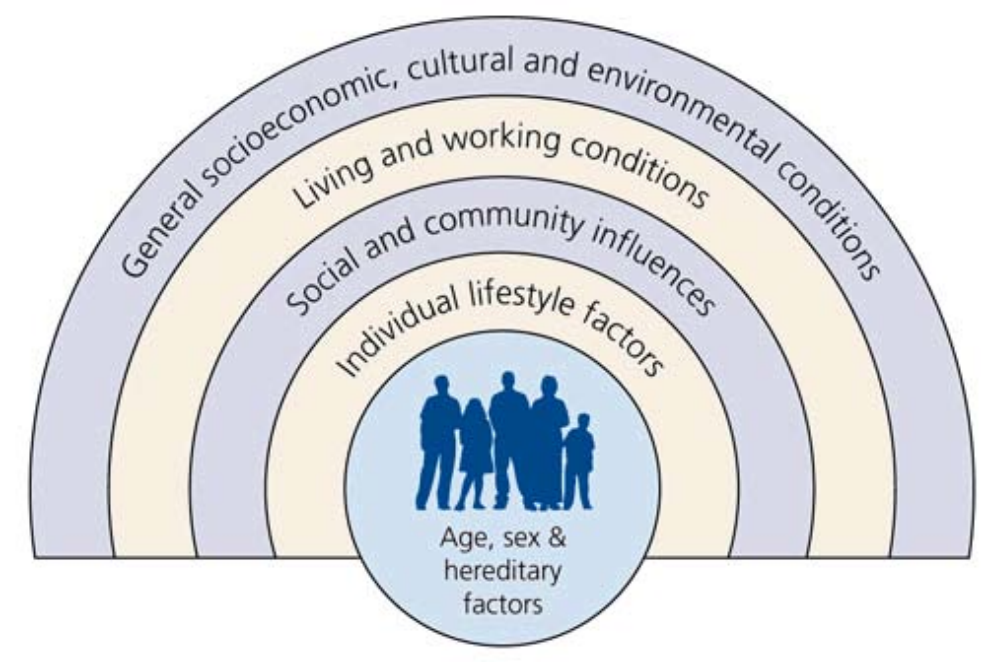

Figure 5: Social determinants of health[11]

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2. Screening

Screening establishes the need for and value of conducting an HIA. Screening considers:

- whether a proposed policy, plan, project, or program will potentially have substantial adverse or beneficial health effects (even if there is a low likelihood);
- if the information from the HIA could alter a decision or help decision-makers choose between alternatives;
- if there could be a disproportionate burden placed on vulnerable populations;
- if there is public concern or controversy surrounding the policy or program;
- whether there is an opportunity to incorporate health information into the decision-making process that would otherwise not occur; and,
- if there is the ability to complete the assessment prior to the decision being made with available resources.[1]

At the conclusion of the screening step, the HIA team should have:

- a complete description of the proposed policy, program, plan or project including a timeline for decision and the political and policy context;
- a preliminary opinion on the importance of the proposal for health and the opportunities for the HIA to inform the decision;
- a statement of why the proposal was selected for screening;
- an outline of expected resources needed to conduct the HIA; and,
- a recommendation on whether the HIA is warranted. [1]

2.1 Screening Process Followed

The screening of this HIA took place from October to November 2011. After the Town of Davidson received the grant from the Centers for Disease Control and Prevention and DD4L became a formal entity, the committee met to discuss what would be the topics for the three HIAs in year 1. Originally the Street Design Standards HIA was grouped with an HIA on SB731 and entitled "Public Health and the Public Realm." A project worksheet describing the project and timeline was prepared for the first Regional Advisory Commission (RAC) meeting held on November 15, 2011 (See Appendix 2).

After the RAC meeting, which was attended by Dr. Arthur Wendel of the CDC as well as Katherine Hebert, the soon to be DD4L Coordinator, the proposed HIA was vetted further. It was determined that "Public Health and the Public Realm" would have two separate decision makers, the North Carolina House of Representatives on SB731 and Davidson's Town Board on the planning ordinance that determines how streets are designed, and therefore should be separated into two HIAs. This idea was accepted by the DD4L Committee and work on the two HIAs began.

2.2 Results of Screening

At the end of the screening step it was determined that an HIA on Davidson's street design standards was warranted. Because the planning ordinance rewrite was scheduled to take place during the 2013 fiscal year (July 2012 to June 2013), an HIA on the section of the ordinance on street design would be completed before the rewrite began and incorporated into the Town's recommended changes to the ordinance.

Stakeholder Identification and Community Engagement

Stakeholder Identification: Because street design standards impact the future development of roads within the Town's jurisdiction, there were many stakeholders identified with this HIA including: those currently living in the Town of Davidson; visitors to Davidson and the region; current bicyclists, walkers, and transit users; future residents of the town; as well as business owners, town staff (including planning, public works, and emergency services), and developers.

Community Engagement: Due to the broadness of stakeholders, DD4L relied on some existing documents, networks, public events, and meetings to gather comments about street design in Davidson and share information about the HIA. Staff examined the *2008 Davidson Bicycle Transportation Plan* which had extensive public involvement including public meetings, newsletters and an online survey. DD4L Project Coordinator, Katherine Hebert presented initial findings of the HIA to committees involved with the Planning Ordinance rewrite and vulnerable population groups including the Planning Ordinance Commission, Planning Board, Livability Committee, and Davidson Committee on Aging. A public meeting was held on July 25 where members of the community watched a video on healthy community design, saw a presentation on the initial findings of the HIA, and could provide feedback by survey as well as in a focus group setting. The survey was also provided online and distributed at two Farmers' Market Saturdays. Community members were also encouraged to email DD4L directly with any concerns they might have. A newsletter describing healthy street design and announcing the public meeting and events was also distributed through the Town's E-crier and printed versions distributed to key places around town.

Figure 6: Surveying community members at the Davidson Farmers' Market

Section References

1. *Improving Health in the United States: The Role of Health Impact Assessments*. (2011). Washington, DC: National Research Council.

3. Scoping

Scoping develops the work plan for conducting an HIA. Scoping considers:

- which potential health impacts will be analyzed within the HIA;
- what populations will be affected, the socioeconomic and health characteristics of those population groups, and if there are any particularly vulnerable subgroups;
- what research questions will be examined and what data and methodology will be used to answer those questions;
- who will be involved in the HIA process and what types of community or stakeholder engagement will be used;
- how information will be shared with stakeholders and decision-makers; and,
- how the HIA process will be evaluated. [1]

At the conclusion of the scoping step, the HIA team should have:

- a list of team members and expected roles within the HIA;
- a diagram of potential health impacts to be analyzed within the HIA and what data, literature, or expert opinion is available to examine these impacts;
- a community profile of the geographic area and populations expected to be impacted by the decision;
- a list of key deadlines and activities that need to be completed; and
- plans for community engagement, communication of findings, and evaluation of the HIA process. [1]

3.1 Scoping Process Followed

Once the decision was made to conduct an HIA on Davidson's street design standards, a scoping worksheet was filled out by DD4L Coordinator Katherine Hebert and approved by the DD4L Committee with additional edits (See Appendix 3). The scoping worksheet was also shared with the DD4L Regional Advisory Commission by email and discussed at their next meeting along with a progress report on the HIA efforts concerning the standards.

3.2 Potential Health Impacts

The potential health impacts that were identified within the scoping process and considered within the HIA include:

- Reduction in the number and severity of motor vehicle accidents and the resulting injuries and fatalities.
- Increased levels of physical activity as people choose to switch to active forms of transportation (such as biking and walking) and walked to transit stops.
- Improved air quality and reduced asthma rates as people drive less and switch to active modes of transportation.
- Greater access and health equity for those who cannot drive.

The expected short-term increases in accidents and injuries as drivers become accustomed to new design components is difficult to predict. However, recommendations for public education similar to that implemented with the roundabouts (public presentations, newspaper articles, and one-on-one instruction) were made.

Potential Health Impacts

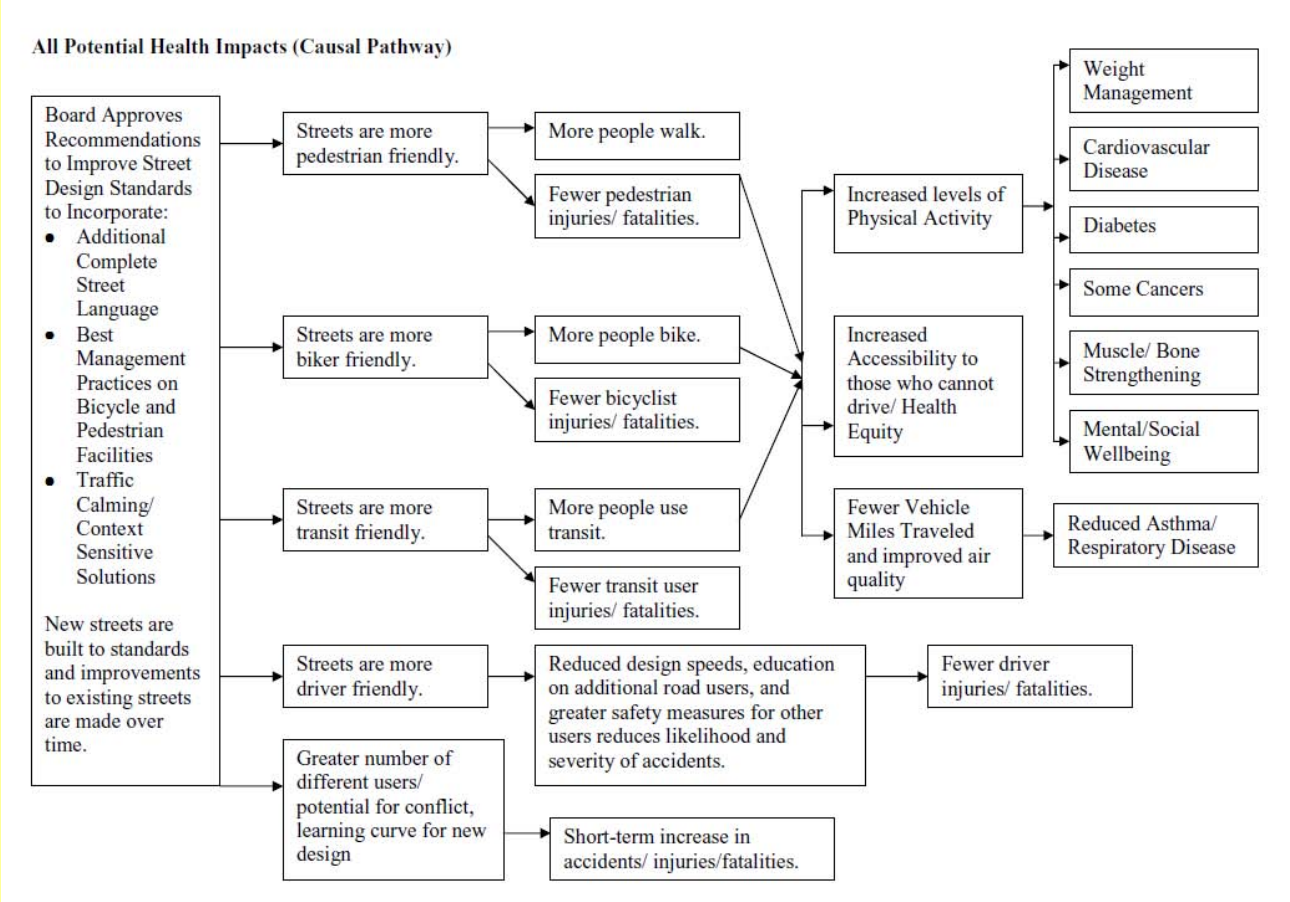


Figure 7: Logic model of all potential health impacts considered in the scoping process

3.3 Health Profile (Davidson, Mecklenburg County, North Carolina)

Motor Vehicle Accidents: Injuries and Fatalities

Davidson

From January 2009 to April 2012, there were 32 injury-causing accidents within Davidson including 4 accidents involving pedestrians and 11 accidents involving bicyclists.[2] On November 3, 2011, Dr. Robert Whitton, a professor at Davidson College was struck within the crosswalk while crossing Concord Road by College Drive. He died 8 days later.[3] Because of his death, there has been a renewed interest by Davidson College and the Town of Davidson to increase public education regarding pedestrian and bicycling safety and improve facilities around the campus and throughout Davidson.

Table 1: Injury-Causing Accidents in Davidson (January 2009-April 2012) Involving Pedestrians and Bicyclists[2]

Date	Location	Description
3/9/2009	Armour St. @ Watson St.	Pedestrian struck while crossing Armour St.
5/6/2009	226 Concord Rd.	Fender bender due to crossing pedestrian
6/5/2009	447 Woodland St.	Biker hit parked vehicle-brake failure
6/9/2009	Jackson St. @ Main St.	Biker hit after traveling on sidewalk against traffic flow
12/15/2009	219 Spinnaker Cove	Pedestrian struck by vehicle making illegal U-turn
5/6/2010	400 Beaty St.	Biker swerved into car
7/10/2010	N. Main St. @ Depot St.	Biker hit while driver tries to parallel park car
8/19/2010	15124 E. Rocky River Rd.	Biker hit by moving van
8/23/2010	NC 115 @ Concord Rd.	Biker hit while walking bike in crosswalk
8/24/2010	599 N. Main St.	Biker hit while on sidewalk against traffic flow
12/2/2010	18434 River Foard Dr.	Biker side-swiped by passing vehicle
4/23/2010	Hwy 73@ Summers Walk Blvd.	Biker hit from behind by car (blinded by sun)
5/14/2011	Dembridge Dr. @ Winged Oak Way	Biker ran stop sign and hit car
9/8/2011	Concord Rd. @ Kimberly Rd.	Biker illegally passed cars and hit car turning in front of it
11/3/2011	Concord Rd. @ College Dr.	Pedestrian struck while crossing in crosswalk

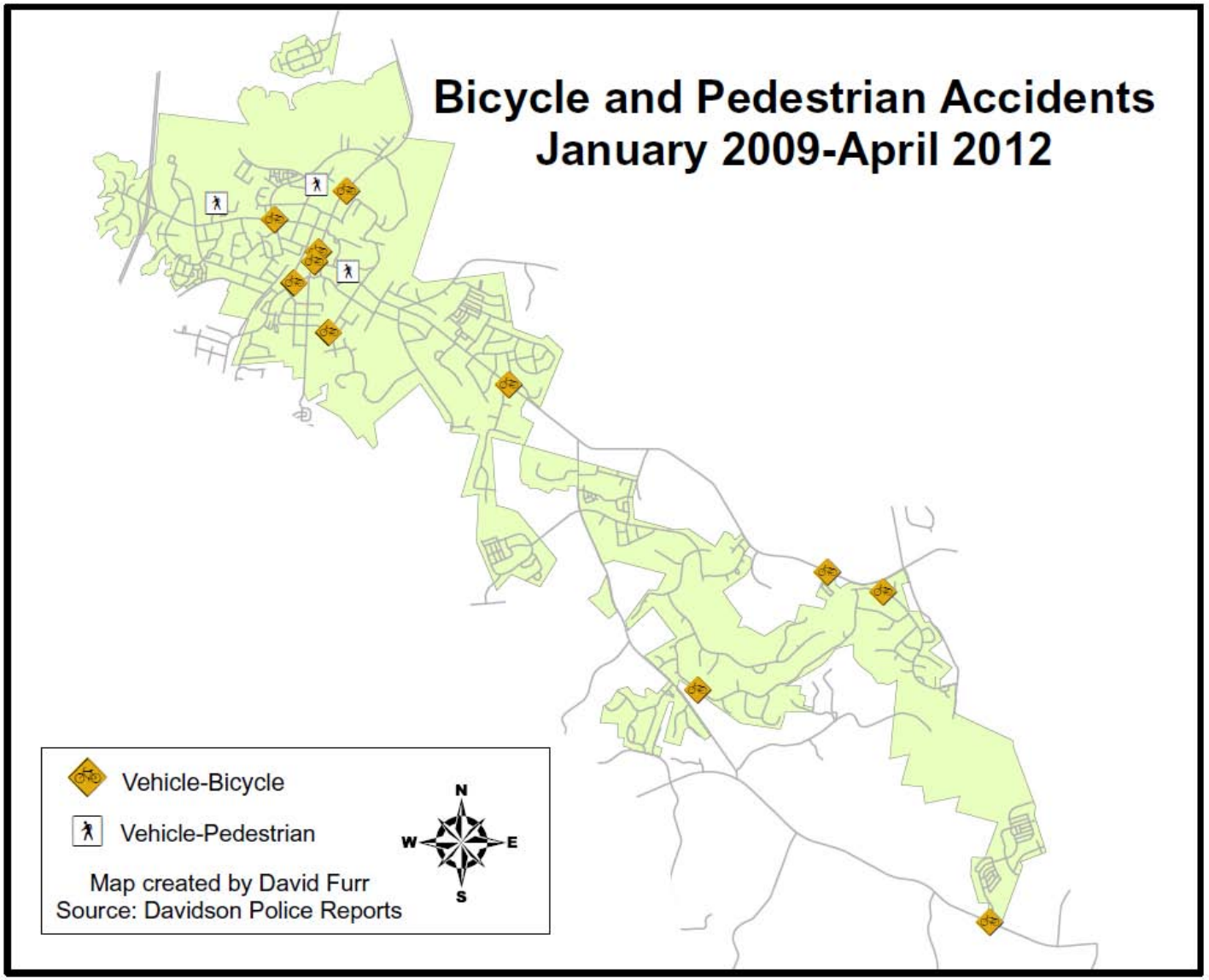


Figure 8: Map of bicycle and pedestrian accidents in Davidson (January 2009-April 2012) [2]

As evident in the table below, quite a few injury-causing accidents between vehicles took place while drivers were either waiting to turn or turning. These accidents in particular were looked at because street design elements such as separate turning lanes, restricted turning, and stop lines further back from the intersection could assist with reducing these types of accidents depending on the intersection.

Table 2: All Injury-Causing Accidents in Davidson (January 2009-April 2012) [2]

Date	Location	Description
2/19/2009	Hwy 115 @ Ridge Rd.	Vehicle hit while waiting to turn left
3/6/2009	15270 E. Rocky River Rd.	Motorcycle malfunctioned
3/27/2009	15500 Davidson Concord Rd.	Vehicle hit while turning onto Stanley McElrath Rd.
3/28/2009	200 Griffith St.	Vehicle hit while turning into Sadler Sq. Parking Lot
5/4/2009	18724 Greyton Lane	Vehicle hit parked landscaping truck
7/9/2009	20000 Davidson Concord Rd. @ Concord Rd.	Vehicle making too quick of turn off of Concord struck another vehicle
8/6/2009	15826 E. Rocky River Rd.	Vehicle hit tree avoiding animal
10/14/2009	1300 Grey Rd.	Vehicle hit tree
12/3/2009	1136 Concord Rd.	Vehicle hit deer
12/17/2009	Ramah Church Rd.	Vehicle hit tree
6/3/2010	18000 River Crossing Blvd.	Vehicle ran off road while avoiding deer
7/19/2010	200 Griffith St.	Rear end collision
9/8/2010	1-77 Northbound Ramp	Drunk driver ran off ramp
11/9/2010	Davidson-Concord Rd. @ Ramah Church Rd.	Vehicle ran off road and rolled
12/17/2010	Beaty St.	Vehicle slid on ice
5/20/2011	Davidson Concord Rd.	Tree fell on vehicle
10/1/2011	Hwy 73 @ Ramah Church Rd.	T-Bone
10/12/2011	Hwy 115 @ Ridge Rd.	Head on Collision
12/5/2011	Hwy 115 @ Potts St.	Rear End Collision

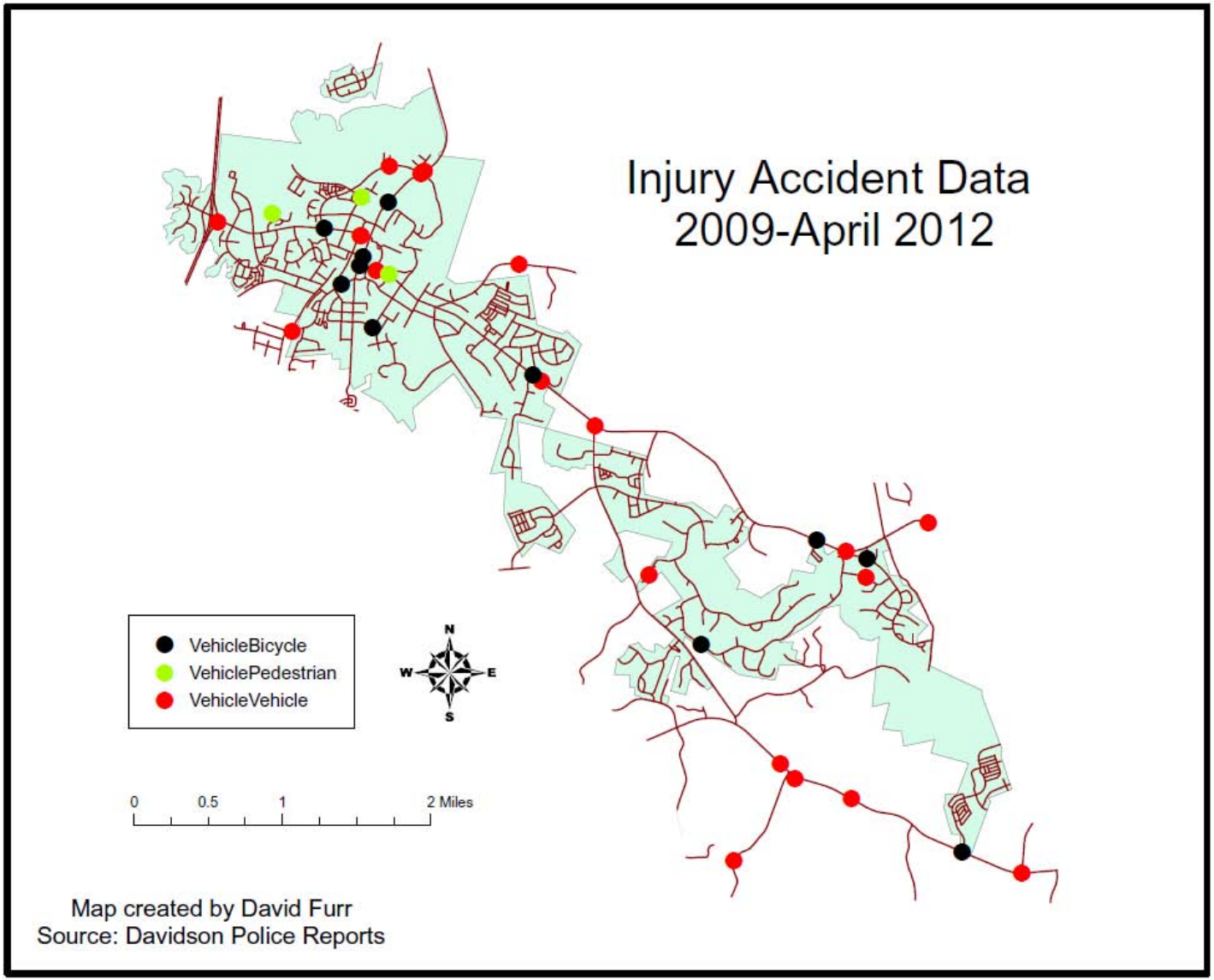


Figure 9: Map of all injury-causing accidents in Davidson (January 2009-April 2012) [2]

Mecklenburg County

Mecklenburg County has been consistently ranked within the middle of North Carolina's 100 counties in County Crash Rankings based on a multitude of criteria including the total crash rate, fatal crash rate, and non-fatal injury crash rate. Its best ranking was in 2003 with a ranking of 53 and its worse raking was in 2007 with a ranking of 45. Charlotte's crash rates influence this score greatly—from 2006 to 2009, Charlotte has ranked within the 4 worst ranked cities with populations of 10,000 or more (See Table 3). The other towns within Mecklenburg County have fared better with Cornelius and Davidson scoring in the top 15% and Huntersville consistently improving since 2006.[4]

Table 3: 2009 Ranking of Cities with Populations of 10,000 or More (Based on All Reported Crashes from January 1, 2007 through December 31, 2009- Out of 83)[4]

City	Total Crashes	% Alcohol Related Crashes	Fatal Crashes	Non-Fatal Injury Crashes	2006 Ranking	2007 Ranking	2008 Ranking	2009 Ranking
Charlotte	90810	3.26%	217	22,875	4	2	2	4
Mooresville	3757	4.74%	5	1035	27	33	30	31
Huntersville	33350	4.50%	8	800	33	34	46	48
Cornelius	1231	5.44%	5	253	70	71	70	71
Davidson	406	3.45%	0	85	---	---	---	82

On average, Mecklenburg County experiences 322 pedestrian crashes and 63 bicycle crashes each year including 14 pedestrian fatalities and 1 bicyclist fatality.[5]

The total cost associated with both fatal and non-fatal crashes in Mecklenburg County, based on the 5 year average crash rates (2004-2008) and 2010 Standardized Crash Cost Estimates in North Carolina, was over $815 million. This estimate includes expenses associated with medical care, public services, victim work loss, employer costs, travel delay, property damage, and reduction in quality of life.[6]

Figure 10: Memorials for bicyclist and pedestrian fatalities

North Carolina

Overall, motor vehicle injuries are the 10th leading cause of death in the state and the leading cause of death for North Carolina youth ages 5 through 24 years.[7] In 2009, motor vehicle injuries resulted in 1,394 deaths. Crash data available for pedestrians and pedalcyclists (defined as a road user traveling on a bicycle or a non-motorized vehicle with at least two wheels and pedals or hand-cranks) indicate that 169 pedestrians and 25 pedalcyclists were killed by a crash in 2008 (See Table 4).[8, 9] Twenty-three percent of these fatalities and 45% of injuries were among those aged 0 to 24 years old. [9]

Table 4: Age of Pedestrian and Pedalcyclist Casualty in North Carolina (2008)[9]

	Pedestrians			**Pedalcyclists**		
AGE	*Total*	*Killed*	*Injured*	*Total*	*Killed*	*Injured*
0 to 4	52	2	50	4	0	4
5 to 9	105	4	101	36	0	36
10 to 14	121	6	115	94	0	94
15 to 19	248	16	323	100	3	97
20 to 24	210	13	197	73	0	73
25 to 34	284	20	264	96	5	91
35 to 44	324	38	286	88	4	84
45 to 54	296	37	259	116	4	112
55 to 64	143	21	122	61	8	53
65 to 74	55	6	49	24	0	24
75- Older	41	6	35	6	1	5
Not Stated	11	0	11	3	0	3
Total	**1,890**	**169**	**1,721**	**701**	**25**	**676**

Physical Activity: Chronic Disease Prevention

Chronic diseases, such as heart disease, stroke, cancer, diabetes, and arthritis, are among the most common, costly, preventable and deadly health problems in the United States. Common causes of chronic disease include a lack of physical activity, poor nutrition, tobacco use, and excessive alcohol consumption.[10]

Health Benefits of Physical Activity

The health benefits of meeting recommended physical activity levels include:

- Weight management,
- Reduced risk of cardiovascular disease,
- Reduced risk of type 2 diabetes and metabolic syndrome,
- Reduced risk of certain cancers,
- Stronger bones and muscles,
- Improved mental health and mood,
- Improved ability to do daily activities and prevent falls,
- Improved quality of life and length of life.

Figure 11: There are many health benefits to walking and biking!

North Carolina

In 2010, the leading cause of death in North Carolina was cancer (17,476 deaths) followed closely by heart disease (17,133 deaths). Diabetes, another chronic disease that can be prevented through proper diet and physical activity, was the 7th leading cause of death (2,107 deaths).[11] Hospitalization expenses in North Carolina associated with cardiovascular, circulatory diseases, and diabetes totaled $9.6 billion in 2009.[7]

Mecklenburg County

Similar to the state and the nation, chronic diseases are the leading causes of death in Mecklenburg County. Nine out of ten of the leading causes of death in Mecklenburg are chronic diseases or have chronic components. In 2008, cancer was the leading cause of death in Mecklenburg (1,146 deaths) followed by heart disease (954 deaths). Similar to North Carolina's mortality rates, diabetes was also the 7th leading cause of death in Mecklenburg (135 deaths). Hospitalization expenses in Mecklenburg County associated with cancer, cardiovascular diseases, and diabetes totaled $338 million. [12]

Inactivity

Inactivity can lead to chronic disease. There are many health benefits to being physically active including managing weight, reducing the risk of many chronic diseases such as heart disease, cancer, and diabetes, and living a longer and happier life.[13] According to the *2008 Physical Activity Guidelines for Americans*, it is recommended that adults do two types of physical activity each week to improve health- aerobic and muscle strengthening activities.[14]

Figure 12: Inactivity like watching too much television can lead to chronic disease

There are two levels of aerobic activity- moderate-intensity aerobic activity such as brisk walking and vigorous-intensity aerobic activity such as jogging or running. Many daily activities that are not typically considered exercise (gardening, yard work, cleaning the house, playing chase with the kids) are physical activity and should be counted if done in at least 10 minute intervals. Muscle strengthening activities should work all the major muscle groups (legs, hips, back, abdomen, chest, shoulders, and arms) and is extremely important to retain muscle mass and prevent falls in older adults. [14]

Children and teens also need to be physically active including 60 minutes a day of age-appropriate aerobic, muscle strengthening, and bone strengthening activities.[15]

Table 5: Physical Activity Recommendations for Adults and Children[14,15]

Age Group	Physical Activity Recommendation
Adults	2 hours and 30 minutes of moderate-intensity aerobic activity every week and muscle strengthening activities on 2 or more days a week **OR**
	1 hour and 15 minutes of vigorous-intensity aerobic activity every week and muscle strengthening activities on 2 or more days a week **OR**
	An equivalent mix of moderate and vigorous aerobic activity and muscle strengthening activities on 2 or more days a week.
Children	Aerobic activity should make up most of a child's 60 minutes of physical activity a day and can include moderate and vigorous-intensity activities. Be sure to include vigorous-intensity aerobic activities such as running on at least 3 days per week.
	Muscle strengthening activities, such as gymnastics or sit ups, should be done at least 3 days per week as part of the daily hour of activity.
	Bone strengthening activities such as jumping rope or running should also be done at least 3 days a week.

North Carolina

In North Carolina, 64% of adults do not meet recommended levels of physical activity defined as 2 hours and 30 minutes of moderate-intensity activity or 1 hour and 15 minutes of vigorous-intensity activity each week.[16] Furthermore, 26% of adults in North Carolina reported participating in no physical activity over the last month.[17]

Inactivity is not limited to adults. As part of the Youth Risk Behavior Surveillance System, high school students in North Carolina were asked how often they participated in physical activity, and sedentary activities such as watching television or using a computer.

- 15% of youth did not participate in the recommended 60 minutes of physical activity on any day.
- 74% were physically active at least 60 minutes per day on less than 7 days.
- 35% watched television 3 or more hours per day on an average school day.
- 28% used computers 3 or more hours per day on an average school day.[18]

Mecklenburg County

In Mecklenburg County, 46% of adults reported participating in moderate physical activity on a regular basis and 28% indicated participation in vigorous activities. In 2009, one fifth of Mecklenburg County adults reported not exercising in the past 30 days. [12]

Mecklenburg teens are less active than the state average. Over 43% of Mecklenburg teens reported being physically active for a total of 60 minutes or more per day on five or more days in the past week (compared to the state average of 46%). Forty-two percent of teens participated in sedentary activities such as watching three or more hours of TV on an average school day. Only a quarter of teens attended physical education classes daily during the school year. [12]

Overweight and Obese

Overweight and obese both describe weights that are greater than what is considered healthy for a given height and have been associated with an increase risk of certain diseases and other health problems. For adults, overweight and obesity ranges are determined using a number called the "body mass index" (BMI) which is calculated using a person's weight and height. An adult with a BMI between 25 and 29.9 is considered overweight and an adult with a BMI of 30 or higher is considered obese. BMI tends to correlate with the amount of body fat in most adults but can

Figure 13: Being overweight or obese can increase the risk of disease

sometime be an inaccurate measure of body fat (such as in the case of athletes with large amounts of muscle mass) because it does not directly measure body fat. [19]

BMI is also used to estimate overweight and obesity rates in children; however, it is determined using an age and gender specific percentile for BMI rather than the BMI categories for adults. Because children's body composition varies as they age and varies between boys and girls, overweight is defined as a BMI at or above the 85th percentile and lower than the 95th percentile for children of the same age and sex and obesity is defined as a BMI at or above the 95th percentile.[20]

Being overweight or obese is a result of an energy imbalance involving eating too many calories and not burning enough calories through physical activity. Body weight and problems maintaining body weight are a result of multiple factors including genes, metabolism, behavior (such as eating and physical activity patterns), environment, culture, and socioeconomic status. Behavior and environment play a large role in weight management efforts and have been identified as the greatest areas for prevention and treatment actions.[21]

The potential health consequences of being overweight or obese include increase risk of:

- Coronary heart disease
- Type 2 diabetes
- Cancers (endometrial, breast, and colon)
- Hypertension (high blood pressure)
- Dyslipidemia (high total cholesterol or high levels of triglycerides)
- Stroke
- Liver and gallbladder disease
- Sleep apnea and respiratory problems
- Osteoarthritis
- Gynecological problems[21]

North Carolina

North Carolina has the 12th highest percentage of obese adults and the 14th highest percentage of obese and overweight children in the United States.[22] According to the 2010 Behavioral Risk Factor Surveillance System, 65% of adults are overweight or obese. Adult obesity rates have doubled since 1990 from 13% to 30% in 2009. [7] According to America's Health Rankings, North Carolina's obesity related healthcare cost are estimated to be an average of $4.3 billion by 2013 (approximate $620 annually per capita).[7]

According to the North Carolina Nutrition and Physical Activity Surveillance System (NC-NPASS), obesity prevalence is also on the rise in children and young adults. In 2009, 15% of children ages 2-4, 26% of children ages 5-11, and 28% of children ages 12-18 were classified as obese based on their Body Mass Index (BMI). An additional 15 to 18 percent were considered overweight for their age-group. It is likely that the unhealthy habits learned in childhood will continue into adulthood and additional chronic diseases

such as diabetes and cardiovascular disease will impact these children later in life. [7]

Mecklenburg County

Over 64% of Mecklenburg adults are overweight or obese (slightly lower than state average).The distribution of obesity is not equal by race/ethnicity or by gender. African-Americans were more likely to be overweight than White or Hispanic adults. Adult males were more likely than females to be overweight (67% compared to 53%). Approximately 17% of Mecklenburg teens surveyed are overweight (at or above the 85th percentile but below the 95th percentile) and over 12% are considered obese (at or above the 95th percentile for body mass index, by age and sex). [12]

Diabetes

Figure 14: Diabetes is approaching epidemic proportions in North Carolina [7]

Diabetes is a disease where blood glucose levels are above the normal level. Glucose or sugar is found in food and is broken down by the body for energy. The pancreas is the organ responsible for producing a hormone called insulin that helps the body's cells absorb glucose. With diabetes a person's body either does not make enough insulin or can't use its own insulin as well as it should and sugar builds up within the person's blood. Diabetes can cause serious health complications including heart disease, blindness, kidney failure, and lower-extremity amputations. Risk factors for type 2 diabetes (formerly know as late-onset diabetes and accounting for 90-95% of diabetes cases) include: older age, obesity, family history of diabetes, prior history of gestational diabetes, impaired glucose tolerance, physical inactivity, and race/ethnicity. In most cases diabetes can be prevented and treated through healthy eating and physical activity. Frequent blood glucose testing, medication, and insulin injections are required for many cases of diabetes.[22]

North Carolina

According to the 2011 North Carolina Health Profile, "with a greater prevalence of obesity and an increasing elderly population, diabetes is approaching epidemic proportions in North Carolina". In 2009, 9.6% of the adult population had been diagnosed with diabetes (an increase of 50% since 1998). Another 7% of respondents indicated that they had been diagnosed with pre-diabetes and the actual prevalence may be twice as high given the estimate that there is an undiagnosed case of diabetes for every 2.7 cases that are diagnosed.[7]

In 2009, diabetes was the seventh leading cause of death in North Carolina (causing 2,107 deaths) and a large contributing factor to other leading causes of death such as heart disease, stroke, and kidney failure. Diabetes can also lead to amputations, kidney

disease, and blindness. The total hospitalization costs associated with diabetes in 2009 were more than $4.4 billion. [7]

Mecklenburg County

In 2008, diabetes was the 7th leading cause of death in Mecklenburg County (resulting in 135 deaths). The rate of deaths as a result of diabetes has increased 11% from 2005 to 2008, due largely to Mecklenburg's aging population. Mecklenburg's rate of diabetes is lower than the North Carolina average (15.4 compared to 23.5). According to the 2009 Mecklenburg Behavioral Risk Factor Surveillance System, 6% of the population reported being told by a doctor that they had diabetes and another 3% is estimated to have the disease and not realize it. In 2009, the inpatient hospitalization charges for diabetes in Mecklenburg County were over $23 million.

