

Greater Triangle Commuter Rail (GTCR) Phase II Feasibility Study

Client: GoTriangle

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Appendix R Operations & Maintenance (O&M) Cost Methodology and Estimates

FINAL
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Contents

1. Introduction..... 1

2. Methodology 1

 2.1. *Assignment of Cost Categories and Service Variables2*

 2.2. *Peer System Selection3*

 2.3. *Calculation of Unit Costs.....4*

 2.4. *Calculation of Service Quantities4*

3. Estimation of O&M Costs 5

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1. Introduction

Phase 2 of the Greater Triangle Commuter Rail (GTCR) study has advanced the development of several potential scenarios for the proposed commuter rail service in the North Carolina Railroad (NCR) corridor. As part of the evaluation of the service scenarios, Operations & Maintenance (O&M) costs were estimated to assess the relative cost of each scenario. At this early stage of planning, and as commuter rail would represent a new transit mode in the Triangle Region, the team applied the typical FTA-approved methodology for assessing O&M costs. This methodology, originally developed during Phase 1 and updated for Phase 2, relies on the cost experience of peer systems and builds cost estimates on the planning-level estimates of service for the corridor.

The service scenarios under consideration in this memorandum are:

- Base Case: 8-2-8-2 from West Durham to Auburn
- Base Case: 8-2-8-2 from West Durham to Auburn, with limited service (3-1-3) to Clayton
- Enhanced Midday/Evening: 30-min Peak / 60-min Off-Peak from West Durham to Auburn
- Hourly All Day: 60-min Peak / 60-min Off-Peak from West Durham to Auburn
- Starter Service: 60-min Peak / 60-min Off-Peak from Raleigh to Auburn

2. Methodology

The O&M cost estimates for the GTCR study were developed using a typical FTA methodology for O&M cost estimating consisting of a four-category fully-allocated cost model. Under this methodology, all costs for a transit system are grouped into one of the four primary National Transit Database (NTD) cost categories: Train Operations, Vehicle Maintenance, Non-Vehicle Maintenance, and General Administration. A fully-allocated cost model assumes that all O&M costs are linked to a service quantity and that all costs will increase proportionally as service increases. FTA typically requires this methodology, especially for new projects, and it represents a simple but comprehensive approach to cost estimating.

The methodology consists of the following steps:

- Assignment of Cost Categories and Service Variables
- Peer System Selection
- Calculation of Unit Costs
- Calculation of Service Quantities

- Estimation of O&M Costs

2.1. Assignment of Cost Categories and Service Variables

As stated previously, O&M costs are estimated in terms of the four primary National Transit Database (NTD) cost categories: Train Operations, Vehicle Maintenance, Non-Vehicle Maintenance, and General Administration. These categories represent the full range of costs associated with operating a transit service¹. They are defined, per NTD, as follows:

- **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; and servicing (cleaning, fueling, etc.) vehicles. In addition, vehicle maintenance includes 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.*

These cost categories were assigned the following service variables:

- Train Operations - Annual Revenue Train Hours – Train Operations costs are considered proportional to labor costs for conductors and engineers, so Train Hours are used.

¹ It is important to note that costs reported to NTD reflect the annual cost to operate the service. Where the operator does not own the railroad, the reported costs include annual leases or access fees but do not include up-front payments made to the railroad owner.

- Vehicle Maintenance - Annual Revenue Car Miles – Vehicle Maintenance costs are considered proportional to wear-and-tear on vehicles, so Car Miles are used.
- Non-Vehicle Maintenance - Track Miles – Non-Vehicle Maintenance is considered proportional to system size, and mostly related to track maintenance, so Track Miles are used.
- General Administration - Peak Fleet Size – General Administration costs are considered proportional to system size, and FTA recommends that peak fleet size be used as a proxy for system size. Data reported to NTD reflects the peak requirement in terms of passenger coaches.

This methodology is a good tool for estimating costs for comparative purposes. However, the aggregation of costs means that the model will not fully capture cost differences associated with single variables. As an example, the model is not sensitive to changes in the number of stations to be served because station maintenance costs are captured in the Non-Vehicle maintenance category, driven by Track Mileage. The methodology does provide a basis for comparing costs but should not necessarily be the basis for cost negotiations.

2.2. Peer System Selection

To estimate O&M costs, first a set of existing cost data must be identified. The team looked to the most recently available NTD cost reports for FY 2017, FY 2018, and FY 2019; while FY 2020 data is recently available, the team opted not to include this year to avoid the many impacts of the Covid pandemic on transit service.

