
1 Statement of the Problem and Study Objective

1.1 STUDY AREA

The study area is shown in Figure 1. This corridor is centered on US 15-501 between Franklin Street (US 501 Business) in Chapel Hill and Chapel Hill Boulevard (US 15-501 Business) in Durham, and further bounded by Erwin Road and Old Durham-Chapel Hill Road. From the perspective of traffic demand, the major areas of focus for the Master Plan study were the I-40/US 15-501 Interchange, US 15-501, streets served by US 15-501, and existing and potential access to individual properties.

1.2 PROBLEM STATEMENT

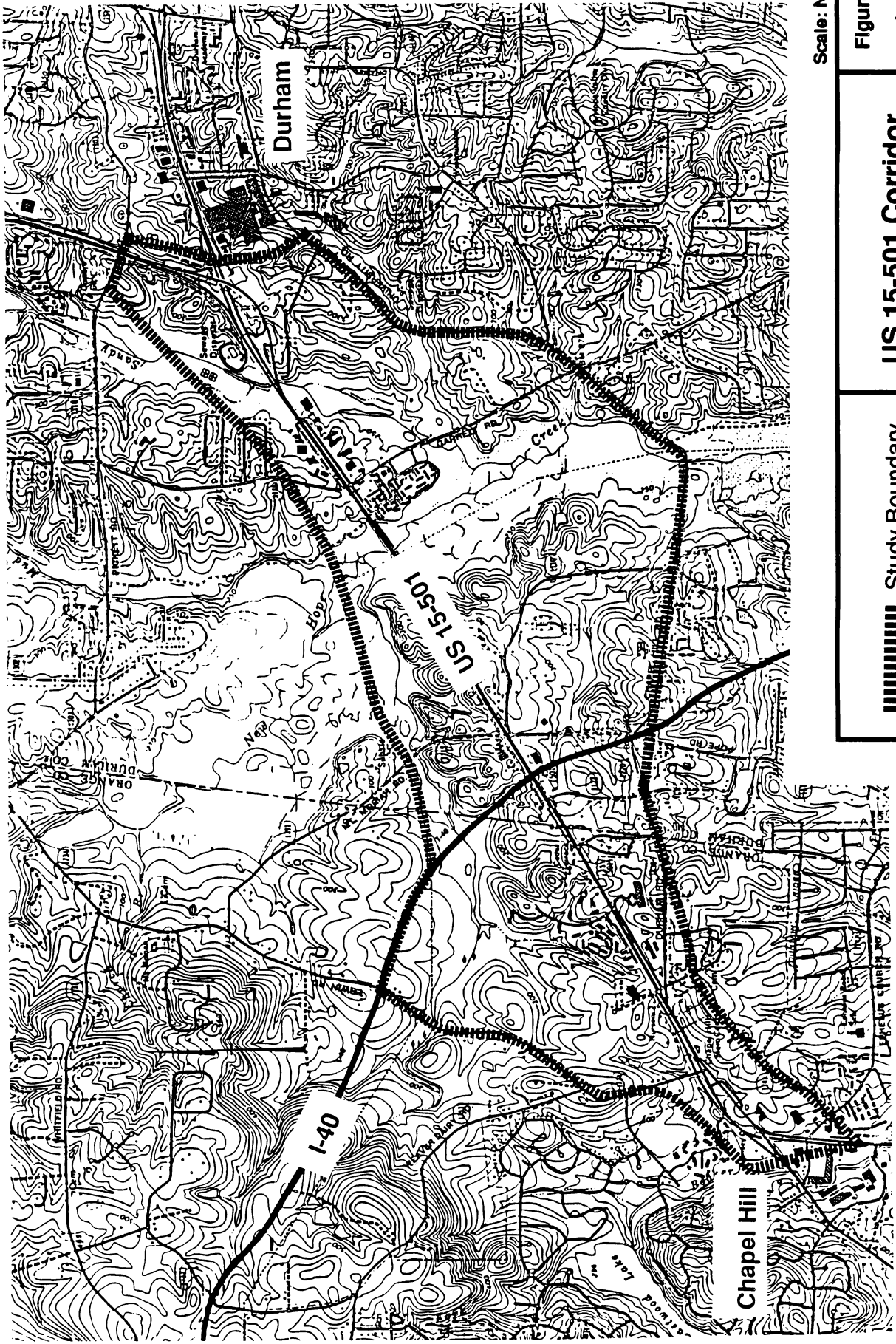
US 15-501 is a four-lane expressway between Durham and Chapel Hill. Within the study area, US 15-501 is approximately four miles in length and includes at-grade intersections at Erwin Road, Sage Road and Eastowne Road in Chapel Hill, and Mt. Moriah and Garrett Roads in Durham. Interchanges are at the two end points of the study area, Franklin Street in Chapel Hill and the US 15-501 Bypass in Durham. A diamond type interchange exists at I-40, in the midst of the study area.

