# MANAGED OR FAST LANES

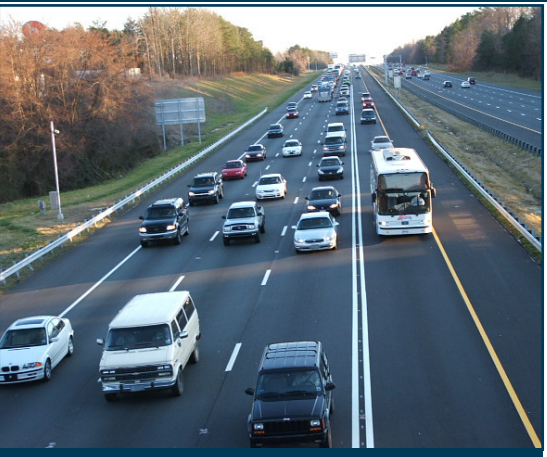


**FIGURE 1.** I-77 HOV Lane in Charlotte

## What are *Fast Lanes*?

The following special lane treatments are considered *Fast Lanes* if they are designed and operated to promote an assured travel condition:

- High-Occupancy Vehicle (HOV) lanes
- High-Occupancy Toll (HOT) lanes
- Truck-Only-Toll (TOT) lanes
- Value priced lanes
- Express or special use lanes and roadways
- Bypass lanes, primarily for commercial vehicles

## What Are High-Occupancy Vehicle (HOV) Lanes?

Managed lanes over the past 30 years have typically been termed HOV lanes. For planning purposes, the following definition is relevant:

> *HOV Facility: A lane or roadway dedicated to the exclusive use of specific high-occupancy vehicles, including buses, carpools, vanpools or a combination thereof, for at least a portion of the day.*

By offering a reserved lane for vehicles carrying more than the driver, HOV lanes emphasize person movement rather than traditional vehicle movement, thus improving the roadway's ability to transport more people in fewer vehicles. (Figure 1)

Figure 2 shows the cities in the United States where HOV lanes are in operation.

HOV lanes make the most sense when:

- Adjacent general-purpose lanes are heavily congested during peak periods.
- Sufficient demand exists from transit and rideshare users to justify a dedicated lane.
- Travel benefits are enough to cause solo commuters to shift to transit or ridesharing.
- Resources are limited for expanding roadway capacity to meet future demand conventionally.

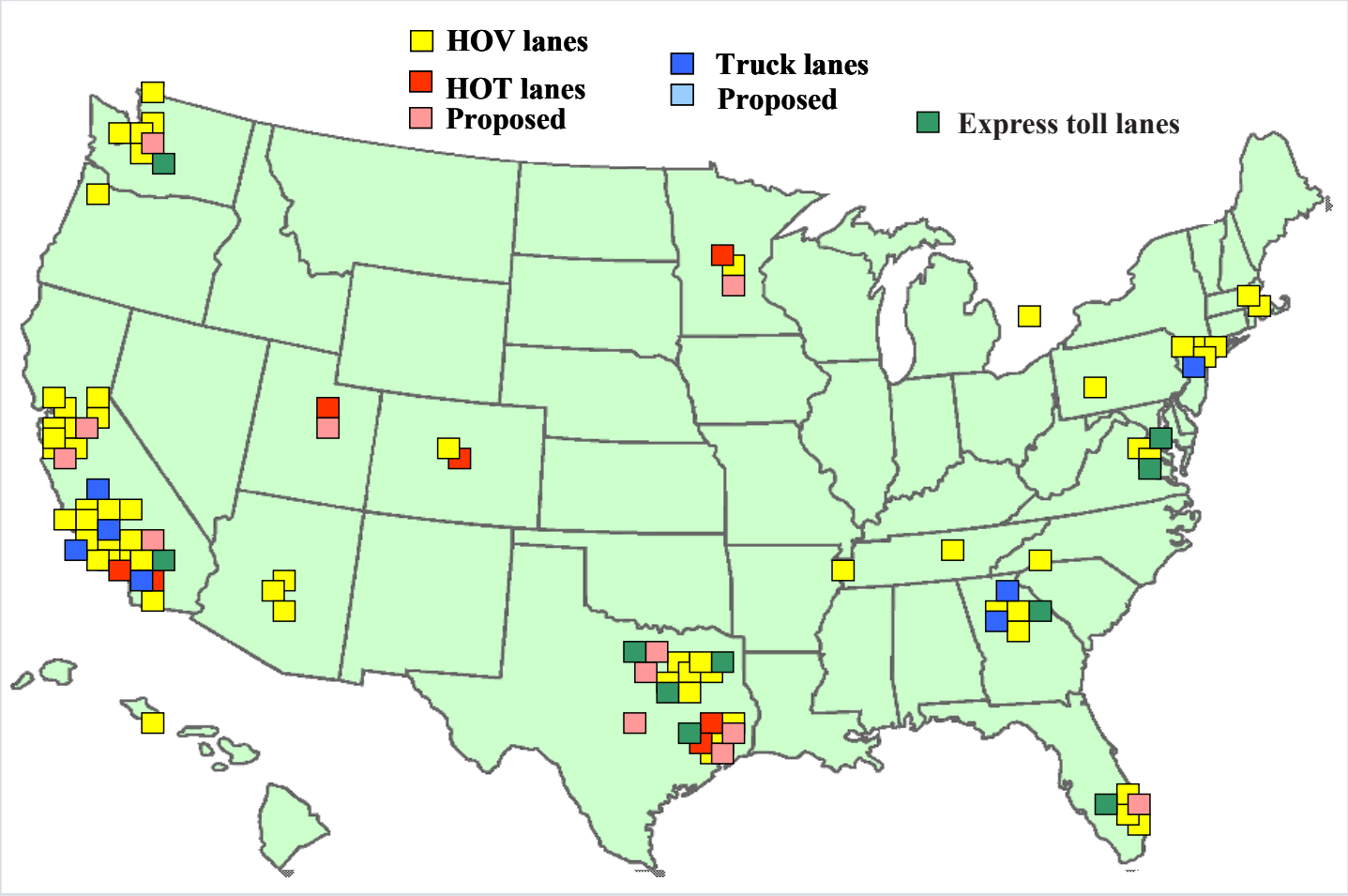
The history of HOV lanes has shown that they can have a positive impact on corridor transit and rideshare use. Various before and after studies have shown that about 40 percent of HOV users come from previous carpoolers who have shifted from adjacent lanes or other routes into the HOV lane (called "spatial shifts"); another 40 percent are riders of newly-formed-carpools and vanpools and transit riders who previously drove alone (called "mode shifts"); and the balance were new trips in the corridor often created because the dedicated lane provided a superior way of commuting. All of these trips often changed the nature of lane use and commuting in the corridor.

