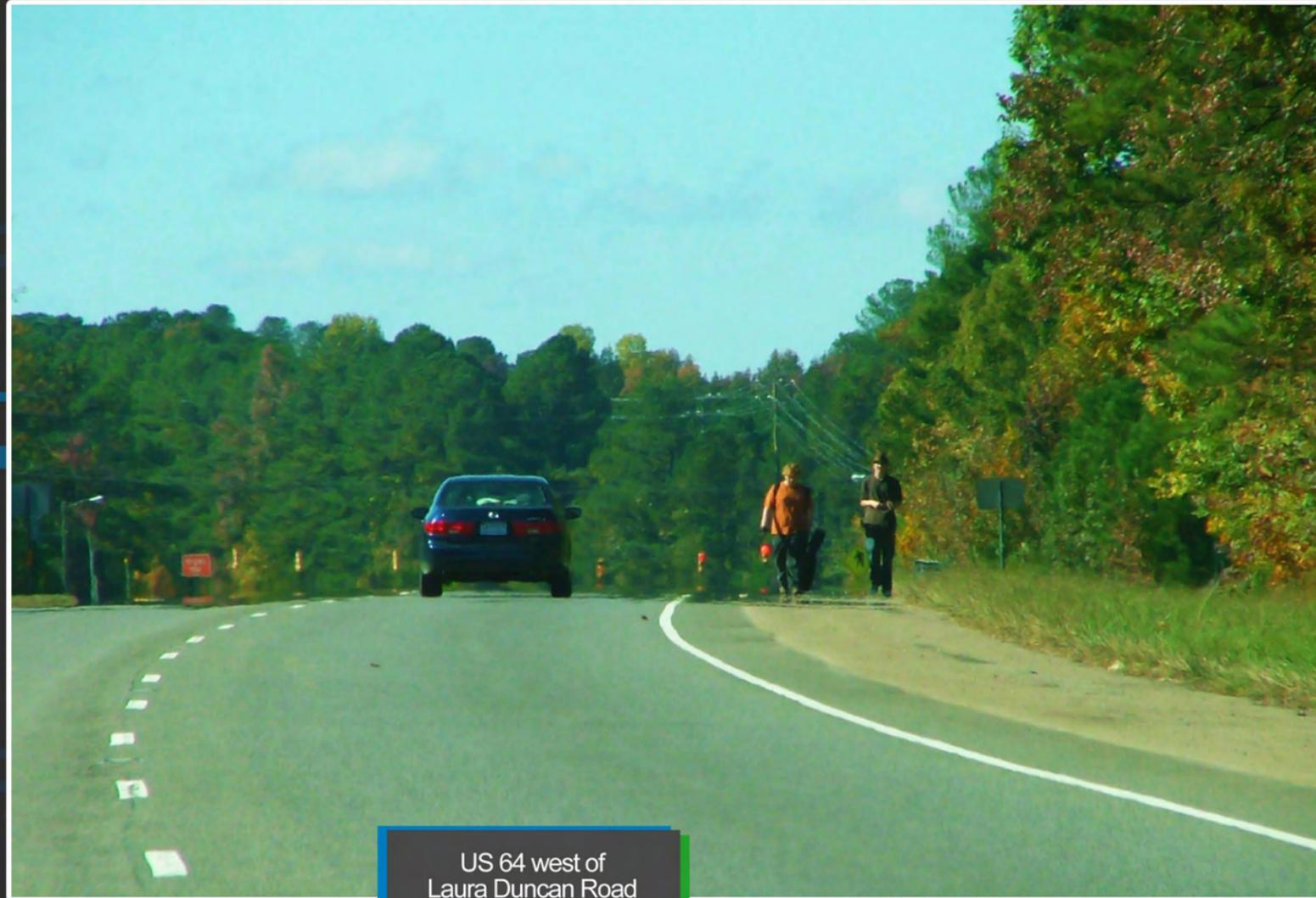




# Chapter 5: System Linkage Evaluation





US 64 west of  
Laura Duncan Road  
(October 2009)

## CHAPTER 5. SYSTEMS LINKAGE EVALUATION

An evaluation of the multi-modal systems along the US 64 corridor is the focus of this chapter. The primary means of transportation along US 64 is by motor vehicle; however, there is a substantial need to provide for improved connectivity for all modes of transportation, including transit, bicycles and pedestrians.

