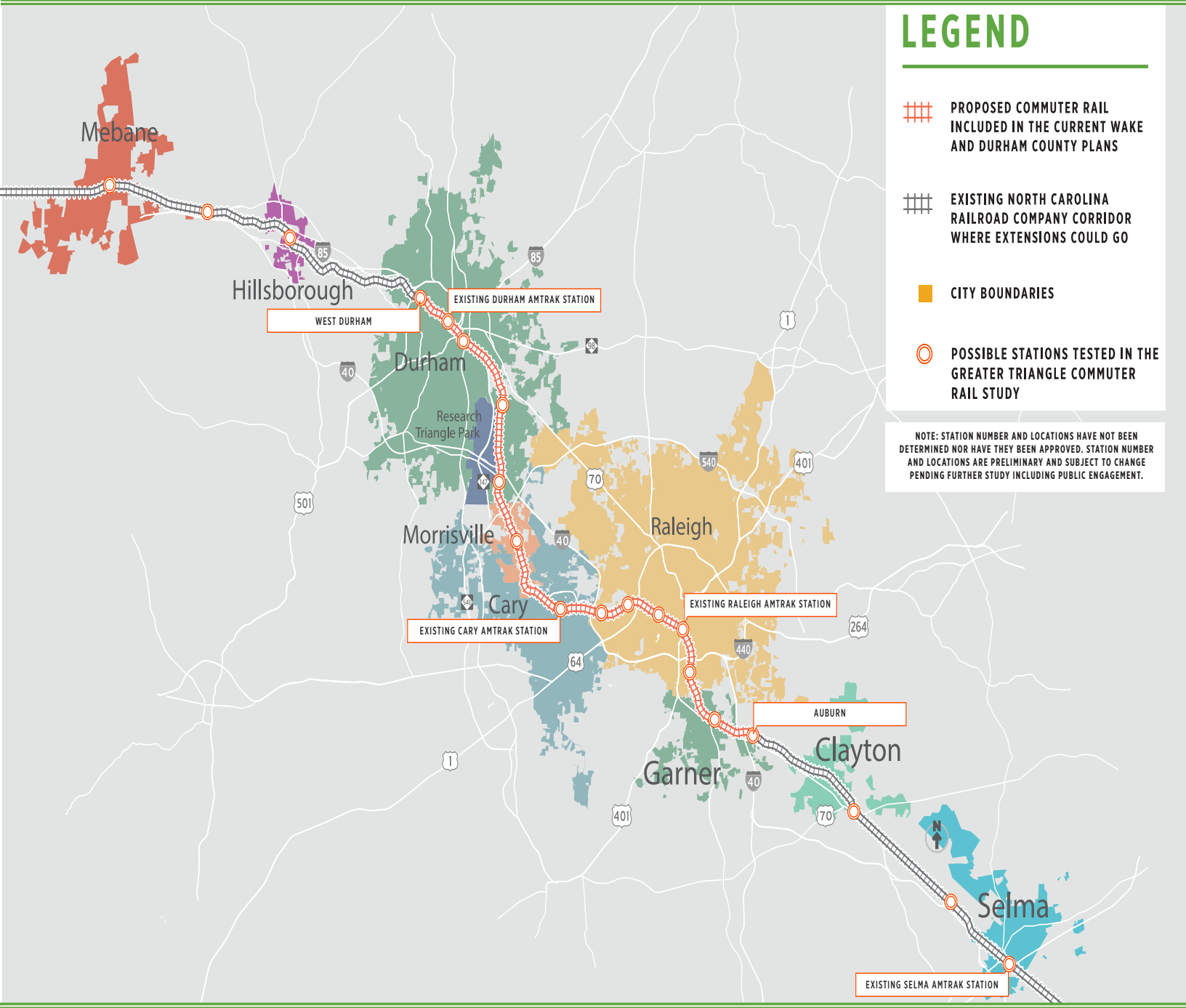
Greater Triangle Commuter Rail Phase I Feasibility Study FINAL

May 2020



Prepared For:

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1. Background and Purpose

1.1. Background

In 2016, Wake County voters approved a half-cent sales tax to invest in transit improvements that would connect the region; connect all Wake County communities; provide frequent, reliable urban mobility; and enhance access to transit. In so doing, Wake County joined Durham and Orange Counties in a commitment to transit that safeguards and improves quality of life in the Triangle region. Transit services implemented or planned by the counties include bus service and infrastructure expansion, bus rapid transit, and commuter rail.

