LINCOLN MPO
2040 LONG RANGE TRANSPORTATION PLAN

BICYCLE AND PEDESTRIAN CAPITAL PLAN

LINCOLN MPO
METROPOLITAN PLANNING ORGANIZATION

Final Report
May 2013

City of Lincoln Bicycle and Pedestrian Capital Plan

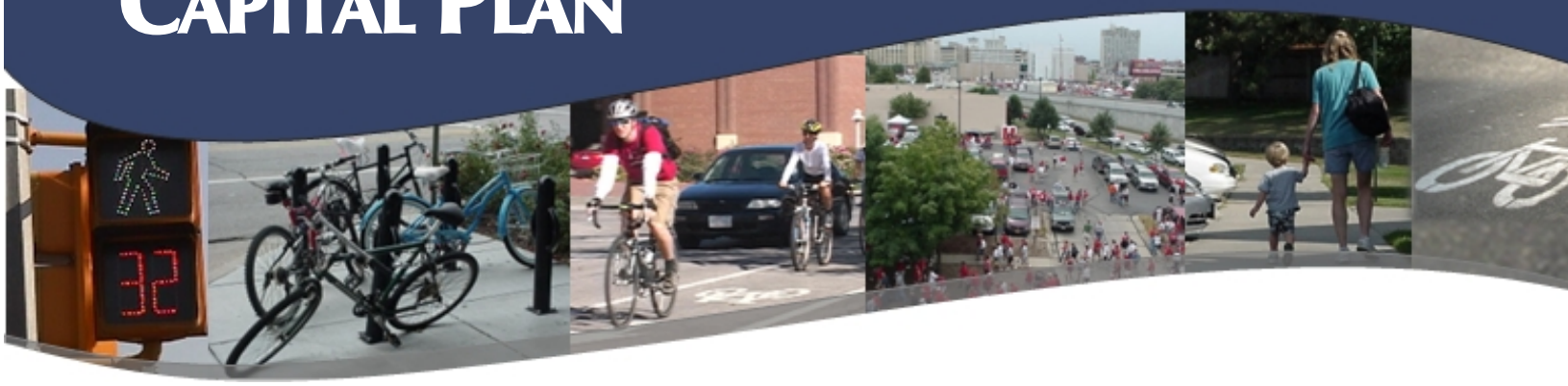


Table of Contents

Required Credit / Disclaimer Statement

"The preparation of this report has been financed in part through grants from the Federal Highway Administration and Federal Transit Administration, U.S. Department of Transportation, under the Metropolitan Planning Program, Section 104(f) of Title 23, U.S. Code. The contents of this report do not necessarily reflect the official views or policy of the U.S. Department of Transportation."

1 INTRODUCTION

The City of Lincoln and Lancaster County completed the update to the City's 2040 Comprehensive Plan and Long Range Transportation Plan in December 2011. These plans recognize that mobility plays a large role in the standard of living for residents in the community, and a well-balanced, well-maintained transportation system is critical for sustaining Lincoln's high quality of life. A well-balanced transportation system includes choice of travel, including walking and bicycling, in addition to automobile and transit.

Included in the implementation section of the Comprehensive Plan and Long Range Transportation Plan is the task to prepare a Bicycle and Pedestrian Plan that analyzes the existing bicycle and pedestrian system, examines the existing and future growth within the City and throughout the County to identify bicycle and pedestrian destinations, incorporates public input for a preferred plan, and provides implementation strategies for prioritizing projects and implementing a successful plan. It is intended that this document will be accepted as a support document to the Long Range Transportation Plan. This Bicycle and Pedestrian Capital Plan is a response to this task, rounding out the community vision for a well-balanced transportation system and establishing priorities in recognition of budget limitations.

In this Chapter

Why We Are Doing a Bicycle and Pedestrian Capital Plan?

Why "think biking and walking"? Nationally, there is a growing sentiment among the public, elected officials, and transportation professionals to improve provisions for biking and walking as a viable choice for transportation, for health/fitness benefits, for air quality benefits, and for recreational opportunities. Preparing a Bicycle and Pedestrian Capital Plan was also a strategic implementation objective of the City and County's recently completed Comprehensive Plan and Long Range Transportation Plan. There are a number of reasons to bike and walk. A few of them are:

Quality of Life

Quality of life is a hard concept to define clearly. However, it is something that most individuals seek either consciously or in a less-direct fashion. It does include the idea of an outdoor environment that provides bicycle and pedestrian facilities that are attractive and safe for people to pursue short trip travel, healthy living, exercise goals, and recreational activities.

The 2040 Comprehensive Plan and Long Range Transportation Plan public involvement process found that providing transportation choices are important to the community's quality of life. This includes pedestrian connections to transit, the development of a comprehensive bicycle network, and continued development of our street system to include bicycle facilities and detached sidewalks.

Providing Choice for those that Cannot Drive

Providing a bicycle and pedestrian system is an important alternative to driving an automobile. Like all cities, the City of Lincoln has a population of those that are unable to drive, whether from a disability, the inability to afford a car, age, or not wanting to drive.

Furthermore, children rely on walking, bicycling, and being chauffeured to get around. Children are also at risk as bicyclists or pedestrians for a number of physical and maturity factors:

- Young children believe if they can see a driver, a driver can see them;
- They think cars can stop instantly;
- They can't tell where sounds are coming from;
- Few can judge how fast traffic is moving;
- Their field of vision is one-third that of an adult; and
- They don't recognize danger or react to it quickly enough.

The elderly are more likely to walk for trip purposes. Older adults tend to be over represented in traffic crashes and require a safe bicycle and pedestrian network.

Latent Demand

National surveys consistently find that over 20% of respondents would consider bicycling or walking to work, shopping, and other local activities if adequate facilities were available.

Benefits to the Individual and Family

Two major reasons why individuals choose to walk or bike are for psychological and physical health. Individuals and families can also save their financial resources through a reduction in motor vehicle use, as well as reduced chauffeuring time.

Ideal Topography and Geography

The City of Lincoln is fortunate to have an ideal topography to walk and bike. The city is flat, making it easy to walk and bike from place to place. The City also has a density that provides for many places to walk or bike to.

Economic Vitality

One area that is often overlooked when considering the benefits of a strong bicycle and pedestrian system is the community's economic vitality. Research has found that the cities which have the highest ratings in economic vitality are those that keep and retain the 25 to 55-year old white collar creative workforce. It is this population group that buys goods and services, creates new job opportunities and keeps the economy vital. Although there are many factors for considering where to live, one of the major criteria cited through national surveys is if the community has a good recreational trail and bicycle system and is walkable.

Environmental Benefits

As cities have matured from the post war period into the new millennium, there has been a growing concerted effort to grow in a manner that minimizes impacts to the environment through minimized land absorption and minimized vehicle miles of travel. Such effort impacts air quality and fuel consumption and improves a community's walking and biking environment. The development of a comprehensive bicycle and pedestrian network is critical to achieving these environmental objectives, which is consistent with the 2040 Comprehensive Plan and Long Range Transportation Plan.

Purpose

The Lincoln/Lancaster County 2040 Comprehensive Plan and Long Range Transportation Plan are the planning documents that guide the community on the orderly and planned implementation of the City's multimodal transportation system.

One of the 2040 Plan's goals is to plan a safe, efficient, continuous, coordinated and convenient multi-modal transportation system that serves the needs of the community now and in the future. A multi-modal transportation system needs to incorporate bicycles and pedestrians into the planning and implementation of transportation improvement projects.

The purpose of the Bicycle and Pedestrian Capital Plan is to identify strategies and activities to develop a comprehensive bicycle and pedestrian network, to increase the use, safety, and convenience of bicycling and walking within and around the City of Lincoln and Lancaster County and to promote bicycling and walking as integral components of the region's multi-modal transportation system.

Plan Goals

The 2040 Comprehensive Plan and Long Range Transportation Plan contain extensive vision statements, goals and policies regarding bicycle and pedestrian mobility. These statements address a wide range of important elements within the City and County including community design, transportation, parks and recreation, education and community health. A complete list of all of the bicycle and pedestrian related vision statements, goals and objectives can be found in the 2040 Plan.

In review of these statements, and with input from the public, the Mayor's Pedestrian and Bicycle Advisory Committee and the Metropolitan Planning Organization's Technical Committee, the following Bicycle and Pedestrian Capital Plan Goals were developed as follows:

- Provide and maintain a safe and effective bicycle and pedestrian system that allows individual citizens of all ages and abilities to be able to efficiently choose to bike or walk to a variety of destinations throughout the City as a means of travel, attaining health, and quality of life.
- Fill in the missing bicycle and pedestrian segments and provide for safe intersection crossings that connects residences and places of work, shopping, schools, transit, activity centers and public activities, so that people can reach destinations by walking or bicycling in addition to relying on personal vehicles.

What questions will the Bicycle and Pedestrian Needs Plan answer?

- How complete is the current bicycle and pedestrian system?
- Where do bicyclists and pedestrians want to go?
- What are the recommended bicycle and pedestrian improvements for the City of Lincoln?
- How do we prioritize the limited number of dollars available?
- How do we maximize the implementation of the bicycle and pedestrian improvements through other capital programs including construction of new roads and trails?
- What are the recommended changes to current codes, ordinances, standards, and policies?

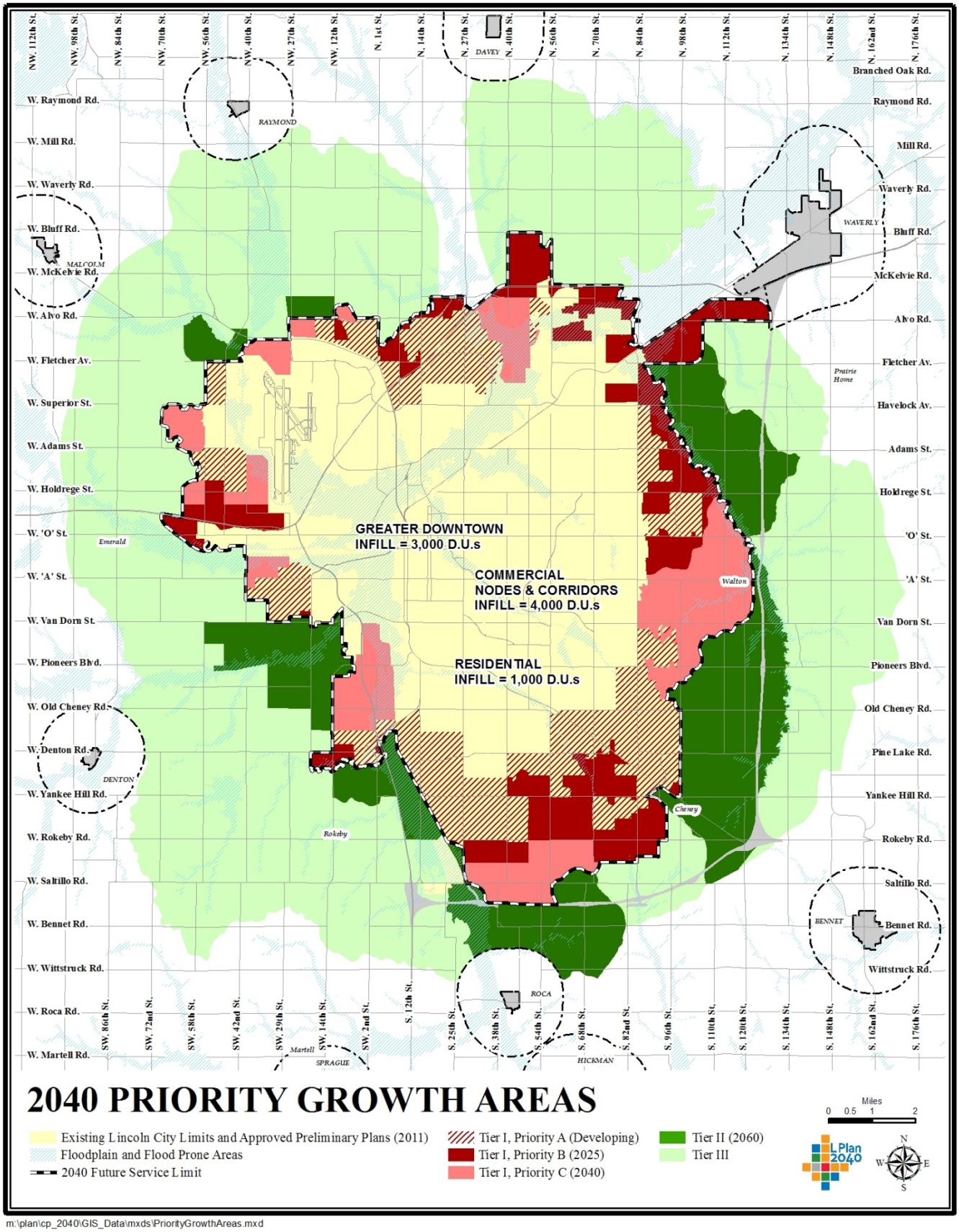
- Design and develop a "complete streets" bicycle and pedestrian system that adheres to local, state and national codes.
- Develop a sustainable and reliable implementation strategy through roadway improvements, trails implementation, and

bicycle and pedestrian funding. Provide accountability through annual bicycle and pedestrian performance reporting to determine what bicycle and pedestrian enhancements result in the greatest benefit for bicycle and pedestrian travel.

Plan Area

The primary plan area is comprised of the City of Lincoln and the adjacent developing area within Lancaster County. The planning area includes areas of the City which are already built and will need improvements to complete missing gaps and barriers, and future development areas where the bicycle and pedestrian network will be completed with new streets when demand warrants.

FIGURE 1-1: CITY OF LINCOLN AND SURROUNDING GROWTH AREAS



Plan Overview

The City of Lincoln's Bicycle and Pedestrian Capital Plan provides a comprehensive approach to identifying bicycle and pedestrian needs, reviewing improvements, and prioritizing implementation strategies and viable funding sources. The Plan looks for opportunities to connect and integrate existing facilities. Precise alignments may be determined during the implementation process.

The planning effort was divided into four (4) phases:

- **Phase 1: Assessment of Existing Conditions and Capital Needs Assessment:** This effort included mapping the existing bicycle and pedestrian system to understand where facilities are provided and where missing segments occur. This process also examined primary bicycle and pedestrian destinations and identified where missing segments in the system are located and limit access to those destinations.
- **Phase 2: Guidelines for Plan Development:** This phase identified the types of things to consider when developing a bicycle and pedestrian system including level of service techniques, network design and spacing, and other best practices for plan considerations.
- **Phase 3: Plan Development:** In this phase, the Bicycle and Pedestrian Capital Plan was developed based on the existing conditions capital needs assessment, network guidelines, and future demand.
- **Phase 4: Prioritization and Implementation.** The development of a comprehensive bicycle and pedestrian network will take time. This phase of the work identified prioritization guidelines and implementation strategies to achieve the Comprehensive Bicycle and Pedestrian Capital Plan.

Public Involvement

Public input was instrumental to the development of the Bicycle and Pedestrian Capital Plan. At its core are the findings of the 2040 Comprehensive Plan and Long Range Transportation Plan. Over the course of many months preparing the 2040 Comprehensive Plan and LRTP, public meetings were held throughout the community soliciting public input on how to grow. Transportation was a major topic throughout the process and the desire to have a more robust bicycle and pedestrian network was a high priority. The public's input and ideas became the framework for the 2040 Plan's development, and for the further refinement of projects and costs in the Bicycle and Pedestrian Capital Plan.

In developing the Bicycle and Pedestrian Capital Plan, the Mayor's Pedestrian and Bicycle Advisory Committee played a major role. This Committee provided key guidance for months regarding critical bicycle and pedestrian improvements. In addition, many of the Committee's members participated in an all day Saturday charrette work shop mapping bicycle and pedestrian improvements needed in the community.

A public meeting was held to present the Bicycle and Pedestrian Capital Plan and gather additional input. This meeting provided the opportunity to comment on all aspects of the Plan. These comments were reviewed and used to further refine the Plan.

Plan Organization

The Lincoln and Lancaster County Bicycle and Pedestrian Capital Plan is divided into four (4) chapters and support appendices. The following provides a list of the chapters and their general contents:

1. **Introduction:** This chapter provides the background, purpose, and need for the Plan.

2. **Existing Conditions and Capital Needs Assessment:** This chapter presents the existing bicycle and sidewalk system within the City of Lincoln and in growth areas of the County.

3. **Bicycle and Pedestrian Capital Plan:** This chapter begins with evaluation tools and some basic best practices to be considered when developing a bicycle and pedestrian plan. This chapter also presents a map of destinations to be connected via a pedestrian and bicycle system. The financially unconstrained Bicycle and Pedestrian Capital Plan presents the compilation of all proposed bicycle and pedestrian improvements

within the City. Because this Plan does not include a dedicated source of funding, it represents a vision for the community out to the year 2040. Planning level cost estimates were also developed for the Plan.

4. **Implementation:** This chapter presents various strategies including roadway and trails capital improvements to implement the Plan. Because funding is limited, this chapter presents a conceptual prioritization process for selecting and implementing preferred plan elements. This chapter also presents implementation strategies and performance measures to evaluate plan implementation.

2 Existing Conditions

Chapter 2 of the Bicycle and Pedestrian Capital Plan consists of an inventory of existing bicycle and pedestrian facilities and a review of their missing segments.

Bicycle

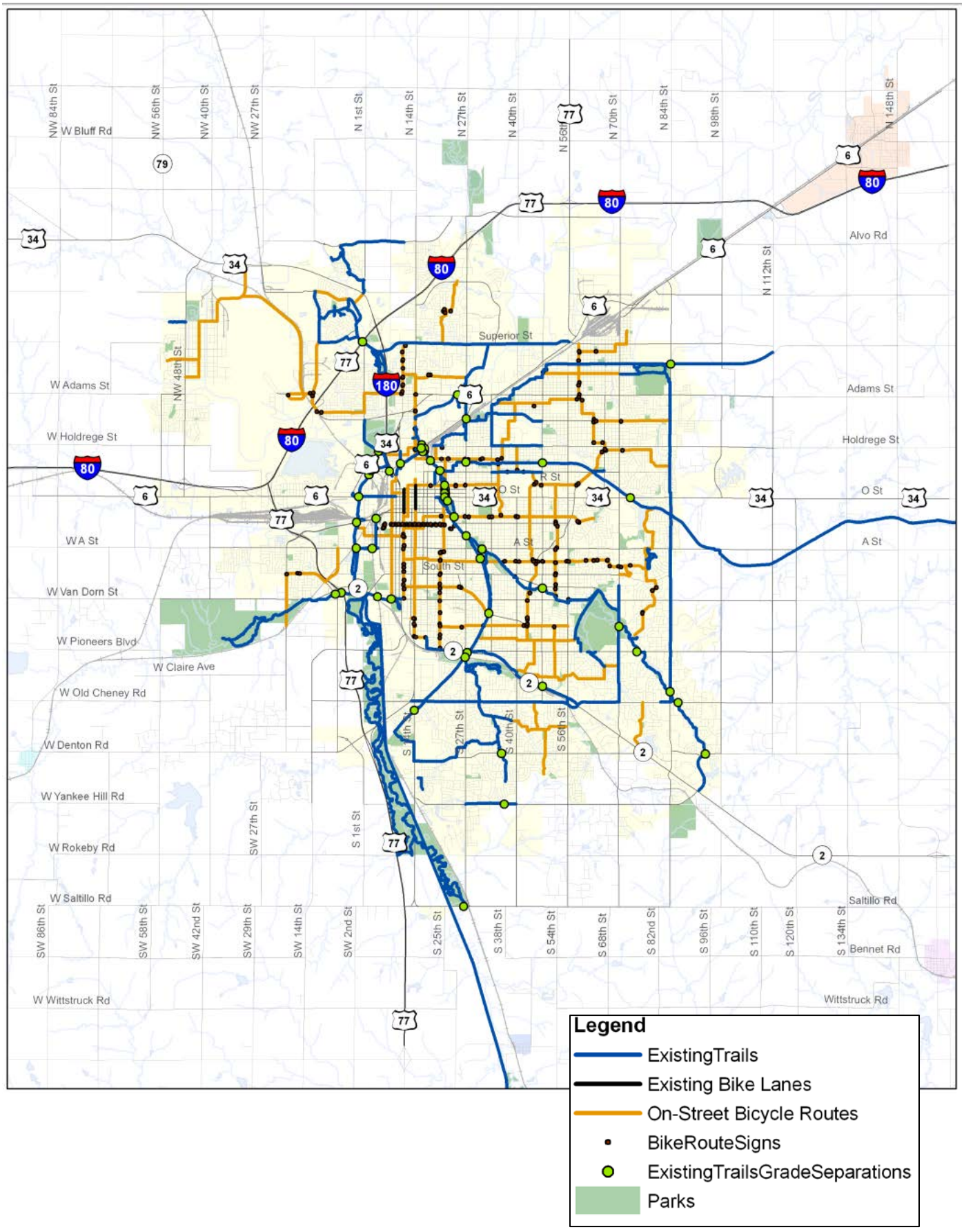
Lincoln's existing bicycle system is presented in Figure 2-1. The bicycle system includes recreational trails, shared use paths, bike routes, a shared lane facility, and two bike lanes.