## What Are High-Occupancy Toll (HOT) Lanes?

While many HOV projects are adequately used, some are not, leaving space for more persons to use the lanes. In some instances HOV demand outpaces lane capacity, potentially requiring increasing minimum occupancies to carpools with three or more occupants. Adding pricing to an HOV lane – creating a HOT lane – can help regulate demand better by either permitting more persons to use the lane or pricing some out (Figure 3).

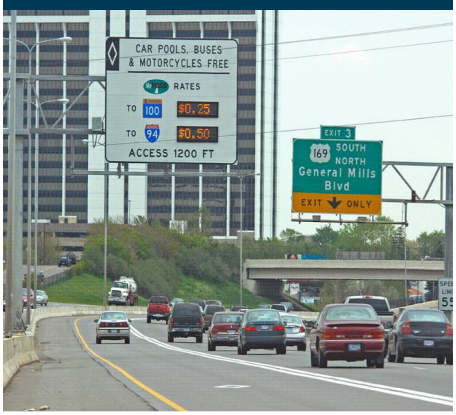
HOT lanes are derived from the con-

**FIGURE 2**. Location of Existing and Proposed *Fast Lanes*.




cept of congestion pricing, which recognizes that the value of travel time savings will vary for trips at different times and places and that these trips have different values for different individuals.

**FIGURE 3**. I-394 HOT Lane in Minneapolis




*HOT Facility: A lane or roadway in which electronic pricing is applied in conjunction with eligibility preference given to buses, vanpools and perhaps carpools to give others a travel option to use the lane. Others may include solo motorists or lower occupancy carpools.*

HOT lanes offer one possible means of addressing mobility surges or peaks, while helping ensure the long-term availability of HOT lanes for improved person movement. Transit and carpools are typically allowed to continue to use the HOT lanes for free. The toll value is set so that the prior "free-flow" level of service is not degraded, or the charge is maintained high enough to reflect parity with the prevailing transit fare in a corridor. Figure 2 indicates where HOT lanes currently exist or are proposed in the United States.

HOT lanes make the most sense when:

- The HOV facility's adjacent general-purpose lanes are heavily congested during peak periods.
- Significant excess capacity exists on the HOV facility, even at its peak utilization, or significant excess capacity will be created by raising

restrictions on HOV lanes that are overloaded.

- Resources are limited for either expanding roadway or guideway transit capacity.
- The public is concerned by low use of the HOV lanes.

## What Are Truck-Only-Toll (TOT) Lanes?

TOT lanes offer the potential to apply the same benefits for commercial goods movement as are provided to commuters. While there have been various studies of truck-only lanes and roadways and more recent studies to levy tolls for trucks on these lanes, several operational and institutional issues have prevented these lanes from being implemented. The obstacles relate to the need to provide two directional lanes so that trucks can pass one another, because otherwise, service capacity and operational benefits can be lost. Perhaps most difficult to resolve is the high cost of building dedicated truck lanes and the strong position that trucking interests have taken against mandatory tolling, if trucks will be precluded from current highway lanes. Although this institutional barrier has prevented some potential projects from moving forward, Figure 2 shows locations where TOT lanes exist or are proposed in this country.

TOT lanes make sense when:

- High volumes of trucks have common origins and destinations which will benefit from a limited-access roadway.
- Potential to provide meaningful time and reliability benefits indicates truck toll lanes are cost effective and will generate revenue.
- There is political and institutional support to toll trucks, perhaps by mandating that all through trucks without local destinations use the TOT lanes.

## What Are Other Forms of *Fast Lanes*?

Express lanes that assure a higher level of service through restrictions on access have been operated on various urban interstates in Chicago, St. Louis, Seattle and other cities for many years. A broader application of dynamically managing express lanes through tolling, known as express toll lanes (ETL), is planned for a number of areas in the United States, as shown by Figure 2.

These forms of managed lanes may make sense when:

- General-purpose lanes are heavily congested during peak periods.
- There is not enough HOV demand to justify preferential treatment, but enough commute demand and travel benefits to justify a managed lane.
- Resources are limited for expanding the roadway.

## What Are Three Strategies for Managing Lane Use?

Lane management strategies used to regulate demand fall into three broad categories.


**FIGURE 4**. Example Eligibility Restriction

### Eligibility

Restricting a dedicated lane to specific users will limit demand. HOV lanes are primary examples of limiting use to specific vehicle classes based on the number of persons they are carrying. Most commonly, user restrictions on HOV lanes have taken the form of eligibility requirements based on the requisite minimum number of people traveling in a vehicle (Figure 4). Over the years, restrictions on HOV lanes have evolved to include several other occupancy-exempt vehicle classes (e.g., motorcycles, inherently low emission vehicles (ILEVs) or hybrid vehicles, emergency vehicles, deadheading buses, paratransit vehicles, etc.).

### Access

Limiting access has traditionally been applied to HOV and express lanes as a means of regulating entry and exit movements (Figure 5). Restricting access helps ensure that the lanes do not become overloaded, regardless of the level of demand they generate. Access restrictions may also help alleviate specific traffic bottlenecks where short-distance trips cause a lane to exceed its capacity.


**FIGURE 5**. Example Access Treatment

### Congestion Pricing

The introduction of electronic toll collection (ETC) technology has allowed this tool to become increasingly practical and inexpensive in regulating demand (Figure 6). ETC technology eliminates the need for booths to collect tolls from motorists. Congestion pricing can help maximize the use of available pavement, while continuing to prioritize operation for selected users such as HOVs. The introduction of congestion pricing offers an opportunity to manage a dedicated lane by allowing others to use the lane as capacity allows.

Pricing at existing HOT lanes has been implemented in a limited number of metropolitan areas. Congestion pricing may permit all vehicles, or only a select user group, to access the managed lanes. Revenue generated from value pricing typically covers the operation, enforcement and administrative costs associated with toll collection, but may also cover some of the capital costs associated with construction.

**FIGURE 6**. Electronic Toll Technology Applied To Managed Lanes

# STUDY DESCRIPTION

## Purpose of the Study

With volumes of traffic increasing on the Charlotte Region's road network, and given the persistent physical, financial and environmental constraints to the widening of major highways, an emphasis on serving travel demand through innovative use of existing or planned roadway capacity is ever more compelling. In 2004, the North Carolina Department of Transportation (NCDOT) began to use roadway capacity more efficiently by implementing HOV lanes along 10 miles of I-77 between Huntersville and Charlotte. This was the first, and still is, the only HOV facility in North Carolina. Based on public acceptance of this HOV facility, NCDOT and local governments in the Charlotte region initiated an examination of existing and planned major highways throughout a 10-county region to identify where *Fast Lanes* – HOV, HOT or TOT facilities – could improve roadway capacity.

Studies of similar projects around the country showed that successful implementation requires a thorough analysis of the technical, financial and institutional feasibility of a managed lanes strategy. All three perspectives are important, and any missing perspective can preclude successful study outcomes. The primary focus of this study for NCDOT, the City of Charlotte and other agency stakeholders in the region was to assess corridor performance against criteria established for all three feasibility perspectives.