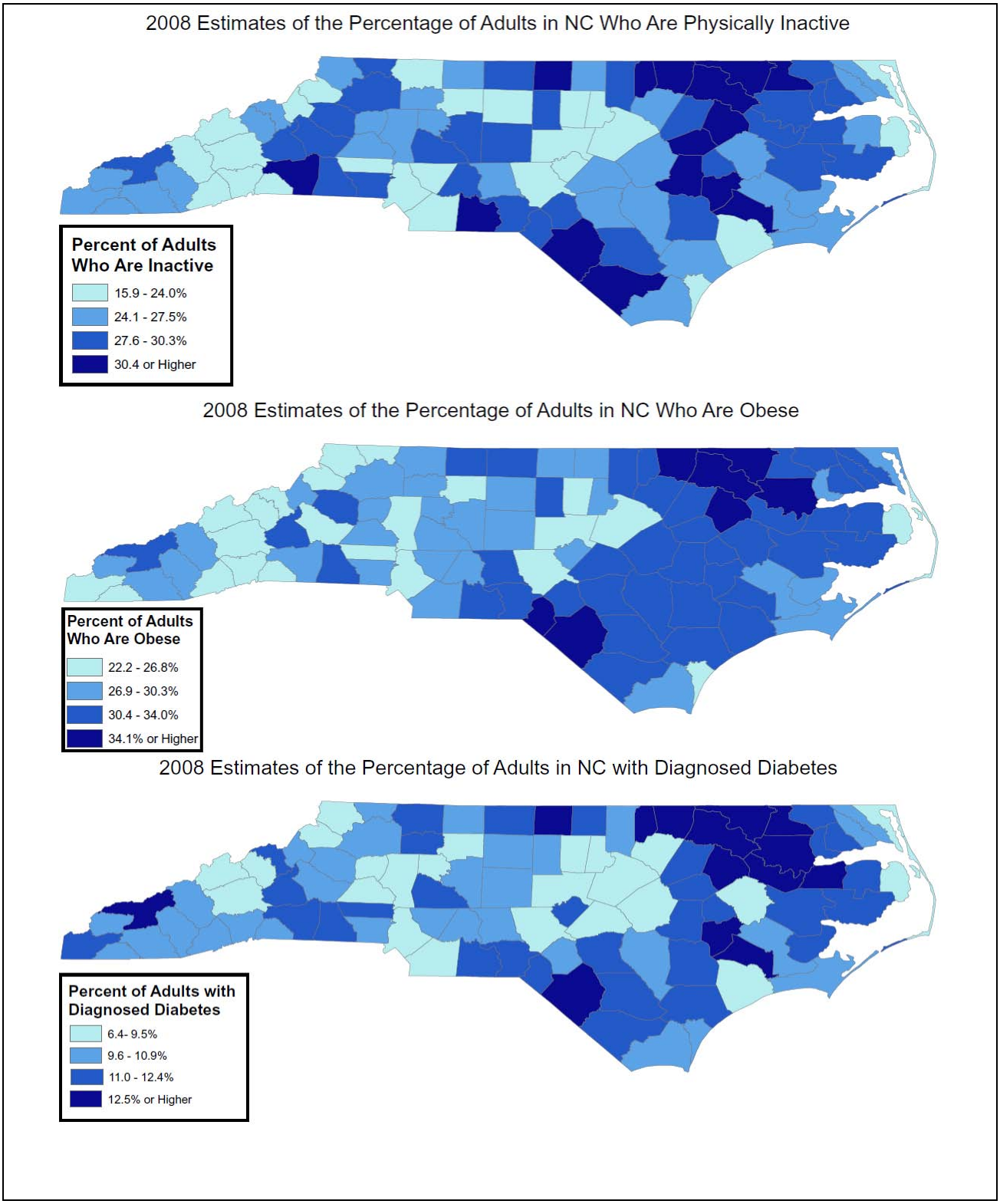


Figure 15: Rates of physical inactivity, obesity, and diabetes in North Carolina (2008)[23]

Air Pollution: Asthma

Asthma is a disease that affects a person's lung capacity causing wheezing, breathlessness, chest tightness, and coughing. Asthma attacks can be triggered by multiple factors including tobacco smoke, dust mites and cockroach allergens, mold, pet dander, smoke from burning wood, grass clippings, and outdoor air pollution. During an asthma attack, a person's airways swell and less air can get in and out of their lungs making it difficult to breath. Asthma can be treated through various medications and by avoiding triggers to asthma attacks.[24]

Figure 16: Air pollution can trigger asthma attacks[24]

North Carolina

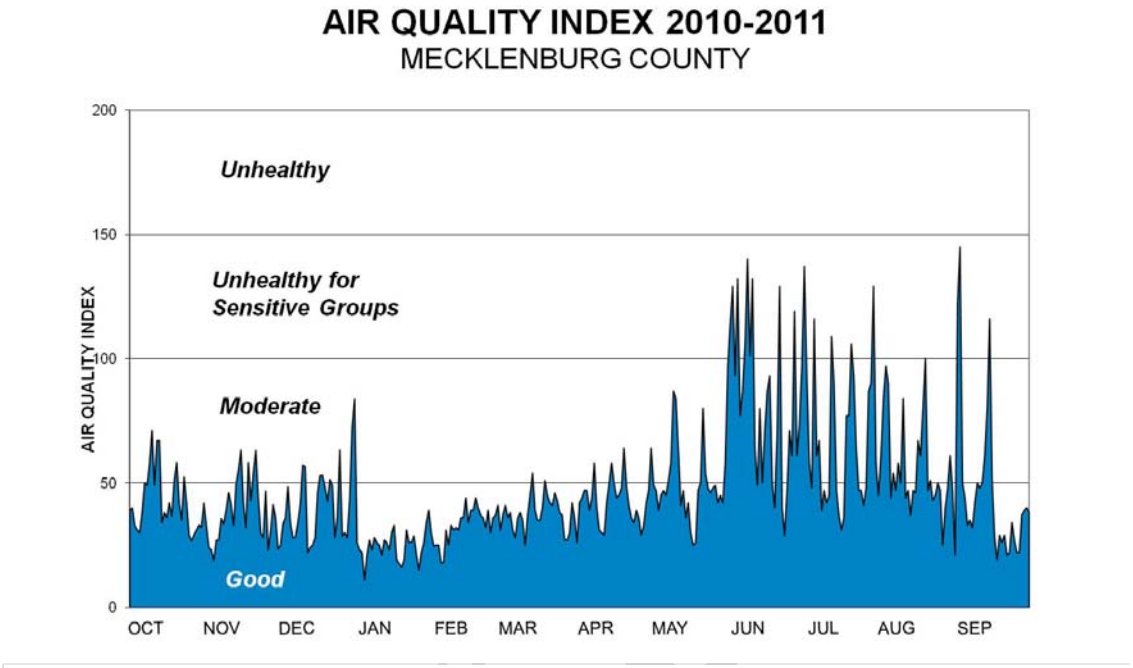
The state of North Carolina has consistently ranked below the national average for asthma rates. The average prevalence rate for asthma in North Carolina from 2001 to 2010 was 7.2% compared to the national average of 8.1%. In 2010, only Tennessee, Louisiana, Mississippi, West Virginia, and Texas had lower prevalence rates for asthma than North Carolina. The distribution of asthma is not equal among socioeconomic factors or race/ethnicity.[25] According to the 2009 Behavioral Risk Factor Surveillance System, 12.9% of those surveyed had been told by a doctor that they had asthma.[26] Native Americans and African Americans had higher rates of asthma (20% and 15.6% respectively). Those with less education and lower household incomes also had higher rates of asthma. An average of 7.8% of the population reported still having asthma in 2009.[27]

A possible contributing factor to North Carolina's recent decrease in an already low asthma rate is legislation passed in 2010 requiring nearly all restaurants and bars to be smoke-free. [25] Thanks to North Carolina's Smoke-Free Restaurants and Bars law all enclosed areas of restaurants and bars, as well as parts of hotels, motels, and inns where food and drink are prepared, are required to be smoke-free.[12] This legislation removes a major trigger to asthma attacks- tobacco smoke.

Mecklenburg County

In 2008, it was estimated that 76,100 people (12% of the adult population) within Mecklenburg County had asthma. Asthma is considered a leading chronic illness among children and youth and a major cause of school absenteeism. In the 2009 Charlotte-Mecklenburg Youth Risk Behavior Survey, 19% of students had been diagnosed with asthma. On average these students missed 8.8 days of school and 426 Mecklenburg children ages 0-14 years old had been hospitalized because of asthma. [12]

Air quality in Mecklenburg County has also improved from having 10 days of elevated ozone in 2005 to zero in 2009 within the Charlotte Metro Area. Several initiatives have been formed to address air quality in Mecklenburg County including Mecklenburg Air Quality Program, Clean Air Works!, and Clean Air Carolina. [12]



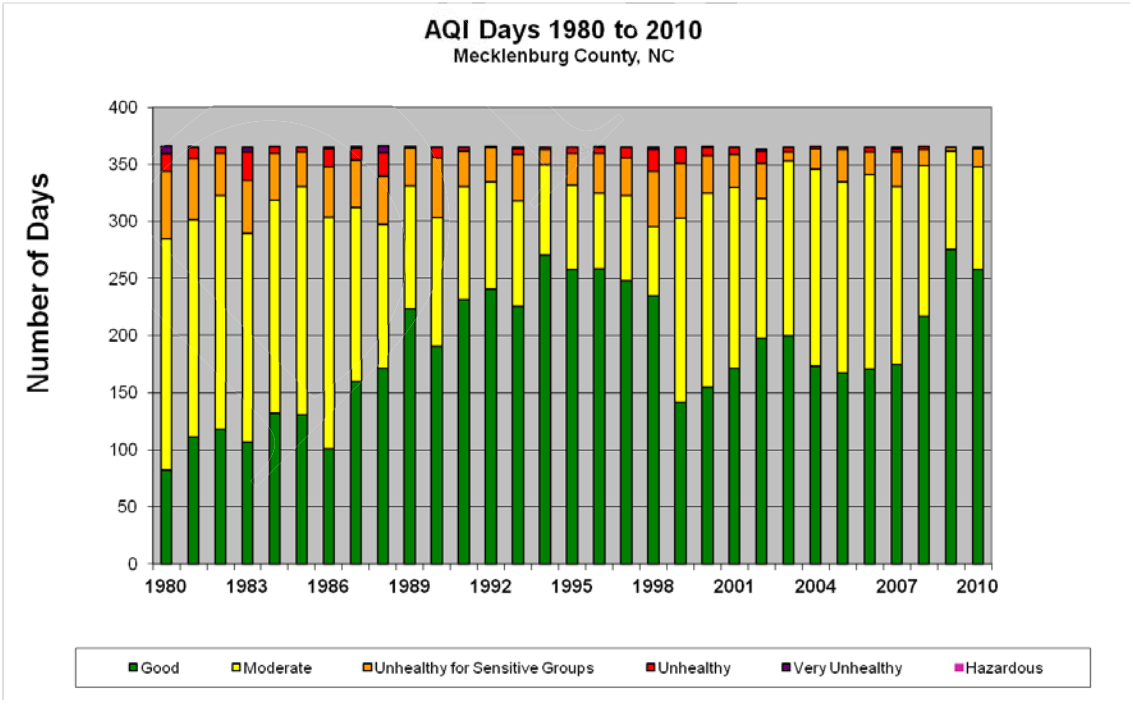


Figure 17: Air quality in Mecklenburg County 1980-2011[28]

Mobility: Health Equity

Accessibility is a crucial component to promoting health equity and a healthy community. Mobility- the ability to move or travel from one place to another- is a key element of accessibility.[29] If a community is designed solely for vehicular access-void of sidewalks, public transit, and bicycling facilities- then the mobility of those who cannot afford a car or cannot drive due to age or circumstance will be limited. In order to determine what percentage of the population may have limited mobility the indicators of vehicle ownership, poverty levels, age, and physical disability were examined for Davidson.

Vehicle Ownership

Whether by choice or economic hardship, not having access to a vehicle can limit mobility if a community does not have alternative modes of transportation such as public transit or bicycling. It is estimated that 78 households or roughly 2% of households in Davidson do not have a vehicle. Another 978 or 26% of homes only have one vehicle.[30]

Poverty Levels

There was an average rate of 8.8% of the population below the poverty level for Davidson from 2006-2010.[31] Poverty rates are particularly high for single parent households especially those maintained by single mothers. There are a total of 3,669 households within the Town of Davidson. For 7.3% of these households, there is a single mother householder with a subsequent 5.1% of these households containing children under the age of 18. Of the families whose income in the past 12 months was below the poverty level, 17.2% of these were led by single mothers, often with young children (under the age of 5). [32]

Age

According to the American Community Survey (2006-2010), of the 10,320 residents of Davidson, 2,030 or 19.7% of the population are under the age of 15 and are legally unable to drive. Another 3.7% of the population or 387 people are over the age of 75 and are probably unable to drive or choose to drive in a limited capacity (for example only during the day time or only on local streets).[32]

Disability

There is no reliable data on disability in Davidson. However, according to the 2010 Behavioral Risk Factor Surveillance System, 12.5% of Mecklenburg County adults are limited in some form of activity such as driving by a physical, mental, or emotional problem.[33]

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4. Assessment

Assessment is the actual analysis of the potential health impacts on the selected population and can take many forms depending on the subject of the HIA. Assessment considers:

- the literature and data available to suggest the likelihood of a particular health impact occurring, the severity of that impact, and the magnitude of the impact;
- expert opinions from those knowledgeable in the field relevant to the health impact being examined and the project, policy, plan, or program being analyzed;
- stakeholder concerns and local knowledge; and,
- the different potential impacts of multiple alternatives being considered within the HIA.[1]

At the conclusion of the Assessment step, the HIA team should have:

- the baseline health status of the populations expected to be impacted;
- a description of the data and analytical methods used;
- findings from the literature review, quantitative modeling, interviews or focus groups with experts, or stakeholder engagement;
- a list of any limitations or assumptions made during the assessment; and,
- a summary of the findings of the assessment. [1]

4.1 Literature Review

Street Design and Injury/ Fatality Reduction

Drivers/Passengers in Motor Vehicle

Travel by motor vehicle accounts for more than 90% of transportation-related fatalities and is the leading cause of death for those aged five to thirty-four years in the United States.[2] Thanks to changes in vehicle and roadway environments such as airbags, shoulder and lap belts, brake lights, divided highways and two-way traffic, breakaway signs and utility poles, improved lighting, transportation-related injuries have steadily decreased from the 1920s.[3] At the same time, increasing the network of well-built, high-speed roads may have indirectly led to increased urban sprawl and the associated increase in commute time, vehicle miles traveled and exposure to traffic accidents.[4] Communities with more compact development and fewer vehicle miles traveled have lower traffic fatality rates per capita.[5] Reducing travel demand through community design such as mixed use, compact development and complete streets with lower speeds, narrower travel lanes, and bicycling, transit, and pedestrian facilities may be an effective strategy for preventing motor vehicle fatalities and injuries.

Bicyclists/ Pedestrians

Only 1% of federal transportation funds are spent on pedestrian and bicycle facilities in the United States.[6] Although walking or biking accounts for 11% of trips made, pedestrian and bicyclists represent 14% of all motor vehicle fatalities.[7,8] Building walkable and bikeable communities to promote active transportation instead of driving, as included in planning approaches such as New Urbanism, smart growth, and Active Living by Design, is an effective way to prevent pedestrian and bicyclist injury.[9] In countries where significant funding and attention has been paid toward creating a safe system of bicycle and pedestrian facilities that encourage lower speeds and separate vehicular traffic from pedestrian traffic, the number of pedestrian deaths per distance traveled has decreased significantly. For example, pedestrian death rates in the United States are three times higher than in Germany and five times higher than in the Netherlands.[9] From 2007-2009, North Carolina was ranked 44th in the nation for walker and bicyclist safety. [10]

Street designs that include separating pedestrians from motor vehicles and installing traffic signals, in-pavement flashing lights, four-way stops, pedestrian overpasses, and sidewalks have been shown effective in preventing pedestrian injuries.[11] Crosswalk design and location in particular can either contribute to or subtract from the likelihood of pedestrian injury. For example, crosswalks located on busy streets or streets with more than two lanes without traffic signals can actually increase the risk for pedestrians especially youth and the elderly.[12] Engineering measures to increase visibility of pedestrians and reduce speeds such as increased lighting, small roundabouts, four-way stops, and speed humps also decrease injury risk. [11, 13]

Additional environmental strategies such as routing traffic away from residential settings, providing off-road trails for pedestrians and bicycles, and implementing area wide traffic calming which would slow down traffic speeds are all promising methods to improve safety needing more research.[14]

Street Design and Increased Physical Activity

Active Transportation (walking/bicycling)

Many studies have shown that transportation facilities, such as the presence and condition of sidewalks, bike lanes, and the design of roads, can encourage or impede active transportation and physical activity levels. In a systematic review of policies to support physical activity, it was found that street-level improvements such as improved street lighting, street crossings, sidewalk continuity, landscaping, and traffic calming resulted in an average increase in physical activity levels of 35%. In addition to street-level improvements, community-scale design and land use regulations can contribute to physical activity by providing destinations within walking or biking distance through mixed land use and providing safe and attractive pathways to get there through sidewalks and bike lanes. [15]

For youths, sidewalks, safe crossings, and traffic-calming features such as speed humps and traffic lights were related to greater total physical activity.[16] The evidence is less clear for relationship between transportation facilities and physical activity levels in adults. This could be attributed partly because for adults who have easy access to vehicular travel, other influences such as destinations within walking distance may be a more influential factor.[17]Adults also have a greater ability to be seen by drivers, have more experience, and better discernment of whether an environment is safe to walk or bike in. Therefore, to a certain extent, they are more willing to walk or bike in areas lacking proper active transportation facilities.

Rates of walking have consistently correlated with the existence of sidewalks, connectivity, mixed land-use, safety, and neighborhood type.[17] Street connectivity, often measured by the number of intersections and block size, creates shorter routes to destinations.[18] Higher residential density and mixed use supports local retail and creates more destinations within walking distance. [18] Although the relationship between crime and physical activity is complex in adults, the sight of others being physically active and the absence of crime were positively related to increased physical activity in youths.[17,19]

Bicycling facilities such as bicycle lanes, separate paths, and bicycle boulevards have been associated with increased levels of bicycling.[20] Other characteristics of the built environment that influence bike route choice include higher intersection density, fewer hills, traffic calming devices, mixed land uses, higher population density, and the presences of bicycle infrastructure.[21] Through a systematic review of 16 studies, cycling was consistently associated with improved cardiovascular fitness, reduced cancer risk, and reduced risk of being obese or overweight.[22] In a comparison of all 50 states and large U.S. cities, higher rates of bicycling and walking to work were associated with more adults reaching recommended physical activity levels, fewer obese adults, and reduced prevalence of diabetes.[23]

Transit Use

Increased transit use can result in an increase in physical activity as users walk or bike to and from transit stops. The median amount of time spent walking to a transit stop is 19 minutes and 29% of transit riders exceed 30 minutes of physical activity daily.[24] People of lower socio-economic status and minorities on average walked further to transit stops and transit riders are willing to walk further to a rail stop than a bus stop. [24] In a study of the Charlotte light rail system, it was determined that use of light rail to commute to work was associated with a 1.18 reduction in body mass index (BMI) and a 81% reduced odds of becoming obese over time.[25] Techniques to encourage commuters to cycle or walk to transit including providing weather and security protection for bicycles and sponsoring employee transit passes have been shown to increase transit use and physical activity levels.[26,27] Safety around transit stops also influence levels of transit use and pedestrian injuries around transit. The location of transit stops near intersections with crosswalks and in populated areas, increased lighting around stops, the presence of pedestrian refuge islands on wider roads, and sheltered stops can all improve the safety of transit use.

Street Design and Reduced Asthma

Reduced Vehicle Miles Traveled and Vehicle Trips

Improving accessibility to a destination and the overall design of a street network can greatly reduce the vehicle miles traveled. Vehicle miles traveled and vehicle trips are linked to traffic safety, air quality, energy consumption, climate change, and other social costs of automobile use. Travel demand is determined within planning using the six Ds-density, diversity, design, destination accessibility, distance to transit, and demand management (See Figure 18). [28]

Design is of specific interest to this HIA and includes all the street network characteristics within an area. Street networks vary from dense urban grids with straight, highly connected streets to suburban networks with curving streets and cul-de-sacs. Measures of design include average block size, proportion of four-way intersections, the number of intersections per square mile, sidewalk coverage, average street widths, building setbacks, number of pedestrian crossing, and other pedestrian friendly factors such as street trees, benches, etc. [28]

In a study by Ewing and Cervero, it was found that destination accessibility, or ease of access to trip attractions such as stores, employment centers, or downtown, was the most strongly associated variable with vehicle miles traveled. The next most strongly related variables are the design components of intersection density and street connectivity. Short blocks and many street interconnections shorten travel distances and vehicle miles traveled. The likelihood of walk trips was also strongly associated with street design and the diversity of land uses within a given area. [28]

Six D's of Travel Demand

- *Density:* a variable of interest (population, dwelling units, employment, etc.) per unit of area.
- *Diversity:* the number of different land uses in a given area and the degree to which they are represented in land area, floor area, or employment.
- *Design:* the street network characteristics (block size, proportion of four-way intersections, number of intersections, sidewalk coverage, average building setbacks, average street width, number of pedestrian crossings, etc.) within an area.
- *Destination Accessibility:* the ease of access to trip attractions (measured either by distance to an attraction or number of attractions reachable within a given travel time).
- *Distance to Transit:* the average of the shortest street routes from the residences or workplaces in an area to the nearest rail station or bus stop or transit route density, distance between transit stops, or the number of stations per unit area.
- *Demand Management:* parking supply and cost. [28]

Figure 18: The six D's of travel demand

Reduced Regional Air Pollution and Exposure/Asthma

Ground-level ozone and airborne particles found in air pollution can be detrimental to health, particularly for those with respiratory or heart disease, children, and the elderly.[29] Ozone is a colorless gas and the main ingredient of smog.[30] Ground-level ozone forms when air pollutants emitted by cars, power plants, and chemical plants react chemically to the presence of sunlight and is therefore typically worse in warm, sunny months. [30]

Particle pollution or particulate matter is a mixture of microscopic solids and liquid droplets suspended in air. These particles are the main ingredient of haze, smoke, and airborne dust and can occur year round. Particulate matter can be composed of acids such as nitrates and sulfates found in car exhaust, organic chemicals, metals, soil or dust particles, and allergens such as mold spores or pollen. Small particles are of particular concern because those less than 10 micrometers in diameter can travel deep into the lungs and even enter into the bloodstream increasing the risk of lung and heart disease.[31]

Long-term exposure (years) to particles has been associated with reduced lung function and the development of chronic bronchitis and premature death. Short-term exposure (hours or days) can aggravate lung disease, trigger asthma attacks and acute bronchitis, and increase susceptibility to respiratory infections. Short-term exposure has also been linked to heart attacks and arrhythmias in people with heart disease. [31]

Those with existing health problems are at greater risk of suffering acute health issues due to ozone or particulate matter especially while being physically active outside. Exercise causes people to breathe faster and more deeply which means they will take in more of the air pollutants and that the pollutants will travel deeper into the lungs. To avoid unhealthy exposure; one should limit outdoor activity during the hottest parts of the day, reduce their level of exertion (walk instead of jog), and avoid exercising by busy roads where particle and ozone levels are higher. Checking the Air Quality Index for daily ozone forecasts and avoiding the outdoors on those days can also reduce exposure rates (See Figure 19). [31]

Air Quality Index

The Air Quality Index (AQI) is used to report levels of ozone and other common pollutants in the air including particle pollution, carbon monoxide, and sulfur dioxide. The AQI focuses on the health effects that may be experienced within a few hours or days after breathing unhealthy air. An AQI value of 100 corresponds to the national air quality standard for the pollutant set by the EPA. Values below 100 are generally considered satisfactory for health, while those above 100 are considered to be unhealthy- first for sensitive groups and eventually for everyone. [32]

Air Quality Index	Protect Your Health
Good (0-50)	No health impacts are expected when air quality is in this range.
Moderate (51-100)	Unusually sensitive people should consider limiting prolonged outdoor exertion.
Unhealthy for Sensitive Groups (101-150)	The following groups should limit prolonged outdoor exertion: • People with lung disease, such as asthma • Children and older adults • People who are active outdoors
Unhealthy (151-200)	The following groups should avoid prolonged outdoor exertion: • People with lung disease, such as asthma • Children and older adults • People who are active outdoors Everyone else should limit prolonged outdoor exertion.
Very Unhealthy (201-300)	The following groups should avoid all outdoor exertion: • People with lung disease, such as asthma • Children and older adults • People who are active outdoors Everyone else should limit outdoor exertion.

Figure 19: The Air Quality Index indicates daily air quality[30]

Street Design and Health Equity

Accessibility/Mobility

Accessibility is a crucial component to promoting health equity and a healthy community. Mobility- the ability to move or travel from one place to another- is a key element of accessibility.[33] If a community is designed solely for vehicular access-void of sidewalks, public transit, and bicycling facilities- then the mobility of those who cannot afford a car or cannot drive due to age or circumstance will be limited.

Mobility challenges disproportionately affect minorities and low-income populations. According to a brief published by PolicyLink and the Prevention Institute, people of color have limited access to cars: 19% of African Americans, 13.7% of Latinos, and 4.6% of whites lack access to automobiles. Poverty increases the problem with 33% of poor African Americans, 25% of poor Latinos, and 12.1% of poor whites lacking access to an automobile. Additionally, cars owned by low-income people are typically unreliable and less fuel-efficient making commuting to work or other appointments unpredictable and expensive. [34]

Transportation costs can create a barrier to other health promoting expenses. U.S. households earning $20,000 to $35,000 and living far from employment centers, spend on average 37% of their income on transportation. This takes away from income available for other expenses such as food, medical care, childcare, or housing. [34]

Elderly and disabled populations are also adversely affected by automobile-dominant environments. More than 1 in 5 Americans 65 and older do not drive. Of these non-drivers, 50% (3.6 million) stay at home on any given day due to lack of transportation options and 1.9 million are disabled. Non-drivers also take fewer trips to the doctor (15%), shops and restaurants (59%), and social activities (65%) than their driving counterparts. [34]

Transit Use

The likelihood of transit trips is strongly associated with transit access. Therefore, living near a bus stop or rail stop (within a quarter mile for bus and a half mile for rail) greatly increases the likelihood of traveling by transit.[28] Access to transit has an indirect relationship with health with many people relying on public transit to go to work or access healthcare.[35, 36] Those who are steadily employed generally have better health due to steady income and improved access to healthcare benefits than those who are unemployed.[37] Additionally, studies have shown that commuters who take transit to work are more physically active improving their health status.[38, 39]

Although there are significant health benefits for individuals who have access to transit, sometimes those benefits have been unevenly distributed across socioeconomic groups. Transit plays a significant role in equity particularly the marginalization of minorities and

low income individuals who tend to be transit dependent through a prioritization of highway funding over public transit funding. [40, 41, 42]

Pedestrian/ Bicycle Facilities

Walking and bicycling for recreation or transportation contribute to numerous health benefits including opportunities to reduce health disparities.[43] Traffic safety, which can be improved by providing pedestrian and bicycle facilities, disproportionately affects low-income neighborhoods and neighborhoods of color. In a study of pedestrian deaths in Atlanta in the mid 1990s, the pedestrian death rate for Latino males was 6 times greater than for whites. Also, African Americans make up 12% of the population nationally but account for 20% of pedestrian deaths.[34]

4.2 Analysis of Existing Street Design Standards

Following the literature review and with a thorough understanding of the connections between health, transportation planning, and street design, staff analyzed each line of the existing street design standards as included within the Davidson Planning Ordinance (2001). Using a basic table, each section of the ordinance was entered, emphasis was added to key language, health benefits were identified, health concerns were expressed, and recommendations were made (See Section 5.1 for the Table of Recommendations). For each of the street type drawings, the cross-section was added, the associated language was reviewed, and additional images were added as recommendations. The original analysis was shared with members of Davidson's planning staff as well as the Planning Ordinance Committee for review and comment.

4.3 Review of Davidson Bicycle Transportation Plan 2008

Although there had been prior planning efforts associated with bicycling, the first comprehensive bicycle transportation plan for the Town of Davidson was completed in 2008 through a partnership between the Town and the North Carolina Department of Transportation, Division of Bicycle and Pedestrian Transportation. The planning process was led by a 15-member steering committee and a 7-member technical committee. It included extensive public input through workshops, newsletters, and an online survey.[44]

Vision Statement and Goals

Three components of the plan's vision statement specifically relate to this HIA:

- The streets of Davidson are designed, built, and maintained to accommodate the bicycle as a viable means of transportation.
- Bicycle facilities connect neighborhoods, parks, shopping centers, schools, employment centers, bus stops, trails, and regional destinations, thereby reducing overall motor vehicle traffic congestion and dependence on the automobile.
- Education is creating safety and building courtesy between drivers and cyclists.[44]

To reach this vision, the plan proposes seven measurable goals:

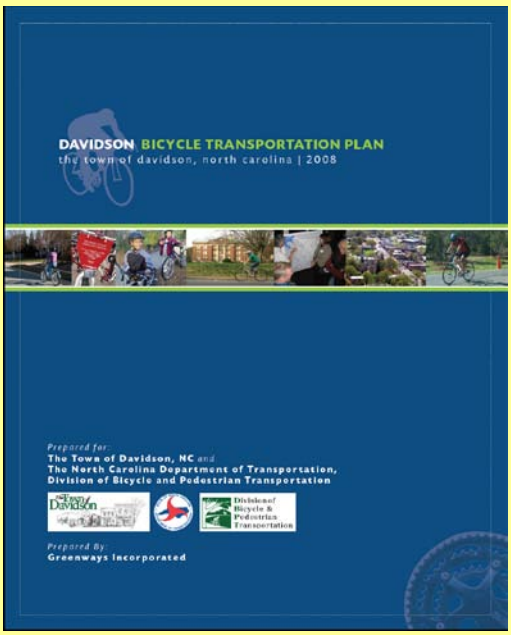
1. Make bicycling an integral part of life in the Town of Davidson: Double the 2000 Census bicycle commute rate by 2012; Establish 'bike-to-school' groups and regular bicycling activities for children through the Safe Routes to School Program through 2012.
2. Launch three new programs in three years that aim to increase bicycling among a) children, b) commuter/utilitarian cyclists, and c) recreational/fitness cyclists. Sustain such programs with a partnership between the Town, local businesses, and non-profit organizations.
3. Sponsor at least one planner *and* one engineer from the Town of Davidson to attend a bicycle planning and design training session (such as those offered by NCDOT).
4. Initiate a local bicycle safety and courtesy educational campaign by 2009 with the assistance of local, regional, state, and national bicycle advocacy groups. Petition the NC Division of Motor Vehicles and other appropriate officials to include a bike-safety question on licensing exams by 2012.
5. Connect neighborhoods, parks, shopping centers, schools, employment centers, bus stops, trails, and regional destinations with bicycle routes: Complete this plan's top five priority bicycle projects by 2012.
6. Provide bicycle services such as covered parking, bicycle stations, showers at employment centers, and bicycle rentals: Provide bicycle parking in key locations throughout Town by 2010.
7. Take the necessary steps to become designated by the *League of American Bicyclists* as a silver-level 'Bicycle Friendly Community' by 2012. [44]

Value of Bicycle Transportation

Realizing the time and resources needed to implement the plan; the value of adding bicycling facilities is examined by the plan and includes: increased health and physical activity, economic benefits, environmental improvements, transportation benefits, and improved quality of life. Increased health and physical activity is listed as the first value added and includes a description of the physical activity recommendations, the health effects of inactivity, and the ability of community design to affect people's ability to reach these recommendations. [44]

Although not directly related to health, other value added components of bicycling facilities influence health. For example the money saved by operating a bicycle instead of a car on an annual basis (approximately $7,680 without factoring in increasing oil prices) could be used towards health-promoting activities such as nutritious food, additional recreational activities, or improved housing options. The reduction of air pollution associated with a greater use of bicycling as a mode of transportation also has significant implications for those with asthma or other respiratory diseases. Reducing vehicular congestion on the streets by replacing short trips often taken by car (40% of all trips taken by car are less than 2 miles) can also lead to less air pollution, increased mobility for those who cannot drive, and reduced stress for motorists and cyclists. By adding

bicycling facilities, overall quality of life can also be improved through increased social connectivity and time outdoors which is particularly important for youths and the elderly.[44]



"Communities across the United States and throughout the world are implementing strategies for serving the bicycle needs of their residents, and have been doing so for many years. They do this because of their obligations to promote health, safety and welfare, and also because of the growing awareness of the many benefits of cycling."