In review of Figure 2-1, a number of observations can be made, summarized as follows. It should be noted that these findings and observations were also based on an extensive field survey of the entire City conducted by members of the Mayor's Pedestrian and Bicycle Advisory Committee, volunteers from the public, and staff.

- The system of bicycle trails, lanes, and routes provides the framework for a good bicycle system to serve the community. Supplemental facilities will need to be developed to provide the opportunity for a comprehensive bicycle network, particularly in areas of new development and in areas where biking is more likely if a good network is available.
- Many of the existing bicycle routes have been neglected and have missing signs and route designations. There are also many areas of the City where bicycle routes are missing. This lack of a maintained bicycle network limits bicycle mobility and travel.

In this Chapter

FIGURE 2-1: EXISTING BICYCLE NETWORK



- Some bicycle facilities begin and end erratically. These often are associated with new development. Many additional planned improvements have an unknown timeframe for completion.
- Many of the bicycle facilities have missing segments or intersect with a high volume arterial with no traffic controls for the bicyclist to cross.
- Many of the City's bicycle facilities are in need of repair and require basic maintenance such as sweeping or removing tree overhangs.

In reviewing the bicycle system, it is also important to consider the types of bicycle travel, the experience of the bicycle rider, and the type of facilities riders may use.

In general, there are three types of bicycle travel: commuting, adult recreation, and children. The design of bikeways differs considerably for each of these purposes. Commuter bicyclists are typically advanced riders and use their bicycles as they would a motor vehicle. They want direct access to destinations with minimal detour or delay and are typically comfortable riding besides motor vehicle traffic. Commuting bicyclists often want to ride the most direct route from their origin to their destination.

Recreational adult riders may also use their bicycles for transportation purposes (e.g., to get to the store or to visit friends), but prefer to avoid roads with fast and busy motor vehicle traffic unless there is ample roadway width to allow easy overtaking by faster motor vehicles. Thus, recreational riders are comfortable riding on recreational trails, shared use paths, and neighborhood streets. They may also consider bicycle lanes or wide shoulder lanes on busier streets. Recreational riders may also use their bicycles for pleasure and exercise without a specific destination in mind. Such riders may prefer recreational trails along open spaces instead of traveling adjacent to or with motor vehicle traffic.

BIKE ROUTES, LANES, AND PATHS - HOW ARE THEY DIFFERENT?

Bikeway - A general term for any street or trail which in some manner is specifically designated for bicycle travel, regardless of whether such facilities are designed with bike lanes for the exclusive use of bicycles or are to be shared with other transportation modes.

Recreational Trails/Shared-Use Paths - This is a shared use bicycle and pedestrian facility that is physically separated from motor vehicle traffic by open space or a barrier and is either within the road right-of-way or within an independent right-of-way. These are also referred to as a shared-use or multi-use paths or recreation trails. **Recreational Trails** are located off-street and typically follow a recreational or open space easement, such as along a river or between development areas or along old railroad rights of way. **Shared-Use Paths** are also separated from street but are adjacent to roadways and typically within the dedicated street right-of-way.

Protected Bikeway (Cycle Track) – These are bicycle lanes that have some physical separation through the use of bollards or raised curb to keep the cyclist separated from the automobile traffic.

Bicycle Lane - This is a bikeway on a portion of a street that has been designated by striping, signage, and pavement markings for the preferential or exclusive use of bicycles.

Bicycle Route/Sharrow - A segment of a system of roadways signed for the shared use of automobiles and bicyclists without lane markings. Bike routes are accompanied by bicycle route signs and possibly sharrow pavement markings that provide designation as a preferred bike route.

Striped Shoulder – A paved shoulder on a rural road that provides *an* edge line that separates the vehicle from the bicyclist.

Rural Road Shoulder – A shoulder on a rural road that is at least four feet wide from edge line to pavement edge that provides a separation between the vehicle and bicyclist.

Children under 12, riding on their own or with their parents, may not travel as fast as their adult counterparts, but still require access to key destinations in their community, such as schools, parks, and recreational facilities. Recreational trails, shared use paths and low volume residential streets are the preferred bicycle facilities for children.

In review of the existing system, the existing bicycle network primarily serves the experienced commuter and not the recreational rider or children. The existing trail system provides very good facilities for the recreational rider, but its accessibility for convenient use in many neighborhoods is limited.

PEDESTRIAN

The City of Lincoln's existing pedestrian sidewalk network is presented in Figure 2-2. The pedestrian system includes the sidewalks along our streets, recreational trails, and shared use paths. The pedestrian system also includes street crossings.

The ideal pedestrian system is best described as a grid system of streets with sidewalks on both sides that provide easy and direct connections between the trip origin and destination. The ideal pedestrian system should also provide for convenient and safe street crossings and include some basic amenities, such as sidewalks separated from streets and shade from trees. The following summarizes some of the pedestrian network observations.

- In general, the City of Lincoln has an excellent sidewalk network. As presented in Figure 2-2, almost all neighborhood streets and arterials have sidewalks along both sides. This is because the City has for years required new development to include sidewalks on both sides of the street.
- It should also be noted that the City of Lincoln has a very strong grid system with short blocks and relatively narrow streets, especially in older areas. The narrow streets increase the safety for pedestrians because traffic travels slower and the pedestrian has reduced exposure to the automobile crossing a narrow street.
- The barrier for pedestrian travel tends to be crossing higher volume arterial streets at locations that do not have signalized traffic control.
- The presence of frequent vehicular curb cuts in some areas also inhibits pedestrian activity by creating more points for pedestrian and vehicle conflict and because the sidewalk must slope to allow for vehicle access.
- The lack of trees and landscaping in some areas can also create an uncomfortable microclimate for pedestrians because there is no shade and the pavement creates an urban heat island effect. However, the City's Design Standards that require street trees limits this negative condition in many instances.
- Many of the older areas of the City are experiencing sidewalks that have developed cracks and heaving pavement and require maintenance. This can be particularly difficult for those with disabilities.

BARRIERS TO WHY WE DON'T WALK OR BIKE

In order to plan for a walkable and bikeable community, it is important to consider some of the factors that contribute to people's decisions not to walk or bike to local destinations. Some decisions involve physical obstacles, such as an incomplete bicycle or sidewalk system that prevent bicyclists and pedestrians from being able to complete their trips. Other decisions involve personal safety.

Barriers to riding a bike or pedestrian activities can occur in any neighborhood. Barriers can arise from inadequate information, budget constraints, or natural physical conditions regardless of the age, location, or layout of an area. Solutions to pedestrian barriers may include planning, design, maintenance, and changing the way citizens view pedestrian

travel. The following are types of barriers that can contribute to a person's decision to walk or bike or not walk or bike.

Bicycle Facility and Sidewalk Conditions

No different than the automobile driver that wants a well designed and maintained road to drive on, the design and condition of the bicycle facility and sidewalk affects his or her decision to walk or bicycle to a destination. Most bicycle and sidewalk-specific issues can be corrected with proper planning, construction, or maintenance. Poor bikeway and sidewalk conditions can be experienced in several different ways, such as:

- Uneven bike facility or sidewalk surfaces (examples include: pavement segments that are not level, heave from frost or tree roots, poorly designed driveway curb cuts, tree grates not level with the walking surface, uneven drainage inlets, and substandard or unmatched paving materials);
- Sidewalks and bikeways in poor condition such as significant cracking on sidewalks, debris, poor street pavement condition, overhanging trees and bushes;
- Sidewalks that are too narrow (precludes two or more persons walking together, or prevents wheelchair access);
- Missing or discontinuous sidewalks and bikeways;
- "Curb walks" or sidewalks attached directly to the curb with no separation between the pedestrians and traffic; and
- Snow removal.

Physical Obstacles

The landscape through which bicyclists and pedestrians must travel can affect their decision to bike or walk. Routes that cause bicyclists or pedestrians to climb steep slopes, to cross major streets or highways, travel out of direction from or to a destination, or that include poor design may preclude bicycle or pedestrian usage.

Separation of Land Use

Through zoning and other land use codes and ordinances that have evolved over the decades, zoning has largely separated places where one may live from locations of employment, shopping, and recreation. These zoning codes have created a land use pattern that creates and reinforces auto dependence. The movement toward mixed-use development and infill redevelopment creates an environment where mixed-uses produce and attract trips within walking and biking distances between one another. A denser pattern of mixed land uses affects the level of convenience to choose walking and biking as a mode choice.

Site Planning

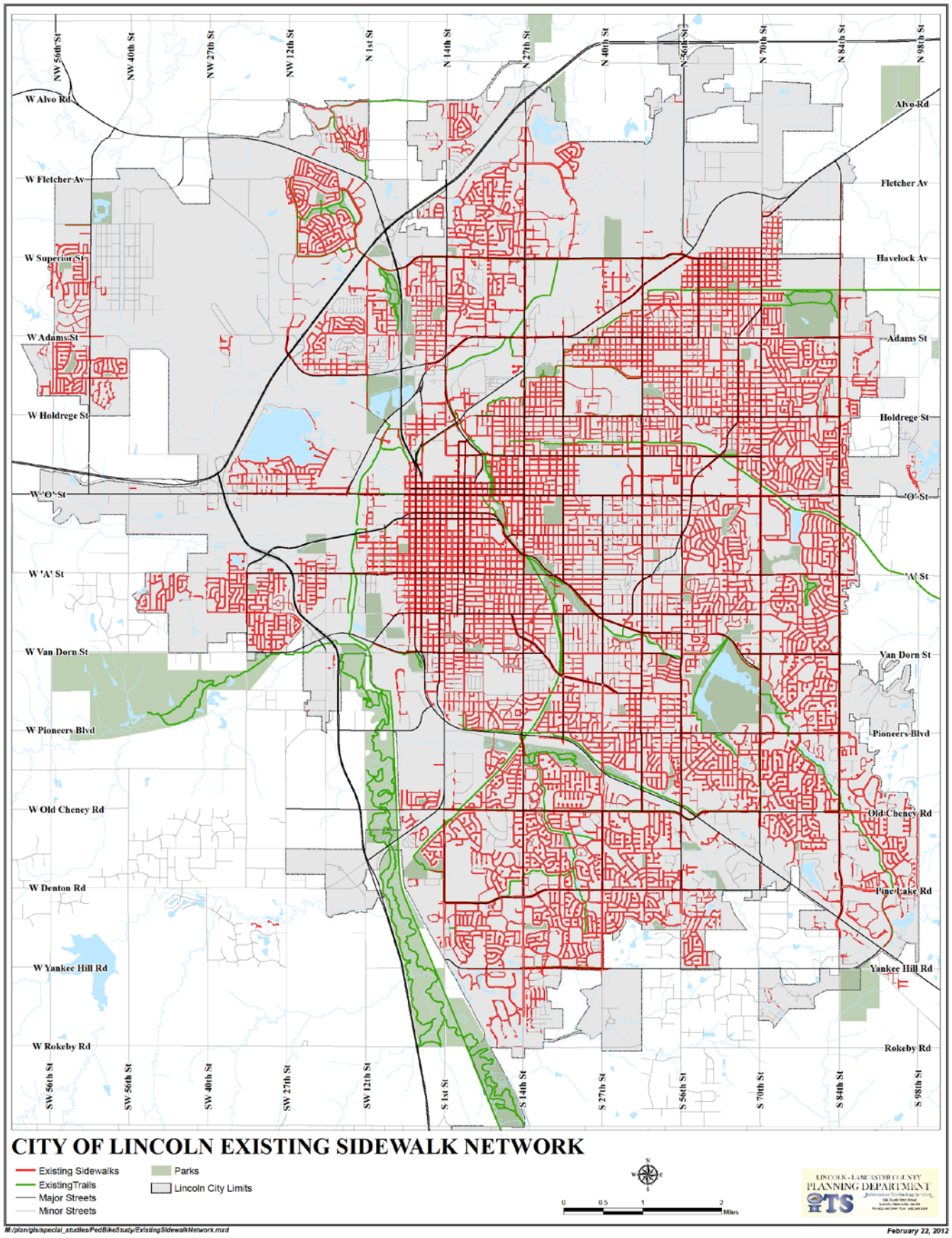
The grid street system has been replaced with curvilinear streets and cul-de-sacs in areas that developed in the past 50 years. With this change, direct connections, which are critical to the bicyclist and pedestrian, are often overlooked. Walls and fences around a residential neighborhood or commercial development can further exacerbate the problem by separating homes from schools, parks, shopping, services, and employment destinations.

Intersections and Crosswalks

One of the most common obstacles to walk or bicycle is safety, particularly at intersections. Lack of street crossings or inadequately designed intersections affect pedestrian and bicycle activity. Eliminating barriers at intersections can often be achieved with design improvements and there are lower cost traffic controls that could be considered when traffic signals are not warranted.

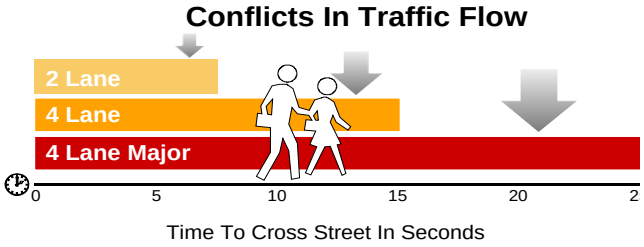
As the number and width of lanes increases, the bicyclist and pedestrian must take more time to cross the street, resulting in greater exposure to potential danger. In addition, the number of lanes often reflects automobile traffic volumes, which increases the amount of conflicts that can occur.

FIGURE 2-2: CITY OF LINCOLN'S EXISTING PEDESTRIAN SIDEWALK NETWORK



Barriers at intersections can be encountered in several forms such as:

- No crosswalk signals, or insufficient time to cross the street;
- No crosswalk markings, or crosswalk markings which are significantly faded;
- No islands or medians for refuge areas(especially at wider or higher-volume streets);
- Uneven curbs or no curb ramps;
- Pavement treatments (decorative treatments may confuse drivers, or may deter visually impaired pedestrians);
- Heavy turning volume that deters pedestrian crossing (especially heavy right-turn movements, that can occur on red lights); and
- Discontinuous walking route through the intersection (curb cuts that occur at different locations within an intersection).



Personal Well-Being

Most pedestrians and bicyclists will avoid settings in which they feel threatened or unsafe, whether real or perceived. Improved design, more visible law enforcement, or educational programs might remove these types of barriers. Personal health barriers include:

- Safety (high speeds and traffic volumes, publicized history of crashes);
- Security (lighting, high crime area, excessive graffiti, emergency telephone availability);
- Health (odors, carbon monoxide levels, or exhaust inhalation on very busy streets);
- Designs not favorable for visually impaired pedestrians (no curb cuts, unfamiliar pavement treatments, lack of audible crossing signals); and
- Designs not accessible for disabled pedestrians (pavement treatments, no curb cuts, inadequate crossing time).

Personal Preference

Barriers to pedestrian and bicycle activity are often based on perceptions. Sidewalks that are complete and well maintained may not be used if interesting destinations are lacking, or if distances are perceived as too great. Some personal preference barriers can be eliminated with local planning, economic development, public awareness or educational campaigns. Some personal preference barriers include:

- Distance between origin and destination, or lack of destinations in neighborhoods;
- Amenities and ambience (visually interesting setting, occasional seating, rest rooms, trash receptacles, drinking fountains, bike parking/storage); and
- Convenience (linkages to transit or other non-motorized modes).

Temporary Barriers

Some pedestrian barriers will disappear with time. Temporary barriers may include seasonal factors that are weather-related, or those related to construction activities. Some temporary barriers can be avoided with detours or improved planning, while others require more patience. Temporary barriers may be comprised of the following:

- Weather impacts (snow, low or encroaching branches on trees, drifts of tree leaves or snow, cold temperatures, wind exposure); and
- Construction (equipment/signs in sidewalks, eliminated sidewalks, temporarily closed streets).

3 Bicycle and Pedestrian Plan

The Bicycle and Pedestrian Capital Plan provides the framework for a communitywide bicycle and pedestrian system. The Plan reflects what is needed to provide more convenient choice in travel modes as an alternative.

The Capital Plan is not financially constrained, so priorities will need to be developed separately (see Chapter 4).

The Plan begins with an understanding of basic evaluation tools and best practices for developing the Plan. This chapter provides an overview of some of those key elements.

The Plan is based in part on addressing current missing segments and deficiencies in the existing bicycle and pedestrian system. These deficiencies were defined, in part, through the public outreach for the Plan.

The Plan is also based on a technical evaluation of work, shopping, business, and recreation destinations, a short trips assignment as to where bicyclists might ride and pedestrians might walk if facilities were available, and an assessment of pedestrian access to Lincoln's public schools.

In this Chapter

Evaluation Tools

While it would be ideal to have great bicycle and pedestrian facilities on every street within the community, this is not practical. It is also not possible to retrofit every street.

Therefore, in order to determine what bicycle and pedestrian improvements should be considered in the Bicycle and Pedestrian Capital Plan, it becomes necessary to identify basic evaluation tools to develop a plan.

These tools include:

- Bicycle and Pedestrian Level of Service
- Destination Analysis
- Short Trip Assignments
- General Parameters for Bicycle Plan Development

Bicycle and Pedestrian Level of Service

Level of Service (LOS) is a method of evaluation used to identify how well a facility may operate. "Level of Service" is a common term used in evaluating automobile congestion. Similar to a report card grade, LOS A through C are passing, LOS D is border line, and LOS E and F are considered failing.

Ideally, the City of Lincoln should strive for level of service of C or better. This is particularly important in areas which potentially have high pedestrian and bicycle demand, such as around schools, parks, and commercial/business centers.

Although the following level of service methodology was initially developed for evaluating the pedestrian system, these principals can also be applied and considered when developing the bicycle system. The five level of service measures are as follows:

- **Directness** – Does the system provide the shortest possible route?
- **Continuity** – Is the system free from missing segments and barriers?
- **Street Crossings** – Can the bicyclist and pedestrian safely cross streets?
- **Visual Interest and Amenities** – Is the environment attractive and comfortable?
- **Security** – Is the environment secure and well lighted with good line of sight to see the bicyclist and pedestrian?

The following level of service assessments are not intended to identify specific walkability problems or improvements, but rather to identify the types of issues and concerns that might exist.

Directness

The directness measure represents the actual distance from trip origin to destination. Since bicycle and pedestrian trips are highly dependent on trip length, the ability of bicycle and pedestrian infrastructure to provide the shortest and most direct route is critical. This fact is easily observed on college campuses and in parks where the most direct route is often worn into the landscape, despite the lack of paving. The ideal system is the grid system, since curvilinear street patterns add additional distance to the potential trip.

Making a decision to walk or ride a bicycle is highly correlated to distance and the time it takes to walk or bike to your destination. If the bicycle and sidewalk system is direct and minimizes travel time, a person is much more likely to ride a bike or walk than if the route is circuitous and adds length and time to the trip. Directness is the measure of distance between destinations including home, transit stops, schools, parks, commercial areas, or activity centers.

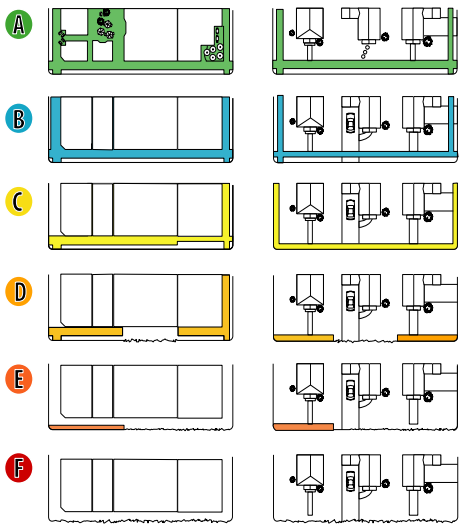
The frequency or density of intersections also correlates with directness and walkability. A pedestrian is typically willing to walk three or four hundred feet. In downtown areas with high pedestrian activity, the frequency of street crossings needs to be higher than in outlying areas.

Barriers will impact bicycle and pedestrian travel. Freeways, rivers, and railroads can divide the community and restrict direct connections between one area and another except at a limited number of street over/under crossings.

Continuity

Continuity measures the completeness of the bicycle or pedestrian system.

A continuous sidewalk or bicycle system allows the pedestrian and bicyclist to make an uninterrupted trip.



The sidewalk system must be of sufficient width and a surface without significant cracks and bumps, to accommodate a stroller or wheelchair.