## What Corridors Were Included in the Study?

Figure 7 indicates the location of the major roadway corridors analyzed in the Charlotte Region *Fast Lanes* Study. There were twelve primary corridors, totaling approximately 334 miles, considered in the first phase of

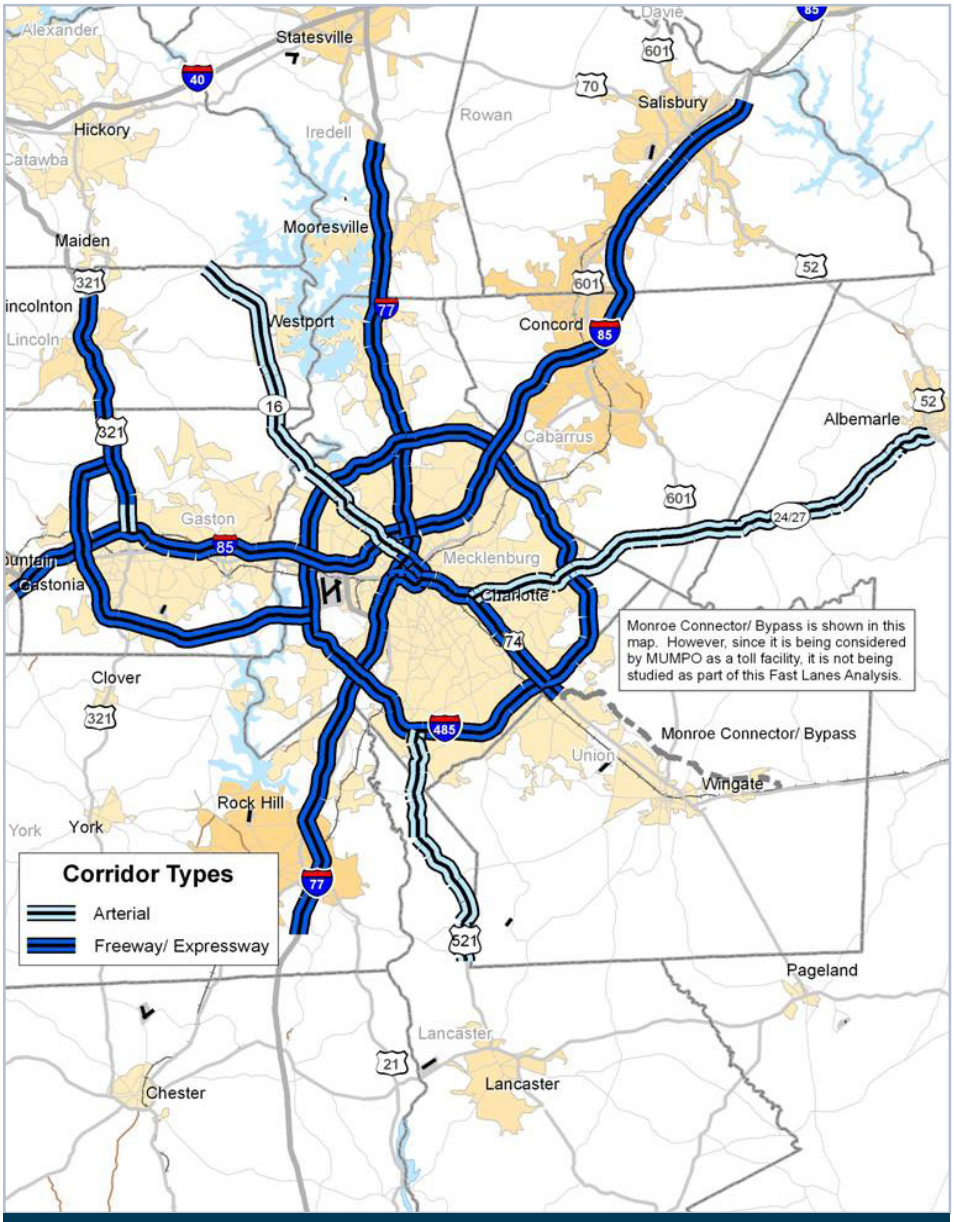



**FIGURE 7**. Charlotte Region *Fast Lanes* Study Corridors

the study. The majority (77 percent) of those miles consist of freeways/expressways. NC-16, NC-24/27, and US-521, which are arterials, were also studied. The proposed Monroe Connector/Bypass in Union County was not included in this analysis because it has already been approved by the Mecklenburg-Union Metropolitan Planning Organization (MUMPO) to operate exclusively as a toll road and is being planned and designed by the North Carolina Turnpike Authority (NCTA).

## How Were the Corridors Evaluated for *Fast Lanes* Feasibility?

### Phase 1 Screening Process

In the first phase of the study, corridors and individual corridor segments were screened for their feasibility for managed lanes by applying criteria thresholds that typically define the effectiveness of *Fast Lanes* strategies. The purpose of the screening was to identify fatal flaws before proceeding into more detailed evaluations.

The screening criteria are based on guidance from several reference sources including the American Association of State Highway and Transportation Officials (AASHTO) Guide for High Occupancy Vehicle Facilities, National Cooperative Highway Research Program (NCHRP) 414 HOV Systems Manual and the HOV Facilities Planning, Operation and Design Guide by Parsons Brinckerhoff. HOT lane guidelines are found in the Federal Highway Administration (FHWA) HOT Lane Guide. Figure 8 illustrates the Phase 1 screening process. Corridors were dropped from the study if there is no existing congestion or if sufficient congestion is not projected for the general purpose lanes in the future. Figure 9 shows which corridors advanced to Phase 2 of the *Fast Lanes* Study, representing about 158 miles of freeways and expressways.