Davidson Bicycling Transportation Plan, 2008

"Individuals must choose to exercise, but communities can make that choice easier."

Rails-to-Trails Conservancy

Figure 20: Quotes from the Davidson Bicycle Transportation Plan (2008)

Network and Facility Design

The plan includes a conceptual network design consisting of a 'hub and spokes' model as well as an entire chapter on facility design for signed/shared roadways, paved shoulders, bicycle lanes, sidepaths, sharrow markings, and bike boulevards. The conceptual model as applied to the Town of Davidson includes popular destinations or trip attractors such as downtown, Davidson College, and shopping areas as the hubs and various facilities available such as bike lanes and paved shoulders as the spokes. [44]

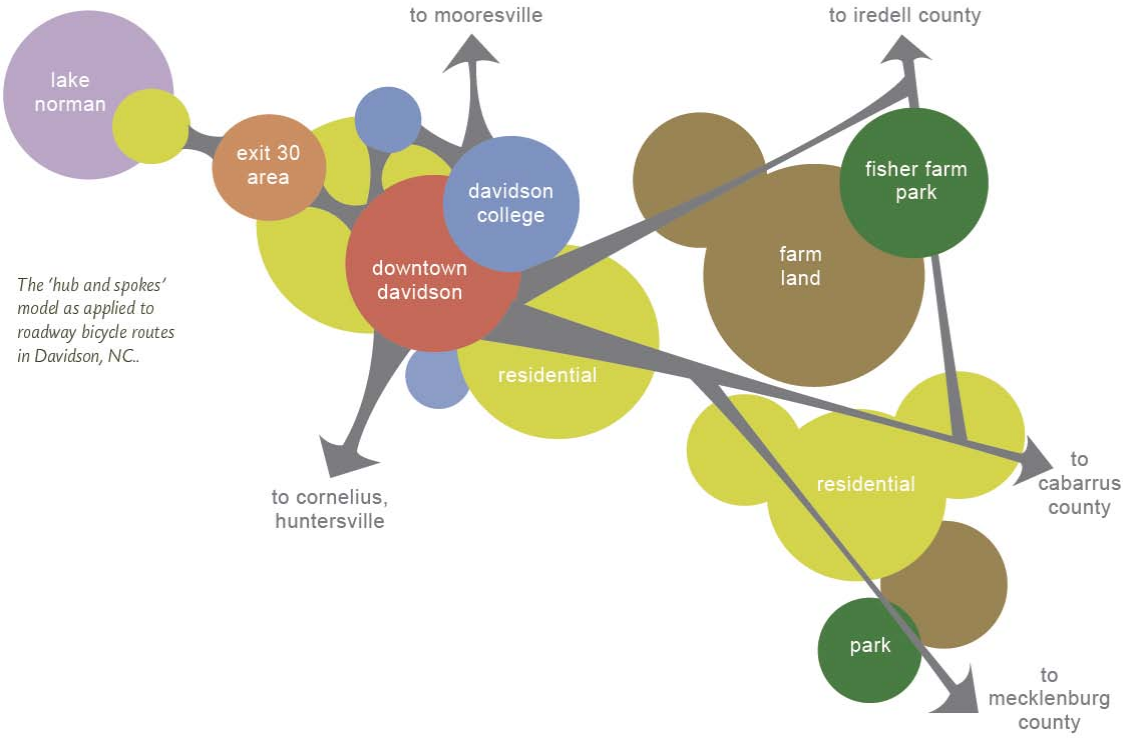


Figure 21: Davidson's "hub and spokes" model of network design[44]

The bicycle facility standards developed as part of the bicycle transportation plan were based on the best practices found throughout the United States as well as accepted national standards for bicycle and greenway facilities. Additional design considerations and resources taken into account include the Americans with Disabilities Act, sustainable design, and context sensitive solutions. The Bicycle Transportation Plan also includes a number of design standard drawings for safe intersection design, signalization, underpasses, overpasses, and other bicycling facilities such as trail heads, signage, and bicycle parking. These items are not featured in this HIA but should be reviewed and used when planning specific bicycle facility improvements. Suggested design improvements for identified 'trouble areas' within the plan should also be taken into consideration when repaving these sections or as capital improvement funding becomes available. [44]

Signed/Shared Roadway

A signed or shared roadway is acceptable for a low volume road (less than 3,000 cars per day) with traffic calming devices and signage to create a safe shared use environment or in a higher volume road with wide (14') outside lanes. [44]

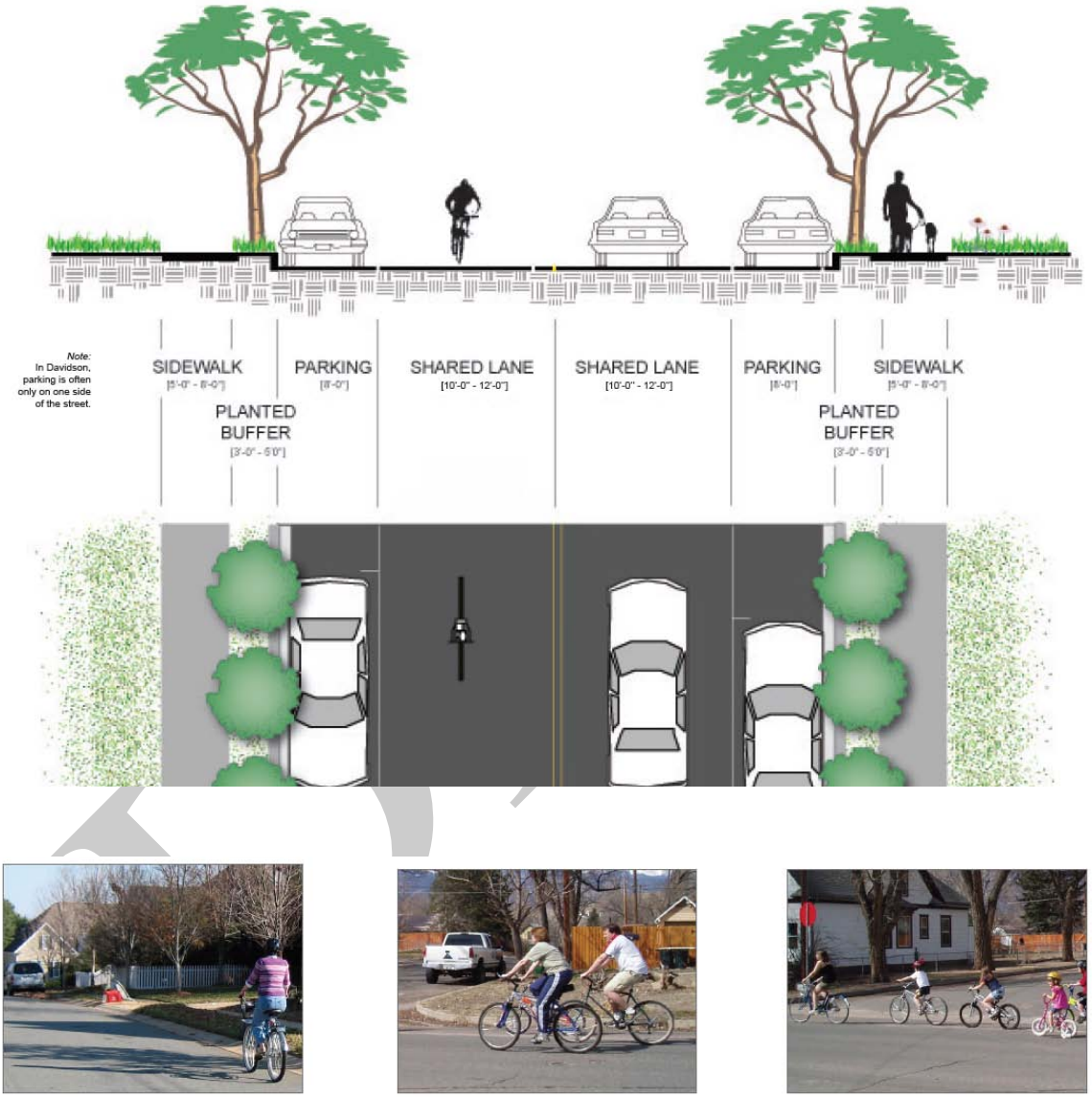


Figure 22: Signed/shared roadway cross section and images[44]

Paved Shoulder

Typically in rural environments, paved shoulders should be delineated by a solid white line, and provided on both sides of the road. The shoulder should be contiguous, on the same level as the roadway, and at least 4 foot in width (wider for roads with higher speeds but not so wide as to be confused with automobile traffic lanes). Rumble strips should not be used within the shoulder. [44]

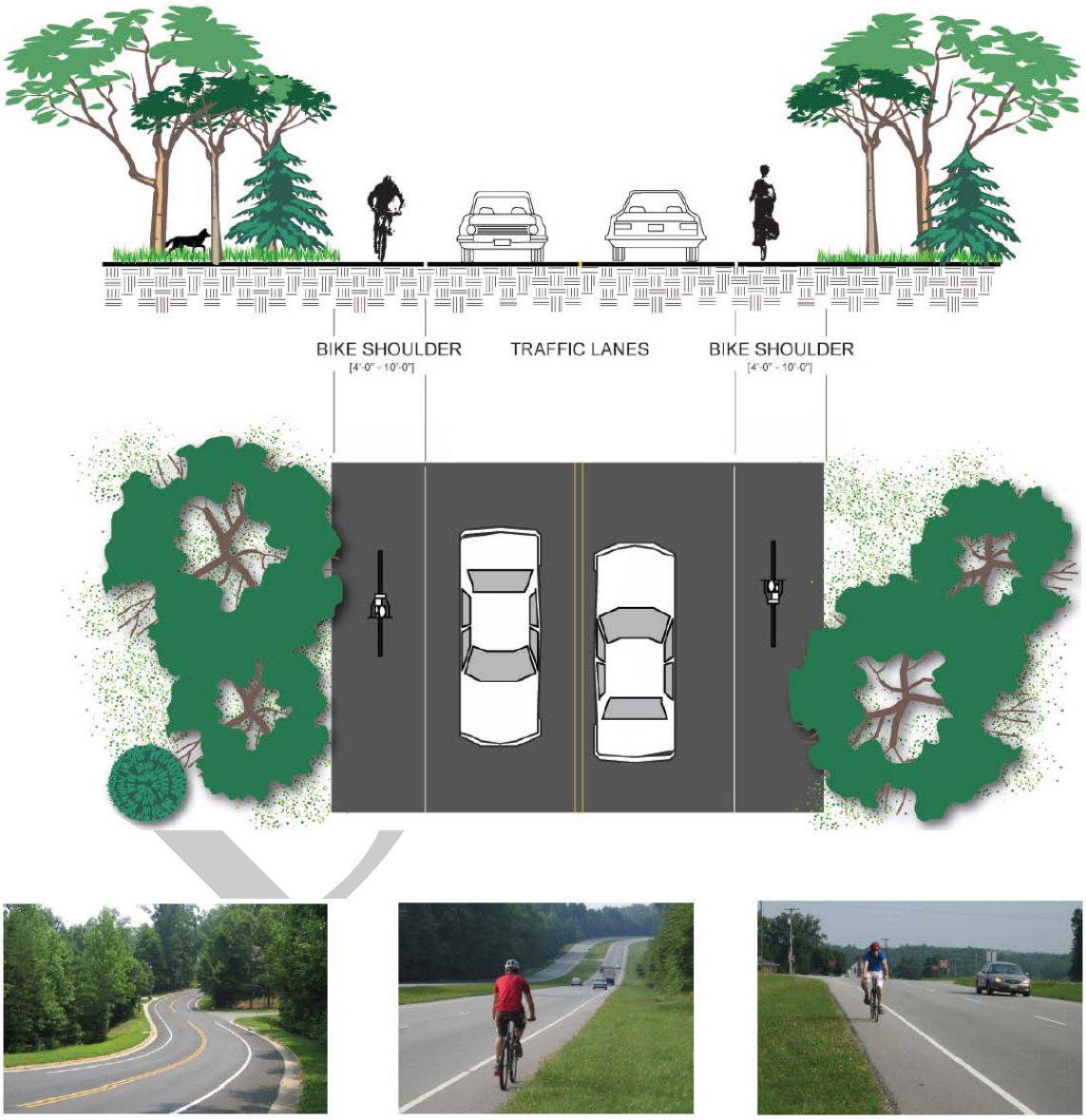


Figure 23: Paved shoulder cross section and images[44]

Bicycle Lane

Bicycle lanes should be used on roadways with 3,000 or more average daily trips, preferably on 2 lane roads or 4 lane roads that are divided by a median. The width of the lane should be 4-6 feet depending on the presence of curb and gutter. When there is on-street parking adequate spacing to avoid cyclists from being hit by open car doors is necessary (12-13 feet is recommended for the parking space and bicycle lane). [44]

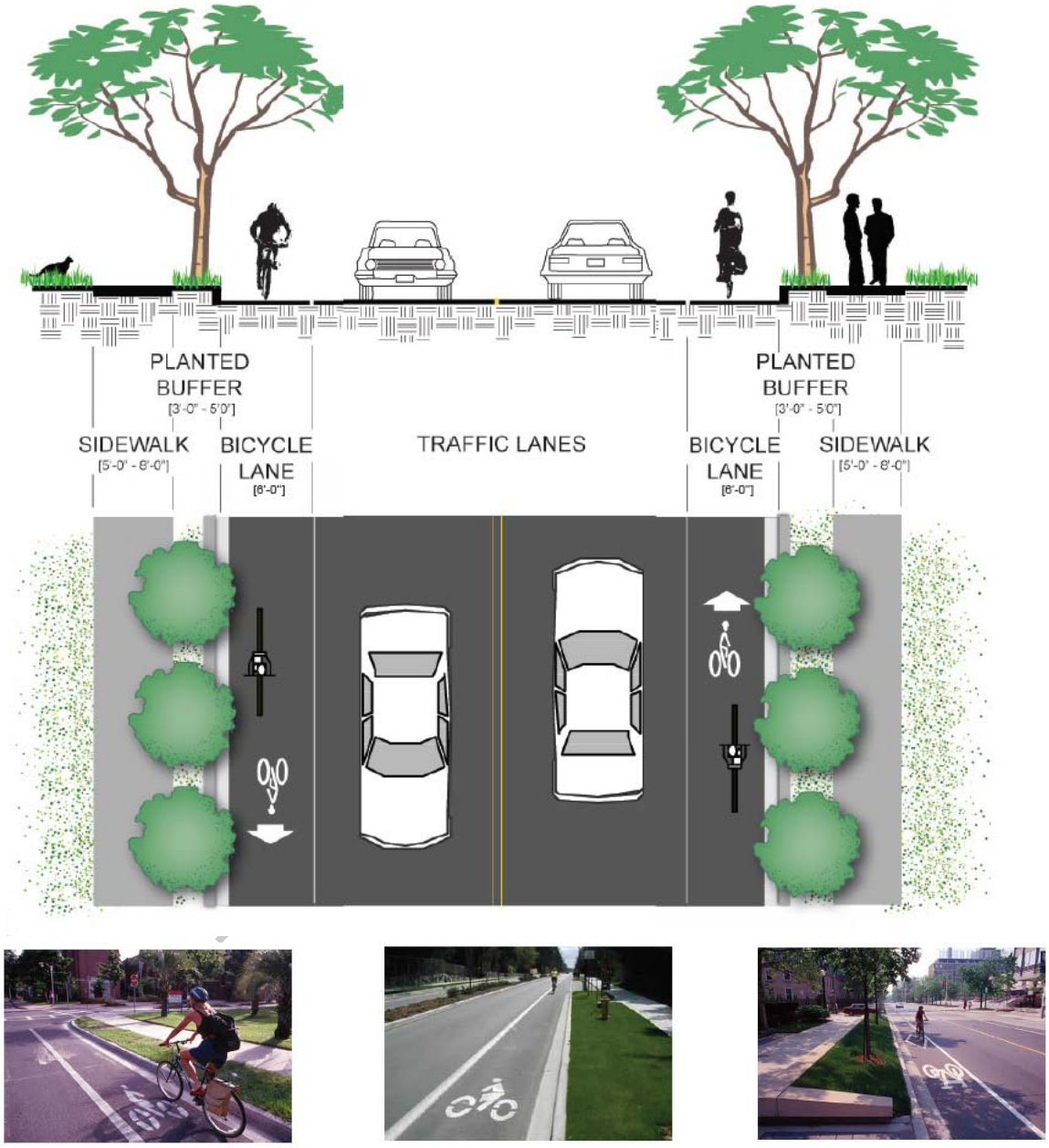


Figure 24: Bicycle lane cross section and images[44]

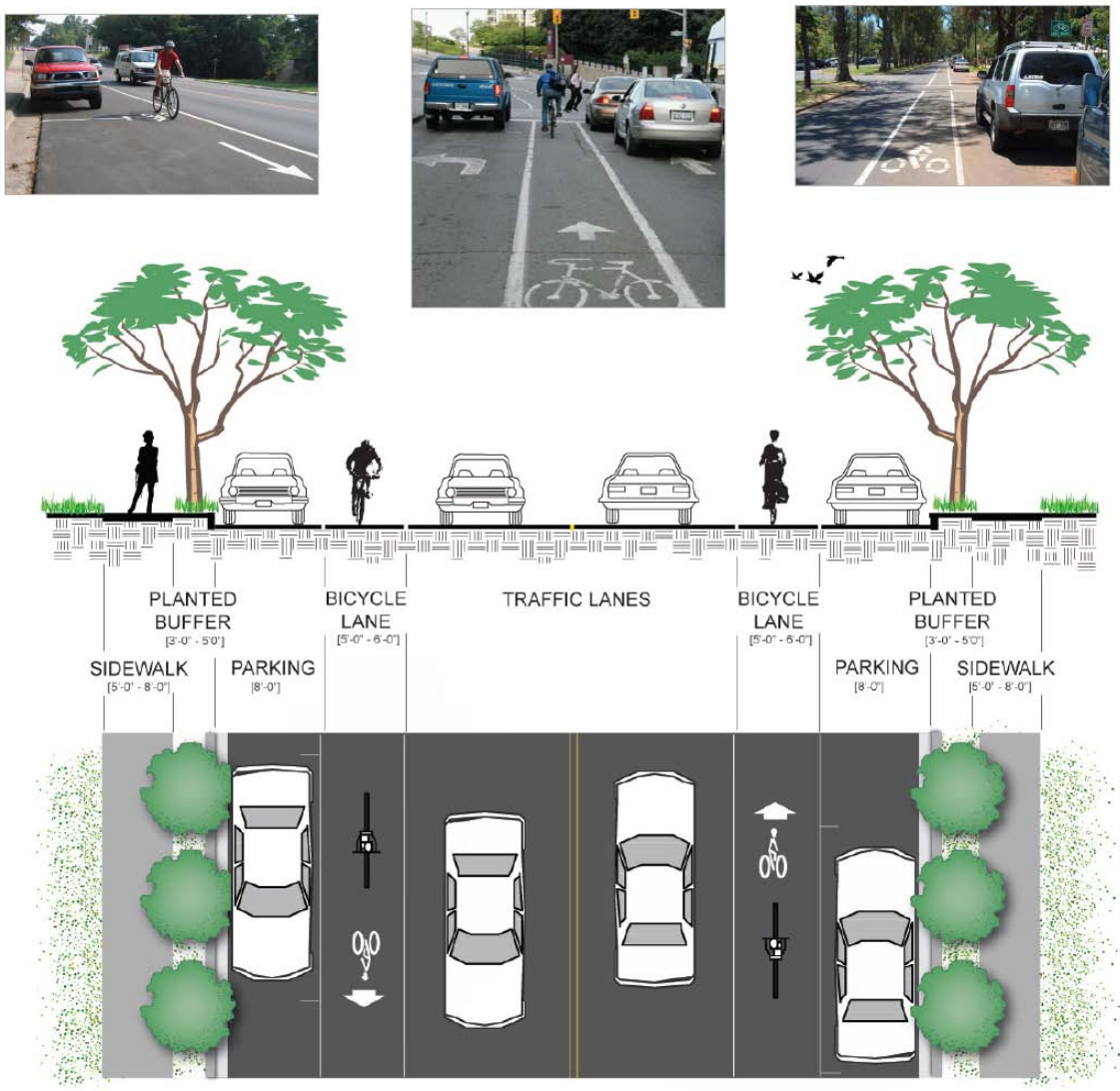


Figure 25: Bicycle lane with on-street parking cross section and images[44]

Sidepath

Intended for use in corridors where there are limited driveway/ intersection crossings, more desirable destinations along one side of the roadway, or not enough roadway space available to provide bike lanes, a sidepath is separated from vehicular traffic by a vegetated buffer (preferably 6 foot buffer when possible). Well designed transitions from sidepaths to on-road facilities are necessary to ensure proper and safe use of the facilities.[44]

Figure 26: Side path cross section and images[44]

Sharrow Markings

Bicycle shared lane arrow (or 'sharrow') can be used when lanes are too narrow for striped bike lanes, when speed limits are 35mph or less, and with or without on-street parking. Sharrows help make motorists aware of bicyclists in their lane, show bicyclists the appropriate direction of travel, and when placed correctly can help prevent 'dooring' by parked cars. [44]

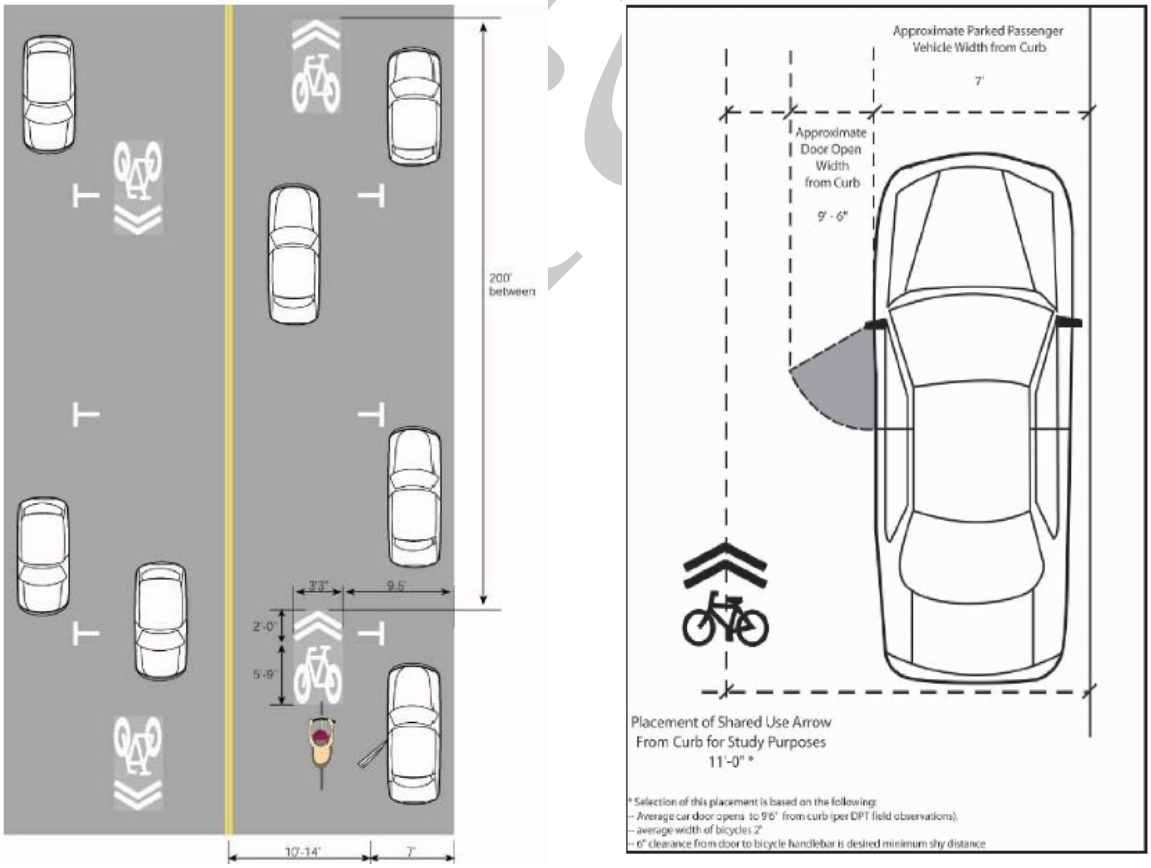


Figure 27: Sharrow markings placement drawings and images[44]

Bicycle Boulevards

Bicycle boulevards can help further identify preferred routes for bicyclists and incorporate traffic calming devices to allow low volume streets to function as through streets for bicyclists while maintaining local access for automobiles. These boulevards typically run parallel to major roadways to divert bicycle traffic from areas of high vehicular traffic where collisions are more likely. [44]

Figure 28: Bicycle boulevard markings and signs[44]

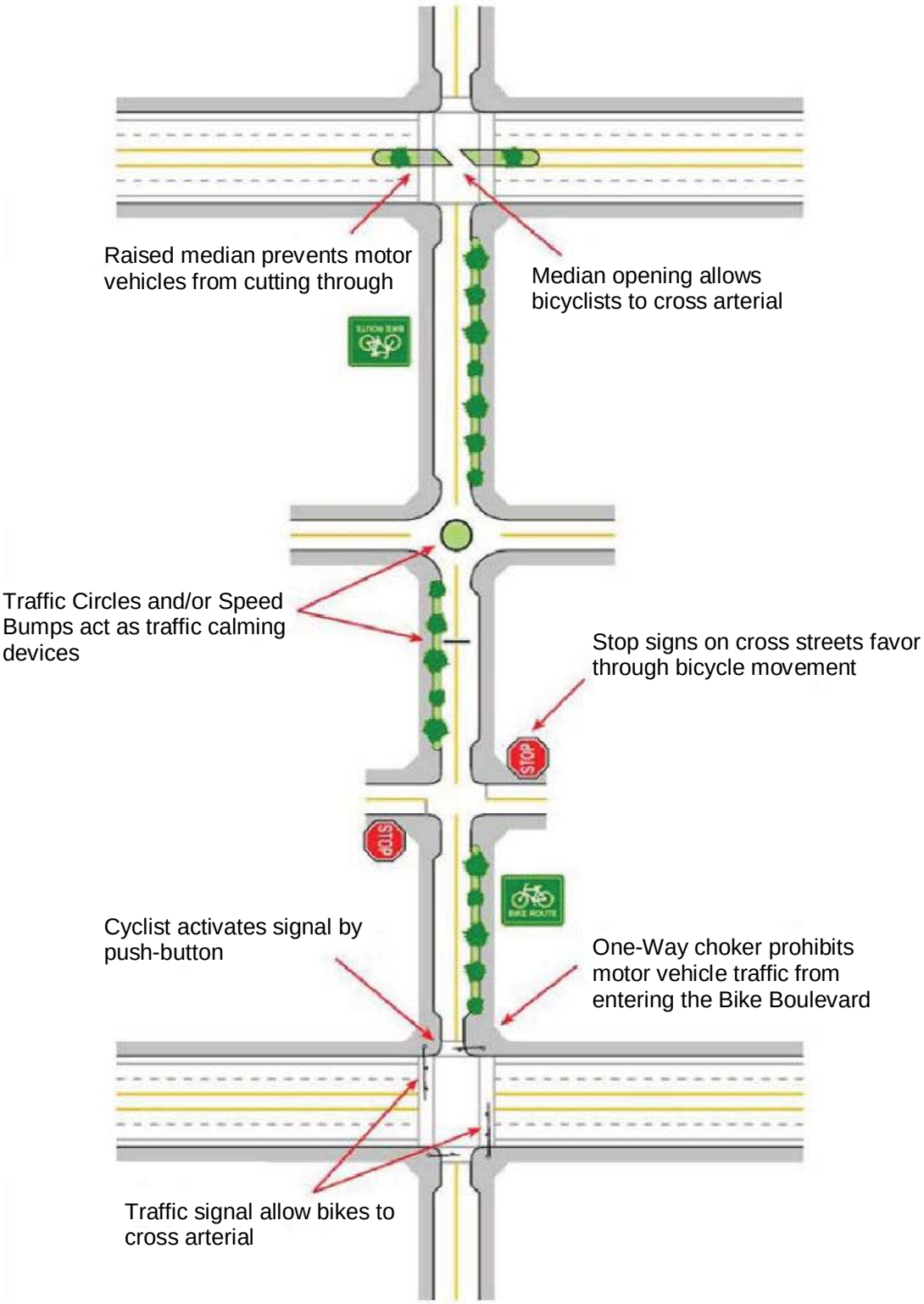


Figure 29: Bicycle boulevard diagram[44]

Neighborhood Survey

In February 2012, a brief survey was mailed to 700 homes located in Davidson, North Carolina in order to receive local data concerning neighborhood choice, barriers to walking and biking, and physical activity levels (See Appendix 4). There was a response rate of 32% and a wide diversity of neighborhoods captured as part of the survey including older homes in downtown Davidson, new urbanist style homes in New Neighborhood in Old Davidson, upscale custom housing in River Run, as well as townhomes and affordable housing units found throughout Davidson. The findings of this survey were used to inform this HIA on frequency of walking and biking for recreational and utilitarian purposes, local barriers to active forms of transportation and popular destinations for walking and biking in Davidson.

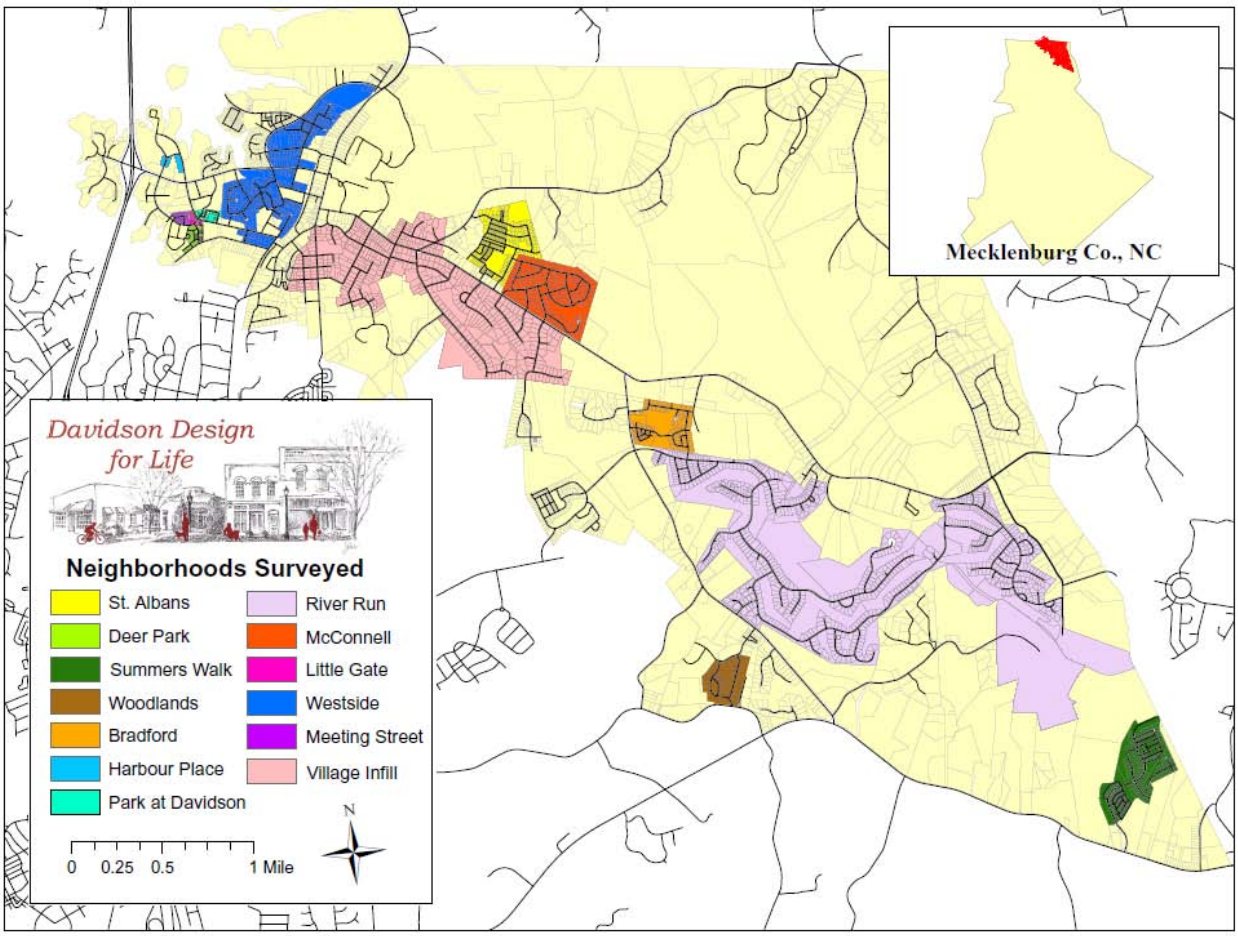


Figure 30: Map of neighborhoods surveyed in Davidson, North Carolina

Walking and Biking for Recreational or Utilitarian Purposes

According to the neighborhood survey, almost 65% of respondents walk or bike for recreational purposes at least once a week with 25% of respondents walking or biking daily. Unfortunately, when asked how often they walk or biked for transportation purposes these numbers drop significantly. Only 30% of respondents walk or bike for utilitarian purposes on a weekly basis, with 9% travelling by bike or walking daily. Survey analysis suggest this change is due to the misconception that traveling by walking or biking is only considered as a commuting pattern. The question previous to this question asked participants to check all the locations that they had ever walked or biked to including destinations such as Downtown Davidson, the grocery store, place of worship, work, or child's school. Many of those who checked one or more of these locations also responded that they never walk or bike for transportation purposes.

