Charlotte Region *Fast Lanes* Analysis

Technical Memorandum Task 1.5

FINAL CORRIDOR SCREENING REPORT

February 15, 2008

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1.0. INTRODUCTION

The purpose of this technical memorandum is to summarize the results of corridor screening based on Phase 1 evaluation criteria developed for this study. These results cover all potential corridors identified by study team members. Recommendations from Phase 1 will determine those corridors that should be evaluated in more detail during Phase 2 of this study.

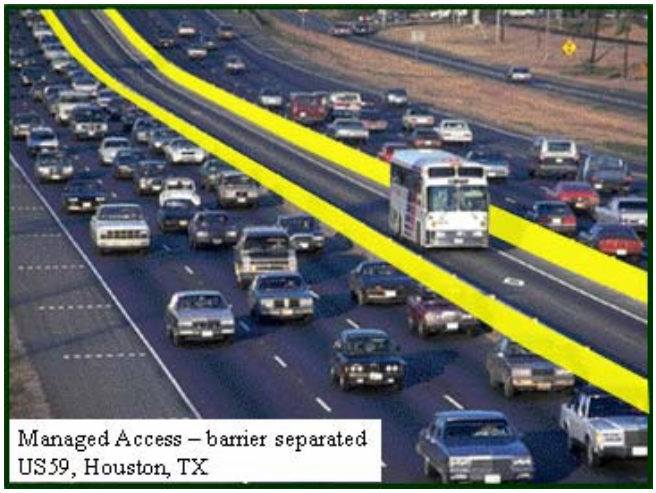
At the study's beginning, a regional technical team (RTT) was formed to work with the consultant team to identify potential corridors. The technical team includes representatives of the North Carolina Department of Transportation (NCDOT), the Charlotte Department of Transportation (CDOT), Metropolitan Planning Organizations (MPOs), Rural Planning Organizations (RPOs) and other local agencies within the Charlotte Region. The RTT also worked with the consultant team to develop screening criteria used in evaluating the corridors.

Continuous Access -8" painted buffer
I-5, Portland, OR

1.1. Study Corridor

Table 1-1 lists the major study corridors evaluated during Phase 1 screening of this study while Figure 1-1 is a map of the corridors. There are eleven primary corridors, totaling approximately 334 miles. Some corridors are further subdivided to facilitate the evaluation process. The majority (77 percent) operate as freeways/expressways. However, NC-16, NC-24/27, and US-521 are assumed to continue to operate as arterials (see Figure 1 2). The map also shows roadways that are planned for the future, e.g. US-321 Bypass and Garden Parkway in Gaston County and northeast section of I-485 loop (between I-77 North and I-85 North). These future roadways are assumed to be in place by the Year 2030. The proposed Monroe Connector/Bypass in Union County is not included in this analysis because it has already being approved by the Mecklenburg-Union MPO to operate as a toll road.

The remaining sections of this report briefly discuss the screening process, screening criteria, evaluation results, and conclusions with recommendations for moving selected corridors into Phase 2 for more detailed evaluation.



Managed Access – barrier separated
US59, Houston, TX

Table 1-1. List of Study Corridors

Corridor	Location / Description	Length (Miles)
US-521	Between SC-5 in Lancaster County, SC and I-485 south near Ballantyne/ Pineville area.	18.1
NC-24/27	Between US-74 in Charlotte and US-52 in Albemarle	35.6
Garden Parkway	Starting at I-85 and US-321 Bypass, heading south (around Gastonia) and east towards Charlotte, terminating at I-485 near Charlotte Douglas International Airport.	20.0
US321-Bypass	Between US-321 and I-85 northwest of Gastonia.	7.4
US-321	Starting at I-85 (Exit 17) in Gastonia and going north and terminating at Lincoln/ Catawba County line.	17.5
NC-16	Starting at Lincoln/ Catawba County line at NC-150 and going southeast toward Charlotte; terminating at I-277/ I-77 interchange.	27.5
US-74	Between I-277 loop in Charlotte to I-485 southeast.	13.1
I-85 south	Between US-74 (Exit 10) and I-77 (Exit 38) in Charlotte.	28.3
I-85 north	Starting at I-77 (Exit 38) in Charlotte, heading northeast through Cabarrus County and terminating near Long Ferry Road (Exit 81) in Rowan County.	41.8
I-77 south	Between Chester/ York County, SC (Exit 73) and I-85 in Charlotte	31.5
I-77 north	Between I-85 in Charlotte (including existing HOV lanes) and US-21/NC-115 (Exit 42) in Iredell County.	27.8
I-485	Includes the entire loop around Charlotte in Mecklenburg County.	65.4
	Total	334.0


Existing I-77 HOV, Charlotte, NC

Figure 1-1. Study Corridors

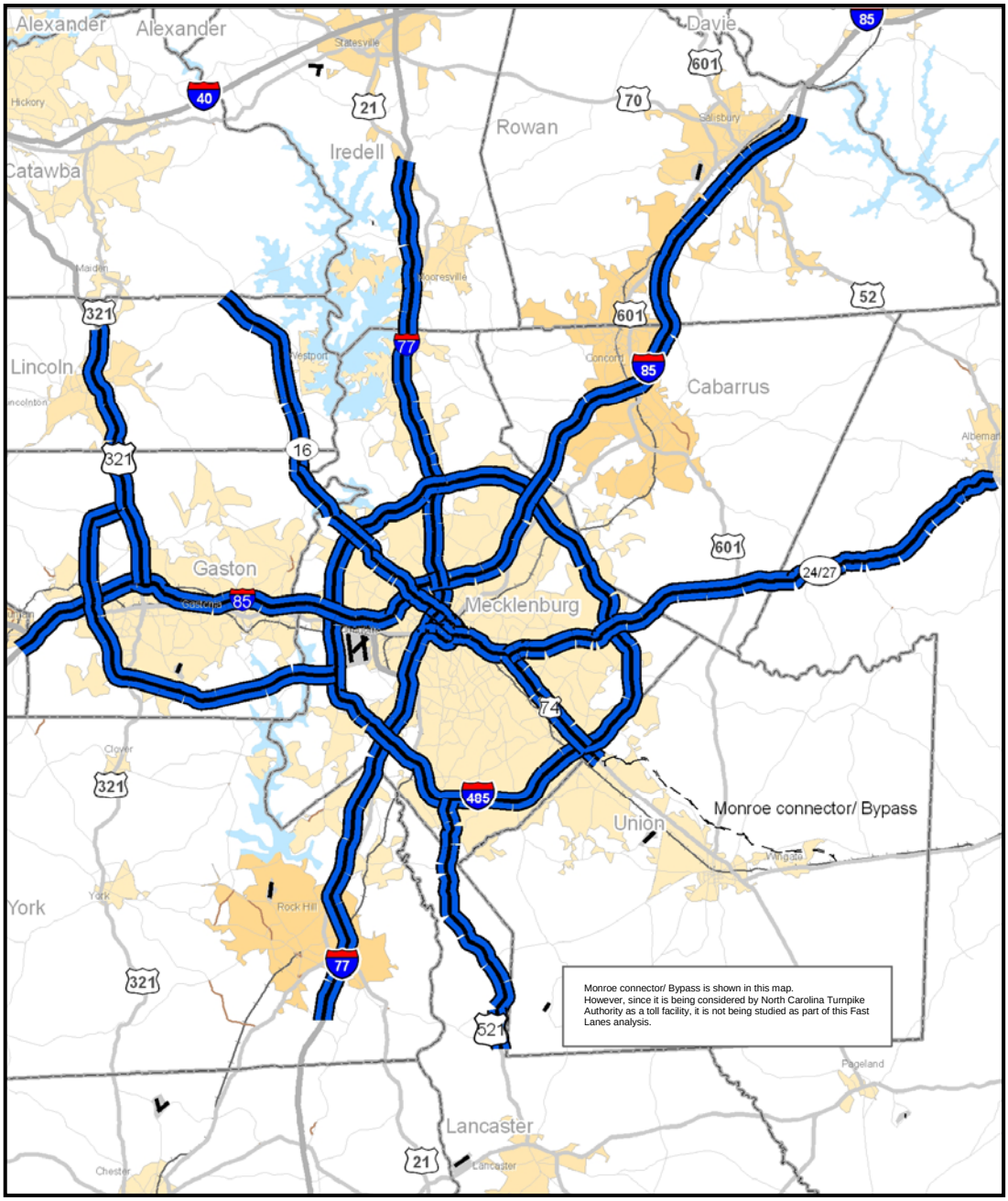
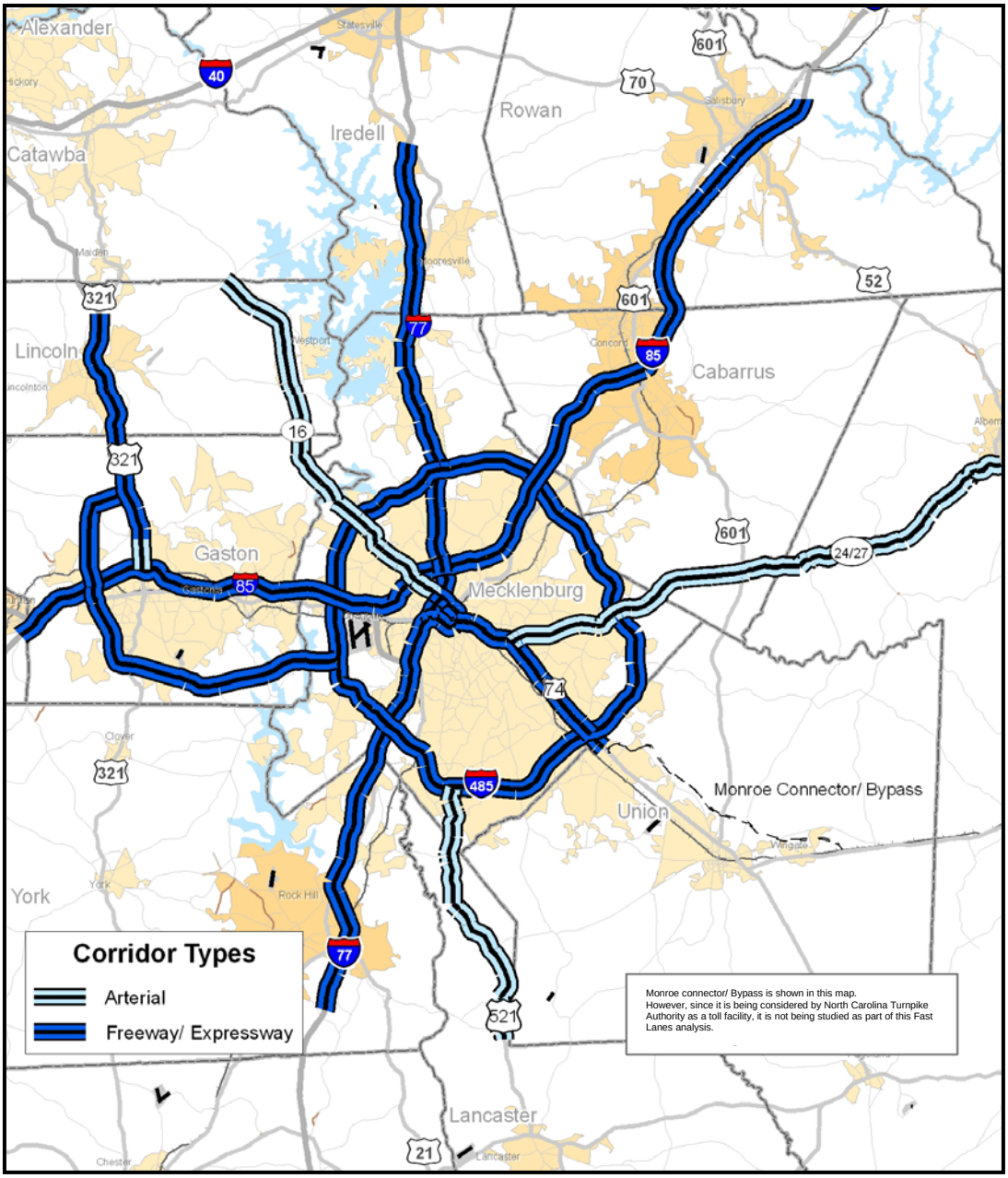


