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3 Transportation

This chapter presents the existing conditions, potential consequences or impacts to transportation resources and mitigation of the proposed project as compared to the No Build, and a summary is included in **Tables 3.0-1** and **3.0-2**. The analysis is organized by resource areas (i.e., modes of transportation) and includes both potential adverse and beneficial impacts or consequences. The analysis that follows is based on the National Environmental Policy Act (NEPA) and federal and state regulations and guidelines (appendix E). The US Department of Transportation (USDOT), through the Federal Transit Administration (FTA), has adopted regulations to implement NEPA (23 C.F.R. 771). This DEIS identifies a NEPA Preferred Alternative, which is required in order to have the option to pursue a combined Final Environmental Impact Statement (FEIS)/Record of Decision (ROD) under MAP-21.

The proposed project alternatives are described in DEIS chapter 2. Potential impacts or consequences to transportation resources and mitigation measures are presented in chapter 3 in the following manner:

- No Build Alternative

Table 3.0-1: Comparative Summary of Impacts and Mitigation

Factor	Potential Impact and Benefit Summary		Potential Mitigation Measure Summary
	NEPA Preferred Alternative [a]	Project Element Alternatives [b]	
Public Transportation *Section 3.1*	23,020 average weekday light rail boardings in 2040	No substantial variation	*NEPA Preferred and Project Element Alternatives Mitigation* • The D-O LRT Project would result in increased access to transit. As a result, mitigation measures are not warranted.
Roadways *Section 3.2*	Traffic impacts at 5 intersections	NHC 1 Alternative would result in one less intersection would be adverse traffic impacted	*NEPA Preferred and Project Element Alternatives Mitigation* • Substantial modifications to the roadway are incorporated into the design including additional turn bays and restriping of intersection approaches to accommodate additional receiving lanes.
Parking *Section 3.3*	705 parking spaces removed	• Little Creek Alternatives and NHC 1 Alternative would remove more parking spaces • NHC LPA Alternative would remove fewer parking spaces • Duke Eye Center Station Alternative would remove more parking spaces	*NEPA Preferred Alternative Mitigation* • Replacement parking spaces would be provided *Project Element Alternatives Mitigation* • Replacement parking spaces would be provided for the Little Creek Alternatives and Duke Eye Center Station Alternative
Freight and Passenger Railroads *Section 3.4*	No direct impacts on the daily rail operations for freight or passenger rail service	No substantial variation	*NEPA Preferred and Project Element Alternatives Mitigation* • Mitigation would not be warranted for the implementation of the D-O LRT Project; however, coordination with NCRR and NCDOT Rail Division will continue through design and construction for use of the NCRR right-of-way.

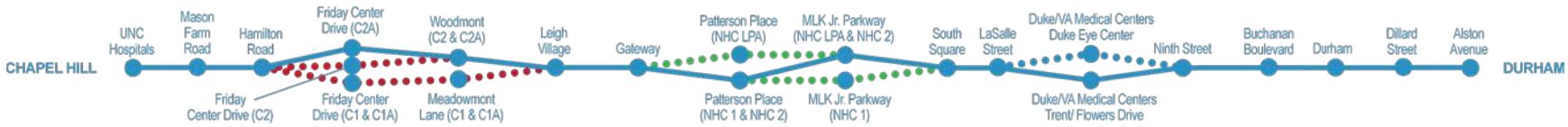


Table 3.0-1: Comparative Summary of Impacts and Mitigation

Factor	Potential Impact and Benefit Summary		Potential Mitigation Measure Summary
	NEPA Preferred Alternative [a]	Project Element Alternatives [b]	
Airports *Section 3.5*	No direct impacts to airport-owned property, portions would be located within the 5 mile protection zone	No substantial variation	*NEPA Preferred and Project Element Alternatives Mitigation* • All required mitigation measures will be coordinated with the FAA throughout the design and construction phases of the project.
Pedestrian and Bicycle Facilities *Section 3.6*	• Improvements including bicycle amenities at stations, reconstructed and enhanced sidewalks and crosswalks • Would result in 80 pedestrian and bicycle facility at-grade crossings, bicycle lanes on some roads would not be accommodated	No substantial variation	*NEPA Preferred and Project Element Alternatives Mitigation* • Impacted sidewalks, crosswalks, curb ramps, and other pedestrian infrastructure would be rebuilt or enhanced • Pedestrian crossings of light rail tracks would be designed in accordance with ADA requirements and standards • Reconstruction options including locating facilities on parallel roadways would be considered for unavoidable impacts • During Engineering, Triangle Transit will work with the City of Durham, Town of Chapel Hill and NCDOT, as well as, the Durham Bicycle and Pedestrian Advisory Commission, and Chapel Hill Transportation and Connectivity Board, and representatives from the Alston Avenue neighborhood to identify ways to improve pedestrian and bicycle connections to stations.

[a] C2A, NHC 2, Trent/Flowers Drive.

[b] Variation of alignment and station alternatives from the NEPA Preferred Alternative.

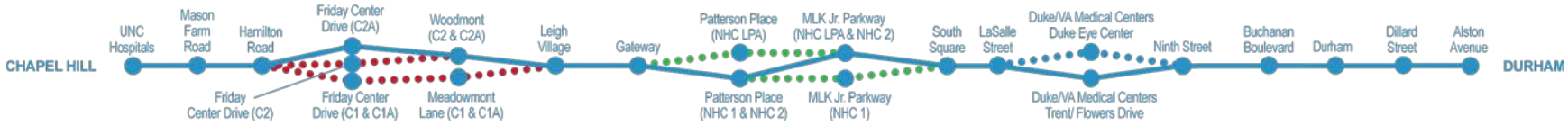


Table 3.0-2: Summary of ROMF Alternatives Impacts and Mitigation

Factor	Potential Impact and Benefit Summary		Potential Mitigation Measure Summary
	NEPA Preferred Alternative [a]	Project Element Alternatives [b]	
Public Transportation *Section 3.1*	No impacts anticipated	No substantial variation	*NEPA Preferred and Project Element Alternatives Mitigation* • No impacts are anticipated; as such no mitigation would be required.
Roadways *Section 3.2*	No impacts anticipated	No substantial variation	*NEPA Preferred and Project Element Alternatives Mitigation* • No impacts are anticipated; as such no mitigation would be required.
Parking *Section 3.3*	No impacts anticipated	No substantial variation	*NEPA Preferred and Project Element Alternatives Mitigation* • No impacts are anticipated; as such no mitigation would be required.
Freight and Passenger Railroads *Section 3.4*	No impacts anticipated	Alston Avenue ROMF would result in the elimination or relocation of one rail spur and would require 0.5 mile of light rail track within the NCRR corridor	*NEPA Preferred Alternative (Farrington Road ROMF) Mitigation* • No impacts are anticipated; as such no mitigation would be required. *Project Element Alternatives Mitigation* • Mitigation measures associated with the Alston Avenue ROMF Alternative would require the acquisition of the property of an existing rail customer and removal of the existing spur track.
Airports *Section 3.5*	No direct impacts to airport-owned property, portions would be located within the 5 mile protection zone	Cornwallis Road and Alston Avenue ROMFs would not be located within the 5 mile protection zone	*NEPA Preferred and Project Element Alternatives Mitigation* • All required mitigation measures will be coordinated with the FAA throughout the design and construction phases of the project.

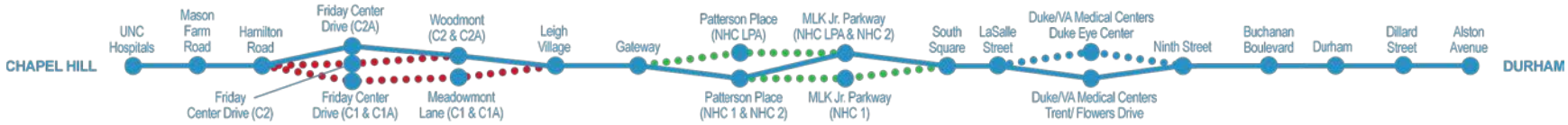
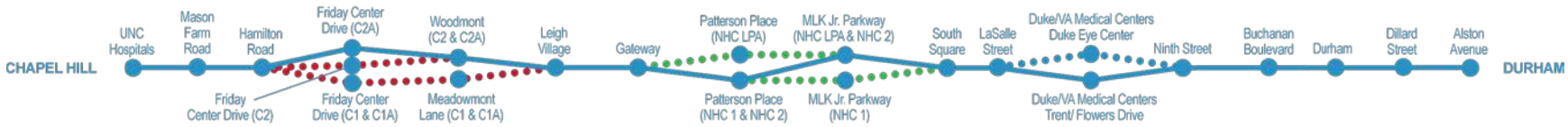


Table 3.0-2: Summary of ROMF Alternatives Impacts and Mitigation

Factor	Potential Impact and Benefit Summary		Potential Mitigation Measure Summary
	NEPA Preferred Alternative [a]	Project Element Alternatives [b]	
Pedestrian and Bicycle Facilities *Section 3.6*	No impacts anticipated	Alston Avenue ROMF: at-grade crossings of planned pedestrian and bicycle facilities	*NEPA Preferred Alternative (Farrington Road ROMF) Mitigation* • No impacts are anticipated; as such no mitigation would be required. *Project Element Alternatives Mitigation* • Impacted sidewalks, crosswalks, curb ramps, and other pedestrian infrastructure would be rebuilt or enhanced • Pedestrian crossings of light rail tracks would be designed in accordance with ADA requirements and standards • Reconstruction options including locating facilities on parallel roadways would be considered for unavoidable impacts

[a] Farrington Road ROMF.

[b] Variation of alignment and station alternatives from the NEPA Preferred Alternative.



- NEPA Preferred Alternative (Common Segments + C2A + NHC 2 + Duke/VA Medical Centers: Trent/Flowers Drive Station + Farrington Road ROMF)
- Project Element Alternatives
  - Little Creek Alternatives (C1, C1A, C2)
  - New Hope Creek Alternatives (NHC LPA, NHC 1)
  - Duke/VA Medical Centers Station – Duke Eye Center Station Alternative
  - Rail Operations and Maintenance Facility (ROMF) Alternatives (Leigh Village ROMF, Patterson Place ROMF, Cornwallis Road ROMF, Alston Avenue ROMF)

The footer of the DEIS document is a representation of the NEPA Preferred and Project Element Alternatives being considered in this DEIS. The color schema presented in the graphic is carried through the figures presented in this section of the DEIS. The blue line represents the NEPA Preferred Alternative. The Little Creek Alternatives (C1, C1A, C2) are represented with a red dashed line. The New Hope Creek Alternatives (NHC LPA, NHC 1) are represented with a green dashed line. In the areas where the alignment alternatives are presented, station locations will differ from the NEPA Preferred Alternative.

The No Build Alternative is the future condition of planned transportation facilities and services in 2040 within the corridor if the D-O LRT Project is not implemented; it provides the basis against which the NEPA Preferred and Project Element Alternatives are compared. While the NEPA Preferred Alternative assumes the implementation of the funded transportation improvement projects included in the Metropolitan Transportation Plan (MTP) for implementation by 2040 within the D-O Corridor, the No-Build Alternative assumes all the projects in the MTP except the Triangle Transit's Regional Rail program (D-O LRT Project and a commuter rail line between Durham and Raleigh). The list of No-Build Alternative projects is included in appendix M.

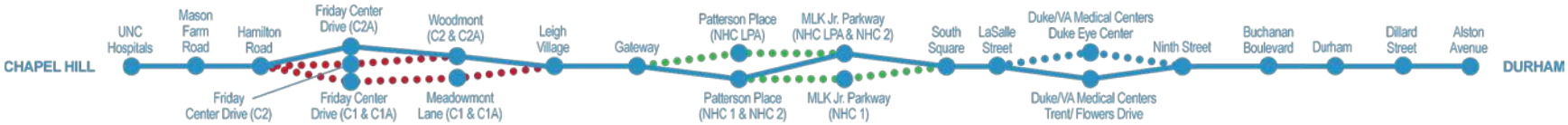
The **No Build Alternative** is the future condition of planned transportation facilities and services in 2040 within the corridor if the D-O LRT Project is not implemented; it provides the basis against which the NEPA Preferred and Project Element Alternatives are compared.

Chapter 3 includes a discussion of the affected environment, environmental consequences and mitigation of potential impacts of the D-O LRT Project for the transportation system. This chapter also includes avoidance and minimization of potential impacts to resources considered in the development of the NEPA Preferred Alternative. Chapter 3 is organized as follows:

- 3.1 Public Transportation
- 3.2 Roadways
- 3.3 Parking
- 3.4 Freight and Passenger Railroads
- 3.5 Airports
- 3.6 Pedestrian and Bicycle Facilities

Each section in this chapter is organized as follows:

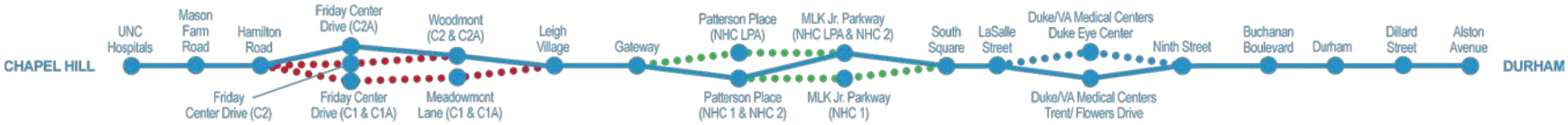
- **Methodology**: an overview of the methods used to evaluate each resource, description of the regulatory considerations, and study area, which vary by resource type
- **Affected Environment**: a summary of the existing conditions in the study area
- **Environmental Consequences**: a summary of the direct impact findings for each of the resource areas as a result of implementation of the proposed D-O LRT Project
- **Mitigation Measures**: the measures that would be implemented to avoid, minimize, or mitigate impacts, as appropriate



Technical Documentation:

Technical reports were used to document more detailed analyses and data for individual environmental topics that were evaluated. The following D-O LRT technical reports for the Transportation chapter are included in appendix K.

- Transit Operating Plan (K.1)
- Travel Demand Methodology and Results Report (K.2)
- Traffic Analysis Methodology (K.3)
- UNC Hospitals Traffic Simulation Report (K.4)
- Fordham Boulevard Traffic Simulation Report (K.5)
- NC 54 Traffic Simulation Report (K.6)
- Leigh Village Traffic Simulation Report (K.7)
- Gateway and Patterson Place Traffic Simulation Report (K.8)
- University Drive Traffic Simulation Report (K.9)
- Erwin Road Traffic Simulation Report (K.10)
- Downtown Durham Traffic Simulation Report (K.11)
- Pedestrian and Bicycle Facilities Technical Report (K.12)



3.1 Public Transportation

This section presents the methodology used to conduct an analysis of the impacts the NEPA Preferred Alternative would have on public transportation (transit) services within the D-O Corridor. Following the methodology is a brief description of the affected environment (existing transit service in the D-O Corridor), followed by a discussion of the environmental consequences of implementing the NEPA Preferred and Project Element Alternatives compared to the No Build Alternative.

3.1.1 Methodology

Ridership forecasts were developed for the NEPA Preferred and Project Element Alternatives and No Build Alternative for forecast year 2040 using the Triangle Regional Model (TRM), Version 5 based on the operating plans included in appendix K.1, consistent with appendix K.2. The TRM was developed by the Triangle Regional Model Service Bureau (TRMSB), in cooperation with regional stakeholders Durham-Chapel Hill-Carrboro Metropolitan Planning Organization (DCHC MPO), Capital Area Metropolitan Planning Organization (CAMPO), NCDOT, and Triangle Transit. The TRMSB is housed at the North Carolina State University Institute for Transportation Research and Education (ITRE). The model is designed to forecast travel throughout the Triangle region's transit and roadway system. As such, it contains a network of existing and planned future transit services consistent with the *2040 Metropolitan Transportation Plan* (2040 MTP).

3.1.2 Affected Environment

The following sections provide information on existing transit conditions, including the agencies that provide transit service and the types of service they provide.

3.1.2.1 Transit Providers

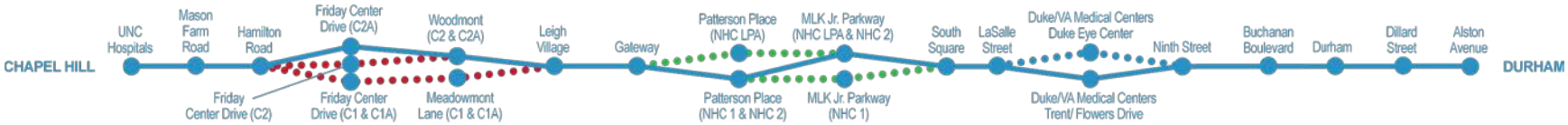
The following four transit service providers presently serve the D-O Corridor:

- Triangle Transit
- Durham Area Transportation Authority (DATA)
- Chapel Hill Transit (CHT)
- Duke Transit

The following are descriptions of each operator and the services they provide within the D-O Corridor as of fall 2014.

Triangle Transit provides regional and express bus service in the Raleigh-Durham-Chapel Hill area. As of fall 2014, Triangle Transit operates 14 regional routes, 8 express routes, and 4 shuttle routes on weekdays. Six of the regional routes also operate on Saturdays and five routes operate on Sundays. Some regional and express routes are operated by other local operators (e.g., Raleigh's Capital Area Transit [CAT] and DATA). Several of the routes connect at Triangle Transit's Regional Transit Center, located off of Slater Road, near I-40 and I-540. Regular, one-way fares are $2.25 for regional Triangle Transit routes and $3.00 for express routes. Regional passes (day pass and multi-day passes) are also available and can be used on other transit systems in the region (i.e., DATA, CAT, Cary Transit [C-Tran]).

DATA provides local route service within the City of Durham. In fall 2014, DATA operated 16 weekday, 16 Saturday, and 15 Sunday routes. Most routes operate at 30-minute headways during the day Monday through Saturday and 60-minute headways in the evening periods, with service until about 12:30 a.m. Sunday service is also provided once every 60 minutes. The regular cash fare for a one-way ride is $1.00. One-day and multiple day regional passes are also available and can be used on other public transit service providers in the region. The Bull City Connector is a special branded route that operates primarily along Main Street and Erwin Road (parallel to the D-O Corridor). This route does not charge fares to passengers (the City of Durham and Duke University prepay fares for Bull City Connector passengers).



Durham Bull City Connector

DATA's routes are structured in a radial manner, even though some routes serve crosstown functions as well. Except for Route 14, all routes operate to and from the Durham Transit Station.

CHT provides bus service generally within the Town of Chapel Hill, the Town of Carrboro, and the UNC campus as of fall 2014. CHT operates 24 weekday routes, 8 Saturday routes, and 2 Sunday routes. All routes provide service to the UNC campus/UNC Hospital area. Weekday route headways vary from 5 to 60 minutes. CHT does not charge passengers fares on its buses (the Town of Chapel Hill, Town of Carrboro, and UNC prepay fares for CHT passengers).

As of fall 2014, CHT provides service to five park-and-ride lots located in the Chapel Hill/Pittsboro/Carrboro area. An additional five lots are available for use by CHT riders with a UNC park-and-ride permit, including the Friday Center park-and-ride lot. CHT charges $2.00 per day to use their park-and-ride lots, with discounts for annual passes, and UNC charges its employees for park-and-ride permits.

Chapel Hill Transit

Duke Transit, operated by Duke Parking and Transportation Services, provides bus service within the Duke University campus and surrounding area. Duke operates more than 30 buses during the school year. Students, staff, faculty, and visitors can ride campus buses at no charge. There are five campus routes (C1, CSW, C2, C1X, and C3), and three "to and from" campus routes (LaSalle Loop, H-5, and PR-1). Hospital shuttle routes connect nearby surface and garage parking to the hospital buildings (H-2 and H-6). Headways are as low as 5 minutes on some routes.

3.1.2.2 Corridor Bus Service

Currently, local and regional transit providers offer multiple transit options within the D-O Corridor, including express, limited stop, and local bus service, in an attempt to accommodate the growing demand for transit. In fall 2014, 17 fixed routes operated within the D-O Corridor (7 routes operated by Triangle Transit, 5 routes operated by DATA, and 5 routes operated by CHT), providing service in various portions of the corridor. These 17 routes provide combined peak hour headways ranging from 1.7 minutes (approaching UNC and UNC Hospitals) to 10 minutes (near Patterson Place). In September 2014, ridership on these routes was approximately 17,850 riders per average weekday, as shown in **Table 3.1-1**.