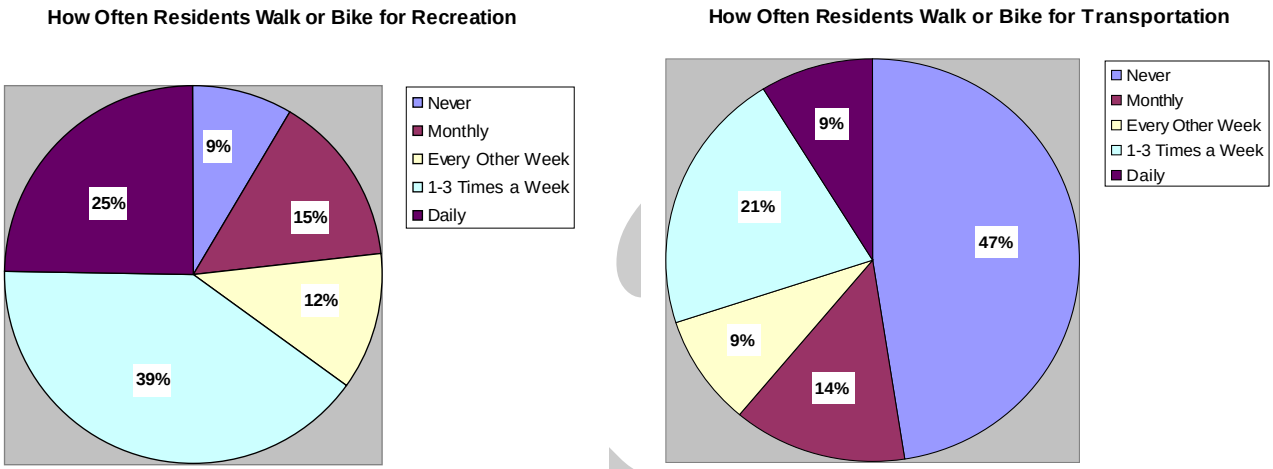


Figure 31: How often residents walk or bike for recreational and transportation purposes

Barriers to Walking and Biking

Participants were asked to check what they considered potential barriers to walking and biking in Davidson including distance, poor lighting, no one to walk or bike with, physical disability, lack of sidewalks or bike lanes, traffic on the road, fear of crime, increased travel time, or lack of showering facilities/ bike racks/ lockers at their destination. Four of the top 5 barriers— distance, road traffic, lack of sidewalks or bike lanes, and poor lighting—can be addressed through changes made during planning and community design.

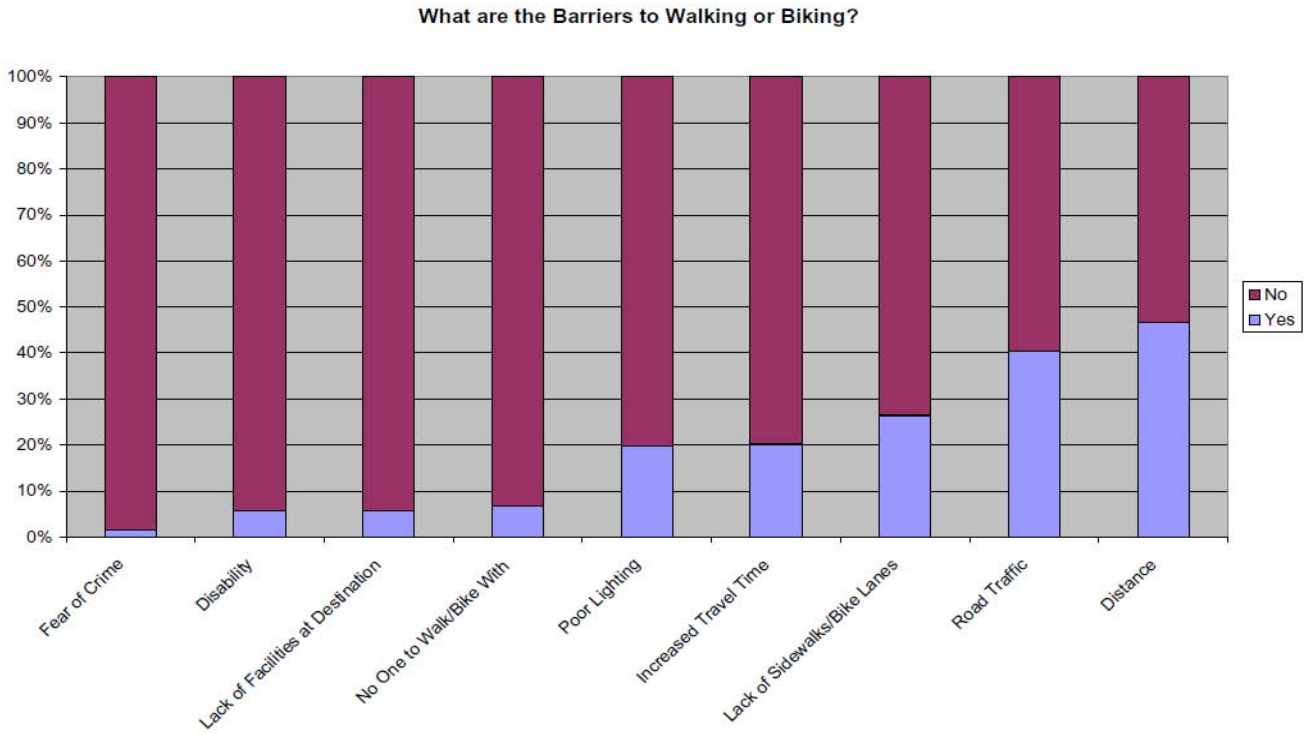


Figure 32: Barriers to walking and biking around Davidson, North Carolina

Survey participants were also able to enter other barriers to walking and biking. Some of the barriers mentioned included:

- having too many things to carry (especially if going to grocery store or work);
- having small children that they didn't feel safe walking or biking with;
- lacking a buffer between the sidewalk and the road and not feeling comfortable being that close to traffic;
- not being able to safely cross the road where they needed to cross to get where they were going;
- breathing in traffic fumes (especially with small children); and,
- gaps in sidewalks or bike lanes preventing completion of trip.

Popular Destinations to Walk or Bike

Participants were asked to check if they walk or bike to the following locations: your workplace, your child's school, your place of worship, greenway/trail, park or recreation center, public transit, grocery store/ food market, downtown, shops, or pharmacy. Downtown is a particularly popular place to walk or bike to and it includes a variety of restaurants and shops as well as a pharmacy. Other popular activities in Downtown Davidson that could draw people on a regular basis include Davidson College, the library, post office, farmers' market, and public events like concerts on the green and Christmas in Davidson. Unfortunately, a lot of the injury-causing accidents have also taken place on or around Downtown's Main Street and major connectors including Griffith Street and Davidson-Concord Road.

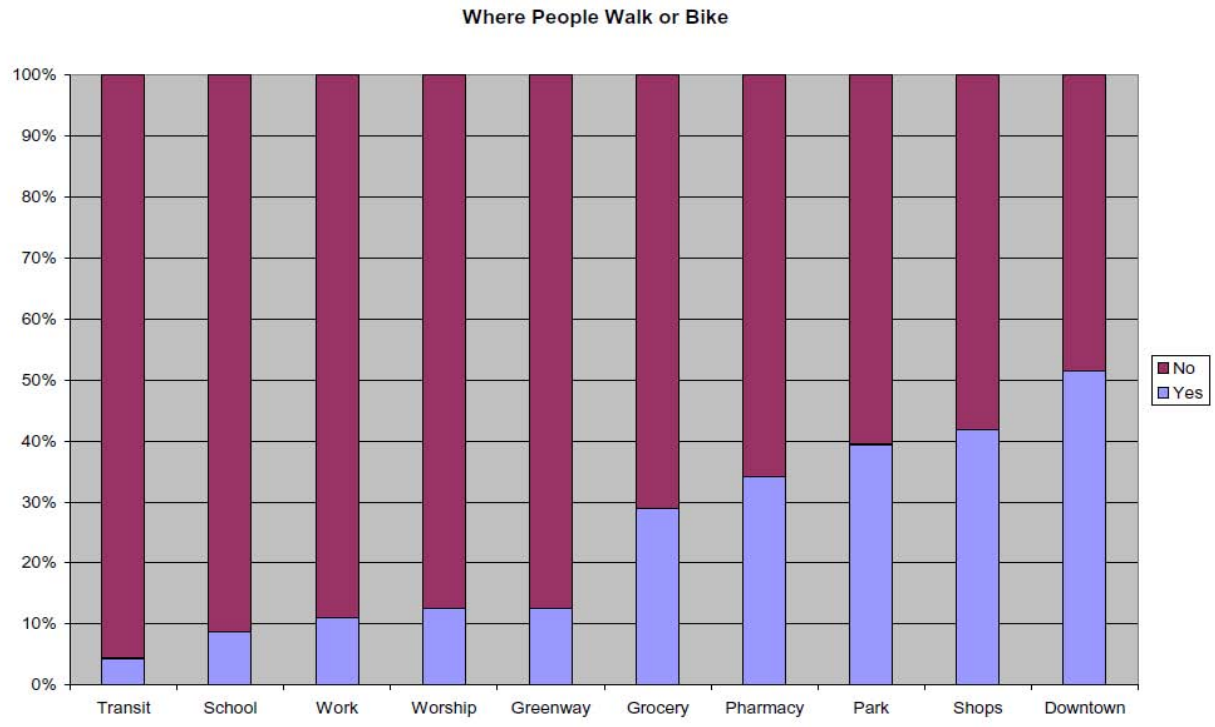


Figure 33: Where people in Davidson walk or bike

4.5 Street Design Standards Survey

In order to capture public sentiment on what residents like and don't like about Davidson's streets, a survey was developed and distributed at public meetings and events (See Appendix 5). The survey was also posted online using Survey Monkey and the link was distributed using the Davidson e-crier and local news coverage. As of July 31, 2012, there were 85 responses to the survey. The completed surveys were reviewed and the comments from the first two open-ended questions were grouped by general design themes and specific intersections/ safety issues. The answers to the last two questions about feeling safe walking and biking during the daytime on most of Davidson's streets were tallied.

What do you like about the streets in Davidson?

Design Themes

- Shady, tree-lined sidewalks that are connected, buffered from traffic, wide enough for people to pass, and well maintained.
- Marked bike lanes that are separated from traffic by bollards or a planting strip, located on low-speed roads, or as part of a larger greenway network.
- The use of traffic circles or roundabouts instead of stoplights.
- The narrowness and speed of most town roads being in between 20-35 mph.
- Quaintness of Downtown with its narrow Main Street, new informational signs, and outdoor seating.
- On-street parking (both parallel and angled spots) and hidden or landscaped parking lots.
- Use of traffic calming devices, speed bumps, pedestrian crossings and signs.
- Short blocks, interconnected neighborhoods, and the lack of cul-de-sacs.

Specific Streets or Intersections

- Main Street
- Griffith Street and Main Street
- Beaty Street and Griffith Street
- Lorimer Road and Avinger Lane
- Lorimer Road, Woodland Street, and Crescent Drive
- Pine Road and South Street
- Concord Road
- Streets within the McConnell and St. Albans Neighborhood

What don't you like about the streets in Davidson?

Design Themes

- The absence of sidewalks or narrow, disconnected, or poorly maintained sidewalks next to traffic.
- The absence and disconnectedness of biking facilities and the need for buffered bike lanes.
- Roads that are too narrow to accommodate motorists, parked cars, large vehicles, and bikers or pedestrians.
- The use of roundabouts.
- Speeds to low and too many stop signs.
- Unfinished, potholes, or bumpy road surfaces.
- Limited visibility around certain curves and visibility being blocked by on-street parking, vegetation, or utility poles.
- Lack of crosswalks, pedestrian signs, crossing lights, and aides for visibility such as flags or a flashing beacon.
- Concerns over increased congestion, school traffic, and neighborhood cut-throughs.
- Not enough cul-de-sacs.
- Lack of curbs and curb cuts in certain areas.
- Additional connectors and more direct routes needed to avoid congestion.
- Not enough lighting.
- Trash cans and yard waste blocking sidewalks and bike lanes.

Specific Streets or Intersections

- South Main Street
- Davidson Concord Road
- Lorimer Road
- Catawba Avenue
- Grey Road
- Depot Street
- Spring Street
- Walnut Street
- Delburg Street
- Potts Street
- Chairman Blake Lane
- Magnolia Street
- Armour Street
- Jackson Street
- Vernon Drive and Twin Oaks Road
- Rocky River Road
- Bailey Springs Drive and Bailey Road
- Concord Road and Main Street
- Woodland Street and Davidson Concord Road
- Griffith Street and Beaty Street
- Concord Road, Grey Road, and Pine Road
- Ridgewood Avenue and Greenway Street
- Jetton Street and Davidson Gateway Drive
- Jackson Street and Griffith Street
- Lakeside Avenue and Beaty Street

Do you feel safe walking along most roads in Davidson during the daytime?

Eighty-five percent of survey participants felt safe walking along most roads in Davidson during the daytime. Many said that although they feel safe, they still pay a great deal of attention to drivers especially when crossing the street or walking on a section of the road without sidewalks. Wide, well maintained, and buffered sidewalks in particular add to the sense of safety for walkers.

Do you feel safe biking along most roads in Davidson during the daytime?

Thirty-four percent of survey participants felt safe biking along most roads in Davidson during the daytime. Bike lanes that are not wide enough, too few bike lanes, disconnected bike routes, blocked bike lanes, and driver inattentiveness or rudeness were mentioned as reasons for not feeling safe biking in Davidson. Separate bike paths in particular were recommended for new bicyclists and children to feel safe. Most inexperienced bikers are currently biking on the sidewalk which poses safety risks for pedestrians and potentially the biker as they pass intersections and driveways.

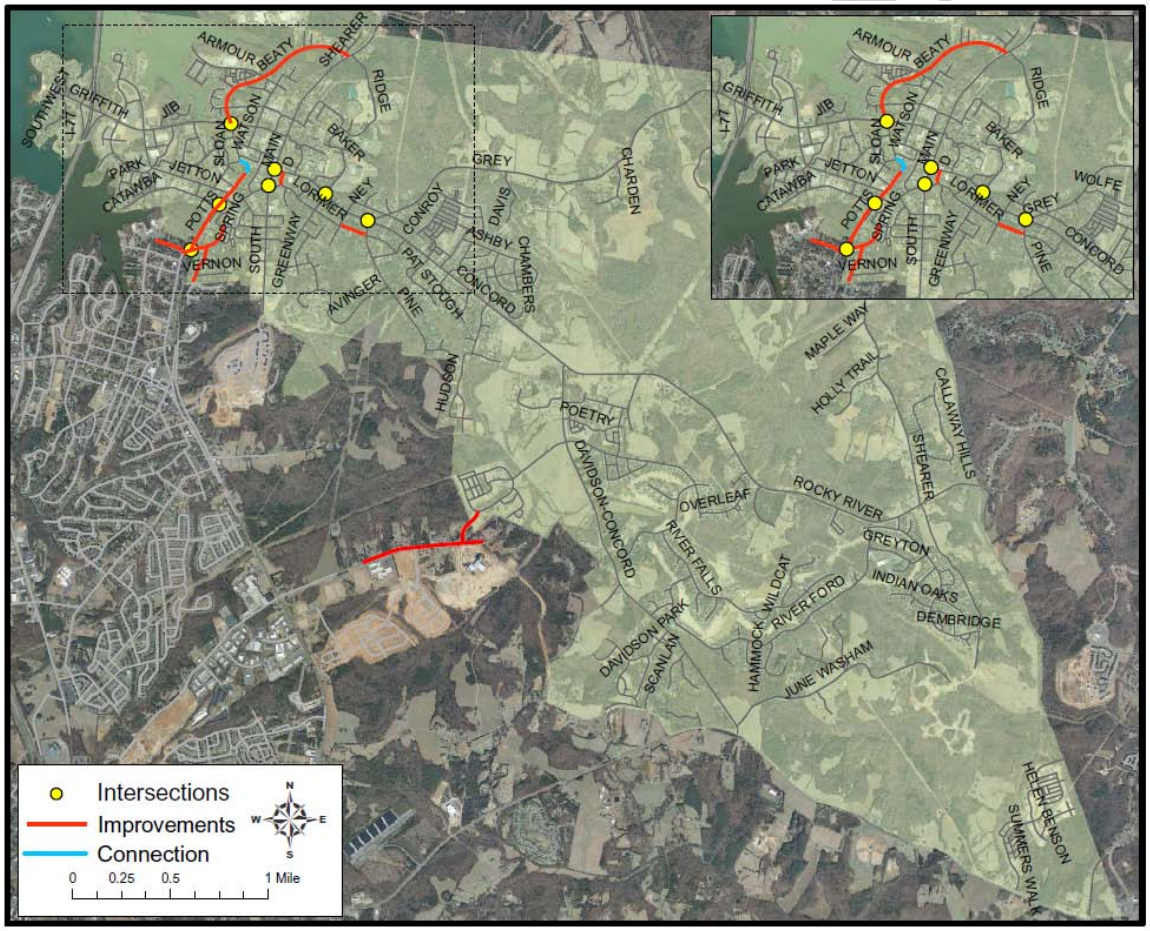


Figure 34: Map of suggested areas for street improvements in Davidson, North Carolina

4.6 Public Meeting/ Events

Davidson Design for Life staff hosted a booth at the Davidson Farmers' Market (July 7th and 21st) to collect comments from the public including handing out the Street Design Standards Survey and a mapping activity where participants could place green, yellow, and red stickers on a street map of Davidson to identify intersections that were well designed, mediocre, or poorly designed. A public meeting was also held at Davidson Town Hall on July 26th and included a presentation by Katherine Hebert, a video on healthy community design components from former CDC National Center for Environmental Health and the Agency for Toxic Substances and Disease Registry Director Howard Frumkin, and opportunities for community members to share their concerns about Davidson's streets.

4.7 Summary of Findings

- How streets are designed impacts the health of surrounding populations.
  - Motor vehicle accidents are responsible for many deaths and the leading cause of death for those aged five to thirty-four. Reducing vehicle miles traveled, speeds of travel, and providing separated bicycle and pedestrian facilities can reduce injuries and fatalities due to accidents.
  - Adults and youth are more likely to be physically active when there are safe sidewalks and bicycle facilities for active transportation and destinations for them to walk or bike to. Transit use can also increase physical activity levels as riders walk or bike to and from transit stops.
  - As street design improves and land use decisions support compact, mixed-use development patterns, vehicle miles traveled and vehicle trips will decrease, air pollution (ozone and particulate matter) will decrease, and respiratory and cardiovascular health will improve.
  - By providing multiple options for travel- walking, biking, transit- those who cannot drive due to age, disability, or income will have increased mobility and improved health. Improving the health for those who are low-income or a person of color will help decrease the health equity gap.

- Davidson's street design standards already have many health promoting aspects.
  - The pedestrian is set as the first priority and buildings and streets should be built with the necessary facilities and at a human scale to accommodate pedestrian activity.
  - Amenities for pedestrians and bicyclists are listed and detailed in their design.
  - Streets are seen as a public space where all means of transportation should be considered and connectivity is stressed.
  - On-street parking, traffic calming devices, right-angle intersections, minimized pavement widths, and other design components contribute to safety.

- There are aspects of Davidson's Planning Ordinance that can be improved upon to promote health.
  - There is no mention of public transportation or the design of these stops or supporting facilities.
  - Bicycle facilities are limited to bike lanes and do not include sharrow markings, painted pavement or bike boulevards as detailed in the Davidson Bicycle Transportation Plan 2008.
  - There is no crosswalk or intersection design components included within the ordinance.
  - The width of the sidewalk and the planting strips could be wider to promote more walking.
  - There is no level of service or level of quality ranking for bicycle or pedestrian facilities (only automobile level of service).
  - The turning radii is only considered as the actual turning radii not the effective radii created by on-street parking, bicycle lanes, bulbouts, etc.

- Davidson's Bicycle Transportation Plan 2008 has many ideas for bicycle facility improvement.
  - The plan includes a strong vision and goals for promoting bicycling and bicycle safety in Davidson.
  - The value of promoting bicycling includes direct health benefits such as increased physical activity, as well as indirect health benefits such as economic benefits, environmental improvements, transportation benefits, and improved quality of life.
  - There are many cross sections and images that can be used for bicycle facility standards not currently included within the street design ordinance such as a bicycle boulevard or sharrow markings.

- The findings of the literature review are applicable to Davidson.
  - Residents walk and bike for both recreational and transportation purposes.
  - Major barriers to walking and biking include distance, road traffic, lack of sidewalks or bike lanes, and poor lighting.
  - Popular destinations for walking and biking include downtown, shops, parks, the pharmacy, and the grocery store.
  - Residents like many of the same street design components examined within the literature including, wide sidewalks with shade and a buffer from traffic, marked bike lanes, traffic calming devices, connective streets with small block size, and mixed land use with diverse facades.

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5. Recommendations

The recommendations stage identifies alternatives to the proposal or actions that can be taken to minimize the negative health impacts and maximize positive health outcomes. This stage considers:

- community input in recommendation development to encourage solutions that will work in the local context;
- feedback from decision makers to ensure that the recommendations are feasible and within the legal and policy framework governing the decision; and,
- the development of a health management plan with indicators to monitor and a breakdown of who is responsible for each measure and the procedure for monitoring each indicator.[1]

At the conclusion of the recommendations step, the HIA team should have:

- a preferred alternative of those identified within the scoping stage or a list of actions to improve the proposal to promote positive impacts and minimize negative health impacts;
- a plan for who will be responsible for implementing and monitoring each recommendation; and,
- the initial comments from the decision making body on the feasibility of the draft recommendations.[1]

5.1 Table of Recommendations

The following table of recommendations was prepared by DD4L staff and reviewed by Davidson's planning staff and the Planning Ordinance Committee at the beginning of the HIA. The goal of analyzing the existing standards was to identify portions of the standards that benefit health and should be kept, portions of the ordinance that could be improved upon to promote health further, and any items within the ordinance that might be detrimental to health and needed to be removed.

Table 6: Recommendations After Reviewing Davidson's Existing Street Design Standards[2]

Section Number	Section Title	Section Text (*emphasis* added)	Health Benefits/ Concerns	Suggested Improvements/ Questions for Clarification
11.0	Streets and Greenways	These regulations are intended to promote an environment built to *human scale* that *accommodates pedestrians as the first priority*. Streets are the *primary public spaces* of the town, so *attractive* street fronts, *connecting walkways*, and *alternative means of transportation* are encouraged while accommodating vehicular movement.	+ Safety from injury + Increased physical activity + Sense of community + Air quality/ respiratory diseases + Mental health/ reduced stress/ road rage	• Mention public transportation • Define pedestrian (does this include bicyclist?) • Incorporate complete street language more fully/ balance of modes • Identify vulnerable populations (youth, elderly, low income/ non-drivers) • Issue of mobility and access • Mention promoting physical, mental, and emotional health
11.1	General Design Principles-Streets	The planning ordinance encourages the development of a *network of interconnecting streets* that work to *disperse traffic* while connecting and *integrating neighborhoods* with the existing fabric of the Town. Equally important, the ordinance encourages the development of a *network of sidewalks and bicycle lanes* that provide an *attractive and safe* mode of travel for cyclists and pedestrians. On-street parking is encouraged.	+ Safety from injury + Increased physical activity + Sense of community + Air quality/ respiratory diseases + Mental health/ reduced stress/ road rage	• Remove on-street parking is encouraged • Replace disperse traffic with reduce traffic congestion when feasible • Replace sidewalks and bicycle lanes with pedestrian and cycling

				facilities (more flexibility in design) • Specifically mention improving mobility and access for all populations • Network that allows for easy changes from one mode of travel to the next- example driving to walking or biking to bus etc.
11.1.A		Streets shall *interconnect* within a development and with adjoining development. Streets within a new development shall connect to existing streets and rights-of-way. Street stubs shall be provided to the property line to provide for future development. Streets shall be planned with due regard to the designated *circulation system* shown on the Comprehensive Plan map and any other applicable approved plans.	+ Connectivity allows for shorter distances and alternative routes increasing likelihood of walking/biking and better dispersion of traffic decreasing air pollution – Greater number of intersections could result in more points of potential conflict with vehicles	• Specifically mention that cul-de-sacs are typically not allowed • Provide reasoning for promoting interconnectivity
11.1.B		Streets shall be designed as the *main public space* of the Town and shall be *scaled to the pedestrian*.	+ Well designed public spaces lead to increased sense of community and improved mental/ emotional health + Scaling to the pedestrian encourages walking and can reduce traffic speeds improving safety	• Define being scaled to the pedestrian • Perhaps add images for clarification • Define the public realm of a street- example from the front of one building to the next- not just the asphalt roadway • List the current mileage of roadway
11.1.C		Streets shall be bordered by *sidewalks on both sides* except on alleys, lanes, parkways, and rural roads. The appropriate governing board may grant exceptions upon recommendation by the Planning Director if it is	+ Sidewalks increase safety and enhance the experience of those walking – Lack of sidewalk on one	• In areas where sidewalks are not appropriate consider a payment-in-lieu fund to contribute to where

		shown that local *pedestrian traffic* warrants their location on one side only.	side of the road may lead to an unconnected network of sidewalks and less walking. It may also cause crossing of the street in unsafe areas to continue on a sidewalk	sidewalks are needed • Define how pedestrian traffic is measured (if a sidewalk was in place would this increase pedestrian traffic?) • Specify width, materials, and quality of sidewalk
11.1.D		Streets shall be designed with street trees planted in a manner appropriate to their function. Commercial streets shall have trees which *shade the sidewalk*. Residential streets shall provide for an appropriate canopy, which *shades both the street and sidewalk*. Street trees should allow the *free movement of emergency vehicles*.	+ Street trees provide shade and air- cleaning qualities increasing walking and decreasing rates of heat stroke and asthma attacks – Concern over blocking visibility and movement of larger vehicles such as emergency vehicles – Tree roots can push up sidewalks and present a tripping hazard	• Specify types of trees that are appropriate for each street type • Encourage a diversity of tree types to prevent spread of tree diseases. • Specify planting strip size or other means to prevent sidewalk buckling • Specify if the trees are to be at full-size when planted or younger • Mention tree preservation when planning sidewalk location and allow for curvy sidewalks to prevent tree removal
11.1.E		Wherever possible, streets should be *designed to fit the contours of the land* and should *minimize removal of significant trees*.	+ Street trees provide shade and air- cleaning qualities increasing walking and decreasing rates of heat stroke and asthma attacks + Less environmental disturbance is good for water quality and air quality which is good for health – Concern over trees blocking visibility and movement of	• Add sidewalks and other relevant bicycle or pedestrian facilities. • Mention striking a balance between less disturbance/ more shade and visibility of all mode users

			larger vehicles – Concern over visibility along curvy streets especially of bicyclists	
11.1.F		All streets, whether publicly or privately maintained, shall be constructed in accordance with the design and construction standards in this code and shall be *maintained for public access* whether by easement or by public dedication. Private streets are allowed when one entity will retain ownership of all properties that abut the street. Private streets, except those in low-impact subdivisions, or rural subdivisions, shall comply with the Charlotte-Mecklenburg Land Development Standards Manual. *Closed, guarded, or gated streets are strictly prohibited.*	+ Prevents substandard roads from being constructed which reduces injury + Speed and accessibility of emergency response improved without gates + Social cohesion of community improved – Potentially improved safety within a neighborhood if gated or guarded	• Provide reasoning for prohibiting gated, guarded, and closed streets
11.1.G		All on-street parking provided shall be *parallel*. Perpendicular or angle parking is permitted only upon approval of the Planning Director.	+ Visibility when reversing back into traffic from a perpendicular parking spot is less than pulling out into traffic from a parallel spot – Increased potential of being doored if biking next to parallel parking spot	• Considered angled parking that is designed to be reversed into so that when pulling out of the space the driver is facing oncoming traffic • Specify which types of streets perpendicular parking could be allowed
11.1.H		The use of *traffic calming devices* such as raised intersections, lateral shifts, and roundabouts are encouraged as alternatives to *conventional traffic control measures* with approval of the Planning Director.	+ Traffic calming devices reduce speeds which decrease the likelihood and severity of accidents	• Define conventional traffic control measures • Consider impacts of traffic calming devices on the safety of all street users • Consider necessary learning phase for uncommon traffic calming devices
11.1.I		Roundabouts shown on the Comprehensive Plan map shall be required. At all other intersections requiring traffic calming, *raised pavement or roundabouts* shall	+ Traffic calming devices reduce speeds which decrease the likelihood and	• Consider impacts of traffic calming devices on the safety of all street users

		generally be used.	severity of accidents	• Consider necessary learning phase for uncommon traffic calming devices
		Minor variations and exceptions to street cross-sections may be permitted with approval of the Planning Director. Such exceptions include variations to the pavement width, tree planting areas, street grade, sight distances, and centerline radii in accordance with principles above. *Right-of-way widths should be preserved for continuity.*	+ Right-of-way widths can determine whether or not bicycle, pedestrian, and transit facilities are built and should be preserved regardless of variations	• Specify the conditions in which variations can be accepted such as due to limitations caused by natural features or nature of adjacent land uses etc.
11.2	Street Engineering and Design Specifications	Street designs shall permit the comfortable use of the street by *cars, bicyclists, and pedestrians. Pavement widths, design speeds, and the number of vehicle lanes should be minimized.* The specific design of any given street *must consider the building types* which *front on the street* and the relationship of the street to the Town's street network. New development shall generally *front on existing publicly maintained streets*, and shall be *required to upgrade those streets* to meet the standards of this Section. The following specifications shall apply to public infrastructure design:	+ Considers use by multiple user types + Minimized widths, speeds and lanes reduce crossing distance for pedestrians and increase safety of all uses from injury (decreased likelihood of accident and severity) + Establishes a tie between land use and street design which helps create a walkable environment + Requires buildings to front the street (instead of a parking lot) which helps create a walkable environment + Encourages infill development and using existing infrastructure which increases density/ mixed use and helps create a walkable environment + Requires upgrades of existing streets to meet	• Change cars to drivers • Add transit users • Add posted speeds to design speeds • Consider addressing turning radius, intersection design, pedestrian facilities, and bicycling facilities. • Specify what new development includes (aka residential, commercial, mixed use, institutes, etc.)

			standards which helps with maintenance of the streets and improved safety of users	
11.2.1	Street Materials	Street and alley materials shall conform to the provisions of the Charlotte-Mecklenburg Land Development Standards Manual. Exceptions may be made for *pedestrian crosswalks*. Sidewalk *material may vary* according to the overall design and character of the development.	+/- Different sidewalk materials can cause various degrees of impact when walked on or ran on. Particularly hard materials may contribute to shin splints. - Sidewalks made out of uneven surfaces such as brick or cobblestone may contribute to trips/ falls	• Specify who grants exceptions. • Consider the physical abilities of all users when selecting materials for crosswalks and sidewalks. • Provide more detail on pedestrian crosswalk materials that are acceptable and consider accident and injury reduction as the priority for crosswalk design
11.2.2	Street Signs and Traffic Control Signs	All *street and traffic control signs posted* in accordance with the Manual of Uniform Traffic Control Devices shall be installed by the developer prior to the issuance of any certificates of occupancy for any building on that street.	+ Proper signage reduces likelihood of accidents/ injury. + Proper wayfinding signs can increase likelihood of walking or biking to locations.	• Specify traffic control signs to include necessary pedestrian crossing and share the road signs. • Include wayfinding signs and route information signs for pedestrians and bicyclists where appropriate. • Consider the location and text size of street signs to enhance their visibility to drivers.
11.2.3	Future Street Connection Signage	All dead-end streets and street stubs that have the potential to connect to adjacent property or with nearby streets must be signed with the following language: "This cul-de-sac is temporary. The street will be extended when the adjacent property develops."	+ Provides notice of future connectivity which leads to a more walkable and bikeable network.	• Specify the timeframe for this signage (such as immediately following the construction of the street stub) to completion of road expansion
11.2.4	Sidewalks	Sidewalks shall be *constructed along both side of all streets* except alleys and rural roads. Residential sidewalks shall be a minimum of 5 ft. in width.	+ Sidewalks add to walkability and protect pedestrians from vehicular traffic.	• Consider increasing the minimum width of the sidewalk to allow two

		Sidewalks serving mixed use and commercial areas shall be a *minimum of 8ft. in width (12-15 feet is required in front of retail storefronts*). All new sidewalks in the block bounded by Main Street, Depot Street, and Jackson Street shall be *paved in brick pavers.* All other sidewalks may be concrete, pavers, or similar material. Sidewalks should not be constructed without an *adequate planting strip* unless on-street parking protects pedestrians.	+ Planting strips can provide a buffer between pedestrians and vehicular traffic and if wide enough can grow trees which provide shade and improve air quality + Brick pavers can add to the character and sense of place in downtown – If a sidewalk is not wide enough injury can occur when people try to pass one another (especially if dogs, strollers, wheelchairs, scooters, bicycles, etc. are involved) – If not properly maintained, brick pavers can contribute to falls/ injuries – If planting strips are not wide enough then tree roots can cause buckling of sidewalk contributing to falls/ injuries – Depending on the location of bicycle lanes, the lowest branch of a shade tree could cause injury if not maintained	people to easily pass- perhaps 6 ft. • Define adequate planting strip. The typical width needed for a large shade tree to grow is 8 feet. • Encourage the use of a planting strip or planted bulbouts even when on street parking is available. • Mention maintenance of sidewalks especially those with brick pavers to prevent falls/ injury. • Suggest even wider sidewalks for retail spaces that may have outdoor seating such as restaurants. • Consider requiring additional pedestrian facilities commonly found within the sidewalk such as trash cans, benches, and water fountains.
11.2.5	Bike Paths	All new development within the existing town limits fronting on North Main Street, Griffith street, Beaty Street, Concord Road, Davidson-Concord Road, East Rocky River Road, or Grey Road *shall include bike lanes,* a *minimum of four feet in width*, on those streets. New developments outside the town limits fronting on North Main Street, Concord Road, Davidson-Concord Road, East Rocky River Road, Grey Road, Barnhardt	+ Bike paths/ lanes offer a protected route for bicyclist to use increasing safety and likelihood of biking. – Narrow bike lanes can give bicyclist a false sense of security	• Define all new development- for example if a single house was to be built fronting one of those roads would it be expected that they provide a bike path? • Consider replacing all the