This road links two municipalities. Significant vacant and prime land is available and indications are that it will be intensively developed. Traffic volumes are growing. Average daily traffic (ADT) in 1990 on US 15-501 ranged between 36,500 and 45,900 vehicles (see Figure 2). These volumes already exceed the capacity of the study area's existing roadway system, particularly at Erwin and Sage Roads in Chapel Hill and Garrett Road in Durham. US 15-501 is presently operating at Level of Service (LOS) E, while the Garrett Road and Erwin Road

intersections are operating at LOS F (roadways in urban areas are typically designed to operate at LOS D or better). Traffic projections developed by NCDOT's Statewide Planning Branch and further refined in this study show significant future growth in travel demand. The forecast demand is great enough that the conversion of this section of US 15-501 from an expressway to an urban freeway appears necessary.

An urban freeway is a multilane roadway designed to carry significant volumes of traffic at moderate speeds (such as US 15-501 between Shannon Road and Chapel Hill Road). The roadway provides for continuous flow of traffic through full control of access and provision of interchanges or grade separations with no access at crossroads, and no traffic signals on the freeway.

Since the construction of I-40, and particularly the interchange with US 15-501, the corridor has become more attractive for development with the improved regional access I-40 has brought to Chapel Hill and Durham. In addition, large tracts of undeveloped land surround the US 15-501 and I-40 interchange, land which is regarded as a prime location for commercial development. Developers are petitioning for access to US 15-501 through traditional permit applications and are seeking re-zoning for more intensive development. Applications have been made by Homart, Wal-Mart/Sam's and Chronaki Properties for commercial development and by Eastowne for office/hotel development. Individual Traffic Impact Analyses (TIAs) have been undertaken by the developers; however, these studies are short-term in their planning horizon (three to five years) and do not adequately account for the cumulative effects of other development.