The Capital Area Metropolitan Planning Organization (CAMPO), Durham-Chapel Hill-Carrboro Metropolitan Planning Organization (DCHC MPO) and GoTriangle completed an exploratory study of commuter rail on the North Carolina Railroad corridor between West Durham and Garner in May 2019 (referred to as the Major Investment Study, available here: http://goforwardnc.org/wp-content/uploads/2019/05/Task-11-CRT-Evaluation-Results-Final-Report-5-31-2019-Clean.pdf). That study showed:

- Commuter rail in the corridor would be more reliable than driving and faster than taking a bus.
- The operating scenario providing service every 30 minutes in peak periods and limited service midday and evenings was the most productive among the scenarios studied.
- Up to sixteen potential candidate station zones would be appropriate for further analysis.
- Ridership results would be consistent with those from similar commuter rail systems.
- Additional analysis was needed to refine ridership estimates, identify infrastructure required to support any commuter rail operating plans, and estimate the costs to build and operate commuter rail.

With the goal of filling those information gaps, designated project sponsor GoTriangle and stakeholder project management partners Wake County, Durham County, Orange County, Johnston County, North Carolina Railroad Company (NCRR), Research Triangle Foundation, CAMPO, and DCHC MPO undertook the work described in this report. The North Carolina Department of Transportation (NCDOT) also contributed staff time and resources to this report.

1.2. Purpose of the Greater Triangle Commuter Rail Phase I Feasibility Study

The core purpose of this phase of study was to identify, based on service planning, infrastructure capacity requirements, ridership forecasts, and cost estimates, whether there is a viable commuter rail project likely to qualify for federal funding and to bring forward for public input and continued refinement. The study partners initially specified evaluation of six scenarios representing alternative service plans and the expansion of the potential service area to Mebane and Selma. Two scenarios (Hillsborough-Clayton and West Durham-Clayton) were added in the course of the study. The scenarios are described in Table 1.

Table 1: Service Scenarios Evaluated in the Study

Service Area	Service Plan – Number of Frequencies	Daily Trains
Mebane - Selma	"8-2-8-2" = 8 Morning Peak Round Trips 2 Midday Round Trips 8 Afternoon Peak Round Trips 2 Evening Round Trips	40
Mebane - Selma	"5-1-5-1" = 5 Morning Peak Round Trips 1 Midday Round-Trip 5 Afternoon Peak Round Trips 1 Evening Round Trip	24
Mebane - Selma	"3-1-3" = 3 Morning-Peak Round Trips 1 Midday Round Trip 3 Afternoon Peak Round Trips 0 Evening Round Trips	14
West Durham - Auburn	8-2-8-2	40
West Durham - Auburn	5-1-5-1	24
West Durham - Auburn	3-1-3	14
Hillsborough - Clayton	8-2-8-2	40
West Durham - Clayton	8-2-8-2	40

Note: West Durham – Auburn is substantively the same as the West Durham – Garner (Greenfield) alternative evaluated in the MIS.

2. Service Planning

2.1. Purpose of the Service Planning Task

The purpose of the service planning task was to validate or update earlier findings about capacity improvements that would need to be made to implement commuter rail service without negatively impacting existing and planned freight and intercity service.

- Freight service is the movement of goods and cargo in freight rolling stock (e.g., boxcars, flatcars) that are typically hauled by diesel-powered locomotives. NCRR owns the railroad corridor, and Class I freight rail providers Norfolk Southern and CSX Transportation operate on, dispatch, and maintain the railroad. Norfolk Southern dispatches and maintains 28 miles through a long-term lease with NCRR. CSX Transportation dispatches and maintains one track on the segment between downtown Cary (CP Fetner) and downtown Raleigh (CP Boylan).