### 5.1 MULTI-MODAL PLANS

There are a number of plans along the corridor that discuss providing multi-modal systems throughout the study area. The following section provides summaries of the current plans.

#### 5.1.1 TOWN OF PITTSBORO PEDESTRIAN TRANSPORTATION PLAN (2009)

The Town of Pittsboro Pedestrian Transportation Plan was completed in 2009 and includes recommendations for pedestrian improvements within the planning jurisdiction of the Town. The plan includes a proposed greenway along the west side of the Haw River that would pass beneath the existing US 64 bridges over the Haw River. The plan does not include any other proposed pedestrian improvements within the study area.

#### 5.1.2 TOWN OF APEX BICYCLE, PEDESTRIAN AND EQUESTRIAN PLAN (2002, AMENDED 2009)

The Town of Apex developed the Apex Transportation Plan in 2002, since this time the maps included in the plan have been updated and reflect the currently approved plans for bicycle, pedestrian and equestrian facilities within the Town of Apex planning jurisdiction. The plan includes the following information for locations within the study area:

- US 64 – proposed multi-use path for bicycles and pedestrians along US 64 from the Chatham County line to east of Lake Pine Drive
- New Hill Road – proposed wide outside lanes for bicycles and sidewalks on both sides of the road
- Jenks Road/Jenks Road Extension – proposed wide outside lanes for bicycles and sidewalks on both sides of the road
- Kelly Road - proposed wide outside lanes for bicycles and sidewalks on both sides of the road
- Creekside Landing Drive – existing multi-use path across US 64
- Green Level Church Road - proposed wide outside lanes for bicycles and sidewalks on both sides of the road
- NC 55 – proposed sidewalk on one side of the road and proposed greenway beginning on the north side of US 64
- Davis Drive/North Salem Street (through US 64 interchange area) - proposed wide outside lanes for bicycles and sidewalks on both sides of the road
- North Salem Street (north of US 64) – proposed wide outside lanes for bicycles
- Laura Duncan Road – proposed wide outside lanes for bicycles, sidewalks on both sides of the road and a proposed multi-use path north of US 64
- Shepherd's Vineyard Drive – proposed sidewalk on south side of US 64, proposed pedestrian bridge over US 64
- Lake Pine Drive – proposed wide outside lanes for bicycles and sidewalks on both sides of the road

#### 5.1.3 TOWN OF APEX TRANSIT PLAN (2002, AMENDED 2009)

The Town of Apex developed the Apex Transportation Plan in 2002, since this time the maps included in the plan have been updated and reflect the currently approved plans for transit within the Town of Apex planning jurisdiction. The plan includes the following information for locations within the study area:

- An existing Triangle Transit bus route along US 64 from the eastern edge of the planning jurisdiction to NC 55
- An existing Triangle Transit bus route along NC 55
- Two existing railroads running in the north-south direction between Davis Drive and Laura Duncan Road
- A future Cary Transit bus corridor along Lake Pine Drive between Cary and downtown Apex
- A proposed future regional light rail corridor running in the north-south direction along the existing rail corridor slightly west of Laura Duncan Road

#### 5.1.4 TOWN OF APEX PARKS, RECREATION, GREENWAYS AND OPEN SPACE MASTER PLAN (2001)

The Town of Apex developed the Parks, Recreation, Greenways and Open space Master Plan in 2001. The plan includes the following information for locations within the study area:

- US 64 – proposed multi-use path for bicycles and pedestrians along US 64 from the Chatham County line to east of Lake Pine Drive
- American Tobacco Trail – existing multi-use path
- New Hill Road – proposed sidewalks on both sides of the road
- Jenks Road/Jenks Road Extension – proposed sidewalks on both sides of the road
- Kelly Road - proposed sidewalks on both sides of the road
- Creekside Landing Drive – existing multi-use path across US 64
- Green Level Church Road - existing sidewalks on both sides of the road
- NC 55 – proposed sidewalk on one side of the road and proposed greenway beginning on the north side of US 64
- Davis Drive/North Salem Street (through US 64 interchange area) - proposed sidewalks on both sides of the road and designated as an existing bicycle route
- Laura Duncan Road – existing sidewalks on west side of road and proposed sidewalk on east side of road with an at-grade crossing of US 64
- Lake Pine Drive – proposed sidewalks on both sides of the road with an at-grade crossing of US 64

#### 5.1.5 TOWN OF CARY COMPREHENSIVE PEDESTRIAN PLAN (2007)

The Town of Cary developed the Town of Cary Comprehensive Pedestrian Plan in 2007 and it was subsequently included as the pedestrian element of the Town of Cary Comprehensive Transportation Plan that was completed in 2008. The plan includes the following information for locations within the study area: a funded sidewalk project along Mackenan Drive, south of US 64. In addition to the above improvement, sidewalks have previously been approved along Queensferry Road and Glasgow Roads to the north of US 64.

### 5.1.6 TOWN OF CARY COMPREHENSIVE TRANSPORTATION PLAN (2008)

The Town of Cary adopted their Comprehensive Transportation Plan in September 2008 and it included bicycle element and a transit element, as well as the incorporation of the Comprehensive Pedestrian Plan as the pedestrian element. The bicycle element of the Comprehensive Transportation Plan includes the following information for locations within the study area: proposed Swift Creek Greenway that follows Mackenan Drive to US 64, crosses US 64 and runs parallel to US 64 before turning to the northwest and intersecting with Lake Pine Drive.

The transit element of the Comprehensive Transportation Plan includes the following information for locations within the study area: a future Cary Transit route from downtown Cary to NC 55 slightly south of US 64, via downtown Apex, which is proposed to travel along the Lake Pine Drive and NC 55 corridors.

### 5.1.7 TOWN OF CARY PARKS, RECREATION AND CULTURAL RESOURCES FACILITIES MASTER PLAN (2003)

The Town of Cary adopted the Parks, Recreation and Cultural Resources Master Plan in December 2003. The plan includes the following information for locations within the study area: proposed Swift Creek Greenway that follows Mackenan Drive to US 64, crosses US 64 and runs parallel to US 64 before turning to the northwest and intersecting with Lake Pine Drive.

In addition to the Master Plan, the Town of Cary also published a *Bike&Hike Map* that includes the Swift Creek Greenway following the same path, but includes a future pedestrian tunnel or bridge across US 64.

### 5.1.8 WAKE COUNTY TRANSPORTATION PLAN (2003)

The Wake County Transportation Plan was adopted in 2002 and includes a portion of the US 64 near the western edge of the county. The plan includes the following information for locations within the study area:

- NC 751 – proposed wide outside lanes for bicycles
- American Tobacco Trail – existing multi-use path
- Kelly Road - proposed wide outside lanes for bicycles

### 5.1.9 CAPITAL AREA METROPOLITAN PLANNING ORGANIZATION – 2035 LONG RANGE TRANSPORTATION PLAN (2009)

The Capital Area MPO Long Range Transportation Plan was adopted in May 2009. The plan includes the following information related to regionally significant off-road and on-road facilities for locations within the study area:

- US 64 corridor from the Chatham County line to US 1 identified as a significant on-road facility for bicycle accommodations
- NC 751 and Kelly Road identified as significant on-road bicycle –pedestrian facilities
- NC 55 identified as a state bicycle route

The Long Range Transportation Plan also includes recommendations for future transit service including the following:

- Express bus service along NC 540/I-540 corridor and along NC 55 corridor
- Light rail line from Apex to Cary crossing US 64 between Laura Duncan Road and Davis Drive

### 5.1.10 NORTH CAROLINA DEPARTMENT OF TRANSPORTATION CHATHAM COUNTY BICYCLE MAP

NCDOT developed a bicycle map for Chatham County in the 1990's that designated the bicycle routes within the county. The map includes the following information for locations within the study area: bicycle connector routes along Hanks Chapel Road, Mt. Gilead Church/North Pea Ridge Road, and Farrington Road/Beaver Creek Road.