Figure 1-2. Corridor Types

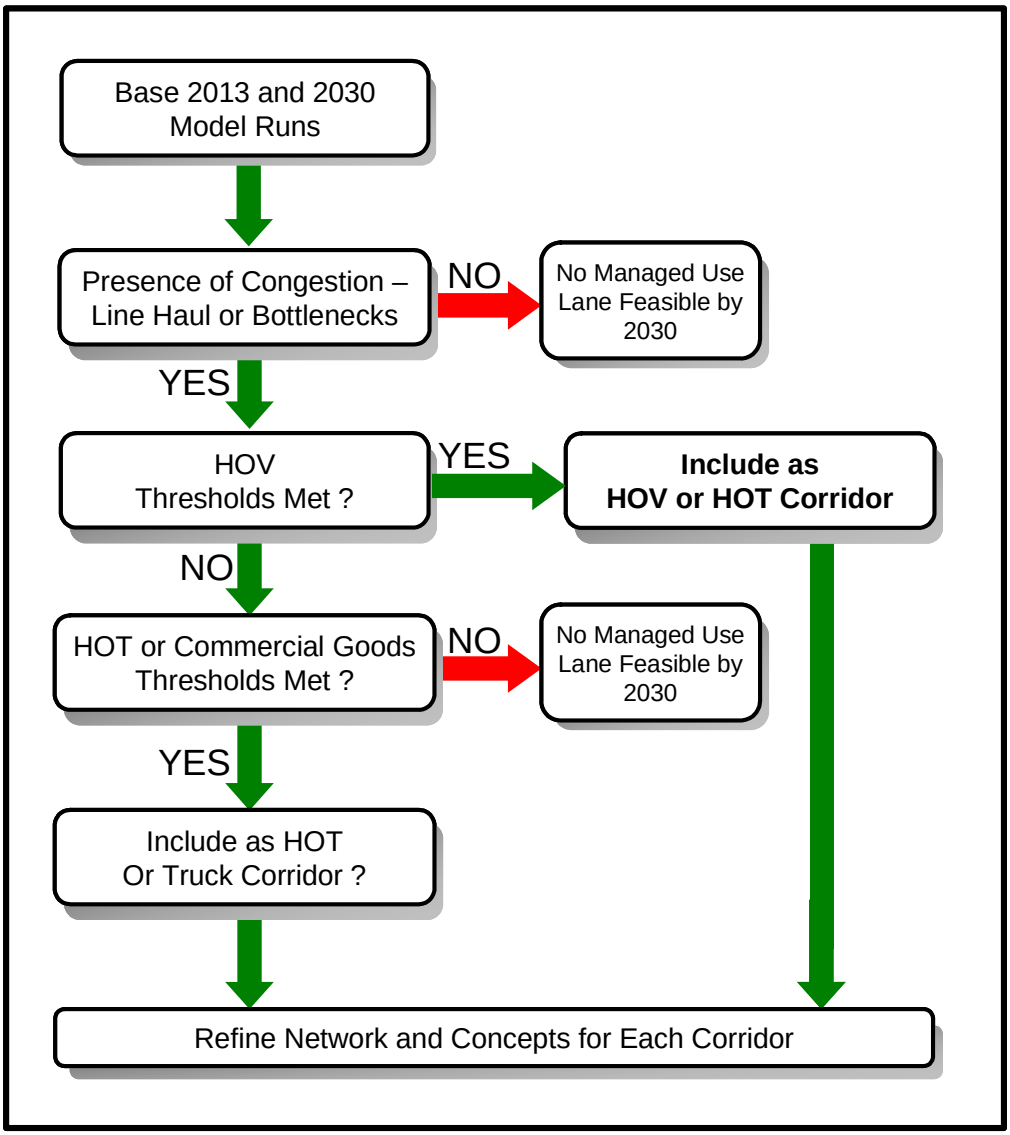


2.0. EVALUATION METHODOLOGY

2.1. Screening Process

The screening process involves a corridor meeting certain criteria thresholds that typically define effectiveness for managed lane strategies. If thresholds are not met, then the candidate corridor is not typically carried forward. These screening criteria are evaluated successively since the presence of congestion must first exist to generate any potential benefits, which in turn, affect demand. The following diagram illustrates how evaluation criteria are applied.

Figure 2-1. Screening Process Flow



2.2. Screening Criteria

The purpose of screening criteria is to define corridor fatal flaws before proceeding into more detailed evaluations for each candidate corridor or corridor segments. Screening criteria for this study are based on guidance in the American Association of State Highway and Transportation Officials (AASHTO) Guide for High-Occupancy Vehicle Facilities [1], National Cooperative Highway Research Program (NCHRP) 414 HOV Systems Manual [2], and the Parsons Brinckerhoff HOV Facilities Planning, Operation and Design Guide [3]. HOT lane guidelines can be found in the Federal Highway Administration (FHWA) HOT Lane Guide [4]. Based on the above references, the study team in consultation with RTT committee selected screening criteria responding to regional mobility goals based on the following measures of effectiveness:

- Congestion levels along a corridor or at isolated traffic bottlenecks (required for any managed lane option)
- Travel patterns (responds to high occupancy vehicle (HOV), high occupancy toll (HOT) and truck potential)
- Vehicle demand for HOV, HOT and truck options (responds to overall potential for effectiveness through different eligibilities)
- Patronage demand for transit and rideshare services (responds to HOV lane person carrying potential)
- Tolling potential (responds to HOT lane potential)
- Physical ability to add *Fast Lanes*, or conversely, to borrow or convert existing lanes based on current corridor operations

Table 2-1 provides a summary of the screening criteria used during Phase 1 of this study. Technical Memorandum 1.3, Evaluation Criteria, of this analysis explains in detail the development and use of these criteria. Each of the corridors will be evaluated based on these criteria.

2.3. Criteria Ranking

All of the corridors/ segments are evaluated based on the criteria for congestion, HOV demand, HOT (pricing) demand, and physical attributes. Each segment is given a value corresponding to a five point scale, using the median value as meeting the threshold. The range of values is determined according to the distribution of results, and each is customized to the values generated for the Charlotte region along with national experience. For example, if none of the corridors meets a minimum threshold, then all values would be reflected below the median and none would pass for that measure of effectiveness.

Under the five point ranking process, a segment meeting the criterion threshold receives a value of three. If the segment exceeds the threshold for a criterion, it gets a value of 4 or 5. A score below 3 indicates the minimum threshold is unmet. These numerical values are converted to filled-in circles (similar to *Consumer Reports* evaluations so as to prevent averaging, tallying and scoring values among different criteria which are not weighted). Table 2-2 shows the ranking system.

Table 2-1. Screening Criteria

Charlotte Region *Fast Lanes* Analysis

Screening No.	Criteria	Threshold(s) to be Met	Parameters	Source
Presence of Congestion				
1.A	Line- haul	Freeways: Volume/capacity (V/C) greater than 1.0 and average speeds below 30 mph in the peak period. Arterials: V/C greater than 1.0 and average speeds below 20 mph in the peak period.	Travel speeds Volume/capacity ratio	Regional model output based on existing and proposed roadways for 2013 and 2030
1.B	Bottlenecks (less than 0.5 miles)	V/C below 1.0 Speeds below 20 mph .	Travel speeds Volume/capacity ratio	Regional model output for 2013 and 2030.
HOV Demand				
2.A	Travel Patterns	Freeway corridors: Average trip distances of 5 miles or more. Arterial corridors: Average trip distances of 3 miles or more.	Vehicle volumes Threshold is either met or not met for each defined corridor or combination of corridors for a defined commute-shed.	Regional model select link data for 2030. Not applied to connecting route segments in core of region.
2.B	Person Moving Demand	Parity or greater when compared to general purpose lane person movement in same corridor, on a per-lane basis, assuming 2000 persons/general purpose lane.	Person moving demand basis for vehicles must be capped based on a maximum per-lane flow rate of 1650 passenger car equivalents (PCEs) per hour for freeways and 900 PCEs per hour on arterials. Threshold is either met or not met.	Carpool forecasts from model (2030 only) Vehicle occupancy surveys from 2007 Transit patronage estimates where number of carpools are below thresholds.
2.C	Vehicle Demand	HOV Freeway: 600 PCEs/hour minimum HOV Arterial: 200 PCEs/hour minimum	Vehicle demand determined for peak period. Maximum volume is 1650 PCEs/lane Criteria is met or not met.	HOV demand from regional model for 2013 and 2030. Confirm through national sketch planning techniques for select corridors.

HOT or TOT Demand				
3.A	Travel Patterns	Freeway corridors: Average trip distances of 5 miles or more for commuters or large trucks. Arterial corridors: Average trip distances of 3 miles or more.	Vehicle volumes Threshold is either met or not met for each defined corridor Not applied to connecting route segments in core of region.	Regional model link data for 2030
3.B	Vehicle Demand (2013 and 2030)	HOT Freeway: 1000 PCEs/hour minimum HOT Arterial: 400 PCEs/hour minimum Commercial movement demand 400 large trucks directionally/hour x two lanes= 800 trucks/hour Common origins/destinations > 5 miles using corridor	Vehicle demand must be capped based at a maximum per-lane flow rate of 1650 PCEs per hour for freeways and 900 passenger car equivalents per hour on arterials. Criteria is met or not met for each vehicle group	Demand from regional model for 2013 and 2030
3.C	Revenue Potential	Forecast revenue (gross) for screening stage	Rapid toll optimization model results based on regional travel forecasts per corridor	Regional model Toll optimization model for 2013 and 2030
Physical Attributes				
4.A	Physical Feasibility-Add a lane	Space to add a managed lane (typically 16 ft per direction)	ROW and roadway characteristics for each corridor	Aerials As builts Project plans implemented by 2030
4.B	Physical Feasibility-Convert a lane	Ability to convert or borrow an existing lane or shoulder for a peak hour or direction (reversible lanes), without more than one degradation in LOS for traffic in the remaining lanes; no spillover traffic onto other routes.	Resulting volumes cannot exceed 2000 vph for conversion, or reductions in lane, shoulder widths acceptable.	ADT/lane in peak hours for 2013 and 2030 Current observed LOS on existing corridors