The majority of the transit service in Durham and Orange counties is focused near the major employment centers of UNC Hospitals and Durham VA Medical Center/Duke University Medical Center. The number of buses serving each of these areas has surpassed or is approaching the feasible limit of the number of buses that can be accommodated on the roadways (**Figure 3.1-1**). At UNC Hospitals in particular, peak hour bus congestion reaches 84 buses per hour for all routes, not just those serving the D-O Corridor, including Triangle Transit and CHT routes.

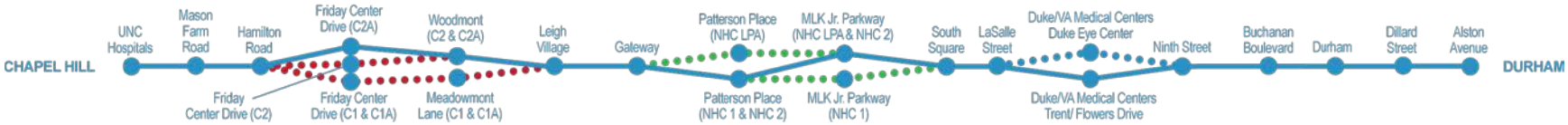


Table 3.1-1: Corridor Bus Routes

Provider	Route	Peak Frequency	Off-Peak Frequency	Span of Service (Weekdays)	Ridership
Triangle Transit	400	30	60	6:15 a.m. – 11:00 p.m.	940
	405	30	No off-peak service	5:50 a.m. – 9:40 a.m., 3:15 p.m. – 7:00 p.m.	560
	700	30	60	6:00 a.m. – 11:00 p.m.	700
	800	30	60	6:00 a.m. – 11:15 p.m.	1,040
	805	30	No off-peak service	6:00 a.m. – 9:00 a.m., 3:00 p.m. – 7:30 p.m.	570
	CRX	25	No off-peak service	6:00 a.m. – 10:00 a.m., 4:00 p.m. – 7:20 p.m.	540
	DRX	25	No off-peak service	6:00 a.m. – 9:30 a.m., 3:30 p.m. – 7:20 p.m.	550
DATA	6/6B	30	30	5:30 a.m. – 12:30 a.m.	1,550
	10/10A/10B	15	35	5:15 a.m. – 12:30 a.m.	2,350
	11	30	30	5:30 a.m. – 12:30 a.m.	880
	RSX	30	30	7:30 a.m. – 11:30 p.m.	310
	BCC	23	23	6:20 a.m. – 10:00 p.m. Friday service until 12:00 a.m.	1,720
CHT	FCX	5	Limited service provided	5:15 a.m. – 10:15 a.m., 3:15 p.m. – 8:25 p.m.	2,260
	HU	18	40	8:20 a.m. – 10:45 p.m.	430
	S	11	30	6:20 a.m. – 7:40 p.m.	1,000
	G	30	60	6:20 a.m. – 7:50 p.m.	1,820
	V	30	60	6:30 a.m. – 8:00 p.m.	630
				Corridor total	17,850

Source: Posted schedules from CHT, DATA, and Triangle Transit from fall 2013. Ridership from data provided by Triangle Transit and CHT for September 2014.

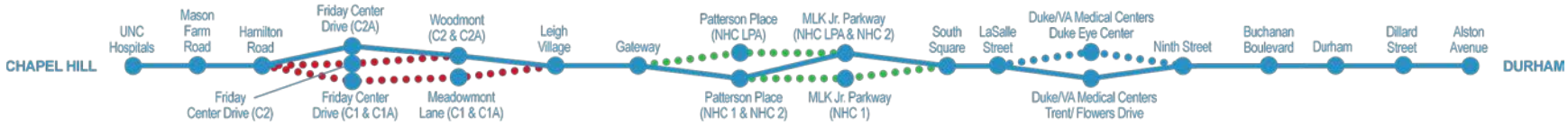
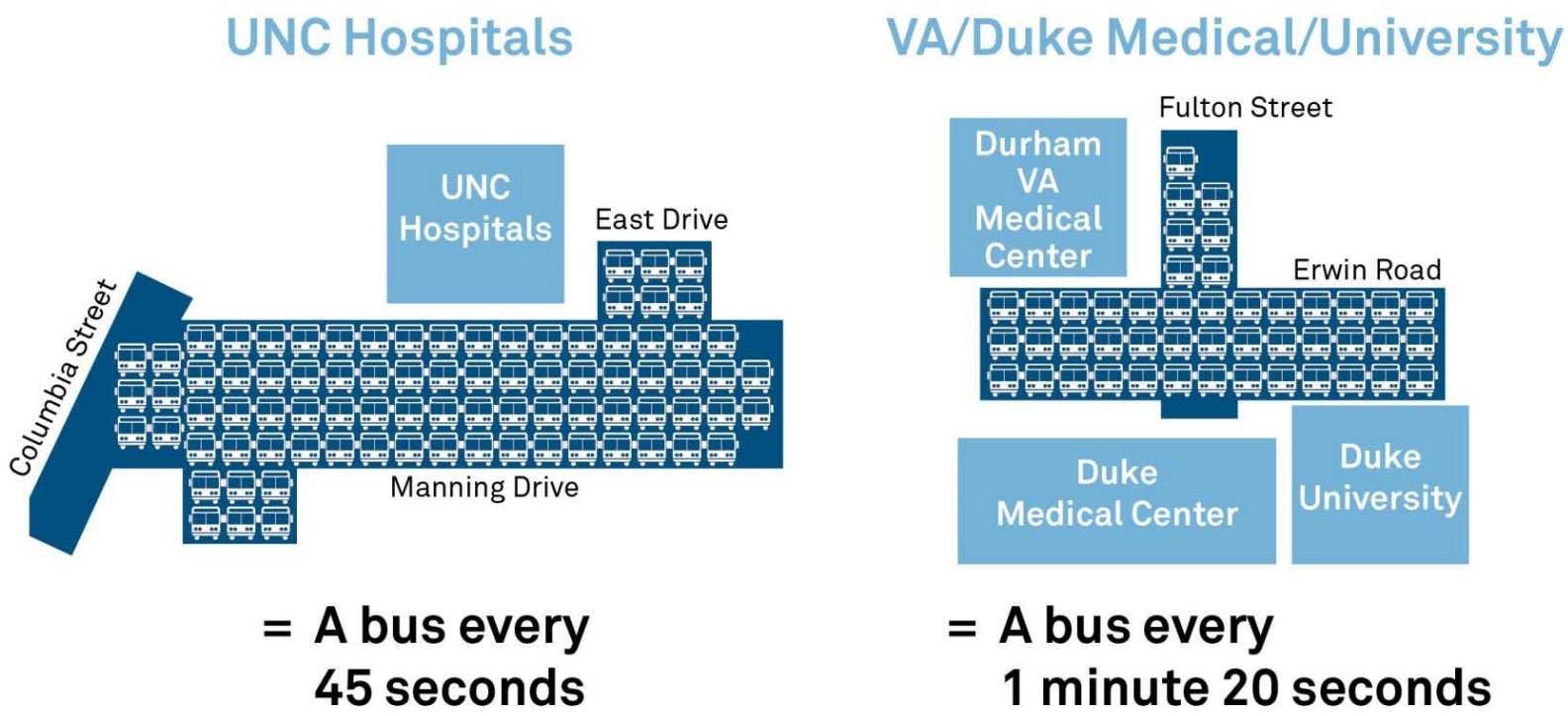
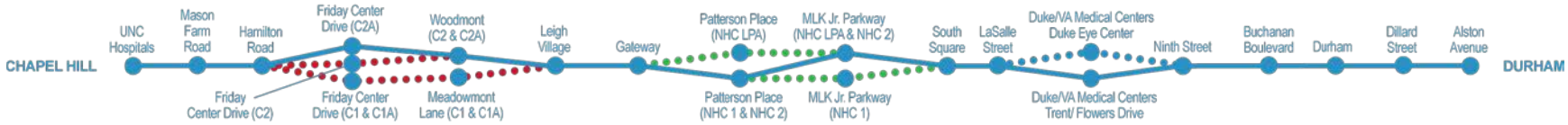


Figure 3.1-1: Total Buses at Key Areas of Congestion during Peak Hour



Each bus shown in the graphic represents one bus during the peak hour.
Source: Posted schedules from CHT, DATA, and Triangle Transit from fall 2013.



3.1.2.3 Pre-paid Service

Four colleges and universities (UNC, Duke University, North Carolina Central University [NCCU], and Durham Technical and Community College) are within the D-O Corridor. In the Triangle region as a whole, university-related transit trips comprised nearly 60 percent of total transit trips in 2008. The density of trips associated with students and employees of these institutions, combined with the policies that limit parking on these campuses, represent an opportunity to serve a growing travel market with a major transit investment.

In addition, pre-paid transit fares are offered by universities, colleges, and major employers in the Triangle. Pre-paid transit fares occur in one of two ways.

Pre-paid Service

Transit users ride “fare-free” on all CHT buses. Beginning in January 2002 and continuing today, pursuant to a joint agreement, UNC pre-pays approximately 60 percent of the fares for all ridership, the Town of Chapel Hill pre-pays approximately 30 percent of the fares, and the Town of Carrboro pre-pays approximately 10 percent of the fares on the system.

Duke University similarly provides fare-free service to students, staff, faculty, and visitors on Duke Transit.

In 2010 DATA implemented the Bull City Connector as a fare-free service in an attempt to boost economic development in downtown Durham. On any CHT service, Duke Transit service, and on the Bull City Connector, passengers simply walk onto vehicles and ride. No swiping or displaying of any fare media is required for any passenger.

GoPass

Employers and institutions purchase prepaid “GoPass” passes for their students and employees that allow them to ride any transit service provided by Triangle Transit (Triangle region), DATA (Durham), CAT (Raleigh), and C-Tran (Cary) without paying a fare, although they do have to swipe the GoPass.

Duke GoPass

3.1.3 Environmental Consequences

The following sections describe potential environmental consequences of the project alternatives when compared with the No Build Alternative.

The No Build Alternative, as described in DEIS chapter 2 and appendix K.1, was modeled using the TRM to create a point of comparison for the NEPA Preferred and Project Element Alternatives.

3.1.3.1 NEPA Preferred Alternative

Proposed Service Plan

Operating hours for the new light rail service would be generally from 5:30 a.m. to 12:00 midnight on weekdays and Saturdays, and 6:30 a.m. to 12:00 midnight on Sundays. Light rail service frequencies by time period are noted in **Table 3.1-2**.

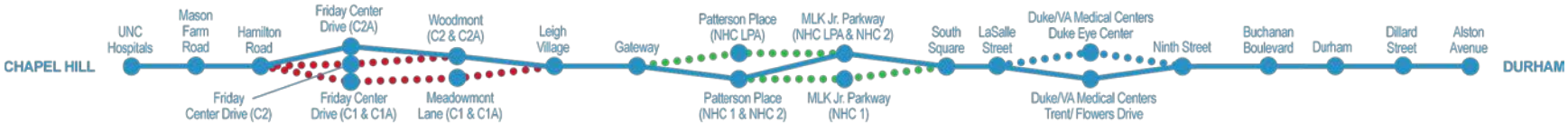


Table 3.1-2: Proposed Light Rail Service Frequencies

Day of Week	5:30-9:00 a.m.	9:00 a.m.-3:30 p.m.	3:30-7:00 p.m.	7:00 p.m.-Midnight
Weekdays	10 minutes	20 minutes	10 minutes	20 minutes
Saturdays	20 minutes	20 minutes	20 minutes	30 minutes
Sundays	30 minutes [a]	20 minutes	20 minutes	30 minutes

[a] Sunday service would begin at 6:30 a.m.

The NEPA Preferred Alternative would consist of light rail service that would operate from UNC Hospitals in Chapel Hill to Alston Avenue in Durham, with 17 stations proposed along the 17 mile alignment. The NEPA Preferred Alternative is proposed to operate every 10 minutes during weekday peak periods and every 20 minutes during off-peak periods. The D-O Corridor connects multiple employment centers, which creates multiple points along corridor where there will be a turn-over of ridership. This allows for a more efficient use of light rail vehicles as the as the same seat can be used by two or three people in a single rail vehicle trip from end to end (UNC Hospitals Station to Alston Avenue Station). Appendix K.1 contains detailed descriptions of the proposed alignment by segment, including station locations, estimated light rail travel times, the proposed service plan, and estimated operating requirements.

Travel Times

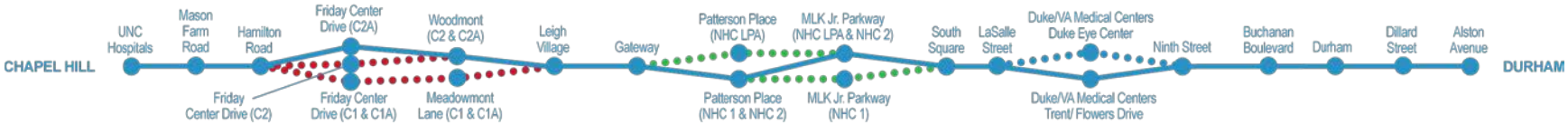
Travel times were calculated for both directions of travel. The travel time estimates reflect the *Basis for Engineering Design* (appendix L), and take into consideration the amount of time that it would take for the train to go around corners, travel up over bridges, come down hills, and make turns, as well as the time it would take the train to operate by itself with no other vehicles or how it would operate in mixed-traffic with other vehicles. The travel time estimates also assume that the train would stop at each of the 17 stations; the train would stop for an average of 20 seconds at each station to allow for passengers to board or exit the train. After leaving the station, it is assumed the train would accelerate at a rate of three miles per hour per second (mphps). It is also assumed the train would slow down at the same rate as it approaches the station. All signalized at-grade intersections would provide signal preemption to light rail vehicles. The light rail vehicles are expected to travel through preempted intersections with minimal or no delay. Automobile traffic at movements conflicting with the light rail would be stopped. Automobile traffic that does not conflict with the light rail could proceed, assuming there are no other vehicle conflicts. Due to variability in the arrival of light rail vehicles at an intersection and the unpredictability of actuated signals, it would also be possible that a preemption event would not cause additional delay to vehicles if the light rail vehicle crosses when the adjacent parallel traffic has a green light.

Station-to-station travel times were developed for each Project Element Alternative and are presented in appendix K.1. The NEPA Preferred Alternative would have a total travel time of approximately 42 to 44 minutes each way.

Ridership Forecasts

This section discusses the forecast ridership, or number of trips people are anticipated to take using the light rail in 2040 on the average weekday. The refined and validated TRM model was used to develop ridership forecasts for the proposed D-O LRT Project as explained in DEIS section 3.1.1.

- Travel times between each station were estimated and included in the model for all the alternatives.



- To account for the GoPass (Triangle Transit's pre-paid transit pass program) and other regional pre-paid fare programs, a weighted average fare input was developed for each service provider using available data on average fare paid. For the proposed light rail services, the estimated fare was calculated based on the expected market penetration of pre-paid fares.

Table 3.1-3 presents the 2040 ridership forecasts for the NEPA Preferred Alternative compared to the No Build Alternative, as well as the Project Element Alternatives. The NEPA Preferred Alternative is expected to carry just over 23,000 trips on the project per average weekday in 2040. Ridership forecasts also predict that bus service would remain an important component of the transit service's approximately 17,000 boardings per average weekday in 2040, a reduction of approximately 3,000 boardings from the No Build Alternative.

In addition to total ridership, one can also draw conclusions regarding the types of trips that would use the proposed D-O LRT Project, how passengers would arrive at a station and which stations would be primary destinations.

- Just under 40 percent of the trips taken on the NEPA Preferred Alternative would be work trips, while another 15 percent are anticipated to be college-related trips, as shown on **Figure 3.1-2**. It is not anticipated that the types of trips taken on the project would vary depending on the alternative.
- On a daily basis, walk and bicycle access was forecasted to account for more than half of the total ridership, with the remaining split between drive access and bus transfers (**Figure 3.1-3**).
- Major production stations (where people would board the light rail in the morning and return in the afternoon/evening) would include Alston, Leigh Village, Friday Center, and Durham Stations, with the largest number of boardings in the morning peak period (**Table 3.1-4**).
- Major attraction stations (where people get off the light rail in the morning and would board in the afternoon/evening) include the UNC Hospitals, Duke/VA Medical Centers, and Durham Stations, with the largest numbers of deboardings occurring in the morning peak period.

3.1.3.2 Project Element Alternatives

The NEPA Preferred Alternative would have similar end-to-end travel times as the other alternatives for crossing Little Creek and New Hope Creek, as well as the Duke/VA Medical Centers Station. The largest difference would be the C1A Alternative, which would be approximately one minute longer.

Similarly the alternatives for crossing Little Creek and New Hope Creek and the Duke/VA Medical Centers Station would not have a substantial difference in ridership. All alternatives are forecasted to be within 1,200 average weekday boardings of each other in 2040.

It is not anticipated that the selection of the ROMF alternative would have an impact on the transit ridership or the level of transit service provided.

3.1.4 Mitigation Measures

The NEPA Preferred Alternative would result in increased access to transit. As a result, mitigation measures are not needed for Public Transportation resources.

Prior to revenue service Triangle Transit will work with service planning staff from CHT, DATA, and Duke Transit to develop and implement a plan to integrate bus and rail service within the D-O Corridor. As part of the process the transit providers will engage the public and complete a Transit Service and Fare Equity Analysis.

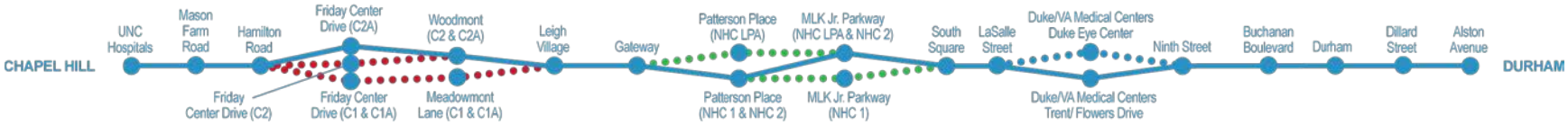


Table 3.1-3: 2040 Daily Light Rail Ridership Forecasts

	No Build Alternative	NEPA Preferred Alternative [a]	Little Creek Alternatives			New Hope Creek Alternatives		Duke/VA Medical Centers
			C1	C1A	C2	NHC LPA	NHC 1	Duke Eye Center
Forecasted average weekday light rail boardings in 2040	-	23,020	-560	-1,020	-300	+180	+120	-160
Forecasted average weekday Corridor bus boardings in 2040[b]	20,240	16,990	-40	+480	-830	+60	0	+80
Forecasted average weekday Corridor total boardings in 2040	20,240	40,010	-600	-540	-1,130	+240	+120	-80

Source: Travel Demand Methodology and Results Report (appendix K.2).

Note: Rounding was used and may lead to discrepancy in totals.

[a] The NEPA Preferred Alternative includes C2A, NHC 2, Trent/Flowers Drive Station, and the Farrington Road ROMF.

[b] Corridor bus routes are identified in Table 3.1-1.

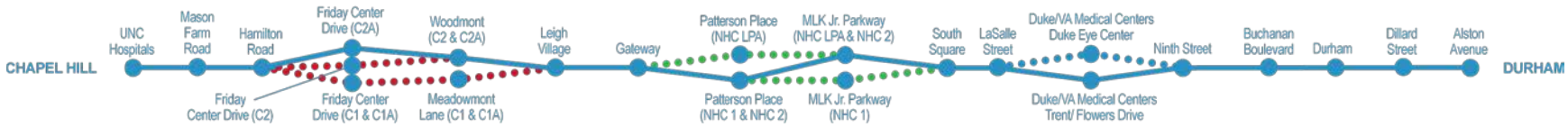


Table 3.1-4: 2040 Daily Ridership Forecasts by Stations for the NEPA Preferred Alternative

Station	UNC-Alston Avenue Boardings	UNC-Alston Avenue Deboardings	Alston Avenue-UNC Boardings	Alston Avenue-UNC Deboardings
UNC Hospitals	2,750	0	0	2,750
Mason Farm Road	1,050	50	50	1,050
Hamilton Road	200	80	80	200
Friday Center Drive	680	980	980	680
Woodmont	300	400	400	300
Leigh Village	490	1,270	1,270	490
Gateway	550	620	620	550
Patterson Place	590	680	680	590
Martin Luther King Jr. Parkway	750	840	840	750
South Square	890	470	470	890
LaSalle Street	630	770	770	630
Duke Trent/Flowers Drive	970	600	600	970
Ninth Street	340	210	210	340
Buchanan Boulevard	250	250	250	250
Durham	740	1,620	1,620	740
Dillard Street	330	1,260	1,260	330
Alston Avenue	0	1,410	1,410	0
TOTAL	11,510	11,510	11,510	11,510

Source: Travel Demand Methodology and Results Report (appendix K.2).

