Table of Contents

List of Tables

7 Project Costs

This chapter discusses the two major cost components associated with the proposed Durham-Orange Light Rail Transit (D-O LRT) Project. These components are (1) capital costs and (2) operating and maintenance (O&M) costs. Since the methodologies for developing and presenting these costs are different, the chapter is separated into two sections. Each section will state the methodology used, followed by the costs associated with the National Environmental Policy Act (NEPA) Preferred and Project Element Alternatives studied in the Draft Environmental Impact Statement (DEIS).

The NEPA Preferred Alternative would cost between approximately…

$1.47 and $1.62 billion

to build and

$17.9 million per year to operate and maintain

7.1 Capital Costs

Capital cost methodology and costs by alternative are provided in the following sections. When the proposed D-O LRT Project is fully advanced through the New Starts process, it is anticipated that the New Starts program will provide approximately 50 percent of the proposed D-O LRT Project's capital cost. The non-New Starts costs will be covered by a combination of funding sources, including sales tax revenue generated in Durham and Orange counties, funding from North Carolina Department of Transportation (NCDOT), and other local fees and taxes. Triangle Transit will also pursue Transportation Infrastructure Finance and Innovation Act (TIFIA) credit assistance and possible alternative financing and value capture options.

7.1.1 Methodology

This estimate provides an approximation of total project capital costs, excluding inflation, finance costs, operations, and maintenance. These elements will be covered in the New Starts Submittal. All estimated costs are in mid-year 2015 dollars with no escalation applied. The New Starts submittal will provide year of expenditure (YOE) capital cost estimates based on additional engineering and design (which has not yet occurred). The estimate in the DEIS (appendix K.27) is based upon the latest version of the *Basis for Engineering Design* (appendix L).

Capital cost estimates for the proposed D-O LRT Project are reported using the latest revision of the Federal Transit Administration's (FTA's) Standard Cost Categories (SCC). Detailed cost estimates have been developed for SCC categories 10-50 construction and SCC category 60 right-of-way (ROW). SCC category 70 vehicle costs are priced from historical unit price data. SCC category 80 professional fees are estimated as a percentage of construction costs.

The cost estimates in this DEIS are based upon a conventional design-bid-build project delivery method for one complete project (i.e., a single contract for the entire project). If design-build, construction manager at risk, public-private partnership, or some other method of procurement is used, this estimate will be re-evaluated to account for savings or additional costs associated with the method of procurement. Likewise, if the project is separated into various work packages, separate contracts, or different sections, this estimate will be re-evaluated for cost and project schedule assumptions. Therefore, each alignment alternative estimate, including the NEPA Preferred Alternative, is tabulated from beginning to end of the project. The cost estimate detail and methodology is contained in a technical report entitled Basis of Estimate and Opinion of Probable Project Cost, April 2015 (appendix K.27). Included in the report are FTA SCC Main Build worksheets for each of the alternatives along with a detailed summary of the costs broken down by SCC code.

7.1.2 NEPA Preferred Alternative: Capital Cost

Table 7.1-1 provides a summary of the capital cost for the NEPA Preferred Alternative in base year dollars (2015 $) broken out by SCC code. These costs will be updated in the New Starts process during the Engineering phase and will be expressed as YOE dollars in the New Starts documentation.

7.1.3 Project Element Alternatives: Capital Cost

In addition to the NEPA Preferred Alternative, three alignment alternatives for crossing Little Creek, two alignment alternatives for crossing New Hope Creek and four different Rail Operations and Maintenance Facility (ROMF) sites are evaluated in this DEIS.

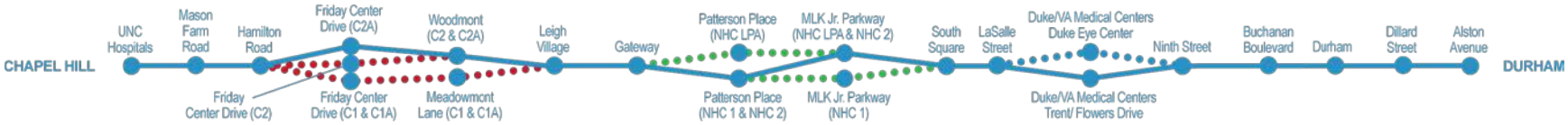


Table 7.1-1: Capital Cost Estimate Summary for NEPA Preferred Alternative (2015 dollars)

SCC	NEPA Preferred Alternative	
	Low Range	High Range
10 - Guideway	$384,000,000	$424,000,000
20 - Stations/Stops	$111,000,000	$123,000,000
30 - Support Facilities (ROMF)	$70,000,000	$78,000,000
40 - Sitework and Special Conditions	$171,000,000	$189,000,000
50 - Systems	$199,000,000	$220,000,000
60 - Right-of-Way	$142,000,000	$157,000,000
70 - Vehicles	$88,000,000	$97,000,000
80 - Professional Services	$219,000,000	$242,000,000
90 - Unallocated Contingency	$84,000,000	$92,000,000
Total (2015)	$1,468,000,000	$1,622,000,000

Note: The NEPA Preferred Alternative includes C2A, NHC2, Duke/VA Medical Centers Station: Trent/Flowers Alternative, and Farrington Road ROMF.