### 5.1.11 OTHER FACILITIES WITHIN THE STUDY AREA

In addition to the approved plans within the study area, two major existing facilities and one proposed facility are important features for systems linkage along the US 64 Corridor.

#### American Tobacco Trail

The American Tobacco Trail is a 22-mile long Rails-to-Trails project, running along an abandoned railroad bed originally built for the American Tobacco Company in the 1970s. The route crosses through the City of Durham, Durham County, Chatham County, the Town of Apex, the Town of Cary and Wake County. The American Tobacco Trail is part of the East Coast Greenway and is open to pedestrians, cyclists, equestrians (in non-urban sections), and other non-motorized users. The American Tobacco Trail crosses the US 64 corridor in western wake county through a culvert under US 64.

#### Jordan Lake State Recreation Area

The Jordan Lake State Recreation Area is located in Chatham County and is maintained by the North Carolina Division of Parks and Recreation and includes a 14,000 acre reservoir and nine recreation areas, including: Crosswinds Campground, Ebenezer Church, Parker's Creek, Poplar Point, Seaforth, Vista Point, Robeson Creek, New Hope Overlook, and White Oak Recreation Area. In addition to the State Park, the Crosswinds Marina is maintained by a private concessionaire, Farrington Point is maintained by the North Carolina Wildlife Resources Commission and the US Army Corp of Engineers maintains Poe's Ridge.

#### Mountains to Sea Trail

The Mountains to Sea Trail, an effort to link Clingman's Dome in the Great Smoky Mountains National Park to Jockey's Ridge State Park on the outer banks, is the flagship project of the North Carolina State Trails Program. Today, over 450 miles of the 1,000 mile route are open for use. Partners across North Carolina are helping to plan and build the trail to link communities together and to serve as the backbone of a growing system of land and water trails. The Mountains-to-Sea Trail primary route is planned to cross substantially north of the US 64 corridor through Orange, Durham and Wake Counties; however, the Draft map for the Piedmont Section of the trail includes an alternative route that will cross US 64 along the west side of the Haw River (similar to the location shown in the Pittsboro Pedestrian Plan) and along Big Woods Road/Seaforth Road.

## 5.2 EVALUATION OF SYSTEM LINKAGE

The following section will include developing an inventory of the existing conditions along the corridor and evaluating the recommended short-term and long-term solutions to provide adequate systems linkage along the corridor.

### 5.2.1 EXISTING SYSTEM LINKAGE

An inventory of the existing system linkage within the study area was completed and is **shown in** Figure 5.1.