Table 2-2. Ranking System

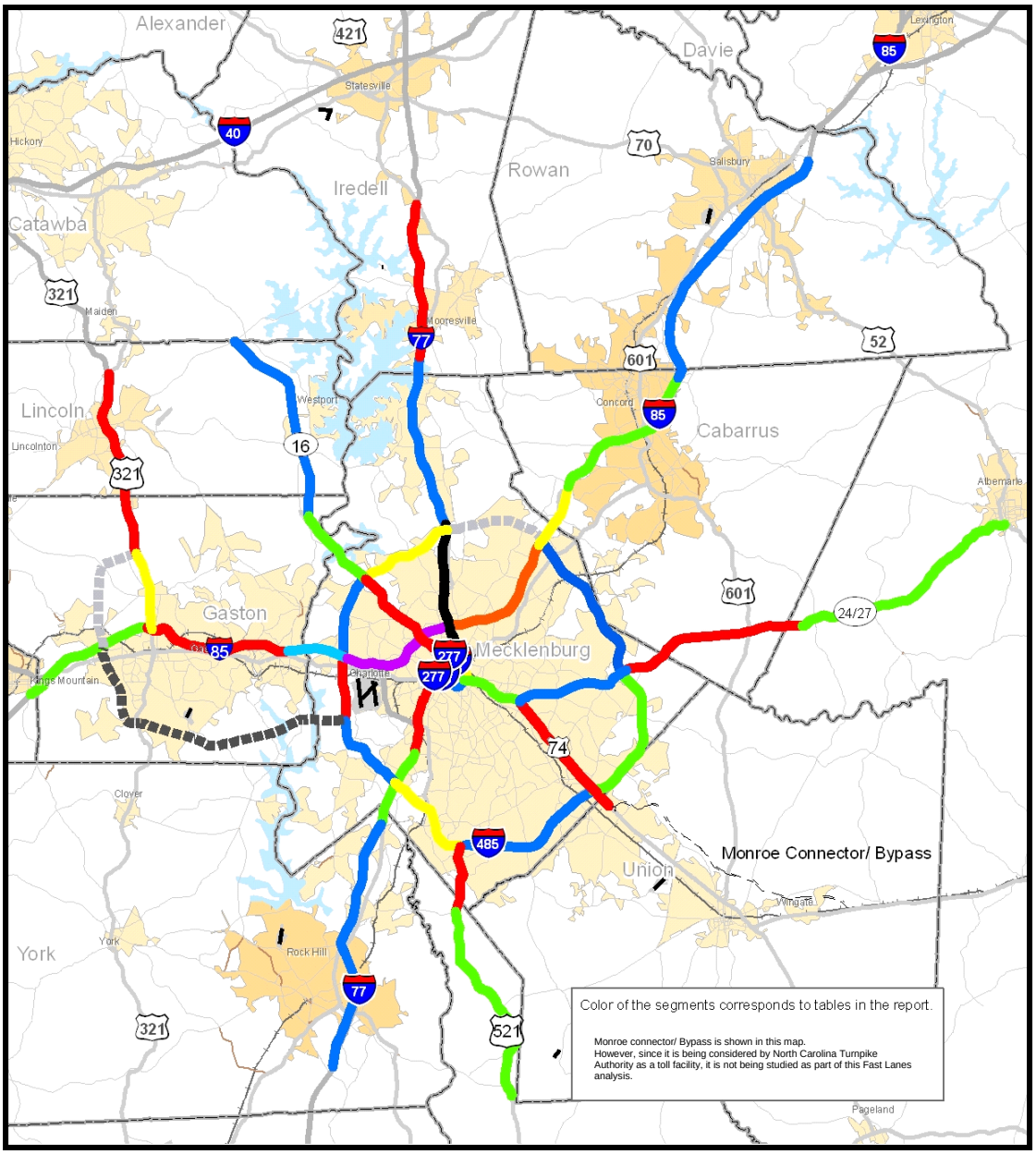
Value	Rank	Ranking Description
1		Not a good candidate for further analysis
2		Below threshold
3		Minimum threshold met
4		Exceeds threshold
5		Definitely a good candidate for detailed analysis

2.4. Study Corridor Segments

Many corridors exhibit widely different attributes. Some portions are more congested and thus, exhibit more demand, than other portions. Some segments have different commute shed patterns, as well as different physical attributes. Corridors were segmented in accordance with these different characteristics. Segments generally were defined for screening purposes based on major junctions where traffic volumes change and along regional geographical boundaries.

Figure 2-2 shows the major corridors subdivided into segments for analysis purposes. These segments represent sections of corridors that exhibit similar physical and operational attributes. Although entire corridors might not pass the screening criteria, some parts (segments) of those corridors could be considered based on connectivity to other corridors or have strategic significance to the system if they are marginal in some of the criteria. I-485 was divided into nine segments based on junctions with radial corridors. Segmentation also facilitates summarizing the study findings. For example, in later sections of this report, tabulated results are color coded for easy reference/ identification of the segment colors shown in Figure 2-2.

Figure 2-2. Study Corridor Segments



3.0. EVALUATION

The following section presents study findings for Phase 1 screening criteria. In the following summary tables, the first column is color-coded to match the segment map in Chapter 2 (Figure 2-2). Segments are grouped such that expressway/ freeway segments are listed first followed by arterial segments. Future roadway segments (Garden Parkway and the northeast portion of I-485) are listed at the bottom of the table.

3.1. Presence of Congestion

The presence of recurring, severe traffic congestion indicates that congestion management strategies, including *Fast Lanes*, should be considered. For this measure, both average travel speeds and volume/capacity ratios (VCR) were evaluated for each of the corridor segments. Table 3-1 shows the threshold values used in the screening criteria while Table 3-2 lists and ranks the corridor segments.

Table 3-1. Congestion Threshold

	Average Speeds		Volume-Capacity-Ratio (VCR)	
Rank	**Freeway**	**Arterial**	**Freeway**	**Arterial**
○	>55	>45	<0.70	<0.70
◔	55	45	0.80	0.80
◑	50	40	1.0	1.0
◕	40	30	1.50	1.50
●	<25	<15	>1.50	>1.50

Congestion criteria were evaluated for the horizon years of 2013 (earliest likely phased openings) and 2030 (long range planning horizon). Some segments could be congested in 2013 but not so in 2030 as a result of committed improvements. Therefore, segments passing the congestion criteria also need to confirm congestion in 2030. The following five segments, which are highlighted in Table 3-2, do not exhibit sufficient congestion for *Fast Lanes* to be feasible by 2030:

Corridor	Location / Description
US-321	Between I-85 interchange and future interchange of US-321 Bypass.
US-321	North of US-321 Bypass.
NC-24/27	In Stanly County.
US-321 Bypass	Between US-321 and I-85 South.
Garden Parkway	South of Gastonia, between I-85 South and I-485.

Although the majority of the region will experience congestion by 2030, these candidates did not meet congestion criteria by the planning horizon because they are generally new corridors (such as the Garden Parkway and several new bypasses). The areas served

by these candidates for *Fast Lanes* will not have matured sufficiently to generate significant traffic congestion by the horizon year. Congestion is also not as prevalent in outlying areas where growth can be addressed through planned and funded roadway improvements. However, there are isolated areas along these corridors creating "bottleneck" conditions resulting in isolated delays and poor levels of service. Figure 3-1 provides "bottleneck" locations that merit further analysis for improvement which is beyond the scope of this study.