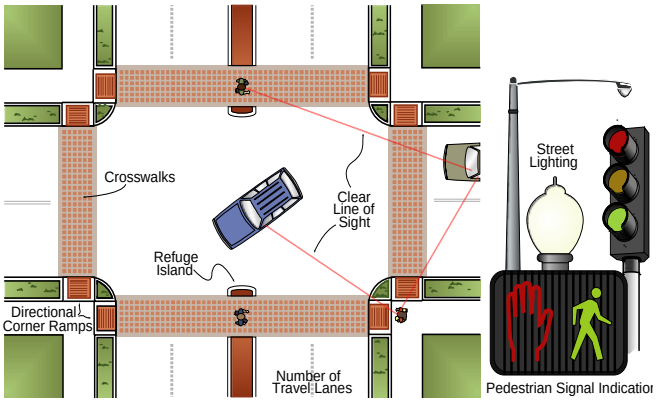
Similarly, a bicyclist may not make a bicycle trip if there is no system. Lack of continuity can come in the form of missing segments, broken or overgrown vegetation, or physical barriers such discontinuous streets or fences.

Other aspects of continuity are whether bicycle lanes and sidewalks exist along one or both sides of the street and whether there is an overall line of sight from block to block.

Street Crossings

The weak link of the bicycle and pedestrian systems is often intersection safety where bicycles and pedestrians must cross a street and interface with automobiles. As streets get wider and carry higher volumes of traffic at higher speeds, potential bicycle riders and pedestrians may avoid making a bicycle or pedestrian trip if safety becomes a concern. Many factors affect the bicyclists and pedestrian's real and perceived comfort and safety in crossing the street, including the following:

- The number of lanes and the widths of the lanes to cross;
- The presence of a raised median or refuge island;
- The presence of a bike lane or crosswalk;
- Use of a pedestrian actuated signal and location of push button;
- Clear sight lines to and from the motorists with the bicyclists or pedestrians;
- Directional corner ramps;
- Street lighting; and
- The presence or lack of on-street parking, which impacts vehicular and pedestrian sight distance, provides a buffer for pedestrians and can slow traffic.



Visual Interest and Amenities

This measure of the pedestrian system's attractiveness and appeal is the most difficult to quantify and compare, and the most likely to change as the area matures. Some aspects of this measure relate to facilities that enhance the comfort of the user, including elements such as shade trees, street lighting, and benches that may be particularly important to pedestrians with mobility or visual impairments, but can also be important to the bicyclist. Other elements are important to visual appeal such as landscaping, tree canopy, planter boxes, trash receptacles, and public art.

Bicyclists and pedestrians often choose to ride a bicycle or walk depending on the quality of the environment. Areas that are pleasing and appealing with activities along the route are used much more than areas that are stark and uninviting. To promote bicycling and walking, the bicycle and pedestrian system should have a basic visual quality with some amenities.

Bicycle and Pedestrian Security

The bike and pedestrian environment must feel like a safe place for people to walk. The key security facility element is whether the bicyclist or pedestrian is clearly visible to other people. This measurement is more appropriate at a site level where one can begin to identify areas where security might be an issue. Bicyclists and pedestrians require a sense of security, both through visual line of sight with others and separation from vehicles. They also require well-lighted pathways and sidewalks for night use.

Bicycle Facility Guidance for Locating Bike Lanes and Routes

While it may be desirable for the bike network to have a bicycle lane on both sides of every street, it is not practical or necessary. There is, however, some general guidance for developing a good bicycle system.

- **Low Volume Roadway:** Bicyclists want to travel to the same destinations as cars. If the primary corridor to get to these destinations cannot accommodate bike facilities, a bicycle route on local streets or low volume collectors that is parallel to the major street corridor must be identified.
- **On or within ¼ mile of arterials:** If a bicycle lane or paths cannot be accommodated on an arterial and needs to be a bike route on a residential street or a low volume collector street, the selected route should be within a ¼ mile of the arterial.
- **Continuity:** A bike route should be reasonably continuous across the City or from activity area to activity area and avoid jogs and turns to maintain continuity.
- **Spacing:** The bicycle network should consist of a north-south and east-west grid spaced between ½ miles in higher density activity areas to one mile in lower density areas.
- **Street Crossings:** Some form of traffic control needs to be considered when a bicycle facility crosses a higher volume roadway. There are lower types of traffic controls available when a signal is not warranted. However, all street and major access drive crossings should have, at a minimum, consistent pavement markings throughout the system.
- **Access to Major Destinations:** The key is to have a bicycle network connect to activity areas and destinations.

Bicycle and Pedestrian Destinations

It is critical to identify potential high bicycle and pedestrian demand areas and then assess the facilities in those high demand areas to determine if adequate bicycle and pedestrian facilities are provided or need to be provided to serve latent demand.

To estimate potential high demand destinations, five potential bicycle and pedestrian activities or destinations were analyzed to create an activity index. These destinations included:

- Park and Recreation Facilities
- Schools and Universities
- Major Medial and Hospitals
- Commercial Centers
- Transit Routes

A map that contains the location of each of these destinations and a one-quarter mile buffer around each activity is presented in Figure 3-1 for pedestrian trips. The reason that a ¼ mile buffer was added to each activity is that one-quarter of a mile is the general distance one may choose to walk if a good pedestrian system with safe street crossings is available. Beyond ¼ of a mile, pedestrian trips are not often made, even with a good pedestrian system. A similar map with a one mile radius for bicycle trips is presented in Figure 3-2.

Each destination and ¼ mile walking radius for pedestrian and one mile radius for bicycling was combined to create a composite map, where the darker overlapping areas defined multiple destinations that would have high probabilities for attracting future pedestrian and bicycle trips.

As the composite map of all destinations illustrates, there are major activity center destinations located throughout the City. These activity center destinations should provide for good bicycle and pedestrian access and facilities. Areas with overlapping destinations are

particularly prevalent in the City's downtown and core area.

Figure 3-1 uses the sidewalk coverage map as an overlay on top of the composite destinations map. In review of this exhibit, it is evident that the City has extremely good sidewalk coverage within areas of high destination activity. Therefore the pedestrian improvements have less need for completing missing segments, but rather strategically defining and improving street crossings, particularly in the higher density destination areas where there is higher demand.

Figure 3-2, the bicycle destinations exhibit, illustrates how extensive a bicycle network should be for the City of Lincoln. Vast areas of the city would benefit with a comprehensive bicycle network, yet the current network is limited and does not function as a system.

PRIORITIZATION OF IMPROVEMENTS RELATED TO DEMAND AND QUALITY OF THE BICYCLE AND PEDESTRIAN NETWORKS

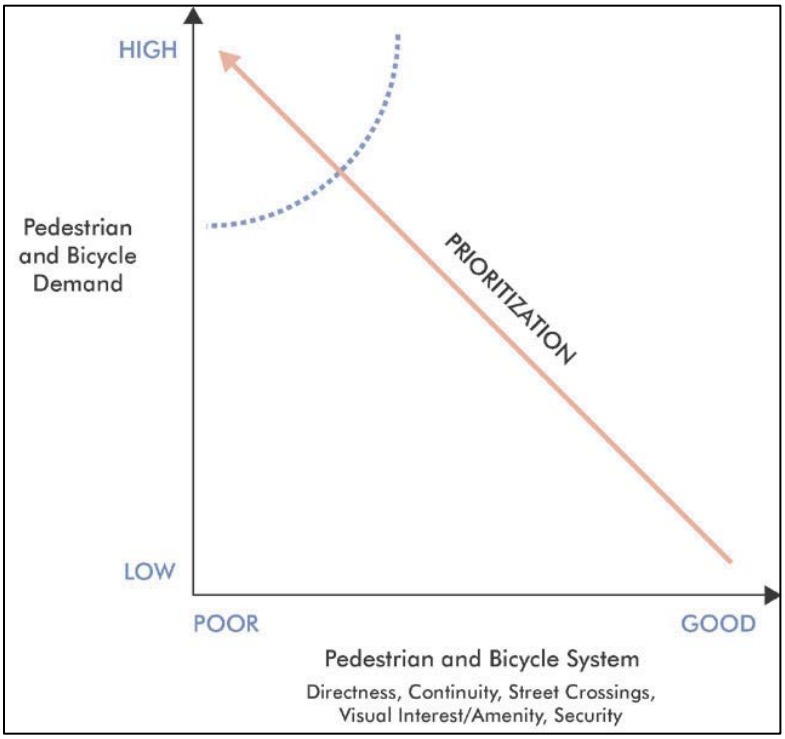
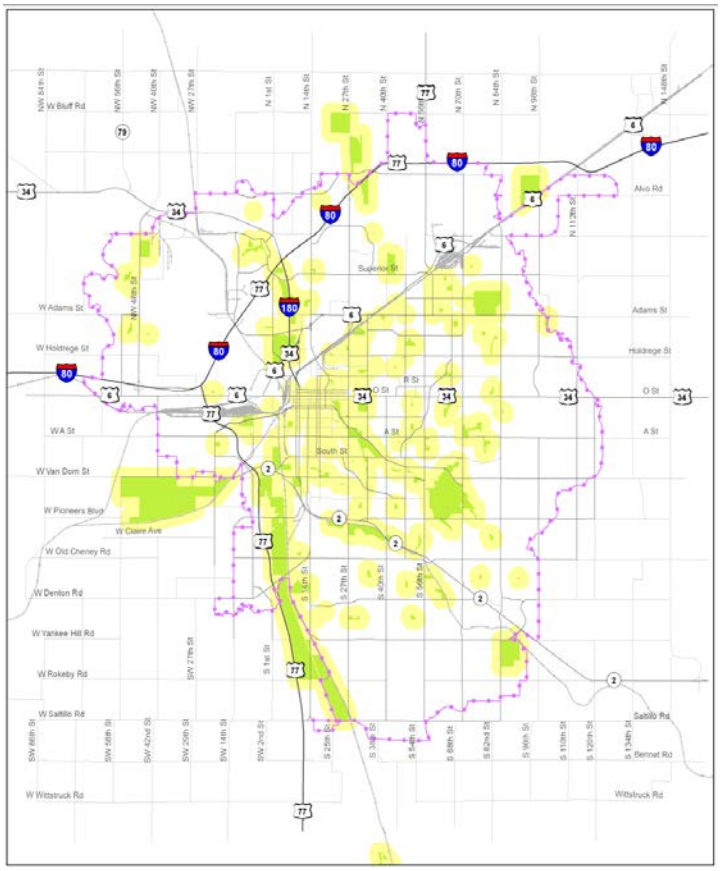
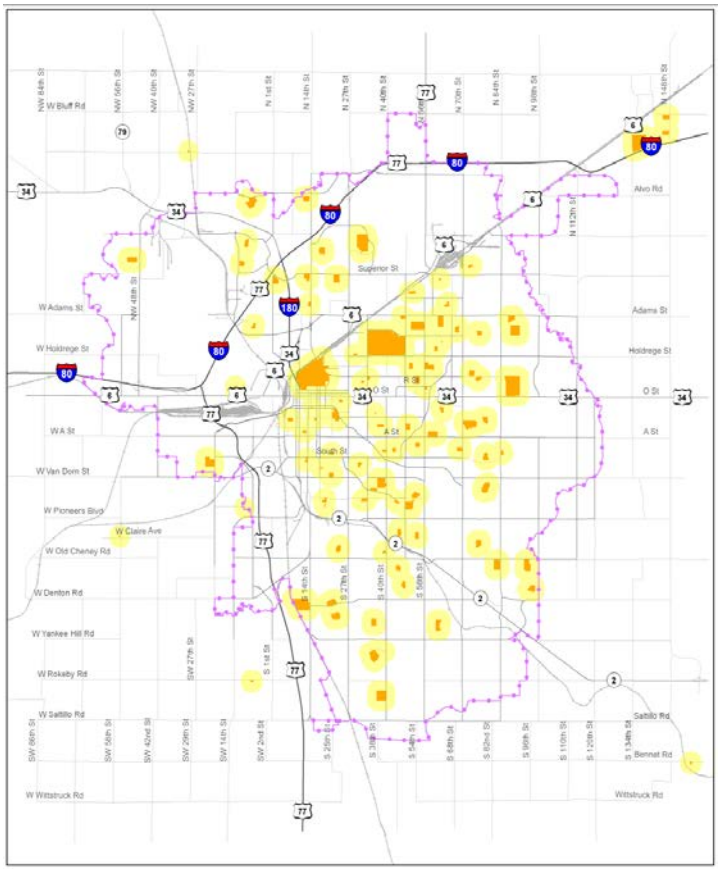