Figure 5.1: Systems Linkage - Existing Conditions



**LEGEND**  
 Existing Pedestrian Facilities  
 Existing Transit Stops



System Linkage  
 Existing Conditions

US 64 Corridor Study  
 Wake & Chatham Counties



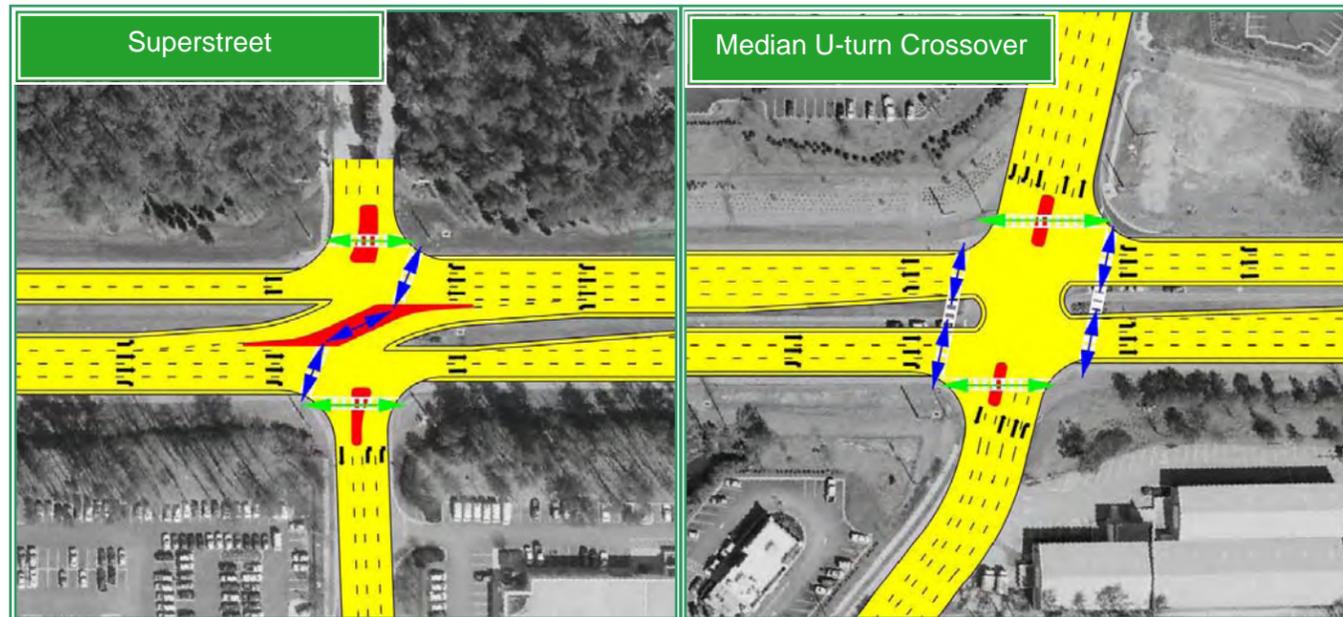
### 5.2.2 EVALUATION OF SHORT-TERM ALTERNATIVE

The evaluation of the system linkage for the short-term solution included assessing the short-term solution for bicycle and pedestrian connectivity. Transit was also evaluated; however, due to the changing nature of routing for buses, the routes for buses were not included in the detailed assessment. None of the current bus routes would be substantially affected by the design of the short-term solution. Any future transit improvements will need to be evaluated in the future to determine if they are compatible with the design.

The primary goal of the short-term solution is to improve the safety and mobility along the existing corridor; therefore, the evaluation of system linkage concentrates on maintaining the connectivity along the US 64 corridor to a level that is compatible with the existing system linkage. More extensive system linkage, that would provide full connectivity along the corridor, is included for the long-term solution and may be implemented during the time period that the short-term solution is implemented. The main solutions that are included in the short-term solution are the use of Superstreet and Median U-turn Crossover designs.

The pedestrian connectivity provided by the Superstreet and Median U-turn Crossover configurations includes a two-stage crossing of US 64 and is shown (in blue) in Figure 5.2. The two-stage pedestrian crossing for the Superstreet utilizes a diagonal crossing of US 64 that allows for pedestrians to cross without any directly conflicting traffic. The Superstreet crossing requires pedestrians to cross from the northeast quadrant of the intersection to the southwest quadrant of the intersection, or vice versa. The diagonal crossing would require pedestrians who originate or are destined for locations in the northwest and southeast quadrants to first cross the side street to utilize the diagonal crossing. The two-stage pedestrian crossing for the Median U-turn Crossover would utilize a standard pedestrian crossing pattern with crosswalks on all four approaches to the intersection. The need for a two-stage crossing is to allow for improved traffic operations by allowing the signals along the corridor to be coordinated in each direction.

**Figure 5.2: Pedestrian and Bicycle System Linkage – Short-term Solution**



The bicycle connectivity provided by the Superstreet and Median U-turn Crossover configurations is substantially different depending on which configuration is included in the recommended short-term solution. The bicycle connectivity for the Superstreet would require the cyclist to choose to either act as a pedestrian

and utilize the crosswalks, in the same manner as described above, or act as a vehicle and follow the same path as a driver would. If the cyclist acts as a vehicle they would be required to turn right at the intersection, travel to the downstream u-turn location and return in the opposite direction to the intersection to complete their crossing. There is a safety concern where cyclists act as vehicles as they must travel a longer distance and mix with weaving vehicular traffic. The bicycle connectivity for the Median U-turn Crossover configuration allows for bicyclists to act as vehicles and cross the intersection in the same manner as they would a standard signalized intersection.