Note: Rounding was used and may lead to discrepancy in totals.

Note: Boarding and deboarding by station for all 24 alternatives are available in appendix K.2.

Note: Average weekday ridership estimates.

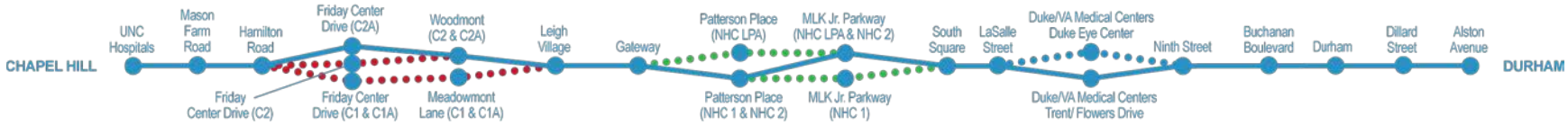
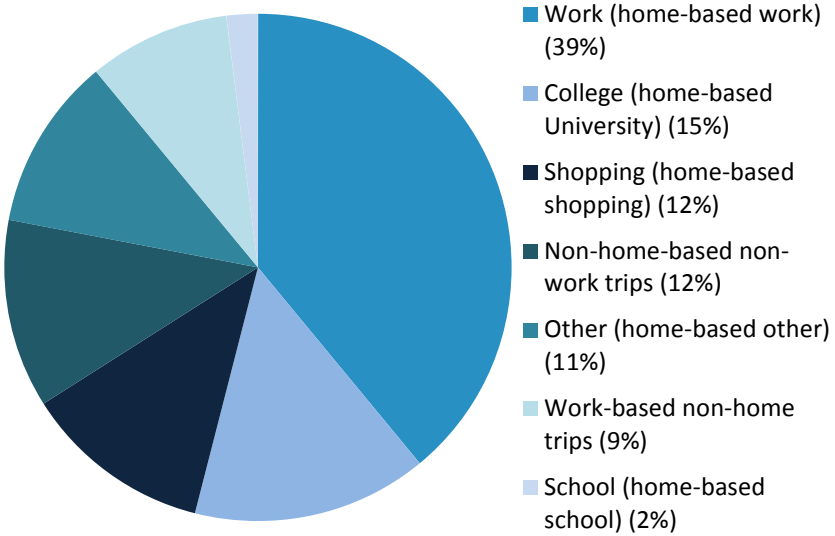
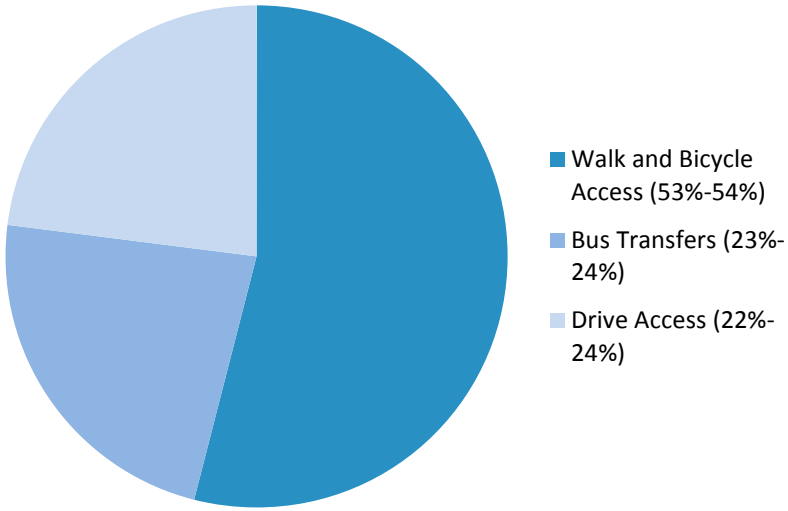


Figure 3.1-2: 2040 Daily Ridership Forecasts by Trip Purposes

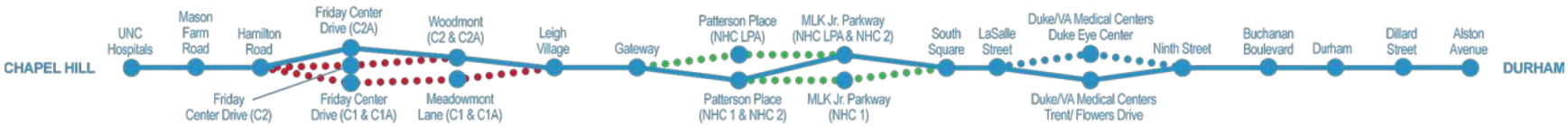


Source: Travel Demand Methodology and Results Report (appendix K.2).

Figure 3.1-3: 2040 Daily Ridership Forecasts by Modes of Access



Source: Travel Demand Methodology and Results Report (appendix K.2).



3.2 Roadways

This section describes expected impacts of the NEPA Preferred and Project Element Alternatives in comparison to the No Build Alternative on the existing roadway network and the measures recommended to mitigate such impacts. It also describes the future planned transportation projects identified in the 2040 MTP that would be implemented by 2040, as well as projects included in the 2006 UNC Campus Master Plan and 2013 Duke University Campus Master Plan, which form the basis of the No-Build Alternative and are included in the NEPA Preferred and Project Element Alternatives. Existing and projected 2040 traffic conditions for roadways and intersections are described. Traffic operations analyses that were developed for the NEPA Preferred Alternative as well as the other alternatives under study in this DEIS are summarized in this section along with potential effects as compared to the No Build Alternative and proposed mitigation. Information included in this section is based in part on the results and findings provided in the traffic simulation reports (appendices K.4 through K.11).

3.2.1 Methodology

For the purposes of determining the project's impacts to the 2040 No Build condition of roadways in Durham and Orange counties, the standards described in the NCDOT's *Policy on Street and Driveway Access to North Carolina Highways* (2003) and *Durham Comprehensive Plan* (amended 2014) were applied in providing the basis for the evaluation and establishing thresholds for acceptable traffic operations for the proposed D-O LRT Project. NCDOT and the City of Durham each have different criteria for determining traffic impacts. These criteria set thresholds for measures to define when a traffic impact is considered substantial. The Town of Chapel Hill has not established such guidelines; therefore, the NCDOT criteria were applied to locations under the jurisdiction of the Town of Chapel Hill.

Interrelated measures known as "Level of Service" (LOS) and "delay" are used to qualify and quantify traffic conditions and consequently determine traffic impacts as defined later in this section. The simplified criteria for determining traffic impacts specified by the two jurisdictions are shown in **Table 3.2-1**.

In order to facilitate an efficient and logical study of the roadways, the approximately 17-mile corridor was divided into four traffic study segments as defined below:

- **UNC/NC 54**: This segment starts at Mason Farm Road and East Drive (near UNC Hospitals) at the western end of the light rail alignment, turns north along Fordham Boulevard from Mason Farm Road to Old Mason Farm Road, then runs east/west to generally follow NC 54 from Hamilton Road to Downing Creek Parkway and includes the Little Creek crossing alternatives referred to as C1, C1A, C2, and C2A (included in the NEPA Preferred Alternative). The segment ends at Farrington Road and Ephesus Church Road (see **Figure 3.2-1** and **Figure 3.2-2**).
- **University Drive/US 15-501**: This segment extends from the Farrington Road overpass of I-40 in the southwest, and runs north until reaching US 15-501 where the alignment turns east to follow McFarland Drive until Southwest Durham Drive. The light rail study area continues east crossing New Hope Creek to then meet University Drive between Ivy Creek Boulevard and Shannon Road where the alignment will move north and follow US 15-501 before turning east near Cameron Boulevard. This segment includes the NHC crossing alternatives referred to as NHC LPA, NHC 1, and NHC 2 (included in the NEPA Preferred Alternative) (see **Figure 3.2-3** and **Figure 3.2-4**).

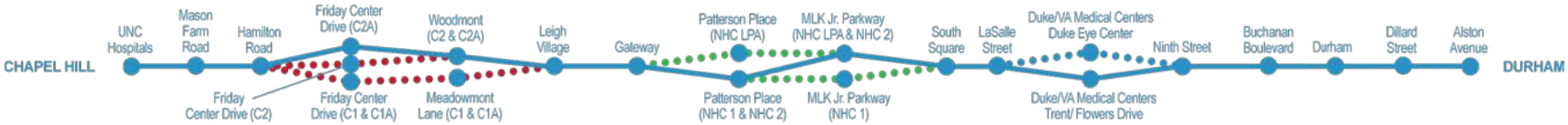


Table 3.2-1: Traffic Impact Criteria

Jurisdiction and Criteria	Standard Maintained
City of Durham – Downtown Tier	LOS E
City of Durham – Compact Neighborhood Tier	LOS E
City of Durham – Suburban Tier	LOS D
NCDOT [a]	Total average delay at the intersection increases by less than 25% while the LOS remains the same as No Build

Source: AECOM 2015.

[a] For the purposes of this analysis, for intersections subject to NCDOT criteria, traffic impacts were considered for mitigation if the Build Alternative delay was at or above a middle LOS D or 45.0 seconds or greater. Degradation in LOS resulting in LOS of D or better was not considered to be a substantial impact.

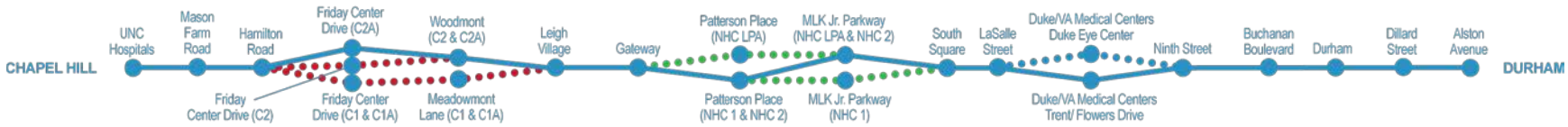
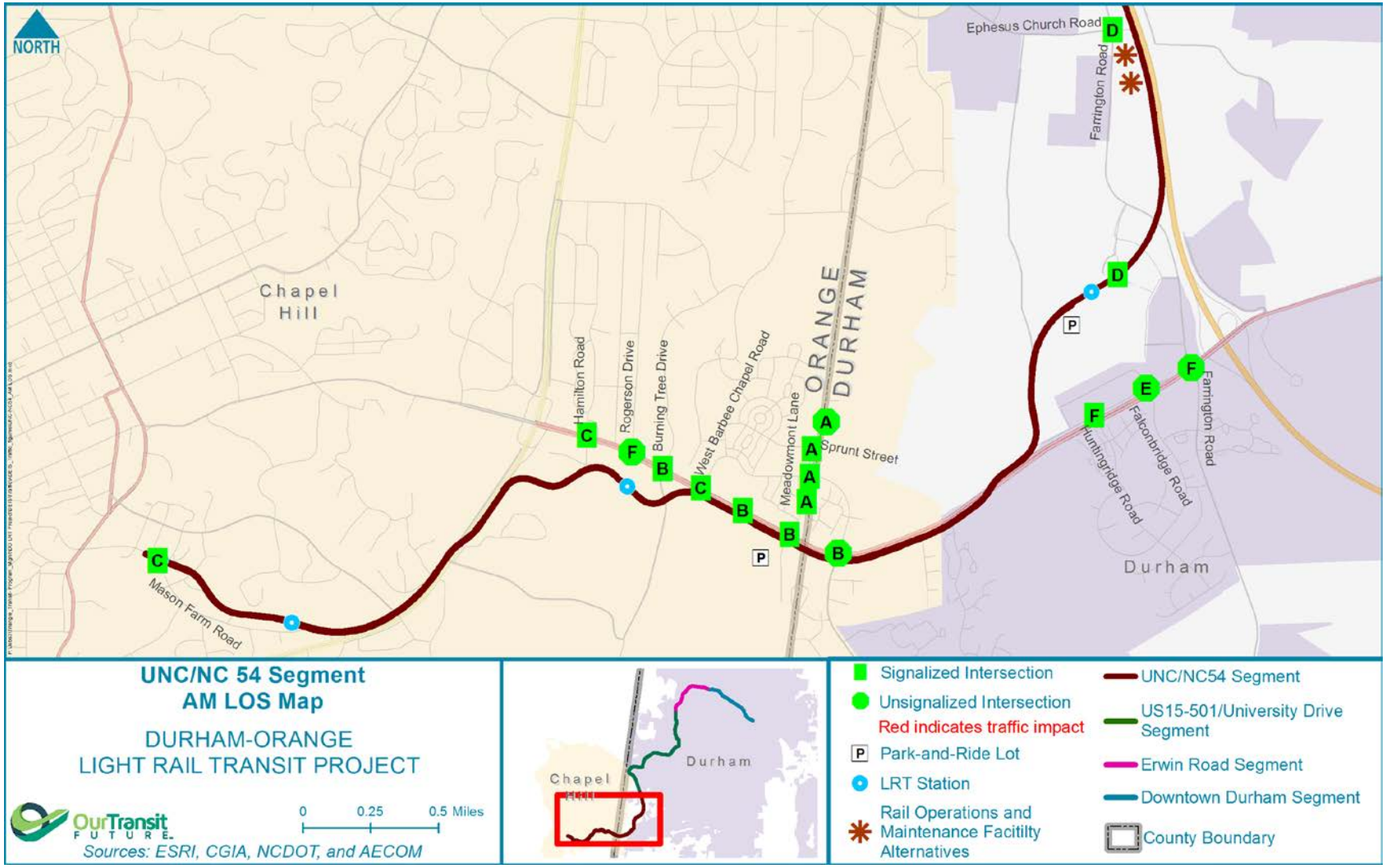


Figure 3.2-1: UNC/NC 54 Segment – Overall LOS – NEPA Preferred Alternative a.m. Peak Hour



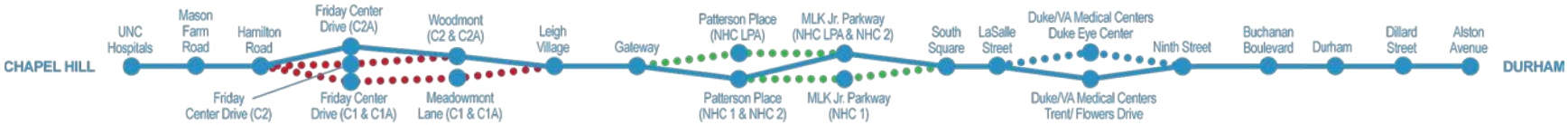
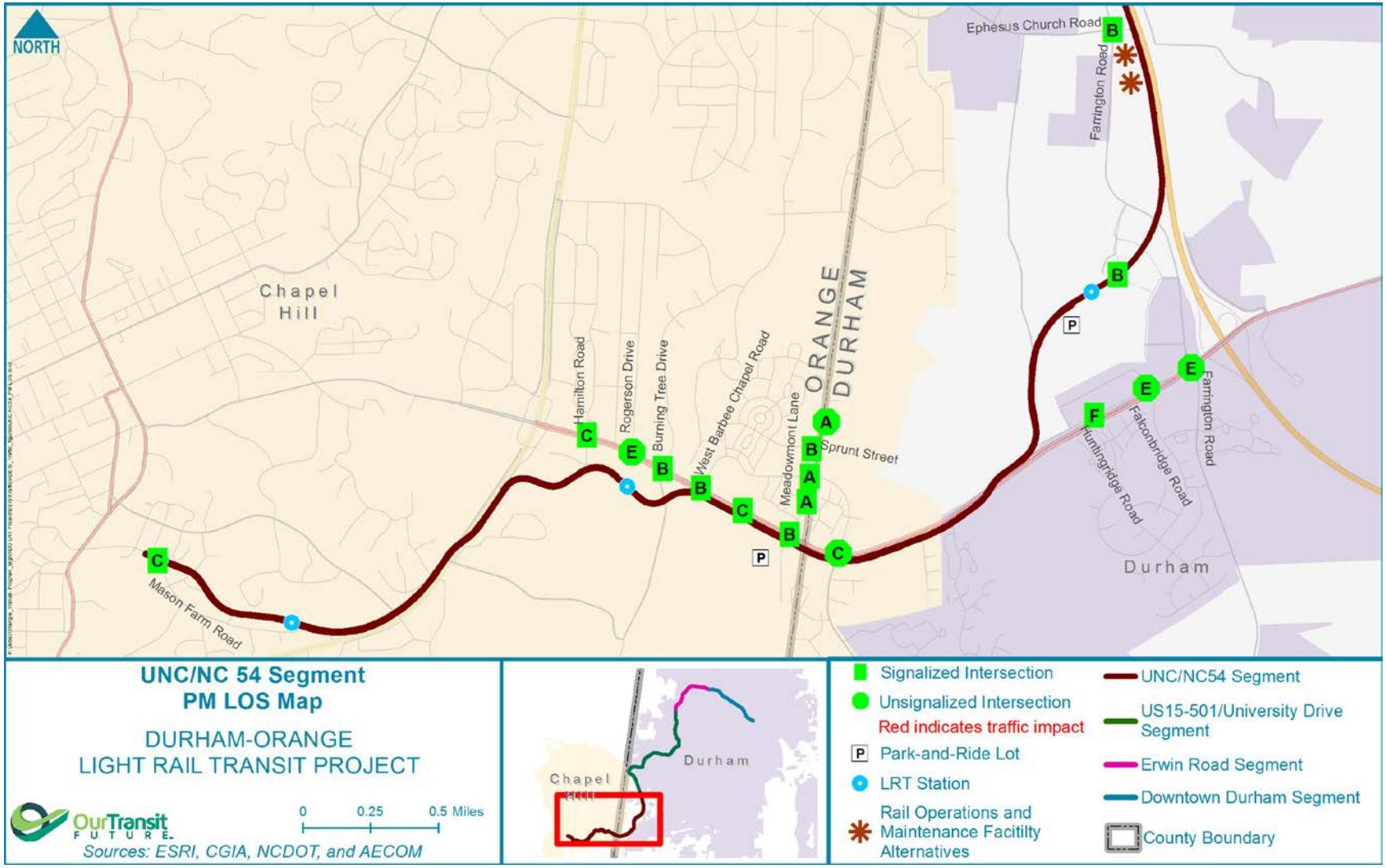


Figure 3.2-2: UNC/NC 54 Segment – Overall LOS – NEPA Preferred Alternative p.m. Peak Hour