FIGURE 3-1: DESTINATIONS & 1/4 MILE WALKING RADIUS

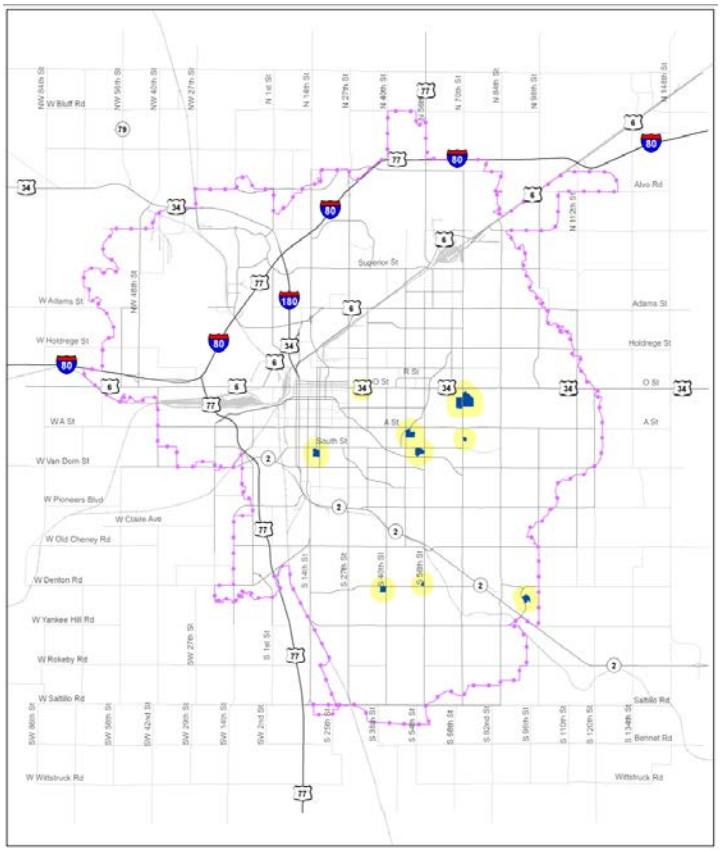


Parks & Recreation

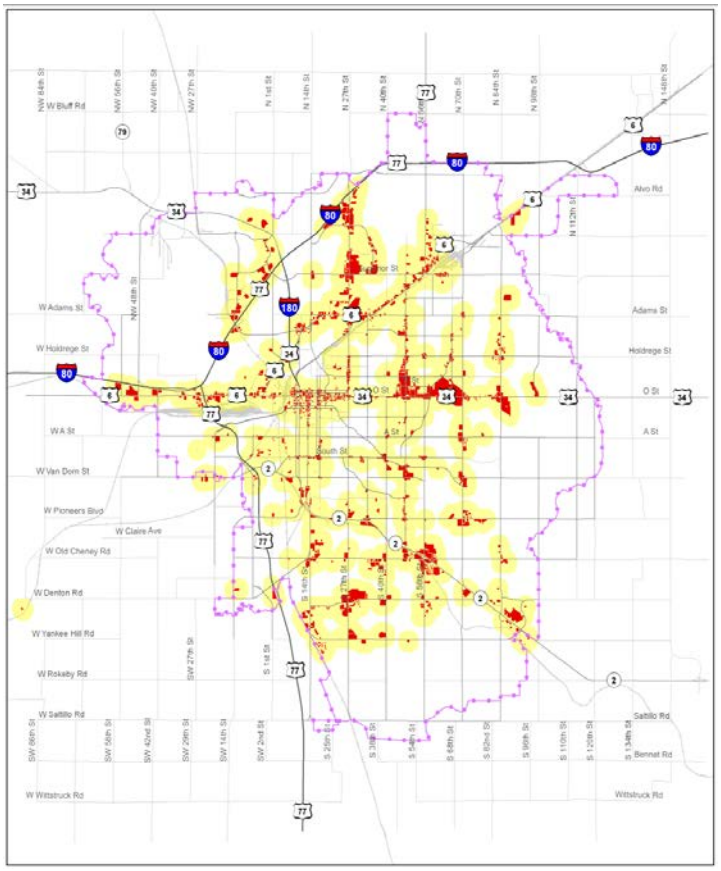


School Sites & Universities

FIGURE 3-1: DESTINATIONS & 1/4 MILE WALKING RADIUS

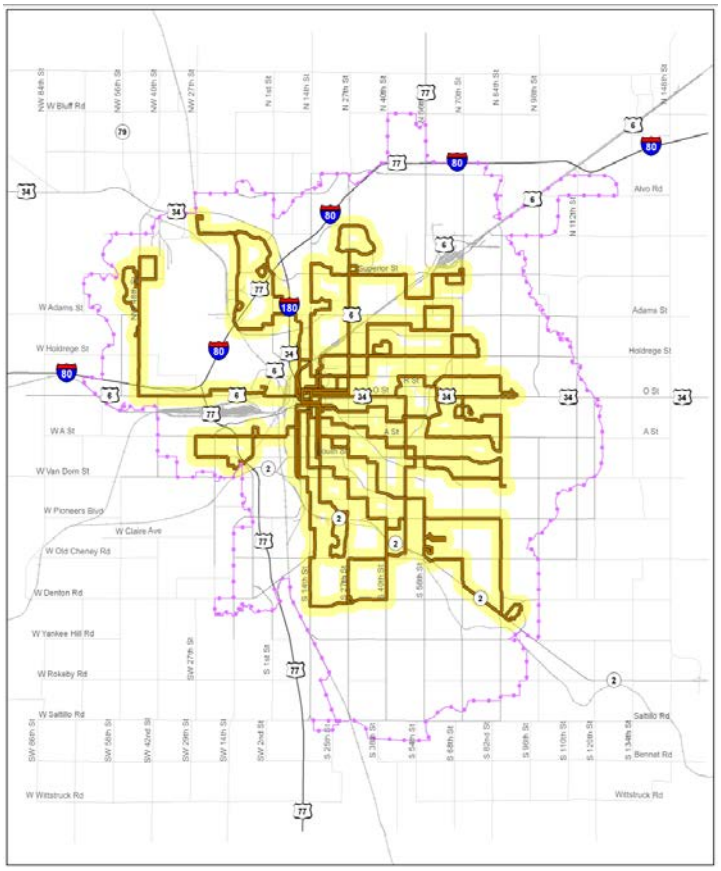


Major Medical & Hospitals

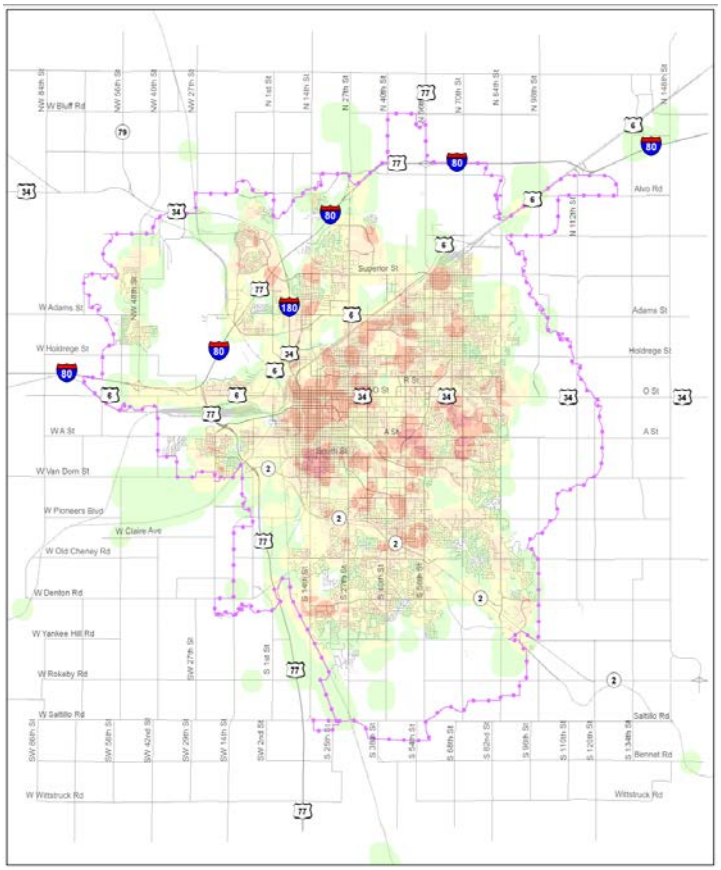


Commercial Centers

FIGURE 3-1: DESTINATIONS & 1/4 MILE WALKING RADIUS

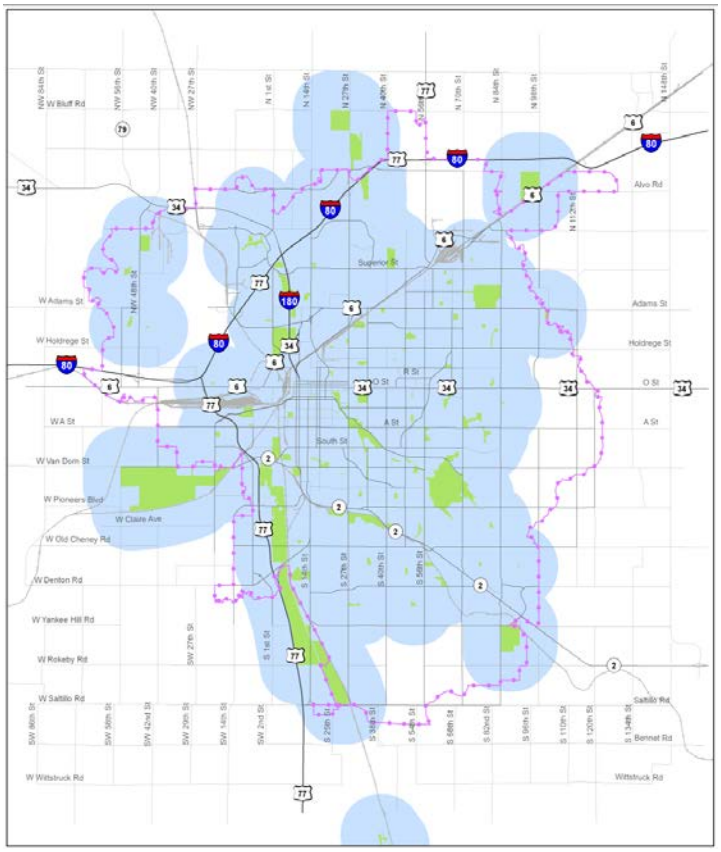


Transit

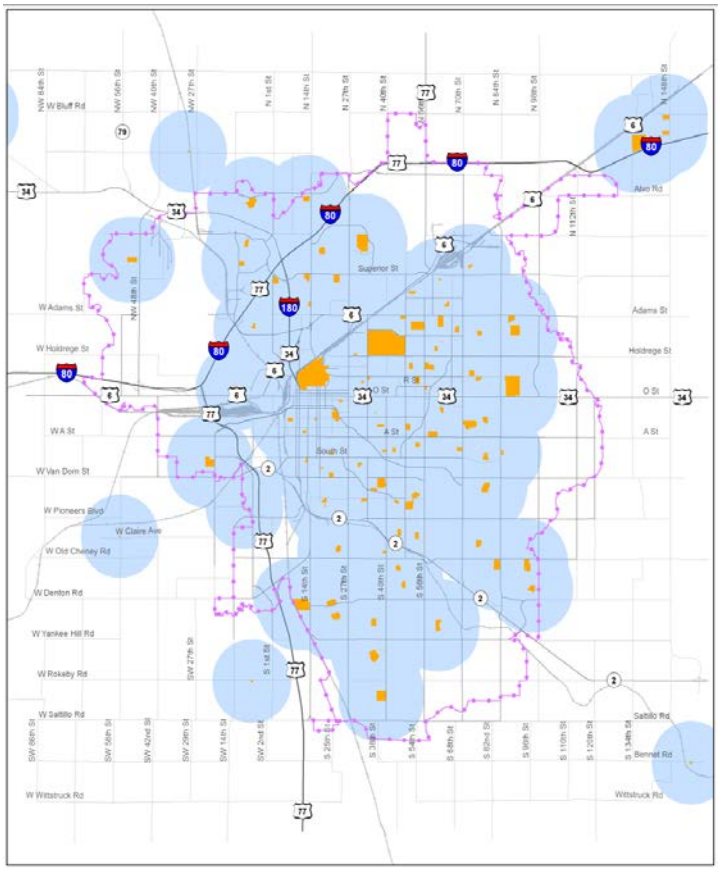


Composite of Destinations with Sidewalk Overlay

FIGURE 3-2: DESTINATIONS & 1 MILE BICYCLE RADIUS

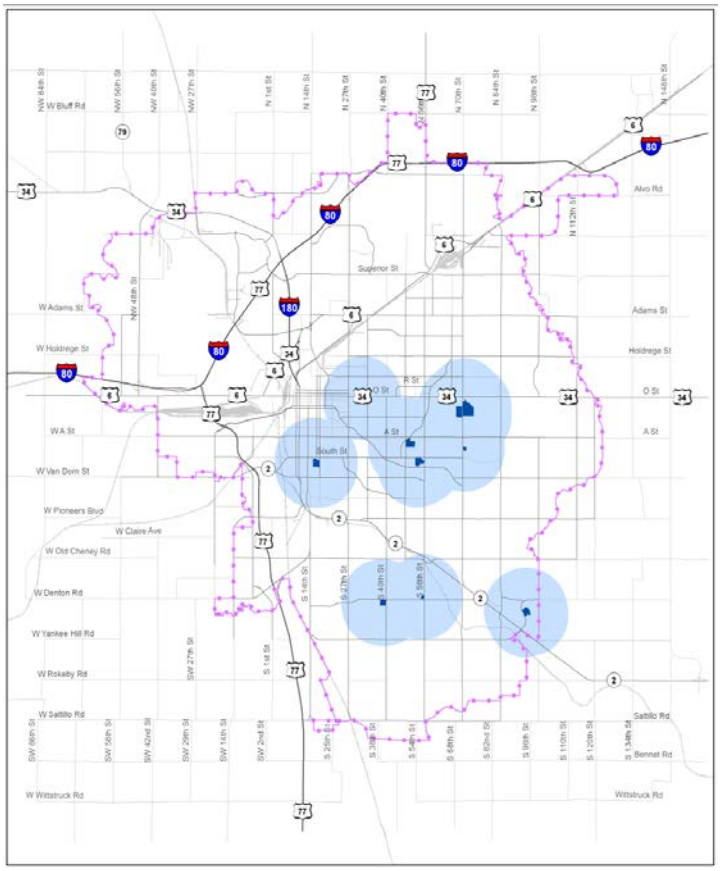


Parks & Recreation

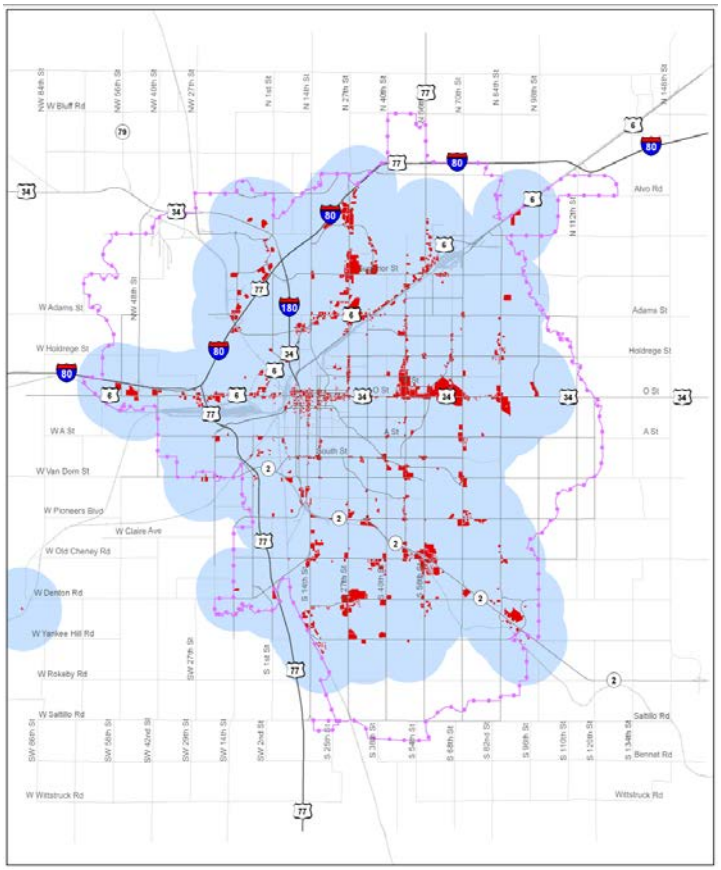


School Sites & Universities

FIGURE 3-2: DESTINATIONS & 1 MILE BICYCLE RADIUS

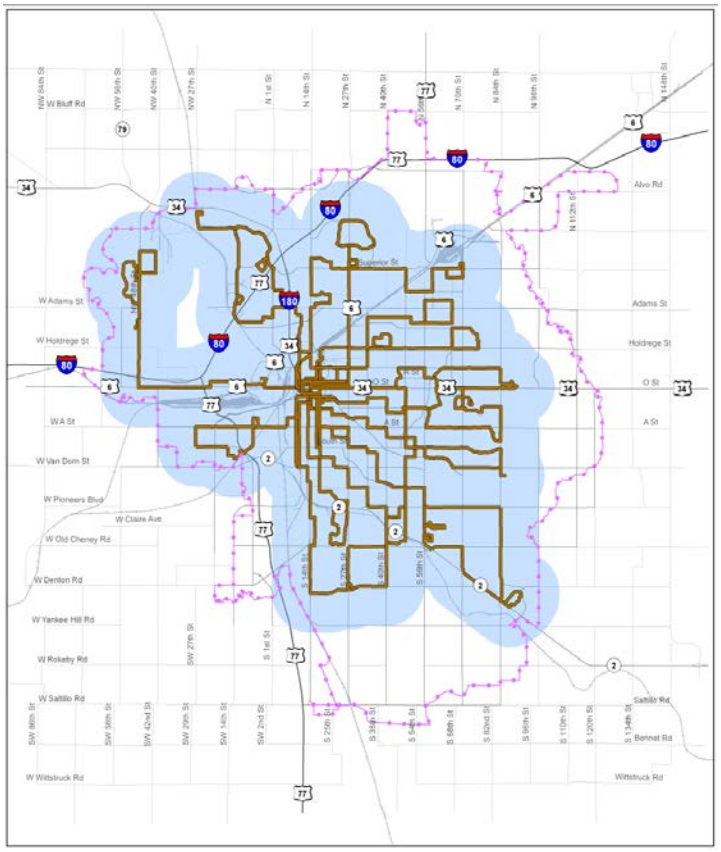


MAJOR MEDICAL & HOSPITALS

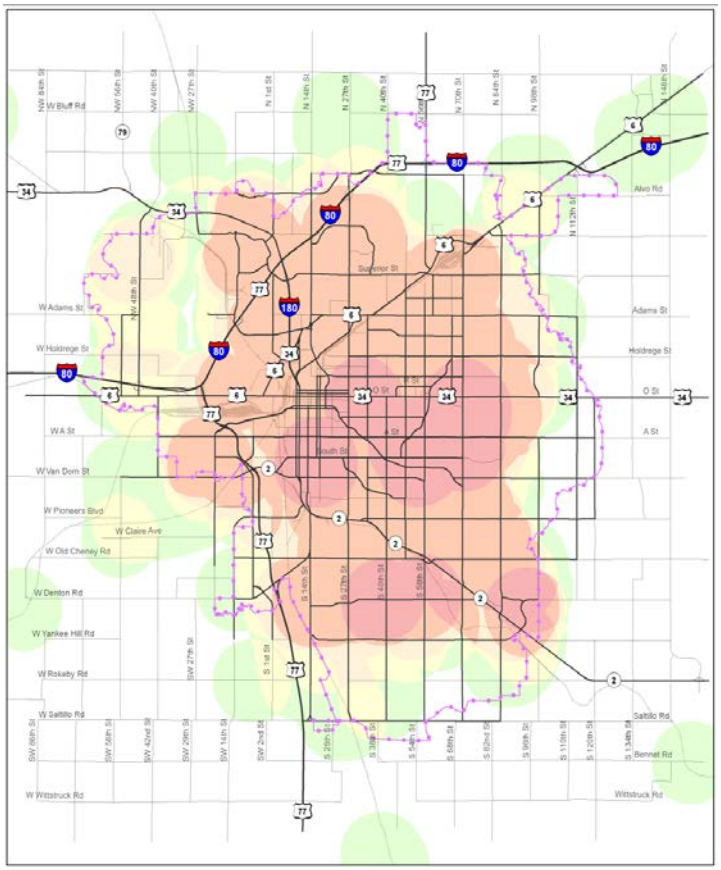


COMMERCIAL CENTERS

FIGURE 3-2: DESTINATIONS & 1 MILE BICYCLE RADIUS



Transit



Composite of Destinations

Short Trip Assignment

The development of the City of Lincoln's 2040 Long Range Transportation Plan Roadway element was based on a travel demand model that estimates future traffic based on many factors including land use, trip generation, and trip interchange characteristics between various land uses. The travel demand model also estimates what percent of trips might be ¼ of a mile, 1 mile, or 10 miles. The travel demand modeling process assigns these trips to a roadway network based on the type of street, the number of lanes, and travel speed.

This modeling process is for all trip lengths. Given that the propensity to consider riding a bicycle may be expected for trips less than 3 miles, it is possible to only assign trips of three miles in length or less. Figure 3-3 presents this 3-mile trips or less traffic assignment from the traffic model for the year 2040, the horizon year for the City of Lincoln's Comprehensive Plan and Long Range Transportation Plan.

As presented, there are three color bandwidths overlaid on top of the city's arterial street system. These bandwidths reflect trips less than one mile (brown), one to two miles (green) and two to three miles (yellow-orange). The wider the band, the more short trips there are on a given arterial.

The objective of this analysis and exhibit is to identify where there is the greatest potential to provide bicycle facilities to accommodate potential bicycle trips. It is recognized that many of these arterials have constraints that would limit the opportunity to include bicycle facilities within their right-of-way, but providing bicycle routes along parallel streets would vastly open up bicycle opportunities for the City. Where arterial street right of way does allow for additional facilities, improvements such as shared use paths or bike lanes should be considered.

Lincoln Public Schools Pedestrian Access Assessment

As part of the preparation of the City of Lincoln's Bicycle and Pedestrian Capital Plan, a pedestrian access assessment was conducted for all of Lincoln's public elementary, middle, and high schools. This analysis was not conducted for private and parochial schools which have a larger service area and higher percentage of motor vehicle drop offs.

The pedestrian access assessment was based on a mapping exercise that incorporated available GIS data from the City and previously prepared Safe Route to Schools maps. A map was prepared for each Lincoln Public School. The GIS and mapping data included the following:

- Aerial Image
- School Location
- Sidewalks
- Crosswalks
- Trails/Pathways that provide access to the schools
- Traffic Signals and Pedestrian Actuated Signal
- School Boundary
- ¼ Mile Walking Distance

The school access evaluation was based on a review of the maps that identified school location, sidewalks, crosswalks, and traffic control to determine if sidewalks were available within the typical ¼ mile walking radius. If a "Safe Route to Schools" map was previously prepared, this map was also used in the evaluation.

In general, the City of Lincoln provides excellent pedestrian access to the City's public schools. Out of the total 54 schools, only six elementary schools were identified in the mapping process to potentially consider additional pedestrian improvements.

These potential pedestrian improvements are summarized as follows:

Elementary Schools

- **Kooser:** There is a short piece of sidewalk missing on the south side of Humphrey Avenue between 14th Street and 13th Street in City property that would provide sidewalk continuity to 14th Street with the projection of a signalized intersection at 14th Street and Humphrey.

- **Lakeview:** There are no sidewalks along P Street between Capitol Beach Blvd. and Bell Street. This street has residential along the north side of 'P' Street and commercial use on the south side. A sidewalk along the north side of 'P' Street from Capital Beach

Blvd. to 730 P Street would provide continuity of a pedestrian system to the school and avoid potential commercial trip conflicts.

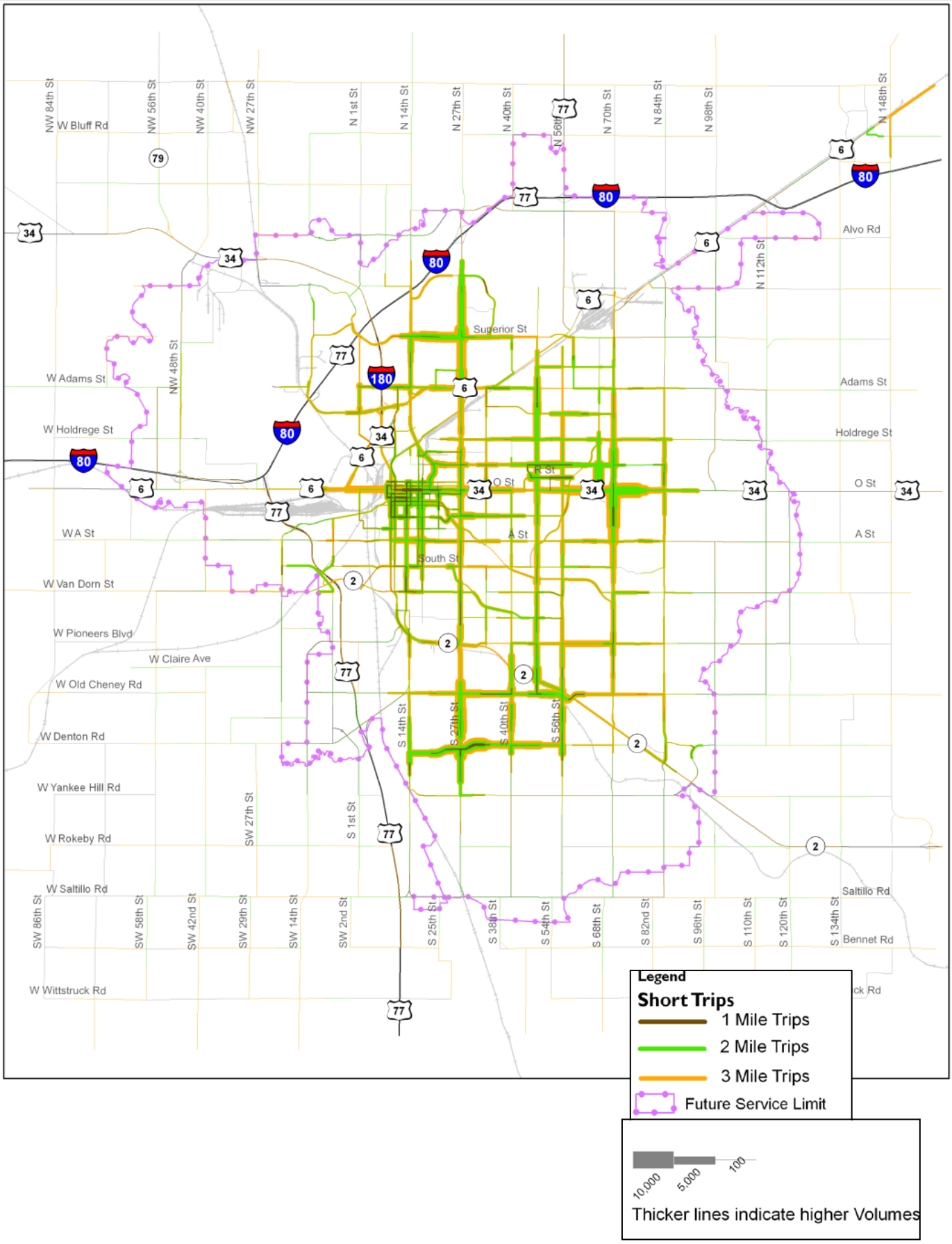
- **Pershing:** The sidewalk system in this area is complete except for the east side of 65th Street, across from the school, between Judson Street and Fremont Street.

- **Randolph:** There is a neighborhood to the south of Randolph School that does not have sidewalks. Although east-west sidewalks on "B", Mohawk and "D" Street are not critical for access to the school, a potential north-south sidewalk on the west side of 38th Sreet between "A" and "D" Street should be considered.

- **Rousseau:** There is a missing segment of sidewalk along the north side of Calvert Street from Hanson Drive to S. 27th Street that would provide improved access to the students located to the northwest of the school.

- **West Lincoln:** Nance Avenue east of West Lincoln Elementary school has no sidewalks on the north side and missing segments on the south side. A potential sidewalk on the south side of Nance Avenue between 4th Street and Chester Street and between 10th Street to North Main Street would provide sidewalk continuity.

FIGURE 3-3: SHORT TRIP ASSIGNMENT – LESS THAN 3 MILES



Proposed Bicycle and Pedestrian Capital Plan

The development of the Proposed Bicycle and Pedestrian Capital Plan was based on a number of sources including input from the public, the Mayor's Pedestrian and Bicycle Advisory Committee, City Public Works & Utilities, County Engineering, Planning, Parks and Health Department staff, GIS data and analysis, and field survey data collection and analysis.

A primary work effort was completed through an all day Saturday workshop charrette where members of the Mayor's Pedestrian and Bicycle Advisory Committee and city staff collectively discussed and mapped bicycle and pedestrian improvements that would help generate a vision plan for bicycle and pedestrian improvements.

There were many different inputs provided at the workshop including a map of existing bicycle facilities and sidewalks, destination spatial analysis, field survey results, short trip assignment and other relevant information.

The process for developing the Bicycle Plan started with a large aerial map with existing bicycle facilities, working around the city from one area to another, discussing what was good and what segments and improvements were missing, discussing various options and documenting the collective suggested bicycle improvements for that area.