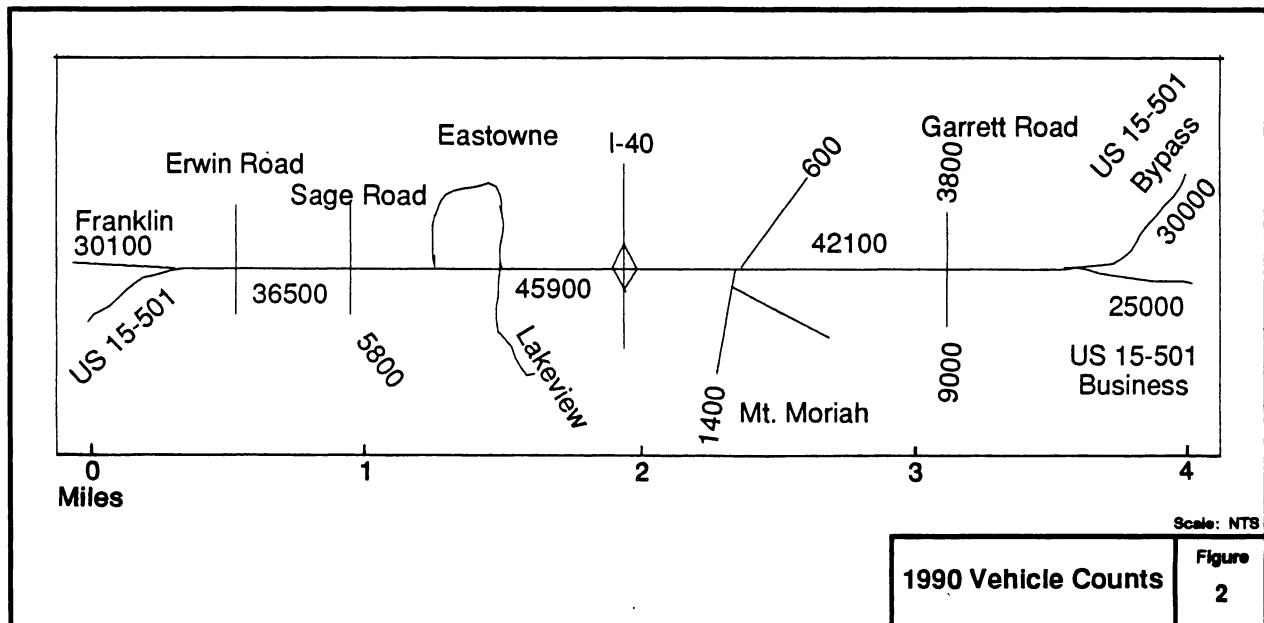
Scale: NTS

Figure

1

US 15-501 Corridor

Study Boundary



Within the context of this study, municipal, development, private and environmental groups have voiced concern about the impact of developing land in and surrounding the corridor. The consensus of these groups is that US 15-501 and future improvements to it should:

- Provide good access to surrounding lands (via appropriately spaced crossroads and service roads).
- Have a capacity adequate to permit development.
- Not become so congested that traffic would begin to divert onto surrounding streets.
- Be aesthetically pleasing.
- Not significantly or only minimally impact the New Hope Creek Area.

- Be reconstructed only if it is absolutely necessary to achieve the other objectives. Strategies to encourage alternative transportation options to the single-occupant automobiles should be encouraged.

1.3 STUDY OBJECTIVE AND SCOPE

The objective of this study was to develop a Transportation Master Plan. The purpose of the Master Plan was to provide the two municipalities, other agencies, developers, environmental and neighborhood groups, and the North Carolina Department of Transportation with the information needed to address the issues presented in Section 1.2.

The scope of work for developing the Master Plan included:

- Definition of the characteristics of future development in the corridor.

- An inventory of the environmental features.
- Review of the NCDOT traffic forecasting model for the area.
- Development of a highway-only alternative for addressing future travel demand.
- Consideration, in several forums, of the highway-only alternative and other strategies for serving travel demand. The other demand strategies were examined based predominantly on their performance elsewhere in the United States.
- Development of the Transportation Master Plan.

The Master Plan is the first step toward the more detailed transportation planning activities to be undertaken in the future. Subsequent steps include as a minimum:

- Establishment, by ordinance, of a transportation corridor overlay zone that will protect right-of-way for future roadway and other possible transportation improvements and will address other transportation issues in the zone such as parking, ridesharing, etc.
- Establishment of a Transportation Management Association to enhance and implement the Master Plan, guide development and provide a mechanism for implementing Transportation Demand Management (TDM) strategies in the corridor.
- Development, implementation and monitoring of Transportation Demand Management (TDM) and transit strategies to reduce the number of single-occupant vehicles.
- Preparation of federal environmental impact documentation and associated engineering plans for needed roadway improvements.

2 Study Approach and Findings

Developing the US 15-501 Corridor Transportation Master Plan involved three major phases:

- A definition of base conditions.
- An options charrette.
- Development of a Master Plan for serving and managing US 15-501 travel demand.

Completion of these phases was guided throughout the study by a steering committee. The steering committee was comprised of four property owners from the study area, four North Carolina Department of Transportation (NCDOT) representatives, two City of Durham representatives, one Town of Chapel Hill representative, and two persons from the study area's neighborhood and environmental groups. The primary role of the steering committee was to ensure that the study thoroughly addressed the transportation issues of the US 15-501 corridor study. The steering committee served as a sounding board for the study team, providing feedback on their efforts to identify corridor needs and their assessment of potential means to meet those needs. In addition to several steering committee meetings, the options charrette and a public meeting were held.

The following paragraphs briefly describe the study components and findings. A more detailed discussion is contained in Part II of this document, "Technical Report."

2.1 BASE CONDITIONS

In this initial phase of the study, existing traffic conditions were determined, the project area's setting was defined (including future land use and community and natural

environmental features), and forecast travel demand was developed. A highway-only solution for meeting forecast travel demand was developed. The highway-only solution represented a worst case scenario in that it assumes no reductions in forecasted traffic volumes that might result from transportation demand reduction strategies or transit improvements. It therefore represented the most extensive roadway improvements. The base conditions were discussed at two steering committee meetings and at the public meeting.