- Intercity rail is the movement of passengers over longer distances than commuter or regional trains. Amtrak is the main provider of intercity passenger rail service in the U.S. Two intercity round-trips operate on the NCRR corridor between Selma and Charlotte: the Silver Star (sponsored by Amtrak) and the Carolinian (sponsored by NCDOT). Three additional intercity round-trips, the Piedmont service supported by NCDOT, operate between Raleigh and Charlotte. NCDOT's agreements with the railroads also permit one additional round-trip and plan for another, for a total of seven operated, permitted, or contemplated intercity round trips.

Service planning also informed requirements for fleet purchase and storage, operating and capital cost, and ridership estimates.

2.2. Service Scenarios

The study evaluated the eight scenarios described in Table 1. For the purposes of analysis, each service scenario was assumed to include the station areas in Table 2. The list was derived initially from previous studies, and then refined (through additions, removals, relocations) during discussion with the project management partners and municipalities.

Table 2: Station Areas Assumed for Analysis

Station Area	Approx. H-Line Milepost
Mebane	31.7
Efland	37.4
Hillsborough	41.6
West Durham	52.9
Downtown Durham	54.7
East Durham	56.2
Ellis Road	57.7
RTP	64.4
Morrisville	67.0
Downtown Cary	72.6

Station Area	Approx. H-Line Milepost
Corporate Center Drive / I-40	75.2
Blue Ridge Road	76.9
NCSU	79.2
Raleigh	80.9
Hammond	83.1
Garner	86.3
Auburn / I-540	90.3
Clayton / NC-42	97.9
Wilson's Mills	103.9
Selma	109.3

Note: Station number and locations have not been approved by the railroads or other parties. They are preliminary and subject to change pending public engagement and further study of operations considerations, engineering, and safety requirements.

2.3. Travel Time Modeling

Travel time estimates were generated using the Train Operations Model (TOM)© Train Performance Calculator (TPC). A TPC generates detailed estimates of travel time taking into account station locations, track alignment, speed restrictions and vehicle performance characteristics. The following points detail the assumptions and data inputs used in the TPC modeling:

- **Alignment:** A TPC model requires several pieces of information related to the alignment: horizontal curvature; vertical curvature and gradients (profile); and speed restrictions. The project team worked from data provided by NCRR to develop horizontal curvature and civil speed restrictions for the alignment. A curve/speed analysis was performed to calculate the civil speed restrictions that would result from the alignment design in that study.
- **Train Performance Assumptions:** The team assumed a typical commuter rail train consisting of one modern diesel-electric locomotive and four bi-level passenger coaches. Together, as modeled, this train achieves a maximum acceleration rate of 1.54 mph/sec and a maximum braking rate of 1.8 mph/sec. This is typical of a modern commuter rail train.
- **Schedule Margin:** A schedule margin is time added to the timetable of a commuter rail project to account for real world operating conditions. Considering peer studies, the schedule margins applied to commuter rail and intercity rail projects typically range from 5% to 10%. For purposes of this study, a schedule margin of 7.5% was applied.

Table 3 presents the end-to-end travel time results in both directions. These results include station stops at all proposed locations, with a 60-second dwell at each intermediate station.

2.4. Railroad Schedule (Timetable) Development

Commuter rail timetables were developed to schedule the desired round-trips in each scenario at regular headways (the amount of time between departures) throughout the peak and off-peak periods. The impetus of this was twofold: first, regular headways provide consistency and convenience to customers. Second, regular headways simplify infrastructure requirements by planning for commuter trains to always pass each other at the same location along the corridor.

Additionally, the timetables were developed around an anchor point at Raleigh Union Station, assuming that trains would pass each other at that location throughout the day. As there are currently plans to expand the station to include three tracks for passenger service, the commuter rail train meets were placed at this location to reduce the need for infrastructure elsewhere.