In regards to the pedestrian network, it was recognized that the sidewalk system is very good, but programs and policies to strategically identify improved street crossings and a well funded maintenance plan for the sidewalk network should be the pedestrian plan objectives, not a map.

Proposed Bicycle Plan

The City of Lincoln's Proposed Bicycle Plan map is presented in Figure 3-4, and consists of existing and proposed trails, bike lanes and bike routes.

In the development of the plan, it was agreed that the existing and funded trails system is the flagship of the bicycle plan, serving both commuter bicyclists and recreational riders. Continuation of the implementation of these trails is both an important element of the 2040 Comprehensive Plan as well as the Long Range Transportation Plan. In review of the Bicycle and Pedestrian Capital Plan Map, trails have been defined as existing, funded, and future and proposed new trails that currently do not have funding. There also are plans to install grade separations with street improvements and trail projects. These are identified the 2040 Comprehensive Plan and Long Range Transportation Plan as needed projects.

Whereas the trails provide a strong framework for the bicycle network, they will not serve the entire city. Hence some on street facilities will be needed to be able to complete the network and provide linkages between home and place of work, shopping and recreation.

Based on the existing conditions inventory, it was evident that given the arterial network within the City, with narrow right-of-way, multiple lanes with high speeds and traffic volumes, the use of bike lanes have limited applications except potentially in developing areas where the streets have not been completed to their ultimate condition. The opportunity to conduct road diets on existing arterial streets is not a significant opportunity in Lincoln since older arterials are not oversized, or have been built or are planned to be built at the two plus center turn lane width.

Conversely, what has worked well for the City has been the use of on-street bicycle routes that are parallel to the arterial street system along residential streets and lower volume collector streets. The other advantage of the bicycle route system is that implementation costs for signing are significantly less than for bike lanes.

In review of the Proposed City of Lincoln Bicycle Plan Map, one can see the desired ½ to 1 mile grid to serve the city and its destinations, when complete, will provide an excellent bicycle network for the City.

A summary of the number of miles of bicycle facilities that exist today and are proposed as future improvements is presented in Table 3-1. Trails have been divided into three categories; those that exist today, those that have funding

but have not been constructed, and those that are planned for the future per the 2040 Comprehensive Plan. Not all of the planned future trails can be constructed by 2040 under the assumptions used in the financially constrained 2040 Long Range Transportation Plan.

Table 3-1: Existing and Future Miles of Bicycle Facilities

Facility Type	Existing	Future	Change
Trails - Existing	148	291.9	+143.9
Trails -Funded	9.5		
Cycle Tracks	0.0	2.2	+2.2
Bike Lanes	0.9	0.5	- 0.4
Bike Routes	82	135.6	+53.6
Sharrows	1.7	10.7	+9.0
Total	**232.6**	**440.9**	**208.3**

Currently there are approximately 233 miles of existing bicycle facilities within the County (trails, bike lanes, bike routes). With the potential completion of 208 additional miles of facilities, the total miles of bicycle facilities will be approximately 441, or an increase of 90 percent.

The following sections provide additional information regarding each of the bicycle facility elements.

Recreational Trails and Shared Use Paths

As previously mentioned the foundation of Lincoln's bicycle network is the off-street trails system consisting of recreational trails and shared use paths. These two types of off street trail facilities are very similar, consisting of a hard surface pathway of at least 10 feet in width to be used by pedestrians, joggers, bicyclists and in-line skaters. However, the recreational trails are facilities typically located within parks and greenways, whereas shared use paths are facilities within the right-of-way of an arterial but outside the roadway. This trail system (both recreational trails and shared use paths) is planned to expand according to the prioritized funding strategy adopted into the 2040 Long Range Transportation Plan. For this reason, the costs of these types of facilities are not included in the financial estimates in the Bicycle and Pedestrian Capital Plan since they are part of a separate funding and prioritization program in the 2040 Long Range Transportation Plan.

This trail system provides a strong asset from which to build in Lincoln. The trail system will be interconnected with the on-street system and together these facilities form the bicycle network. It is also important to note the sidewalk connections to the trails system such as the connection between Calvert and the Billy Wolff Trail along South 56th Street.

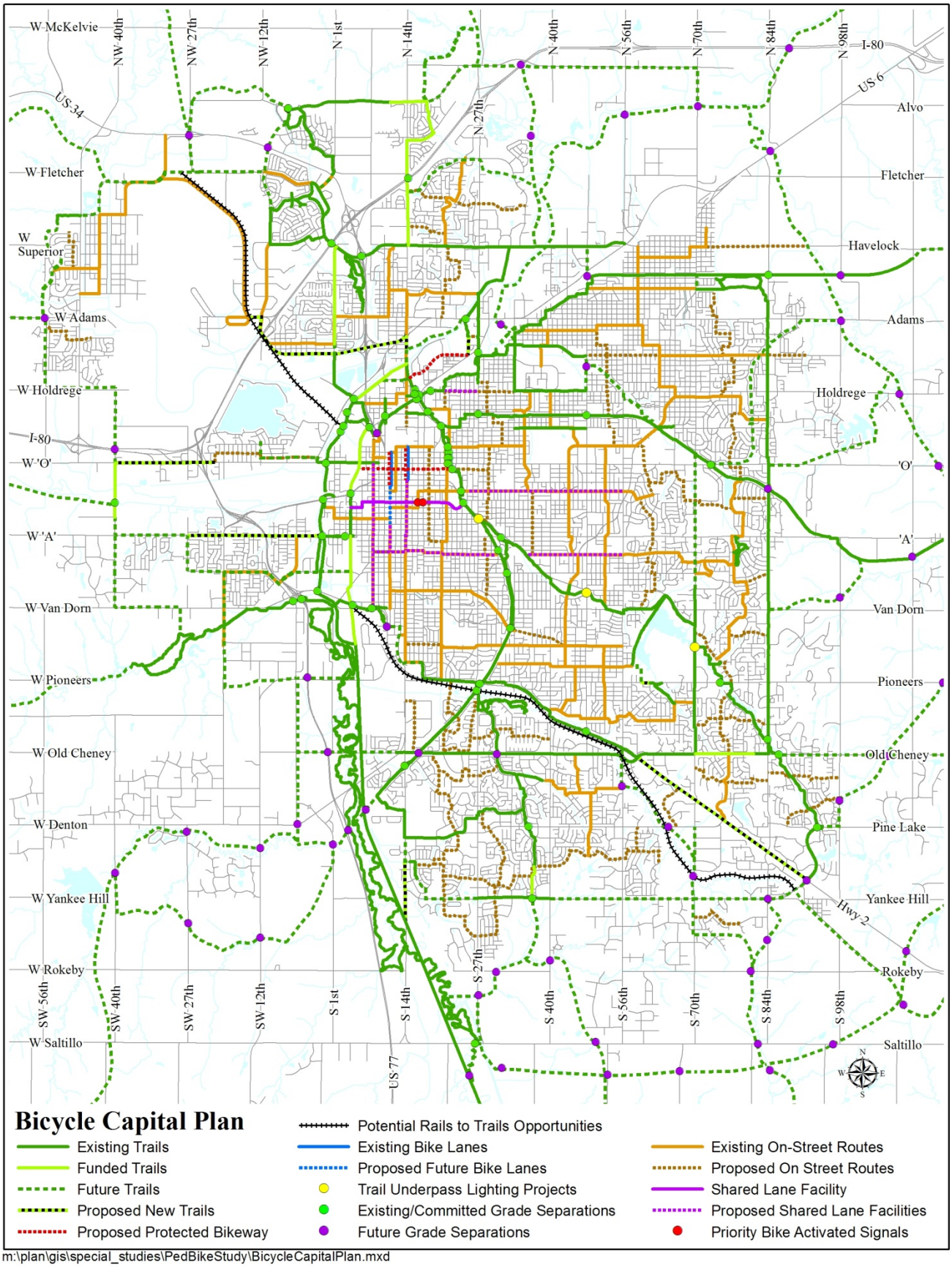
In review of the Proposed Bicycle Plan, there are 10.1 miles of new trails that have been identified for inclusion in the 2040 Comprehensive Plan and in the Long Range Transportation Plan. Figure 3-4 identifies these additional trail segments. The additions include the following:

- Highway 2 Trail extension
- Holmes Lake/Pioneers Boulevard trail connection
- Jamaica North/Yankee Hill Road/South 14th Street trail connection
- West A Street trail extension
- West O Street trail extension
- Theresa Street trail extension
- Cornhusker Highway trail from North 14th to North Park Road

Because of the popularity and use of the trails, there are some 10 foot trails that are reaching their capacity during peak periods and potentially could be widened to 12 or 14 feet in width to accommodate the volume of users. Examples of these high demand trails include the Helen Boosalis Trail from South 48th to South 27th Street, and the intersection of the Billy Wolff and Rock Island Trails at Capitol Parkway to the new Antelope Valley bicycle and pedestrian bridge south of Randolph Street.

As the trail system grows and becomes a greater element of the City's transportation system, a wayfinding system of signs to indicate the names of crossing streets, general trail navigation as well as directional signs to indicate major destinations will need to be provided. Such a system should be coordinated in design and functionality with the City's ongoing efforts to establish a pedestrian wayfinding system in the downtown and surrounding the new arena in the Haymarket.

FIGURE 3-4: PROPOSED CITY OF LINCOLN BICYCLE PLAN



m:\plan\gis\special_studies\PedBikeStudy\BicycleCapitalPlan.mxd

Priority Trail Connections: As the trails system is extended, it will also be important to provide short sidewalk connections from the neighborhoods that have major trails running through them to the trail. For a nominal cost of the short sidewalk length, these sidewalk connections will provide convenience for the neighborhoods and will result in increased trail usage.

The use of the existing public right-of-way that abuts the trail would be used to limit the cost of improvements. It should be noted that grade issues and other barriers may limit the ability to make some connections, and the maintenance responsibilities need to be worked out for these facilities.

The following provides a list of some of these neighborhood sidewalk connections to the trail system. These locations have been identified on Figure 3-5.

- Rock Island Trail Connections
- Washington Street within existing right-of-way (120 feet)
- Everett Street within existing right-of-way (50 feet)
- Arlington Street within existing trail right-of-way (50 feet)
- Franklin Street within existing trail right-of-way (70 feet)
- Unimproved pedestrian easement between 2626 and 2640 Colonial Drive (200 feet)
- MoPac Trail Connections
- 29th Street within existing right-of-way (85 feet on the south and 35 feet on the north)
- Fontenelle Street within existing right-of-way (100 feet)
- 45th Street within existing right-of-way (50 feet on the north and 45 feet on the south)
- North 48th Street – potential for a switchback to get direct access to 48th Street? (225 feet is an estimate)
- North 52nd Street within existing right-of-way (45 feet to the north). This is an important connection to make the 52nd Street bike route continuous north and south of the trail.
- East of 84th Street to the YMCA soccer fields to the north. Land is owned by Lincoln Public Schools so coordination with them would be needed. Length of connection is undetermined due to range of locations to make such a connection. Grades may be an issue. (660 feet is an estimate)
- Murdock Trail Connection
- West of North 84th Street –potential for a switchback to get direct access to 84th Street? (225 feet is an estimate)
- Helen Boosalis Trail Connections
- Dunn Avenue within existing right-of-way (15 feet to the north)

Priority Major Trail Projects: As part of the development of the 2040 Comprehensive Plan and the Long Range Transportation Plan, there were two trails that received a high level of interest. They are the Prairie Corridor along the Haines Branch trail extension (see Figure 3-6) and the grade separation facility between the Haymarket and the UNL campus that would avoid at-grade crossings of 9th and 10th Streets (see Figure 3-7). Both projects provide significant trail system connectivity and are considered high priority projects. As part of the trail system, these projects are included in the 2040 Plan's trail system so the costs of these projects are not included in the financial estimates in the Bicycle and Pedestrian Capital Plan.

Figure 3-5: Potential Neighborhood to Trail Connections

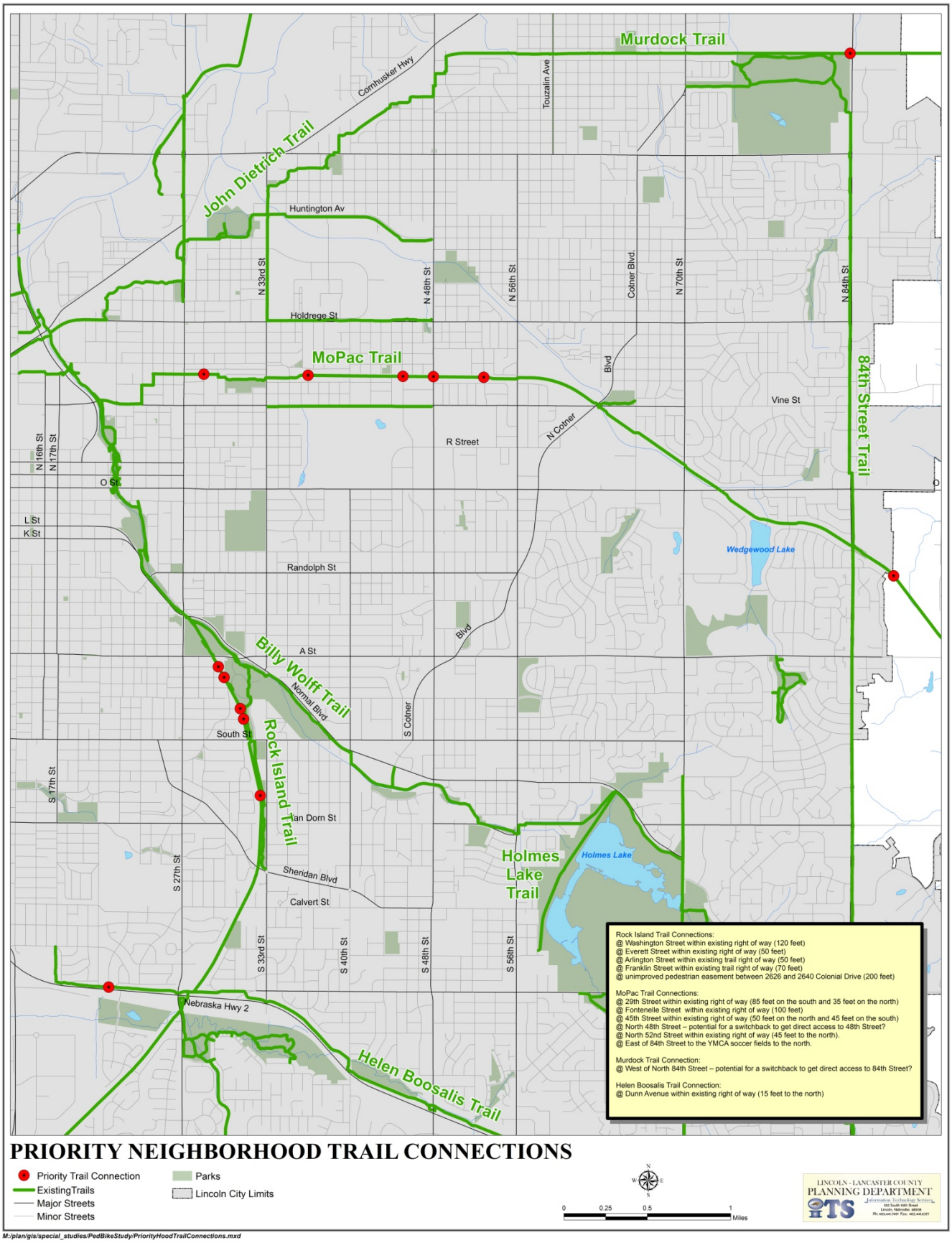


FIGURE 3-6: PRIORITY TRAIL PROJECT – PRAIRIE CORRIDOR HAINES BRANCH TRAIL EXTENSION

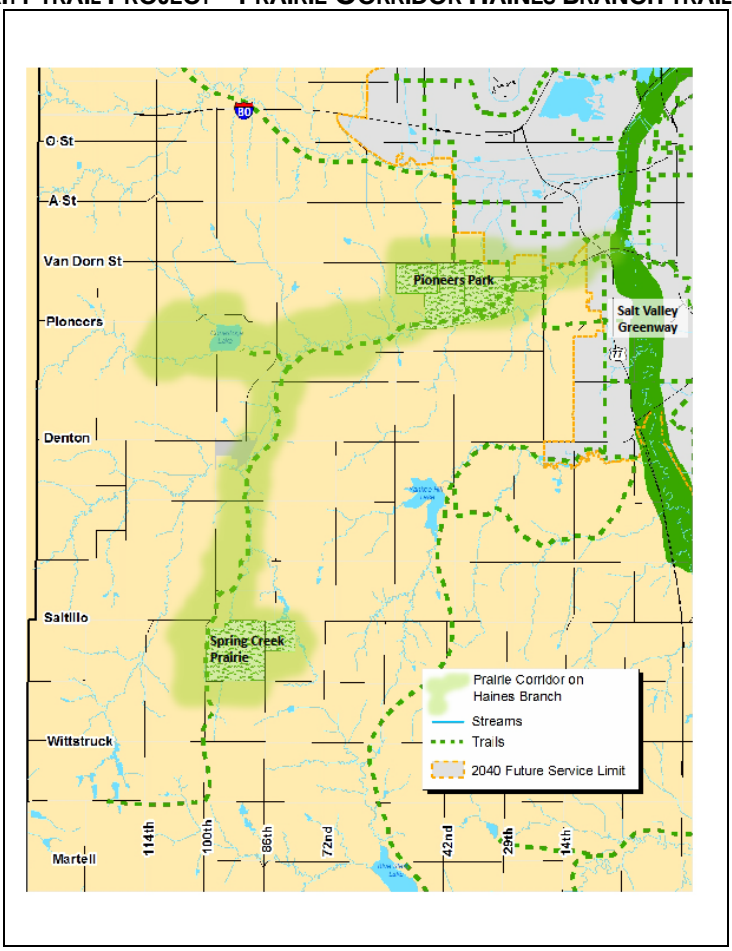
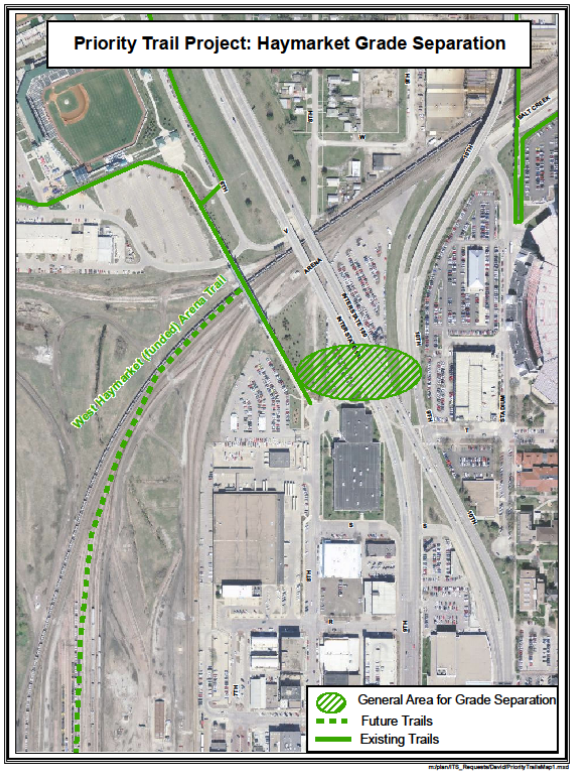


FIGURE 3-7: PRIORITY TRAIL PROJECT – HAYMARKET GRADE SEPARATION



Rails to Trails: A popular method for expanding the trails system has been the use of rail corridors that are no longer operational. There are two rail corridors within the City that would provide trail expansion opportunities if these rail lines are ever abandoned. See Figure 3-4 for the location of these potential future trail opportunities. These include:

- Highway 2 and Beal Slough running south and east; and
- Rail line running from the rail yard west of Haymarket to the north and west around the airport property.

At-Grade Trail Crossings: As trails intersect and cross arterials, there needs to be some protection for the bicyclists or pedestrians that use these facilities. Under ideal conditions these trail extensions would be grade separated with construction of the arterial. The street improvement projects that are constructed should include planned grade separations as part of the project. Unfortunately, some of these arterials are not planned for improvements for many years. Therefore, it may be more feasible, both in cost and in timing, to provide at-grade trail crossings of arterial roadways in the near to mid-term timeframe.

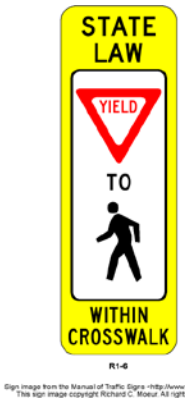
There are many lower cost solutions to a grade separation that might be $1 million, or a signal at $250,000, to address some of these arterial crossings. There are a number of at grade crossing solutions that could be considered. These include the following.