Figure 3-1. Bottleneck Locations

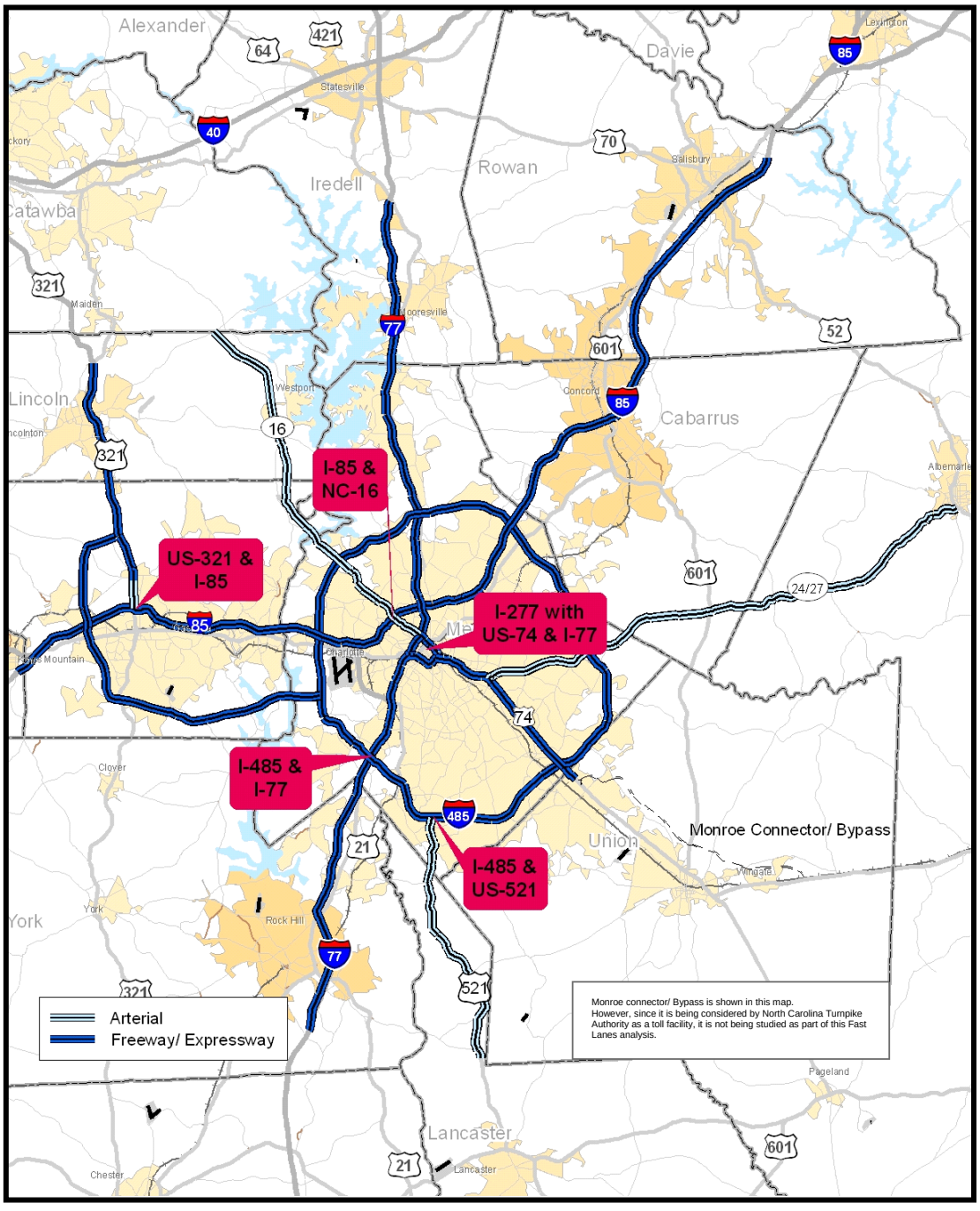


Table 3-2. Presence of Congestion in 2013 and 2030

Segment Desription	From	TO	Year 2013 Average Speed AM	Year 2013 Average Speed PM	Year 2013 VCR AM	Year 2013 VCR PM	Year 2030 Average Speed AM	Year 2030 Average Speed PM	Year 2030 VCR AM	Year 2030 VCR PM
I-277 (Brookshire)	I-77	US-74	◑	◑	◔	◑	◑	◑	◑	◑
I-277 (John Belk)	US-74	I-77	◑	◔	◑	◔	◑	◔	◑	◑
I-485 south	I-77	US-521	◑	◔	◕	◕	○	○	◕	◑
I-485 south	US-521	US-74	○	◑	◑	◕	○	○	◑	◕
I-485 east	US-74	NC-24/27	○	○	◔	◑	○	○	◑	◔
I-485 east	NC-24/27	I-85	○	○	○	○	○	◔	○	◑
I-485 northwest	NC-16	I-77	○	○	○	○	○	◔	◑	◕
I-485 northwest	I-85	NC-16	○	○	○	◔	◔	○	◕	◕
I-485 west	I-85	Garden Parkway	○	○	○	◑	○	○	◔	◕
I-485 west	Garden Parkway	I-77	○	○	◔	◑	○	○	◑	◕
I-77 south, York Co	Exit 73, SC	Exit 90 (US-21)	○	○	◑	◑	◑	○	◕	◕
I-77 south	Exit 90 (US-21)	Exit 4 (Nations Ford)	◕	◕	◕	◕	◕	○	◕	◕
I-77 south	Exit 4 (Nations Ford)	I-277(Brookshire)	◕	◕	◕	◕	◔	○	◑	◑
I-77 existing HOV	I-277(Brookshire)	I-485 north	◑	◑	◕	◕	◕	◔	◕	◕
I-77 north, Meck Co	I-485 north	Meck/ Iredell CL	●	●	◕	◕	◕	◔	◕	◕
I-77 north, Iredell Co	Meck/ Iredell CL	US-21/I-77	◔	◑	◕	◕	○	○	◑	◑
I-85 south, west Gastonia	Cleveland/ Gaston CL	Exit 17 (US-321)	◑	◔	◕	◑	◕	◑	◕	◕
I-85 south, east Gastonia	Exit 17 (US-321)	Exit 27 (NC-273)	◕	◕	◕	◕	◕	○	◕	◕
I-85 south, outside I-485	Exit 27 (NC-273)	I-485 west	◕	◕	◕	◕	●	○	◕	◕
I-85 south	I-485 west	I-77	○	◔	◑	◕	◔	○	◑	◕
I-85 north	I-77	I-485 east	○	○	◑	◕	○	○	◕	◕
I-85 north, outside I-485	I-485 east	Exit 49 (Speedway Blvd)	◑	◕	◕	◕	○	○	◑	◕
I-85 north, Cabarrus Co	Exit 49 (Speedway Blvd)	Cabarrus/ Rowan CL	◕	◕	◕	◕	◔	○	◕	◕
I-85 north, Rowan Co	Cabarrus/ Rowan CL	Exit 81, Long Ferry Rd	○	○	◔	◔	○	○	◑	◑
US-321 north	US-321 Bypass/ US-321	US-321 Business	○	○	○	○	○	○	○	○
US-74	I-277	Albemarle Rd	◑	◑	◔	◑	◑	◑	◑	◑
US-74	Albemarle Rd	I-485 southeast	◕	◕	◕	◕	◕	◑	◕	◕
NC-16	Lincoln/Catawba CL	Killian Rd	○	○	○	○	◑	○	◔	◔
NC-16, outside I-485	Killian Rd	I-485 northwest	◕	◑	◕	◕	◕	○	●	◕
NC-16, inside I-485	I-485 northwest	I-277 (Brookshire)	◑	◑	◕	◕	◕	◔	◕	◕
NC-24/27	US-74	I-485 east	◕	◕	◕	●	◕	◑	●	●
NC-24/27	I-485 east	Cabarrus/ Stanly CL	◑	◔	◕	◑	◕	○	◕	◕
NC-24/27, Stanly Co	Cabarrus/ Stanly CL	US-52, Albemarle	○	○	○	○	○	○	○	○
US-321 south	US-321 Bypass/ US-321	I-85	○	○	○	○	○	○	○	○
US-521, Lancaster Co	SC-5, SC	SC/NC state line	○	○	○	○	◔	○	◑	◑
US-521, Meck Co	SC/NC state line	I-485 south	◕	◑	◕	◑	◕	○	●	◕
US-321 Bypass	US-321	I-85 south	These are committed improvements, only expected to be in place by 2030				○	○	○	○
Gpkwy - south Gastonia	I-85 south	I-485 southwest					○	○	○	◔
I-485 northeast	I-77	I-85					○	○	◑	◕

Legend: ○= Fail, ◔= Below average, ◑= Average, ◕=Above average, ● = Best

Highlight indicates that the segment is not being considered for Phase 2 at this point.

3.2. HOV Demand

HOV demand focuses on person and vehicle movement. Person movement represents the highest and best use of managed lane efficiency in most project settings while a minimum level of vehicle usage is needed to determine if the lane can be adequately used by HOVs alone. The following criteria are evaluated, using 2030 volume, at this stage. If HOV thresholds are met, a managed lane candidate segment moves forward for more detailed evaluation. Candidates not meeting HOV demand thresholds are still viable as HOT or perhaps truck-only toll (TOT) candidates.

3.2.1. Travel Patterns/ Trip Length Distribution (TLD)

Examining the specific travel patterns, including origins and destinations of commuters, is critical to determining the "fast lane" market because access will typically need to be more restricted in whatever lane treatment is subsequently evaluated. Trips need to be long enough on a given route to generate meaningful time savings, which can in turn, cause spatial and modal shifts into the managed lane. Short distance trips are not typically targeted on left-side oriented managed lanes due to weaving and throughput friction and the need to maintain operating safety and performance. At the screening stage, the best proxy is examining overall trip lengths or select link data for corridor segments between identified travel producers, such as residential areas, and attractions, which include major employment and activity centers.

The regional travel demand model was utilized to determine trip length distribution (TLD) at selected locations. The TLD analysis indicates that the study corridors contain enough trips that travel a sufficient distance (minimum of three miles on arterials and five miles on freeways and expressways). Because there is not a significant difference among the corridors or segments with regard to TLD, this criterion was not a differentiating factor in corridor screening.

3.2.2. Person Moving Demand

Existing and likely levels of person movement—primarily transit, carpool and vanpool demand—are an early study indicator of *Fast Lane*© effectiveness. Vehicle occupancy counts, combined with traffic forecasts for each user group, are typically generated for this determination. Minimum existing demand is critical to determine whether a *Fast Lanes* can be a success in its opening year. In general, a *Fast Lanes* should move more people than a general purpose lane would at a reliable level of service. Table 3-3 lists the threshold values used in this study. Study corridors or segments pass this screening test if they are estimated to carry more than 1,600 persons per hour per lane (pphpl) on freeways and more than 800 pphpl on arterials.

Table 3-4 ranks the corridor segments based on this screening criterion. The table indicates that only a couple of corridors and segments pass the threshold if a HOV3+ policy is adopted. Under a HOV2+ policy, more than half of the corridors and segments pass the screening criteria threshold. This finding suggests that a future operation policy focused on a 2+ minimum occupancy restriction is feasible. The pphpl estimate in the table is conservative because potential bus transit riders were not included. The level of bus transit service represents the greatest potential to improve person movement in a corridor, and thus, the highest level of effectiveness that may be achieved for *Fast Lanes*. Bus volumes were not able to be extracted from the regional model in a manner to offer consistency in output among other criteria. The expected contribution of transit ridership for typical corridors in the Charlotte region is not likely to

be high enough by itself to cause a low volume corridor to pass screening. Projected transit patronage will be assessed further for corridors moving into Phase 2 of the study.

Table 3-3. HOV Demand Threshold

	Persons per Hour per Lane		PCE Vehicles per Hour per Lane	
Rank	**Freeway**	**Arterial**	**Freeway**	**Arterial**
○	970	480	394	197
◔	1,230	620	525	263
◑	1,580	790	700	350
◕	3,580	1,940	1,650	900
●	> 3,580	> 1,940	> 1,650	> 900
NOTE: Passenger Car Equivalency (PCE) is based on single occupancy vehicles + commercial vehicles + (1.5*Medium Trucks) + (2.5*Heavy Trucks).				

3.2.3. Vehicle Demand

A minimum threshold for vehicle demand must be met for any *Fast Lane* strategy, and this value varies between freeway and arterial treatments, depending on the overall *Fast Lanes* vehicle moving threshold. Table 3-3 lists the threshold values used in this study. The study corridors/ segments pass this screening test if they are estimated to carry more than 700 vehicles per hour per lane (vphpl) on freeways and more than 350 (vphpl) on arterials.

Table 3-4 ranks the corridor segments in 2030 based on this screening criterion. Similar to person demand, the table also shows that only a couple of corridors and segments pass the threshold if HOV3+ policy is adopted. Under a HOV2+ policy as shown in Table 3-4, two-thirds of the corridors and segments pass the screening criteria threshold, validating a 2+ minimum occupancy requirement.

Those corridors not meeting the established threshold for both persons and vehicles for AM and PM peak periods include US-321, Garden Parkway and most portions of I-485. These findings would not change based on consideration of transit market potential for the corridors. Primary factors contributing to low HOV levels on these corridors include low volume trips too far from major employment generators and non-radial commute trips, typically oriented from suburb-to-suburb, which cannot be generated in enough critical mass to meet the threshold. This is a typical finding for circumferential corridors such as I-485.

Table 3-4. Year 2030 HOV Demand

Segment Desription	From	TO	Persons per Hour per Lane				PCE Vehicles per Hour per Lane			
			HOV 2+		HOV 3+		HOV 2+		HOV 3+	
			AM	PM	AM	PM	AM	PM	AM	PM
I-277 (Brookshire)	I-77	US-74	●	●	●	●	◕	◕	◕	◑
I-277 (John Belk)	US-74	I-77	●	●	◑	◑	◕	◕	◔	◔
I-485 south	I-77	US-521	●	●	◔	◔	◕	◕	○	○
I-485 south	US-521	US-74	○	◕	○	○	○	◕	○	○
I-485 east	US-74	NC-24/27	○	○	○	○	○	○	○	○
I-485 east	NC-24/27	I-85	◔	◕	○	○	◔	◕	○	○
I-485 northwest	NC-16	I-77	○	◔	○	○	○	◔	○	○
I-485 northwest	I-85	NC-16	○	◑	○	○	○	◑	○	○
I-485 west	I-85	Garden Parkway	○	◑	○	○	○	◑	○	○
I-485 west	Garden Parkway	I-77	○	●	○	◔	○	◕	○	○
I-77 south, York Co	Exit 73, SC	Exit 90 (US-21)	●	●	◔	◑	◕	◕	○	◔
I-77 south	Exit 90 (US-21)	Exit 4 (Nations Ford)	●	●	●	●	◕	◕	◑	◑
I-77 south	Exit 4 (Nations Ford)	I-277(Brookshire)	●	●	◑	●	◕	◕	◔	◕
I-77 existing HOV	I-277(Brookshire)	I-485 north	●	●	◑	◕	◕	◕	◔	◔
I-77 north, Meck Co	I-485 north	Meck/ Iredell CL	●	●	◑	◕	◕	◕	◔	◔
I-77 north, Iredell Co	Meck/ Iredell CL	US-21/I-77	◕	●	◔	◑	◕	◕	○	○
I-85 south, west Gastonia	Cleveland/ Gaston CL	Exit 17 (US-321)	●	◕	◔	◔	◕	◕	○	○
I-85 south, east Gastonia	Exit 17 (US-321)	Exit 27 (NC-273)	●	●	◑	◑	◕	◕	◔	◔
I-85 south, outside I-485	Exit 27 (NC-273)	I-485 west	●	●	◕	◕	◕	◕	◔	◑
I-85 south	I-485 west	I-77	●	●	◔	◔	◕	◕	○	○
I-85 north	I-77	I-485 east	●	●	◔	◑	◕	◕	○	◔
I-85 north, outside I-485	I-485 east	Exit 49 (Speedway Blvd)	●	●	◑	◑	◕	◕	◔	◔
I-85 north, Cabarrus Co	Exit 49 (Speedway Blvd)	Cabarrus/ Rowan CL	●	●	◑	◑	◕	◕	○	◔
I-85 north, Rowan Co	Cabarrus/ Rowan CL	Exit 81, Long Ferry Rd	◕	◕	○	◔	◑	◕	○	○
US-321 north	US-321 Bypass/ US-321	US-321 Business	○	○	○	○	○	○	○	○
US-74	I-277	Albemarle Rd	●	●	◕	◕	◕	◕	◑	◑
US-74	Albemarle Rd	I-485 southeast	●	●	◑	◕	◕	◕	◔	◑
NC-16	Lincoln/Catawba CL	Killian Rd	◔	◑	○	○	◔	◑	○	○
NC-16, outside I-485	Killian Rd	I-485 northwest	●	●	◑	◑	◕	◕	◔	◔
NC-16, inside I-485	I-485 northwest	I-277 (Brookshire)	●	●	●	●	◕	●	◕	◕
NC-24/27	US-74	I-485 east	●	●	●	●	◕	●	◕	◕
NC-24/27	I-485 east	Cabarrus/ Stanly CL	●	●	◑	◑	◕	◕	○	○
NC-24/27, Stanly Co	Cabarrus/ Stanly CL	US-52, Albemarle	○	○	○	○	○	○	○	○
US-321 south	US-321 Bypass/ US-321	I-85	○	○	○	○	○	○	○	○
US-521, Lancaster Co	SC-5, SC	SC/NC state line	◕	◕	○	◔	◑	◕	○	○
US-521, Meck Co	SC/NC state line	I-485 south	●	●	◕	●	◕	●	◑	◕
US-321 Bypass	US-321	I-85 south	○	○	○	○	○	○	○	○
Gpkwy - south Gastonia	I-85 south	I-485 southwest	○	○	○	○	○	○	○	○
I-485 northeast	I-77	I-85	○	◔	○	○	○	◔	○	○

Legend: ○= Fail, ◔= Below average, ◑= Average, ◕=Above average, ● = Best

Highlight indicates that the segment is not being considered for Phase 2 at this point.