		Road, or Mayes Road *shall include bike paths a minimum of eight feet in width* and *separated from vehicular traffic on those streets.* Bike lanes and bike paths shall be designed according to the North Carolina Bicycle Facilities Planning and Design Guidelines, published by NCDOT.	– Bike paths that also serve as a sidewalk or a multidirectional path if not wide enough could have conflict between user groups resulting in injury.	street names with in accordance to Davidson's bicycle plan. • If these roads are state maintained can Davidson require bike paths on them? • Consider adding sharrows instead of narrow bike paths. • Consider bike boulevards in neighborhood developments • Specify how bike paths should be separated from vehicular traffic. • Don't use bike path and bike lane interchangeably, add bike lane to title, and define each. • Are sidewalks also required on roads with separated bike paths or does this path take the place of the sidewalk? • In more urban/ commercial areas consider painting the bike paths green to help with visibility and delineation from on street parking or traffic lanes. • Include language about providing wayfinding signs/ markings for bicyclists to major destinations.
11.2.6	Cul-de-sacs	Cul-de-sacs may be *permitted only where topographic conditions and/or exterior lot line configurations offer no practical alternatives* for connection or through traffic. Cul-de-sacs, if permitted, *shall not exceed 250 ft. in length* from the nearest intersection with a street	+ Cul-de-sacs limit connectivity which makes walking, bicycling, and driving distances further between two locations so it	• Consider putting limitations on the width or size of the cul-de-sac in addition to the distance from an intersection • Change length to distance

		providing through access (not a cul-de-sac). A *close is preferred* over a cul-de-sac.	is good to prevent them when possible and limit their distance from an intersection.	from the nearest intersection • Define a close
11.2.7	Blocks	Blocks shall not be *less than 150 feet nor more than 600 feet in length* except where topographic conditions and/or unique lot configurations offer no practical alternatives. Such blocks shall be approved by the Planning Board prior to final approval.	+ Shorter blocks add to walkability	• Consider designating different block lengths to residential uses and mixed use/ commercial uses.
11.2.8	Intersections			
11.2.8.A		All streets shall intersect as nearly as possible at *right angles* and no street shall intersect at less than 60 degrees	+ Right angles increase visibility and reduce turning speeds adding to safety	• Consider adding language about bulbouts and other mechanisms to help make a street intersect at a right angle.
11.2.8.B		Intersections shall be at least 150 feet apart measured from centerline to centerline (exception: lanes and alleys). Where a centerline offset occurs at an intersection, the distance between centerlines of the intersecting streets shall not be less than 60 ft.	+ Adequate distance from intersections determine block size and allows adequate distance to turn and keep traffic from backing up into intersections – Because there is no maximum distance between centerlines the block size could be less walkable	• Consider adding a maximum distance from one intersection to the other to keep block size walkable • Consider increasing the distance with centerline offset or discouraging the use of centerline offsets
11.2.8.C		Curb radii at street intersections shall be rounded with a minimum radius of 15 feet. At an angle of intersection of less than 90 degrees, a greater radius may be required. Curb radii shall be designed to *reduce pedestrian crossing times* along all streets. In general, curb radii should not exceed 25 ft.	+ The shorter the radius the shorter the pedestrian time needed to cross and the slower the traffic will turn + Need to make sure the curb radii is enough for emergency vehicles to access	• Consider decreasing the minimum radius to 10 • Consider different minimum/ maximums for different street types (residential versus more commercial areas with greater truck/bus activity) • Encourage 90 degree intersections • Like that there is a minimum

				and a maximum radii • Consider taking into account the actual radii created by separated bike lanes or parked cars not just the curb • Consider the use of mountable curbs on the corners or collapsible barriers to discourage drivers to make quick turns but allow emergency vehicle access
11.2.8.D		Proper sight lines shall be maintained at all intersections of streets to *permit adequate sight distance*.	+ Adequate sight distance adds to safety.	• Define adequate sight distance- perhaps with drawings • Consider all possible vehicle types and users when considering sight distance including children and people in wheelchairs
11.2.8.E		Street trees and on-street parking *shall be held 20' from intersections* to allow turning radius of emergency vehicles.	+ Adds to visibility as well as access of emergency vehicles improving safety and response times	• Consider placement of other amenities within this 20' space including fire hydrants, flowers, trash cans, etc. • Is a mountable curb warranted to allow for smoother turns?
11.2.8.F		Roundabouts are encouraged at intersections to allow a smooth and continuous flow of traffic.	+ Fewer stops and less idling than with a traffic light reduces air pollution and collision rates – Learning curve in how to use roundabouts including proper yielding to vehicles within the roundabout and to	• Include language about the appropriate signing at roundabouts and design elements leading into a roundabout that can help slow down traffic entering the roundabout • Consider adding an

			pedestrians crossing prior to the roundabout	educational component during the planning and construction of roundabouts for residents/ business owners
11.2.9	Utility Location	*Underground utilities* shall be located in alleys and lanes. If no alley or lane is provided, then a *5-foot (minimum) utility easement shall be provided behind the sidewalk* located within either the right-of-way or a public utility easement.	+ Underground utilities are preferable to above-ground utilities for walkability and neighborhood aesthetics. + An easement in addition to the sidewalk provides for additional right-of-way space to include the sidewalk and utilities reducing barriers to walking	• Clearly define behind the sidewalk- is the utility easement between the road and the sidewalk or on the side of the sidewalk furthest from the road?
11.2.10	Curbs and Drainage	Curbs shall be constructed in accordance with Charlotte-Mecklenburg Land Development Standards Manual. Standard curbing is required along all streets with marked on-street parking and around all required landscaping areas and parking lots. Valley curb and gutter are not allowed. 2' curb and gutter is required at streets: 1'-6" curb and gutter is allowed at parking areas. Drainage shall be provided using closed curb and gutter systems along all streets except in rural areas and along pathways that *may use open swales* upon approval of the Planning Director. All storm drainage systems shall be designed in accordance with the Mecklenburg County Storm Drainage Design Manual. *All drainage grates must be safe for bicyclists.* Bicycle-safe drainage grates are Types E, F, and G approved by the North Carolina DOT.	+ Curbs can provide clear separation between the pedestrian realm and vehicular traffic increasing safety. + Drainage and stormwater management adds to the safety of the roadway + Drainage grates that are safe for bicyclists reduces injury – Open swales instead of gutters could lead to standing water and breeding grounds for mosquitoes if poorly designed	• Consider adding bioswales for stormwater management considerations especially in residential areas. • Consider adding language on curb cuts especially in commercial/ mixed use areas (fewer curb cuts means less chance of collision between uses) • Consider adding language on changing grate direction or grate replacement for existing grates that are not safe for cyclist. • Clarify parking areas vs parking lots (does this include on-street parking)
11.2.11	Centerline Radius	A 90 ft. minimum radius and minimum 50' tangent shall be provided between reverse curves on all streets. Centerlines may be varied upon approval of the	+ This increases visibility on curvy roads – May need to increase to	• Consider increasing minimums to improve visibility of bikers

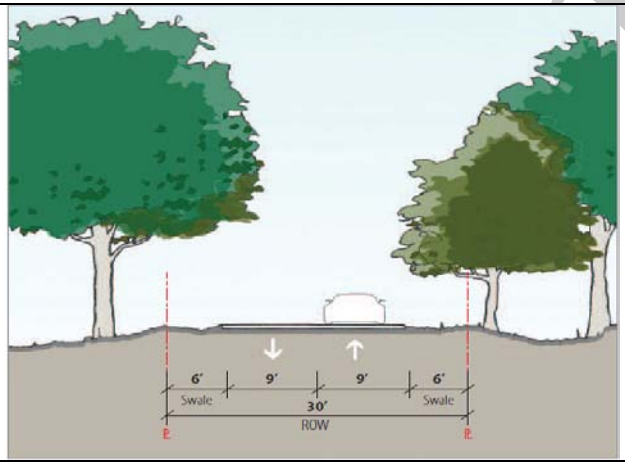
		Planning Director.	improve visibility of bikers	• Consider the use of sharrows in the middle of the lane (in and around curves) versus biking on the shoulder to improve visibility
11.2.12	Pedestrian Crosswalks	Where deemed necessary by the Planning Director, a *pedestrian crosswalk at least ten feet in width* may be required to provide convenient *public access to a public area such as a park, greenway, or school, or to a water area such as a stream, river, or lake.* Sidewalks and crosswalks *must be ADA compliant.*	+ Crosswalks add to safe crossing for pedestrians + ADA compliancy increases accessibility for those who are physically handicapped	• Add language about proper signage and signaling at crosswalk and additional crosswalk design criteria. • Add requirements about crosswalks at intersections with high levels of pedestrian activity.
11.2.13	Posted Speed Limits	All streets except alleys and state roads shall be posted with a 25 mile per hour speed limit.	+ Lower speeds reduces the likelihood and severity of an accident improving safety and reducing injuries	• Add language about the relationship between design speed and posted speed limits
11.2.14	Street Lighting	See Section 13 for street lighting standards.		
13.5	Street Lighting	The owner, developer, or subdivider of property shall be required to *install street lighting via underground distribution* along all proposed streets and *along all adjoining existing streets* in accordance with the following:	+ Street lighting enhances visibility of all street users and increases safety from crime + Underground distribution is preferable to above-ground utilities for walkability and neighborhood aesthetics. + Connective lighting to existing corridors lengthens visibility and enhances safety from crime.	
13.5.A		All underground and other electrical distribution systems for street lighting within the corporate limits of the Town of Davidson and its extraterritorial planning jurisdiction shall be installed in conformance with Duke Power and Town of Davidson standards at the		

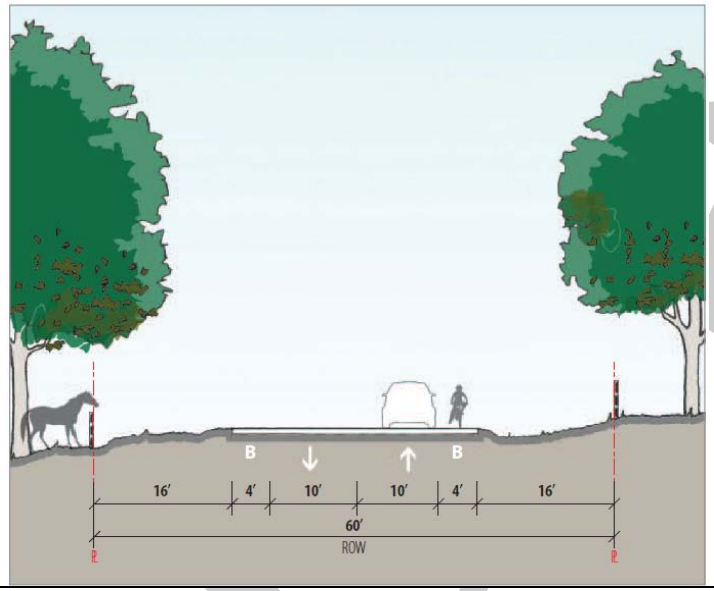
		developer's expense.		
13.5.B		The placement of street lighting fixtures in residential areas shall be at 160 to 200 foot intervals and at each intersection unless:	+ Street lighting enhances visibility of all street users and increases safety from crime	• Does this create any shadows along a stretch of sidewalk/ pavement? • Add a drawing to better describe this
13.5.B.1		The roadway length is less than 200 feet, a street light is placed at the intersection, and no natural features create a problem, in which case a street light will not be required at the end of the street; or	+ Street lighting enhances visibility of all street users and increases safety from crime	• Replace create a problem with more specific language
13.5.B.2		The vertical and horizontal street alignment or natural features necessitate shorter spacing intervals.	+ Street lighting enhances visibility of all street users and increases safety from crime	
13.5.C		The Town will accept responsibility of the lights at the time streets are accepted for maintenance and one-time decorative fees have been paid to the Town or light provider.		
11.3	Street Types			
	Rural Road	Designed to maintain the character of Davidson's rural areas. No curbs or gutters are required. Drainage swales shall be on one or both sides of road, with either a cross slope or center crown, respectively.	– Open swales instead of gutters could lead to standing water and breeding grounds for mosquitoes if poorly designed	• Consider adding bioswales for quicker absorption and water treatment • Add maximum widths for these roads • Add rural areas as in accordance with Land Use Map • Any bicycling or pedestrian facilities required such as share- the-road signs or separate bicycle paths?
	Alley	Residential alleys are low-speed (10 mph) public rights-of-way providing *rear access to garages and residences.* Garages and parking pads shall be held five feet from the edge of the right-of-way. Alleys are required where lot widths are 60 feet wide or less,	+ Rear access to garages/ parking adds to appeal and walkability of residential neighborhoods + Navigability by garbage	• Consider using open carports or separated garages instead of enclosed, ground level garages in multi-home developments

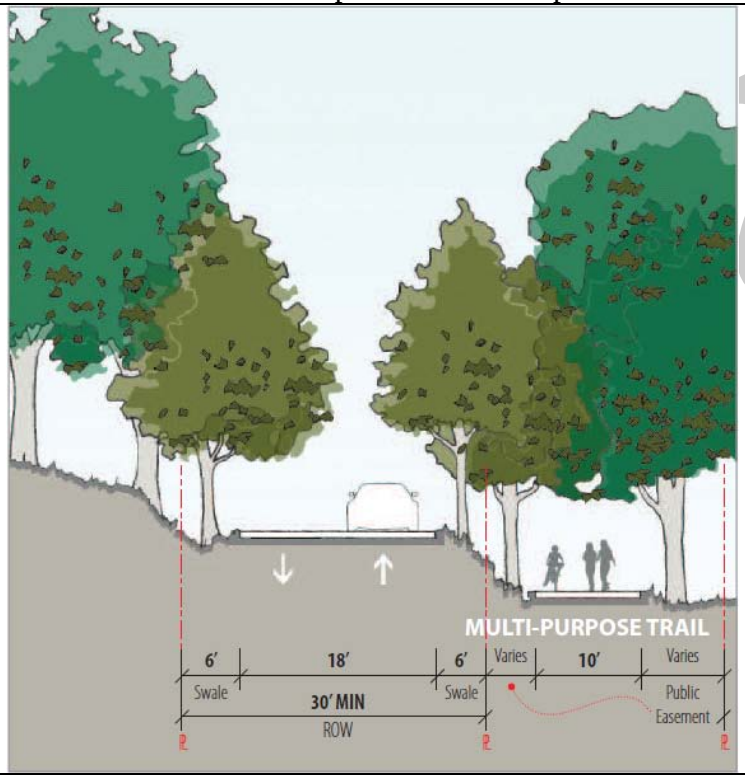
		unless topography is prohibitive. The radius at the street/alley connection *must be navigable by garbage trucks and emergency vehicles*.	trucks and emergency vehicles add to sanitation and safety – If not properly designed, ventilation from ground level garages may not be sufficient to prevent carbon monoxide poisoning	• Consider adding conditions on windows facing the alley in order to add natural surveillance • Add language about the width of the alley and if they are one-way (if so appropriate signage is needed) • Add language about no parking in the alleyway or blocking the alleyway
	Lane	Lanes are *pedestrian-oriented* and residential in nature, functioning primarily to provide access within neighborhoods. A traffic speed of 15 mph is appropriate.	+ Pedestrian-oriented streets increase walkability + Lower speeds reduces the likelihood and severity of an accident improving safety and reducing injuries	• Add language on width of the road and ways it is pedestrian-oriented • Is on-street parking allowed? Required?
	Parkway	Parkways are bounded on one side by structures and the other by a greenway, park, or open space. On-street parallel parking is on one side.	+ Having greenway, parks and open space accessible to the street increases accessibility and the likelihood of their use	• Is the on-street parking encouraged on the side with structures or the park side? • Why not parking on both sides? • Mention street widths and crossing guidelines. • Consider requiring a bike lane to connect bikers to greenways, parks, and open space.
	Neighborhood Street	Neighborhood streets are *pedestrian-oriented* and residential in character, functioning primarily to provide access to neighborhood destinations and to provide connections within neighborhoods. *Low traffic speeds are appropriate*. There is on-street parallel parking on one side of the street.	+ Pedestrian-oriented streets increase walkability + Lower speeds reduces the likelihood and severity of an accident improving safety and reducing injuries	• Specify low traffic speeds (15 mph) • Why not parking on both sides? • Difference between lane and neighborhood street? • Consider bike boulevards on

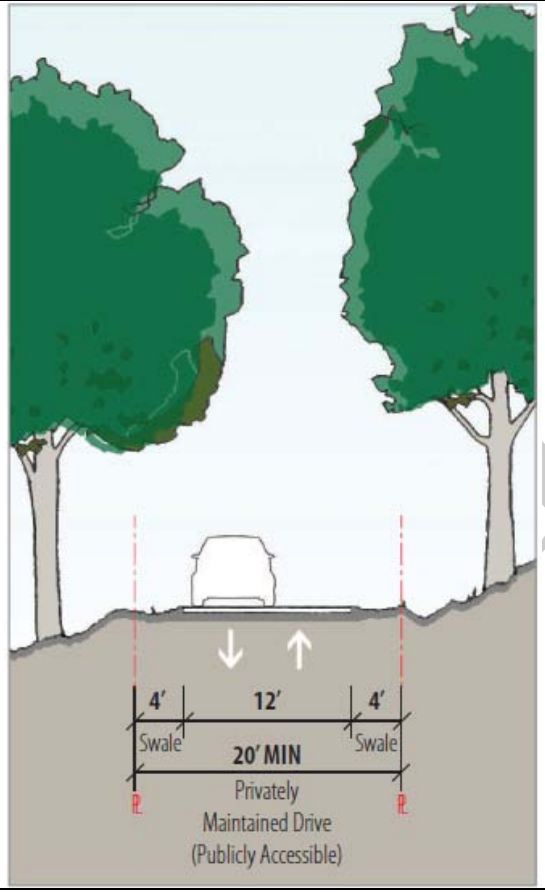
				some neighborhood streets.
	Town Street	Town streets are urban in character and provide *low-speed, pedestrian-friendly* access to neighborhoods as well as neighborhood commercial and mixed-use buildings. *On-street parking is on both sides, and bike lanes are provided to accommodate bicyclists.*	+ Lower speeds reduces the likelihood and severity of an accident improving safety and reducing injuries + On-street parking can create a buffer for pedestrians and reduces the need for parking lots + Bike paths/ lanes offer a protected route for bicyclist to use increasing safety and likelihood of biking. – Combining bike lanes with on-street parking especially on narrow roadways may result in the biker being doored	• Consider adding language about transit facilities such as bus stops/ shelters • Define low-speed • Consider different bicycle facilities than lanes such as sharrows
	Commercial Street	Commercial streets connect neighborhoods to commercial centers and carry diverse traffic volumes. It is urban in character and generally operates at *low to moderate speeds* since these streetscapes function as vibrant *pedestrian environments. On-street parking is on both sides.*	+ Lower speeds reduces the likelihood and severity of an accident improving safety and reducing injuries + Pedestrian-oriented streets increase walkability + On-street parking can create a buffer for pedestrians and reduces the need for parking lots	• Consider adding bicycle facilities to commercial streets • Consider adding language about transit facilities such as bus stops/ shelters • Add language about parking lots (location, size, orientation to pedestrians, etc.)

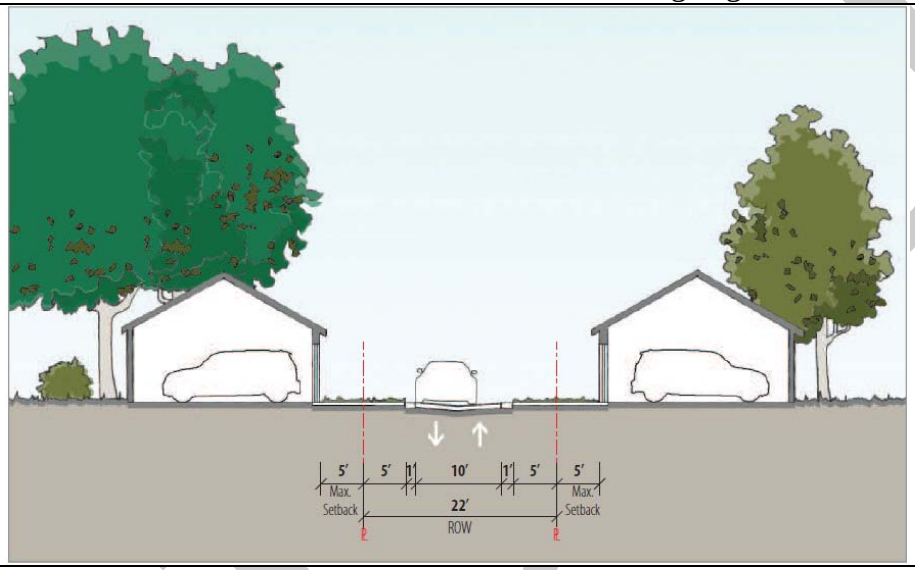
Table 7: Recommendations After Reviewing Cross Sections in the Davidson Ordinance[2]

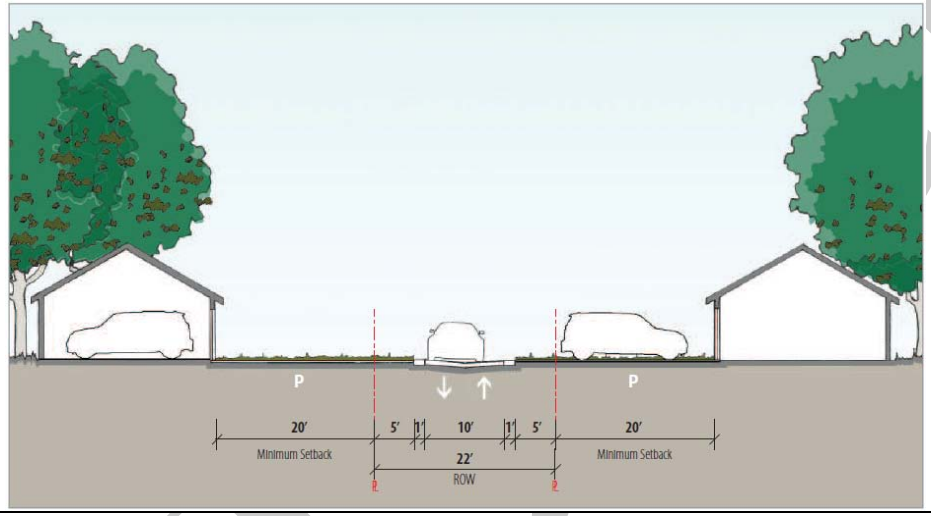
Road Type	Cross Section in Davidson Ordinance	Alternative Cross Section
General:	• Add the entire description and applicable codes to the caption beside each cross section. • Develop an easy to use table with road type and applicable codes for quick reference. • Each cross section should have a corresponding street type as described in section 11.3 (such as the Low Impact Subdivision Access Road, High Density Street, Village Infill Street) • Show cross sections as a transect changing the further from town center development takes place. • Give examples of streets within Davidson that are similar to the cross section provided when available. • Add a table with pedestrian/ biker ratings with photos for easy reference (example used in Seattle). • Add a cross section and road type that has on street parking with places to pull to the side and two way traffic within one travel lane (as found on Faust Street).	
Rural Road:	• This street section is intended to be used in the Rural Planning Area where low density predominates. • Potential for greater shoulder on these roads to allow for passing bicyclist/ break downs? • Share the road signs possible?	
		

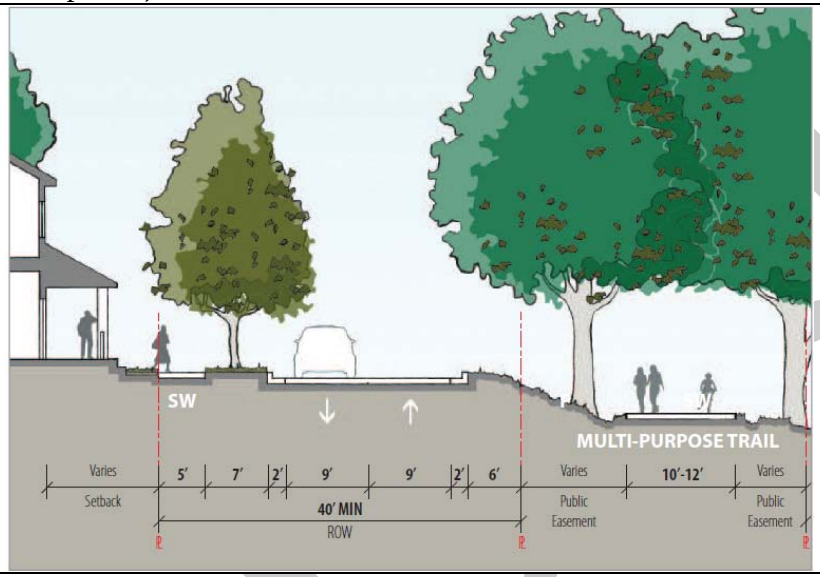
Road Type	Cross Section in Davidson Ordinance	Alternative Cross Section
Rural Road with Bike Lanes:	• This rural road is shown with additional pavement on both sides for pedestrians and cyclists and is an option for the Rural Planning Area. • Is it better to have a multidirectional, separated from traffic, 8' foot bike path or two one directional bike lanes? • Why such a large unpaved shoulder/ swale from property lines? • Why are lanes 10' instead of 9'? Could lane be decreased and bike lane increased?	
		

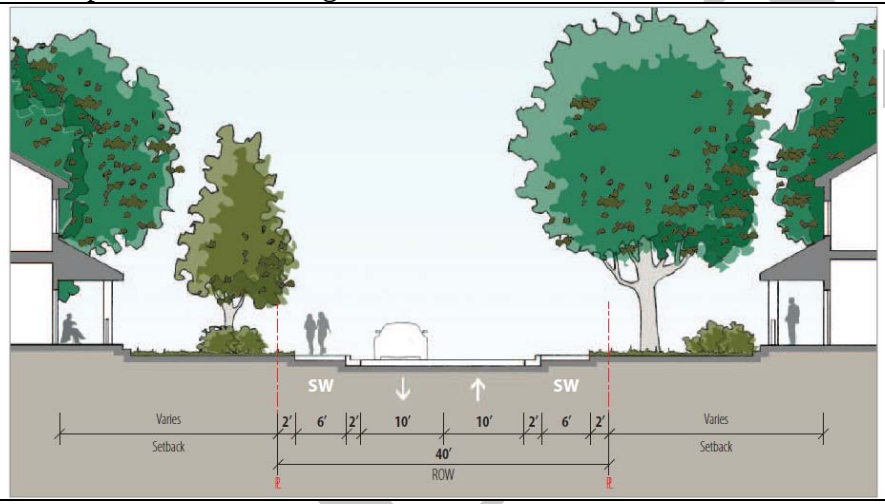
Road Type	Cross Section in Davidson Ordinance	Alternative Cross Section
Rural Road with Side Path:	• This street section shows a narrow, low speed, low traffic road that connects neighborhoods with minimal environmental impact. A bicycle/ pedestrian path is separate from the roadway to preserve existing topography and vegetation. • Is an elevation separation necessary? • Add rural to description. • This cross section is preferable to the previous one for biker/ pedestrian safety.	
		

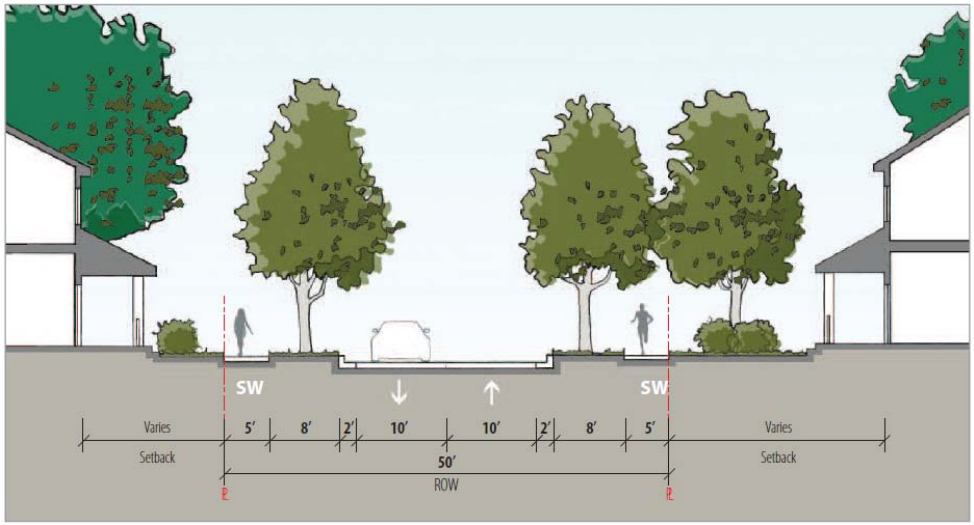
Road Type	Cross Section in Davidson Ordinance	Alternative Cross Section
Low-Impact Subdivision Access Road:	• This road is privately maintained, but publicly accessible. The street section may be gravel or paved to provide access to low-impact and farmhouse cluster subdivisions. • Is this solely in rural areas? • If paved should the swale be larger for stormwater management?	
		

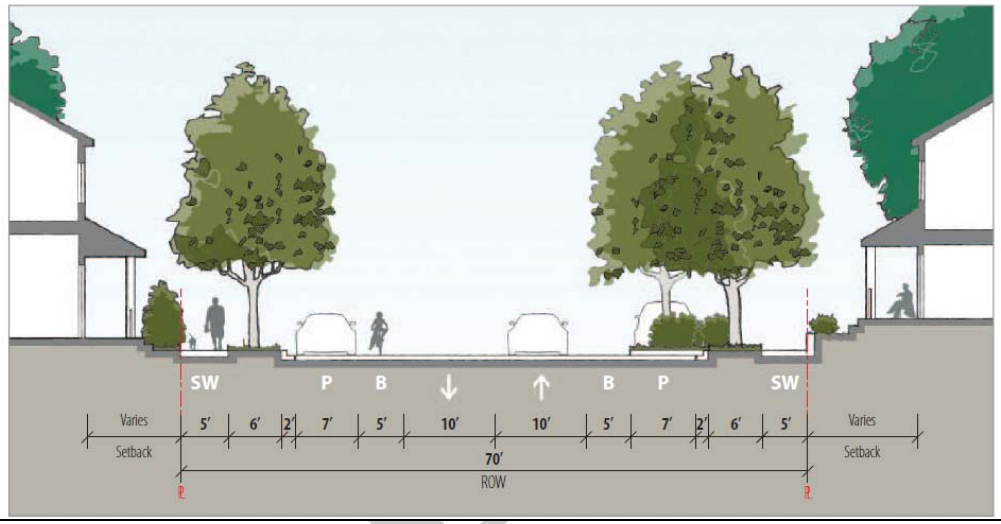
Road Type	Cross Section in Davidson Ordinance	Alternative Cross Section
Alley (Option A):	• Parking is permitted only in rear accessed garages. In order to dedicate the frontage to the pedestrian instead of the automobile, an alley is required for parking behind residential lots less than 60' in width. • Can the garage have a loft/ granny flat/ studio apartment above it? • What is the distance between the house and the garage?	
		

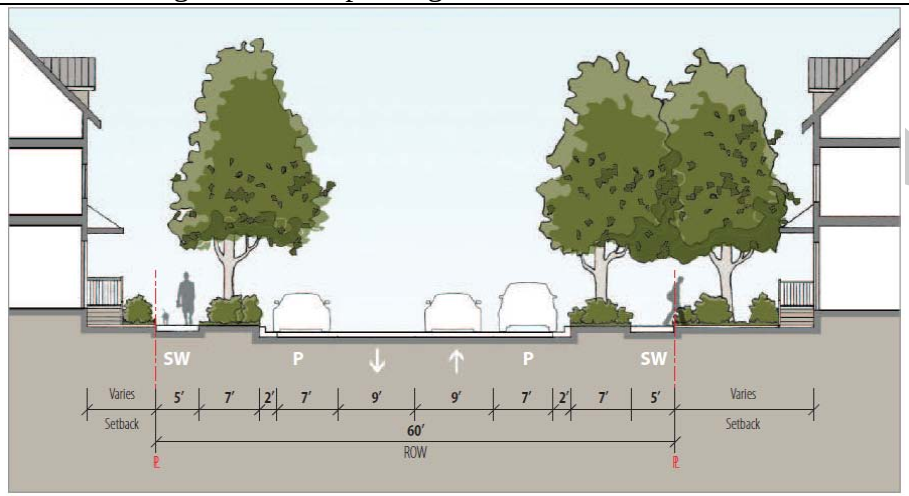
Road Type	Cross Section in Davidson Ordinance	Alternative Cross Section
Alley (Option B):	• Parking is permitted in both the garage as well as on a driveway pad large enough to accommodate a parked car. • Can the garage be used as an office/ studio? • Can the garage have a loft/ granny flat/ studio apartment above it? • What is the distance between the house and the garage? • If on-street parking is available in front of the house is a garage and parking pad necessary?	
		

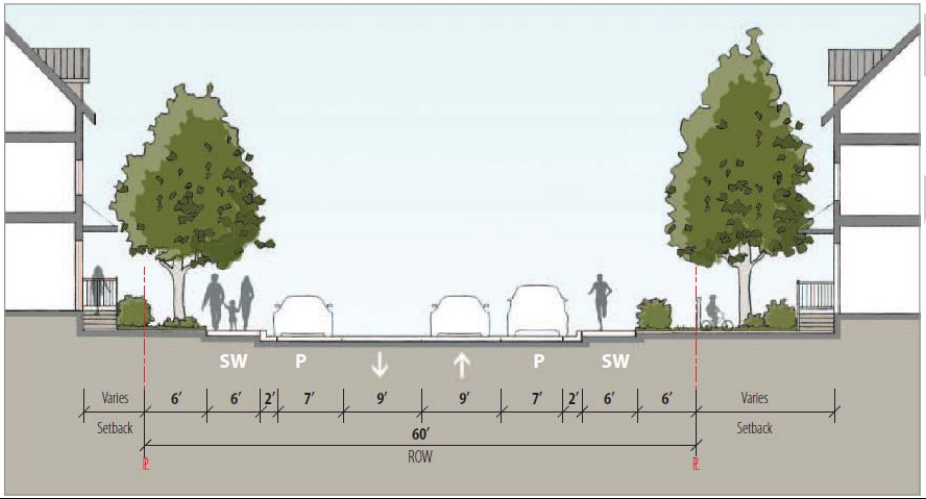
Road Type	Cross Section in Davidson Ordinance	Alternative Cross Section
Parkway:	• This single-loaded street includes development located on one side only. The street section is primarily used along greenways and open spaces. • Where is the on-street parking located? • Does there need to be a change in elevation between the road and trail? (this limits accessibility to trail/ entrance points)	
		

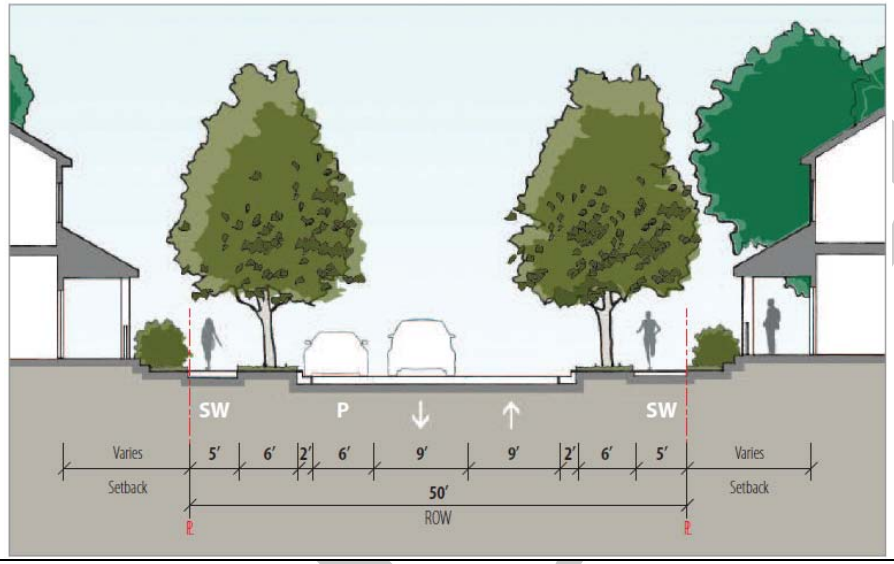
Road Type	Cross Section in Davidson Ordinance	Alternative Cross Section
Residential Street (Option A):	• This option contains houses with deeper front setbacks and sidewalks directly adjacent to a low speed, low traffic narrow streets that are no more than one to two blocks in length. Note the required street trees are planted in the setback. • There is no buffer between pedestrians and street- perhaps add on-street parking or even a grass strip between the curb and sidewalk on each side? Or reduce the sidewalk to one side of the street with more of a buffer between the sidewalk and roadway? • Where is lighting placed on this type of street? • Would this cross section be used if sidewalk was added to existing development where there are no sidewalks and a pre-established larger setback? Or if there were natural features such as large/ mature trees to be saved?	
		