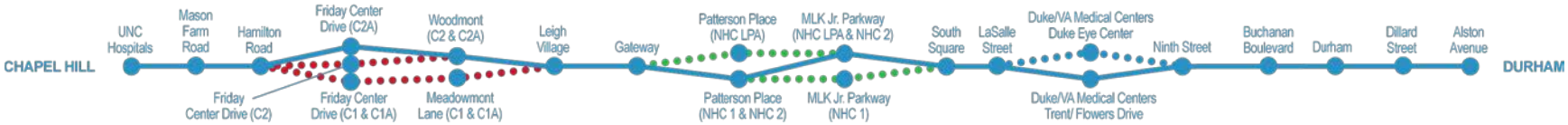
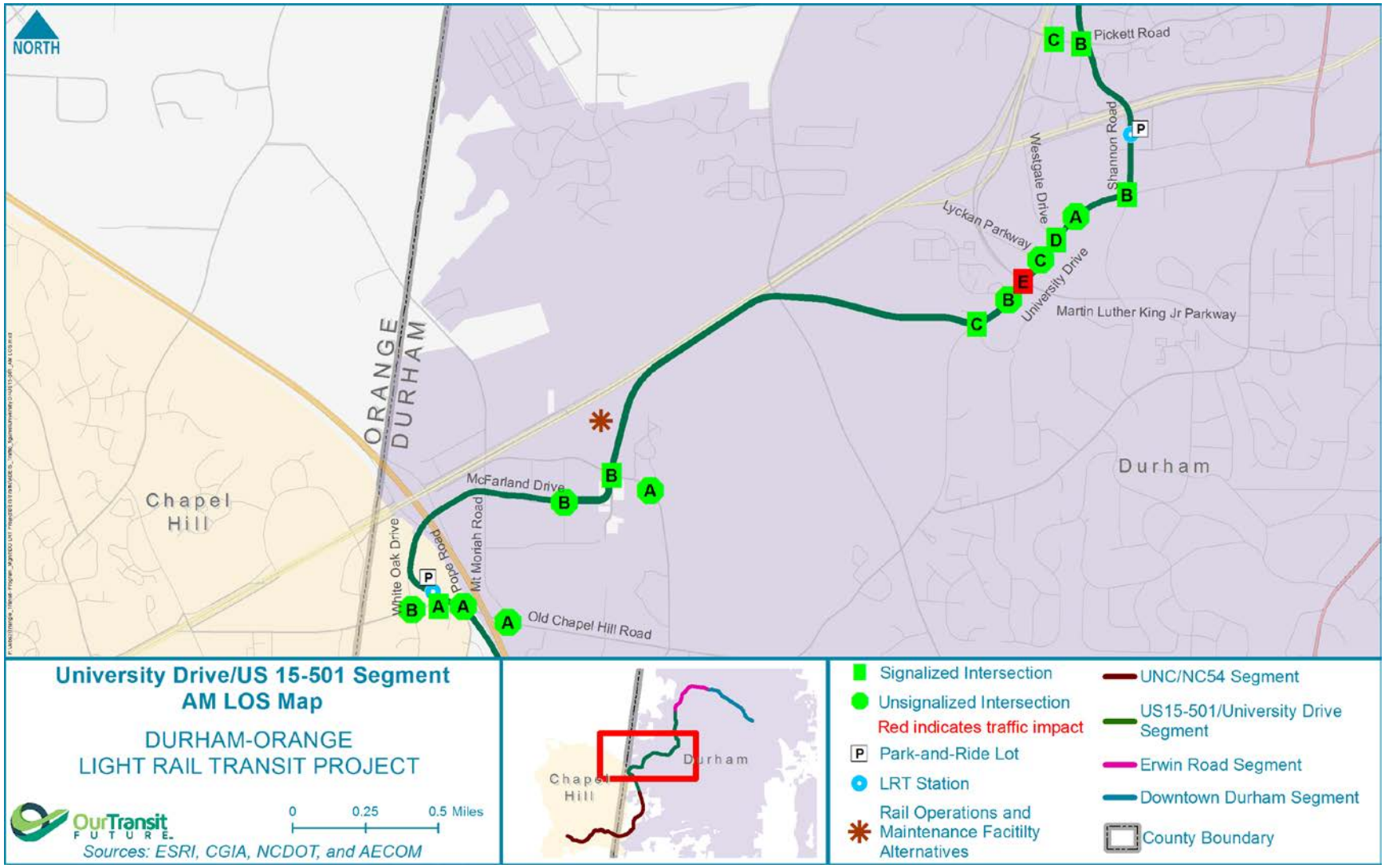


Figure 3.2-3: University Drive/US 15-501 Segment - Overall LOS– NEPA Preferred Alternative a.m. Peak Hour



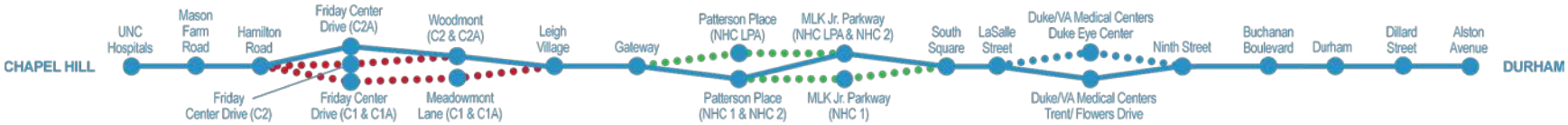
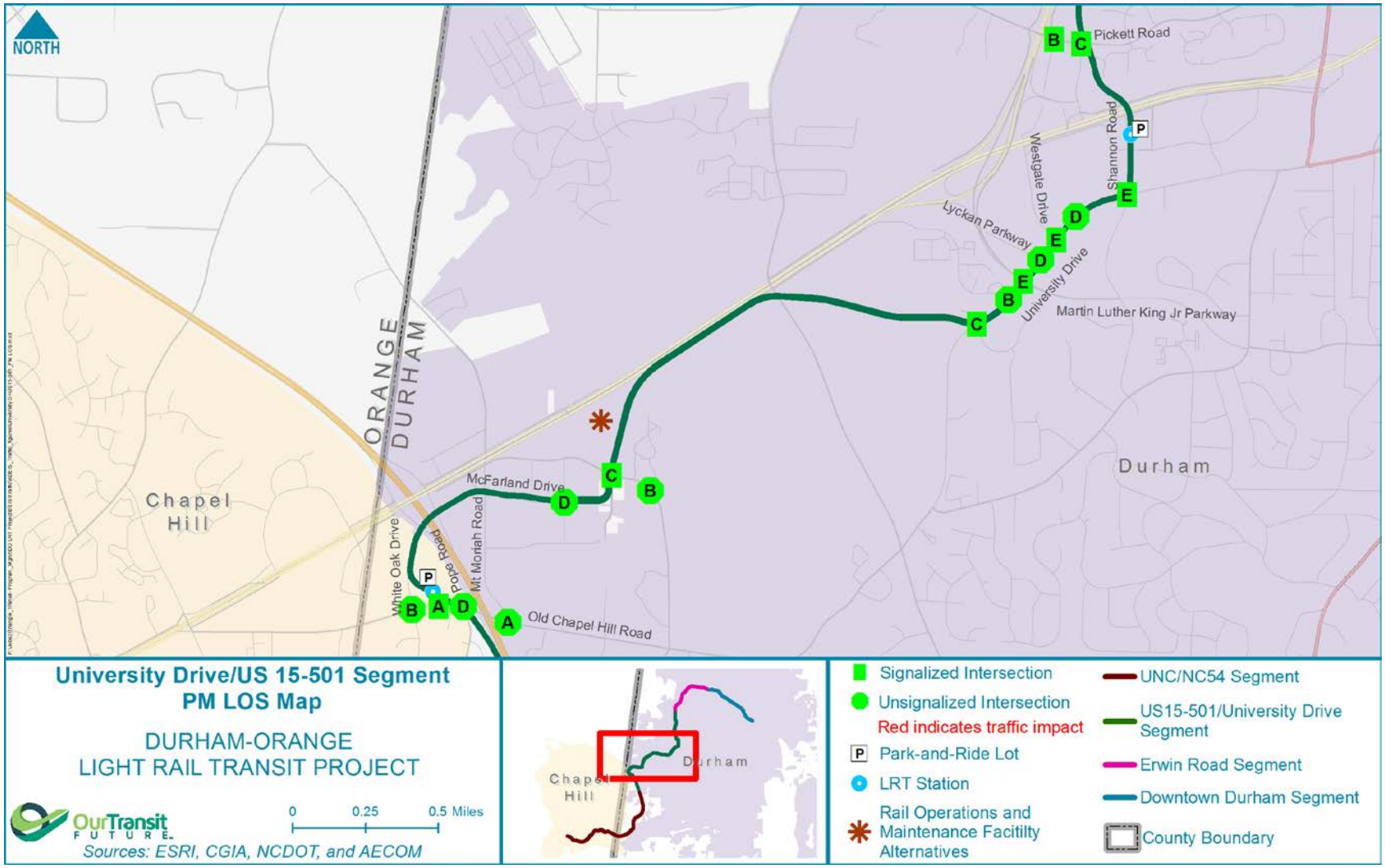
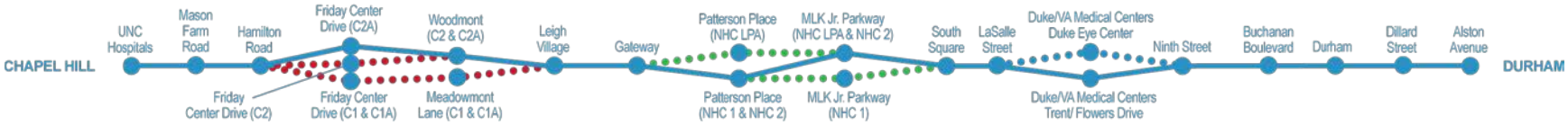


Figure 3.2-4: University Drive/US 15-501 Segment – Overall LOS – NEPA Preferred Alternative p.m. Peak Hour





- **Erwin Road**: This segment includes Erwin Road from Cameron Boulevard in the southwest to Anderson Street in the northeast and includes the Duke/VA Medical Centers Station alternatives referred to as Trent/Flowers Drive Alternative and Duke Eye Center Alternative. The Trent/Flowers Drive Alternative is included in the NEPA Preferred Alternative (see **Figure 3.2-5** and **Figure 3.2-6**).
- **Downtown Durham**: This segment extends along Pettigrew Street from the Ninth Street Station to the eastern end of the light rail alignment at the Alston Avenue Station (see **Figure 3.2-7** and **Figure 3.2-8**).

A detailed breakdown of the traffic impact criteria applied to each intersection in the study area is presented in **Table 3.2-2**.

Intersections along NC 54 and Erwin Road are under NCDOT jurisdiction, most intersections along University Drive are under the City of Durham's jurisdiction, and intersections in downtown Durham are divided between NCDOT and the City of Durham jurisdictions.

Travel demand forecasts were developed for the No Build Alternative and the NEPA Preferred and Project Element Alternatives for the forecast year 2040 using the TRM, Version 5 as described in the traffic simulation reports (appendices K.4 through K.11).

The traffic micro-simulation modeling software VisSim was used to evaluate No Build traffic operations in forecast year 2040. The VisSim software simulates how traffic will move along existing and planned roadways. These simulation results help identify intersections where traffic would operate unimpeded as well as any intersections where congestion and queueing would cause substantial delays. The alternatives under study in this DEIS were then modeled and this analysis tool was used to predict how the implementation of the NEPA Preferred and Project Element Alternatives would potentially affect 2040 vehicular traffic.

The overarching goals of the traffic simulation are to (1) evaluate the ability of the future roadway network to accommodate future travel demand; (2) help determine which modifications would be necessary to accommodate that demand; and (3) illustrate the potential effects on roadway traffic that would result from implementation of the alternatives being studied in this DEIS.

Detailed documentation of the traffic analysis methodology is included in the traffic simulation reports (appendices K.4 through K.11). VisSim traffic models were developed for the No Build Alternative and for each of the NEPA Preferred and Project Element Alternatives. These models provide the following information about the intersections in the study area:

- **Level of service (LOS)**: LOS is a letter grade designation used to measure road congestion and delays at an intersection. LOSs are ranked from best "A" (no congestion) to worst "F" (highly congested conditions). Traffic flow conditions experienced under each LOS are described in **Figure 3.2-9**.
- **Delay**: Delay is the average amount of time vehicles would wait at a traffic signal or stop sign, expressed in seconds per vehicle. A delay of less than 10 seconds equates to LOS A for traffic signals, while a delay of more than one minute and 20 seconds equates to LOS F.
- **Queue**: Queue is a quantitative measure of vehicle stacking at intersections that occurs while vehicles wait at a traffic signal or stop sign—in other words, the length of the line of cars that are waiting. Queue is measured in feet.

LOSs for intersections within the study area are presented in DEIS section 3.2.3. Detailed tables of delays and queues are provided in the traffic simulation reports (appendices K.4 through K.11).

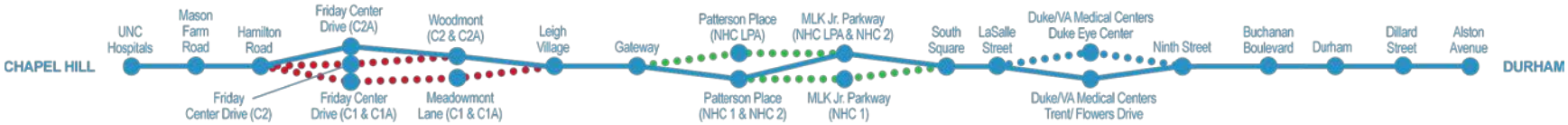
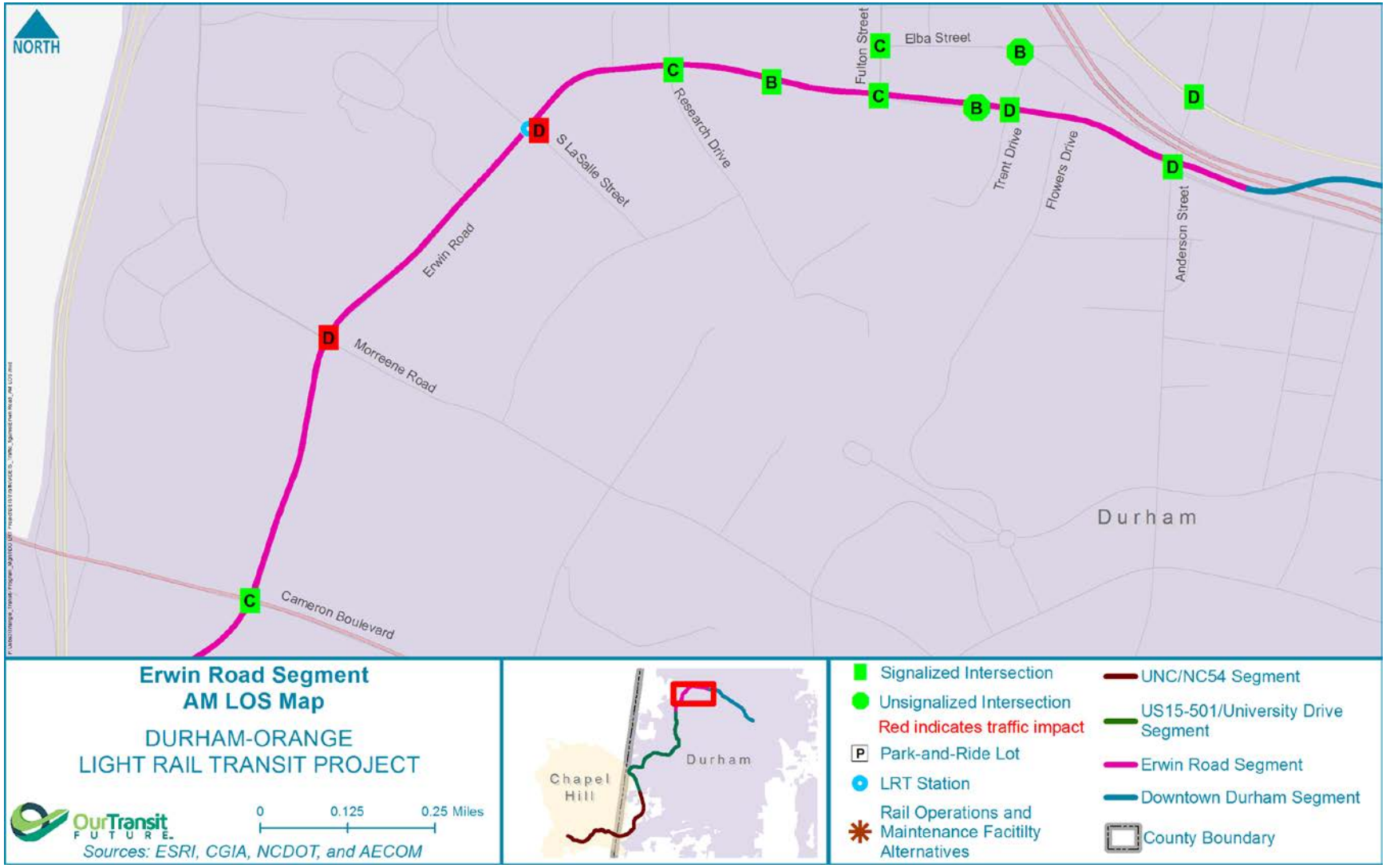


Figure 3.2-5: Erwin Road Segment – Overall LOS – NEPA Preferred Alternative a.m. Peak Hour



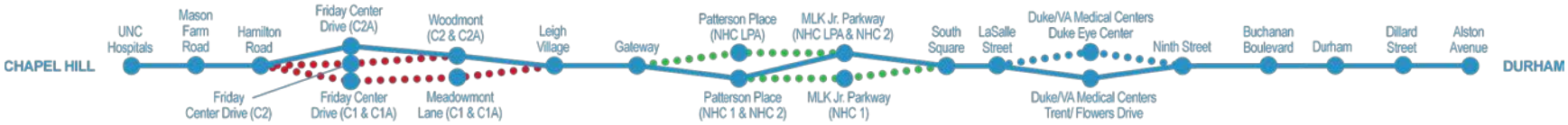
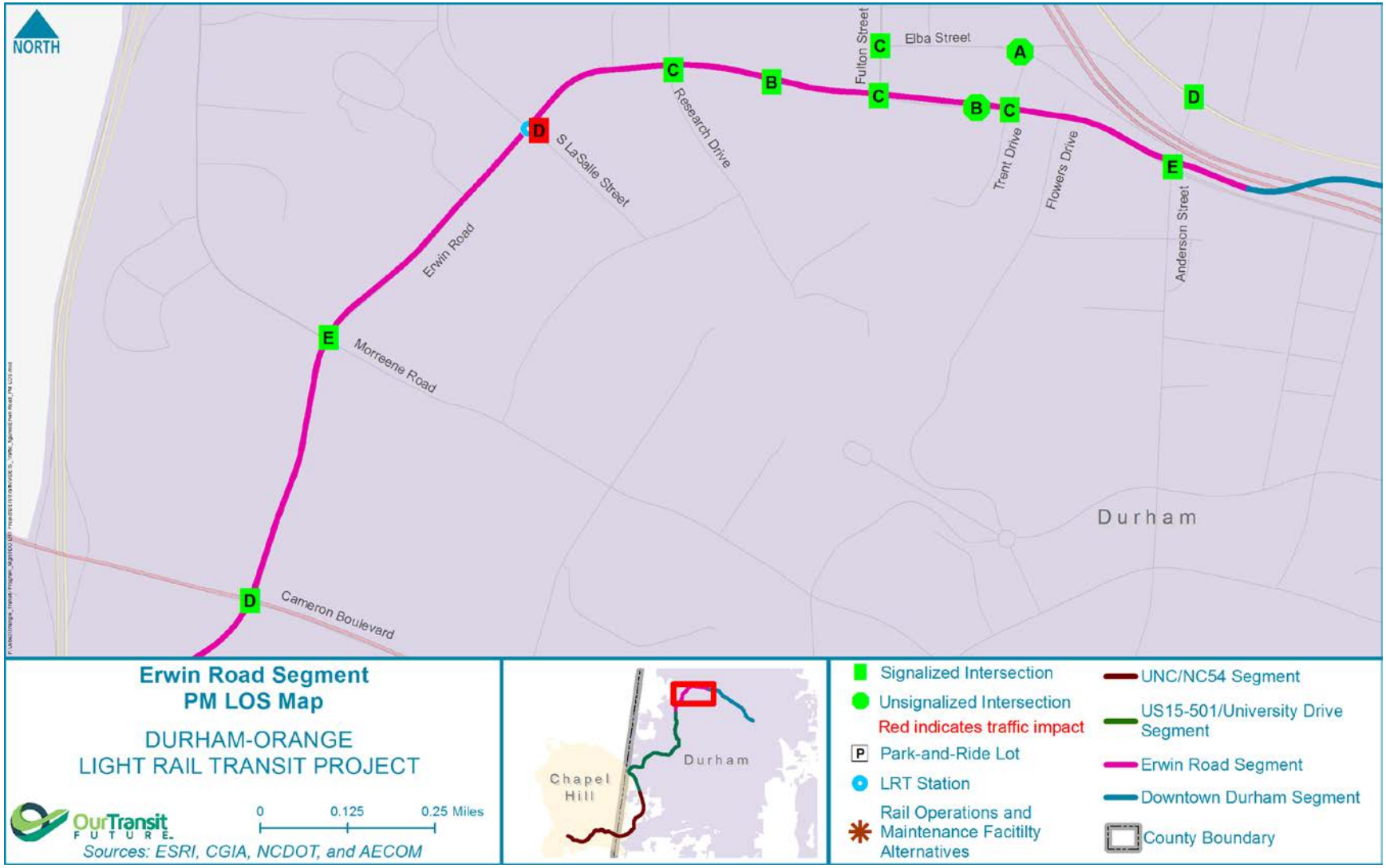


Figure 3.2-6: Erwin Road Segment – Overall LOS – NEPA Preferred Alternative p.m. Peak Hour