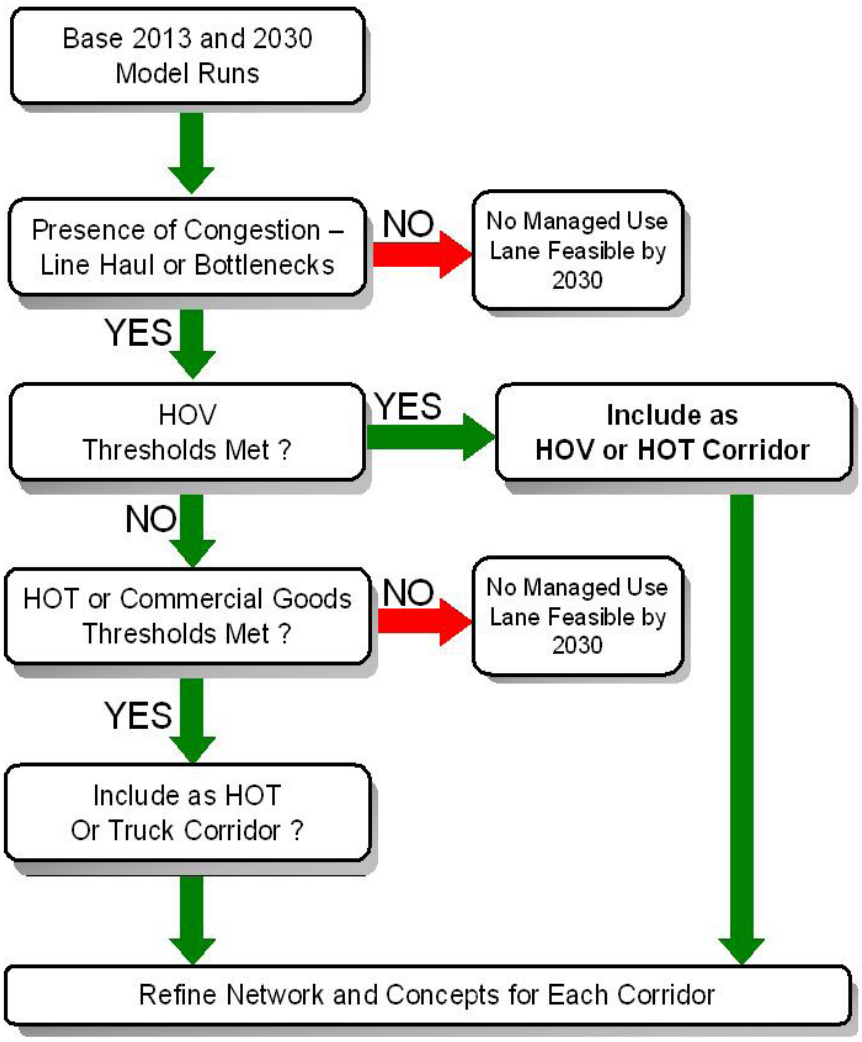



**FIGURE 8**. Phase 1 Screening Process.

### Phase 2 Detailed Analysis

During this phase, costs, tolls, and revenues were analyzed, as well as other factors affecting implementation of *Fast Lanes* in the Charlotte region. Phase 2 involved estimating capital, operating and maintenance costs by corridor and segment to determine the financial feasibility of *Fast Lanes*. As appropriate for a first-order assessment of a *Fast Lanes* network at a regional scale, simplified, yet conservative approaches to forecasting

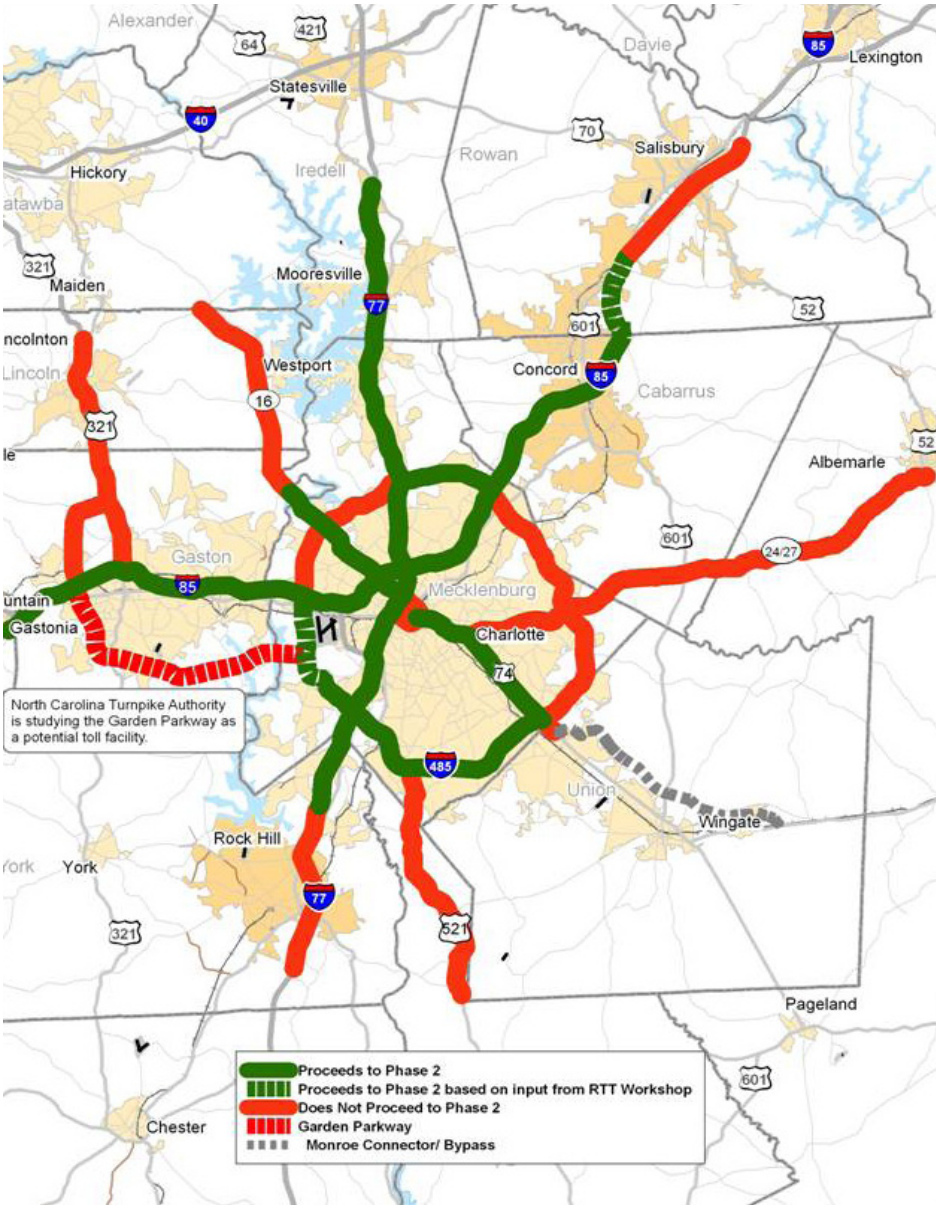



**FIGURE 9**. Phase 1 Screening Recommendations.

revenues and costs were used. Capital and operations and maintenance costs include significant contingencies. Revenue projections were generated by using a tolling model which builds upon forecasts from the Metrolina Regional Travel Demand Model.