Note: A range of 5% above and below a calculated cost for each of the SCC headings was applied to represent the level of confidence of the estimate. The estimated cost for the Farrington Road ROMF facility is included in the above costs. Contingency is included but inflation and finance costs are not included.

7.1.3.1 Alignment and Station Alternatives: Capital Cost

Twelve individual alignment combinations were considered. Given the methodology of developing costs for the alternatives, a total cost from end-to-end of the alignment was developed for each alternative. **Table 7.1-2** presents comparative costs for the various alignment alternative combinations. To facilitate comparative evaluation, **Table 7.1-2** lists the total cost for the NEPA Preferred Alternative along with the eleven other alternative alignment combinations studied based upon a confidence range of five percent above and below a calculated probable cost for each alternative. The Duke/Veterans Affairs (VA) Medical Centers Station: Duke Eye Center Alternative is not anticipated to affect the project cost.

7.1.3.2 Rail Operations and Maintenance Facility Alternatives: Capital Cost

The capital cost of the ROMF alternatives will vary depending on the alternative site selected. Variables between each site include the following:

- Guideway lead track: construction of non-revenue track connecting the light rail alignment to the ROMF
- Site work and special conditions: demolition of existing structures, site clearing, utility relocation, earthwork, retaining walls, vehicular access and hazardous materials remediation
- Systems: signals and power systems associated with the non-revenue track
- ROW: acquisition of ROMF property and relocation of existing businesses or residences

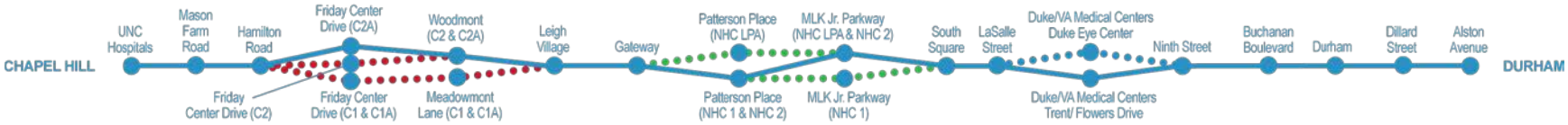


Table 7.1-2: Comparative Costs for Alignment Alternative Combinations (2015 dollars)

Alternative	Low Range	High Range	Delta Above Apparent Low	Comment
C2A NHC LPA	$1,458,000,000	$1,612,000,000	$0	Apparent Lowest Cost Alternative
C2 NHC LPA	$1,463,000,000	$1,617,000,000	$5,000,000	
C2A NHC 2	$1,468,000,000	$1,622,000,000	$10,000,000	NEPA Preferred Alternative
C2 NHC 2	$1,473,000,000	$1,628,000,000	$15,000,000	
C2A NHC 1	$1,493,000,000	$1,651,000,000	$37,000,000	
C1A NHC LPA	$1,498,000,000	$1,656,000,000	$42,000,000	
C2 NHC 1	$1,499,000,000	$1,657,000,000	$43,000,000	
C1 NHC LPA	$1,502,000,000	$1,660,000,000	$46,000,000	
C1A NHC 2	$1,508,000,000	$1,666,000,000	$52,000,000	
C1 NHC 2	$1,511,000,000	$1,671,000,000	$56,000,000	
C1A NHC 1	$1,533,000,000	$1,695,000,000	$79,000,000	
C1 NHC 1	$1,537,000,000	$1,699,000,000	$83,000,000	

Assumptions: Variance between low and high is plus or minus 5%.

Note: The NEPA Preferred Alternative includes C2A, NHC2, Duke/VA Medical Centers Station: Trent/Flowers Alternative, and Farrington Road ROMF.

Note: The total estimated cost of the ROMF based upon Farrington Road is accounted for in Table 7.1 2. The variance in cost for the ROMF alternatives is addressed in Table 7.1 3 and discussed later in this document. The selection of the Duke/VA Medical Centers Station Alternative is not anticipated to affect the project cost.