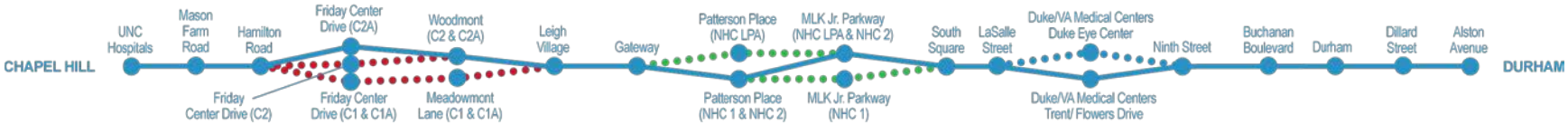
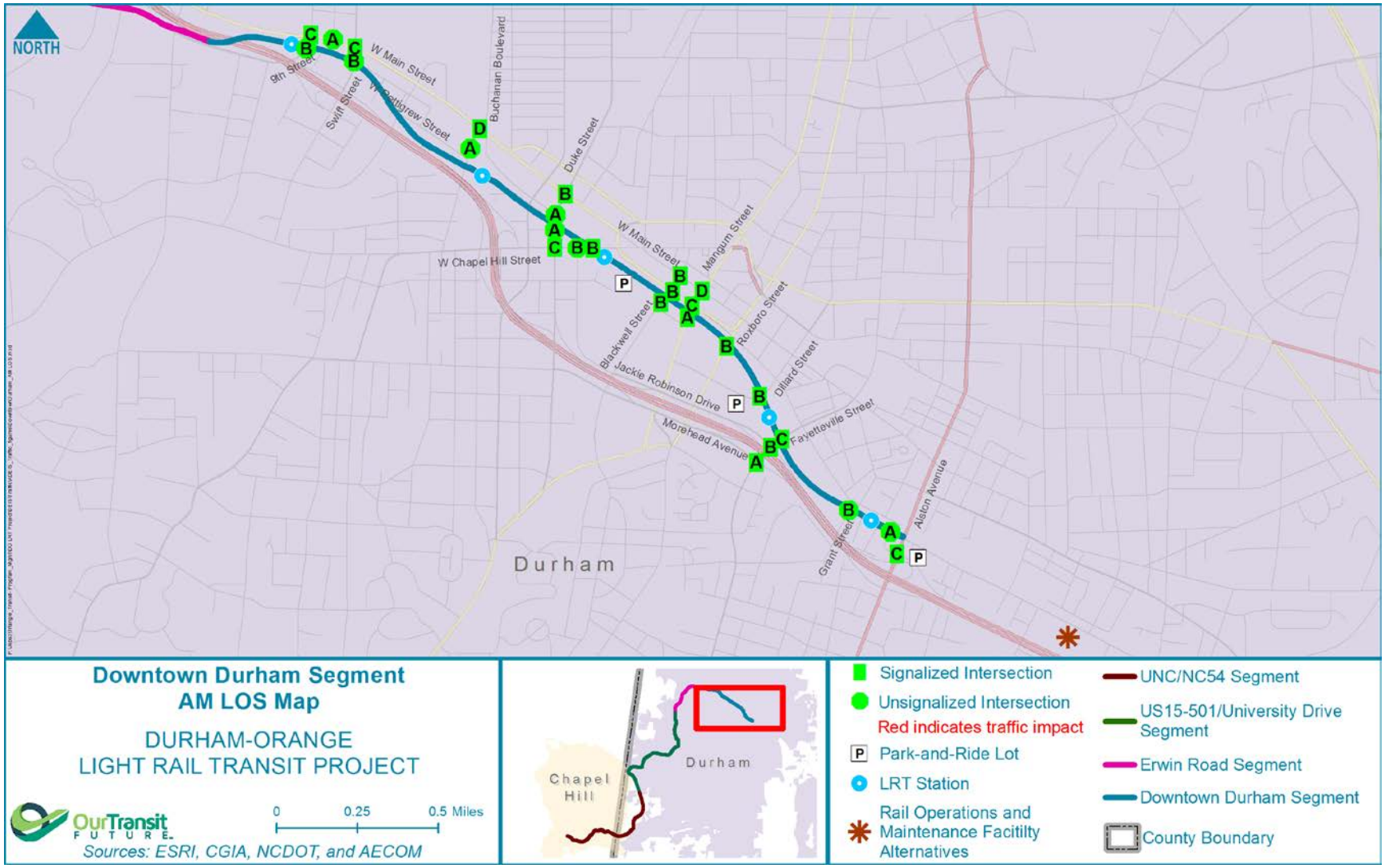


Figure 3.2-7: Downtown Durham Segment – Overall LOS – NEPA Preferred Alternative a.m. Peak Hour



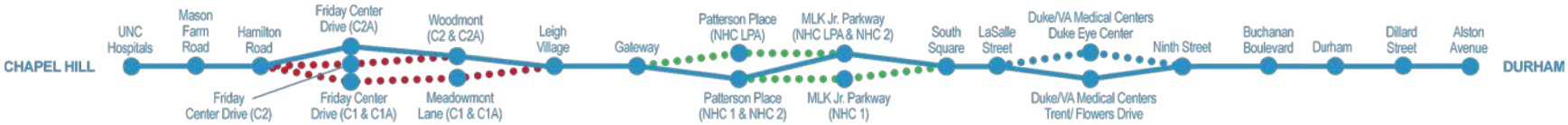
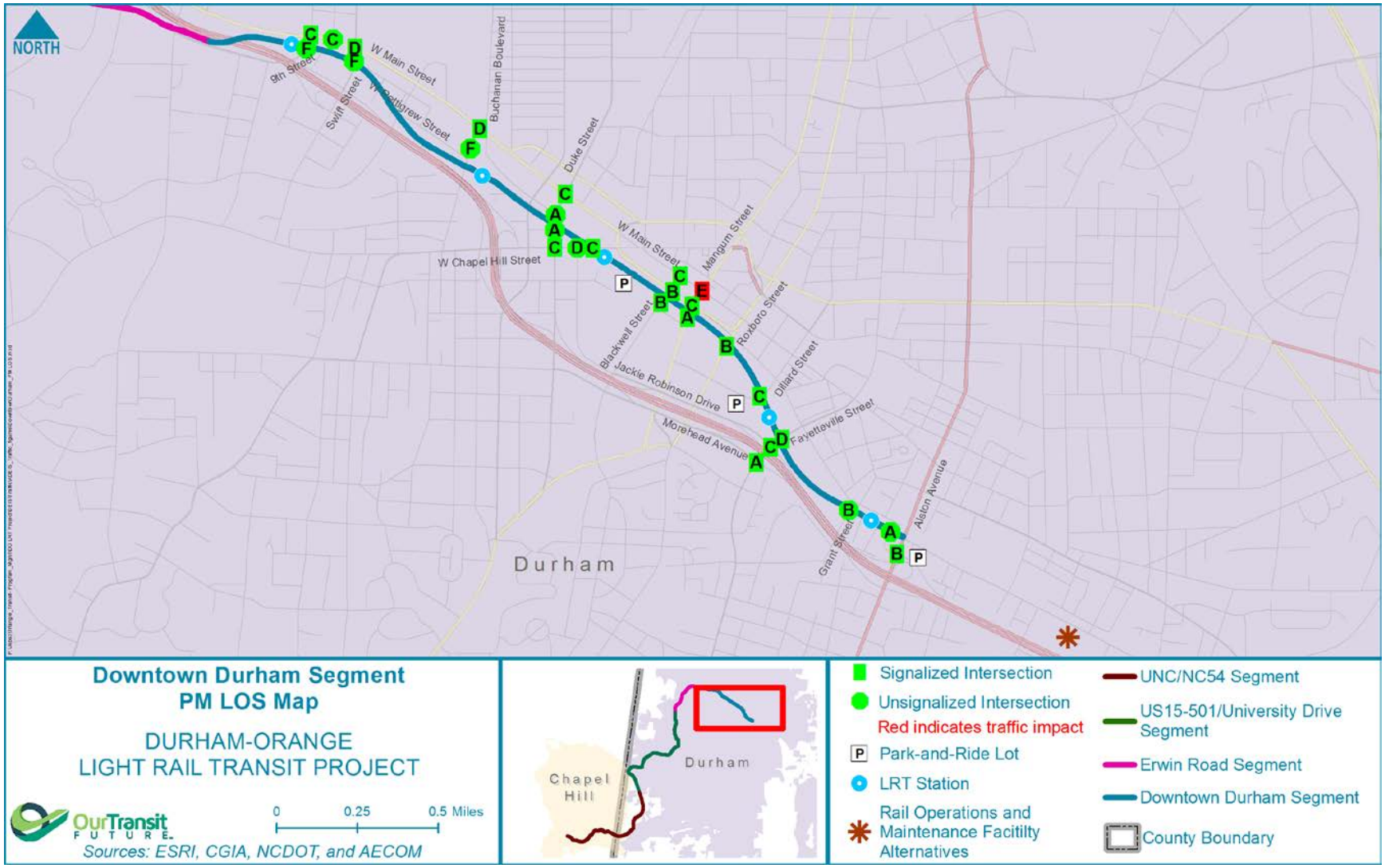


Figure 3.2-8: Downtown Durham Segment – Overall LOS – NEPA Preferred Alternative p.m. Peak Hour



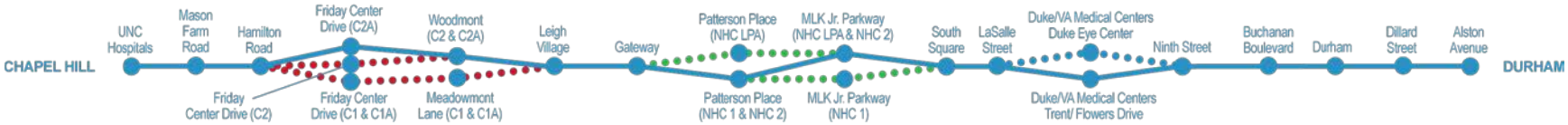


Table 3.2-2: Application of Traffic Impact Guidelines

Segment	Location	Criteria Applied
UNC/NC 54	New East-West Street C at N-S Connector Road	City of Durham (Compact Neighborhood) [a]
	Farrington Road and Ephesus Church Road	City of Durham (Suburban Tier)
	All other intersections	NCDOT
University Drive/US 15-501	Pope Road and Old Chapel Hill Road	NCDOT
	McFarland Drive and Witherspoon Drive	City of Durham (Compact Neighborhood)[a]
	Pickett Road and Tower Road	NCDOT
	Intersection with Martin Luther King Jr. Parkway	NCDOT
	All other intersections	City of Durham (Compact Neighborhood)[a]
Erwin Road	All intersections	NCDOT
Downtown Durham	Maxwell Street at Buchanan Boulevard	City of Durham (Downtown Tier)
	Blackwell Street at Pettigrew Street	City of Durham (Downtown Tier)
	Main Street at Corcoran Street	City of Durham (Downtown Tier)
	Pettigrew Street at Dillard Street	City of Durham (Downtown Tier)
	Pettigrew Street at Grant Street	City of Durham (Compact Neighborhood)
	Chatham/Gann Street at Pettigrew Street	City of Durham (Compact Neighborhood)
	All other intersections	NCDOT

Source: AECOM 2015.

[a] Although Compact Neighborhood criteria do not currently apply (as of April 2015), the City of Durham has indicated these areas will be reclassified as such.

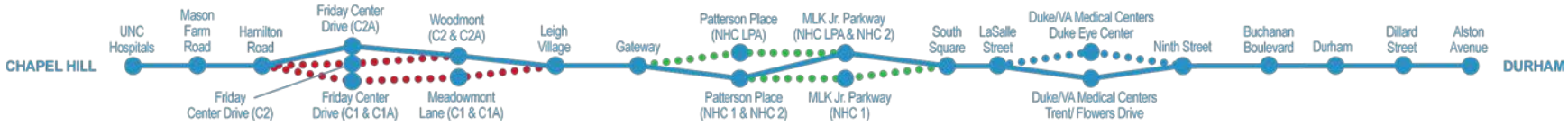
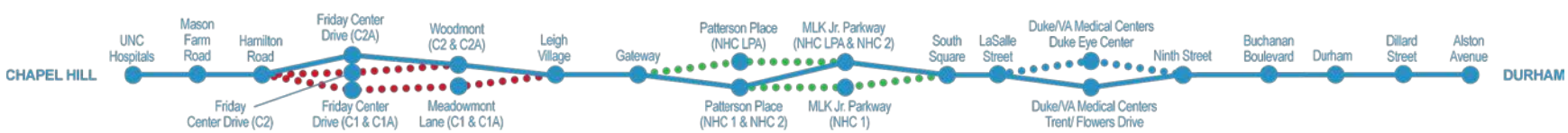


Figure 3.2-9: Level of Service Description

QUALITY OF TRAFFIC FLOW DECREASES →

LOS A	LOS B	LOS C	LOS D	LOS E	LOS F
Minimal delays	Low levels of delay and queuing	Intermittently vehicles wait through more than one signal indication, occasionally backups may develop, traffic flow still stable and acceptable	Delays at intersections may become extensive, but enough cycles with lower demand occur to permit periodic clearance, preventing excessive backups	Traffic fills intersection capacity, long queues and delays, many vehicles need to wait through more than one green indication	Traffic demand exceeds capacity of intersection, very long queues and delays, most vehicles need to wait through more than one green indication



3.2.2 Affected Environment

The affected environment is the roadway network within the study corridor and includes the intersections presented in **Figure 3.2-1** through **Figure 3.2-8** as well as listed in **Table 3.2-3**. Existing roadways, along with the future transportation projects identified in the 2040 MTP that would be implemented by 2040, as well as the projects included in the 2006 UNC's *Campus Master Plan* and 2013 *Duke University Campus Master Plan*, are described for each of the traffic study segments.

3.2.2.1 UNC/NC 54 Segment

By 2040, Mason Farm Road will be realigned to form a four-legged intersection with East Drive and the Jackson Deck parking garage per the UNC *Campus Master Plan* (2006).

Fordham Boulevard (NC 54/US 15-501) is currently a four lane divided facility with at-grade intersections and a grass median. In the future, Fordham Boulevard will be widened from four lanes to six lanes [MTP 73 (U-5304)].

NC 54 is currently a divided highway with at-grade intersections. Contiguous future projects would convert NC 54 to a superstreet corridor and widen the existing four-lane section to six lanes between Burning Tree Drive/Finley Golf Course Road and the interchange with I-40 [MTP 70 (U-5324A), 70.1, 70.2, and 70.3, and 69.1 (U-5324B)].

The following is a list of improvements that are expected to be implemented on NC 54 as part of these future transportation projects:

- Existing intersections between Burning Tree Drive and Huntingridge Road would be modified to ban through movements and left turns from the side streets, and median breaks would be added on NC 54 to accommodate U-turns.
- Exclusive eastbound and westbound Huntingridge Road right turn lanes would be added at the intersection of NC 54 and Huntingridge Road.
- The intersection with Falconbridge Road would be converted to a full-movement signalized intersection with exclusive northbound and southbound Falconbridge Road right turn lanes added.
- The intersection with Farrington Road would be replaced with an elevated NC 54 section that would pass over Farrington Road and the eastbound I-40 slip ramp.
- The interchange at NC 54 and I-40 would be revised. However, this modification is beyond the limits of the traffic simulation model.

By 2040, in addition to the improvements described for NC 54 in the East Chapel Hill study area, Southwest Durham Drive will be extended from I-40 (at Farrington Road) to NC 54 at Falconbridge Road (MTP 230), referred to as the Falconbridge Road Extension. This intersection with NC 54 will become a full-movement signalized intersection as part of the NC 54 project.

Separate projects will add managed (toll) lanes on I-40 in both directions from US 15-501 to NC 147 [MTP 45.2 (FS-1205A)] (2040) and widen I-40 from four to six lanes from US-15-501 to NC 86 [MTP 43 (I-3306)].

NCDOT project FS-1205A is a feasibility study that is evaluating the viability of one or two managed lanes per direction on I-40 and includes the section in which the light rail project parallels I-40 east of US 15-501.

3.2.2.2 University Drive/US 15-501 Segment

Old Chapel Hill Road is a two-lane undivided facility running east-west with a bridge over I-40. East of I-40, McFarland Drive is a two-lane undivided facility within the Patterson Place shopping center. Durham Drive is a combination of a five-lane undivided and two-lane undivided facility.

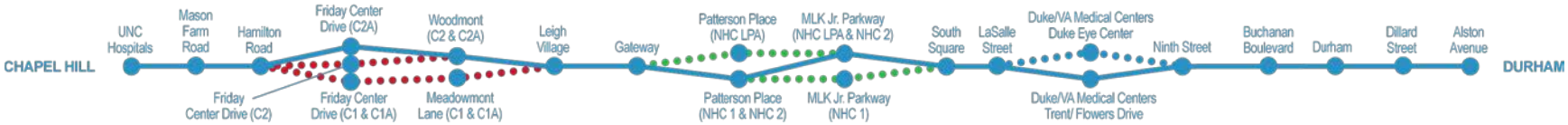


Table 3.2-3: Overall Intersection 2040 LOS

Segment	Intersection	2040 No Build		2040 NEPA Pref.	
		a.m.	p.m.	a.m.	p.m.
UNC/NC 54	Mason Farm Road at East Drive/Jackson Deck [a]	B	B	C	C
	Hamilton Road at NC 54[a]	C	C	C	C
	Rogerson Drive at NC 54[a] (Unsignalized)	F	E	F	E
	Finley Golf Course Road/Burning Tree Drive at NC 54[a]	B	B	B	B
	West Barbee Chapel Road at NC 54[a]	C	B	C	B
	NC 54 at Midblock U-Turn (West of Friday Center Drive)[a]	B	C	B	C
	Friday Center Drive/Meadowmont Lane at NC 54[a]	B	B	B	B
	Meadowmont Lane at Village Crossing Drive [a]	A	A	A	A
	Meadowmont Lane at East Barbee Chapel Road [a]	A	A	A	A
	Meadowmont Lane at Sprunt Street [a]	A	A	A	B
	Meadowmont Lake at Green Cedar Lane [a] (Unsignalized)	A	A	A	A
	East Barbee Chapel Road at NC 54[a] (Unsignalized)	F	F	B	C
	Huntingridge Road at NC 54[a] (Unsignalized)	F	F	F	F
	Falconbridge Road at NC 54[a]	E	E	E	E
	New East-West Street C at N-S Connector Road [b]	-	-	D	B
	Farrington Road at I-40 Eastbound Slip On-Ramp [a] (Unsignalized)	F	E	F	E
	Farrington Road at Ephesus Church Road [b]	D	B	D	B
University Drive /US 15-501	Mount Moriah Road at Old Chapel Hill Road [a] (Roundabout)	A	A	A	A
	Pope Road at Old Chapel Hill Road [a] (Roundabout)	C	A	A	D
	Park-and-Ride Entrance at Old Chapel Hill Road [a] (Unsignalized)	-	-	A	A
	White Oak Drive at Old Chapel Hill Road [a] (Unsignalized)	B	B	B	B
	McFarland Drive at Witherspoon Boulevard [b] (Unsignalized to Signalized)	B	F	B	D
	Southwest Durham Drive at McFarland Drive [a]	-	-	B	C
	Hopedale Avenue at Southwest Durham Drive [a] (Unsignalized)	A	B	A	B
	University Drive at Snowcrest Trail/Ivy Creek Boulevard [b]	B	D	C	C
	University Drive at Larchmont Road [b] (Unsignalized)	C	E	B	B
	University Drive at Martin Luther King Jr. Parkway [a]	D	E	E	E
	University Drive at Lyckan Parkway [b] (Unsignalized)	A	D	C	D
	University Drive at Westgate Drive [b]	C	D	D	E
	University Drive at Westgate Shopping Center [b] (Unsignalized)	A	E	A	D
	University Drive at Shannon Road [b]	B	D	B	E