## How Were Revenues Forecast for Potential HOT Lanes?

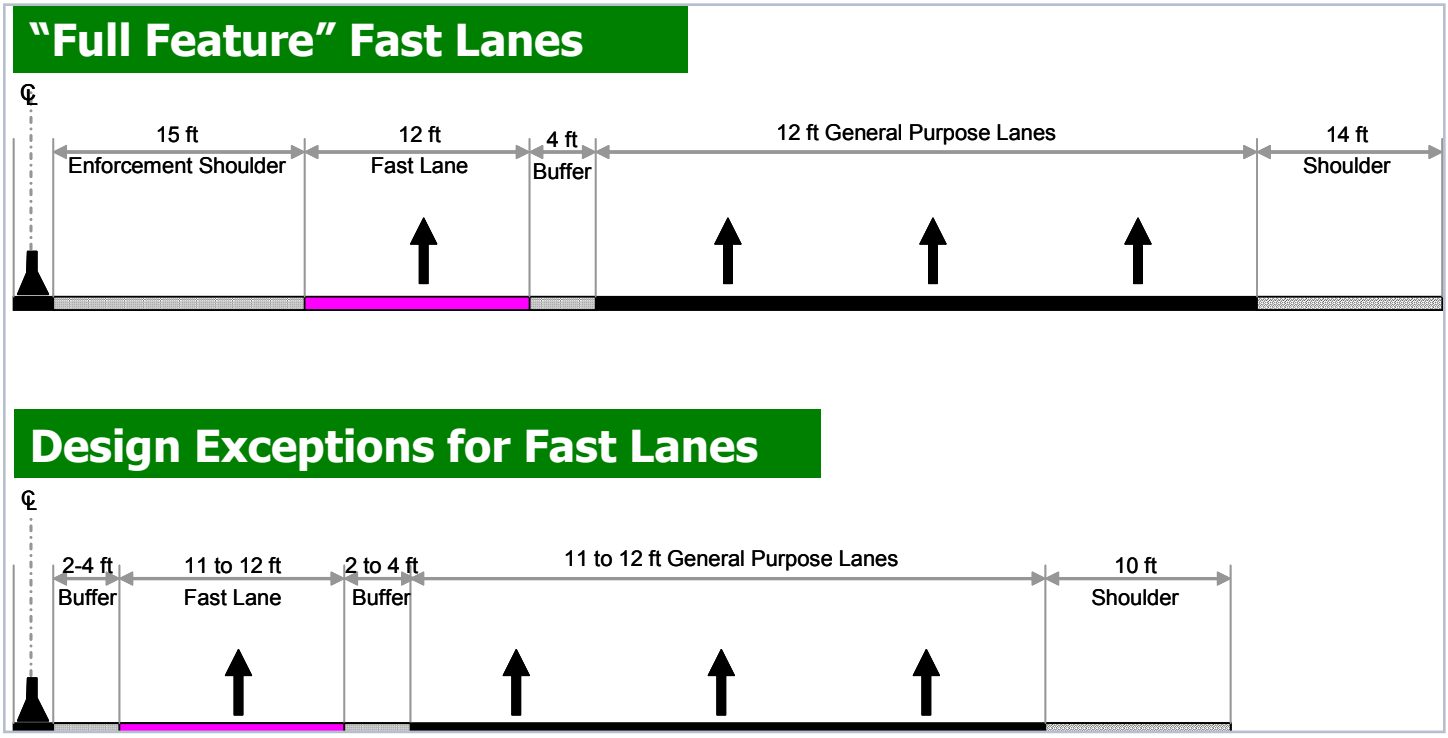
Different revenue and toll estimates were generated by varying four key factors:

- **Pricing objective.** HOT lanes can be operated to achieve a variety of different objectives. Some facilities might be operated to maximize toll revenues, which is appropriate when the HOT lane facility must cover its capital costs. Other facilities that are not financially constrained can be operated to maintain a target level of traffic service or to minimize travel time costs for commuters within a corridor or for the overall network. Tolls were established in the Charlotte Region *Fast Lanes* Study to 1) maximize toll revenues, and 2) minimize the aggregate dollar value of time costs in each corridor. For both scenarios, the managed lane was assumed to carry no more than 1,600 vehicles per hour per lane.
- **Carpool policy.** Tolls were optimized for optional ridesharing policies where vehicles with two or more occupants travel for free, vehicles with three or more occupants ride for free, and all users must pay.
- **Vehicle volumes.** Revenue forecasts from the tolling model were derived from the Metrolina Regional Travel Demand Model's forecasts 1) when vehicles with two or more occupants would travel for free in the HOT lanes, and 2) when the HOT lanes would be operated as general purpose lanes.
- **Year of operation.** Modeling was done for two planning years, 2013 and 2030.

## How Were Capital Costs for Implementing *Fast Lanes* Estimated?

Construction cost estimates for implementing *Fast Lanes* are based on a methodology which uses a cost-per-mile table developed by NCDOT. This

**FIGURE 10**. Typical Cross Sections ("Full Feature" vs. Design Exceptions)




methodology was also used to prepare construction cost estimates for the 2030 Long Range Transportation Plan for the Mecklenburg-Union urbanized area. In this study, cost estimates were included for the following two design approaches:

- "Full feature" uses widths provided by NCDOT for shoulders and lanes and for the buffer separation between managed lanes and adjacent general purpose lanes. This approach requires major widening to provide the new travel lanes and full shoulders where they currently don't exist.
- Use of design exceptions where needed would be consistent with practices employed along a portion of I-77 to implement the HOV lane between I-85 and I-277 (Brookshire Freeway), as well as in many cities around the United States. *Fast Lanes* projects have often been created by converting the inside shoulder to a managed lane and narrowing adjacent lanes with a goal to provide the benefits of HOV or HOT lanes as early as possible at an affordable cost without requiring new right-of-way.

Figure 10 compares a "full feature" cross section with the cross section that would be developed on constrained highway segments by allowing "design exceptions".

## How Were Operations and Maintenance Costs for *Fast Lanes* Estimated?

Operations & Maintenance (O&M) costs for the Charlotte Regional *Fast Lanes* Study were developed based on experiences of other toll and HOT lane facilities around the country. When available, estimates and assumptions were obtained from local sources, such as the NCDOT. The NCTA was consulted to ensure consistency on study assumptions and unit cost estimates for toll-related expenses. When necessary, assumptions were developed using data and results from the following toll projects:

- Mountain View Corridor in Salt Lake City, Utah

- Columbia River Crossing in Washington and Oregon
- SR-520 in Washington
- Inter-County Connector in Maryland
- Bay Area Transportation Authority in San Francisco/Oakland, California
- E-470 in Denver, Colorado

## What Factors Were Used in Phase 2 Detailed Analysis?

The following factors were used to evaluate the Phase 2 corridors:

- **Demand.** The projected numbers of persons and vehicles that would use a *Fast Lane* during peak periods were compared to those numbers for adjacent general-purpose lanes.
- **Travel time savings.** These would be the estimated times saved during peak periods by *Fast Lanes* users compared to the travel times of motorists traveling in the general-purpose lanes. The numbers of minutes saved per mile of managed lane facility were used to evaluate each corridor and corridor segment.
- **Comparison of estimated revenues to O&M costs.** This comparison revealed the extent to which the annual projected revenues for a corridor or corridor segment could cover estimated annual O&M expenses. This revenue-to-cost comparison provides a general indication of the financial feasibility of implementing HOT lanes in a corridor.
- **Other projects or studies impacting the timing of *Fast Lanes* implementation.** This analysis included the timing or sequencing of impacts on implementation resulting from adjacent corridor projects.