A detailed description of the study of base conditions is presented in Chapter 5 of this document. The key findings of this element of the study were:

- Existing Traffic Conditions. The US 15-501 corridor is the major transportation link between Durham and Chapel Hill and one of the most heavily traveled and congested thoroughfares in the Durham-Chapel Hill-Carrboro urban areas. The four-lane expressway is already over capacity, carrying daily volumes in 1990 of between 36,500 and 45,900. In the afternoon peak-hour period, the facility is operating at Level of Service (LOS) E, with several intersections operating at LOS F (e.g., Garrett Road in Durham and Erwin Road in Chapel Hill). Roadways in urban areas are typically designed to operate at LOS D or better.
- Future Land Use. Future densities and land use types included in Durham's and Chapel Hill's adopted land use plans were selected for use in the traffic forecasts. In areas designated for mixed uses, a mix of commercial, office and residential development was selected by Chapel Hill and Durham planners. This mix represented a worst case travel generation scenario.

- **Environmental Features.** The most sensitive component of the project area is the New Hope Creek area, which includes natural areas, wetlands, streams and a system of planned trails. The William N. Patterson House, included on the State Study List of historic structures, is between US 15-501 and Watkins Road. Sensitive environmental features were generally avoided during the later identification of US 15-501 improvements. Any widening of US 15-501 would, however, use some lands from the New Hope Creek floodplain.
- **Traffic Forecasting Model.** The NCDOT TRANPLAN model was found to be acceptable for regional travel demand forecasting. Improvements were made to the model to make it more applicable to the US 15-501 study area, including refining the model's zone and network structure and updating the future land use assumption for the study area.
- **Future Roadway Network.** The future roadway network contained in the area's Thoroughfare Plan was applied to the traffic model. This network calls for US 15-501 to be improved as an urban freeway (access limited to interchanges with cross streets and designed to carry traffic at moderate speeds).
- **Trip Generation by Proposed New Development.** Trips generated by four proposed new developments (Wal-Mart/Sam's, Homart, Chronaki and, Eastowne) would contribute 30.5 percent of the total 1995 trips east of I-40 and 22.7 percent of the total 1995 trips west of I-40. US 15-501 would need to be widened to a six-lane expressway by 1995 even without these developments. Traffic generated by these four developments alone is enough to warrant considering the conversion of US 15-501 from its present form to an urban freeway.
- **Traffic Forecasts and Capacity Needs.** In 2010, US 15-501 traffic volumes are projected to reach approximately 112,000 vehicles per day west of I-40 and 122,000 vehicles per day east of I-40. A four- and six-lane urban freeway with a collector-distributor system would be required both east and west of I-40, respectively, to accommodate this traffic at an adequate level of service.
- **Highway-Only Alternative.** If future travel demand were met solely by roadway improvements, US 15-501 would need to be redeveloped as an urban freeway for its full length within the study area. Its major intersections would need to be replaced by interchanges. An internal circulator system that connects the four quadrants of the I-40 interchange and reduces the number of movements on and off US 15-501 would also prove beneficial.

2.2 OPTIONS CHARRETTE

The purpose of the charrette was to examine options for managing travel demand on US 15-501 that could reduce the need for increases in the road's traffic capacity. Both traditional and non-traditional methods for managing travel demand were presented by experts in the field of travel management and discussed with charrette participants. These methods included: roadway improvements, Transportation Demand Management (TDM) strategies, high occupancy vehicle (HOV) lanes, and fixed guideway transit and land use strategies for supporting transit.

Participants in the charrette included the steering committee and other representatives from the sponsoring communities, land owners and interest groups. The objective of these discussions was to select several promising options that were then to be tested for their applicability to the US 15-501 corridor.

The charrette and its findings are described in detail in Chapter 6. Key conclusions of the charrette's participants are as follows:

- Roadway Type. US 15-501 should be upgraded to satisfy travel demand, i.e., an urban freeway should be planned for based on the current traffic projections.
- Transportation Demand Management (TDM). TDM strategies could not serve as "the " solution but could be an element within a larger package of transportation improvements. TDM strategies could include: employer and developer incentives to reduce single-occupancy vehicle trips, ridesharing incentives, improved and subsidized transit, parking restrictions and pricing, pedestrian and bicycle facilities, flexible working hours, and telecommuting. These are detailed in Part II and Appendix A. There was an apparent preference for a mandatory TDM program to reduce the magnitude of the roadway improvements required in the study area.
- High Occupancy Vehicles (HOV). It was agreed that under current projections, which include a relatively low proportion of through trips on US 15-501, an HOV lane has limited potential to reduce trips in the corridor; however, it could be an important part of a regional HOV system. If future modeling or other data shows that the proportion of through trips is in fact higher, or if there is a significant directional bias in traffic flow in the peak periods, an HOV lane contained within the corridor may be feasible. However, typically HOV lanes in short corridors are not feasible without serious congestion in the corridor and controls on single-occupant vehicle parking.