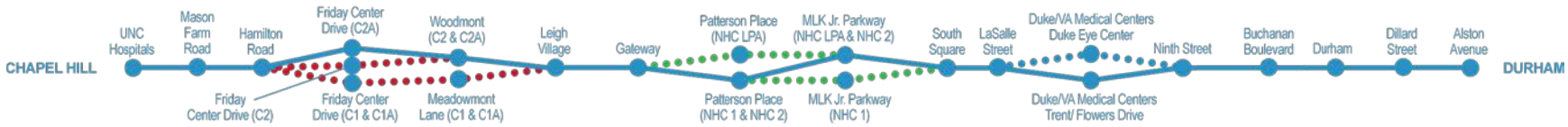


Table 3.2-3: Overall Intersection 2040 LOS

Segment	Intersection	2040 No Build		2040 NEPA Pref.	
		a.m.	p.m.	a.m.	p.m.
	Pickett Road at Petty Road [b]	B	A	C	B
	Pickett Road at Tower Boulevard [b]	A	A	B	C
Erwin Road	Cameron Boulevard (NC 751) and Erwin Road [a]	D	D	C	D
	Morreene Road/Towerview Road and Erwin Road [a]	D	E	D	E
	LaSalle Street and Erwin Road [a]	C	C	D	D
	Douglas Street/Research Drive and Erwin Road [a]	C	C	C	C
	Duke Eye Center Drive and Erwin Road [a]	A	B	B	B
	Fulton Street and Erwin Road [a]	D	C	C	C
	Fulton Street and Elba Street [a]	C	C	C	C
	Trent Drive and Erwin Road [a]	C	D	D	C
	Anderson Street and Erwin Road [a]	C	E	D	E
	NC147 Off-On Ramps/Trent Drive/Elba Street [a] (Roundabout)	C	A	B	A
	Anderson Street/15th Street/Main Street [a]	D	D	D	D
	Emergency Drive and Erwin Road [a]	A	B	B	B
	Flowers Drive and Erwin Road [a] (Unsignalized)	A	B	-	-
Downtown Durham	Main Street at Ninth Street [a]	C	D	C	C
	Main Street at Iredell Street [a] (Unsignalized)	A	D	A	C
	Main Street at Broad Street [a]	C	D	C	D
	Pettigrew Street at Ninth Street [a] (Unsignalized)	B	F	B	F
	Pettigrew Street at Swift Avenue [a] (Unsignalized)	D	F	B	F
	Main Street at Buchanan Boulevard [a]	D	D	D	D
	Maxwell Street at Buchanan Boulevard [b] (Unsignalized)	A	F	A	F
	Duke Street at Main Street [a]	C	C	B	C
	Duke Street at Peabody Street [a] (Unsignalized)	A	A	A	A
	Memorial Street at Duke Street [a] (Unsignalized)	A	A	A	A
	Chapel Hill Street at Duke Street [a]	C	C	C	C
	Chapel Hill Street at Willard Street [a] (Unsignalized)	A	A	B	D
	Pettigrew Street at Chapel Hill Street [a]	A	B	B	C
	Blackwell Street at Pettigrew Street [b]	B	B	B	B
	Blackwell Street at Ramseur Street [a]	B	B	B	B
	Main Street at Corcoran Street [b]	B	B	B	C

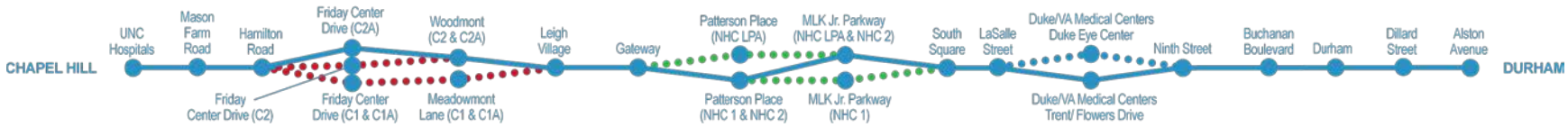


Table 3.2-3: Overall Intersection 2040 LOS

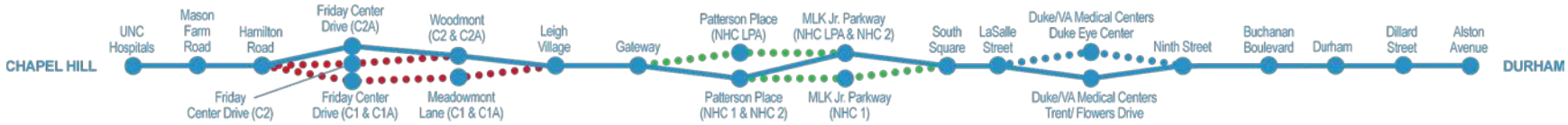
Segment	Intersection	2040 No Build		2040 NEPA Pref.	
		a.m.	p.m.	a.m.	p.m.
	Mangum Street at Main Street [a]	C	D	D	E
	Mangum Street at Ramseur Street [a]	B	C	C	C
	Mangum Street at Pettigrew Street [a]	B	B	A	A
	Roxboro Street at Pettigrew Street [a]	B	B	B	B
	Pettigrew Street at Dillard Street [b]	B	B	B	C
	Fayetteville Street at Pettigrew Street [a]	C	C	C	D
	Fayetteville Street at Jackie Robinson Drive [a]	B	B	B	C
	Morehead Avenue at Fayetteville Street [a]	A	A	A	A
	Pettigrew Street at Grant Street [b]	B	B	B	B
	Gann Street at Pettigrew Street [b] (Unsignalized)	A	A	A	A
	Alston Avenue at Gann Street [a]	C	B	C	B

Source: Traffic simulation reports (appendices K.4 through K.11).

Indicates traffic impact

[a] NCDOT Traffic Impact Criteria is applied

[b] City of Durham Traffic Impact Criteria is applied



Final plans are currently being prepared by NCDOT for a project that will add bicycle lanes and sidewalks along Old Chapel Hill Road from US 15-501 to Southwest Durham Drive, and reconfigure the intersection of Old Chapel Hill Road/Pope Road as a roundabout (EB-4707).

Separate future projects will extend Southwest Durham Drive from US 15-501 Business to Mount Moriah Road (MTP 106) and later widen this extension to four lanes (MTP 106.1) by 2040. The section of Southwest Durham Drive from Witherspoon Boulevard to Old Chapel Hill Road is scheduled to be widened from two to four lanes (MTP 104).

Also by 2040, US 15-501 is planned to be converted to a limited-access freeway between I-40 and US 15-501 Bypass [MTP 113 (U-2807)], and is planned to be widened to six lanes from Pickett Road to Cameron Boulevard (MTP 114).

University Drive is a five-lane roadway with a center two-way left turn lane that runs parallel to US 15-501 and serves local traffic within the South Square area and cross-town traffic in the City of Durham. Martin Luther King Jr. Parkway intersects with University Drive and is a major cross-town connector.

3.2.2.3 Erwin Road Segment

Erwin Road is a five-lane facility with a center two-way left-turn lane that serves as a cross-town connector and provides access to the Duke University Medical Center and Durham VA Medical Center.

At Towerview Road, an eastbound right turn bay on Erwin Road is under construction. Duke University has initiated planning and design to add a signal at Emergency Drive east of Fulton Street. Duke University also has plans for a pedestrian/bicycle trail that follows an abandoned railroad corridor and crosses Erwin Road east of Emergency Drive and crosses Elba Street west of Trent Drive.

3.2.2.4 Downtown Durham Segment

Pettigrew Street is a two lane local roadway maintained by the City of Durham located within downtown Durham. As part of the No Build improvements, the existing at-grade railroad tracks would be grade-separated at Corcoran Street and Mangum Street (MTP 232 and MTP 231). The VisSim models do not include freight and intercity passenger rail traffic due to their limited occurrence during the a.m. and p.m. peak hours.

3.2.3 Environmental Consequences

This section discusses the effects of the NEPA Preferred and Project Element Alternatives on the roadway network and vehicular traffic operations in the traffic study segments.

A substantial portion of the light rail alignment would be at-grade under the NEPA Preferred and Project Element Alternatives. A list of locations where the light rail alignment would interface with the roadway network at-grade is provided in **Table 3.2-4**. The locations of these interfaces are depicted in the *Basis for Engineering Design* (appendix L). All such interfaces will be designed in accordance with state and federal safety regulations and best practices pertaining to such crossings.

Roadway modifications are proposed to minimize traffic impacts (excessive queues or delays) as defined by NCDOT and the City of Durham criteria. These measures include additional lanes, increased turning bay lengths, reassignment of lanes, modifications to signal phasing, and prohibition of turning movements. All practical roadway modifications expected to minimize and reduce the effects of the project have been included in the NEPA Preferred and Project Element Alternatives, as shown in the *Basis for Engineering Design* (appendix L), and described in **Table 3.2-5.**

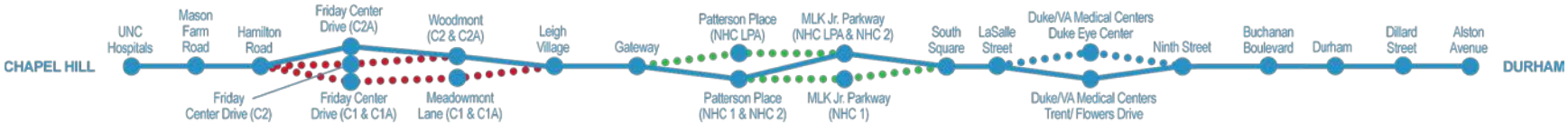


Table 3.2-4: At-grade Interfaces between the Light Rail Alignment and Roadway Network

Location	Type of Roadway Interface [a]
UNC/ NC 54	
East Drive south of Mason Farm Road	LRT Crossing
Baity Hill Drive north of Mason Farm Road	LRT Crossing
Finley Golf Course Road south of Prestwick Road	LRT Crossing
Exchange Drive south of NC 54 (NEPA Preferred Alt. [C2A])	LRT Crossing
Friday Center Drive south of NC 54 (NEPA Preferred Alt. [C2A] and C2)	LRT Crossing
East Barbee Chapel Road south of NC 54 (NEPA Preferred Alt. [C2A] and C2)	LRT Crossing
Stancell Drive east of East Barbee Chapel Road (C2)	LRT Crossing
Littlejohn Road south of NC 54 (NEPA Preferred Alt. [C2A] and C2)	LRT Crossing
Downing Creek Parkway south of NC 54 (NEPA Preferred Alt. [C2A] and C2)	LRT Crossing
East Barbee Chapel Road west of Meadowmont Lane (C1 and C1A)	LRT Crossing
Sprunt Street west of Meadowmont Lane (C1 and C1A)	LRT Crossing
Meadowmont Lane south of Green Cedar Lane (C1 and C1A)	LRT Crossing
Cedar Pond Lane south of Green Cedar Lane (C1 and C1A)	LRT Crossing
Iron Mountain Road east of Park Bluff Drive (C1A)	LRT Crossing
George King Road (Realigned) west of New North-South Connector	LRT Crossing
New East-West Street C at New North-South Connector	LRT Crossing
Farrington Road south of Wendell Road	LRT Crossing
University Drive/US 15-501	
Pope Road at Old Chapel Hill Road	LRT Crossing
Witherspoon Boulevard	LRT Crossing
Southwest Durham Drive west of Sayward Drive (NEPA Preferred Alt. [NHC 2] and NHC 1)	LRT Crossing
Southwest Durham Drive east of Sayward Drive (NHC LPA)	LRT Crossing
Garrett Road south of US 15-501 (NHC LPA)	LRT Crossing
Lyckan Parkway Access from US 15-501 (NHC 1)	LRT Crossing
Ivy Creek Boulevard / Snowcrest Trail at University Drive (NEPA Preferred Alt. [NHC 2] and NHC LPA)	Median-running LRT in Exclusive Transit Lanes
Martin Luther King Jr. Parkway at University Drive (NEPA Preferred Alt. [NHC 2] and NHC LPA)	Median-running LRT in Exclusive Transit Lanes
Lyckan Parkway (NHC 1)	LRT Crossing
Westgate Drive at University Drive	Median-running LRT in Exclusive Transit Lanes
Shannon Road at University Drive	Median-running LRT in Exclusive Transit Lanes
Pickett Road east of Tower Boulevard	LRT Crossing
Western Bypass north of Pickett Road	LRT Crossing

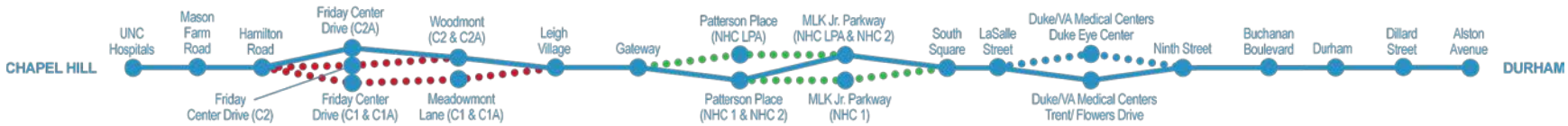


Table 3.2-4: At-grade Interfaces between the Light Rail Alignment and Roadway Network

Location	Type of Roadway Interface [a]
Erwin Road	
Cameron Boulevard at Erwin Road	Median-running LRT in Exclusive Transit Lanes
Center for Living Drive at Erwin Road	Median-running LRT in Exclusive Transit Lanes
Morreene Road / Towerview Road at Erwin Road	Median-running LRT in Exclusive Transit Lanes
LaSalle Street at Erwin Road	Median-running LRT in Exclusive Transit Lanes
Downing Street at Erwin Road	Median-running LRT in Exclusive Transit Lanes
Douglas Street / Research Drive at Erwin Road	Median-running LRT in Exclusive Transit Lanes
Eye Center Drive at Erwin Road	Median-running LRT in Exclusive Transit Lanes
Fulton Street at Erwin Road	Median-running LRT in Exclusive Transit Lanes
Emergency Drive at Erwin Road	Median-running LRT in Exclusive Transit Lanes
Trent Drive at Erwin Road	Median-running LRT in Exclusive Transit Lanes
Flowers Drive at Erwin Road	Median-running LRT in Exclusive Transit Lanes
Anderson Street at Erwin Road	Median-running LRT in Exclusive Transit Lanes
Downtown Durham	
Buchanan Boulevard south of Erwin Road	LRT Crossing
Wilkerson Avenue south of Pettigrew Street	LRT Crossing
Gregson Street south of Pettigrew Street	LRT Crossing
Duke Street north of Memorial Street	LRT Crossing
West Chapel Hill Street at Pettigrew Street	Street-Running LRT in Exclusive Transit Lanes
Blackwell Street / Corcoran Street at Pettigrew Street	Street-Running LRT in Exclusive Transit Lanes
Mangum Street at Pettigrew Street	Street-Running LRT in Exclusive Transit Lanes
Roxboro Street at Pettigrew Street	Street-Running LRT in Exclusive Transit Lanes
Dillard Street at Pettigrew Street	Street-Running LRT in Exclusive Transit Lanes
Fayetteville Street at Pettigrew Street	LRT Crossing
Grant Street at Pettigrew Street	LRT Crossing
Plum Street at Pettigrew Street (Alston Avenue ROMF)	LRT Crossing

Note: Locations apply to all alternatives unless otherwise noted.

[a] LRT crossings will be controlled by flashing light signals, flashing light signals plus gates, or traffic signals depending on the specific intersection circumstances to be determined during the Engineering phase in consultation with NCDOT and local jurisdictions.

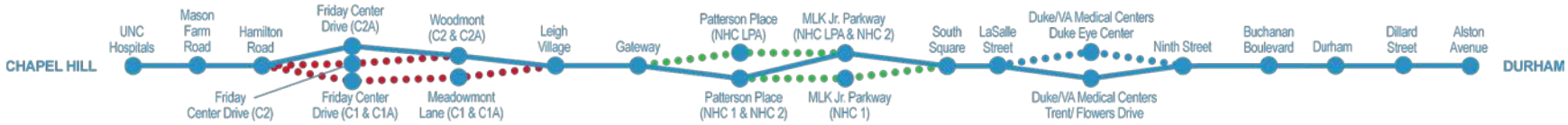


Table 3.2-5: Roadway Modifications Proposed as Part of the NEPA Preferred and Project Element Alternatives

Location	Appendix L Sheet #	Proposed Roadway Modification
UNC/NC 54		
West Barbee Chapel Road and at NC 54 (NEPA Preferred [C2A])	C2A-02	Add acceleration lane along eastbound NC 54 for northbound West Barbee Chapel Road right turn
East Barbee Chapel Road at NC 54 (NEPA Preferred [C2A])	C2A-02	Add acceleration lane along westbound NC 54 for southbound East Barbee Chapel Road right turn
Leigh Village Station area, George King Road, Cleora Drive, Falconbridge Drive	C2-04, and C2A-04	Realign George King Road to intersect Falconbridge Road Extension and connect to Cleora Drive
	C1-05, C1A-06, C2-05, and C2A-05	Construct two legs of a new intersection east of the proposed Leigh Village Station where the light rail alignment would cross Falconbridge Road Extension
University Drive/US 15-501		
Pope Road at Old Chapel Hill Road	D-03 and D-04	Reconstruct roundabout to allow the light rail alignment to pass through the center
		Add north leg of roundabout to connect to park-and-ride lot and Gateway Station
		Add eastbound right turn “slip lane” on Old Chapel Hill Road to southbound Pope Road
McFarland Drive at Witherspoon Boulevard	D-06, D1-06 and D2-06	Install traffic signal
		Increase northbound Witherspoon Boulevard left turn bay
		Prohibit westbound McFarland Drive left turn
Southwest Durham Drive at McFarland Drive (NHC LPA)	D-06	Extend McFarland Drive to intersect with Southwest Durham Drive
		Install traffic signal
Hopedale Avenue at Southwest Durham Drive (NHC LPA)	D-06	Prohibit westbound Hopedale Avenue left turn movement
		Increase southbound Southwest Durham Drive left turn bay
McFarland Drive Extension to Sayward Drive (NEPA Preferred Alt [NHC 2] and NHC 1)	D1-06 and D2-06	Extend McFarland Drive to connect to Sayward Drive
		Reconstruct Sayward Drive to provide separate right and left turn lanes at Southwest Durham Drive
University Drive at Ivy Creek Boulevard (NEPA Preferred Alt. [NHC 2] and NHC LPA)	D-09 and D2-10	Add third eastbound University Drive through lane between Ivy Creek Boulevard and Martin Luther King Jr. Parkway
	D-09 thru D-11, and D2-10 thru D2-11	Add dedicated westbound University Drive right turn bay
University Drive at	D-09 and D2-10	Convert Larchmont Road to right-in/right-out

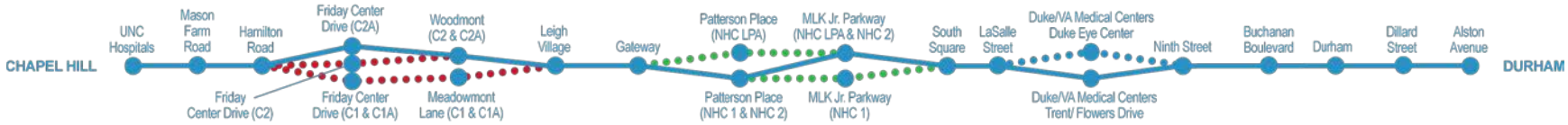


Table 3.2-5: Roadway Modifications Proposed as Part of the NEPA Preferred and Project Element Alternatives

Location	Appendix L Sheet #	Proposed Roadway Modification
Larchmont Road (NEPA Preferred Alt. [NHC 2] and NHC LPA)	RD-02	Construct two-lane connector roadway between Larchmont Road and Snow Crest Trail
University Drive at Martin Luther King Jr. Parkway (NEPA Preferred Alt [NHC 2] and NHC 1)	D-10 and D2-11	Extend westbound University Drive right turn lane from Martin Luther King Jr. Parkway to Westgate Drive
University Drive at Lyckan Parkway and Parkway Plaza (NEPA Preferred Alt [NHC 2] and NHC LPA)	D-10, D2-11, and D-11	Convert Lyckan Parkway and Parkway Plaza driveways to right-in/right-out
Lyckan Parkway *(NHC 1)*	D1-08 and D1-09	Reconstruct Lyckan Parkway along US 15-501 between Garrett Road and Sandy Creek
	D1-10	Increase length of westbound University Drive right turn bay from Martin Luther King Jr. Parkway to Parkway Plaza
University Drive at Westgate Drive	D-10, D1-10, D2-11, and D-11	Add second eastbound University Drive left turn bay
		Increase length of outer eastbound University Drive left lane from Westgate Drive to Martin Luther King Jr. Parkway
University Drive at Westgate Shopping Center and other drives	D-10, D1-10, D2-11, and D-11	Convert access onto University Drive between Westgate Drive and Shannon Road to right-in/right-out
Pickett Road at Tower Boulevard	D-12 and D-13	Install traffic signal
		Add dedicated northbound Tower Boulevard right turn bay
Western Bypass	D-13	Reconstruct a segment of Western Bypass between Pickett Road and Cornwallis Road
Erwin Road		
Cameron Boulevard at Erwin Road	E-01 and RD-03	Increase the length of northbound Cameron Boulevard right turn bay
		Add two exclusive southbound Cameron Boulevard left turn bays onto Erwin Road
		Increase the length of westbound right turn bay on Erwin Road
Center for Living at Erwin Road	E-01	Prohibit southbound left turns from the Duke Center for Living onto eastbound Erwin Road
		Add traffic signal to control eastbound Erwin Road left turn to the Center for Living
Morreene	E-02	Add dedicated westbound Erwin Road right turn bay