While Figure 11 shows the corridor limits, Table 1 summarizes the evaluation of the Phase 2 corridors using the previously described factors.

| Corridor | Demand for *Fast Lanes* | | Peak Hour Travel Time Savings from Use of *Fast Lanes* | | Estimated Percentage of Annual Revenues Compared to O&M Costs | | Other Projects/Studies Impacting Phasing |
|---|---|---|---|---|---|---|---|
| | 2013 | 2030 | 2013 | 2030 | 2013 | 2030 | |
| **I-77 North** | 700 – 900 vph[1] *(1,800-2,200 pph [2])* | 1,000-1,200 vph *(2,500-2,900 pph)* | 10 minutes saved between Davidson & Center City Charlotte (0.5 minutes/mile) | 17 minutes saved between Davidson and Center City Charlotte (0.9 minutes/mile) | For existing HOV lane plus its extension to Iredell County Line ***Rev. Max.*** [3] 150-300% ***Travel Time Cost Min.*** [4] 60-120% | ***Rev. Max.*** [3] 200-400% ***Travel Time Cost Min.*** [4] 60%-200% | •HOV lane in operation since 2004 (current demand of 300 vehicles or 1000 persons/peak hour)<br>•NCDOT began HOV-to-HOT conversion feasibility study in February 2009<br>•NCDOT is also conducting a physical feasibility study for HOV lane extension between I-85/I-77 interchange and 5th Street<br>•NCDOT is preparing environmental documents and preliminary design for widening lanes and shoulders between I-277 (Brookshire Freeway) and I-85/I-77 interchange<br>•NCDOT will be conducting planning, engineering and environmental analysis for widening I-77 between NC-73 in Huntersville and I-40 in Statesville. |
| **US-74 East** | 900-1,100 vph *(2,100-2,600 pph)* | 1,100-1,300 vph *(2,800-3,300 pph)* | 5 minutes saved between Matthews & Center City Charlotte (0.7 minutes/mile) | 8 minutes saved between Matthews and Center City Charlotte (0.9 minutes/mile) | ***Rev. Max.*** 160-340% ***Travel Time Cost Min.*** 40-125% | ***Rev. Max.*** 250-280% ***Travel Time Cost Min.*** 70-200% | •Rapid transit technology (BRT or LRT) east to I-485 is undecided; CATS has placed corridor transit planning/design on hold.<br>•NCDOT is designing the next US-74 project between Sharon Amity Road and Conference Drive.<br>•The City of Charlotte modified requirements for transitional setback to include general purpose lanes, rapid transit service and managed lanes.<br>•NCTA is completing environmental documents for the Monroe Connector/Bypass; the 21-mile toll road is estimated to open to traffic in 2013. |
| **I-85 North** | 700-900 vph *(1,500-2,200 pph)* | 1,200-1,300 vph *(2,900-3,100 pph)* | 5 minutes saved between UNCC & Center City Charlotte (0.6 minutes/mile) | 7 minutes saved between UNCC and Center City Charlotte (0.7 minutes/mile) | North to I-485 ***Rev. Max.*** 30-50% ***Travel Time Cost Min.*** 10-20% | ***Rev. Max.*** 50 – 80% ***Travel Time Cost Min.*** 15-45% | NCDOT is designing widening between Bruton Smith Blvd (Exit 49) and NC-73 (Exit 55); construction scheduled to begin in 2011 |
| **I-85 South** | 600-800 vph *(1,500-2,000 pph)* | 1,100 vph *(2,700 pph)* | 9 minutes saved between Gastonia & Center City Charlotte (0.4 minutes/mile) | 19 minutes saved between Gastonia and Center City Charlotte (0.8 minutes/mile) | ***Rev. Max.*** 100-225% ***Travel Time Cost Min.*** 50-100% | ***Rev. Max.*** 235-480% ***Travel Time Cost Min.*** 100-220% | |

(1) vph= vehicles per hour
(2) pph= persons per hour
(3) Rev. Max= revenue maximization
(4) Travel Time Cost Min.= travel time cost minimization

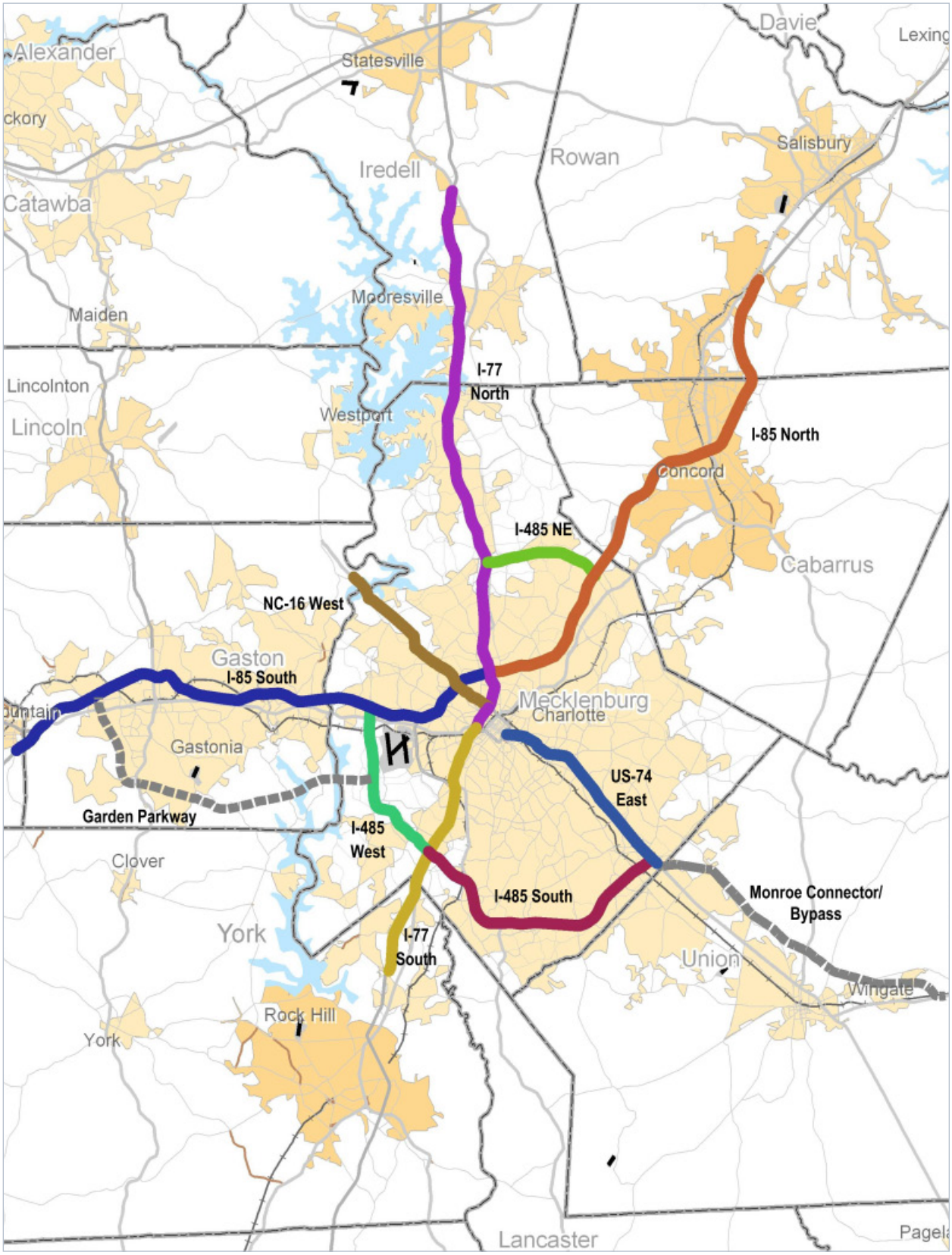
▲ **TABLE 1**. Phase 2 Corridor Evaluation.