Since the yard and building facilities would be nearly identical for all sites, engineering drawings were developed for a single facility which was used for all five alternative locations. Variable costs for each site included ROW and relocations, lead track, and necessary environmental mitigation measures. These factors are summarized in **Table 7.1-3**; the rightmost column in the table indicates the variance for each ROMF from the Farrington Road site, which is included in the NEPA Preferred Alternative and the other alternative alignment total costs.

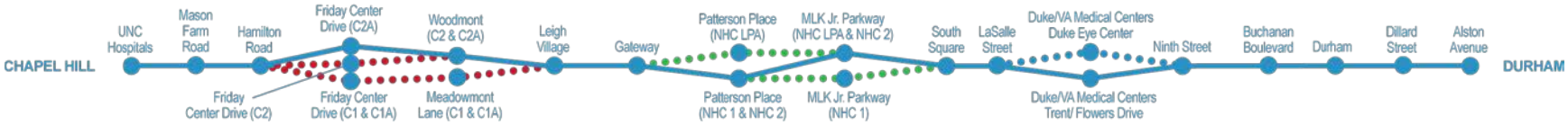


Table 7.1-3: ROMF Alternatives Capital Cost Estimate Summary (2015 dollars)

Yard Sites	Heavy Repair Maintenance Building, All Equipment, Maintenance Vehicles and Yard	ROW and Relocation Costs	Lead Track Delta	Environmental Impacts	Total	Total Delta Costs
Leigh Village [a]	$73,881,000	$2,760,000	-	$2,000,000	$78,641,000	$1,400,000
Farrington Road	$73,881,000	$2,360,000	-	$1,000,000	$77,241,000	-
Patterson Place [b]	$73,881,000	$6,760,000	$17,990,000	-	$98,631,000	$21,390,000
Cornwallis Road [c]	$73,881,000	$5,140,000	$13,260,000	$100,000	$92,381,000	$15,140,000
Alston Avenue [d]	$73,881,000	$37,100,000	$4,480,000	$5,000,000	$120,461,000	$43,220,000

Note: The NEPA Preferred Alternative includes C2A, NHC2, Duke/VA Medical Centers Station: Trent/Flowers Alternative, and Farrington Road ROMF.

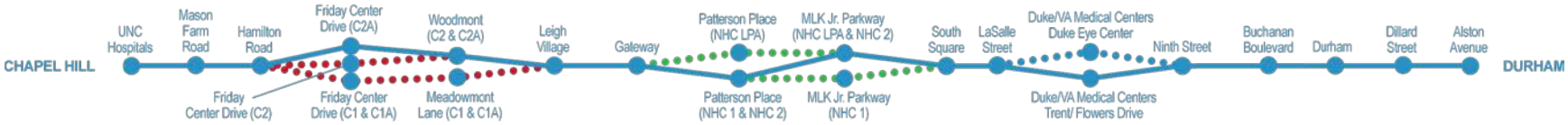
Note: The total cost for the Farrington Road site is included in each of the alternatives shown in Table 7.1-3.

[a] The environmental impact costs of Leigh Village Yard are estimated based on presumed impacts and likely mitigation necessary for historic district and buildings.

[b] Patterson Place non-revenue track is on aerial structure transition for 1000 feet.

[c] Cornwallis Road non-revenue track is on aerial structure for 700 feet with extensive earthwork and retaining walls.

[d] Includes acquisition and relocation costs for existing businesses, including one requiring a freight rail spur. Approximately 3,000 feet non-revenue track required with bridge over Alston Avenue.



7.2 Operating and Maintenance Costs

In addition to capital cost, each alternative has recurring costs for ongoing operations and maintenance (O&M) of the rail line and the light rail vehicle fleet (e.g., employee salaries, electricity, parts). In this section, these costs are quantified on an annual basis.

7.2.1 Operations and Maintenance Cost Methodology

The methodology utilized for development of operations and maintenance costs is outlined in the FTA guidance, Procedures and Technical Methods for Transit Project Planning (Draft Version 3), 2008. In accordance with FTA Guidance, detailed descriptions of the proposed D-O LRT Project's O&M spreadsheet cost models are provided separately in appendix K.28.