3.3. HOT Demand

The same assessment for demand related to HOT or TOT feasibility was performed based on the year 2030 regional model output. Vehicle demand, travel patterns and potential for revenue generation are primary attributes. While the regional model will generate HOT demand, this demand also was confirmed using a Toll Optimization Model that uses forecasted traffic demand and tests this demand for specific HOT lane potential. This approach yielded a parallel set of HOT lane vehicle demand estimates based on assumptions including value of time, 2+vehicles allowed free use, and other assumptions related to access to HOT lane. Because a HOT lane facility is expected to have greater use than an HOV lane (the HOT lane is open to more potential users), the demand thresholds shown in Table 3-5 are higher than HOV lanes. The study corridors and segments pass this screening test if they are estimated to carry more than 1,100 vphpl on freeways and 500 vphpl on arterials by the year 2030. Table 3-6 ranks the corridor segments based on this screening criterion.

Findings for HOT demand show that the same corridors pass the prescribed higher thresholds for 2030, indicating that these corridors could operate as HOV or HOT lanes. Corridors not passing the screening do not exhibit enough demand in the respective commute sheds to support a dedicated lane treatment. Table 3-6 also provides a cursory assessment of the projected number of vehicles willing to pay a toll to use a HOT lane over a 1-hour AM or PM peak period. These values do not have relevance to screening at this stage, but are indicative of the level of relative demand among corridors, and can help in developing appropriate assumptions for more in-depth study of lane pricing in the next phase of the study. Toll paying vehicles include single-occupant and commercial vehicles only. Heavy truck traffic was excluded from accessing the HOT lanes in this early test scenario because the default lane treatment was a single lane in each direction. Most truck operations only benefit if multiple lane treatments are provided.

Table 3-5. HOT/ TOT Demand Threshold

	High Occupancy Toll (PCE vphpl)		Truck Only Toll
Rank	**Freeway**	**Arterial**	
○	619	281	Do not pass
◔	825	375	Do not pass
◑	1,100	500	> 800 trucks per hour
◕	1,650	900	Passes
●	> 1,650	> 900	Passes

Figure 3-2 shows the relative truck demand based on the model's forecasts for the morning peak hour. Segments that do not meet the threshold (<800 vphpl) is shown in red. Segments with large commercial vehicles between 800 and 1,000 are shown in light green and those carrying more than 1,000 are shown in dark green. Although some corridors do not meet the prescribed threshold (colored in red), there may be some short segments with significant truck volume that meet the threshold criteria. These findings will be carried into the next phase of the study for the corridors having truck lane potential.

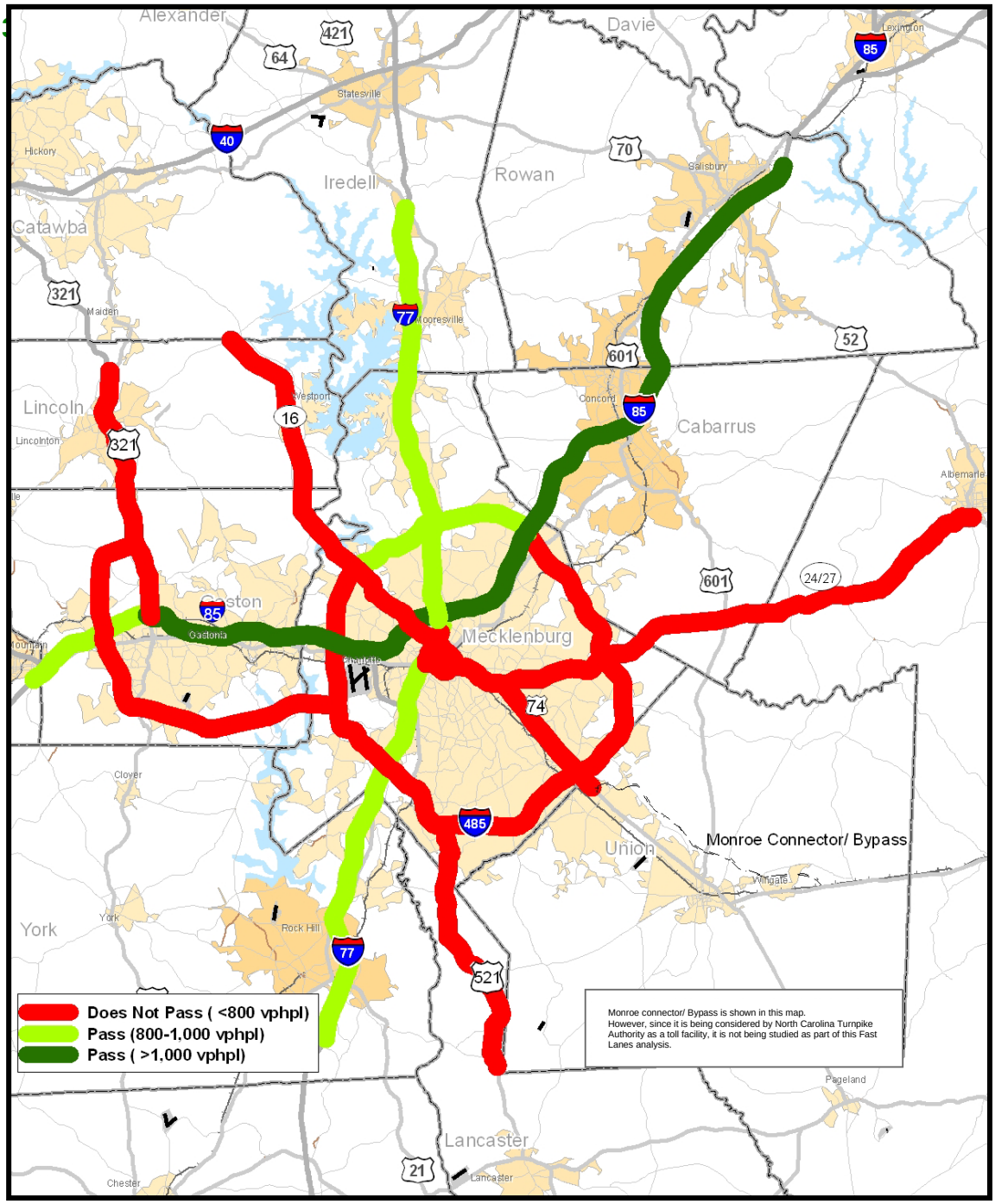
Table 3-6. Year 2030 HOT Demand

Segment Desription	From	TO	PCE vphpl AM	PCE vphpl PM	Paying Toll AM	Paying Toll PM
I-277 (Brookshire)	I-77	US-74	◕	◕	329	298
I-277 (John Belk)	US-74	I-77	◑	◕	152	453
I-485 south	I-77	US-521	◑	◕	91	245
I-485 south	US-521	US-74	○	◑	2	13
I-485 east	US-74	NC-24/27	○	○	1	1
I-485 east	NC-24/27	I-85	○	◑	3	5
I-485 northwest	NC-16	I-77	○	○	0	70
I-485 northwest	I-85	NC-16	○	◔	2	75
I-485 west	I-85	Garden Parkway	○	○	3	4
I-485 west	Garden Parkway	I-77	○	◔	7	34
I-77 south, York Co	Exit 73, SC	Exit 90 (US-21)	◑	◕	7	1
I-77 south	Exit 90 (US-21)	Exit 4 (Nations Ford)	◕	◕	141	36
I-77 south	Exit 4 (Nations Ford)	I-277(Brookshire)	◕	◕	87	152
I-77 existing HOV	I-277(Brookshire)	I-485 north	◕	◕	130	129
I-77 north, Meck Co	I-485 north	Meck/ Iredell CL	◕	◕	148	331
I-77 north, Iredell Co	Meck/ Iredell CL	US-21/I-77	◔	◑	29	130
I-85 south, west Gastonia	Cleveland/ Gaston CL	Exit 17 (US-321)	◕	◑	742	264
I-85 south, east Gastonia	Exit 17 (US-321)	Exit 27 (NC-273)	●	◕	576	286
I-85 south, outside I-485	Exit 27 (NC-273)	I-485 west	●	●	526	257
I-85 south	I-485 west	I-77	◑	◑	262	103
I-85 north	I-77	I-485 east	◑	◕	17	62
I-85 north, outside I-485	I-485 east	Exit 49 (Speedway Blvd)	◕	◕	58	83
I-85 north, Cabarrus Co	Exit 49 (Speedway Blvd)	Cabarrus/ Rowan CL	◑	◕	4	38
I-85 north, Rowan Co	Cabarrus/ Rowan CL	Exit 81, Long Ferry Rd	○	◔	0	13
US-321 north	US-321 Bypass/ US-321	US-321 Business	○	○	0	2
US-74	I-277	Albemarle Rd	◕	◕	402	202
US-74	Albemarle Rd	I-485 southeast	◕	◕	183	283
NC-16	Lincoln/Catawba CL	Killian Rd	○	◔	15	19
NC-16, outside I-485	Killian Rd	I-485 northwest	◕	◕	68	92
NC-16, inside I-485	I-485 northwest	I-277 (Brookshire)	●	●	164	252
NC-24/27	US-74	I-485 east	◕	●	252	293
NC-24/27	I-485 east	Cabarrus/ Stanly CL	◕	◕	97	84
NC-24/27, Stanly Co	Cabarrus/ Stanly CL	US-52, Albemarle	○	○	3	1
US-321 south	US-321 Bypass/ US-321	I-85	○	○	5	2
US-521, Lancaster Co	SC-5, SC	SC/NC state line	◑	◑	52	30
US-521, Meck Co	SC/NC state line	I-485 south	◕	●	118	231
US-321 Bypass	US-321	I-85 south	○	○	0	0
Gpkwy - south Gastonia	I-85 south	I-485 southwest	○	○	287	49
I-485 northeast	I-77	I-85	○	○	27	4

Legend: ○= Fail, ◔= Below average, ◑= Average, ◕=Above average, ● = Best

Highlight indicates that the segment is not being considered for Phase 2 at this point.

Figure 3-2. Truck Volume Threshold



Physical Attributes

Screening physical roadway attributes for potential *Fast Lanes* takes two perspectives: the ability to add *Fast Lanes*, or the opportunity to convert or borrow existing lanes or shoulders for the respective peak period and direction. At this stage in the study, no engineering investigations have been performed. Potential lane additions involved a review of right-of-way (ROW) width data from NCDOT and verification using aerial images and field observation in some instances. Conversion examines the current and forecast demand on remaining lanes and whether the potential exists to borrow temporarily or permanently lanes and shoulders for part-time managed lanes. Table 3-7 shows the rationale applied in analyzing physical attributes and ranking the corridor segments.

Table 3-7. Ranking of Physical Attributes

Rank	Description and Rationale for Ranking
	No space is available. Borrowing a lane is considered if VCR on remaining lanes is less than 0.90.
	Space is available if available outside right-of-way (ROW) is paved, inside shoulder is converted to a travel lane and/ or remaining lane widths are narrowed.
	Space is available in median for minimum section (12 ft. each direction).
	Space is available for full section if either buffer or barrier separation is applied (24 ft. each direction).
	Space is available for up to two (2) directional *Fast Lanes* plus dual shoulders (28-40 ft. each direction, including existing inside shoulders).

Results from the ranking of physical attributes are shown in Table 3-8.