Table 3: Modeled Travel Time Results (Eastbound and Westbound)

Station	Eastbound Model Results	
	Run Time incl Dwell (minutes)	Departure Time
Mebane		6:23 AM
Efland	7.3	6:30 AM
Hillsborough	7.1	6:37 AM
West Durham	14.8	6:52 AM
Downtown Durham	3.8	6:56 AM
East Durham	3.6	6:59 AM
Ellis Road	3.5	7:03 AM
RTP	8.3	7:11 AM
Morrisville	4.4	7:15 AM
Downtown Cary	7.7	7:23 AM
Corporate Center Dr	4.6	7:28 AM
Blue Ridge Road	3.6	7:31 AM
NCSU	4.1	7:35 AM
Raleigh	3.7	7:39 AM
Hammond	4.3	7:43 AM
Garner	5.9	7:49 AM
Auburn / I-540	6.5	7:56 AM
Clayton / NC-42	8.8	8:05 AM
Wilson's Mills	7.2	8:12 AM
Selma	5.8	8:18 AM

Station	Westbound Model Results	
	Run Time incl Dwell (minutes)	Departure Time
Selma		7:00 AM
Wilson's Mills	6.8	7:06 AM
Clayton / NC-42	7.2	7:13 AM
Auburn / I-540	8.9	7:22 AM
Garner	6.5	7:29 AM
Hammond	5.9	7:35 AM
Raleigh	4.3	7:39 AM
NCSU	3.6	7:43 AM
Blue Ridge Road	4.1	7:47 AM
Corporate Center Dr	3.6	7:51 AM
Downtown Cary	4.8	7:55 AM
Morrisville	7.8	8:03 AM
RTP	4.4	8:07 AM
Ellis Road	8.3	8:16 AM
East Durham	3.5	8:19 AM
Downtown Durham	3.6	8:23 AM
West Durham	3.8	8:27 AM
Hillsborough	14.9	8:42 AM
Efland	7.2	8:49 AM
Mebane	6.1	8:55 AM

Note: Station number and locations have not been approved by the railroads or other parties. They are preliminary and subject to change pending public engagement and further study of operations considerations, engineering, and safety requirements.

After developing the timetables for each service scenario, the service plan characteristics summarized in Table 4 were identified: peak and off-peak headway (time between trains); typical terminal layover time and cycle time (the total round-trip time including running time and terminal time); and peak fleet requirements. The estimates are subject to revision after a detailed service plan is tested in network modeling and more refined crew and fleet assignments can be developed.

Table 4: Commuter Rail Service Plans

Scenario	Headways	Roundtrip Travel Time	Typical Peak Terminal Time	Typical Peak Cycle Time	Estimated Peak Fleet
Mebane to Selma 8-2-8-2	Peak: 30 min Off-Peak: ~2 hours	230 min	Approx 20 min at each end	270 min	9 trains
Mebane to Selma 5-1-5-1	Peak: 30 min Off-Peak: ~2 hours	230 min	Approx 20 min at each end	270 min	9 trains
Mebane to Selma 3-1-3	Peak: 60 min Off-Peak: ~4 hours	230 min	Approx 35 min at each end	300 min	5 trains
West Durham to Auburn 8-2-8-2	Peak: 30 min Off-Peak: ~2 hours	126 min	Approx 27 min at each end	180 min	6 trains
West Durham to Auburn 5-1-5-1	Peak: 30 min Off-Peak: ~4 hours	126 min	Approx 27 min at each end	180 min	6 trains
West Durham to Auburn 3-1-3	Peak: 60 min Off-Peak: ~4 hours	126 min	Approx 57 min at each end	240 min	4 trains
Hillsborough to Clayton 8-2-8-2	Peak: 30 min Off-Peak: ~2 hours	174 min	Approx 33 min at each end	240 min	8 trains
West Durham to Clayton 8-2-8-2	Peak: 30 min Off-Peak: ~2 hours	144 min	Approx 33 min at each end	210 min	7 trains

The timetables for each of the commuter rail service scenarios were combined with the freight and intercity rail timetables in a spreadsheet-based operations model to analyze train movements.