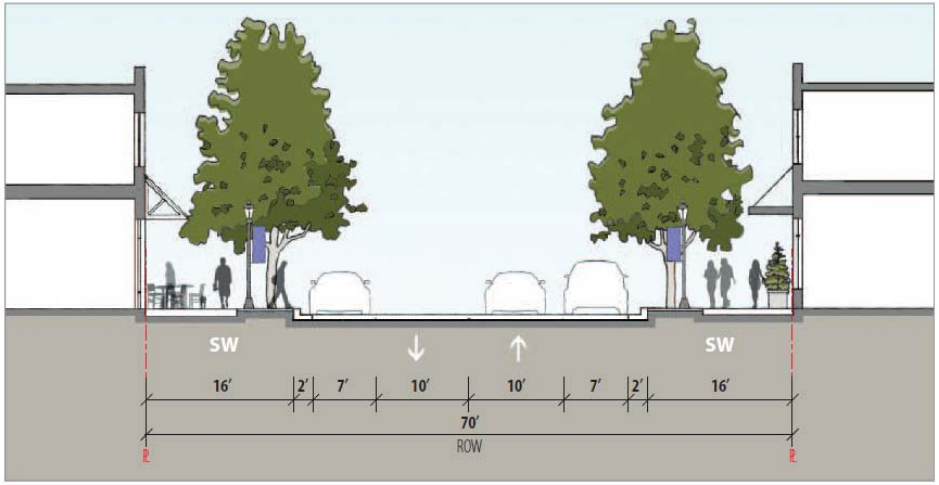
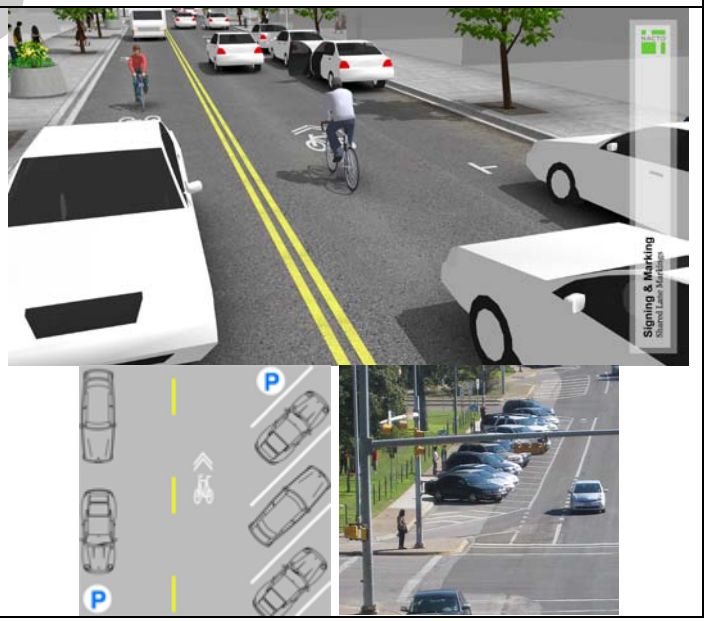
Road Type	Cross Section in Davidson Ordinance	Alternative Cross Section
Residential Street (Option B):	• This option contains houses with shallow front setbacks. Instead of sidewalks directly next to the street, a large planting strip separates the pedestrian from the road. • Prefer this option to the previous cross section because the planting strip provides a buffer between the pedestrian and traffic and there is shade.	
		

Road Type	Cross Section in Davidson Ordinance	Alternative Cross Section
Residential Street (Option C):	• Street section to be used along main collector streets in residential areas. On-street parking and bike lanes are included on both sides of the street. Curb extensions (bulbouts) are encouraged at intersections for safe pedestrian crossings, traffic calming and can include additional landscaping. • Concerned over dooring potential- potentially sharrows instead of bike lanes or wider bike lane with narrower traffic lanes(9'). • Like bulbouts and would use them to enclose parking and extend pass the car to increase visibility of pedestrians. Also choose plantings with pedestrian visibility in mind. • Cross walks required? Pedestrian signage or signaling required?	
		

Road Type	Cross Section in Davidson Ordinance	Alternative Cross Section
High Density Street (Option A):	• Street section to be used in higher density residential and mixed-use areas. On-street parking is provided on both sides of the street and the sidewalk is separated from the street with a large planting strip. Bike lanes should be added where shown on the Bicycle Master Plan. • Add bulbouts where necessary for safe crossing. • Where would they place the bike lane within the right-of-way? Perhaps sharrows/ bike boulevard instead or removing one side of parking?	
		

Road Type	Cross Section in Davidson Ordinance	Alternative Cross Section/Images
High Density Street (Option B):	• Street section to be used in higher density residential and mixed-use areas. On-street parking is provided on both sides of the street. The front setback is generally larger in this scheme to include street trees behind the sidewalk. • There is no buffer between pedestrians and parked cars- perhaps add a grass strip between the curb and sidewalk on each side? • Where is street lighting included?	
		

Road Type	Cross Section in Davidson Ordinance	Alternative Cross Section/Images
Village Infill Street:	• Street type to be used in Village Infill planning area and mixed-use centers in traditional neighborhood developments. On-street parking is provided on one side of the street. • Add areas this applies to/ example streets. • Include signage/ pavement markings for parking on only one side of the street. • Bike boulevards or sharrows maybe an option in village infill where many destinations are within a short bike ride.	
		

Road Type	Cross Section in Davidson Ordinance	Alternative Cross Section/ Images
Town Center Street:	• Sidewalks are much wider to accommodate more pedestrians and permit activity to spill out to the sidewalk. On street parking enables convenient access to goods and services. Bike lanes should be added where shown on the Bicycle Master Plan. • Suggest crosswalks and bulbouts for safer pedestrian crossing. • Suggest use of Town Center Street for mixed-use or commercial streets particularly in close proximity to residential areas and containing restaurants with outdoor seating potential. • Consider raised beds for new trees- provide seating opportunities and deeper area for roots without buckling sidewalks. • Consider additional bicycling facilities to encourage bikers to get off their bike and walk through the town center or to use sharrows on the street instead of riding on sidewalks. • Consider reverse angled parking in town center areas (allows for drivers to pull out facing traffic instead of backing out into traffic).	
		

5.2 Summary of Recommendations

- Overall Recommendations
  - Include reasoning or goals behind the standards especially when they are health-related.
  - Add a glossary of terms and drawings whenever possible to make the standards clear and understandable for developers as well as committees and the interested public.
  - Be sure that the cross sections match up with the description of the road types.

- Specific Design Components
  - Bike Facilities
    - Add sharrows, painted pavement, bike boulevards, and protected bike lanes in addition to bike lane standards in place.
    - Refer to the most recent version of the Bike Plan instead of listing specific sections of road on schedule for improvement.
  - Pedestrian Facilities
    - Include standards and drawings of potential crosswalk designs that could be used including designs for historic areas, signage, different crosswalk types and potential areas where diagonal crosswalks may be used.
    - Consider requiring wider planting strips to allow for a greater diversity of trees to provide shade and serve as a buffer from traffic.
    - Include the width and materials of sidewalks most applicable to different land uses or areas such as in neighborhoods, historic areas, or the business/ mixed use centers.
  - Public Transportation Facilities
    - There is no mention of public transportation facilities within the existing ordinance.
    - Standards for bus shelters, crosswalk location next to bus stops, and inlets for a bus to pull over would reduce accidents and promote health.
    - Reference to pedestrian and bicycle facilities around transit stops (both bus and rail) would be good to include.
  - Intersection Design
    - Include potential intersection designs including roundabouts, lights, bulbouts and other traffic calming devices, signage, turning lanes, etc.
    - Consider the differences between the actual turning radi and the effective turning radi created by items such as bulbouts, on-street parking, and bicycle lanes.

- Educational and Recognition Programs
    - Mention of signage or public education with unusual traffic management measures to promote proper usage would be beneficial.
    - Consider including a Level of Quality or Level of Service rankings for bicycle and pedestrian facilities and recognizing developers for achievements beyond the required standards.

Section References

1. *Improving Health in the United States: The Role of Health Impact Assessments*. (2011). Washington, DC: National Research Council.

2. Town of Davidson, NC. *Davidson Planning Ordinance*. (2001). Retrieved from http://www.ci.davidson.nc.us/index.aspx?NID=598

6. Reporting

Reporting is how the process, findings, and recommendations of the HIA are shared with stakeholders and decision makers. Reporting can take many forms and should consider:

- the attention span and preferred means of communication of the audience receiving the report;
- the content of the report including a description of the proposed policy, plan, project, or program, the data sources and methodology used during the HIA, a description of the process, and the findings and recommendations of the HIA; and,
- making the report publically available.[1]

At the conclusion of the reporting stage, the HIA team should have:

- publically available forms of reporting such as presentations, policy briefs, executive summaries, and full reports;
- a plan for distributing the findings of the HIA;
- documentation of the HIA process; and,
- a record of the findings, proposed recommendations, and results of the HIA.[1]

6.1 Forms of Reporting Used

There were many forms of reporting used during this HIA. A newsletter describing healthy street design and announcing a public meeting and two Saturday events at the Davidson Farmers' Market was sent out through the Town's E-crier and distributed to key spots around town (See Appendix 6). Press releases explaining the project and asking for residents to provide feedback on what they do and don't like about Davidson's streets were picked up by the local papers (See Appendix 7). Presentations of the initial findings of the HIA were made to the Davidson Planning Ordinance Committee, Planning Board, and Livability Committee. Brief conversations were also held with the Davidson Committee on Aging and members of the public during the town meeting and Davidson Farmers' Market events. Information about the HIA was also posted on the DD4L website on a regular basis.

6.2 Meeting/ Presentation Schedule

A presentation updating the Davidson Board of Commissioners on the progress being made on this HIA and introducing the draft report and findings is scheduled in October of 2012. As the planning ordinance rewrite team is formed, another presentation of the findings of this report will be shared with that team. The draft report will also be made publically available on the DD4L website for comment.

Section References

1. *Improving Health in the United States: The Role of Health Impact Assessments*. (2011). Washington, DC: National Research Council.

7. Evaluation and Monitoring

The evaluation stage of the HIA consists of three types of evaluation; process, impact, and outcome evaluation. Monitoring is similar to evaluation but specifically involves the tracking of the adoption and implementation of recommendations suggested within the HIA as well as changes in the health indicators identified within the HIA. Evaluation and monitoring considers:

- process evaluation or how well the HIA was done and if there are ways that the process could be improved for future HIAs;
- impact evaluation or whether or not the HIA influenced or informed the decision making process for example were the recommendations accepted by the decision makers; and,
- outcome evaluation or if the implementation of the accepted recommendations has the intended health outcomes.[1]

At the end of the evaluation and monitoring stage, the HIA team should have:

- an evaluation of the HIA process and guidance on how to improve the process for the next HIA;
- an indication of what recommendations were accepted by the decision makers and whether or not the HIA had an impact on their decision; and,
- plans for future outcome evaluation and monitoring of changes in health indicators.[1]

7.1 Process Evaluation

Process evaluation will be completed once there is a decision made on Davidson's Planning Ordinance. See the Evaluation Plan as part of the Scoping Worksheet in Appendix 3.

7.2 Impact Evaluation

Impact evaluation will be completed once there is a decision made on Davidson's Planning Ordinance. See the Evaluation Plan as part of the Scoping Worksheet in Appendix 3.

7.3 Outcome Evaluation/ Monitoring Plan

Outcome evaluation will be completed once there is a decision made on Davidson's Planning Ordinance. See the Evaluation Plan as part of the Scoping Worksheet in Appendix 3.

Section References

1. *Improving Health in the United States: The Role of Health Impact Assessments*. (2011). Washington, DC: National Research Council.

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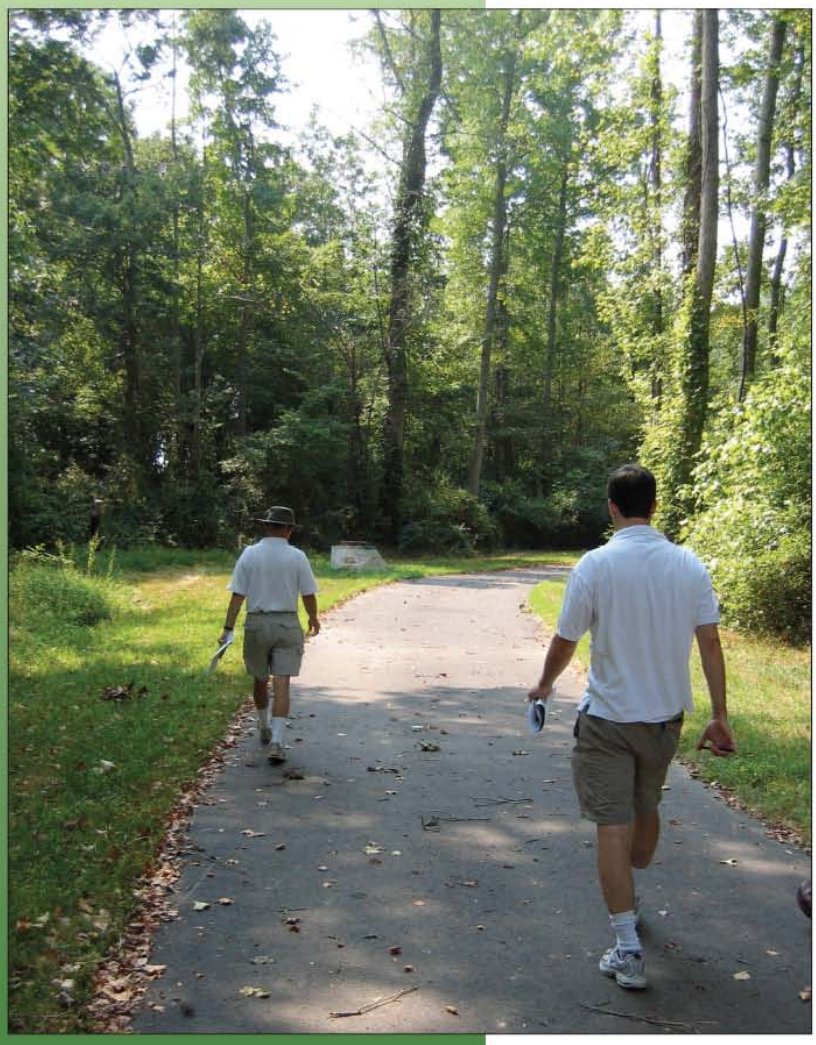
Appendix 1: Current Town of Davidson Street Design Standards



There is more to life than increasing speed.

-GANDHI

11 SECTION ELEVEN
STREETS AND GREENWAYS

11.0 Streets and Greenways

These regulations are intended to promote an environment built to human scale that accommodates pedestrians as the first priority. Streets are the primary public spaces of the town, so attractive street fronts, connecting walkways, and alternative means of transportation are encouraged while accommodating vehicular movement.

11.1 General Design Principles - Streets

The planning ordinance encourages the development of a network of interconnecting streets that work to disperse traffic while connecting and integrating neighborhoods with the existing fabric of the Town. Equally important, the ordinance encourages the development of a network of sidewalks and bicycle lanes that provide an attractive and safe mode of travel for cyclists and pedestrians. On-street parking is encouraged.

A. Streets shall interconnect within a development and with adjoining development. Streets within a new development shall connect to existing streets and rights-of-way. Street stubs shall be provided to the property line to provide for future development. Streets shall be planned with due regard to the designated circulation system shown on the Comprehensive Plan map and any other applicable approved plans.

B. Streets shall be designed as the main public space of the Town and shall be scaled to the pedestrian.

C. Streets shall be bordered by sidewalks on both sides except on alleys, lanes, parkways, and rural roads. The appropriate governing board may grant exceptions upon recommendation by the Planning Director if it is shown that local pedestrian traffic warrants their location on one side only.

D. Streets shall be designed with street trees planted in a manner appropriate to their function. Commercial streets shall have trees which complement the face of the buildings and which shade the sidewalk. Residential streets shall provide for an appropriate canopy, which shades both the street and sidewalk. Street trees should allow the free movement of emergency vehicles.

E. Wherever possible, streets should be designed to fit the contours of the land and should minimize removal of significant trees.

F. All streets, whether publicly or privately maintained, shall be constructed in accordance with the design and construction standards in this code and shall be maintained for public access whether by easement or by public dedication. Private streets are allowed when one entity will retain ownership of all properties that abut the street. Private streets, except those in low-impact subdivisions, farmhouse clusters, conservation easement subdivisions, or rural subdivisions, shall comply with the Charlotte-Mecklenburg Land Development Standards Manual. Closed, guarded, or gated streets are strictly prohibited.

G. All on-street parking provided shall be parallel. Perpendicular or angle parking is permitted only upon approval of the Planning Director.

H. The use of traffic calming devices such as raised intersections, lateral shifts, and roundabouts are encouraged as alternatives to conventional traffic control measures with approval of the Planning Director.

I. Roundabouts shown on the Comprehensive Plan map shall be required. At all other intersections requiring traffic calming, raised pavement or roundabouts shall generally be used.

Minor variations and exceptions to street cross-sections may be permitted with approval of the Planning Director. Such exceptions include variations to the pavement width, tree planting areas, street grade, sight distances, and centerline radii in accordance with principles above. Right-of-way widths should be preserved for continuity.

11.2 Street Engineering and Design Specifications

Street designs shall permit the comfortable use of the street by cars, bicyclists, and pedestrians. Pavement widths, design speeds, and the number of vehicle lanes should be minimized. The specific design of any given street must consider the building types which front on the street and the relationship of the street

to the Town's street network. New development shall generally front on existing publicly maintained streets, and shall be required to upgrade those streets to meet the standards of this Section. The following specifications shall apply to public infrastructure design:

11.2.1 Street Materials

Street and alley materials shall conform to the provisions of the Charlotte-Mecklenburg Land Development Standards Manual. Exceptions may be made for pedestrian crosswalks. Sidewalk material may vary according to the overall design and character of the development.

11.2.2 Street Signs and Traffic Control Signs

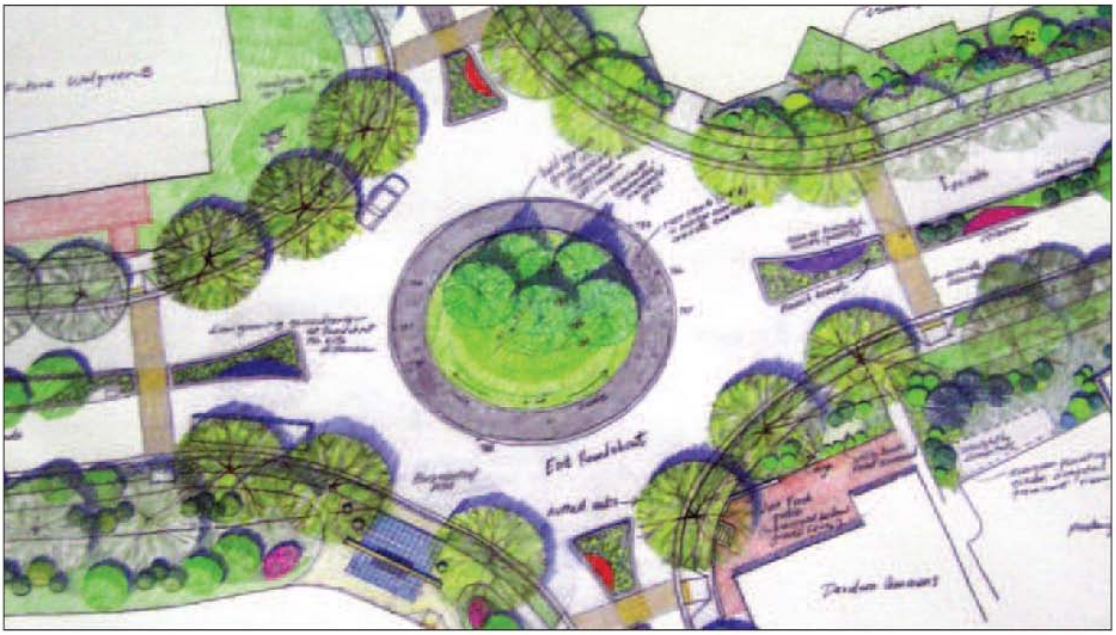
All street and traffic control signs posted in accordance with the Manual of Uniform Traffic Control Devices shall be installed by the developer prior to the issuance of any certificates of occupancy for any building on that street.

11.2.3 Future Street Connection Signage

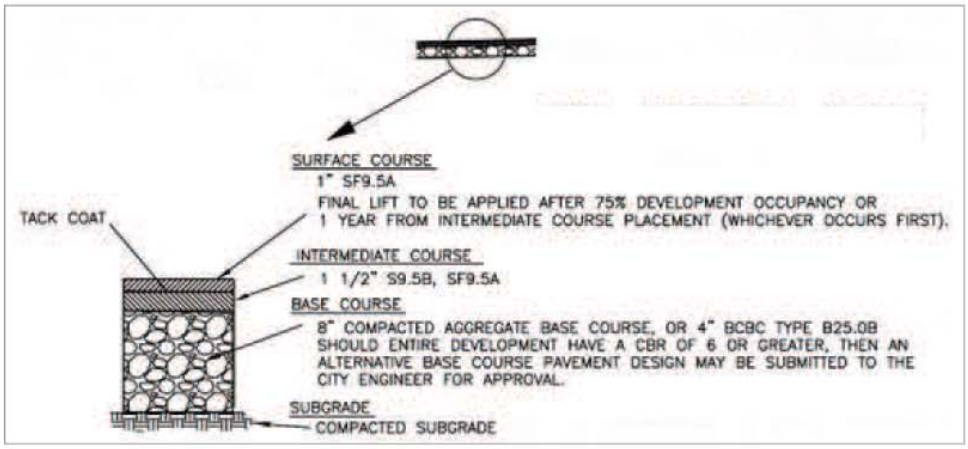
All dead-end streets and street stubs that have the potential to connect to adjacent property or with nearby streets must be signed with the following language: "This cul-de-sac is temporary. The street will be extended when the adjacent property develops."

11.2.4 Sidewalks

Sidewalks shall be constructed along both sides of all streets except alleys, and rural roads. Residential sidewalks shall be a minimum of 5 ft. in width. Sidewalks serving mixed use and commercial areas shall be a minimum of 8 ft. in width (12 – 15 feet is required in front of retail storefronts). All new sidewalks in the block bounded by Main Street, Depot Street, and Jackson Street shall be paved in brick pavers. All other sidewalks may be concrete, pavers, or similar material. Sidewalks should not be constructed without an adequate planting strip unless on-street parking protects pedestrians.



The rendering above shows a landscape plan for the roundabout located at the intersection of Griffith and Jetton. Roundabouts are utilized as a traffic calming device.



Above is a typical pavement section of a local residential street.

11.2.5 Bike Paths

All new development within the existing town limits fronting on North Main Street, Griffith Street, Beaty Street, Concord Road, Davidson-Concord Road, East Rocky River Road, or Grey Road shall include bike lanes, a minimum of four feet in width, on those streets. New developments outside the town limits fronting on North Main Street, Concord Road, Davidson-Concord Road, East Rocky River Road, or Grey Road, Barnhardt Road, or Mayes Road shall include bike paths a minimum of eight feet in width and separated from vehicular traffic on those streets. Bike lanes and bike paths shall be designed according to the North Carolina Bicycle Facilities Planning and Design Guidelines, published by NCDOT.

11.2.6 Cul-de-sacs

Cul-de-sacs may be permitted only where topographic conditions and/or exterior lot line configurations offer no practical alternatives for connection or through traffic. Cul-de-sacs, if permitted, shall not exceed 250 ft. in length from the nearest intersection with a street providing through access (not a cul-de-sac). A close is preferred over a cul-de-sac.

11.2.7 Blocks

Blocks shall not be less than 150 feet nor more than 600 feet in length except where topographic conditions and/or unique lot configurations offer no practical alternatives. Such blocks shall be approved by the Planning Board prior to final approval.

11.2.8 Intersections

A. All streets shall intersect as nearly as possible at right angles and no street shall intersect at less than 60 degrees.

B. Intersections shall be at least 150 feet apart measured from centerline to centerline (exception: lanes and alleys). Where a centerline offset occurs at an intersection, the distance between centerlines of the intersecting streets shall not be less than 60 ft..

C. Curb radii at street intersections shall be rounded with a minimum radius of 15 feet. At an angle of intersection of less than 90 degrees, a greater radius may be required. Curb radii shall be designed to reduce pedestrian crossing times along all streets. In general, curb radii should not exceed 25 ft.

D. Proper sight lines shall be maintained at all intersections of streets to permit adequate sight distance.

E. Street trees and on-street parking shall be held 20' from intersections to allow turning radius of emergency vehicles.

The roundabout at Jetton St. and Griffith St. permits a steady flow of traffic from Exit 30 to downtown Davidson.

F. Roundabouts are encouraged at intersections to allow a smooth and continuous flow of traffic.

11.2.9 Utility Location

Underground utilities shall be located in alleys and lanes. If no alley or lane is provided, then a 5-foot (minimum) utility easement shall be provided behind the sidewalk located within either the right-of-way or a public utility easement.

11.2.10 Curbs and Drainage

Curbs shall be constructed in accordance with Charlotte-Mecklenburg Land Development Standards Manual. Standard curbing is required along all streets with marked on-street parking and around all required landscaping areas and parking lots. Valley curb and gutter are not allowed. 2' curb and gutter is required at streets; 1'-6" curb and gutter is allowed at parking areas. Drainage shall be provided using closed curb and gutter systems along all streets except in rural areas and along parkways that may use open swales upon approval of the Planning Director. All storm drainage systems shall be designed in accordance with the Mecklenburg County Storm Drainage Design Manual. All drainage grates must be safe for bicyclists. Bicycle-safe drainage grates are Types E, F, and G approved by the North Carolina DOT.

11.2.11 Centerline Radius

A 90 ft. minimum radius and minimum 50' tangent shall be provided between reverse curves on all streets. Centerlines may be varied upon approval of the Planning Director.

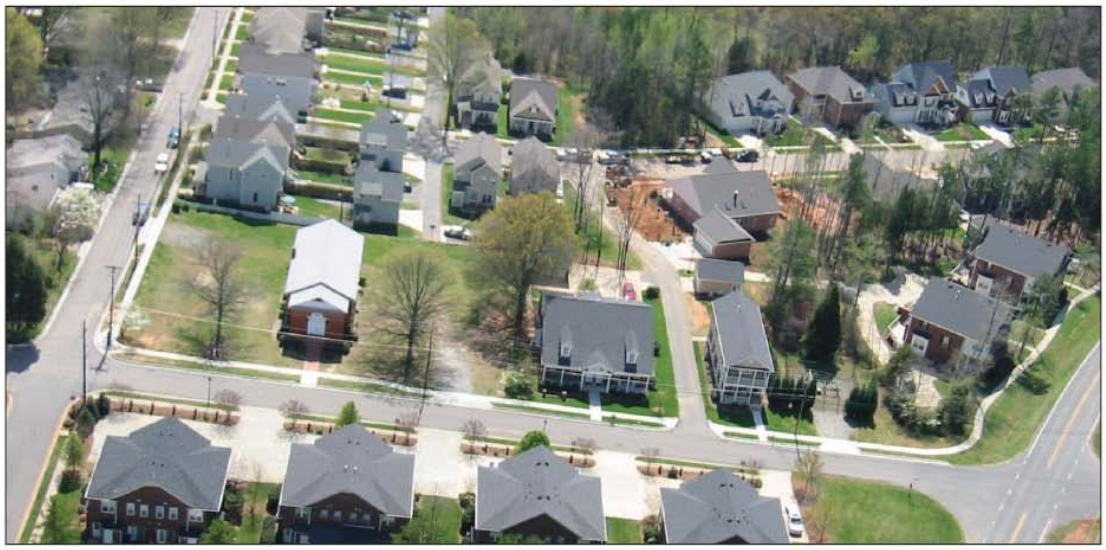
11.2.12 Pedestrian Crosswalks

Where deemed necessary by the Planning Director, a pedestrian crosswalk at least ten feet in width may be required to provide convenient public access to a public area such as a park, greenway, or school,

The photograph of June Washam Rd. shows a rural road that utilizes drainage swales instead of curb and gutter.

Streets become more pedestrian friendly by including crosswalks and a median refuge as shown above next to Davidson Day School on Griffith St.

SECTION ELEVEN
STREETS AND GREENWAYS



Often, areas in Davidson include a variety of street types, from neighborhood streets to parkways, multimodal arterials, and service alleys.

or to a water area such as a stream, river, or lake. Sidewalks and crosswalks must be ADA compliant.

11.2.13 Posted Speed Limits

All streets except alleys and state roads shall be posted with a 25 mile per hour speed limit.

11.2.14 Street Lighting

See Section 13 for street lighting standards.

11.3 Street Types

Rural Road: Designed to maintain the character of Davidson's rural areas. No curbs or gutters are required. Drainage swales shall be on one or both sides of road, with either a cross slope or center crown, respectively.

Alley: Residential alleys are low-speed (10 mph) public rights-of-way providing rear access to garages and residences. Garages and parking pads shall be held five feet from the edge of the right-of-way. Alleys are required where lot widths are 60 feet wide or less, unless topography is prohibitive. The radius at the street/alley connection must be navigable by garbage trucks and emergency vehicles.

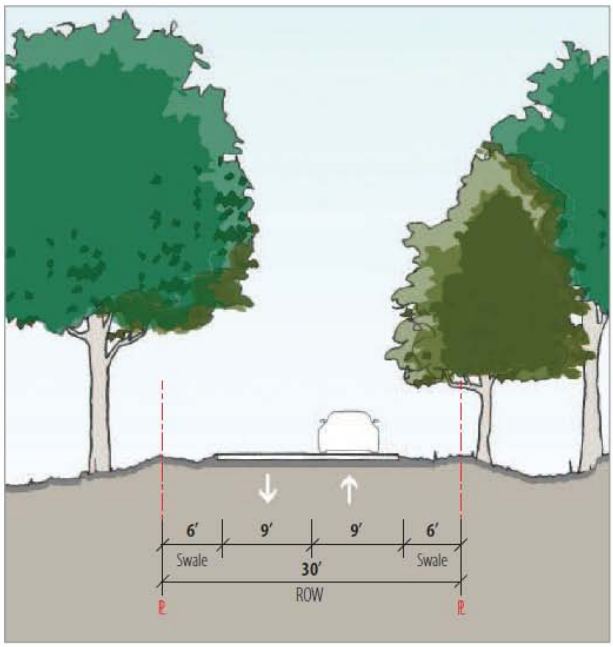
Lane: Lanes are pedestrian-oriented and residential in nature, functioning primarily to provide access within neighborhoods. A traffic speed of 15 mph is appropriate.

Parkway: Parkways are bounded on one side by structures and the other by a greenway, park, or open space. On-street parallel parking is on one side.

Neighborhood Street: Neighborhood streets are pedestrian-oriented and residential in character, functioning primarily to provide access to neighborhood destinations and to provide connections within neighborhoods. Low traffic speeds are appropriate. There is on-street parallel parking on one side of the street.

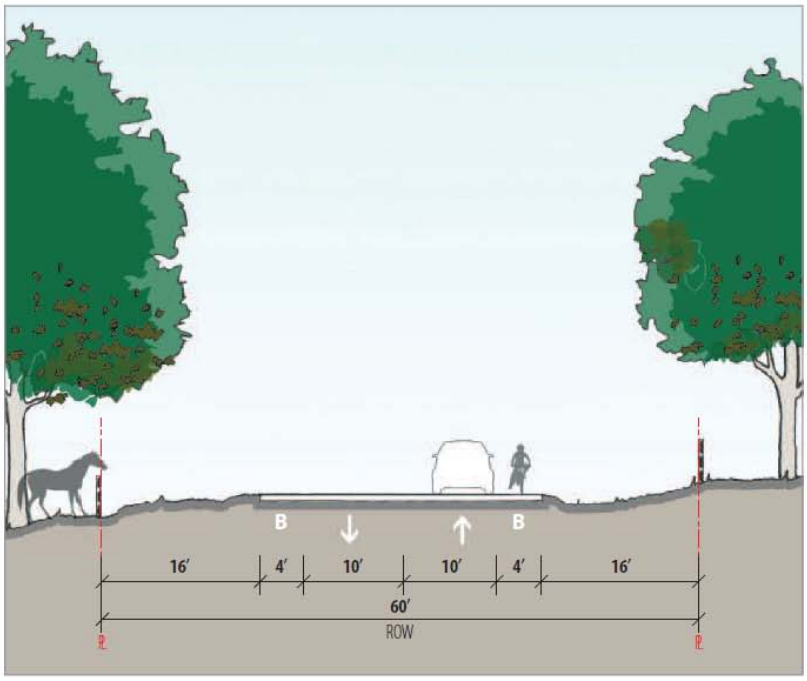
Town Street: Town streets are urban in character and provide low-speed, pedestrian-friendly access to neighborhoods as well as neighborhood commercial and mixed-use buildings. On-street parking is on both sides, and bike lanes are provided to accommodate bicyclists.

Commercial Street: Commercial streets connect neighborhoods to commercial centers and carry diverse traffic volumes. It is urban in character and generally operates at low to moderate speeds since these streetscapes function as vibrant pedestrian environments. On-street parking is on both sides.