Table 3-8. Result of Physical Attributes

Corridor	Route Limits	Description	Rank
I-77S	SC-160 to Gold Hill	4 ft left shoulder, 4NB and SB, 15-25 ft ROW ea side	◔
I-77S	Gold Hill to County Line	4 ft left shoulder, 4NB and SB, 15-25 ft ROW ea side	◔
I-77S	County line to Westinghouse	25 ft median + 10 ft shoulders, 4SB and 4NB, 50' ROW ea side	◑
I-77S	Westinghouse to I-485	25 ft median + 10 ft shoulders, 4SB and 3NB w CD	◑
I-77S	I-485 to Arrowood	25 ft median +10 ft shoulders, 3SB and 3NB plus 3-lane direct ramps, 10-20 ft ROW ea side	◑
I-77S	Nations Fd Rd to W Arrowood	25 ft median + 10 lft shoulders, 4SB and NB (aux lanes incl), 20-40 ft ROW ea side	◑
I-77S	S. Tryon to Nations Fd Rd	4-8 ft lft shoulder except at Tyvola, 3NB and SB, 20-50 ft ROW ea side	◔
I-77S	S. Tryon to West Blvd	4-8ft lft shoulder, 3NB and SB, 20-50 ft ROW ea side	◔
I-77S	West Blvd to I-277 (Belk Fwy)	Lft shoulder >4 ft, 4NB, 3SB w CD, 20-40 ft ROW ea side, major RR overcrossing w conflicting columns	○
I-77S	I-277(Belk Fwy) to 5th	No median, no extra ROW, left hand exits (2), 3SB w CD, 3NB w CD	○
I-77N	5th to I-277 (Brookshire Fwy)	No median, no extra ROW, left hand exits (2), 4SB w CD, 5NB	○
I-77N	I-277 (Brookshire Fwy) to I-85	No median, HOV SB, 5SB-4NB, very limited ROW, existing HOV lane planned in both directions	◑
I-77N	At I-85	SB HOV connector full std, no NB conn.--planned	◑
I-77N	I-85 to Cindy Ln	wide median, 3+1SB, 4NB	●
I-77N	Cindy Ln to Sunset	20 ft remaining median, extra ROW on outside, 3+1SB and NB w noisewalls on edge of shoulders	●
I-77N	Sunset to I-485	20 ft min median and varies to 120', 3+1SB and NB, limited ROW on outside	●
I-77N	I-485 to Hambright	20 ft min median with extra ROW and pavement to outside, 3+1 both directions (not striped)	●
I-77N	Hambright to Gilead	20 ft median to 110 ft varies, 2SB, 3NB (aux), plus outside ROW	●
I-77N	Gilead to Catawba	100+ ft median varies down to 50 ft no inside shldr, 2SB and NB	◕
I-77N	Catawba to Griffith	50 ft median, no inside shldr, 2SB and NB, causeway over L Norman w 10-15 ft outside slopes	◕
I-77N	Griffith to US-21	Median narrows to about 26 ft, causeway over L Norman w 10-15 ft outside slopes, otherwise min available outside ROW (varies)	◑

Results of Physical Attributes (Continued)

Corridor	Route Limits	Description	Rank
I-85S	US-321 to NC-279 New Hope	22 ft median, 3NB and SB, 30 ft ROW ea side, tight loop ramps, sharp alignment curves and overpasses, needs rebuilding	
I-85S	NC-279 to NC-7	22 ft median, 3NB and SB, 30+ ft ROW ea side, tight bridge cols.	
I-85S	NC-7 McAdenville to Belmont/Mt Holly	22 ft median varies (wide in short stretch), 3NB and SB, 30-50 ft ROW ea side	
I-85S	Belmont/Mt Holly to I-485	22 ft median incl shoulders, 4NB and SB, 30+ ft ROW ea side	
I-85S	I-485 to Graham Pkwy	22 ft median incl shoulders, 4-5NB and SB, no outside ROW at frontage roads but 30 ft ea side elsewhere	
I-85S	Graham Pkwy to NC-16	22 ft median incl shoulders, 4-5NB and SB, no outside ROW due to frontage roads for most segments	
I-85S	NC-16 (Brookshire Blvd) to I-77	22-25 ft median incl. shoulders, 4-5NB and SB, limited outside ROW	
I-85N	I-77 to US-29	22 ft median, 4NB and SB, 0-10 ft ROW due to frontage rds	
I-85N	US-29 to Harris Blvd	22 ft median, 4NB and SB, 30-50 ft ROW	
I-85N	Harris Blvd to I-485	22 ft median, 4NB and SB, 30-50 ft ROW	
I-85N	I-485 to Speedway Blvd	22 ft median, 4NB and SB, 30-50 ft ROW	
I-85N	Speedway Blvd to US-601	22 ft median, 4NB and SB, 30-50 ft ROW by 2030	
I-85N	US-601 (S Cannon Blvd) through Rowan County	22 ft median, 4NB and SB, 20-30 ft ROW	
I-485W	I-85 to NC-16	20 ft median, 4NB and SB, 20-50 ft outside ROW	
I-485W	NC-16 to I-77	20 ft median, 4NB and SB, 20-50 ft outside ROW	

Results of Physical Attributes (Continued)

Corridor	Route Limits	Description	Rank
I-485W	I-85 to NC-49	30 ft median incl shoulders, 3NB and SB, wide outside ROW	◕
I-485S	NC-49 to I-77	50-60' median incl shoulders, 3NB and SB, 2NB and SB thru I-77	◕
I-485S	I-77 to US-521	50-60 ft median incl shoulders, 3NB and SB and widening planned into median, 30-50	◕
I-485S	US 521 to NC-51 Pineville Matthews	50-60 ft median incl shoulders, 3NB and SB, 50+ ft ROW ea side	◕
I-485S	NC-51 to NC-16	50+ ft median incl shoulders, 2NB and SB, 50+ ft ROW ea side	◕
I-485S	NC-16 to US-74	50+ ft median incl shoulders, 2NB and SB, 50+ ft ROW ea side	◕
I-485E	US-74 to Albemarle Rd	30-50 ft median incl shoulders, 2NB and SB, 50+ ft ROW ea side	◕
I-485E	Albemarle Rd to NC-49 (Univ City Blvd)	30-50 ft median incl shoulders, 3NB and SB, 50+ ft ROW ea side	◕
I-485E	NC-49 to N Tryon	30-50 ft median incl shoulders, 4NB and SB, 50+ ft ROW ea side	◕
I-485E	N. Tryon to I-85	30-50 ft median incl shoulders, 4NB and SB (future striping), 50+ ft ROW ea side	◕
US-74E	Stallings Rd to I-485	3-4NB and SB, 20 ft median, 10-15 ft ROW ea side.	○
US-74E	I-485 to Matthews Mint Hill Rd	3-4NB and SB, 10 ft median, channelized left turns, 10-15 ft ROW ea side	○
US-74E	Matthews Mint Hill to Matthews Township Pkwy	25 ft median, 2-3NB and SB, no intersections, 25-50 ft ROW ea side	◑
US-74E	Matthews Twnshp to Windsor Square	0-25 ft median, 3NB and SB, 30-50 ft ROW ea side, signal at Windsor Sq	○
US-74E	Windsor Sq to Village Lake Dr	• 0-25 ft median, 2NB and SB, left and right decal lanes • Signals at Sam Newell, Sardis Rd N, Village Lake Dr	○

Results of Physical Attributes (Continued)

Corridor	Route Limits	Description	Rank
US-74E	Village Lake Dr to Buick Dr.	0-25 ft median, 3NB and SB, left and right decal lanes, 15-25 ft ROW ea side. Signals at Margaret Wallace Rd, E Harris Blvd, Buick Dr.	○
US-74E	Buick Dr. to NC-24/27 (Albemarle Rd)	0-25 ft median, 3NB and SB, left and right decal lanes, no ROW ea side (sidewalks only). Signals at Idlewild Rd, Farmingdale Dr., N Sharon Amity Rd,	○
US-74E	NC-24/27 to Eastway Dr	Busway (24 ft barriered) in median, 4NB and SB, no ROW on outside	◑
US-74E	Eastway Dr to I-277(Brookshire)	Busway (24 ft barriered) in median, 3NB and SB, no ROW on outside, tight ramps with acel/decal lanes.	◑
US-521	SC-5 to SC-75	2NB and SB, at-grade crossings, 25-36 ft median varies to continuous left turn lane in segments, tight ROW	○
US-521	SC-75 to Six Mile Creek Rd	2NB and SB, at-grade crossings, 25 ft median, tight ROW	◔
US-521	Six Mile Creek Rd to Laurel Hill Rd	2NB and SB, at-grade crossings, continuous left turn lane, tight ROW	○
US-521	Laurel Hill Rd to Ballantyne Commons Parkway	2NB and SB, at-grade crossings, 25 ft median, tight ROW (landscaped 6-10 ft median at BC Pkwy)	◔
US-521	Ballantyne Commons Parkway to I-485	2-4 lanes NB and SB, at-grade intersections, no median, tight ROW (future NB to WB flyover site since routing takes I-485)	○
US-321	North of Hardin Rd.	2 lanes NB and SB in expressway with limited crossovers, 15-50 ft median, up to 50 ft ROW ea side	◕
US-321	I-85 to future Garden Parkway (Hardin Rd)	4 lane arterial with signals, no median, limited outside ROW. Gains 15-50 ft median s. of Hartman Rd. Expressway w/o signals between of C Grier Beam Blvd and Hardin Rd (2 lanes NB and SB).	○
NC-24/27	US-74 to I-485	Mostly 4 lane arterial with signals, no median, some left turn pockets, limited outside setbacks. 6 lanes from Reddman Rd/Central to Lawyers Rd. Limited median further east.	○
NC-24/27	I-485 through Cabarrus Co	4 lane arterial with 15 ft median, left turn pockets, 25 ft setbacks ea side to Sam Black Rd; 2-lane highway Sam Black to McManus, Browns Hill Rd to SR-1213 and east of SR-1253. Many intersections.	○
NC-24/27	Cabarrus Co to Albemarle (Stanly Co)	Mostly 2 lane highway, many intersections, some setbacks except in communities.	○

Results of Physical Attributes (Continued)

Corridor	Route Limits	Description	Rank
I-277 Brookshire Frwy	US-74 to I-77	Old expressway, lots of deficient ramps. Typically 3 lanes ea direction: • 4'-3@12'-4' ea direction over E 10th St • 10'-3@12'-4' SB, 4'-3@12'-ramp NB at N. College • 4'-4@12'-4' ea direction at N. Graham • 3 lanes ea dir through I-77, w NB left exit to SB I-77, SB I-77 left entry to SB Brookshire, and NB I-77 left entry to NB Brookshire • Outside shoulders vary from 4' to 10' • Limited outside ROW	○
I-277 Belk Frwy	I-77 to US 74/Brookshire	Old expressway, lots of deficient ramps. Typically 3 lanes ea direction	○
NC-16 (Brookshire Blvd)	I-77 to I-85	• Partial expy and arterial section, no traffic lights except at I-77. • 2 NB and SB with 36 ft median, some outside ROW. • Median narrows at Idaho to curb/gutter. • Difficult urban IC at I-85.	◑
NC-16	I-85 to N Hoskins	• Arterial, 3 lanes ea direction, no median, limited ROW • Signal at N. Hoskins	○
NC-16	N. Hoskins to Belhaven Blvd	• Arterial, 2 lanes ea direction, no median on S end and 20 ft median N of Lawton Rd, ROW varies to 20+ ft ea side at Hovis Rd. • Signals at Lawton Rd, Hovis/Oakdale, DMV Dr, Belhaven Blvd	○
NC16	Belhaven Blvd to I-485	Arterial, 2 lanes ea direction, wide 50 ft median, 15 ft ROW ea side. Signals at Pleasant Grove Rd	◑
NC16	I-485 to Lucia Bypass/Co Line	• Arterial 2 lanes ea direction, 40-50 ft median, 30+ ft ROW ea side. Long bridges at Mt Island Lake with narrower outside ROW. • Signal at Mt Holly-Huntersville Rd., Nance Cove Rd.	◑