The D-O LRT Project O&M cost models are dependent on several factors regarding the bus and light rail service that would be provided, including the following:

Triangle Transit Bus Input Variables

- Annual revenue Triangle Transit bus-hours
- Annual revenue contractor bus-hours
- Annual revenue Triangle Transit bus-miles
- Annual revenue contractor bus-miles
- Number of bus garages
- Number of regional transit centers
- Number of peak buses

Durham Area Transit Authority (DATA) Bus Input Variables

- Annual revenue bus-hours
- Annual revenue bus-miles
- Number of bus garages
- Number of regional transit centers
- Number of peak buses

Chapel Hill Transit (CHT) Bus Input Variables

- Annual revenue bus-hours
- Annual revenue bus-miles
- Number of bus garages
- Number of peak buses

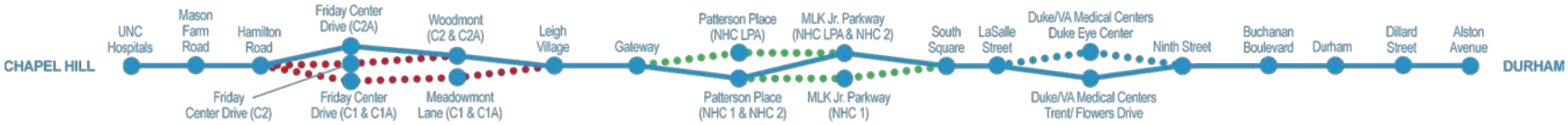
Light Rail Input Variables

- Annual revenue train-hours
- Annual revenue car-miles
- Number of yards
- Directional route miles
- Number of passenger stations
- Number of peak cars

The O&M cost model has been designed to show a difference among the alternatives, including the No Build, rather than to provide the O&M cost estimate for the Triangle region.

O&M costs depicted in this section are based on actual 2012 expenses for the Triangle Transit, DATA, and CHT bus systems. The light rail costs were based on costs for peer light rail systems that are comparable to the proposed D-O LRT Project. Bus and light rail costs were inflated to 2015 dollars using the Consumer Price Index of the U.S. Department of Labor (CPI-U), Bureau of Labor Statistics, as follows:

- Local bus costs were inflated with the consumer price index for all urban consumers (CPI-U) for the south region, using data for the two most recent annual periods (2012 to 2013, and 2013 to 2014) and then applying the average annual rate for this two-year period as a proxy for an additional 12 months of inflation so that project O&M cost estimates will represent 2015 dollars.
- Light rail costs were inflated with the CPI-U for the U.S. city average, using data for 2012 to 2013, and then from



2013 to 2014. As was done for the existing local transit providers, the average annual rate for this two-year period was used as a proxy for an additional full year of inflation so that project light rail O&M cost estimates will represent 2015 dollars.

7.2.2 NEPA Preferred Alternative: Operation and Maintenance Costs

The O&M costs for the No Build and NEPA Preferred and Project Element Alternatives are based on the project's operating plans and O&M cost model methodology referenced above. The light rail service plan assumes 11 trains in peak period operation, with three trains operating as 2-car trains and the other eight trains operating as single-car trains. All model inputs for the study alternatives reflect the incremental change in service for the D-O LRT portion of regional transit, rather than system-wide service. Annual O&M costs have been developed for the No Build and NEPA Preferred and Project Element Alternatives using the cost models fully described in appendix K.28.

Table 7.2-1 shows the comparison of the No Build with the NEPA Preferred Alternative. Transit service included in the No Build Alternative is anticipated to cost $8.1M annually in O&M costs in the study corridor. The NEPA Preferred Alternative would cost approximately $17.9M annually to operate and maintain. However, due to an anticipated reduction in bus operating expenses of approximately $1.6M annually, the net increase over the No Build Alternative would be approximately $16.3M annually.

7.2.3 Project Element Alternatives: Operation and Maintenance Costs

The annual O&M cost estimates for the Project Element Alternatives as compared to the NEPA Preferred Alternative are shown in **Table 7.2-1**. The range of incremental difference is less than one percent of the NEPA Preferred Alternative's total operating costs. Since the number of stations is the same and the location of the maintenance facility is assumed to have negligible impact on the annual operating costs, the difference can be attributed to route-miles to maintain and the cost of the revenue miles. Therefore the shorter the route the less cost of operation and maintenance.

Table 7.2-1: Summary of Annual Operating and Maintenance Costs (2015 dollars)

	No Build	NEPA Preferred Alternative [a]	Little Creek Alternatives			New Hope Creek Alternatives		Duke/VA Medical Centers Station
			C1	C1A	C2	NHC LPA	NHC 1	Duke Eye Center
Support bus network [b]	$8,100,000	$6,478,000	$0	$0	+$0	$0	$0	$0
Light Rail		$17,944,000	-$45,000	+$35,000	+$9,000	-$74,000	+$25,000	$0
Total	$8,100,000	$24,422,000	-$45,000	+$35,000	+$9,000	-$74,000	+$25,000	$0
Change from No Build	-	$16,323,000						

[a] The NEPA Preferred Alternative includes C2A, NHC 2, Duke/VA Medical Centers Station: Trent/Flowers Alternative, and Farrington Road ROMF.

[b] Support bus network includes Triangle Transit, DATA, and CHT routes affected by the proposed D-O LRT Project; see appendix K.1.