Thus, space for an HOV lane should be included in the right-of-way of any major US 15-501 improvement.
- Land Use and Transit. It was agreed that future fixed guideway transit should be allowed for in the US 15-501 Master

Plan. Like HOV, it should be studied and developed at the regional level. It was also observed that the incorporation of a circulator road within future development along US 15-501 would improve bus access to that development, as well as serve pedestrian and bicycle movement. Finally, more consideration should be given to developing land use types, densities and design that support transit.

2.3 MASTER PLAN DEVELOPMENT

These findings, which represent the best information available to date, were used as a basis for developing the US 15-501 Corridor Transportation Master Plan. The plan was developed according to the following steps:

1. Testing the sensitivity of travel demand to alternative land use strategies and testing the ability of promising Transportation Demand Management (TDM) strategies to reduce the number of single-occupancy vehicle trips in the project area.
2. Studying two location options for a Laurel Hill Drive interchange.
3. Reaching study conclusions and developing Master Plan recommendations
4. Discussing the Master Plan recommendations and adoption of plan parameters by the steering committee.
5. Developing the Master Plan.
6. Adoption of the Master Plan by the steering committee.

These steps are discussed in detail in Chapter 7 of this document. In testing the sensitivity of travel demand to alternative land use strategies, it was discovered that interchanges at cross streets along the entire length of the study area were necessary, except for the no

growth alternative. In testing the ability of promising Transportation Demand Management (TDM) strategies to reduce the number of motor vehicle trips to the study area, it was found that these strategies could delay or possibly eliminate certain aspects of a US 15-501 urban freeway.

Based on the conclusions and recommendations of the study team, the steering committee defined the following decision parameters for the Master Plan:

- Roadway Type. The urban freeway concept should be used for the entire length of the project. This roadway should include interchanges and an internal circulator system in the four quadrants of the I-40 interchange.
- Right-of-Way. A right-of-way should be reserved for the urban freeway, possible future HOV lanes and/or fixed guideway transit, and the internal circulator system.
- Development. For analyzing the worst case scenario, it is appropriate to assume that by 2010, 100 percent of the undeveloped lands in the study area will be developed and will contain the land use mix assumed for the traffic modeling.
- Transportation Corridor Overlay Zone. The Master Plan should include a transportation corridor overlay zone that will protect right-of-way for future roadway and other possible transportation improvements, guide development, and provide a mechanism for implementing Transportation Demand Management (TDM) strategies in the corridor.
- TDM and Transit Strategies. The full range of TDM strategies, including incentives-disincentives for single-occupancy vehicle travel, as well as increased bus service, HOV lanes, and fixed guideway systems should be a part of the plan. The objective of TDM and transit is to minimize roadway improvements and delay urban freeway implementation.

- Transportation Management Association. A transportation management association should be formed to spearhead the development of TDM strategies for the corridor.

The Master Plan and a strategy for implementing that plan are presented in Chapters 3 and 4.

3 Master Plan

The US 15-501 Corridor Transportation Master Plan is illustrated in Figure 3. It shows a right-of-way that should be reserved for future highway and possible transit improvements, as well as the type of highway improvements that could be required.

Transportation Demand Management (TDM) strategies to reduce future traffic volumes in the corridor and perhaps eliminate the need for some of the highway improvements shown in the plan also are an integral part of the Master Plan. A modest TDM program that can result in an eight percent reduction in the afternoon peak period traffic has been assumed in the Plan. A more aggressive program could further reduce or delay the implementation of some planned elements.

This plan is the first step in implementing improvements in the US 15-501 corridor. It is endorsed by a steering committee comprising representatives of the City of Durham, the Town of Chapel Hill, the North Carolina Department of Transportation, the private sector, neighborhood and environmental groups. The committee further recommends that the plan be incorporated in the State of North Carolina and local *Transportation Improvement Program*.