Rural Road

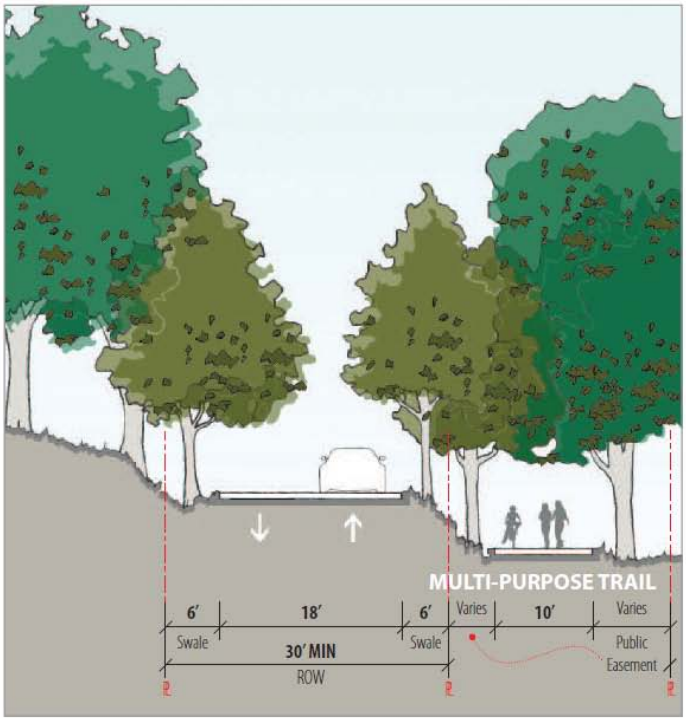
This street section is intended to be used in the Rural Planning Area where low density predominates.



Rural Road with Bike Lanes

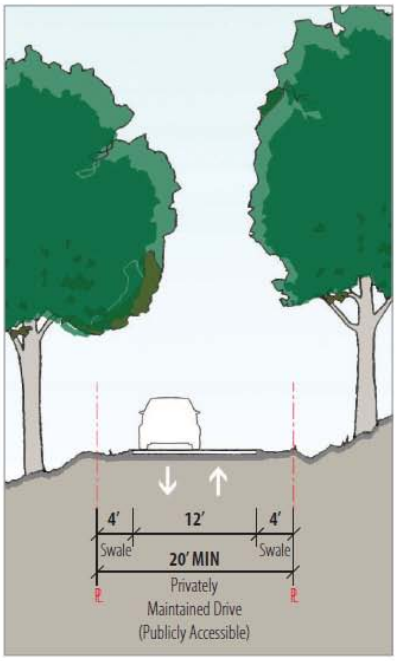
This rural road is shown with additional pavement on both sides for pedestrians and cyclists and is an option for the Rural Planning Area.

11 SECTION ELEVEN
STREETS AND GREENWAYS



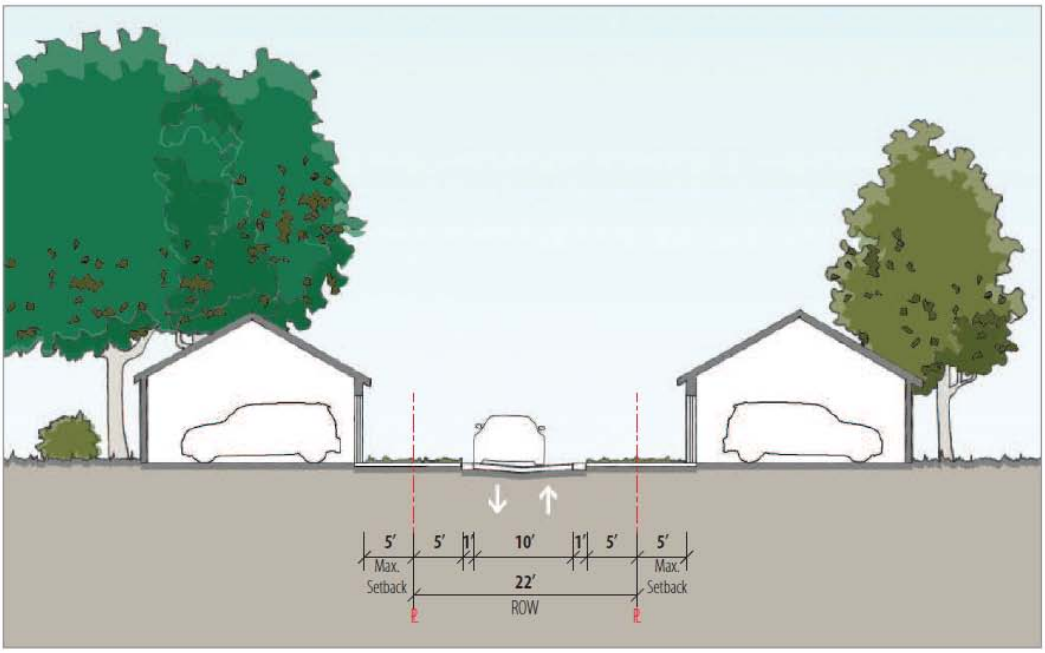
Rural Road with Side Path

This street section shows a narrow, low speed, low traffic road that connects neighborhoods with minimal environmental impact. A bicycle/ pedestrian path is separate from the roadway to preserve existing topography and vegetation.



Low Impact Subdivision Access Road

This road is privately maintained, but publicly accessible. The street section may be gravel or paved to provide access to low-impact and farmhouse cluster subdivisions.

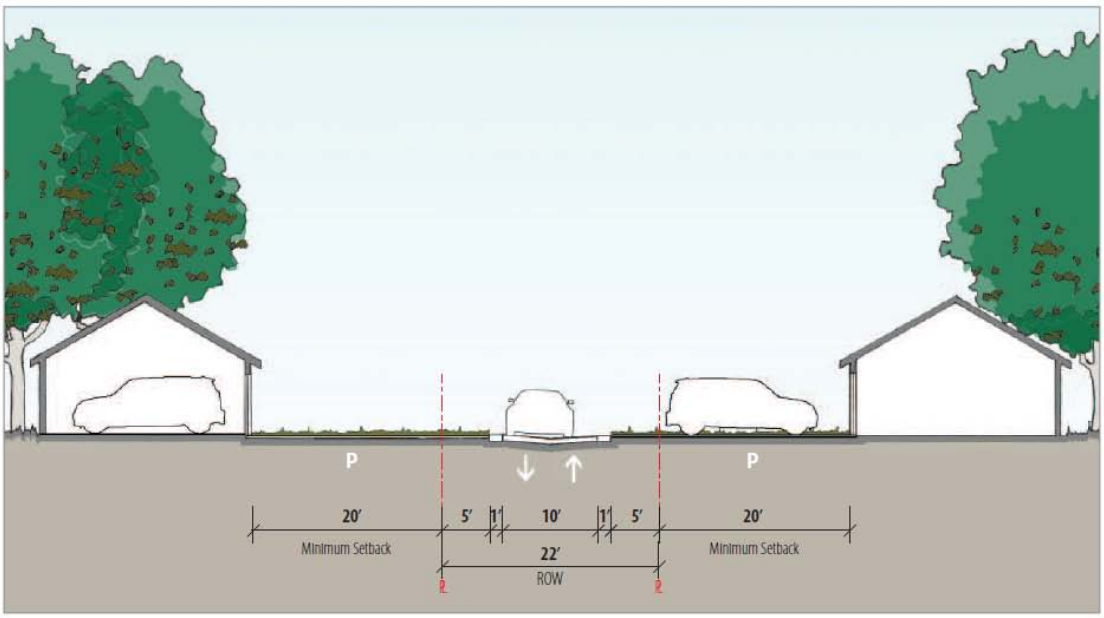


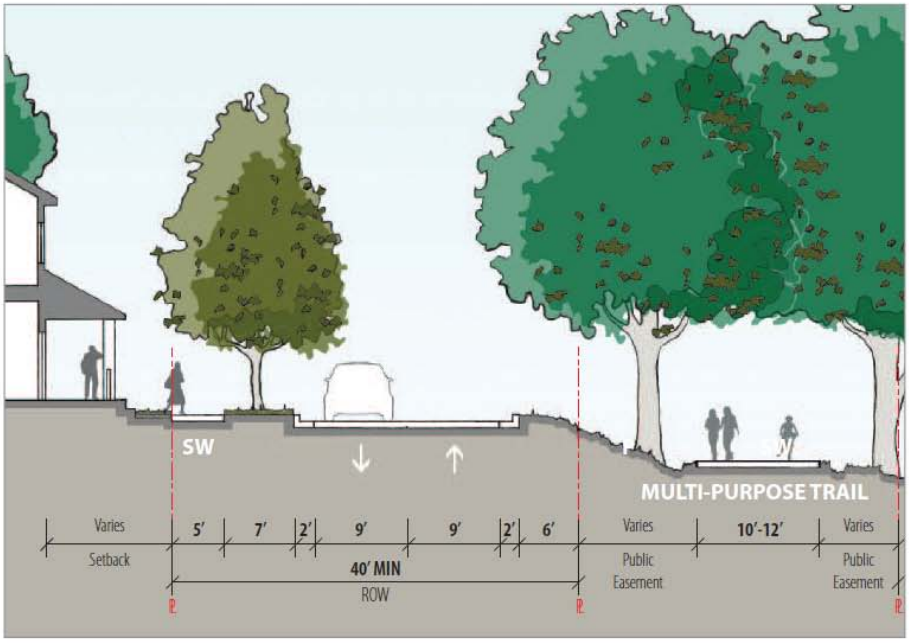
Above: Alley (Option A)

Parking is permitted only in rear accessed garages. In order to dedicate the frontage to the pedestrian instead of the automobile, an alley is required for parking behind residential lots less than 60' in width.

Below: Alley (Option B)

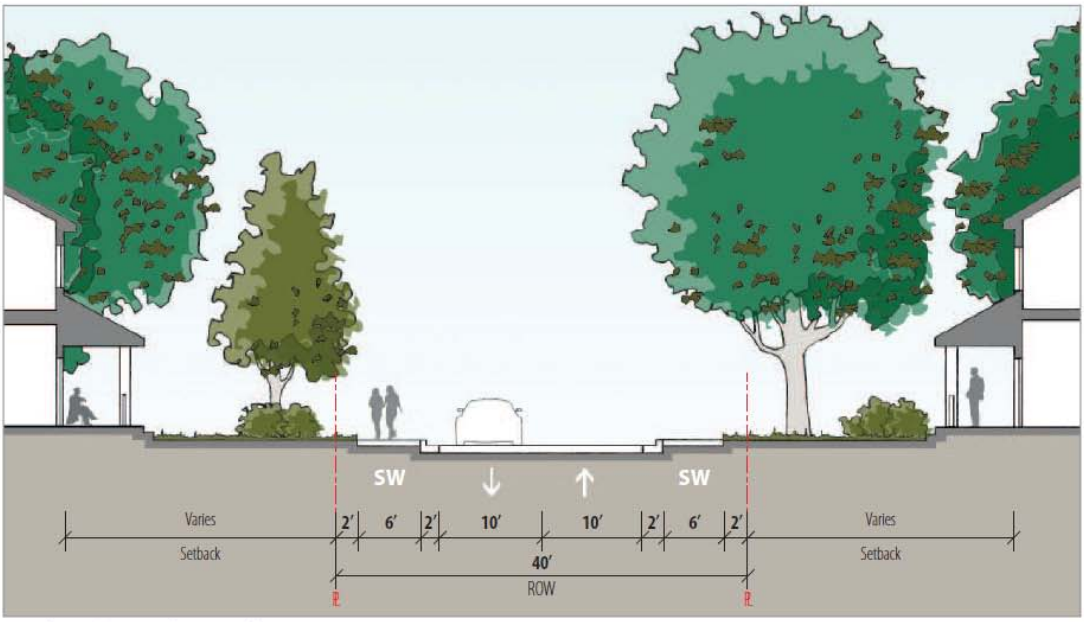
Parking is permitted in both the garage as well as on a drive-way pad large enough to accommodate a parked car.





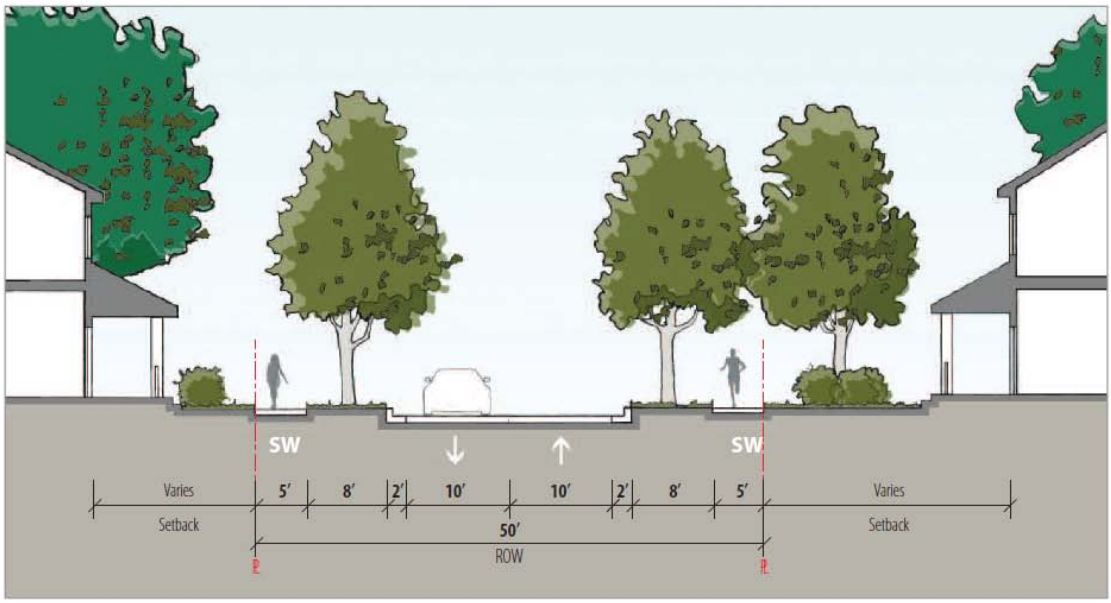
Parkway

This single-loaded street includes development located on one side only. The street section is primarily used along greenways and open spaces.



Residential Street (Option A)

This option contains houses with deeper front setbacks and sidewalks directly adjacent to a low speed, low traffic narrow streets that are no more than one to two blocks in length. Note the required street trees are planted in the setback.

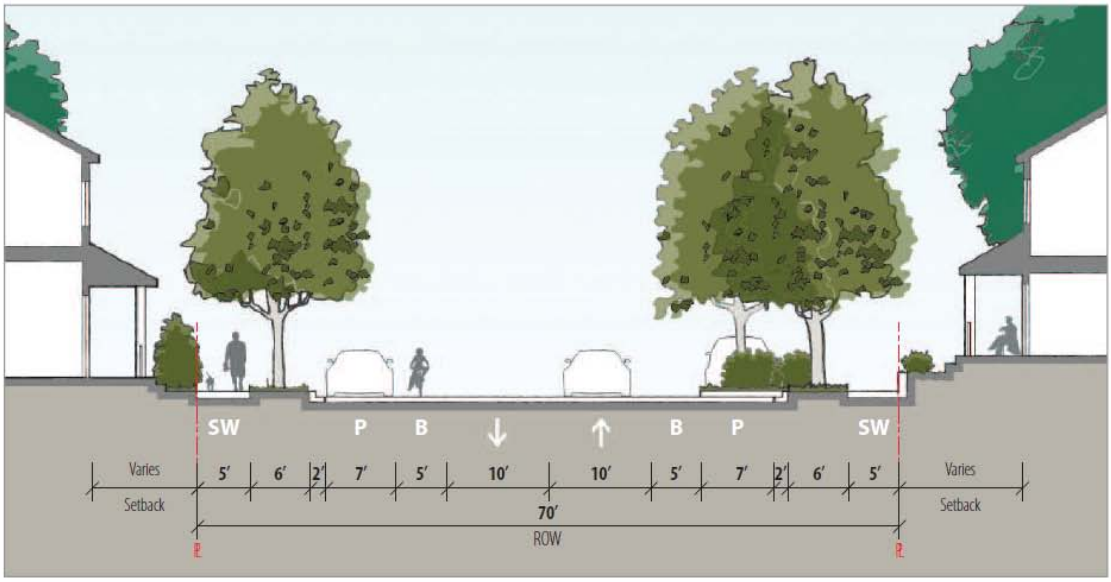


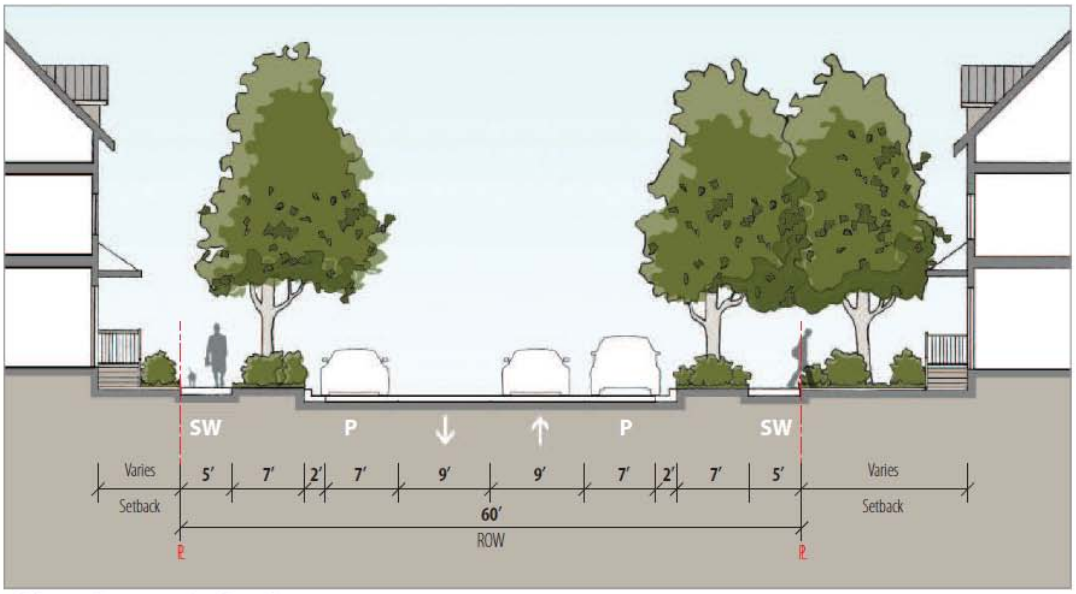
Above: Residential Street (Option B)

This option contains houses with shallow front setbacks. Instead of sidewalks directly next to the street, a large planting strip separates the pedestrian from the road.

Below: Residential Street (Option C)

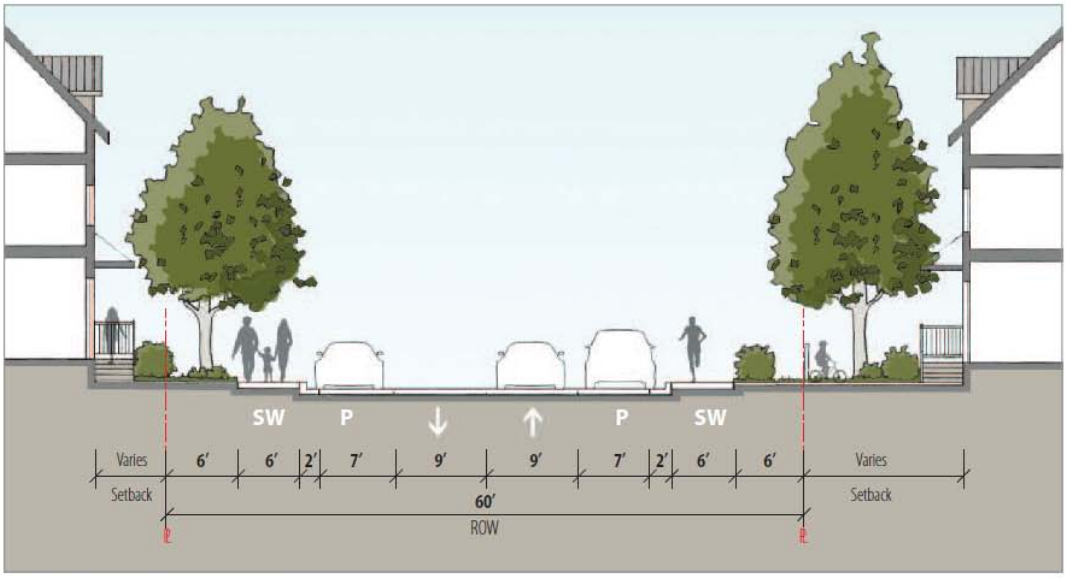
Street section to be used along main collector streets in residential areas. On-street parking and bike lanes are included on both sides of the street. Curb extensions (bulbouts) are encouraged at intersections for safe pedestrian crossings, traffic calming and can include additional landscaping.





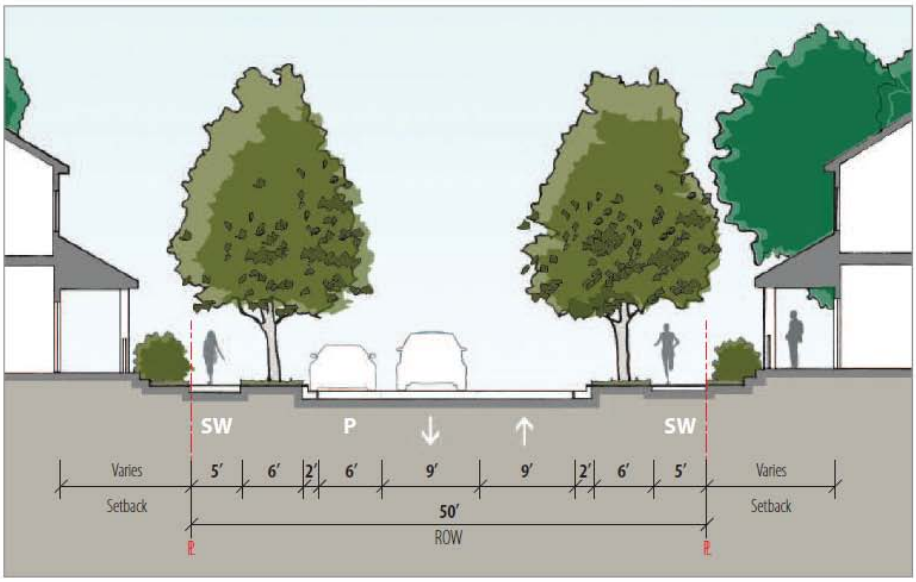
High Density Street (Option A)

Street section to be used in higher density residential and mixed-use areas. On-street parking is provided on both sides of the street and the sidewalk is separated from the street with a large planting strip. Bike lanes should be added where shown on the Bicycle Master Plan.



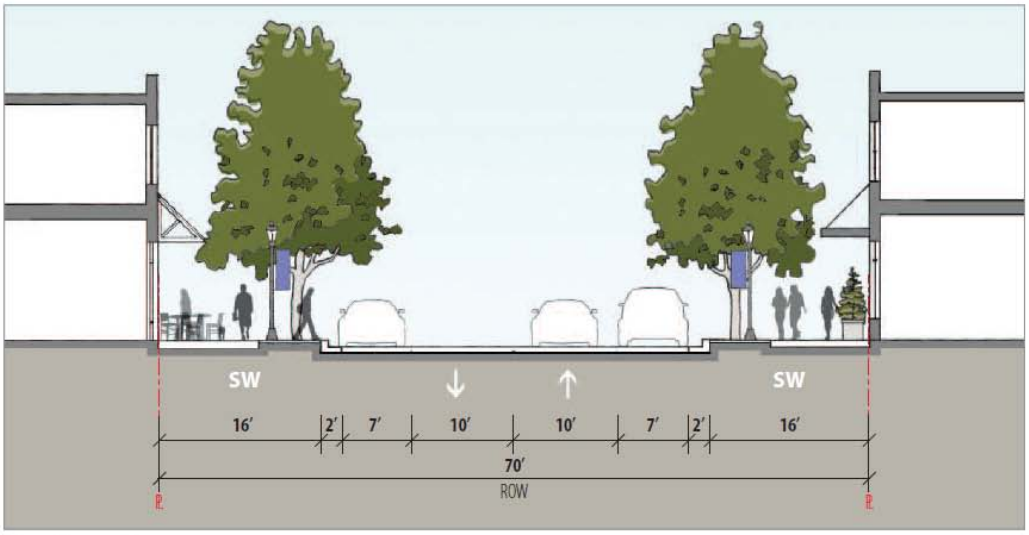
High Density Street (Option B)

Street section to be used in higher density residential and mixed-use areas. On-street parking is provided on both sides of the street. The front setback is generally larger in this scheme to include street trees behind the sidewalk.



Village Infill Street

Street type to be used in Village Infill planning area and mixed-use centers in traditional neighborhood developments. On-street parking is provided on one side of the street.



Town Center Street

Sidewalks are much wider to accommodate more pedestrians and permit activity to spill out to the sidewalk. On street parking enables convenient access to goods and services. Bike lanes should be added where shown on the Bicycle Master Plan.

Appendix 2: Screening Worksheet

HIA #1: Public Health and the Public Realm

How the Design of Residential Neighborhood Streetscapes Affects Public Health

HIA Coordinator: Town of Davidson, North Carolina
Katherine Hebert, DD4L Coordinator
khebert@ci.davidson.nc.us

Background:
Beginning in the early 1990s, communities across the United States were exploring "new urbanism" and "neo traditional development" as planning concepts for new neighborhoods. These concepts model residential design standards after the development patterns in America's historic urban neighborhoods (typically dating pre 1945). New urbanist residential design standards call for narrow streets, on-street parking, wide planting strips and sidewalks, and front setbacks placed much closer to the street than found in typical suburban neighborhoods. New urbanist, or neo-traditional, development also calls for modifications to the front façade of the home to be more sensitive to the public realm, including features such as front porches and garage entries set back behind the front of the living space.

In North Carolina, this development model was explored with great intensity in the three towns comprising the Northern Mecklenburg County region (Huntersville, Cornelius and Davidson) in the mid 1990s. The three towns revised their local development ordinances to require elements of new urbanist or neo-traditional design. From 1990-2010, the Northern Mecklenburg region added ____ new households, ____% located in neighborhoods that replicate the new urbanist model. Property values in these new urbanist and historic neighborhoods demonstrated the strongest retention and/or growth between the 2004 and 2011 Mecklenburg County property revaluation of all neighborhoods in Northern Mecklenburg County.

Since the initial practice and implementation of new urbanism, technical understanding of how streets are best designed to respond to adjacent land uses and multi-modal safety has been vastly improved. In particular, the emergence of the "complete streets" movement in transportation planning has driven the study of design of pedestrian and bicycle facilities as part of or separate from motor vehicle systems. These studies have revealed that not all streets are equal, but all streets should respond to the land use context. For example, a residential street may not include bike lanes, but the design speed of motor vehicle traffic and placement of sidewalks will be equally conducive to bicycle travel through neighborhoods. The complete streets movement has also spurred the "green streets" concept, directing attention also to the design of planting areas and health of urban forests.

The Davidson Planning Ordinance was adopted in 2001, following six years of planning and study by various stakeholders and citizen groups. The Davidson Planning Ordinance embraced new urbanism and complete streets, as best understood in the late 1990s. However, as technical knowledge of the design of residential streets has evolved, so should the Davidson Planning Ordinance where it addresses streets and off-road multi-modal transportation systems (i.e. greenways and trails).

In 2010, the Town of Davidson Board of Commissioners adopted a goal "to enhance the physical, mental and emotional well being of our residents." The Town of Davidson secured grant funding in 2011 from the Centers for Disease Control and Prevention (CDC)'s Healthy Community Design Initiative (HCDI) to conduct a series of Health Impact Assessments (HIA) in order to work toward this goal. The Town of Davidson will conduct a Health Impact Assessment on the design of the public realm in residential neighborhoods (the space between the front doors of homes across a public street) in order to address two key areas of concern:

Project Workheet 10/20/2011

1. Understanding that current technical expertise in transportation planning and green infrastructure may call for different street design standards as compared with those in the Davidson Planning Ordinance, the town will compare the health impacts of current **street design standards** with those recommended by national best practices and knowledge of innovative transportation planning practitioners. If warranted, the findings of this HIA will be used to draft new ordinance language and street cross sections to be presented to the Town of Davidson Board of Commissioners.

2. In 2011, the North Carolina Senate passed SB 731 entitled "Zoning/Design and Aesthetic Controls", which if passed by the NC House of Representatives will limit a local jurisdiction's ability to adopt and enforce local design controls in low-density residential areas (less than 5 housing units per acrea). Design controls or "building design elements" mentioned in the proposed bill include "exterior building color, type or style of exterior cladding material, style or materials of roof structures or porches, exterior nonstructural architectural ornamentation, location or architectural styling of windows and doors, including garage doors, the number and types of rooms, and interior layout of rooms." The HIA will compare the health impacts of maintaining locally adopted **design controls** in residential areas in Davidson, as specifically defined in the bill, with the likely health impacts of removing these controls. The two design elements of specific interest to this HIA will be porches and location of windows and doors. The HIA will also consider the likely impacts of increased urban sprawl due to weaker design restrictions in low density residential developments as compared to high density or mixed use developments.

Proposed Project Timeline:

October 2011	Town of Davidson staff contact stakeholders of interest and form Advisory Committee on HIAs Town of Davidson hires consultants for deliverables and presentations on street design standards and impacts of aesthetic controls
November 2011	Hold kick-off stakeholder committee meeting to create a scope of work for the HIA (including consultant presentation by Deb Ryan)
December 2011	Survey developed to collect neighborhood perceptions on aesthetic elements and street design. Town of Davidson staff interviews specific stakeholders to collect information on street designs and aesthetic controls
	Town of Davidson designs alternative policies (street standards) based on best practices, transportation plans, research and interviews, and audit of current policies
January 2012	Analyze surveys and interviews collected as part of the aesthetic controls HIA. Prepare draft policy brief for NC House on SB 731 Town of Davidson staff presents draft policy brief and street standards to stakeholder committee for review and comment
February 2012	Town of Davidson staff revises materials based on comments and begins writing

Project Workheet 10/20/2011

	draft of the full HIA report
March 2012	Town of Davidson staff presents policy brief to NC House committee reviewing SB731
	Town of Davidson staff holds public hearing for street design standards
April 2012	Town of Davidson Board of Commissioners consider adopting revised recommended street design standards
May 2012	Conduct evaluation of HIA process and outcomes.
June 2012	Finish draft of HIA report and send out for comments by advisory committee.

Potential Health Impacts:

- SB 731
  - Porches-
    - increase social interaction which improves social cohesion and mental health and well being
    - improved visibility from house which provides more "eyes on the street" and reduces crime
  - Garage on Side versus Front-
    - Improved pedestrian realm (less likely to block sidewalk and less auto-centric environment) which increases physical activity
    - Improved visibility from house which increases "eyes on the street" and reduces crime
    - Increased opportunities for children to play in driveway if driveway is longer to get to the side of the house which increases physical activity and social interactions
  - Increased Sprawl with Looser Aesthetic Controls in Low Density Areas
    - Increased traffic congestion and highway construction:
      - Increasing air pollution and respiratory disease and attacks
      - Increasing water pollution with more vehicle miles traveled reducing potable water sources and increasing environmental degradation
      - Increasing commute times and traffic speeds resulting in greater injuries to drivers
      - Increasing stress, road rage, and mental illness
      - Decreasing social cohesion
    - Decreased Pedestrian Realm Around Street
      - Fewer destinations within walking or biking distance resulting in lower amounts of physical activity
      - A less safe public/ pedestrian realm resulting in more injuries to bikers and walkers
    - Increased Impact on Vulnerable Populations
      - Greater impact on those who cannot afford a car
      - Greater impact on women who are typically the caregiver for children or older adults

- Street Standards
  - Increasing infrastructure for pedestrian realm resulting in increased pedestrian safety, fewer injuries, and increased physical activity
  - Increasing infrastructure for bicyclists resulting in increased biker safety, fewer injuries, and increased physical activity
  - Increasing the width of planting strips resulting in larger trees and more shade improving the pedestrian realm- concern over driver visability
  - Decreasing the width of carriage ways/ road width resulting in lower speeds, smaller crossing lengths for pedestrians, fewer accidents and less severe injuries.

Stakeholders:

- SB 731
  - NCAPA, NC-AIA, other opponents of SB 731
  - Sample of residents of neighborhoods approved post 2001 ordinance + 1 area in Village Infill
  - Local and regional homebuilders affiliated with post 2001 development projects
  - Real Estate Agents
  - Banks providing funding for homebuilders
- Street Design Standards
  - Davidson Planning Board
  - Davidson Design Review Board
  - Local and regional cycling and pedestrian advocates and experts (KT, Shireen Campbell, etc)
  - Davidson Livability Committee
  - North Carolina Urban Forestry Council
  - Davidson Public Works department
  - Public Safety Departments (fire, police, rescue)

Decision Makers:

- SB 731- NC House of Representatives
- Street Design Standards- Davidson Board of Commissioners
-

Deliverables:

- HIA report documenting the findings, recommendations, and outcomes of both SB 731 and the updated street design standards.
- SB 731 policy brief and testimony/ presentation.
- Documentary video (*Healthy Communities, Healthy People):* Interviews with residents, videography
  capturing the Town of Davidson's neighborhood streets and planning philosophy
- Davidson Planning Ordinance Section 11, Streets and Greenways, revisions including cross section graphics and text amendments.