Due to this safety concern the Corridor Study Team evaluated the corridor and determined that the intersections with Laura Duncan Road and Lake Pine Drive would be the two locations that would have the highest cross traffic for cyclists. The recommended short-term solution at Laura Duncan Road is a tight modern roundabout interchange, which will provide the cross connectivity. The recommended short-term solution at Lake Pine Drive is the Median U-turn Crossover which allows for cross connectivity for cyclists.

The Corridor Study Team also evaluated each of the intersections along the corridor to determine if striped pedestrians crosswalks should be provided. The Corridor Study Team determined that crosswalks would be provided at each of the intersections east of the Davis Drive interchange. In addition to the crosswalks at the intersections, a signalized pedestrian crossing with crosswalk is included in the plan slightly west of the U-turn movement located west of Lake Pine Drive. This location will improve pedestrian access to the library and to Apex Community Park. The development of the plans for the pedestrian connections to this crossing will be undertaken by the Town of Apex Planning Department. To accommodate the future Swift Creek Greenway a signalized pedestrian crossing with crosswalk is included in the plan slightly west of the U-turn movement located at Autopark Boulevard. This location will provide improved pedestrian access to Apex Community Park and the development of the plans for the pedestrian connections, including evaluating a pedestrian overpass or tunnel for this crossing will be undertaken by the Town of Cary Parks and Recreation Department.

A summary of the proposed system linkage within the study area for the short-term solution is shown in Figure 5.3.

Figure 5.3: Systems Linkage - Short-term Solution



**LEGEND**

- Existing Pedestrian Facilities
- Proposed Pedestrian Facilities

System Linkage

Short-term Solution

US 64 Corridor Study  
Wake & Chatham Counties



### 5.2.3 EVALUATION OF LONG-TERM ALTERNATIVE

The evaluation of the system linkage for the long-term solution included a full assessment of the bicycle and pedestrian connectivity for the long-term solution. Transit was also considered; however, due to the evolving nature of mass transit options being considered within the Triangle region, the full implementation of transit in this section was not included. Any future transit improvements will need to be evaluated in the future to determine if they are compatible with the recommended design for the long-term solution.

The first step in evaluating the system linkage for the long-term solution was to determine if the recommended design would be compatible with the recommendations included in the multi-modal plans described in Section 5.1. Based on the evaluation it was determined that the recommended long-term design could be made consistent with the following multi-modal plans:

- Town of Pittsboro Pedestrian Transportation Plan
- Town of Apex Transit Plan
- Town of Cary Comprehensive Pedestrian Plan
- Town of Cary Comprehensive Transportation Plan
- Town of Cary Parks, Recreation and Cultural Resources Facilities Master Plan
- Wake County Transportation Plan
- NCDOT Chatham County Bicycle Map
- American Tobacco Trail
- Jordan Lakes State Recreational Area
- Mountains to Sea Trail

The proposed long-term solution would not be completely consistent with the following three multi-modal plans:

- Town of Apex Bicycle, Pedestrian and Equestrian Plan
- Town of Apex Parks, Recreation, Greenways and Open Space Master Plan
- CAMPO 2035 Long Range Transportation Plan

The inconsistency with the two plans developed by the Town of Apex relates to the inclusion of a multi-use path along US 64 from the Chatham County line to east of Lake Pine Drive. The recommended design from Kelly Road to east of Laura Duncan Road is not conducive to a multi-use path due to safety concerns relating to the interaction between free flowing vehicular traffic along US 64 and bicyclists and pedestrians along the multi-use path. The recommended long-term solution does not include any signalized intersections from NC 540 to Laura Duncan Road. Similarly, the inconsistency with the CAMPO Long Range Transportation Plan is due to the designation of US 64 as a significant on-road facility for bicyclists.