3. Capacity, Infrastructure, and Fleet Requirements

The assessment of system capacity and infrastructure requirements took the following approach:

1. As all of the previous studies called for a two-track system to accommodate future passenger service and to ensure the reliability of all train services, the project team maintained that assumption of constructing a second track throughout the corridor as a starting point.
2. The team then considered the capacity required to accommodate the maximum service scenarios (20 roundtrips) to both develop conceptual plans to be tested in network modeling, and to inform the capital cost estimates. This analysis included assessments of:
    - Areas where more than two tracks may be required, where there is a significant number of parallel freight and passenger movements
    - Passing locations and special trackwork requirements (track switches, crossovers, interlocking systems, etc.)
    - Track and special trackwork requirements at terminals
    - Impacts to existing infrastructure (bridges, grade crossings, etc.) and an identification of which projects are already programmed or funded

- Total fleet size and maintenance & storage requirements

3. The team also considered the lower frequency scenarios (12 and 7 roundtrips) to identify any changes in infrastructure for purposes of testing in network modeling; the maximum scenario was maintained as the conservative assumption for capital cost estimation.

Under the maximum service scenarios (8-2-8-2), the full system would be double-tracked between the terminals. Train meets would occur at several locations along the line, with crossovers on either side of the meet locations; in some cases two new crossovers are required, while in others, existing crossovers could be relocated or expanded. Rail network modelling and engineering will be needed to determine efficient and cost-effective crossover locations.

In addition to the train meet locations described above, several other locations were recommended for additional tracks:

- Terminal Requirements: Two station platform tracks, plus storage tracks, should be constructed at each terminal location. These tracks should be constructed in addition to the existing mainline track, to allow freight and intercity traffic to bypass the terminals freely while commuter trains are stopped for long periods of time.
- The Raleigh Union Station should be expanded as describe in long-term plans, with three passenger tracks and one (current) freight track.
- CP Fetner / Cary Station: An expansion of tracks and other infrastructure is proposed at CP Fetner just east of Cary Station, where CSX joins the H-Line. This additional infrastructure would allow CSX trains to merge into the corridor smoothly and allow for CSX freight traffic to bypass the train meet at Cary Station.

Table 5 summarizes the key infrastructure elements that would require expansion or replacement.

Table 5: Total Infrastructure Requirements for Terminal Scenarios

Key Infrastructure Elements	Mebane to Selma	Hillsborough to Clayton	West Durham to Clayton	West Durham to Auburn
New Track Miles	59.3	37.4	27.2	24.6
New/Relocated Crossovers	20	11	9	8
Spur Track Connections	20	16	12	11
Grade Crossings	79	49	43	34
Bridges/Crossings	65	54	44	43

Finally, requirements for maintenance and storage of the fleet were identified. Building from the peak fleet requirements identified in the Service Planning task, the team developed an estimate of total fleet requirements; this includes provisions for a spare fleet, typically assumed to be at least 20% of the peak fleet. The following table summarizes the fleet requirements of each scenario.

Table 6: Commuter Rail Fleet Requirements

Scenario	Peak Fleet Requirement		Spare Fleet Requirement		Total Fleet Requirement	
	Locomotives	Coaches	Locomotives	Coaches	Locomotives	Coaches
Mebane to Selma 8-2-8-2	9	36	2	8	11	44
Mebane to Selma 5-1-5-1	9	36	2	8	11	44
Mebane to Selma 3-1-3	5	20	1	4	6	24
West Durham to Auburn 8-2-8-2	6	24	2	8	8	32
West Durham to Auburn 5-1-5-1	6	24	2	8	8	32
West Durham to Auburn 3-1-3	4	16	1	4	5	20
Hillsborough to Clayton 8-2-8-2	8	32	2	8	10	40
West Durham to Clayton 8-2-8-2	7	28	2	8	9	36

4. Ridership Estimates

Ridership estimates were prepared using two separate models. No model is perfect, and the study sponsors wanted the benefit of continuity with the traditional regional model plus the use of a model developed by the Federal Transit Administration (FTA) in support of its process for recommending projects for funding.

- The Triangle Regional Model (TRM) is the travel demand model used to plan transportation investments in the Triangle region of North Carolina. TRM is developed and maintained by the NC State University Institute for Transportation Research and Education (ITRE) with four stakeholder sponsors: NCDOT, DCHC MPO, CAMPO, and GoTriangle. TRM is a predictive model that can be used to forecast peak period and daily trips of automobile, transit, commercial vehicle, and non-motorized travel for any given socioeconomic scenario.
- The Federal Transit Administration's (FTA) Simplified Trips-on-Project Software (STOPS) is intended as a standardized national procedure that takes advantage of the ridership experience gained from recent fixed guideway (including commuter rail) projects implemented across the United States. At the same time, STOPS can be customized to represent unique local circumstances that describe the market for transit services in specific local areas. This capability is particularly important for the Raleigh-Durham area with its unique transit systems serving residential areas, multiple business districts, major medical facilities, and large research-oriented universities.