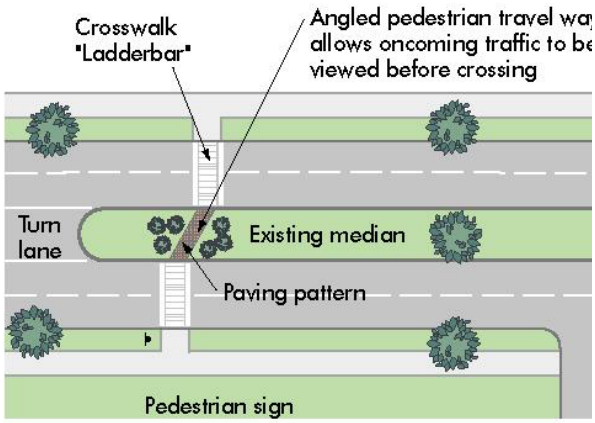
Pavement Markings and Signage: All road and major driveway crossings should be clearly identifiable with crosswalk markings. Additional enhancements may include raised crosswalks and/or decorative pavement markings such as stamped colored concrete. The need for increased safety at trail crossings was a predominant theme throughout the public input process.

In addition to crosswalk pavement markings, all at-grade crossings should also be accompanied by appropriate signage as recommended in the Manual of Uniform Traffic Control Devices (MUTCD). Such signage should include a message to drivers that they must yield to pedestrians in the crosswalk.

Mid-Block Crossings with Median Refuge Island: Mid-block crossings should be provided where there is an existing or potential pedestrian demand to cross at higher volume roadways or streets where existing crossings are more than 800 feet away. Where space is available, these crossings should be accommodated with a refuge island. Where mid-block crosswalks are installed at uncontrolled locations (i.e., where no traffic signals or stop signs exist), crossing islands should be considered as a supplement to the crosswalk in order that the pedestrian or bicyclist will only cross one direction of traffic at a time. Painted medians offer little refuge other than getting the pedestrian out of a lane of traffic. Substantive raised medians of significant width with a cut through provide some increase in security for the crossing pedestrian. For arterials with four or greater lanes, a raised median refuge island should be designed for all intersections and mid-block crossings. Center crossing islands allow pedestrians to deal with only one direction of traffic at a time, and enable them to stop partway across the street and wait for an adequate gap in traffic before crossing the second half of the street. Providing an angled pedestrian travel way across the median allows oncoming traffic to be better viewed before crossing, further improving safety.

Further, to react to public feedback that education is necessary to inform drivers that it is State law to yield to pedestrians in a crosswalk, it is recommended that eye catching signage as is recommended by the MUTCD be utilized at all mid-block crossings which are not otherwise signalized. Such signage should instruct drivers that it is State law to yield to pedestrians in the crosswalk.





Pedestrian Actuated Rectangular Rapid Flashing Beacon (RRFB): An alternative to a traffic signal when a signal is not warranted is the Pedestrian Actuated Rectangular Rapid Flashing Beacon (RRFB). The RRFB is a special LED flashing device installed below a crosswalk sign and placed at marked and signed but unsignalized crosswalk locations. The RRFB increases pedestrian visibility by attracting driver attention with the flashing beacons and making them aware of the pedestrian's presence. The MoPac trail crossing of North 33rd Street is identified as a first use of this enhanced crossing treatment and is identified on Figure 3-10. Other trail crossings of major streets that could benefit from this treatment may be identified in the future.

On-Street Bike Routes

The on-street bike routes provide the local grid to connect the resident with their destinations and the trail system. Bike Routes are located on residential streets and low volume collector roadways where the automobile and bicyclist share the travel lane. These facilities are signed with bike route signs on both sides of the street at approximately five per mile or when a bike route might begin, end, turn on to an intersecting street, or intersect with another bicycle facility.

In response to public input for better cyclist safety on designated bike routes, it is recommended that a "Share the Road" sign be installed consistent with MUTCD standards and Bike Route sign spacing. Such a sign responds to public input in a variety of ways ranging from driver education, increased cyclist safety and awareness by cyclists and motorists that they are not only permitted but encouraged to use the road.

In addition to the bike route and share the road signs, some higher volume collector roadways might benefit with a pavement marking defined as a sharrow. Sharrows are becoming a popular form of bike route pavement marking and include the following benefits:

- Encourage motorists to be more aware of bicycles.
- Increase the distance between bicyclists and parked cars.
- Increase the distance between bicyclists and passing vehicles.
- Reduce the number of sidewalk riders.
- Significantly reduce the number of wrong-way riders.

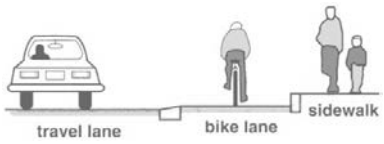
It should further be noted that the addition of the sharrow has both the higher initial installation cost and needs to be replaced more frequently than the bike route sign alone. Potential bike routes that should be considered for sharrow markings include 8th Street, 11th Street, 14th Street, Sumner, J, and Holdrege. See Figure 3-4 to view these routes.

When reviewing Figure 3-4, note that all future bike routes would require the cost of sign

installation. Because of the lack of bike route sign maintenance, there are many locations where bike route signs need to be reinstalled or old worn signs replaced.

Typical installation of the bike route signs and sharrows are included in the Manual of Uniform Traffic Control Devices (MUTCD) and should be followed accordingly.

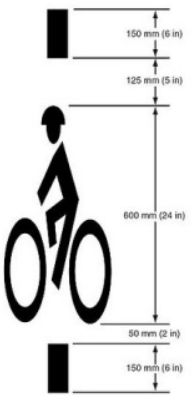
Bike Routes and Limited Turning Movement Intersections: When a bike route intersects with an intersection that prohibits certain turning movements (i.e., either by signage or medians prohibiting left turns or prohibiting thru traffic by way of a median), the bicyclist is to follow the legal flow of traffic on the street they are traveling. The desired crossing or turn movement should only be made when the biker may safely make that movement by following the rules of the road. The best location to make this movement is at the nearest allowed traffic intersection, or at the nearest pedestrian crossing where available.



On a case by case basis, consideration may be given to situations where higher volumes of bike users along particular routes may suggest a median break to allow only bike traffic to cross an arterial to provide more convenience to the biker. If such an option is considered, previously mentioned crossing treatments should be considered.

Bicycle Activated Signals: Any designated bike routes that intersect with a signalized intersection should be considered for installation of in-pavement signal loop detectors that detect bicycles. In addition, intersections with higher traffic volumes and/or elevated bicyclist conflicts should be considered priority intersections for Bicycle Activated Signal enhancements. Ideally this would be done with a street overlay maintenance project when all signal loops are replaced. If bicycle detection is already available at a signal, then that signal should be equipped with the following pavement markings to indicate where a cyclist should position themselves in order to activate the signal. If a signal on a Bike Route requires a push button for activation, placement of those buttons should be located near the roadway and convenient to cyclist without requiring dismounting or entering the sidewalk.

Figure 9C-7. Example of Bicycle Detector Pavement Marking



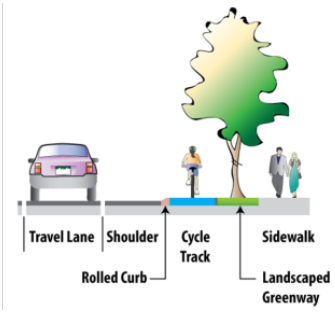
R10-22

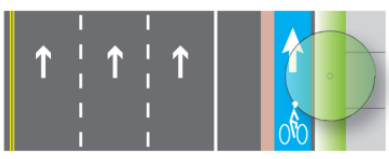
Bike Lanes

A bicycle lane is a bikeway on a portion of a street that has been designated by striping, signage, and pavement markings for the preferential or exclusive use of bicycles. These bike lanes are five feet or wider. Because of the additional 10 feet or more for bike lanes on two sides of a street, they have limited opportunity of use within the City given the available right-of-way. As streets are developed in the outlying areas, the use of bicycle lanes should be considered along corridors where it may make sense.

Protected Bikeways

Protected bikeways, often referred to as a Cycle Track, is a facility that has some physical separation through the use of bollards or raised curb to keep the cyclist separated from the automobile. These facilities would typically be located in high density areas where the protected bikeway provides safety and separation for high bicycle demand. As part of the update to the City of Lincoln Downtown Master Plan, a protected bikeway has been proposed for N Street from the Antelope Valley trail at approximately 22nd Street to the new trail along Arena Drive that is part of the West





Haymarket development. A second protected bikeway project is proposed within the Innovation Campus project. The locations and extents of these potential protected bikeway projects are shown on Figure 3-4. Future opportunities for protected bikeways are also identified on 14th Street and 11th Street in the Master Plan.

Potential Bike Lane and Protected Bikeway Projects:

- Extend 11th Street bike lane concept from K Street to C Street with lanes in both directions. This concept is included in the Greening America's Capitals plan. Details of this facility need to be worked out, especially interaction with on-street parking.
- Protected bikeway facility on N Street from the West Haymarket trail to the Antelope Valley Trail. Details of this facility need to be worked out with the implementation of the project based on the approved Downtown Master Plan Update.
- Potential protected bikeway facility in the Innovation Campus development connecting the Antelope Valley Parkway to the eastern terminus of the campus roadway connection at Salt Creek Roadway. Details of this facility need to be worked out with the development.
- There is potential for a future protected bikeway on 11th and 14th Streets where bike lanes exist today. Details of this facility need to be worked out with the implementation of the project based on the approved updated Downtown Master Plan. These improvements would be installed after the N Street facility is installed and considered a viable option for additional application.

PAVED SHOULDERS

The pavement edge line with a paved shoulder provides a separated space for the bicyclist much like a bike lane. Such facilities are most useful in rural settings. Shoulders four feet wide are considered the minimum width to accommodate bicycle traffic. Experienced riders will benefit from shoulder widths as narrow as one to two feet, but these facilities should not be signed for bicyclists. Surface irregularities such as rumble strips, textured paving, and raised lane markers should be avoided on routes intended for bicyclists. AASHTO recommends that four feet of ride-able surface be present for bicyclists if rumble strips are used on a shoulder.

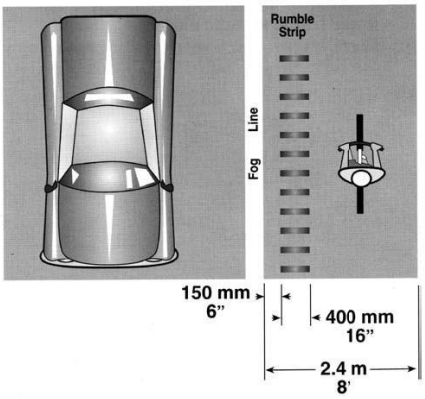


Figure 3-8 indicates those roadways that include paved shoulder facilities.

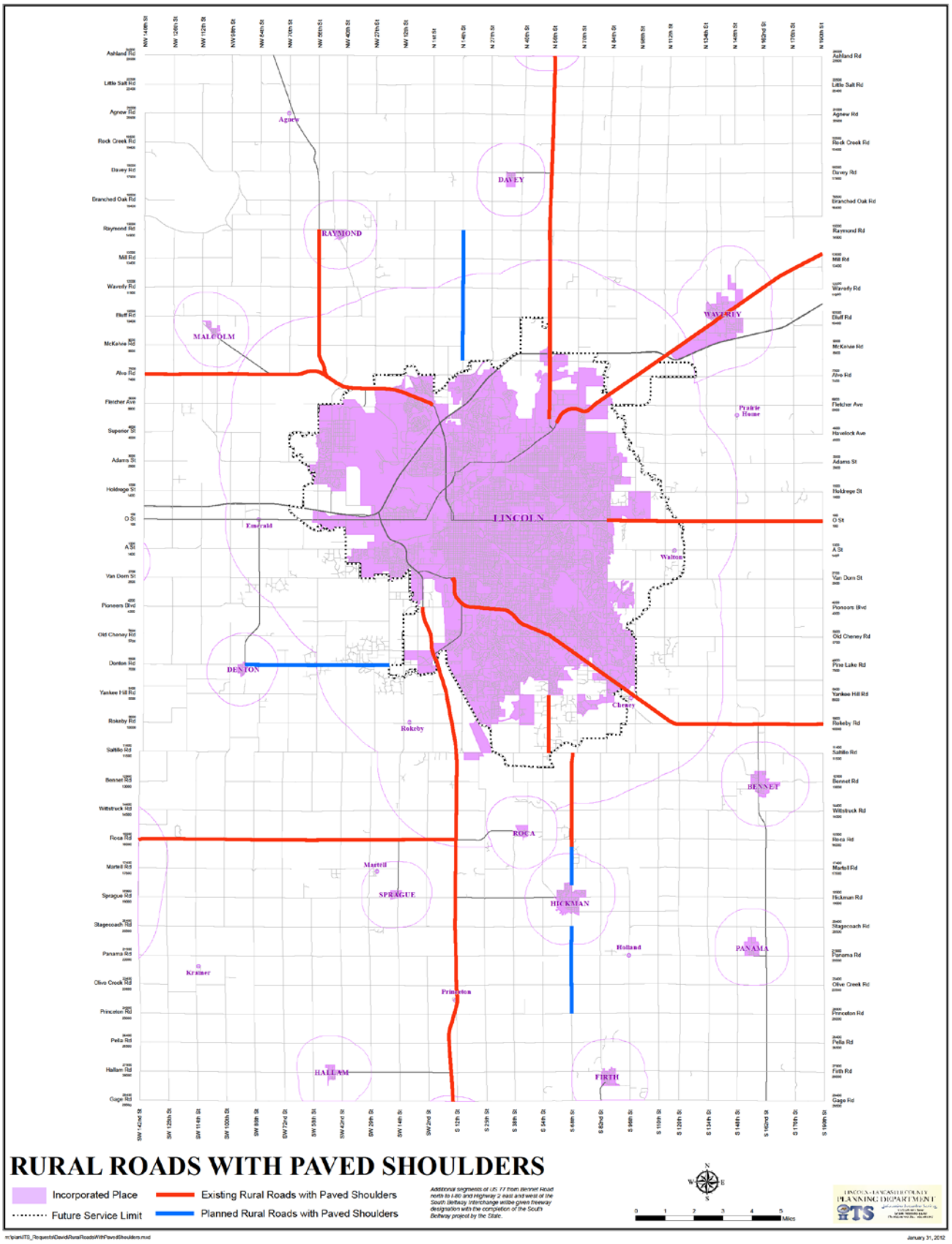
LIGHTING

A key requirement of the bicycle network is security, which is associated with whether the bicyclist can be seen, particularly at night. There is the need to "light" bike trail underpasses where they are not yet lighted or where there is not sufficient daylight access designed into the underpass. In addition, there are some key locations along the bike trail system that should have some night lighting. The locations are shown on Figure 3-4.

- Trail underpass at 70th Street near Holmes Lake;
- Trail underpass at 48th Street south of Normal Boulevard; and
- Trail underpass at 27th Street and Capital Parkway.

Lighting serves to make the trail more appealing to users by increasing both perceived and real safety. Due to the high cost of installation and maintenance, however, further study is necessary to determine which existing trail segments should be prioritized for lighting. Lighting is most important in trail segments that serve high levels of commuters, have high levels of conflicts, incorporate a road intersection, or at trail heads. Lighting should also be considered for all new trail segments.

FIGURE 3-8: RURAL ROADS WITH PAVED SHOULDERS



Bicycle Parking and Storage

Convenient and secure bicycle parking should be provided at the destination end of a trip. Inadequate bicycle parking facilities and fear of theft are major deterrents to bicycle transportation. A sufficient supply of effective bicycle parking requires a properly designed rack in an appropriate location for the type of use.

The provision of bicycle parking in the public realm and in private developments provides a level of convenience to the biking community and sends a message of acceptance to the community that bicycling is an option. This, along with the other improvements included in this strategy, will help grow support for biking and increase its viability.

Racks should be highly visible so bicyclists can spot them immediately when they arrive from the street. A visible location also discourages theft and vandalism. Adequate lighting and surveillance is essential for the security of the bicycles and the users. Bicycle racks and lockers must be well anchored to the ground to avoid vandalism and theft.

Bicycle lockers should be provided at locations such as park and ride lots, parking garages, transit centers and employment centers.

Bicycle parking facilities should meet these requirements:

- Hold the bicycle frame, not just a wheel;
- Can be used with a U-shaped shackle lock;
- Accommodate wide range of bicycle sizes, wheel sizes and types;
- Is covered with material that will not chip the paint of a bicycle that leans against it; and
- Does not have hazards, such as sharp edges.

There are many types of bicycle racks and lockers available. Some are suitable for certain situations but not others, and some designs are unsuitable anywhere. There are two general categories of bicycle parking requirements:

Long-Term parking is needed where bicycles will be left for hours at a time. It requires a high degree of security and weather protection, with well-designed racks in covered areas, lockers, storage rooms, or fenced areas with restricted access. Underutilized spaces in parking garages and inside employment buildings are opportunities for this type of parking.

Short-Term parking is needed where bicycles will be left for short stops. It requires a high degree of convenience (as close to destinations as possible). Some short-term bicycle parking should be protected from the weather (a portion can be unprotected, since demand tends to increase during dry weather). This can use an existing overhang or covered walkway, a special covering, weatherproof outdoor bicycle lockers, or an indoor storage area.

The following table provides a guideline for providing parking spaces for different land uses.

Table 3-2: Recommended Minimum Bicycle Parking Requirements

Use	Required Bicycle Parking
Multi-Family Dwellings	1 space per 4 dwelling units
Elderly and Retirement Housing	1 space per 20 beds
Group Living	1 space per 20 beds
Public/Semi-Public Uses	5% of required auto spaces
Education and Instruction	1 space per 10 students
Civic Services	1 space per 3,000 sq. ft. of floor area
Commercial Office/ Financial/Professional	1 space per 3,000 sq. ft. of floor area
Commercial Recreation and Entertainment Facilities and Major Entertainment and Event	5% of required auto spaces
Retail Sales and Services	1 space per 3,000 sq. ft. of floor area
Hotels and Motels	1 space per 10 employees
Food and Drink Establishments	1 space per 1,000 sq. ft. of floor area
Office	1 space per 3,000 sq. ft. of floor area
Heavy Commercial Services	1 space per 10,000 sq. ft. of floor area
Manufacturing, Processing, Storage and Distribution and Waste Management and Extractive Services	1 space per 10 employees

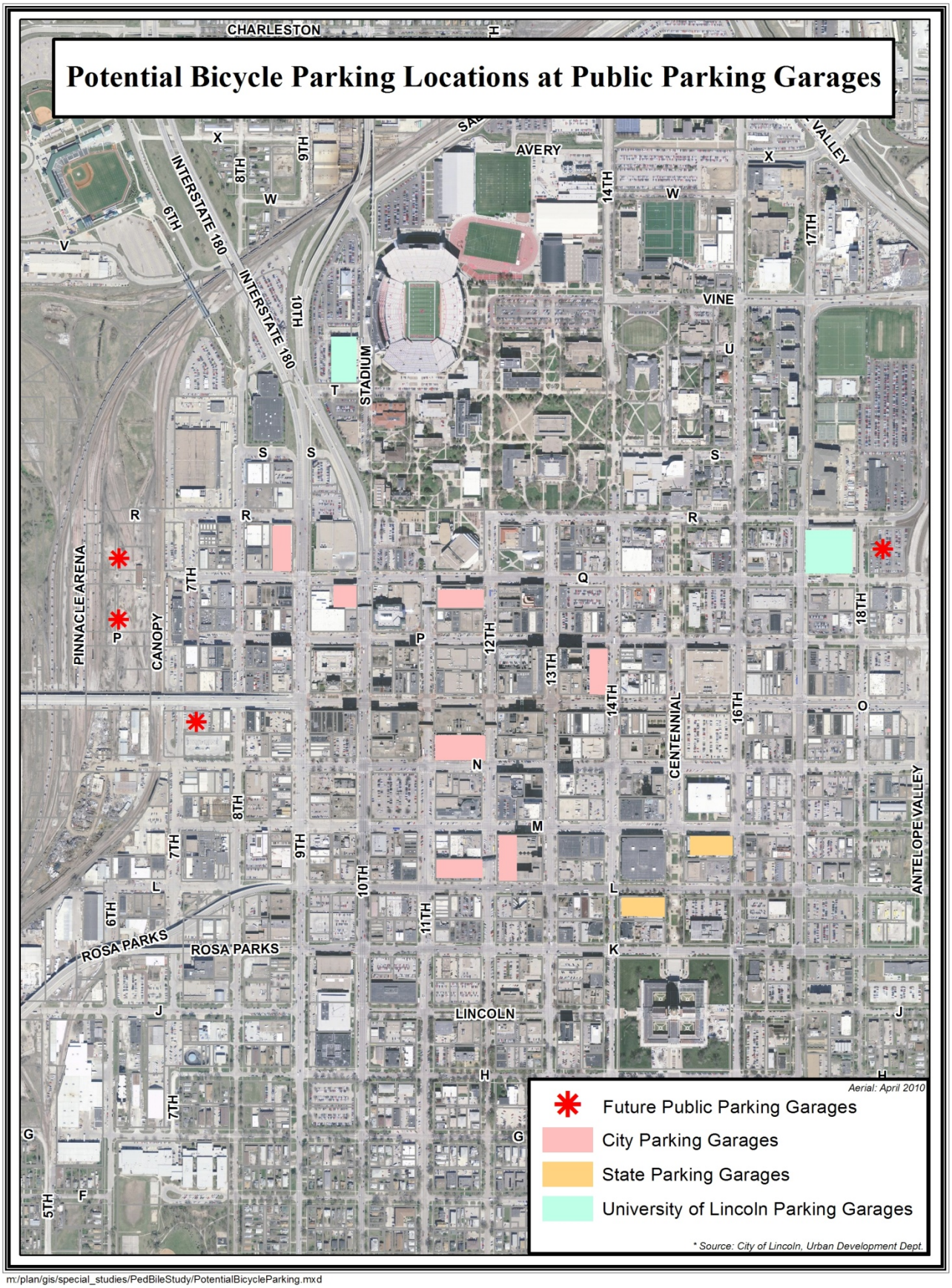
There are a number of bicycle parking options that could be considered. These include the following:

- Provide protected and secure bicycle parking facilities in all public (City, State, UNL) parking garages and lots. (see Figure 3-9)

- Use some strategic on-street parking spaces in higher bike and pedestrian usage areas such as Downtown, Haymarket, University Place, College View, and Havelock.