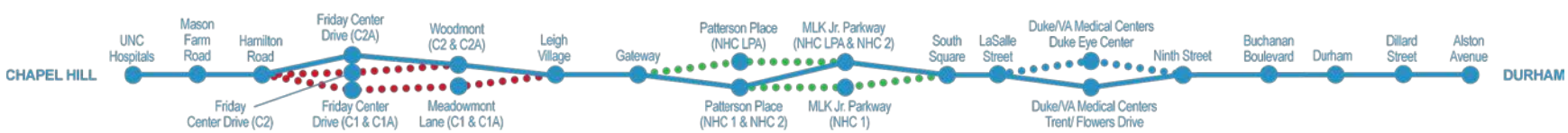


Table 3.2-5: Roadway Modifications Proposed as Part of the NEPA Preferred and Project Element Alternatives

Location	Appendix L Sheet #	Proposed Roadway Modification
Road/Towerview Road at Erwin Road		Eliminate on-street parking spaces to provide two northbound Towerview Road approach lanes
Lambeth Circle at Erwin Road	E-03	Convert to right-in/right-out
LaSalle Street at Erwin Road	E-04	Restripe to provide two southbound LaSalle Street left turn bays and one southbound LaSalle Street shared through/right lane
Downing Street at Erwin Road	E-04	Prohibit left turns from Downing Street onto eastbound Erwin Road
		Add traffic signal to control eastbound left turns from Erwin Road onto Downing Street
Douglas Street/Research Drive at Erwin Road	E-05 and E1-05	Restripe to provide dedicated right, through, and left turn lanes on both northbound (Research Drive) and southbound (Douglas Street) approaches
Duke Eye Center Drive at Erwin Road	E-05 and E1-05	Add dedicated Erwin Road westbound right lane (Trent/Flowers Station Alternative only)
		Increase dedicated eastbound Erwin Road right lane bay
Fulton Street at Erwin Road	E-06 and E1-06	Remove dedicated westbound Erwin Road right turn lane bay
Emergency Drive at Erwin Road	E-06 and E1-06	Prohibit eastbound Erwin Road left turn
		Restripe northbound Emergency Drive to provide exclusive left turn lane
Trent Drive at Erwin Road	E-07 and E1-07	Add second dedicated eastbound Erwin Road left turn bay
		Add dedicated southbound Trent Drive right turn bay
		Restripe north leg of Trent Drive to accommodate one southbound through lane, one dedicated left turn lane, and two northbound receiving lanes
Flowers Drive at Erwin Road	E-07 and E1-07	Prohibit northbound left turns from Flowers Drive to Erwin Road
		Add traffic signal to control westbound Erwin Road left turn to Flowers Drive
Anderson Street at Erwin Road	E-08 and E1-08	Add second eastbound Erwin Road left turn bay
		Restripe north leg of Anderson Street to accommodate one southbound through/right shared lane, one dedicated left turn lane, and two northbound receiving lanes
NC 147 Off-On Ramps/Trent Drive/Elba Street	RD-04	Replace existing stop controlled intersection with a roundabout with two-lane approaches
Downtown Durham		
Pettigrew Street at Chapel Hill Street	F-03	Remove westbound Pettigrew Street general traffic lanes

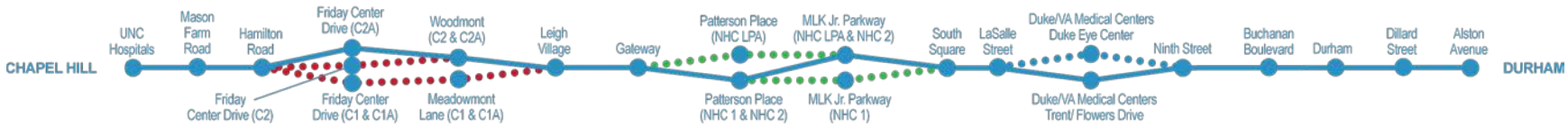


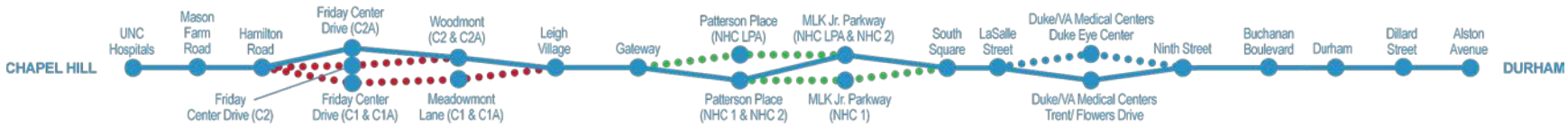
Table 3.2-5: Roadway Modifications Proposed as Part of the NEPA Preferred and Project Element Alternatives

Location	Appendix L Sheet #	Proposed Roadway Modification
Pettigrew Street at Blackwell Street	F-04	Remove westbound Pettigrew Street general traffic lanes
		Remove dedicated eastbound Pettigrew Street left turn bay to provide a single shared left/through/right lane
Pettigrew Street at Mangum Street	F-04	Remove westbound Pettigrew Street general traffic lanes
		Restripe existing southbound Mangum Street right turn lane to provide a through lane
	F-04	Add dedicated eastbound Pettigrew Street right turn lane
Pettigrew Street at Roxboro Street	F-04	Remove westbound Pettigrew Street general traffic lanes
		Add dedicated eastbound Pettigrew Street left turn lane
		Restripe existing northbound Roxboro Street left/through to provide a through lane only
Pettigrew Street at Dillard Street	F-04 and F-05	Eliminate dedicated northbound Dillard Street left turn lane
		Reconstruct westbound Pettigrew Street lane to prohibit through traffic and provide a dedicated left turn lane and dedicated right turn lane
		Restripe southbound Dillard Street left/through lane to provide a through lane

Source: Traffic simulation reports (appendices K.4 through K.11).

Note: Proposed roadway modifications apply to all alternatives unless otherwise noted

Note: For consistency of discussion, in this table the proposed D-O LRT Project operates east-west, and intersection approaches have been named accordingly (northbound/southbound/eastbound/westbound).



3.2.3.1 No Build Alternative

As described in DEIS section 3.2.2, the No Build Alternative includes other planned transportation improvement projects that are presumed to be constructed if the proposed D-O LRT Project is not built. The analysis results for the No Build Alternative are presented side-by-side with the NEPA Preferred Alternative in **Table 3.2-3**.

3.2.3.2 NEPA Preferred Alternative

This section summarizes the results and findings of the traffic operations analysis for the proposed NEPA Preferred Alternative and the roadway modifications listed in **Table 3.2-5**. The 2040 NEPA Preferred and Project Element Alternatives traffic operations analysis evaluated both weekday a.m. and p.m. peak hour traffic conditions. **Table 3.2-3** presents the results of the traffic simulation and analysis for the NEPA Preferred Alternative as compared to the No Build Alternative.

The modeled overall LOS at each NEPA Preferred Alternative intersection is presented in **Table 3.2-3** and illustrated on **Figure 3.2-1** through **Figure 3.2-8**.

Light rail and traffic control modeling was based on the conceptual designs depicted in the *Basis for Engineering Design* (appendix L). Refinement of crossing control signals will be developed during the Engineering phase based on additional engineering detail and in coordination with NCDOT and other authorities having jurisdiction over the roadways. For this analysis, where the light rail alignment is proposed to be median-running (such as on University Drive and Erwin Road) or side-running within the street (such as on Pettigrew Street between Chapel Hill Street and Alston Avenue), the intersections were programmed to be controlled by traffic signals that would be preempted by approaching light rail vehicles. As the light rail vehicles approach the traffic signals, the signal would change to allow the light rail vehicle to move through the intersection with minimal delay. Where the light rail alignment crosses roadways at grade, and is not operating within the roadway, the crossings were generally programmed to be controlled by crossing gates and flashing light signals. For the future signal timings, minimum green times, yellow and all-red clearance intervals were based on build intersection geometry, the Institute of Transportation Engineers' pedestrian phasing formula, and recommended traffic settings documented in the *Congestion Management Capacity Analysis Guidelines* (NCDOT 2012).

UNC/NC 54

Under the NEPA Preferred Alternative (C2A, NHC 2, Trent/Flowers Drive, and Farrington Road ROMF) the signal at Mason Farm Road and East Drive would be programmed to operate with signal preemption. The Mason Farm Road at East Drive/Jackson Deck intersection is anticipated to operate at LOS C in 2040 during both peak hours as shown in **Table 3.2-3**. Detailed delay and queuing analysis results are documented in appendix K.4.

No roadway modification is proposed as part of the NEPA Preferred Alternative at this location.

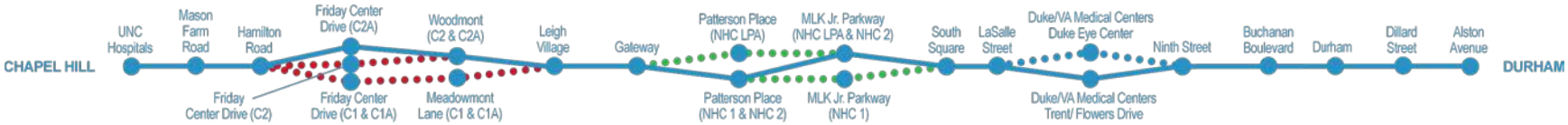
As the NEPA Preferred Alternative exits the UNC Campus, the light rail tracks would be elevated while running parallel to Fordham Boulevard before crossing over the roadway via a bridge to continue toward NC 54. The elevated light rail tracks would have no interaction with Fordham Boulevard and its intersections and would therefore not affect traffic operations.

No roadway modification is proposed as part of the NEPA Preferred Alternative along Fordham Boulevard.

Three stations are proposed along NC 54: Hamilton Road Station, Friday Center Drive Station, and Woodmont Station.

Under the NEPA Preferred Alternative (C2A), the alignment would run adjacent to NC 54 on the south side and would be at grade near the following intersections:

- West Barbee Chapel Road at NC 54



- Friday Center Drive/Meadowmont Lane at NC 54
- East Barbee Chapel Road at NC 54

Right turn acceleration lanes are proposed at two intersections as part of the NEPA Preferred Alternative as described in **Table 3.2-5** to allow for right-on-red turning movements to enter into the congested stream of traffic on NC 54 more easily and reduce queuing on the side streets. As part of the NEPA Preferred Alternative, Triangle Transit would coordinate with NCDOT to determine whether these modifications would be implemented as part of the planned NC 54 superstreet project described in DEIS section 3.2.2.1. All of the intersections would meet NCDOT traffic impact criteria, and there would be no significant LOS impacts under the NEPA Preferred Alternative. Detailed delay and queuing analysis results are documented in appendix K.6.

The NEPA Preferred Alternative would cross over NC 54 and Little Creek on a bridge. The alignment would return to be at grade in the Leigh Village area. After leaving the proposed Leigh Village Station the NEPA Preferred Alternative would cross through the proposed intersection of a new east-west street (referred to as New East-West Street C) and the Falconbridge Road extension, as identified in DEIS section 3.2.2.1; see the *Basis for Engineering Design* (appendix L). The Leigh Village Station park-and-ride is proposed to be located southwest of this intersection. Traffic that would access this intersection from the proposed park-and-ride lot was accounted for in the traffic analysis.

As part of the NEPA Preferred Alternative, George King Road is proposed to be removed from service for the portion where it currently passes through the U.S. Army Corps of Engineers property. The existing George King Road right-of-way is proposed to be used for the light rail alignment. To maintain connectivity, a new connection between George King Road and Cleora Drive would be built, referred to as the realignment of George King Road. The intersection of the connector and the Falconbridge Road Extension would be proposed to be a single-lane roundabout per City of Durham recommendations.

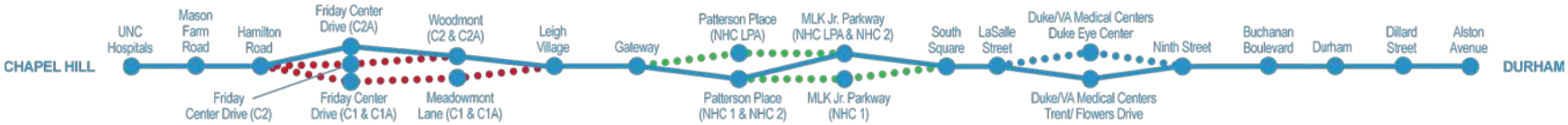
With the NEPA Preferred Alternative, traffic operations at the intersections along Farrington Road would be similar to operations under the No Build Alternative, as listed in **Table 3.2-3**. Under the No Build Alternative, the intersections of NC 54 with Huntingridge Road and the I-40 Eastbound Slip On Ramp would operate at LOS F under one or both peak periods. These intersections are expected to continue to operate at LOS F under the NEPA Preferred Alternative. This is not considered an impact under City of Durham or NCDOT traffic impact criteria since the No Build operations are used as the basis of comparison as described in DEIS section 3.2.1. No roadway modification is proposed at these locations as part of the NEPA Preferred Alternative.

The proposed intersection of the Falconbridge Road Extension and New East-West Street C would operate at LOS D or better during both 2040 Build peak hours. Detailed delay and queuing analysis results are documented in appendix K.7.

University Drive/US 15-501

In this area, the NEPA Preferred Alternative would run parallel to I-40, crossing Old Chapel Hill Road, McFarland Drive, and Southwest Durham Drive at grade. The proposed Gateway Station and park-and-ride lot, the proposed Patterson Place Station, the proposed Martin Luther King Jr. Parkway Station and park-and-ride lot, and the proposed South Square Station and park-and-ride lot would also be located in this area. The US 15-501 Corridor includes University Drive, which is a major roadway that runs south of US 15-501 and serves local traffic within the South Square area in the City of Durham, and Pickett Road, which is north of US 15-501 Business (Durham-Chapel Hill Boulevard).

As listed in **Table 3.2-3**, the intersections along Old Chapel Hill Road in the vicinity of the Gateway Station would be expected to operate at LOS D or better under the NEPA Preferred Alternative. As part of the NEPA



Preferred Alternative, the roundabout at Old Chapel Hill Road and Pope Road would be expanded to accommodate the light rail alignment and crossing gates, as well as a driveway and right turn slip lane from eastbound Old Chapel Hill Road to southbound Pope Road. The slip lane would allow traffic to turn before reaching the light rail crossing gate. Detailed delay and queuing analysis results are documented in appendix K.8.

Adding a traffic signal is proposed as part of the NEPA Preferred Alternative at the intersection of McFarland Drive and Witherspoon Boulevard as described in **Table 3.2-5**. Additional turn bay storage on northbound Witherspoon Boulevard and prohibition of left turns from McFarland Drive are proposed to alleviate delays and queuing identified during the analysis. As listed in **Table 3.2-3**, this intersection would be expected to operate at LOS D or better under the NEPA Preferred Alternative.

Under the NEPA Preferred Alternative (NHC 2), the existing north/south segment of McFarland Drive would end within the Kroger parking lot due to conflict with the proposed Patterson Place Station platform. The east/west segment of McFarland Drive would be extended to intersect with Sayward Drive, at an unsignalized intersection, along the south side of the light rail alignment in order to restore the vehicular connection to Southwest Durham Drive. Detailed delay and queuing analysis results are documented in appendix K.8.

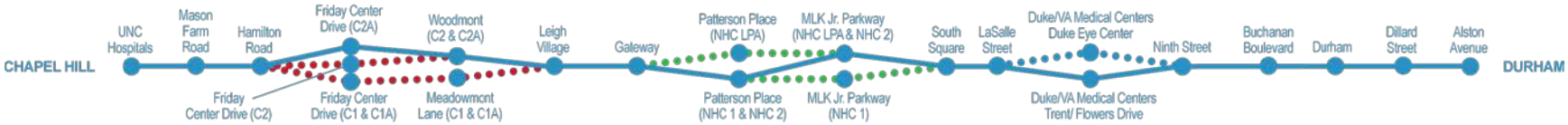
The traffic operations model indicates that all intersections within the University Drive area would be anticipated to operate at LOS E or better during a.m. and p.m. peak hours under the NEPA Preferred Alternative.

The traffic analysis for University Drive in the vicinity of the proposed Martin Luther King Jr. Parkway Station indicates that additional through lanes, increased turn bay lengths, and turning restrictions would be required at the intersections along University Drive in order to alleviate peak hour delays and queues under the NEPA Preferred Alternative as described in **Table 3.2-5**. Unsignalized driveways and side streets along University Drive would be converted to right-in/right-out in order to avoid conflicts between the light rail vehicles and left-turning traffic at these locations.

The NEPA Preferred Alternative (NHC 2) would run in the median of University Drive between Ivy Creek Boulevard and Shannon Road. The intersections of University Drive with Larchmont Road, Lyckan Parkway and Parkway Plaza are proposed to be converted to right-in/right-out. A new two-lane connector roadway is proposed between Larchmont Road and Snow Crest Trail to provide alternative access. An additional eastbound through lane is proposed on University Drive between Ivy Creek Boulevard/Snow Crest Trail and Martin Luther King Jr. Parkway, and additional turning lanes are proposed at the intersections of University Drive and Ivy Creek Boulevard/Snow Crest Trail, Martin Luther King Jr. Parkway, and Westgate Drive. Due to increased congestion on eastbound University Drive, some traffic may divert from Westgate Drive to Shannon Road and from Martin Luther King Jr. Parkway to Shannon Road. A traffic signal is proposed as part of the NEPA Preferred Alternative at the intersection of Pickett Road and Tower Boulevard as described in **Table 3.2-5**. As listed in **Table 3.2-3**, the intersections of Pickett Road with Tower Boulevard and Petty Road would be expected to operate at LOS C or better under the NEPA Preferred Alternative. Detailed delay and queuing analysis results are documented in appendix K.9.

Erwin Road Segment

The implementation of the NEPA Preferred Alternative along Erwin Road would require reconstruction of the roadway from NC 751 (Cameron Boulevard) to east of Anderson Street. The traffic analysis for Erwin Road indicates that additional turn lanes, increased length of turn bays, and turning restrictions would be needed at intersections along Erwin Road in order to alleviate peak hour delays and queues as described in **Table 3.2-5**. Driveways and minor side streets along Erwin Road would be



converted to right-in/right-out in order to avoid conflicts between the light rail vehicles and left turning traffic at these locations. In addition, the existing stop-controlled intersection at Elba Street/NC 147 on-off ramps and Trent Drive would be reconstructed as a roundabout with two-lane approaches, including a new northbound Trent Drive left turn movement, to provide more efficient operation at this intersection. Along with the proposed modifications at the intersection of Trent Drive and Erwin Road, the roundabout would allow for the elimination of the dedicated westbound Erwin Road right turn bay at Fulton Street, which would be required to avoid physical impacts to existing buildings due to the addition of light rail in the existing median under the NEPA Preferred Alternative.

As shown in **Table 3.2-3** all intersections along Erwin Road would operate at LOS E or better during a.m. and p.m. peak hours under the NEPA Preferred Alternative. Only the intersection of Erwin Road and LaSalle Street would experience an overall degradation in LOS, but because that intersection would not fall below LOS D under the NEPA Preferred Alternative, the degradation is not considered to be substantial. The intersection of Erwin Road and Morreene Road/Towerview Road would also experience an overall increase in delay greater than 25 percent in the a.m. peak hour; however, the LOS would remain at LOS D and is therefore not considered to be a substantial impact. Due to signal preemption activities, the movements that conflict with the light rail would experience increased delays. At Erwin Road and Morreene Road/Towerview Road, a dedicated westbound Erwin Road right turn bay would be added and the northbound Towerview Road approach would provide two lanes by removing curbside parking. At Erwin Road and LaSalle Street, the southbound LaSalle Street left turn is forecasted to increase by 300 vehicles per hour in both the a.m. and p.m. peak hours due to demand and access changes to the adjacent intersections. To alleviate the southbound left turn delays and queuing, the southbound approach would be restriped to provide two southbound LaSalle Street left turn bays and one southbound LaSalle Street shared through/right lane.