TRM and STOPS use some of the same input data (e.g., regional socioeconomic and other assumptions, plus the characteristics of the new transit service), but they are different tools and as a result they produce different estimates. The ridership estimates and major conclusions are described below.

Table 7: Estimated Weekday Boardings for Greater Triangle Commuter Rail

Scenario / Model	Mebane-Selma 3-1-3	Mebane-Selma 5-1-5-1	Mebane-Selma 8-2-8-2	West Durham-Auburn 3-1-3	West Durham-Auburn 5-1-5-1	West Durham-Auburn 8-2-8-2	West Durham-Clayton 8-2-8-2	Hills-borough-Clayton 8-2-8-2
Year 2018								
TRM	4,060	4,196	5,579	3,239	3,871	4,541	Not calculated	
STOPS	5,083	6,058	7,103	4,835	5,810	6,709	6,648	6,818
Year 2040								
TRM	5,742	7,491	9,428	3,977	5,565	7,530	Not calculated	
STOPS	8,896	10,374	12,337	8,634	10,086	11,900	11,785	11,981

The following conclusions are derived from the STOPS estimates, but also apply to the TRM estimates. Trip productions refer to the home end of trips; trip attractions refer to the non-home end of the trips.

- Downtown Raleigh station is principally an attraction station. Out of 12,300 daily trips on the line, 4,100 (about one-third) have an attraction end in Raleigh. There is a modest number of trip productions at the station serving a growing population base nearby, but more residential-end trips are likely to use other, nearby stations.
- The production-end locations for Raleigh trip attractions are concentrated toward the Southeast side of the area. Over half of Raleigh attractions come from Hammond, Garner, Auburn, and Clayton stations. The west side has nearly as many productions, but they are distributed over many more stations and volumes over 100 trips per day extend as far west as Durham.
- Other key attraction locations (over 1,500 attractions per day) include NC State University, Downtown Durham, and West Durham. Each station serves a combination of Central Business Districts and major research universities.
- The Durham/West Durham stations serves trip productions distributed in the corridor between Durham and Raleigh showing the regional role these areas play in the economy of the Raleigh-Durham area and the ability of the commuter rail line to assist in connecting various communities to the region's activity centers.
- By contrast to trip attractions, trip productions are distributed across the area with fewer very large production-end stations. Only Garner, Hammond, NC State, and Downtown Cary serve more than 1,000 daily trip productions and none serves more than 1,300 daily productions. This outcome points to the fact that outside of the major activity centers, development is reasonably consistent in the Raleigh-to-Durham corridor. Only at the far extremes of the corridor (Mebane, Wilson's Mills, and Selma) does demand appear to drop off. Even there, actual demand may be

larger than what is reported here. Since current transit service is sparse to non-existent in these areas, the incremental form of STOPS may have an under-developed sense of the transit potential in these areas. Though not likely to be as large as transit markets closer to the city centers of Raleigh and Durham, these markets may be somewhat larger than represented with Incremental STOPS. As the project and forecasting methodologies are refined in future phases of the work, the ridership potential for these areas can be revisited as more data becomes available over time.

5. Cost Estimates

5.1. Operating and Maintenance Costs

Operating and maintenance (O&M) costs include the costs to operate trains, maintain physical assets, and provide associated services and support. For early stages of planning, when alternatives are being compared, FTA endorses the use of a fully-allocated resource build-up methodology that multiplies operating statistics calculated for the new service by unit costs derived from peer systems. Table 8 lists the operating categories and corresponding statistics.