- Install inverted U racks at bus stops along routes with high usage of bus bike racks. These efforts would likely be focused on bus routes that serve college campuses and would be funded through transit enhancement funding sources.

FIGURE 3-9: POTENTIAL LOCATIONS FOR PUBLIC BICYCLE PARKING AND STORAGE



m:/plan/gis/special_studies/PedBileStudy/PotentialBicycleParking.mxd

Pedestrian Plan

Walking is an essential part of our daily activities, whether it is trips to work, shop, or play. Lincoln's greatest pedestrian asset is the long standing policy of requiring sidewalks on both sides of all City streets and connectivity between subdivisions. Because of this policy, the vast majority of homes and businesses are served by Lincoln's 1,500 miles of sidewalks. The continuation of this requirement for sidewalks to be installed on both sides of all streets is imperative for future development areas. See Figure 2-2 in Chapter 2 to view the existing sidewalk system in Lincoln.

Another longstanding policy that needs to continue to be applied is the requirement to limit block lengths in new development areas along with the requirement to install pedestrian easements when block lengths do get lengthy. If a block exceeds 1,000 feet in length, a pedestrian easement is required to maximize pedestrian directness, which is critical to the pedestrian network. Sidewalks should not be placed adjacent to the curb, but separated by a landscaped parkway consistent with the City's Design Standards for street trees, parking screening and landscaping. The standard to require street trees is another existing standard that should continue for the benefit of the pedestrian environment.

The rehabilitation of sidewalks, particularly in older residential and commercial areas, has proven to be a challenge. The responsibility for rehabilitation of sidewalks was passed from the adjoining property owner to the City in two separate votes during the early 1990s. The sidewalk rehabilitation program has been underfunded in the recent past. In order to continue this program at an appropriate level, serious consideration of increased funding must be taken. Only $500,000 has recently been allotted this program annually when much more is needed. This program is especially important for older areas of the city where sidewalks are in worse disrepair.

Sidewalk and pedestrian ramps are required to comply with the American's with Disabilities Act (ADA). The City of Lincoln follows its ADA Transition Plan and utilizes its available maintenance and rehabilitation budget for ADA ramp improvements to assist citizens with disabilities and will continue to implement this plan.

The residential and arterial street pavement rehabilitation program has historically provided maintenance funding for rehabbing and replacing sidewalks and installing ADA accessible curb ramps. Additional funding for these programs is identified in the 2040 Long Range Transportation Plan and additional funding was approved as part of the FY 2012 budget process. This will increase the amount of rehabilitation of streets and with that the pedestrian system will experience even more improvements throughout the system. However, additional funding for these programs is needed to address both the street needs and sidewalk needs throughout the city.

Proposed Improvements

Although the City has an excellent pedestrian network, there are additional pedestrian improvements that are needed. These include:

Completing Missing Gaps: Some gaps in the sidewalk network exist and have been identified as priorities related to schools, parks, activity centers, and gaps in the arterial street sidewalk system. Figure 3-10 identifies the priority sidewalk system connection locations. These locations include the following:

- West side of South 40th Street south of Highway 2 from Sweetbriar to Wildbriar
- Cornhusker Highway from North 11th Street to North 1st Street
- West side of South 27th Street from Tipperary Trail to Jameson

- Near Holmes Elementary School, North of A Street, install sidewalk along the east side of Fall Creek Road
- Near Kooser Elementary, install a piece of sidewalk on the south side of Humphrey Ave. between 14th and Trinidata Road
- Near Lakeview Elementary, install a sidewalk along the north side of P Street from Capitol Beach Blvd. and Bell Street
- Near Pershing Elementary, install a sidewalk on the east side of 65th Street across from the school site between Knox Street and Fremont Street
- Near Randolph Elementary, install a north/south sidewalk on the west side of 38th Street between A and D Street
- Near Rousseau Elementary, install a sidewalk along the north side of Calvert Street west of Hanson Drive
- Near West Lincoln Elementary, install a sidewalk on the south side of Nance Avenue east of the school between 4th and Chester Street
- South side of A Street from SW 24th Street to SW 38th Street

Pedestrian Amenities at Transit Stops: A quality pedestrian environment which is visually interesting with pedestrian amenities is critical for an area to promote itself as pedestrian friendly. Through transit enhancement funding sources, potential improvements for installing heightened pedestrian connections, amenities such as lighting and benches/shelters, and wider sidewalk space at bus stops along routes with high ridership could be provided.

Priority Pedestrian Projects: There are a number of priority projects that were identified as part of the field survey and as input from the Mayor's Pedestrian and Bicycle Advisory Committee and City staff. These projects are summarized as follows:

- **Grade Separation:** Provide a grade separation facility between the Haymarket and the UNL campus providing a connection that avoids at-grade crossings of 9th and 10th Streets and provides a significant pedestrian system connection. This is especially important with increased major events at the new West Haymarket arena and for football weekends. See Figure 3-7 to view the location of this needed grade separation.
- **Pedestrian Countdown Signal Heads:** It is a goal of the City to have all signalized intersections include pedestrian countdown signal heads. Therefore, the objective is to install pedestrian countdown signals at those signalized intersections that do not yet include such technology as funding is available. It would also be the Plan's policy to install countdown signal heads when a signal is replaced or built new. See Figure 3-12 to view the identified intersections needing these signal heads.
- **Intersection Traffic Control:** There are intersections located throughout the City that have relatively high traffic volumes and pedestrian activity but no traffic control to assist the pedestrian to cross. If the traffic volumes do not meet minimum signal warrants volumes, then other potential solutions including the Pedestrian Actuated Rectangular Rapid Flashing Beacon (RRFB) and the Pedestrian Hybrid Beacon- High Intensity Activated Crosswalk (HAWK) should be evaluated and considered.
- **Mid-Block Pedestrian Crossings:** Pedestrians will typically not walk more than a few hundred feet to walk to an intersection to cross an arterial. In situations where block lengths are near 1,000 feet or more and there exists a high demand of pedestrian trips from one side of an arterial to the other, a mid-block pedestrian crossing should be considered and constructed to meet standard design regulations. See Figure 3-10 to view the identified mid-block pedestrian crossings.
- **Pedestrian Wayfinding:** Implement a pedestrian wayfinding system throughout the City with an initial emphasis on Downtown.

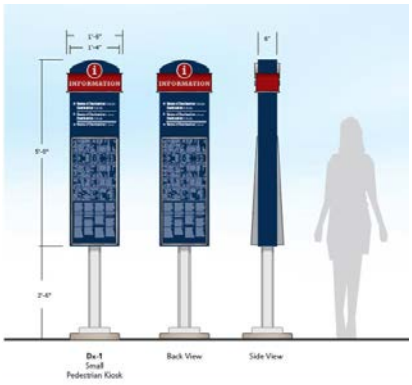
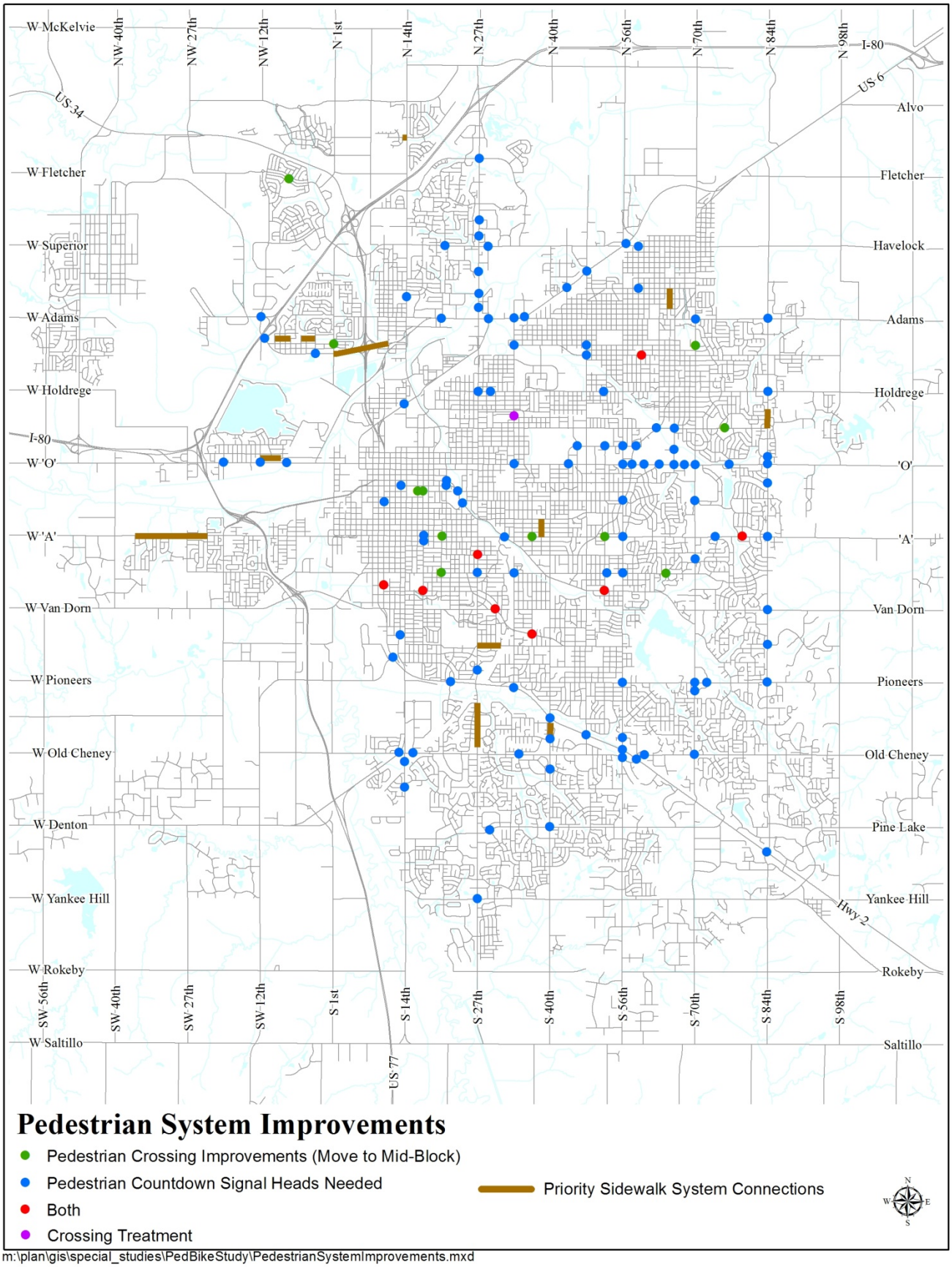


FIGURE 3-10: PROPOSED PEDESTRIAN SYSTEM IMPROVEMENTS



m:\plan\gis\special_studies\PedBikeStudy\PedestrianSystemImprovements.mxd

Bicycle and Pedestrian Capital Plan Cost Estimates

The cost estimates for the Bicycle and Pedestrian Capital Plan are based on planning level unit costs for various improvements multiplied by the number of miles or units that will be necessary to complete these improvements. These costs are presented in Table 3-3. Note that shared use paths/multi-use trails and grade separations that will be funded through the trails program and through various arterial street improvement projects are not included in this listing but are assumed to be constructed according to the funding assumptions for these programs in the 2040 Long Range Transportation Plan.

As presented, the total cost to implement the proposed bicycle and pedestrian plan is estimated at $4.5 million. It should be noted that in Chapter 4: Implementation Strategies, a more detailed discussion as to how these projects will be prioritized is presented.

Table 3-3: Total Project Cost Estimates

Facility Type	Number	Units	Cost per Unit	Cost
Cycle Tracks	3.1	Miles	$360,000	$1.12 M
Existing Bike Routes w/ "Share the Road" signs	82	Miles	$2,000	$164,000
New Bike Routes w/ "Share the Road" signs	53.6	Miles	$4,000	$214,400
New Bike Routes with Growth	56	Miles	$3,000	$168,000
Shared Lane Markings	9.0	Miles	$3,000	$27,000
Additional Shared Lane Markings with Growth	20	Miles	$3,000	$60,000
Sidewalk Connections to Trails	1,975	Linear Feet	$25.00	$49,375
Enhanced At Grade Trail Crossings	5	# Crossings	$20,000	$100,000
Trail Underpass Lighting	3	# Underpasses	$20,000	$60,000
Bike Activated Signals	2	# Intersections	$40,000	$80,000
Completing Missing Sidewalk Gaps	23,760	Linear Feet	$25.00	$594,000
Public On Street Bike Parking	12	8 Inverted U/space	$1,600	$19,200
Public Garage Bike Parking	15	# Garages	$15,000	$225,000
Pedestrian Countdown Signal Heads	736	# Signal Heads	$90.00	$66,240
Mid-Block Crossings	18	# Crossings	$80,000	$1.44 M
Pedestrian Wayfinding	1	System	$331,700	$331,700
Cyclist Wayfinding	1	System	$8,000	$8,000
Total Costs				**$4.65 M**

South Beltway, Highway 77 and Highway 2

Although there has been discussion surrounding the construction of the South Beltway and designating a portion of Highway 77 and Highway 2 as a Freeway for many years, it is now evident that it is possible these changes could occur within the timeframe of this Plan. In accordance with State law, these roadways will legally not be able to accommodate cyclists after completion. As a result, it is necessary to consider how the installation of the South Beltway and change in designation for Highway 77 and Highway 2 will impact the City of Lincoln and Lancaster County's cycling and pedestrian network.

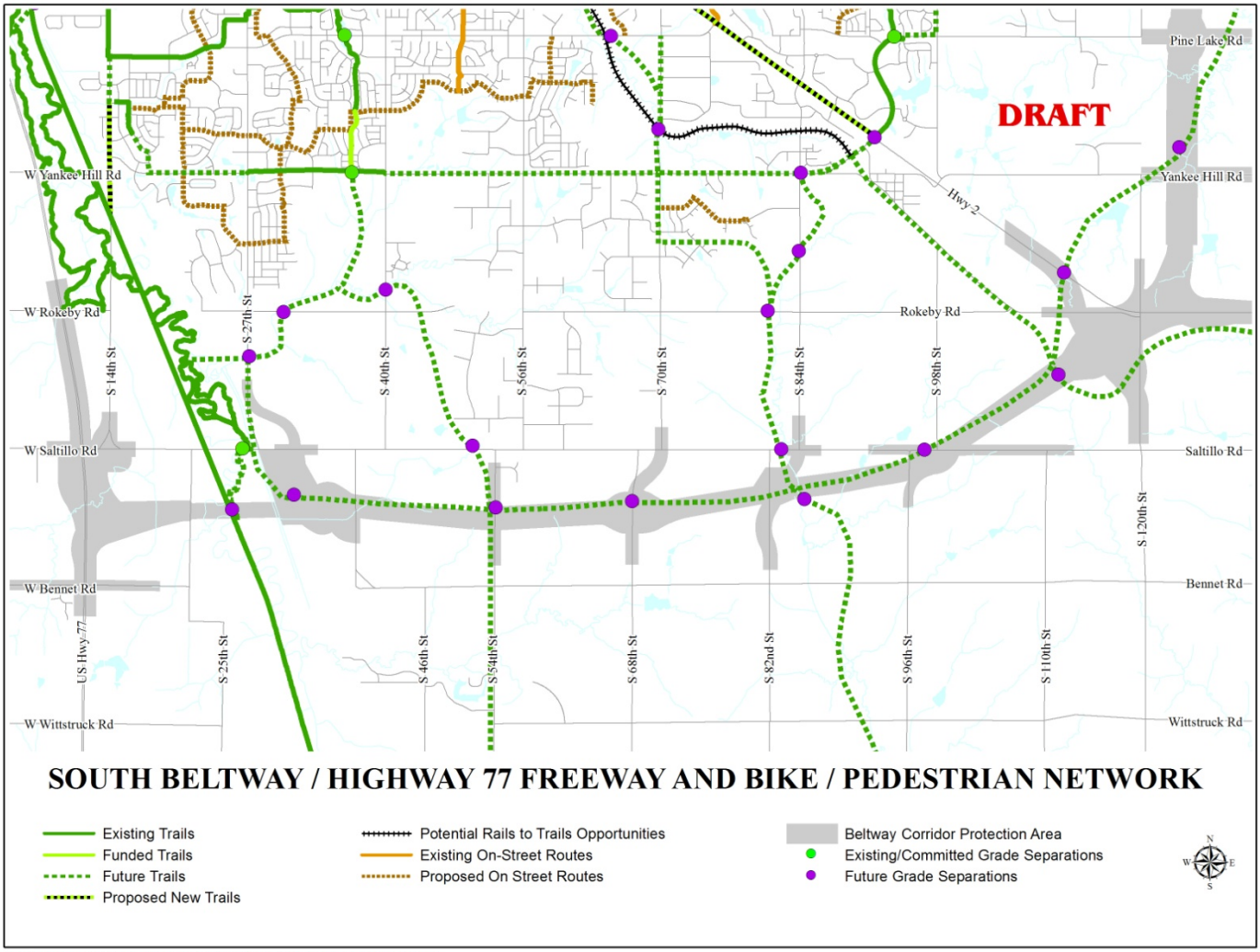
Based on conversations with the Nebraska Department of Roads (NDOR), the Planning Department has created maps and a general plan for providing cyclist and pedestrian accommodations which will avoid the new road installations while, to the extent possible, providing access to the same destinations. It is anticipated that the cyclist and pedestrian improvements as identified will be accommodated in the South Beltway Project. *Specific locations and funding for the bicycle and pedestrian infrastructure identified in the South Beltway corridor are subject to further discussions with NDOR. As a result, a cost estimate for the infrastructure necessary to mitigate the impacts from the South Beltway project on the City's bicycle and pedestrian system have not been included in this Plan.* Further, as the exact alignment for the South Beltway and associated road connections have not yet been determined, the identified cyclist and pedestrian improvements are subject to change. See Figure 3-11, Figure 3-12 and Figure 3-13.

Highway 77 Change in Designation: In creating a link to the South Beltway from Interstate 80, Highway 77 will be designated a Freeway from Interstate 80 to the South Beltway interchange. Since cyclists are not permitted on Freeways in the State of Nebraska, it is necessary to reroute cyclists to another entry/exit point South of the South Beltway Interchange. Following review of our street and cycling network, the interchange of Highway 77 and Highway 33/State Spur 55 appears to be the most logical new connection. In order to accomplish this connection, it will be necessary to install shoulders along South 14th Street from Vavrina Boulevard to the Jamaica North Trail. The Jamaica North Trail will then need to be paved at a 10 foot width from South 14th Street to Highway 33/State Spur 55 near Roca. To connect the Jamaica Trail to Highway 77, paved shoulders of Highway 33/State Spur 55 to Highway 77 will need to be installed. See Figure 3-11 and Figure 3-12.

South Beltway: The construction of the South Beltway will require the creation of several grade separated trail crossings as well as trail alignments which accommodate the new roadway. NDOR will design and construct the South Beltway to accommodate these future trail facilities. Generally, the South Beltway will be paralleled by a trail which is connected at several locations by access routes to the greater Lincoln trail system.