| Corridor | Demand for *Fast Lanes* | | Peak Hour Travel Time Savings from Use of *Fast Lanes* | | Estimated Percentage of Annual Revenues Compared to O&M Costs | | Other Projects/Studies Impacting Phasing |
|---|---|---|---|---|---|---|---|
| | 2013 | 2030 | 2013 | 2030 | 2013 | 2030 | |
| **I-77 South** | 800-1,000 vph *(2,000-2,300 pph)* | 1,200-1,300 vph *(3,000-3,300 pph)* | 4 minutes saved between Rock Hill & Center City Charlotte (0.2 minutes/mile) | 7 minutes saved between Rock Hill and Center City Charlotte (0.3 minutes/mile) | ***Rev. Max.*** 70-90% ***Travel Time Cost Min.*** 15-50% | ***Rev. Max.*** 185-270% ***Travel Time Cost Min.*** 30-170% | •NCDOT conducting a physical/operational feasibility study for HOV lanes and widening between Fifth Street in Center City Charlotte and South Carolina state line.<br>•SCDOT interested in *Fast Lanes* in York County |
| **I-485 South** | 500-700 vph *(1,200-1,700 pph)* | 600-800 vph *(1,600-2,100 pph)* | 6 minutes saved between I-77 near Pineville and US-74 near Matthews (0.3 minutes/mile) | 6 minutes saved between I-77 near Pineville and US-74 near Matthews (0.3 minutes/mile) | ***Rev. Max.*** 70-250% ***Travel Time Cost Min.*** 30-50% | ***Rev. Max.*** 25-110% ***Travel Time Cost Min.*** 20-40% | •NCDOT considering peak-period shoulder use east of I-77 (potential for *Fast Lane*).<br>•NCDOT designing I-485 widening to six lanes between I-77 and US-521. |
| **NC-16 North** | 400 vph *(900-1,000 pph)* | 600 vph *(1,400 pph)* | 5 minutes saved between Mountain Island & Center City Charlotte (0.5 minutes/mile) | 8 minutes saved between Mountain Island and Center City Charlotte (0.8 minutes / mile) | ***Rev. Max.*** 40-50% ***Travel Time Cost Min.*** 10-30% | ***Rev. Max.*** 40-50% ***Travel Time Cost Min.*** 10-40% | |
| **I-485 West** | 100 vph *(300 pph)* | 100-300 vph *(400-80 pph)* | 1 minutes saved between I-85 southI-77 south | 3 minutes saved between I-85 south and I-77 south (0.1 minute/mile) | ***Rev. Max. & Travel Time Cost Min.*** 3% | ***Rev. Max. & Travel Time Cost Min.*** 4-8% | |
| **I-485 Northeast** | 100-200 vph *(300-500 pph)* | 300 vph *(800 pph)* | Not applicable | < 1 minute saved between I-85 north & I-77 north | Not applicable | ***Rev. Max.*** 1-7% ***Travel Time Cost Min.*** 2% | • NCDOT designing this un-built segment between I-77 north and I-85 north |

(1) vph= vehicles per hour
(2) pph= persons per hour
(3) Rev. Max= revenue maximization
(4) Travel Time Cost Min.= travel time cost minimization

**TABLE 1 (continued)**. Phase 2 Corridor Evaluation.

**FIGURE 11**. Phase 2 Corridors



Based on the information in Table 1, the key conclusions for each corridor are as follows:

### I-77 North

The demand for *Fast Lanes* in this corridor is ranked near the top of all Phase 2 corridors. The forecasted travel time savings for managed lanes users in 2030 would exceed the industry rule-of-thumb of a half-minute per mile savings. The revenues projected for HOT lane operations in this corridor are greater than the forecasted O&M expenses in 2030. The only managed lanes in North Carolina are operated on I-77. NCDOT has four feasibility, planning or environmental studies underway along the corridor. Work began in February 2009 on a feasibility study to assess the benefits and costs of extending the existing HOV lane from its current terminus near I-485 (south of Exit 23) to Griffith Street at Davidson (Exit 30). A complementary study will assess the potential for converting either the existing HOV lanes or the lengthened HOV facility to HOT lanes with both studies scheduled to be completed in spring 2010. NCDOT's engineering and operations studies will begin to address many of the issues associated with expanded HOV implementation and the technical, institutional and financial feasibility of HOT lanes in North Carolina.

### US-74 East

This corridor shows great demand for managed lanes, with acceptable travel time savings even in the short-term. Based on the revenue maximization pricing strategy, forecasted annual revenues for HOT lanes would be about three times greater than the projected annual O&M costs in both 2013 and 2030. NCDOT is working to re-build this roadway east to Conference Drive. The City of Charlotte is expected to endorse a new area plan which will include the cross-section and roadway design for US-74 becoming a freeway with *Fast Lanes*. This new vision provides an opportunity to reflect *Fast Lanes* concepts in upcoming plans and projects. The NCTA is currently completing environmental analysis and conceptual design of the planned Monroe Connector-Bypass, a 21-mile toll facility which will begin at the eastern terminus of this corridor near I-485 and end near the Town of Marshville in Union County. This toll facility is expected to open to traffic in less than five years.

### I-85 North

The I-85 North corridor is characterized by significant demand for *Fast Lanes* and shows the potential for travel time savings for managed lanes users which would exceed the industry rule-of-thumb for both 2013 and 2030. There could be the opportunity to implement *Fast Lanes* more quickly and at a lower cost through design exceptions along I-85 in Mecklenburg County. More detailed corridor-level analysis would not only resolve engineering issues associated with managed lanes implementation, but would also evaluate the benefits of improvements such as a direct *Fast Lanes* connector between I-85 and I-77. NCDOT should consider future *Fast Lanes* implementation in projects to widen I-85 to eight lanes between Bruton Smith Boulevard (Exit 49) and NC-152 (Exit 68) in Rowan County.