NTD identifies 25 systems as “commuter rail” systems; however, not all of these systems are appropriate peers for the proposed GTCR project. The team identified systems that have similar characteristics to the proposed project, including:

- Diesel power commuter rail with push-pull equipment
- Single lines or other small operations

The team omitted systems that were not good matches to the proposed project, including:

- Intercity Amtrak lines that are grouped as commuter rail for NTD reporting
- Large systems with many lines
- Legacy systems from the Northeastern US
- Electrified commuter rail

Following this approach, a set of 12 peer commuter rail agencies were identified and were used for estimating unit costs for the cost model:

- Sounder (Seattle)
- VRE (Norther 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)

2.3. Calculation of Unit Costs

Unit costs were calculated for each data year (FY 2017, FY 2018, and FY 2019) for each peer system, using the NTD data previously identified. Unit Costs were calculated as follows:

- Train Operations Cost / Annual Train Revenue Hours = \$/hour
- Vehicle Maintenance Cost / Annual Car Revenue Miles = \$/mile
- Non-Vehicle Maintenance Cost / Track Mileage = \$/mile
- General Admin Cost / Peak Vehicle = \$/vehicle

A combined unit cost for each category was calculated by adjusting all unit costs to 2022 dollars using National CPI and averaging all years and systems. The resulting unit costs were:

O&M Categories	Unit Costs (2022 \$)	
Train Operations	\$1,221	<i>per revenue train hour</i>
Vehicle Maintenance	\$5.61	<i>per revenue car mile</i>
Non-Vehicle Maintenance	\$98,545	<i>per track mile</i>
General Administration	\$302,323	<i>per peak coach in service</i>

2.4. Calculation of Service Quantities

The following sections describe the calculation of service quantities for each of the five service scenarios for the GTCR project:

- For purposes of estimating Train Operations Costs, Annual Revenue Train Hours were estimated for each scenario. In Phase 2, Revenue Train Hours were calculated from the timetables for each scenario, reflecting actual travel times from RTC modeling. Following the approach from NTD reporting, time spent in terminal layovers is typically recorded as revenue hours, as crews remain on duty. In the future, specific train and crew assignments should be developed for a more refined estimate of crew labor hours and the resulting train operating costs for the system.

Calculation: Total hours in service from scenario timetables

- For purposes of estimating Vehicle Maintenance Costs, Annual Revenue Car Hours were calculated for each scenario. Car miles were calculated in terms of coaches only, according to the approach used by other agencies in NTD reporting.

Calculation: 2 x Number of Roundtrips x Route Length

- For purposes of calculating Non-Vehicle Maintenance Costs, the number of New Track Miles proposed for each scenario was calculated. It is understood that any increase in maintenance costs due to additional trains/frequencies (i.e. commuter trains) will be the responsibility of the commuter rail operator. New Track Mileage inputs were determined from the Capital Cost Estimates (June 2022).
- For purposes of estimating General Administration Costs, Peak Fleet Size was calculated for each scenario based on the timetables for each scenario. Only passenger coaches were included in the model, according to the approach used by other agencies in NTD reporting.

An Annualization Factor of 250, provided by GoTriangle planning staff, was applied to both Train Hours and Car Miles to generate Annual totals. This value reflects service on approximately 250 weekdays per year (excluding holidays).

3. Estimation of O&M Costs

Using the previously identified unit costs and service quantities, O&M estimates were developed for each of the five service scenarios. These estimates are presented below.

Service Scenarios (Weekday Service Only)			Annual Rev Train Hours	Train Operations	Annual Rev Car Miles	Vehicle Maintenance
				O&M Cost		O&M Cost
Base Case 8-2-8-2 Service Plan	8-2-8-2	West Durham to Auburn	17,575	\$21,500,000	1,520,000	\$8,500,000
	8-2/3-1	West Durham to Clayton	17,720	\$21,600,000	1,660,000	\$9,300,000
Enhanced Midday/Evening	30/60	W Dur to Aub	21,840	\$26,700,000	1,748,000	\$9,800,000
Hourly All Day	Hourly	W Dur to Aub	18,470	\$22,500,000	1,444,000	\$8,100,000
Starter Service	Hourly	RUS to Aub	9,720	\$11,900,000	180,500	\$1,000,000

Service Scenarios (Weekday Service Only)			New Track Miles	Non-Vehicle Maintenance	Peak Fleet (Coaches)	General Administration	Total O&M Cost (2022\$)
				O&M Cost		O&M Cost	
Base Case 8-2-8-2 Service Plan	8-2-8-2	West Durham to Auburn	35.5	\$3,500,000	28	\$8,500,000	\$42,000,000
	8-2/3-1	West Durham to Clayton	35.7	\$3,500,000	28	\$8,500,000	\$42,900,000
Enhanced Midday/Evening	30/60	W Dur to Aub	35.5	\$3,500,000	28	\$8,500,000	\$48,500,000
Hourly All Day	Hourly	W Dur to Aub	35.5	\$3,500,000	16	\$4,800,000	\$38,900,000
Starter Service	Hourly	RUS to Aub	8.4	\$800,000	4	\$1,200,000	\$14,900,000

As noted earlier, the cost model does not fully capture cost differences associated with single variables. In particular, the model is not sensitive to the additional station in the Clayton scenario. The methodology provides a basis for comparing costs but should not necessarily be the basis for cost negotiations.

Comparison to Phase 1 Estimates

Only one service scenario, West Durham to Auburn 8-2-8-2, is directly comparable to Phase 1. The Phase 2 estimate of \$42 million in 2022 dollars is approximately 35% higher than the Phase 1 estimate of \$31.2 million in 2019 dollars. The difference is attributable to the following:

- An increase of \$3.0 million, or 10%, is associated with net increases in unit costs (inflation from 2019 to 2022, slightly offset by lower costs for some peer systems).
- An increase of \$7.8 million, or 25%, is associated with net increases in service quantities. Service hours and miles reflect final timetables; track mileage reflects additional infrastructure required by Norfolk Southern; the annualization factor was revised to 250 from 255 to reflect GoTriangle standard.