The inconsistencies with the local plans were discussed with the Corridor Study Team members representing the Town of Apex and the CAMPO to determine if the inconsistencies could be addressed by providing alternate connectivity or by modifying the design to be consistent with the local plan. It was determined that alternative means of connectivity that provide comparable pedestrian and bicycle access would be the best means of addressing the inconsistency. The Town of Apex stated that the existing or proposed pedestrian and bicycle connectivity through the subdivisions adjacent to US 64 would provide similar access and connectivity to the multi-use path proposed on their plans.

Once it was determined that the long-term solution could be made compatible with all of the multi-modal plans or adequate alternative connectivity could be utilized, the next step was to develop a comprehensive set of measures to address the system linkage. The results of the evaluation of system linkage for the long-term solution are shown on Figure 5.4 and summarized as follows:

- A 12-foot wide multi-use path would be constructed along the south side of US 64 from slightly west of the Haw River to slightly east of Jenks Road with a portion of the eastbound US 64 lanes being shifted to the median in the vicinity of the Haw River and Jordan Lake.
- The multi-use path crossings at major roadways will be accommodated at the signalized intersections where the ramp intersects the side street.
- A multi-use path could be constructed along the west side of the Haw River, crossing under the existing US 64 bridges over the Haw River, to provide the connectivity recommended for the Mountain to Sea Trail alternative route.
- A striped bicycle lane along both directions of Mt. Gilead Church Road/North Pea Ridge Road could be incorporated to accommodate the designated bicycle route.
- A multi-use path along the east side of Big Woods Road/Seaforth Road that would provide access to the future Chatham County Park and the connectivity recommended for the Mountain to Sea Trail alternative route could be constructed.
- A striped bicycle lane along both directions of Farrington Road/Beaver Creek Road could be incorporated to accommodate the designated bicycle route.
- A pedestrian overpass of US 64 slightly east of the Farrington Road/Beaver Creek Road interchange could be constructed to provide cross connectivity between the service road on the north side of US 64 and the multi-use path on the south side providing improved access to Jordan Lake State Park.
- A striped bicycle lane along both directions of NC 751/New Hill Road could be incorporated to accommodate bicycle traffic and sidewalks on both sides;
- Sidewalks and bicycle lanes on both sides of Jenks Road and the Future Jenks Road Extension as recommended in the Town of Apex Bicycle, Pedestrian and Equestrian Plan could be incorporated.
- A striped bicycle lane along both directions of Kelly Road to accommodate bicycle traffic and sidewalks on both sides as recommended in the Town of Apex Bicycle, Pedestrian and Equestrian Plan could be incorporated.
- A striped bicycle lane along both directions of NC 55 to accommodate the designated bicycle route and a sidewalk on the western side of the roadway that can transition to a multi-use path north of the interchange as recommended in the Town of Apex Bicycle, Pedestrian and Equestrian Plan could be incorporated.
- Sidewalks on both sides and wide outside lanes for bicycles on North Salem Street and Davis Drive as recommended in the Town of Apex Bicycle, Pedestrian and Equestrian Plan could be incorporated.
- A safe crossing for pedestrians and bicycles at the recommended tight modern roundabout interchanges at Laura Duncan Road and Lake Pine Drive should be determined when the detailed design is undertaken.
- A signalized pedestrian crossing (as included in the short-term solution) for the Future Swift Creek Greenway slightly west of Autopark Boulevard or a pedestrian overpass/tunnel as determined by the Town of Cary could be incorporated.
- Consideration should be given to maintaining the pedestrian and bicycle connectivity included in the short-term solution from east of Lake Pine Drive to the US 1 interchange.

Figure 5.4: Systems Linkage - Long-term Solution



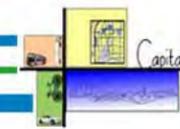
**LEGEND**

- Existing Pedestrian Facilities
- Proposed Pedestrian Facilities
- Proposed Striped Bicycle Lanes
- Proposed Multi-use Path
- Pedestrian Facility included in Local Plan
- Multi-use Path included in Local Plan

System Linkage  
 Long-term Solution

US 64 Corridor Study  
 Wake & Chatham Counties





Capital Area Metropolitan Planning Organization

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