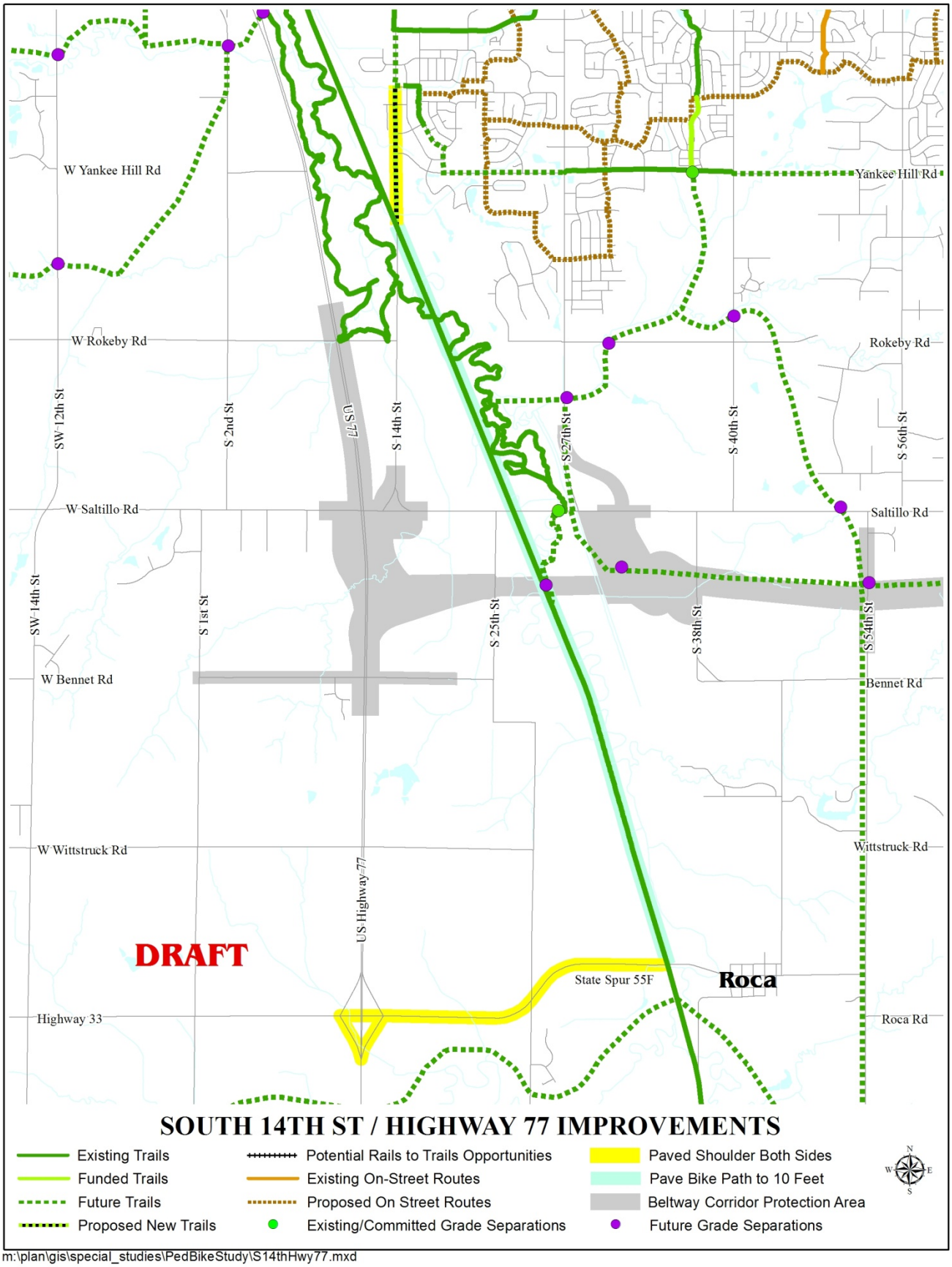
Highway 2 Change in Designation: In order to accommodate a cyclist connection back onto Highway 2, paved shoulders along Old Cheney Road from 88th Street to 148th street will be established. Further, shoulder improvements will occur from Old Cheney Road along 148th Street to Hooper Road to 158th Street which will then allow access to Highway 2 at the interchange. See Figure 3-11 and Figure 3-12.

FIGURE 3-11: PROPOSED SOUTH BELTWAY / HIGHWAY 77 BIKE / PEDESTRIAN NETWORK



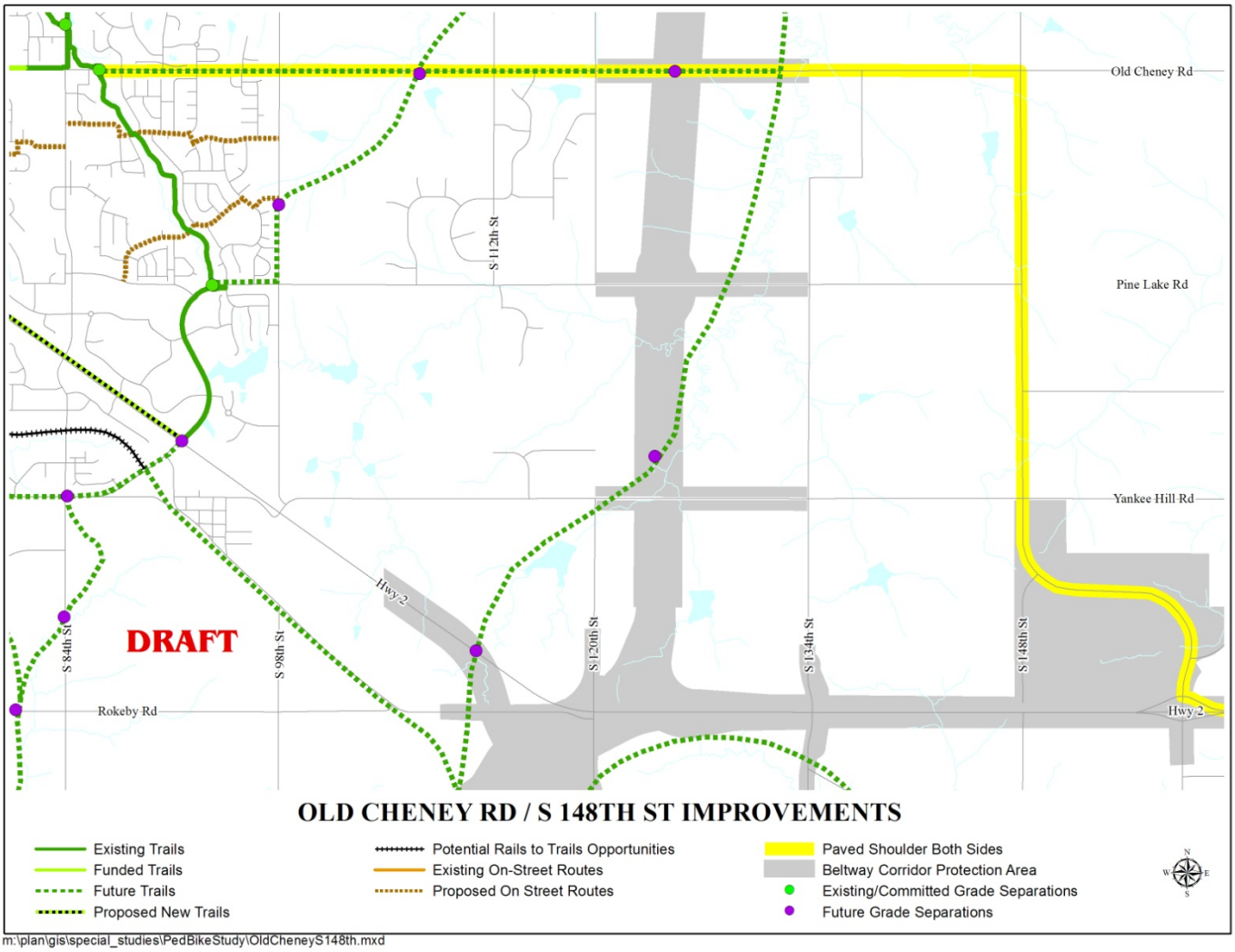
m:\plan\gis\special_studies\PedBikeStudy\SouthBeltwayPedNetwork.mxd

FIGURE 3-12: PROPOSED SOUTH 14TH STREET / HIGHWAY 77 IMPROVEMENTS



m:\plan\gis\special_studies\PedBikeStudy\S14thHwy77.mxd

FIGURE 3-13: PROPOSED OLD CHENEY ROAD / 148TH STREET IMPROVEMENTS



m:\plan\gis\special_studies\PedBikeStudy\OldCheneyS148th.mxd

4 Implementation Strategies

The implementation of the City of Lincoln's Bicycle and Pedestrian Capital Plan will require many different strategies for the plan to be successful. These strategies include funding, policy implementation, design standards and prioritization of projects.

Funding

As previously presented in Chapter 3, the total cost to implement the projects identified in the Bicycle and Pedestrian Capital Plan is $4.5 million. Based on limited current funding levels, it will take many years beyond the 2040 planning horizon year to complete all of the bicycle and pedestrian improvements identified in the plan. In order to reasonably complete the Bicycle and Pedestrian Capital Plan elements, some improvements will need to continue to be accomplished through existing and future funding programs in addition to obtaining dedicated annual bicycle and pedestrian funds. These additional funding program options are described as follows:

Sidewalks: Sidewalks on both sides of local streets and arterials have been required for all new streets and have resulted in a very good pedestrian network for the City. Continuation of the policy that holds the developer responsible for new sidewalks, as well as the City for installing sidewalks with public street improvements will be critical to complete the sidewalk network as the City continues to grow.

In this Chapter

Recreational Trails/Shared-Use Paths: The recreational trails and shared-use paths are a critical element to the Bicycle and Pedestrian Capital Plan. The 2040 LRTP has identified $850,000 dollars in dedicated annual funding for recreational trail improvements, which will provide a significant number of new trails within the 2040 timeframe, but not all. The Public Works & Utilities Department has completed many miles of shared use paths and related grade separations as part of major roadway projects. This level of effort will need to continue in order to complete as many miles of new trails and paths and grade separations as possible over time. The City has also been able to acquire grants and donations to assist in the development of the trail system. These grants and donations must continue to be pursued.

Bike Routes and Shared Lanes: The implementation of the bike route program will require installation of bike route signs and in strategic locations shared lane pavement markings. Currently, the City has a pavement management plan that targets pavement overlays and reconstruction on a scheduled basis. If a shared lane pavement marking is to be installed along a particular street, that street segment should be given additional priority with the pavement management plan so that the shared lane marking improvement may be coordinated with the pavement maintenance program and have them installed with new asphalt in order to extend the life of the marking.

Street Rehabilitation Programs: The City of Lincoln implements arterial street and residential street rehabilitation programs on an annual basis. Street rehabilitation projects often include improvements to the related sidewalk system and ADA accessible curb ramp improvements. Recently additional funding has been programmed into the City's street rehabilitation programs. These programs at the increased level of funding should continue in order to improve the pedestrian system as much as possible.

At Grade Trail Crossings: Historically, the City has included in its roadway improvement program funding for grade separated trail crossings when the arterial is constructed. This is the ideal and most cost effective time for making these improvements and is recommended for continuation. However, when there is a gap in time between when a trail is constructed and when a grade separation for that trail can be constructed with an arterial street project, at grade trail crossings of arterial streets may be the most cost effective way to develop the trail system.

Sidewalk Connections to Trails: This is currently and unfunded program. Ideally, these sidewalk connections should be included in the trail costs when constructing new trails, but bicycle and pedestrian capital funding could be used for construction of sidewalk connections to existing trails.

Sidewalk Missing Gaps: The construction of missing gaps has occurred ad hoc as part of ongoing roadway maintenance. This process is proposed to be continued with the opportunity to use some bicycle and pedestrian capital funding to assist in project construction.

Intersection Traffic Control: The safety of the street system is the responsibility of the City of Lincoln's Public Works & Utilities Department and is a very important aspect of the pedestrian and bicycle network. Efforts related to this should continue and should increase over time as the street system expands.

On-Going Maintenance Needs: In addition to the need to provide adequate funding for the bicycle and pedestrian capital projects, the importance of having an adequate and ongoing maintenance budget to maintain and replace infrastructure such as signs and worn markings over time needs to be considered during regular budget discussions.

Bicycle License Fees: Establishing a bicycle licensing fee, the proceeds from which could be dedicated to bicycle improvements and programs, is a strategy that should be pursued.

Project Evaluation and Prioritization

The Bicycle and Pedestrian Capital Plan will take years to implement all plan elements. In order to provide some prioritization of bicycle and pedestrian projects from year to year, it is necessary to identify key measurements that can be used to evaluate the projects and select those for short term implementation. This evaluation checklist consisted of developing a list of evaluation criteria that responded to the City of Lincoln's issues and needs used to develop the full list of improvements.

These issues and needs included connections to key destinations, completing missing segments, addressing safety problems, etc. Through this process, eight evaluation measures were developed with two additional measures for ADA considerations for those projects that would directly benefit a known person with disabilities. The resulting evaluation concept is presented in Figure 4-1, with the evaluation criteria defined in Figure 4-2.

Figure 4-1: Bicycle and Pedestrian Evaluation and Prioritization Criteria

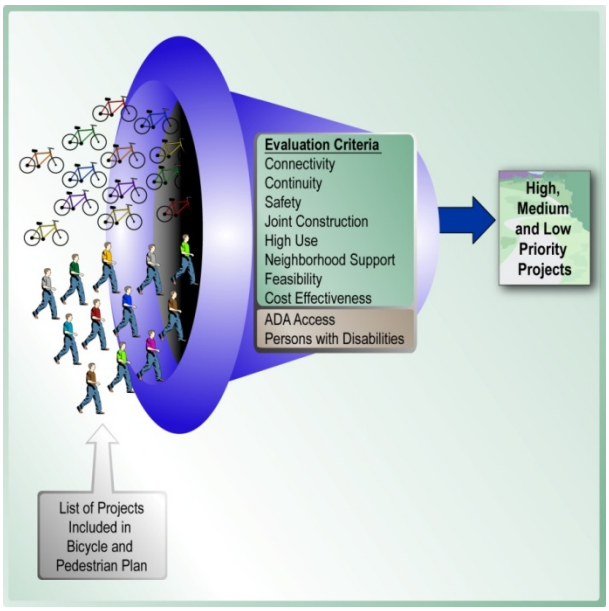


Figure 4-2: Evaluation Criteria

Bicycle and Pedestrian Project Selection and Priority Criteria

Connectivity:	Will the project provide connections or access to major employment, business, shopping, civic uses, schools, senior facilities, and public housing?
Continuity:	Does the project provide for a missing link in the system or eliminate a barrier that inhibits use?
Safety:	Does the project mitigate a known safety hazard?
Joint Construction/ Developer Contribution:	Can the project be "piggybacked" with other major project(s), such as a road widening or land development project?
High Use:	Will the project result in a likelihood of use (*i.e.*, satisfy demand, increasing use)?
Neighborhood Support:	Is there strong neighborhood support for the project?
Feasibility:	Is the project ready to be implemented (*i.e.*, right-of-way acquired, preliminary engineering completed)?
Cost Effectiveness:	Does the project represent a good value for the investment?
Pedestrian Facilities	
ADA:	Is the project required to comply with ADA?
Persons w/ Disabilities	Does the project provide improvements to meet the needs of a person with disabilities?

Ordinance and Design Standard Recommendations

The City of Lincoln currently has existing ordinances and design standards that address much of the needed plan improvements that will help create a more useable bicycle and pedestrian system. Continued enforcement of these existing rules is very important to the success of the Plan. There are, however some additional codes and ordinances to consider for improving bicycle and pedestrian mobility within the community.

Bicycle Parking

Providing bicycle parking and storage is essential to promote a bicycle and pedestrian environment. In order to achieve this goal the City should include in its design standards requirements for a minimum amount of bicycle parking facilities using quality racks in appropriate locations with adequate space, lighting, public viewing, and convenience related to public entrances.

Coordination

Coordination and communication among the various City and County Departments regarding bicycle and pedestrian planning and implementation of improvements or programs is critical. The current internal and external review processes should be evaluated to ensure bicycle and pedestrian needs are considered as an integral part of the review process.

It should also be noted that currently there does not exist a dedicated staff employee to oversee the bicycle and pedestrian program. The creation of a Bicycle and Pedestrian Program Manager should be strongly considered. This person would be given the authority to leverage funds for bicycle and pedestrian improvements. The duties of this Bicycle and Pedestrian Program Manager would also include coordinating City bicycle and pedestrian planning efforts and programs with other local, regional and state agencies.

The 5 E's – Engineering, Education, Enforcement, Encouragement, and Evaluation

Facilities are only one of several elements essential to building a successful bicycle and pedestrian planning transportation system. With bicycle and pedestrian safety education and training encouraging walking and bicycling, and enforcing the rules of the road as they pertain to bicyclists, pedestrians, and motorists should be combined with facilities development to form a comprehensive approach to bicycle and pedestrian use. The 5 E's - Engineering, Education, Encouragement, Enforcement, and Evaluation – is an important element for a comprehensive bicycle and pedestrian plan.

- **Engineering.** Engineering includes facilities, maintenance, and parking. An adequate bicycle or pedestrian transportation system is one that allows users with varying abilities to safely and efficiently travel from origin to destination. Bicycle facilities include on-street facilities such as bike lanes, bike routes, low-volume roads and roads with adequate shoulders, and off-street facilities such paths, bridges, overpasses, and underpasses.
- **Education.** Education of the public is the most important element in reducing bicyclist and pedestrian injuries, reducing hostility between the various transportation modes, ensuring that the law is obeyed, and facilities are properly designed and built. Bicyclists, pedestrians, and motorists need safety education. Police officers need to continue to receive education regarding the manner in which to enforce bicycle and pedestrian laws, and engineers and planners need facility design education.
- **Encouragement.** Encouraging bicycling and walking can help mitigate air pollution and traffic congestion, as well as promote healthier, friendlier communities. One-way trips of three miles or less are often suitable for bicycling. Often bicyclists are willing to travel even further distances for commuting trips or recreation. Shorter trips are often suitable for walking. Providing safe, well-designed and

maintained facilities encourages bicycling and walking. Annual events, such as Bike to Work Day or Walk to School Day promote bicycling and walking through events and media attention. These events are designed to celebrate non-motorized transportation, encourage people to bicycle or walk, build awareness through safety campaigns in the media, and institutionalize bicycling and walking as viable modes of transportation.

- **Enforcement.** Enforcement goes hand in hand with education. Education is not effective if there is not enforcement to back it up. Therefore, it is important to enforce the rights and responsibilities of all modes of transportation by ticketing motorized and non-motorized transportation users alike. Bicyclists and pedestrians should be expected to be ticketed for traffic offenses the same as motorists.
- **Evaluation:** Evaluation involves monitoring outcomes and documenting trends through data collection before and after transportation improvements. Evaluation includes review of existing policies and standards, monitoring traffic volumes and flow, evaluating crashes, prioritization of future projects and identifying potential funding sources.

Performance Measures and Critical Success Factors

Defining success and measuring performance is essential to execution of any plan, both in the short and long term. In past transportation plans there have not been clear performance measures defined to assess whether the plan is meeting objectives. The development of performance measures for the Bicycle and Pedestrian Capital Plan would be done to better assure its success.

Performance measure data should be easy to collect to minimize the cost, yet provide an indication as to how the plan implementation is working. Some performance measurements to consider are as follows:

- Total miles of bicycle facilities by type and percent change from previous year;
- Households within one-half mile of a bicycle facility;
- Number of pedestrian gaps completed;
- Number of enhanced crosswalks and mid-block crossing completed;
- Number of pedestrian facilities that have been reconstructed to be ADA compliant; and
- Tracking of pedestrian and bicycle crash statistics for trends over time and identification of high crash locations.

These performance measures represent a sampling of what could be included in an annual bicycle and pedestrian performance report. Each factor will be tracked for the current year, as well as past years with applicable data. Recommended annual performance goals in each area will define progress toward the key achievements defined in the Plan.

Prioritized Project Listing

Acknowledging the financial reality that there is limited dedicated funding for capital pedestrian and bicycle projects, a majority of the identified projects in this Plan cannot be accomplished by the year 2040. Thus a prioritized listing of the projects was created to identify the best use of limited available funding. Table 4-1 indicates this listing of prioritized projects using constrained funding amounts for the first half of the planning period from 2013-2025. The evaluation criteria highlighted earlier was used to determine which projects should receive limited funding in this timeframe.

Table 4-1: Near Term (2013-2025) Prioritized Project Listing

Priority Facility	Number	Cost
Existing Bike Routes with "Share the Road" signs(update with new signs)	82 miles	$164,000
New Bike Routes with "Share the Road" signs (new signs)	53.6 miles	$214,400
Share Lane Markings	9.0 miles	$27,000
Trail Underpass Lighting	3 underpasses	$60,000
Bike Activated Signals	2 intersections	$80,000
Completing Missing Sidewalk Gaps	2 miles	$264,000
Sidewalk Connections to Trails	1,000 feet	$25,000
Enhanced At Grade Trail Crossings	1 crossing	$20,000
Public On Street Bike Parking	6 spaces	$9,600
Public Garage Bike Parking	4 garages	$60,000
Pedestrian Countdown Signal Heads	736 signal heads	$66,240
TOTAL COST		**$990,240**