3.4.1. Reversible Lane Analysis

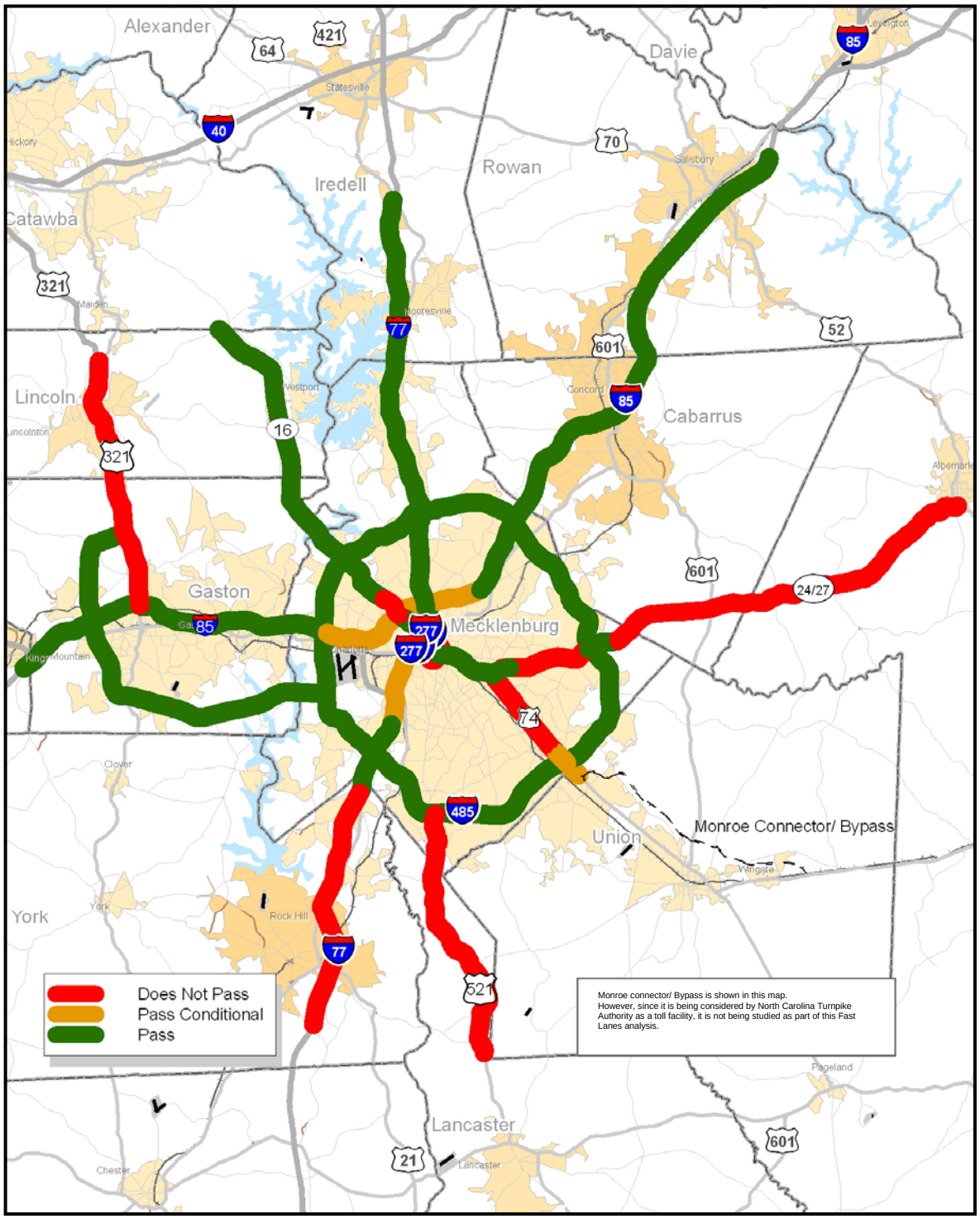
Several of the corridor segments were further evaluated for temporary reversible lane operations based on the directional distribution of traffic during weekday peak periods. In general, there was not a distinct peak direction of travel (i.e. directional split 60/40 or greater) for most corridors needed to borrow a lane or lanes in the off-peak direction without adversely affecting existing or forecast traffic volumes. Although several corridor sections exhibited a more pronounced directional split than others, reversible lanes would have negatively impacted the defined "off-peak" direction in many candidate corridors based on available travel lanes and estimated 2030 traffic volumes. Two corridors that can be considered for reversible lanes application during Phase 2 are:

NC-16 between North Hoskins Road and Belhaven Boulevard is a corridor segment that could benefit from reversible lane operation. This arterial has a 69/31 AM peak split inbound with 920 vehicles per hour outbound which could be accommodated by one lane.

Although the entire I-77 corridor in York County does not merit reversible lanes, I-77 between Gold Hill Road and the North Carolina/ South Carolina state line, has a 70/30 split in the AM peak direction (inbound) and borrowing one lane provides adequate capacity for the outbound traffic.

Figure 3-3 shows which segments do not pass (red colored lines), pass (green colored lines), or pass under certain assumptions (orange colored lines). For purposes of screening, several corridors not meeting physical attributes above were retained for further consideration where it appeared that borrowing a lane could be feasible. These corridors include NC-16 for a one-mile section north of I-77 and a segment of I-77 south of I-485. Portions of I-85 between Gastonia and I-485 may also be appropriate. These segments were retained as conditionally passing the physical attribute criteria based on directional splits.

Figure 3-3. Physical Attribute Ranking



4.0. SCREENING RECOMMENDATIONS

This section summarizes the Phase 1 screening analysis and provides recommendations on corridors and segments that merit detailed analysis in Phase 2 of this study. Table 4-1 summarizes the screening criteria findings for the candidate corridors. Results of corridor screening are depicted on a map in Figure 4-1. Corridors and segments that passed Phase 1 screening and are being recommended for more detailed study in Phase 2 are separated in two groups:

- Pass to Phase 2 – includes corridors and segments that ranked high on the screening criteria and are excellent candidates for Phase 2 evaluation.
- Pass Conditionally – includes corridors and segments that would be a good candidate provided they meet certain conditions that were found in this phase to be marginal unless certain assumptions are changed. The most common basis for conditional passing included constrained physical attributes that could not be overcome without significant design exceptions or major corridor reconstruction. The partnering agencies on the RTT can provide input on the potential these corridors represent and the likelihood that physical attributes can be acceptably addressed in the next study phase.

4.1. Recommended for Phase 2 Evaluation

The following corridors and segments meet the screening criteria and are being recommended for detail study during Phase 2:

- I-77 North between Center City Charlotte and Iredell County – majority of the corridor meets the congestion, HOV demand, and physical attribute criteria. This corridor is also a logical extension of the existing I-77 HOV which is experiencing increased use during peak travel periods.
- I-85 North in Cabarrus County, northeast of I-485 – meets congestion, HOV demand, and physical threshold criteria.
- US-74 East between Center City Charlotte and I-485 – meets congestion, HOV demand, and physical threshold criteria. There is already a bus-only lane for part of this corridor which could be analyzed for conversion to a *Fast Lane*©.
- Future I-485 northeast, between I-85 and I-77 – although traffic forecasts do not fare well against the congestion and HOV demand criteria, the segment should advance to Phase 2 because it is a new facility, has adequate right-of-way, and connects two major freeways (I-77 and I-85) in a growing area.
- I-485 between Arrowood Road and US-521 – passes the congestion threshold and meets HOV demand and physical attribute threshold criteria, especially the section between I-77 South to US-521, which is currently being considered for widening.

4.2. Conditionally Passing Phase 1 Screening Criteria

Although some corridors did not meet selected screening criteria, they have potential for managed lanes despite their weaknesses. Successful implementation of *Fast Lanes* in these corridors would require major improvements and/ or dependent on other factors that will be analyzed further in Phase 2 of the study. Based on inputs from RTT, study team has initially identified these potential corridors. However, the following segments are recommended to conditionally pass Phase 1, pending final approval from RTT at the start of Phase 2:

- I-85 from I-485 to Gastonia due to limited ability to add a lane without narrowing other lanes and taking inside shoulders.
- I-77 from Center City Charlotte to south of I-485 – although this corridor has the highest traffic volume and meets the congestion criteria, there is limited right-of-way and would require reconstruction of existing I-77. However, this corridor could be considered a continuation of the existing I-77 HOV facility. Without improvements to this corridor, the segment could develop into a bottleneck which diminishes gains from other *Fast Lanes* improvements.
- I-77 south – segment north of Gold Hill Road has a 70/30 split in the AM peak direction (inbound) and could be considered for a reversible lane operation by borrowing one outbound lane. During the PM peak period, an inbound I-77 lane would be borrowed.
- NC-16 (Brookshire Boulevard) between I-77 and I-85 due to a limited number of median breaks and signalized intersections.
- NC-16 between North Hoskins Road and Belhaven Boulevard could be considered for reversible operation because it has a 69/31 AM peak split inbound with 920 vehicles per hour outbound which could be accommodated by one lane.
- I-485 between US-521 and US-74 due to marginal demand and congestion that is likely to grow faster than other regional corridors and become critical beyond the planning horizon.
- US-521 – a short section of US-521 south of I-485 is retained because of potential inclusion in the proposed widening of I-485 between I-77 and US-521.

4.3. Corridors Not Passing Phase 1 Screening Criteria

The following corridors are not recommended for further study during Phase 2:

- US-321 in Lincoln and Gaston Counties – did not pass the presence of congestion and HOV demand criteria.
- Future US-321 Bypass – did not pass the congestion and HOV demand criteria.
- Future Garden Parkway – did not pass the congestion and HOV demand criteria.
- NC-16 – Sections in Lincoln County and sections in Gaston County, north of Killian Road did not pass the congestion and HOV demand criteria.

- I-85 North in Rowan County – did not pass due to a combination of criteria, especially HOT demand and marginal level of projected congestion.
- NC-24/27 from US-74 towards Cabarrus and Stanly Counties – did not pass the physical attribute criteria. Although sections of this corridor exhibited congestion, uncontrolled access and right-of-way issues, makes it difficult to implement a successful *Fast Lanes* project.
- US-521 – sections in Lancaster County and southern portion of US-521 near the Ballantyne area did not pass the HOV demand and physical attribute criteria.
- I-77 south in York County – segment south of Gold Hill Road did not meet the HOV demand criteria and directional split does not justify reversible lanes.
- I-485 East between I-85 North and US-74 – did not pass the HOV demand criteria.
- I-485 West and Northwest between I-77 North and Arrowood Road – did not pass the HOV demand criteria.
- I-277 (Brookshire and Belk Freeways) – although this freeway passed the congestion and HOV demand criteria, it did not pass Phase 1 due to the limited physical conditions. However, recognizing the importance of this corridor, major improvements to I-277 should be studied.