### I-85 South

This corridor ranks among the highest corridors for *Fast Lanes* demand and would have estimated travel time savings between Gastonia and Center City Charlotte greater than the industry rule-of-thumb. Estimated annual revenues compare very favorably to projected yearly O&M costs if HOT lanes were implemented by 2013. The physical attributes of the I-85 corridor in Gaston County, however, would make it costly to add managed lanes to the existing cross-section. There is also little opportunity for constructing a *Fast Lanes* facility west of I-485 using design exceptions.

### I-77 South

Although this corridor ranks near the top in *Fast Lanes* demand for both 2013 and 2030, travel times savings per mile would be lower than for the I-77 north, US-74 east, and I-85 corridors. NCDOT is conducting a feasibility study to consider options for widening or rebuilding the portion of the freeway between Fifth Street in Center City Charlotte and the South Carolina state line. That study should consider managed lanes alternatives. SCDOT's interest in implementing managed lanes along I-77 in York County south of I-485 presents an opportunity to explore design issues associated with extending the HOV or HOT facility beyond Mecklenburg County. More detailed analysis of this portion of I-77 could also explore how new capacity planned along I-485 could connect to the I-77 *Fast Lanes.*

### I-485 South

This corridor ranks just below the top five corridors in *Fast Lanes* demand for 2013 and 2030. NCDOT is considering short-term alternatives for increasing capacity along I-485 east of its interchange with I-77, until they build a programmed widening of the interstate to six lanes between I-77 and US-521 (Johnston Road). With the revenue maximization pricing option, I-485 HOT lanes would yield a

positive annual revenue-to-operating cost ratio by 2013.

**NC-16 North**

Although this corridor ranks below the previously-mentioned corridors in managed lanes demand, it compares very favorably to other corridors in travel time savings per mile for *Fast Lanes* users in both 2013 and 2030. While the projected revenues for HOT lanes operation fall well below estimated O&M costs, this could change by the 2030 planning horizon. Therefore, the potential for managed lanes should be considered when NC-16 improvements are studied.

**I-485 West and Northeast**

These two segments show little demand for or travel time savings from *Fast Lanes* implementation. However, continued or faster growth could create a demand for managed lanes by 2030. Managed lanes would also provide an opportunity to preserve the capacity of any new lanes being considered for implementation along I-485, or through the interchanges with I-77 and I-85.

# NEXT STEPS


**FIGURE 12.** Opening of I-77 HOV Lanes in 2004

The Charlotte Region *Fast Lanes* Study represents the first stage in a series of technical, institutional and financial analyses and decisions that will successively implement a regional managed lanes network. This study's findings should be considered in updates to the Long Range Transportation Plans (LRTPs) in the Charlotte region. Additional data and studies will be needed on a corridor-by-corridor basis to identify the physical attributes and operational characteristics of each *Fast Lanes* corridor. Phasing of projects will be important in achieving the highest potential for early success and in minimizing impacts and risk associated with *Fast Lanes* implementation. Phasing of projects should also consider the programming of adjacent projects.

## Formal Interagency Partnering

A formal interagency process and venue should be established to ensure coordination among state (North Carolina and South Carolina) and regional partners in planning, data collection, design, demand modeling and funding of *Fast Lanes.* The formal group (which may involve the preparation of a memorandum of agreement) could focus on issues such as determining the pricing/vehicle eligibility requirements for managed lanes, collecting data on travel behavior characteristics and *Fast Lanes* use, and identifying financing strategies to cover the costs of managed lanes.

## Incorporate Study Findings in LRTP Updates

The four Metropolitan Planning Organizations in the Charlotte region should reflect the results of the previously discussed Phase 2 corridor evaluation in LRTP updates.

## Corridor-Level Engineering and Usage Studies

The advancement of *Fast Lanes* in the Charlotte region will require more detailed operations analysis and refined engineering design of potential managed lanes at the individual corridor level. Work elements that could be undertaken in these corridor studies include, but are not limited to:

- **Revised demand projections.** The focus of this work is to revise the demand estimates for managed lanes treatments along a corridor based on updated design and phasing assumptions, because the Charlotte Region *Fast Lanes* Study assumed an entire network of managed lanes. Future work efforts will provide for feedback between the tolling and Metrolina Travel Demand models. Work tasks also include traffic simulation modeling to evaluate potential bottlenecks at facility termini and identification of possible mitigation strategies.
- **Revised revenue estimates and potential tolls.** The updated demand forecasts will generate refined estimates of traffic, travel demand and revenue where HOT lanes are being considered. This task will identify optimal tolls for proposed HOT lanes and the corresponding revenues which could be generated from those tolls.
- **Corridor-level design and operations.** This effort will include detailed operations analysis and refining the designs based on more detailed planning and engineering. Design considerations would address the feasibility of implementing "full feature" design alternatives versus the need to request design exceptions from FHWA, NCDOT, or SCDOT. Work tasks would include capital cost estimates based on the

approved design. Operational issues would be addressed based on the managed lanes treatment being considered for each corridor, followed by the generation of corresponding O&M estimates. Work tasks would involve identification of cost-effective enhancements, such as direct access ramps and transit park-and-ride facilities, in order to maximize the benefits of *Fast Lanes.*

- **Financial feasibility and phasing.** For possible HOT lanes or Express Toll Lane (ETL) facilities, this effort involves a comparison of forecasted toll revenues and costs attributable to a priced facility over its life cycle. A comprehensive cash flow analysis will match revenue/funding sources and financing with capital and O&M costs to identify potential funding gaps and possible phasing of improvements. For HOV facilities, the work tasks would involve identification of funding sources for project implementation, including the need for phasing. The timing of other projects programmed in a corridor and their impacts on *Fast Lanes* would be considered as part of this work element. Other factors such as the planned implementation of supportive transit services or corridor maintenance/improvement requirements also should be considered in making phasing decisions.

## Policy for Allocating HOT Lane Revenues

A decision-making and consultation structure should be developed for allocating HOT or ETL revenues. The consultation structure would include state, regional, city and county agencies in addition to possible *Fast Lanes* operating entities. The group could establish strategies when 1) annual revenues do not meet operating costs, 2) costs and revenues are equal, and 3) yearly revenues exceed annual O&M costs.

## Governance Clarification for HOT Lanes Implementation

The question as to whether HOT lanes or tolling can be implemented on federally-funded highways will have to be determined. The authority could change under a re-authorized federal transportation law. NCDOT, SCDOT, the City of Charlotte and other partner agencies should work closely with each state's Congressional delegation to modify language in federal law to request or allow congestion pricing on Interstate roads. The authority for tolling new and/or existing lanes should be explored through continued discussion among NCDOT, SCDOT, NCTA, the City of Charlotte and other partner agencies.

## For More Information

To find out more about the Charlotte Region *Fast Lanes* study, go to www.fastlanes.org or contact:

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