3.1 TDM AND TRANSIT IMPROVEMENTS

Transportation Demand Management (TDM) and transit strategies, in conjunction with HOV lanes, improved transit and bicycle/pedestrian facility improvements, have the potential to significantly reduce traffic volumes in the corridor. The overall objective of TDM and transit programs is to reduce single-occupant vehicles, thereby reducing peak period traffic. This study determined that reductions in traffic of up to 23 percent may be possible in the afternoon

peak period with an effective region-wide program. This would require a very successful program, including fixed guideway. A modest program should result in at least an eight percent reduction.

To achieve the higher end trip reductions, all of the following TDM and transit strategies should be pursued:

- Employer trip reduction ordinances.
- Developer trip reduction ordinances.
- Incentives for ridesharing (carpooling and vanpooling).
- Improved transit service (including the possibility of fixed guideway) and employer-subsidized transit passes.
- Priority treatments for ridesharers (e.g., HOV facilities).
- Parking restrictions and changes in parking pricing policies.
- Pedestrian and bicycle facilities.
- Changed work hours (flextime).
- Telecommuting.
- Establishment of Transportation Management Association (TMA) whose charge is to encourage and implement the TDM and transit strategies.

Appendix A presents descriptions of several TDM strategies.

3.2 BICYCLE AND PEDESTRIAN FACILITIES

A goal of this master planning process has been to develop a bicycle and pedestrian circulation system along the US 15-501 corridor. The concept for this system has been widely supported by both City of Durham and Town of Chapel Hill officials, developers and local citizens who have contributed to the Master Plan.

Bicycle and pedestrian facilities should be included along internal circulation routes so that people can travel between developments without using automobiles. Since destination points along US 15-501 lie within bikable distance of Chapel Hill and most of Durham, there is also a need to provide bicycle facilities that link the downtowns of each to the corridor.

The proposed US 15-501 freeway itself will not accommodate cyclists, since state laws prohibit bicycling on controlled-access freeways. In order for residents of Durham and Chapel Hill to have bicycle access to office, retail and commercial zones in the corridor, bicycle lanes should be provided along all internal circulator roads. This internal bikeway system should be linked to Chapel Hill via Old Durham-Chapel Hill Road and Legion Road. Linkage to Durham should be made through the development of an off-road trail on the southern side of US 15-501 (see Figure 3).

Sage Road, Erwin Road and Garrett Road have been identified by the Regional Bicycle Plan for Durham and Orange Counties to include future bicycle facilities. It is suggested that improvements to these roads should include four- to six-foot paved shoulders (these should not be marked or signed as bicycle lanes until they become linked to other bicycle facilities). Mt. Moriah Road and Eastowne Drive should include four- to six-foot-wide bicycle lanes, which will link to the recommended bicycle lanes along circulator roads. It is important that intersections between US 15-501 and local

roadways do not become barriers to bicycle access. Overpasses and underpasses should include either bicycle lanes or paved shoulders and bike railings (53 inches), and bike-safe drainage grates. Detailed treatment of bicycle features should be considered in the design phase and should meet American Association of State Highway and Transportation Officials (AASHTO) standards.

These internal bicycle circulation routes would not solve the transportation needs of cyclists who are traveling from Durham to Chapel Hill, i.e., "through cyclists." They need more direct routes that do not wind through the development along US 15-501. Bicycle through-routes between Durham and Chapel Hill should be provided on Erwin Road and Old Durham-Chapel Hill Road, each of which will serve distinct urban regions.

Pedestrian access should be provided throughout the internal circulator system and should also extend along Mt. Moriah Road and Eastowne Drive to allow access over I-40. Six-foot-wide (minimum of five-foot-wide) sidewalk avenues should be lined with trees and include pedestrian-friendly amenities such as street lighting and benches.

3.3 ROADWAY IMPROVEMENTS

The roadway improvement component of the Master Plan calls for an urban freeway type of road with control of access through the use of interchanges and the addition of service roads. The roadway improvements proposed already assume that at a minimum an eight percent reduction in traffic will be achieved with TDM and transit strategies. Successful implementation of the TDM and transit strategies described above, which achieve a trip reduction rate of more than eight percent, may eliminate or at least delay the need for some of the roadway improvements shown.

Table 1 shows the general design criteria that apply to the plan's various roadway elements.

US 15-501 Corridor
Transportation
Master Plan

Figure

3