Before and **After** examples of intersection improvements of North Main Street in Fairfield, VA

The above corridors are not being recommended for study in Phase 2 based on the criteria required for successful implementation of a *Fast Lanes* project. However, these corridors could benefit from other types of improvements. The following matrix provides guidance on the type(s) of improvement(s) that could apply along these corridors. More information is available from these two publications:

- ***Freeway Management and Operations Handbook***, FHWA Report No.: FHWA-OP-04-003 EDL No.: 13875 http://www.ops.fhwa.dot.gov/freewaymgmt/publications/frwy_mgmt_handbook
- ***A Toolbox for Alleviating Traffic Congestion and Enhancing Mobility,*** ITE Informational Report/Traffic Congestion/Transportation Demand Management http://www.ite.org/M&O/congestion.asp

Corridors → Types of Improvement	US-321	US-521	NC-24/27	NC-16
Intersection Improvement	X		X	X
Signal upgrades	X		X	
Signal Coordination			X	X
Interchange upgrade	X			
Grade separation	X		X	X
Safety improvements		X		
Transit improvements			X	X
ITS improvement			X	
Active traffic management		X	X	X
Bottleneck removal	X			
Access management		X	X	X

Examples of Access/ Traffic Management using queue bypass

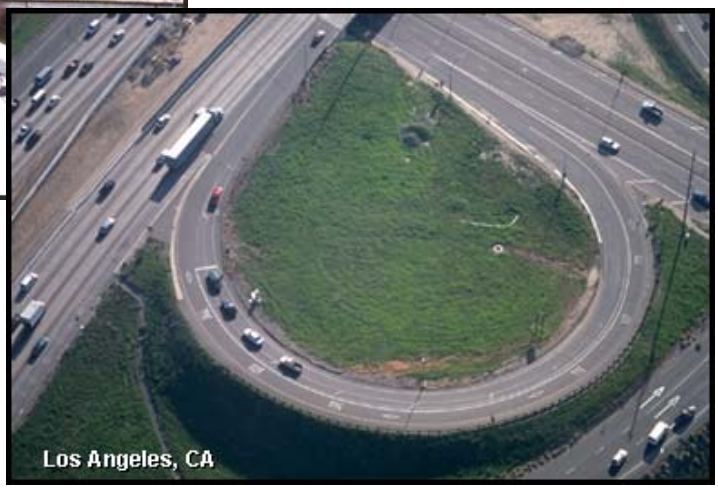


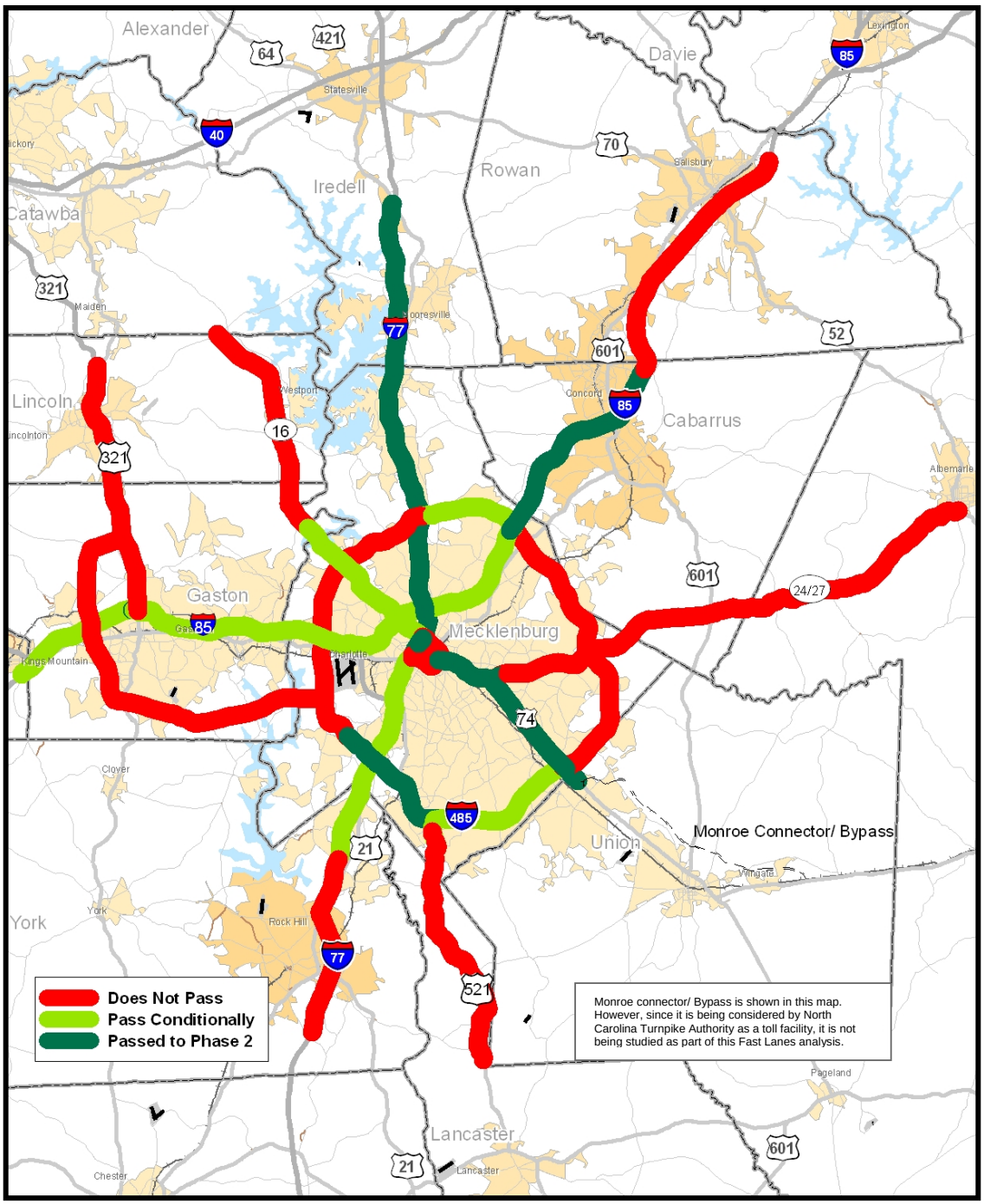
Table 4-1. Summary of Corridor Screening Results

						HOV Demand											
				Congestion		Person		Vehicle		HOT Demand			Truck Demand		Space	Connectivity	
Segment Desription		From	TO	AM	PM	AM	PM	AM	PM	AM	PM	Toll	AM	PM	Available	Needs	Revenue
	I-277 (Brookshire)	I-77	US-74	◑	◑	●	●	●	●	◕	◕	●	○	○	○	◑	●
	I-277 (John Belk)	US-74	I-77	◑	◔	●	●	◑	◑	◑	◕	●	○	○	○	◑	◑
	I-485 south	I-77	US-521	◑	◑	●	●	◔	◔	◑	◕	◕	○	○	◕	●	○
	I-485 south	US-521	US-74	◔	◑	○	◕	○	○	○	◑	◔	○	○	◕	◑	○
	I-485 east	US-74	NC-24/27	◔	◔	○	○	○	○	○	○	○	○	○	◕	◑	○
	I-485 east	NC-24/27	I-85	○	◔	◔	◕	○	○	○	◑	○	○	○	◕	●	○
	I-485 northwest	NC-16	I-77	◔	◔	○	◔	○	○	○	○	◔	◑	◑	◕	◑	○
	I-485 northwest	I-85	NC-16	◔	◑	○	◑	○	○	○	◔	◔	◑	◑	◕	◑	○
	I-485 west	I-85	Garden Parkway	○	◑	○	◑	○	○	○	○	○	○	◑	◕	○	○
	I-485 west	Garden Parkway	I-77	◔	◑	○	●	○	◔	○	◔	◔	○	○	◕	○	○
	I-77 south, York Co	Exit 73, SC	Exit 90 (US-21)	◑	◑	●	●	◔	◑	◑	◕	○	◑	◑	◔	○	◑
	I-77 south	Exit 90 (US-21)	Exit 4 (Nations Ford)	◕	◑	●	●	●	●	◕	◕	◑	●	●	◑	◑	◑
	I-77 south	Exit 4 (Nations Ford)	I-277(Brookshire)	◑	◑	●	●	◑	●	◕	◕	◑	●	●	○	●	◑
	I-77 existing HOV	I-277(Brookshire)	I-485 north	◕	◕	●	●	◑	◕	◕	◕	◑	○	○	○	●	◕
	I-77 north, Meck Co	I-485 north	Meck/ Iredell CL	◕	◕	●	●	◑	◕	◕	◕	◕	◑	◑	●	●	◕
	I-77 north, Iredell Co	Meck/ Iredell CL	US-21/I-77	◑	◑	◕	●	◔	◑	◔	◑	◑	◑	◑	◑	◑	◕
	I-85 south, west Gastonia	Cleveland/ Gaston CL	Exit 17 (US-321)	◕	◑	●	◕	◔	◔	◕	◑	●	◑	●	◕	◔	◕
	I-85 south, east Gastonia	Exit 17 (US-321)	Exit 27 (NC-273)	◕	◑	●	●	◑	◑	●	◕	●	●	●	◕	◑	◕
	I-85 south, outside I-485	Exit 27 (NC-273)	I-485 west	◕	◑	●	●	◕	◕	●	●	●	●	●	◕	◕	◕
	I-85 south	I-485 west	I-77	◑	◑	●	●	◔	◔	◑	◑	◕	●	●	◔	●	◕
	I-85 north	I-77	I-485 east	◑	◑	●	●	◔	◑	◑	◕	◔	●	●	◑	●	◑
	I-85 north, outside I-485	I-485 east	Exit 49 (Speedway Blvd)	◑	◑	●	●	◑	◑	◕	◕	◑	●	●	◕	◕	◑
	I-85 north, Cabarrus Co	Exit 49 (Speedway Blvd)	Cabarrus/ Rowan CL	◕	◑	●	●	◑	◑	◑	◕	◔	●	●	◕	◑	◑
	I-85 north, Rowan Co	Cabarrus/ Rowan CL	Exit 81, Long Ferry Rd	◔	◔	◕	◕	○	◔	○	◔	○	●	●	◕	○	◑
	US-321 north	US-321 Bypass/ US-321	US-321 Business	○	○	○	○	○	○	○	○	○	○	○	◕	○	○
	US-74	I-277	Albemarle Rd	◑	◑	●	●	◕	◕	◕	◕	●	○	○	◑	◑	◕
	US-74	Albemarle Rd	I-485 southeast	◕	◕	●	●	◑	◕	◕	◕	◕	○	○	○	◔	◕
	NC-16	Lincoln/Catawba CL	Killian Rd	◔	○	◔	◑	○	○	○	◔	◔	○	○	◑	○	◔
	NC-16, outside I-485	Killian Rd	I-485 northwest	◕	◑	●	●	◑	◑	◕	◕	◑	○	○	◑	◑	◔
	NC-16, inside I-485	I-485 northwest	I-277 (Brookshire)	◕	◕	●	●	●	●	●	●	◕	○	○	◑	●	◔
	NC-24/27	US-74	I-485 east	◕	●	●	●	●	●	◕	●	●	○	○	○	◑	◔
	NC-24/27	I-485 east	Cabarrus/ Stanly CL	◕	◑	●	●	◑	◑	◕	◕	◑	○	○	○	◔	◔
	NC-24/27, Stanly Co	Cabarrus/ Stanly CL	US-52, Albemarle	○	○	○	○	○	○	○	○	○	○	○	●	○	◔
	US-321 south	US-321 Bypass/ US-321	I-85	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	US-521, Lancaster Co	SC-5, SC	SC/NC state line	◔	◔	◕	◕	○	◔	◑	◑	◑	○	○	◔	◑	◔
	US-521, Meck Co	SC/NC state line	I-485 south	◕	◑	●	●	◕	●	◕	●	◕	○	○	○	◕	◔
	US-321 Bypass	US-321	I-85 south	○	○	○	○	○	○	○	○	○	○	○	●	○	○
	Gpkwy - south Gastonia	I-85 south	I-485 southwest	○	◔	○	○	○	○	○	○	◕	○	○	●	○	○
	I-485 northeast	I-77	I-85	◔	◑	○	◔	○	○	○	○	◔	◑	●	●	○	○

Legend: ○= Fail, ◔= Below average, ◑= Average, ◕=Above average, ● = Best

Highlight indicates that the segment is not being considered for Phase 2 at this point.

Figure 4-1. Preliminary Screening Recommendations



5.0. FINAL PHASE 1 RECOMMENDATIONS

On February 12, 2008, the study screening recommendations discussed in Chapter 4 were presented to the RTT for their approval. A major element of RTT consideration involved examination of the corridors which were recommended for Phase 2 on a conditional basis.

The RTT recommended two additions to the corridors that were not recommended in Chapter 4 for further study in Phase 2:

- I-85 north to Exit 68 in Rowan County – This four-lane segment of I-85 will be widened at the same time as the section of the interstate just south of it in Cabarrus County. Because I-85 north of Exit 68 has already been widened to eight lanes, the RTT recommended that the portion in Rowan County which has not been widened be analyzed for managed lanes.
- I-485 between I-85 and Arrowood Road – The potential for expanded freight movements along this section of I-485 near Charlotte-Douglas International Airport prompted RTT interest in retaining this segment of the Charlotte Outer Loop for further study of managed lanes feasibility.

Figure 5-1 illustrates the corridors advancing to Phase 2 of the *Fast Lanes* Study. About 167 miles of the initial highway system under study advance to the detailed corridor analysis in the project's second phase.

Figure 5-1. Final Phase 1 Screening Recommendations