Table 8: O&M Cost Categories and Associated Operating Statistics

Peer-derived unit cost:	Greater Triangle Commuter Rail statistic:
Train operations	Annual revenue train hours
Vehicle maintenance	Annual revenue car miles
Non-vehicle maintenance	Track miles (new)
General administration	Peak fleet size (coaches)

The unit cost categories listed above capture 100 percent of actual O&M costs reported to the FTA's National Transit Database (NTD), the repository of data for the financial, operating and asset conditions of American transit systems, as summarized below.

- **Train Operations:** All activities associated with train operations, including: transportation administration and support; revenue vehicle movement control; scheduling of transportation operations; revenue vehicle operation; ticketing and fare collection; and system security.
- **Vehicle Maintenance:** All activities associated with revenue and non-revenue (service) vehicle maintenance, including administration; inspection and maintenance; servicing (cleaning, fueling, etc.) vehicles; and repairs due to vandalism and accident repairs of revenue vehicles.
- **Non-Vehicle Maintenance:** All activities associated with facility maintenance, including: administration; repair of buildings, grounds and equipment as a result of accidents or vandalism; operation of electric power facilities; maintenance of: vehicle movement control systems; fare collection and counting equipment; structures, tunnels and subways; roadway and track; passenger stations, operating station buildings, grounds and equipment; communication systems; general administration buildings, grounds and equipment; and electric power facilities.
- **General Administration:** All activities associated with the general administration of the transit agency, including: transit service development; injuries and damages; safety; personnel administration; legal services; insurance; data processing; finance and accounting; purchasing and

stores; engineering; real estate management; office management and services; customer services; promotion; market research; and planning.

The following systems, using diesel-powered push-pull equipment and featuring single or other small operations, were selected as peers Greater Triangle for estimating unit costs:

- Sounder (Seattle)
- VRE (Northern VA)
- Tri-Rail (FL)
- Music City Star (TN)
- SunRail (FL)
- Northstar (MN)
- Trinity Railway Express (TX)
- RailRunner (NM)
- Frontrunner (UT)
- Coaster (CA)
- Caltrain (CA)
- ACE (CA)

Table 9 summarizes the annualized O&M cost for weekday operations for each service scenario.

Table 9: Annual O&M Cost

Service Area and Daily Round-Trips (AM peak-midday-PM peak-evening)		Annual O&M Cost (2019 $ in Millions)
Mebane – Selma	8-2-8-2	$57.4
Mebane – Selma	5-1-5-1	$40.7
Mebane – Selma	3-1-3-0	$26.5
West Durham - Auburn	8-2-8-2	$31.2
West Durham - Auburn	5-1-5-1	$22.4
West Durham - Auburn	3-1-3-0	$15.5
Hillsborough – Clayton	8-2-8-2	$44.2
West Durham - Clayton	8-2-8-2	$37.0

5.2. Capital Costs

Capital costs typically include design and construction of infrastructure improvements, rolling stock acquisition, and related support costs necessary to establish the commuter rail service. The commuter rail capital cost estimates reflect the infrastructure, fleet, and support facilities described in Section 4 and other supporting documentation. The planning-level estimates shown in the table below were informed by industry sources, including FTA, for comparable pricing, and by NCRR and NCDOT Rail Division staff and related work. They do not reflect engineering drawings, quantity take-offs, nor other specifics that will be established during design. A cost estimate range, in year-of-expenditure dollars, is shown to reinforce the preliminary nature of the estimates.

Table 10: Capital Cost Estimates

Service Area and Daily Round-Trips (AM peak-midday-PM peak-evening)		Range of Capital Cost (Year of Expenditure $B)	Required Infrastructure	Required Fleet
Mebane – Selma	8-2-8-2	$2.5 – $3.2	Most	Largest
Mebane – Selma	5-1-5-1	$2.5 – $3.2	Most	Largest
Mebane – Selma	3-1-3-0	$2.3 – $3.1	Most	Smallest
West Durham - Auburn	8-2-8-2	$1.4 – $1.8	Least	Medium
West Durham - Auburn	5-1-5-1	$1.4 – $1.8	Least	Medium
West Durham - Auburn	3-1-3-0	$1.4 – $1.7	Least	Smallest
Hillsborough – Clayton	8-2-8-2	$1.8 – $2.4	Medium	Medium
West Durham - Clayton	8-2-8-2	$1.6 – $2.1	Medium	Medium

The Mebane – Selma scenarios with 20 and 12 daily round trips have the highest capital cost because the long distance and robust frequencies require the most infrastructure and largest fleet. The West Durham – Auburn scenario with 7 daily round trips has the lowest capital cost because the relatively short distance and low-frequency service requires less infrastructure and the smallest fleet.