Partners/Consultants:

- Nancy Fairley, Davidson College Film and Media Studies (assistance with the documentary)
- Deb Ryan, UNC Charlotte School of Architecture (assistance with the street design standards and audits of current street conditions)
- John Cock, Alta Planning and Design (assistance with the street design ordinance audit)

Project Budget:

Project Workheet 10/20/2011

Item	Cost
Stakeholder Committee (refreshments, reproduction of materials)	$250
Documentary	$5000
Street design cross section drawings (UNCC)	$2000
Audit of Section 11 ordinance (Alta)	$2000
Consultant fees (presentation, travel)	$1000
TOTAL	$10,250

Appendix 3: Scoping Worksheet

Health Impact Assessment (HIA) Scoping Worksheet

Title of the Proposed HIA: Davidson Street Design Ordinance

Members of the Scoping Team: DD4L Committee- Dawn Blobaum, Sandy Kragh, Ben McCrary, Katherine Hebert, Christina Shaul, Leslie Willis, Kathryn Spatz, Margo Williams

Key Details of the Proposal being Assessed	
Decision-Maker(s)	Town of Davidson Board of Commissioners
Expected Date of Decision	Late July
Summary of the Proposal	This HIA will examine Davidson's current street design standards through a public health lense to determine what the health impacts of the existing standards would be if implemented. Participants will research best management practices in street design that could enhance the town's existing standards to make them even healthier. Focus groups and interviews with key stakeholders will be conducted to inform the process. The goal of the HIA is to make informed recommendations to the Town Board of Commissioners in order to improve the current street design standards.
Geographic Boundary	Within the town limits and extraterritorial jurisdiction of the Town of Davidson.
Non-negotiable Aspects of Proposal	Streets must still be accessible to emergency vehicles and meet NC DOT standards.
Stakeholders	Committee on Aging, Livability Task Force, NC DOT, Public Safety Departments (Police/Fire), citizens of Davidson (vulnerable populations in particular- children, elderly, low income adults), Davidson College, Developers, Home Owner Associations
Key Gatekeepers	Planning Board, Planning Staff, Public Works

Key Details of the HIA/ HIA Process	
Members of the HIA Team	Kristie Foley's class, representatives of the Committee on Aging, Livability Task Force, and Public Works, Katherine Hebert, Ben McCrary, Leslie Willis, John Cock
Key Deadlines	May- Work Completed by Kristie's Students June- Work on HIA Early/Mid July- Complete HIA Late July- Decision on Ordinance August- Full Report Complete
Aims and Objectives of the HIA	• Goal: To make recommendations to improve the existing street ordinance to increase positive health impacts and mitigate negative health impacts. • Analyze existing ordinance and road way conditions

Health Impact Assessment (HIA) Scoping Worksheet

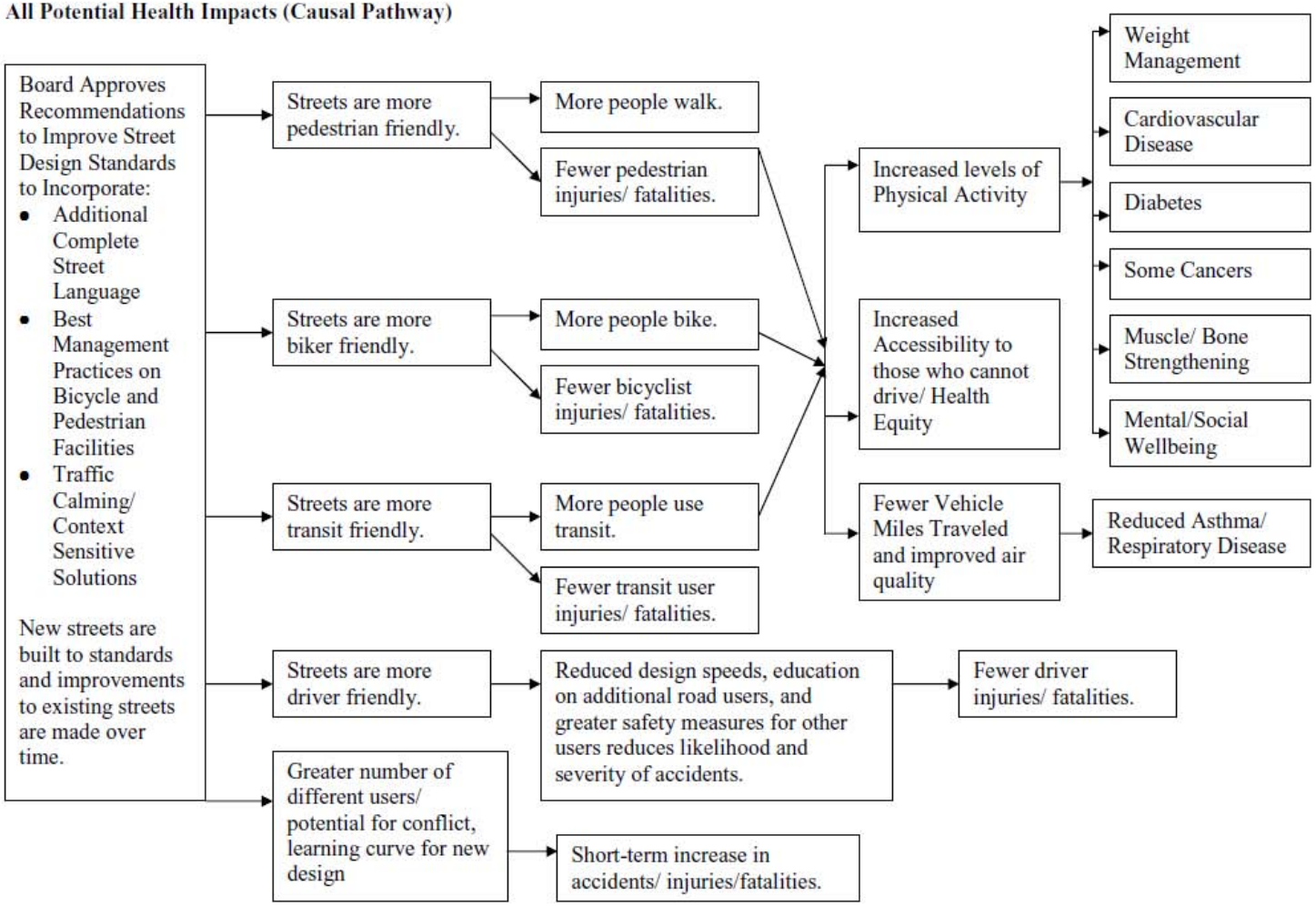
	as they relate to health. • Conduct research on best management practices in street design to promote alternative transportation options, reduce air pollution, reduce injury, promote the public realm, and create a sense of place.
Principles of HIA	• Democracy- the HIA is being done to inform elected decision makers and gather input from a range of stakeholders and agencies representing stakeholders. • Equity- considering the implications of the street design ordinance on residents of Davidson. Particularly of interest are those who are more susceptible to poor street design- elderly, children, the disabled, and low-income populations. • Sustainable Development- considering the needs of future residents of this region and the potential for decreasing pollution by improving the way our streets are designed and constructed. • Ethical Use of Evidence- the HIA will use the best available evidence and be as rigorous, inclusive, and transparent as possible. • Comprehensive Approach to Health- using the wider determinants of health to consider health implications of the proposed ordinance revisions.
Temporal Boundaries	Because ordinances are typically updated 10-15 years and the implementation of the ordinance in the form of road projects can take years to complete we will estimate the impact for the next 15 and 30 years.
Geographic Boundaries	Town of Davidson and Davidson ETJ primarily along public street-ways
Population Assessed	Citizens of Davidson particularly vulnerable populations- children, elderly, low- income populations
Scenarios Considered	• Make no changes to the ordinance. • Make minimal changes to the ordinance. • Make significant changes to the ordinance.
Forms of Community Engagement	Public meeting, interviews with key stakeholders, meetings with relevant committees, inclusion of the HIA on the DD4L website, Hot Topic Newsletter on Street Design, public board meeting to adopt new ordinances
Types of Assessment	• Literature review of best management practices. • Observational collections. • Neighborhood survey. • Collection of injury data • Bike/Ped Counts if possible
How will Recommendations	Recommendations will be suggested by participants in

Health Impact Assessment (HIA) Scoping Worksheet

be formed, prioritized, approved for inclusion?	the public meetings, Kristie Foley's students, online response from website. Recommendations will be prioritized by the HIA team/ planning staff and approved for inclusion by the planning staff and board of commissioners.
Forms of Reporting	• Full HIA Report • Executive Summary • Hot-Topic Newsletter • Presentation to Board • Presentation to Stakeholders
Timeframe of Evaluation	• Process Evaluation-ongoing and at the conclusion of the HIA • Impact Evaluation- after a decision on the ordinance is made • Outcome Evaluation- 2 years and 15 years out

Health Impact Assessment (HIA) Scoping Worksheet

All Potential Health Impacts (Causal Pathway)



Health Impact Assessment (HIA) Scoping Worksheet

Potential Health Impacts Not Considered in HIA

Potential Impact	Why Not Included	Approved by Team?
Short-term increase in accidents/ injuries/ fatalities	• Because it is short-term and difficult to estimate the length of time necessary to overcome learning curve. • Public education and involvement can help overcome this learning curve. • Design can help decrease potential conflict between users.	

Health Impact Assessment (HIA) Scoping Worksheet

Prioritized Potential Health Impacts with Details for Conducting the HIA

Potential Health Impact	Specific Population Affected (vulnerable group, geographic boundaries, etc.)	Sources of Data/ Literature/ Method	Information Source/ Stakeholders/ Focus Group
Increased Physical Activity	Davidson residents- Bikers, pedestrians, those walking to transit stops (half mile of stop)	• Mecklenburg Community Health Assessment • Davidson Neighborhood Survey • Dora C, Phillips M, editors. Transport, environment and health. World Health Organization. WHO Regional Publications, European Series, No. 89. 2000. http://www.euro.who.int/document/e72015.pdf [PDF - 1.24 MB]. • Partnership for Prevention (US). Transportation and Health: Policy Intervention for Safer, Healthier People and Communities. Washington, DC: Partnership for Prevention; 2011. Available at: http://www.convergencepartnership.org/site/c.fhLOK6P	Public meeting/ bicycle groups/ Livability Committee/ Committee on Aging/ transit users

Health Impact Assessment (HIA) Scoping Worksheet

		ELmF/b.4950415/ k.4FF7/Transportation_and_ Health_Toolkit.htm. Accessed on 21 July 2011. • Dora C, Phillips M, editors. Transport, environment and health. World Health Organization.	
Reduced Injury/ Fatality	Davidson residents and visitors- Bikers, pedestrians, drivers, passengers	• Davidson Accident Data • Dora C, Phillips M, editors. Transport, environment and health. World Health Organization. • Partnership for Prevention (US). Transportation and Health: Policy Intervention for Safer, Healthier People and Communities.	Public meeting/ bicycle groups/ Livability Committee/ Committee on Aging/ transit users
Reduced Asthma Attacks/ Respiratory Disease Rates	Those with asthma	• Partnership for Prevention (US). Transportation and Health: Policy Intervention for Safer, Healthier People and Communities. • Dora C, Phillips M, editors. Transport, environment and health. World Health Organization.	Air pollution experts- Cindy Hauser, Mecklenburg County Air Quality
Increased Accessibility to those who cannot drive	Youth, elderly, low-income populations, disabled	• Bell J, Cohen L, Malekafzali S. The transportation prescription:	Committee on Aging, Ada Jenkins, disability representatives? Youth representatives?

Health Impact Assessment (HIA) Scoping Worksheet

		bold new ideas for healthy equitable transportation reform in America. 2009. PolicyLink. http://www.convergencepartnership.org/site/c.fhLOK6PELmF/b.5327643/k.BF0B/Transportation_RX.htm.	
Overall Methodology		• Douglas M, Thomson H, Jepson R, Hurley F, Higgins M, Muirie J, Gorman D (eds). Health Impact Assessment of Transport Initiatives: A Guide. NHS Scotland Edinburgh, 2007. 110 pages. http://www.healthscotland.com/documents/2124.aspx.	John Cock/ Chris Danley/ Mark Fenton/ Arthur Wendel/ Andy Dannenberg

Health Impact Assessment (HIA) Scoping Worksheet

Timeline of Activities and Responsibilities

Activity	Deadline	Who is Responsible?	Who will Help/ Review?
Initial Analysis	Early June	Katherine Hebert	Ben McCrary/ John Cock
Hot Topic Newsletter	Early June	Katherine Hebert	Cristina Shaul
Public Meeting/ Meetings with Committees	Mid and Late June	Katherine Hebert	Cristina Shaul/ Ben McCrary
Meeting with Davidson Planning Board	Late June/ Early July	Ben McCrary	Katherine Hebert
Presentation for Davidson Board of Commissioners	Mid July/ Late July	Ben McCrary	Katherine Hebert/ Dawn Blobaum
Full HIA Report Completed	Late August	Katherine Hebert	DD4L Team

Health Impact Assessment (HIA) Scoping Worksheet

Communication/Reporting Plan

When Report?	Who Receives Report?	Who is Submitting the Report/ Leading the Conversation?	Type of Report	Main Message(s)
Mid June	Residents of Davidson	Katherine Hebert/ Cristina Shaul	Hot Topic Newsletter/ E-Crier	Importance of street design, request for participation in meetings
Mid to Late June	Residents of Davidson/ Select Committees	Katherine Hebert	Presentation/ Public Meeting	Connections between health and street design/ receive information from participants on challenge areas/ qualities of streets that they like
Late June	Davidson Planning Ordinance Committee	Katherine Hebert	Presentation/ Full Analysis	HIA Process, Findings, and Recommendations, Discuss Next Steps
Late June/ Early July	Davidson Planning Board	Ben McCrary	Presentation/ Selected Recommendations	Findings and Recommendations, Discuss Next Steps/ Suggestions from Board
Mid July/ Late July	Davidson Board of Commissioners	Ben McCrary	Presentation	Recommendations from Planning Board
August	CDC	Katherine Hebert	Full HIA Report	Entire HIA Process, Findings, Recommendations, Outcomes etc.

Health Impact Assessment (HIA) Scoping Worksheet

Evaluation Plan

Form of Evaluation	Method	Key Indicators	Timeframe	Person Responsible	Resources
Process	Interview or survey of members of DD4L team, HIA team, stakeholders, and decision-makers	What went well, What could be improved, Did the HIA affect your decision, What were the benefits of the overall process (increased understanding, partnerships, etc.)	Within a month of the decision being made	Katherine Hebert	Survey Monkey, phone calls
Impact	Interview with Decision Makers, Following the decisions made by the Board of Commissioners	Was additional information collected about pedestrian, biker, driver safety collected? Were recommendations accepted? Was a discussion had about health that would not have otherwise been held?	Within a month of the decision being made	Katherine Hebert	Attendance at Board Meetings, Resolution passed, Changes to the Ordinance
Outcome (not likely)	New streets/ repairs Accident Reports Air Quality Measurements Vehicle Miles Traveled Commuting Patterns Bike/ Ped Counts	Injury rates reduced? Air quality improved? Physical activity levels increased	2 and 15 years out	Katherine and others	Accident reports, annual traffic counts and health assessments

Appendix 4: Neighborhood Survey

Davidson: Design for Life
Town of Davidson
PO Box 579
Davidson, NC 28036

Please make sure the return address is visible through the window and return by **February 17, 2012**

What Do You Like About Your Neighborhood?

People choose to live in a neighborhood for many reasons and where you live can affect your well-being. As part of a grant that the Town of Davidson was awarded from the Centers for Disease Control and Prevention, the Davidson: Design for Life program is looking at the relationship between neighborhood design components and overall quality of life. This questionnaire will take about 10 minutes to complete and will inform an assessment of how Davidson's design standards have shaped the character and well being of Davidson. Please answer the following questions and return to the Town of Davidson in the enclosed envelope by **February 17, 2012**. Thank you!

1. When moving into your home, why did you choose that neighborhood? (please rank the following options 0-2 with 0= Did not consider, 1= Somewhat important, 2= Very important)

_____ Price of houses	_____ Size of houses
_____ Age of houses	_____ Design of houses
_____ Proximity to work	_____ Mixture of housing
_____ Quality of school district	_____ Diversity of neighbors
_____ Along CATS bus route	_____ Low crime rates
_____ Proximity to retail/ restaurants	_____ Recreation facilities
_____ Proximity to major thoroughfares	_____ Large yard
_____ Community gardens	_____ Sidewalks
_____ Presence of front porches	_____ Bike lanes
_____ Availability of parking	_____ Proximity to Downtown

_____ Other _____

2. Complete the following sentence: I know the names of _____ of my neighbors (defined as those living within a block of your house).
_____ None _____ 25% _____ Half _____ 75% _____ All

3. On average, how often do you talk with or greet a neighbor?
____Never ____Monthly ____ Every other week ____ 1- 3 times a week ____ Daily

4. Do you have a front porch? (do not include a stoop)
_____ Yes _____ No

5. If you have a front porch, how often do you interact with neighbors from your porch?
____Never ____Monthly ____ Every other week ____ 1- 3 times a week ____ Daily

6. Where is your garage door located?
_____ Don't have a garage
_____ In front of the house, closer to the road than the house's front door
_____ In front of the house, further from the road than the house's front door
_____ To the side of the house
_____ Behind the house

7. Did the location of your garage affect your choice of houses?
   _____ Yes _____ No _____ Don't have a garage

8. Do you walk or bike to the following locations? (check all that apply)
   _____ Your workplace
   _____ Your child's school
   _____ Your place of worship
   _____ Greenway/trail
   _____ Park or recreation center
   _____ Public transit
   _____ Grocery store/ food market
   _____ Downtown
   _____ Shops
   _____ Pharmacy

9. On average, how often do you walk or bike for transportation purposes?
   ____Never ____Monthly ____ Every other week ____ 1- 3 times a week ____ Daily

10. What are the barriers to walking or biking to the locations listed in question 8? (check all that apply)
   _____ Distance
   _____ Poor lighting
   _____ No one to walk/bike with
   _____ Physical disability
   _____ Lack of showering facilities/ bike racks/ lockers at destination
   _____ Other _____
   _____ Lack of sidewalk/ bike lane
   _____ Traffic on the road
   _____ Fear of crime
   _____ Increased travel time

11. On an average day, how much time do you spend commuting to work (one way)?
   _____ Less than 15 minutes
   _____ 15 minutes-30 minutes
   _____ 30 minutes- 1 hour
   _____ More than 1 hour

12. How do you typically get to work?
   _____ Personal Vehicle
   _____ Carpool
   _____ Transit
   _____ Bicycle
   _____ Walking
   _____ Other _____

13. Do you often feel stressed during your commute?
   _____ Yes _____ No

14. On average, how often do you walk or bike for recreational purposes?
   ____Never ____Monthly ____ Every other week ____ 1- 3 times a week ____ Daily

15. When you walk or bike, how often do you go with a friend, neighbor, or family member?
   _____ Never _____ Rarely _____Often _____ Always

16. How long have you lived in the Town of Davidson?
   ___ Less than 1 year ___ 1-5 Years ____5-10 Years ___ More than 10 Year

17. What is your neighborhood? _____

Thank you for your input!

Davidson Design for Life (DD4L) is an initiative of the Town of Davidson to foster healthy community design through the use of health impact assessments (HIA), public participation, and collaborative efforts in Davidson, the Charlotte-Mecklenburg region, and North Carolina.

The connection between how communities are built and public health is a relatively new concept to our region. The activities of DD4L will place Davidson at the forefront of using HIA to inform decisions and help the town grow in a healthy and sustainable manner.

For more information go to **www.townofdavidson.org/DD4L**

Appendix 5: Street Design Standards Survey

Street Design Standards Survey

1. What do you like about the streets in Davidson? (Please name specific roads or intersections whenever possible.)

2. What don't you like about the streets in Davidson? (Please name specific roads or intersections whenever possible.)

3. Do you feel safe walking along most roads in Davidson during the daytime?
   ___Yes ___No ___ Not Applicable

   Why or Why not?

4. Do you feel safe biking on most roads in Davidson during the daytime?
   ___Yes ___No ___ Not Applicable

   Why or Why not?

Appendix 6: Davidson's Hot Topic Newsletter on Healthy Street Design

HOT TOPIC: Healthy Street Design

News from the Town of Davidson, NC June 2012

What Is A Healthy Street?

A healthy street is one that takes into account the needs, health, and safety of all potential street users: pedestrians, bicyclists, transit riders, passengers and drivers. Healthy streets tend to have low traffic volume, slow street speeds, minimal noise, amenities for pedestrians and bicyclists, and short block sizes. When combined with other streets, greenways, and land use decisions, healthy streets encourage people to minimize the amount of time they spend in a vehicle and consider replacing short trips with active means of transportation such as walking or biking.

Common design elements found within a healthy street network include:

- Pedestrian amenities such as sidewalks, crosswalks, benches, trash cans, and water fountains;
- Bicycling amenities such as bike lanes, sharrows, bike parking, and share the road signs;
- Sheltered bus stops, bus shoulders, and signage;
- Shade trees, street lamps, and on-street parking;
- Narrow traffic lanes which keep design speeds between 10 and 25 mph;
- Short turning radii that require low speeds but are still wide enough for larger vehicles such as emergency vehicles or garbage trucks to turn;
- Connected streets and short blocks which allow shorter trips and multiple routes; and,
- Land uses along the street that complement the design of the street and encourage pedestrian access to the building. Commercial buildings should be located right on the sidewalk instead of separated from the street with a parking lot.

Healthy street design takes into consideration the needs of all potential street users including pedestrians, bicyclists, drivers, and transit riders.

Why Is Street Design Important?

Ever wonder why, as you walk around Davidson, you bump into someone you know? The design of our streets provides a comfortable opportunity for chance encounters with neighbors and other members of our community while walking around Main Street or the Circles at 30. When designed correctly, they encourage restaurants to provide outdoor dining, businesses to display their wares, and neighbors to sit on their porches, walk their dogs, or work in their yards.

The way a street is designed can influence the likelihood and severity of an accident. This is particularly important for pedestrians and bicyclists who tend to be more gravely injured during an accident than someone in a motor vehicle. The safety of pedestrian travel, in particular, should be of concern to everyone. After all, every trip begins and ends with walking, even if it is just across a parking lot or across the street.

Davidson's Street Design Standards

Davidson's street design standards guide the development of future streets within the town limits and its extraterritorial jurisdiction. These standards are part of the town's Planning Ordinance and can be found at **www.townofdavidson.org/planningordinance** — simply click on *Section 11: Streets and Greenways.* In 2013, there will be an update to the entire Planning Ordinance including the street design standards. Findings from a health impact assessment and comments from public meetings, such as the ones in July, will provide additional information to those scheduled to work on the ordinance update.

Health Impact Assessment On The Street Design Standards

In Spring of 2012, the Davidson Design for Life (DD4L) Committee started work on a health impact assessment (HIA) analyzing the existing street design standards in Davidson. An HIA is a process that uses multiple means of analysis and community involvement to provide decision-makers with recommendations to minimize the negative, and promote the positive, health impacts of a decision being made.

In this case, the potential health impacts considered include:

- safety and reduction of injury for all roadway users;
- increased levels of physical activity due to additional active transportation opportunities;
- reduced levels of air pollution and associated diseases such as asthma, other respiratory diseases, and heat stroke; and,
- increased mobility and accessibility to those who cannot drive.

DD4L intends to complete its assessment this Summer and present its findings to the Board of Commissioners later this year. For more information on the HIA process and projects, please go to **www.townofdavidson.org/DD4L .**

So, What *Is* DD4L?

In September of 2011, the Town of Davidson received a grant for over $116,000 each year renewable for up to 3 years from the **Centers for Disease Control and Prevention: Healthy Community Design Initiative** to conduct three health impact assessments (HIA) and to train others in conducting HIAs. This grant, which required no direct funding by the town, enabled Davidson to hire a DD4L Coordinator to conduct these HIAs, and promote healthy community design. The grant was highly competitive and ranked Davidson equal to public health departments in Oregon, Massachusetts, San Francisco, Baltimore, and Douglas County, Nebraska (Omaha).

Davidson Design for Life (DD4L) is an initiative the Town of Davidson created as a result of this grant to foster healthy community design through the use of health impact assessments (HIA), public participation, and collaborative efforts in Davidson, the Charlotte-Mecklenburg region, and North Carolina.

DD4L Mission: "To help Davidson be a community that is healthy today and even healthier tomorrow while serving as a model for other small towns by implementing healthy design."

DD4L Goals:

1. Develop a better understanding of the HIA process as it applies to small, rural towns and use HIA to evaluate and inform built-environment decisions by the Town of Davidson as well as regional and statewide decision-makers.
2. More fully and broadly engage our citizens in the decision-making process to make healthier lifestyle options available.
3. Collaborate with local, regional, and national partners to promote the use and understanding of HIA and healthy community design principals.
4. Document and share the steps we take, and the partnerships we form, in order to serve as a model for communities to follow nation-wide.

Katherine Hebert, *Davidson Design for Life Project Coordinator,* began working for the Town of Davidson in December, 2011 to coordinate health impact assessment (HIA) efforts in accordance with the grant received from the Centers for Disease Control and Prevention (CDC) in September, 2011. Prior to coming to Davidson, Katherine completed a fellowship with the CDC, providing technical assistance and training on HIA. Katherine has a Master's degree in City and Regional Planning from the University of North Carolina at Chapel Hill and a Bachelor of Arts in Interdisciplinary Studies: Environmental Policy and Planning from Appalachian State University.

Additional Information

1. Shape Your World: Creating Healthier Built Environments for a Better NC **www.shapeyourworldnc.com**
2. Active Living by Design **www.activelivingbydesign.org**
3. Pedestrian and Bicycle Information Center **www.pedbikeinfo.org**
4. NC Department of Transportation Project Development and Design **www.ncdot.gov/bikeped/projectdevelopment**
5. National Association of City Transportation Officials **www.nacto.org**
6. Walkable Communities, Inc. **www.walkable.org**

Public Meeting Announcement

The Town of Davidson will be hosting a series of public meetings and events to provide additional information on healthy street design and to gather feedback on what residents like about the streets in Davidson and potential hotspots to focus future design efforts. For additional information on healthy street design or the public meetings please contact **Katherine Hebert,** Davidson Design for Life Coordinator, at **(704)940-9620** or **khebert@townofdavidson.org.**

- **July 7 & 21**- Booth at Davidson Farmer's Market *(8:00 AM-Noon)*
- **July 25**- Meeting at Town Hall *(6:00-8:00 PM)*

Davidson Elected Officials

Mayor
John Woods
Commissioners
Jim Fuller
Rodney Graham
Brian Jenest
Laurie Venzon
Connie Wessner

Appendix 7: Press Coverage of Public Meeting/ Project

Davidson survey asks: What makes a healthy street?

Posted By David Boraks On June 28, 2012 @ 6:05 pm In health,health business news
Re-posted on July 5, 2012| Comments Disabled

The Town of Davidson is in the midst of a study looking at how street design affects public health. The coordinator of the Davidson Design for Life program will be at Davidson Farmer's Market on July 7 and 21 to talk with residents about the health study, and to hand out information on street safety and healthy street design.

Katherine Hebert, the town's DD4L Project Coordinator, wants ot talk with residents and answer questions about the "health impact assessment" being conducted on Davidson's street design standards.

A health impact assessment is a tool leaders and policy makers can use to gauge the potential effects of planning decisions on public health, in the same way traffic or environmental impact studies help decision makers. Davidson officials say the HIA will help inform town officials as they rewrite Davidson's Planning Ordinance next year.

A public information session about the Davidson Design for Life program is scheduled on Wednesday, July 25, from 6-8 p.m. at Town Hall. Officials will discuss the health impact study's findings and seek additional public comments.

"We want residents' thoughts on our existing street network, so that we can identify model streets to emulate as the town revises its street design standards next year," Ms. Hebert said in a press release.

Davidson was one of six governments nationwide selected last year to receive grants under the federal Centers for Disease Control and Prevention's Healthy Community Design Initiative. Davidson was the smallest locality in the group, which included San Francisco; Baltimore; Douglas County, Nebraska; Oregon, and Massachusetts.

Friday, Jun. 29, 2012

Weigh in on Davidson streets

Town plans to revise street design standards

By Joe Marusak

Share your thoughts this month on which streets you think are the best designed in Davidson from a health and safety standpoint.

"We want residents' thoughts on our existing street network, so that we can identify model streets to emulate as the town revises its street design standards next year," said Katherine Hebert, coordinator of the town-sponsored Davidson Design for Life initiative.

Davidson Design for Life will have a booth at the Davidson Farmer's Market on July 7 and July 21 to distribute information on street safety and healthy street design.

Hebert will be there to receive comments from the public and answer questions regarding a health impact assessment being conducted on Davidson's street design standards. The town will consider the input as it rewrites its planning ordinance in 2013, she said.

Davidson Design for Life will hold a public information session from 6 to 8 p.m. July 25 at the town hall, 216 S. Main St., to discuss the findings of the health impact assessment and gather more input from residents.

Davidson Design for Life aims to foster healthy community design. The initiative is funded through a grant from the federal Centers for Disease Control and Prevention. Other grant recipients included local and state health departments in San Francisco, Baltimore and the states of Nebraska, Oregon and Massachusetts.

Have your say: Town plans meetings on street design, station area

Posted By Christina Ritchie Rogers On July 25, 2012 @ 3:48 pm In Town Hall | No Comments

[1]In its continued efforts to assess the "health" of the Davidson community, the town plans a public meeting Wednesday, July 25, from 6-8 p.m. at Town Hall to gather feedback from residents on what they like / don't like about street designs in town. The study is being conducted as part of a Healthy Community Design Initiative grant from the Centers for Disease Control and Prevention. Meanwhile, the Planning Board meets next week to discuss station area plans, and the Town Board hosts its next community chat Tuesday. Read below for details.

HEALTHY STREETS JULY 25

Wednesday, July 25 from 6:00 to 8:00 p.m. in the town hall board room: The town will host a public meeting to provide additional information on healthy street design and to gather feedback on what residents like about the streets in Davidson and potential "hotspots" to focus future design efforts. If you are unable to attend this meeting, but want to give input, fill out this short survey: http://www.surveymonkey.com/s/XS35WWX [2].
For additional information on healthy street design or the public meeting, contact Katherine Hebert, Davidson Design for Life Coordinator, at 704-940-9620 or khebert@townofdavidson.org [3].

Appendix 8: Walking and Wheeling Safety Tips Brochure

Walking and Wheeling Safety Tips

Wear A Helmet

Protect your noggin! Adjust helmets for a level, snug fit:

1. Eyes - should see helmet edge when looking up.
2. Ears - straps should form a "Y" just under ears
3. Mouth - straps loose enough for a finger between buckle and jaw, but tight enough that the helmet pulls down on top of head when opening mouth wide.

Testimonial From A Davidson Citizen After A Near-Miss With A Runner:

"I made the turn shaken. What if I had hit that man, I thought. How his life would have changed, how my life would have changed. Could either of us have survived it– him physically, me emotionally? That moment rattled me. Undid me. That man is someone's whole world, I thought, and I could have taken him out of it just because I didn't notice him. So now I look both ways twice when I need to turn in my town. I look for the cars on the roads first and then the runners, bikes, strollers on the sidewalk the second time because I never want to be so busy, so in a hurry, so in my own head, that I am not able to see and make way for the humanity all around me."

The Town of Davidson

College Town, Lake Town, Your Town

We're Social – Are You?

Connect With Us Via Your Smartphone.

Help Keep Davidson A Safe Place To Walk And Roll!

It is everyone's responsibility to keep Davidson a place where it is safe to walk and wheel. Whether you are driving, riding, cycling, skateboarding, scooting, or walking, it is important to know the rules of the road and follow recommended safety tips to protect your own health and the safety of others.

Did You Know?

- There were 15 accidents resulting in injury involving pedestrians or cyclists in Davidson from January 2009 to April 2012, including a pedestrian fatality.
- Children under the age of 16 are required by North Carolina law to wear a helmet while bicycling.
- 74% of Charlotte-Mecklenburg middle school students reported rarely or never wearing a helmet.
- In North Carolina, a pedestrian is either killed or seriously injured daily, and a bicyclist is killed or injured approximately every 12 hours. One out of every three bicyclists killed is under the age of 16.
- Each year, approximately 800 children are hospitalized for bicycle-related injuries and 13,300 individuals receive emergency treatment for bicycle-related injuries.

Motorists Should:

- Obey all speed limits, signs, and signals. Speed plays a major role in the likelihood and severity of injuries during an accident, so please drive slowly and be alert.
- Avoid distractions while driving, such as talking or texting on the phone, changing the radio station, or eating.
- Stop for pedestrians crossing the street.
- Not park in bike lanes, on sidewalks, or block crosswalks.
- Be watchful for pedestrians while pulling into and out of parking spaces, and also be mindful walking to and from the vehicle.
- Pass bicyclists by leaving at least 3 feet of space, and not tailgate, shout, or honk at cyclists to avoid startling them and causing a crash.

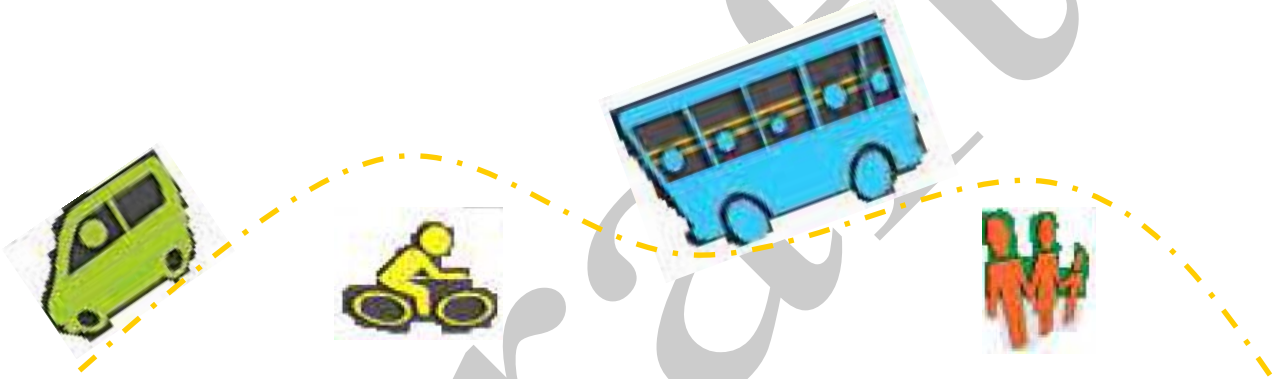
Pedestrians Should:

- Look both ways when crossing a street or driveway, and cross at a crosswalk or street intersection whenever possible.
- Wear light-colored clothing and reflective gear when walking at night or in the early morning.
- Walk on sidewalks, whenever possible, or face traffic on the far shoulder, if a sidewalk is not available.
- Be alert – re-think the use of cell phones and headphones.
- Be courteous – keep dogs on a leash and clean up after them.

Bicyclists And Other Wheelers Should:

- Always wear a helmet and reflective clothing while biking, skateboarding, rollerblading, or scooting.
- Ride on the road with the flow of traffic and obey all traffic signs and signals. If riding on the sidewalk, go slowly, yield to pedestrians, and go with the flow of traffic to prevent being hit at intersections.

- Use the appropriate hand signals when stopping, slowing, or turning.
- Avoid riding after dark. If riding at night, wear reflective clothing and use a headlight and taillight or reflector.
- When in a straightaway, keep to the far right of the travel lane as much as possible.
- Practice looking behind, while not swerving, to check positioning and also whenever entering the flow of traffic.
- Be alert and aware of surroundings – rethink the use of cell phones and headphones.
- Not carry large parcels or another person on the bike without the proper equipment, such as trailers, tandem attachments or baskets.
- Ride defensively and protect their own safety.



Davidson Design for Life

The Town of Davidson

College Town. Lake Town. *Your Town.*

www.townofdavidson.org/DD4L