6. Project Evaluation and Risk Assessment

6.1. Project Evaluation

The project management partners agreed upon metrics to help evaluate and contextualize the results and to provide relevant information for decision makers on whether to proceed with additional study. The published criteria for the Federal Transit Administration's (FTA) New Starts process, part of the Capital Investment Grant (GIG) program. The FTA's Project Justification summary rating is made up of six equally-weighted criteria:

1. ***Mobility Improvements:*** Total annual trips on the project, with trips of riders from zero-car households doubled
2. ***Congestion Relief:*** New weekday trips on the project
3. ***Cost Effectiveness:*** Total annual project trips divided by the annualized capital cost and annual operating and maintenance costs
4. ***Environmental Benefits:*** Monetized benefit of change in vehicle miles traveled (VMT) divided by annualized capital cost and annual operating and maintenance costs
5. ***Land Use:*** Quantitative and qualitative evaluation of existing station area population density, jobs, affordable housing, central business district parking ratio and cost, and built environment characteristics
6. ***Economic Development:*** Qualitative evaluation of locally adopted plans and policies, the performance of those policies, the potential of the project to impact development patterns, and affordable housing plans and policies.

Scores were developed for each scenario using information developed in the study or readily available for the corridor. Table 11 summarizes the expected federal score, highlighting that two scenarios--West

Durham to Clayton and West Durham to Auburn, both with the 8-2-8-2 service pattern--are likely to be eligible for federal funding.

Table 11: Projected Eligibility for Discretionary Federal Funding

Service Area and Daily Round-Trips (AM peak-midday-PM peak-evening)		Expected Federal Score
Mebane – Selma	8-2-8-2	Medium-Low
Mebane – Selma	5-1-5-1	Medium-Low
Mebane – Selma	3-1-3-0	Medium-Low
West Durham - Auburn	8-2-8-2	Medium
West Durham - Auburn	5-1-5-1	Weak Medium*
West Durham - Auburn	3-1-3-0	Weak Medium*
Hillsborough – Clayton	8-2-8-2	Weak Medium*
West Durham - Clayton	8-2-8-2	Medium

* "Weak Medium" indicates that the scenario received the lowest score possible to qualify for a medium rating. These scenarios would be ineligible for federal funding if the score for any one of the six criteria was to be downgraded.

Both of the scenarios that are likely to be eligible for federal funding would have capital and operating costs similar to recently-completed peer projects.

6.2. Risk Assessment

FTA encourages project sponsors to proactively engage in strategic risk-informed, performance-based project management for major capital projects. At this early planning stage of commuter rail, the study included the following industry-standard initial risk identification activities:

- Half-day risk workshop with staff of project management partner organizations
- One-hour jurisdiction-specific risk identification meetings with each municipality and university along the corridor

Dozens of individual risk items were identified. Those with high probability of occurrence and significant impacts on cost, schedule, and/or project viability were distilled into four key risks:

- Railroad coordination and buy-in
- Impact of project scope definition on project cost and schedule
- Federal funding eligibility
- Funding commitments

These key risks formed the basis of activities identified as necessary elements of the scope of priority tasks for evaluation if the project is advanced beyond this phase of study.

7. Next Steps

Upon conclusion of the technical portion of this Phase 1 study, GoTriangle, NCRR, NCDOT, CAMPO, DCHC MPO, and the Counties of Wake, Durham, and Johnston entered into a memorandum of understanding in support of continued development of the Greater Triangle Commuter Rail Project. The parties agreed to continue feasibility study to determine whether commuter rail service is likely to be technically, financially, legally, and politically achievable, and also to identify the characteristics of such a system. Next steps will also include documentation of existing railroad agreements that will require modification and new railroad agreements that will be needed in order to implement commuter rail.