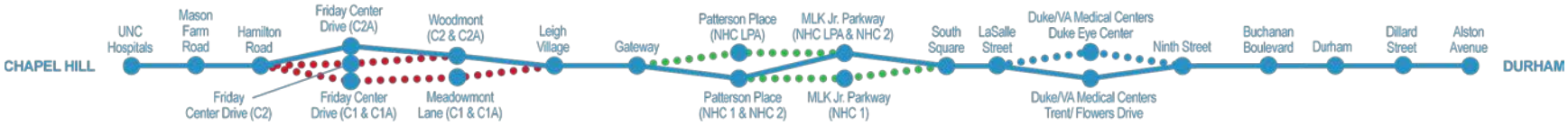
To accommodate the light rail, northbound left turns from Flowers Drive onto Erwin Road would be prohibited, and a signal would be installed to control westbound left turns from Erwin Road onto Flowers Drive. This would have a greater effect on the p.m. peak hour traffic than on the a.m. peak hour traffic. Exiting traffic from Flowers Drive that currently turns left onto westbound Erwin Road would be diverted east to the Erwin Road and Anderson Street intersection or farther west to the Erwin Road and Trent Drive intersection. The traffic modeling indicates that this intersection modification would have little effect on the nearby intersections.

The addition of a dedicated westbound right turn lane on Erwin Road into the Durham VA Medical Center is also proposed as part of the NEPA Preferred Alternative. Although the benefits would not change the overall intersection LOS, this would allow the westbound approach of the intersection to function more efficiently by reducing delay and increasing storage for the right turn movement. Detailed delay and queuing analysis results are documented in appendix K.10.

Downtown Durham

The NEPA Preferred Alternative would follow Pettigrew Street from Ninth Street to the eastern terminus at Alston Avenue. While all of the intersections in the Downtown Durham study area lie within the City of Durham, many of the roadways are maintained by the NCDOT. Traffic impact criteria were applied as shown in **Table 3.2-2**. As shown in **Table 3.2-3** the majority of intersections in Downtown Durham would operate at LOS D or better. Detailed delay and queuing analysis results are documented in appendix K.11.

Under the NEPA Preferred Alternative, the light rail alignment would parallel Pettigrew Street on an elevated structure over Ninth Street and remain above grade to a point



east of Campus Drive. Therefore, there would be no effects to traffic as a result of the NEPA Preferred Alternative in this area.

East of Campus Drive, the light rail alignment would run between the Smith Warehouse and NC 147 while crossing Buchanan Boulevard at grade. Continuing east, the light rail alignment would run within the North Carolina Railroad (NCRR) right-of-way crossing South Gregson Street and South Duke Street at grade. Between West Chapel Hill Street and Dillard Street, the light rail alignment would begin a semi-exclusive street-running alignment, within the NCRR right-of-way generally occupying the space that is currently the northern half of Pettigrew Street. Pettigrew Street would be narrowed to one through lane in the eastbound direction for general traffic and would be closed to westbound general traffic. The light rail alignment is proposed to be built with embedded tracks in this area to allow use by emergency vehicles in the eastbound and westbound light rail transit lanes, and rubber-tired transit vehicles in the westbound light rail transit lane. Eastbound rubber-tired transit vehicles would use the eastbound general purpose lane. At Dillard Street, the light rail alignment would transition to side-running along the north curb of Pettigrew Street where it would continue until the eastern terminus at the Alston Avenue Station. Pettigrew Street would return to two-way traffic east of Dillard Street.

All of the intersections within the Downtown Durham study area are expected to meet NCDOT and City of Durham overall intersection traffic impact criteria, except for the intersection of Main Street and Mangum Street. This intersection is expected to degrade from LOS D under the No Build p.m. peak hour to LOS E under the NEPA Preferred Alternative due to the combination of closely spaced intersections and signal preemption activities. Several measures were included in the light rail alternative at the intersection of Pettigrew Street and Mangum Street to alleviate the direct effects of signal preemption. The traffic analysis for downtown Durham indicates that additional turn lanes and turning restrictions would be needed at intersections along Pettigrew Street in order to alleviate peak hour delays and queues as described in **Table 3.2-5**.

3.2.3.3 Project Element Alternatives

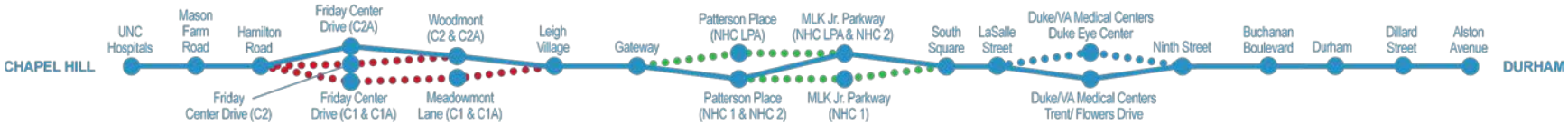
Little Creek Alternatives

Within the UNC/NC 54 segment, there are four alternative alignment crossings of Little Creek between the Hamilton Road Station and the Leigh Village Station (i.e., alternatives C1, C1A, C2, and C2A and associated station location), as shown in the *Basis for Engineering Design* (appendix L). Impacts associated with Alternative C2A are discussed in DEIS section 3.2.3.2. As shown in **Table 3.2-3** the Little Creek NEPA Preferred and Project Element Alternatives would have no impact on the majority of intersections in the NC 54 area, and the majority of intersections would operate at LOS C or better. Under the C2 Alternative, the intersection of East Barbee Chapel Road and NC 54 would operate at LOS F during both peak hours, however, there would be no traffic impact as the No Build conditions are also expected to operate at LOS F. Detailed delay and queuing analysis results are documented in appendix K.6.

C1 and C1A Alternatives

The alignment would be the same under the C1 and C1A Alternatives in the vicinity of the roadway network under study. Therefore, the C1 and C1A Alternatives are analyzed as one combined alternative for the purposes of traffic analyses. Under the C1and C1A alternatives, as the light rail alignment exits the Hamilton Road Station it would run along the northern edge of Finley Golf Course. The alignment would continue east approximately 500 feet south of NC 54 before elevating and turning north at the Friday Center Drive Station.

The alignment would then cross over NC 54 via a bridge near the intersection of Friday Center Drive and would run at grade near the following Meadowmont Lane intersections:



- Meadowmont Lane at Village Crossing Drive
- Meadowmont Lane at East Barbee Chapel Road
- Meadowmont Lane at Sprunt Street
- Meadowmont Lane at Green Cedar Lane

Beyond Green Cedar Lane, the alignment would turn east to continue toward Leigh Village Station.

There are no expected project-related traffic impacts, as shown in **Table 3.2-6**.

C2 Alternative

Under the C2 Alternative, the alignment would continue east from the Hamilton Road Station and run along the northern edge of Finley Golf Course. In this alternative, the alignment would run at grade several hundred feet south of NC 54 between the Hamilton Road Station and East Barbee Chapel Road and would cross the southern legs of the following intersections:

- NC 54 at Friday Center Drive/Meadowmont Lane
- NC 54 at East Barbee Chapel Road

Beyond East Barbee Chapel Road, the alignment would continue northeast and move closer to the south side of NC 54 with at-grade crossings of Littlejohn Road and Downing Creek Parkway. The alignment would then transition to aerial structure to cross over NC 54 east of Downing Creek Parkway and continue toward the Leigh Village Station.

There are no expected project-related impacts as shown in **Table 3.2-6**.

3.2.3.4 New Hope Creek Alternatives

Within the University Drive/US 15-501 segment, there are three Project Element Alternatives (NHC LPA, NHC 1, and NHC 2 and associated station locations), as shown in the *Basis for Engineering Design* (appendix L). Impacts associated with NHC 2 are discussed in DEIS section 3.2.3.2. As shown in **Table 3.2-7** the majority of intersections in the University Drive/US 15-501 segment would operate at LOS E or better under all the New Hope Creek alternatives. Under the NEPA Preferred Alternative (NHC 2) and the NHC LPA Alternative, the NCDOT-maintained intersection of Martin Luther King Jr. Parkway and University Drive would experience a degradation from LOS D to LOS E during the a.m. peak hour; however, queuing analysis indicates that this degradation would not result in upstream traffic impacts on Martin Luther King Jr. Parkway.

Detailed delay and queuing analysis results are documented in appendix K.9.

NHC LPA

The NHC LPA Alternative would cross the intersection of McFarland Drive and Witherspoon Boulevard at grade and meet the proposed Patterson Place Station just east of Sayward Drive. The alignment would continue east along the McFarland Drive proposed extension to cross Southwest Durham Drive at grade between Hopedale Avenue to the north and McFarland Drive to the south. Sayward Drive would be terminated north and south of the proposed Patterson Place Station platform. The NHC LPA Alternative proposes to extend McFarland Drive to Southwest Durham Drive just south of Hopedale Avenue to provide alternative vehicular access at the east end of McFarland Drive. Left turns from Hopedale Avenue onto Southwest Durham Drive would be prohibited due to the proximity of the two intersections and the at-grade crossing of the light rail alignment.

The NHC LPA Alternative shares a common alignment with the NEPA Preferred Alternative (NHC 2) in the vicinity of University Drive as shown in the *Basis for Engineering Design* (appendix L). As shown in **Table 3.2-7**, the intersections in this segment would operate at LOS C or better during both peak hours under the NHC LPA Alternative.

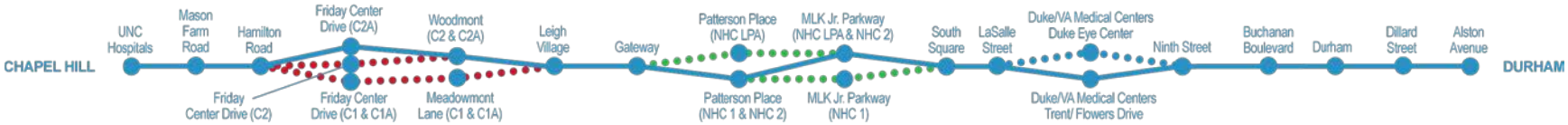


Table 3.2-6: Overall Intersection 2040 LOS – Little Creek Alternatives

Intersection	No Build		NEPA Pref. (C2A)		C1/C1A		C2	
	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.
Finley Golf Course Road/Burning Tree Drive and NC 54[a]	B	B	B	B	N/A	N/A	N/A	N/A
West Barbee Chapel Road and NC 54[a]	C	B	C	B	C	B	B	B
NC 54 and U-Turn [a] (West of Friday Center Drive)	B	C	B	B	B	C	B	C
Friday Center Drive/Meadowmont Lane and NC 54[a]	B	B	B	B	B	B	B	B
Meadowmont Lane and Village Crossing Drive [a]	A	A	A	A	A	A	N/A	N/A
Meadowmont Lane and Barbee Chapel Road [a]	A	A	A	A	B	B	N/A	N/A
Meadowmont Lane and Sprunt Street [a]	A	A	A	B	C	C	N/A	N/A
Meadowmont Lake and Green Cedar Lane [a]	A	A	A	A	A	B	N/A	N/A
East Barbee Chapel Road and NC 54[a]	F	F	B	C	N/A	N/A	F	F

Source: NC 54 Traffic Simulation Report (appendix K.6).

[a] NCDOT Traffic Impact Criteria is applied.

Table 3.2-7: Overall Intersection 2040 LOS – New Hope Creek Alternative

Intersection	No Build		NEPA Pref. (NHC 2)		NHC LPA		NHC 1	
	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.
Southwest Durham Drive and McFarland Drive [a]	—	—	N/A	N/A	B	C	N/A	N/A
Hopedale Avenue and Southwest Durham Drive [a]	A	B	N/A	N/A	A	B	N/A	N/A
University Drive and Snow Crest Trail/Ivy Creek Boulevard [b]	B	D	C	C	C	C	A	B
University Drive and Larchmont [b]	C	E	B	B	B	B	A	B
University Drive and Martin Luther King Jr. Parkway [a]	D	E	E	E	E	E	D	A
University Drive and Lyckan Parkway [b]	A	D	C	D	C	D	A	C
University Drive and Westgate Drive [b]	C	D	D	E	D	E	C	D
University Drive and Westgate Shopping Center [b]	A	E	A	D	A	D	A	D
University Drive and Shannon Road [b]	B	D	B	E	B	E	C	E

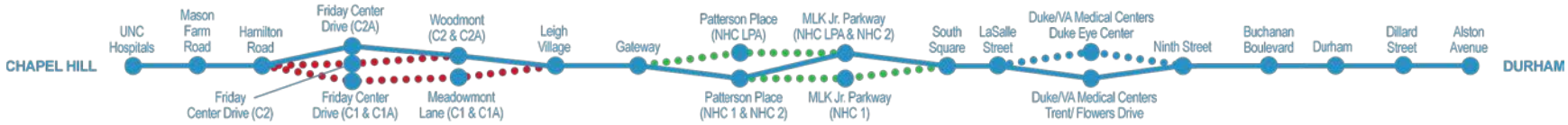
Source: University Drive Traffic Simulation Report (appendix K.9).

Note: The intersection of the park-and-ride entrance and Old Chapel Hill Road would not exist in the No Build Alternative, as a result traffic modeling was not performed for that intersection. N/A indicates that this intersection is not within the area studied as part of this alternative.

Indicates traffic impact.

[a] NCDOT Traffic Criteria is applied.

[b] City of Durham traffic Impact Criteria is applied.



Traffic operations would be the same under both alternatives as shown in **Table 3.2-7**.

NHC 1

The NHC 1 Alternative shares a common alignment with the NEPA Preferred Alternative (NHC 2) in the vicinity of Patterson Place as shown in the *Basis for Engineering Design* (appendix L). Traffic operations would be the same under both alternatives as shown in **Table 3.2-7**.

Under the NHC 1 Alternative, east of Patterson Place the light rail alignment would follow US 15-501 between Garrett Road and Sandy Creek. Lyckan Parkway would be reconstructed in this area in order to accommodate the light rail at-grade adjacent to US 15-501.

After crossing over Martin Luther King Jr. Parkway on a bridge, the NHC 1 Alternative would proceed south from US 15-501 toward University Drive along the eastern side of Martin Luther King Jr. Parkway to the proposed Martin Luther King Jr. Parkway Station, and turn east to run along the north side of University Drive and crossing Lyckan Parkway. The alignment would then cross the westbound University Drive lanes at Westgate Drive to run in the center of University Drive until Shannon Road, where the alignment would then proceed north along the eastern side of Shannon Road, continue north across 15-501 Business on elevated tracks and then run parallel to Tower Boulevard to cross Conifer Glen Lane and Pickett Road. Five intersections along University Drive would be affected due to the implementation of the NHC 1 Alternative. These intersections include University Drive at Martin Luther King Jr. Parkway, Lyckan Parkway, Westgate Drive, Westgate Shopping Center, and Shannon Road.

Additional turning lanes would be added at the intersection of University Drive and Westgate Drive as described in **Table 3.2-5**. It is expected that some traffic would divert from Westgate Drive to Shannon Road due to increased congestion on eastbound University Drive, similar to the expected operations under the NEPA Preferred Alternative (NHC 2) described in DEIS section 3.2.3.2.

The traffic operations model indicates that all intersections in the University Drive area would operate at LOS E or better during a.m. and p.m. peak hours with no traffic impacts expected under the NHC 1 Alternative.

Duke/VA Medical Centers: Duke Eye Center Alternative

There are two alternative locations for the Duke/VA Medical Centers Station. One station alternative, included in the NEPA Preferred Alternative, is located along Erwin Road between the intersections of Trent Drive and Flowers Drive, and the other is located just east of the intersection with the driveways for Duke Eye Center and VA Hospital. They are referred to as the Trent/Flowers Drive Alternative and the Duke Eye Center Alternative. Impacts associated with the Trent/Flowers Drive Alternative are discussed in DEIS section 3.2.3.2.

As shown in **Table 3.2-8**, all intersections in the Erwin Road traffic study segment would operate at LOS D or better during a.m. and p.m. peak hours under both alternatives considered. The overall intersection LOS grades would be the same for both the Duke Eye Center Alternative and Trent/Flowers Drive Alternative. However, the location of the station platform under the Duke Eye Center Alternative would have a greater impact on the roadway network because there would be less space available for vehicle queuing.

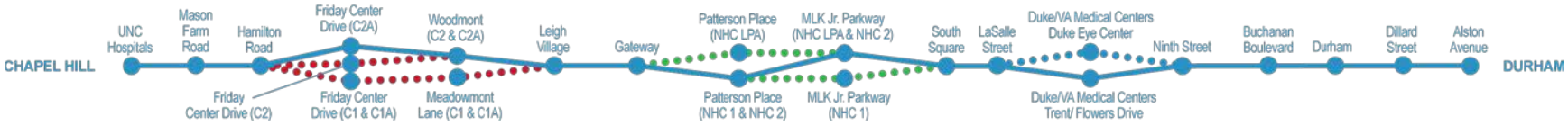


Table 3.2-8: Overall Intersection 2040 LOS – Erwin Road Station Alternatives

Intersection	No Build		NEPA Pref. Alt. (Trent/Flowers Drive)		Duke Eye Center Alt.	
	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.
Duke Eye Center Drive and Erwin Road [a]	A	B	B	B	B	B
Fulton Street and Erwin Road [a]	D	C	C	C	C	C
Trent Drive and Erwin Road [a]	C	D	D	C	D	C
Emergency Drive and Erwin Road [a]	A	B	B	B	B	B
Flowers Drive and Erwin Road [a] (Unsignalized)[b]	A	B	—	—	—	—

Source: Erwin Road Traffic Simulation Report (appendix K.10).

[a] NCDOT Traffic Criteria is applied.

[b] Due to the conversion of the Flowers Drive/Erwin Road intersection to a "T" intersection, allowing only right-in and right-out turns with a permissive westbound left, this intersection cannot be compared to the 2040 No Build scenario.

Because of the proposed station's location, the shorter eastbound and westbound Erwin Road left turn bays into Duke Eye Center would make it more difficult for vehicles to access these bays. This is due to congestion in the adjacent through movements, which would result in increased delays and worse LOS for the left turning vehicles in the Duke Eye Center Alternative. Similarly, in the Duke Eye Center Alternative, there would be limited vehicle storage available in the left turn bay from eastbound Erwin Road onto northbound Fulton Street. In the p.m. peak hour, maximum queue lengths would approach the end of the left-turn bay.

In addition, traffic heading east at the Erwin Road and Fulton Street intersection could spill back to the west, affecting the intersections at Erwin Road and Duke Eye Center Drive, and Erwin Road and Douglas Street/Research Drive.

Detailed delay and queuing analysis results are documented in appendix K.10.

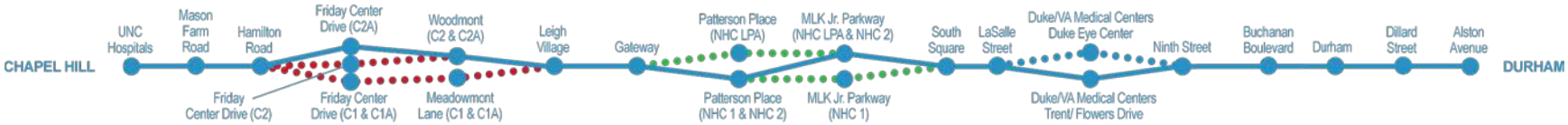
ROMF Alternatives

Due to the operating schedule and low number of employees based at the ROMF, the ROMF would generate minimal peak hour traffic and would not negatively affect overall traffic operations at intersections in the study area as compared to the No Build Alternative.

3.2.4 Mitigation Measures

As described in section 3.2.2, there are numerous roadway project planned by the NCDOT in the vicinity of the proposed D-O LRT Project. During Engineering, Triangle Transit will continue to coordinate with the NCDOT as the designs of these projects advance.

As noted previously and as shown in **Table 3.2-5**, substantial modifications to the roadway are incorporated into the design including additional turn bays and restriping of intersection approaches to accommodate additional receiving lanes in order to minimize impacts to vehicular traffic operations (excessive delays and queues). Additional roadway expansion is not recommended. Additional traffic analysis will be performed during the Engineering phase of the project and the proposed roadway modifications may be refined. It should be noted that several communities in the region are focusing their development efforts on the principles of compact neighborhoods and



complete streets. While design criteria, exemptions, and revisions to comprehensive plans zoning associated with these initiatives are not complete at this time, Triangle Transit will continue to work with the local agencies to determine adjustments to project elements, including inclusion of non-geometric mitigation strategies, if such policies are enacted prior to construction.

Examples of non-geometric mitigation strategies that may be explored by Triangle Transit (coordinated with the City of Durham, NCDOT and major institutional stakeholders along the NEPA Preferred Alternative) include evaluation, development, and enhancement of Travel Demand Management programs to encourage further mode shifts from personal automobiles to transit and non-motorized travel in the station areas.

In coordination with stakeholders and the public during the development of this DEIS, the following areas of interest were identified for further study and potential refinement during the Engineering phase.

3.2.4.1 NC 54

Residents of the Downing Creek neighborhood expressed concern regarding impacts to traffic and safety at the intersections of NC 54 with East Barbee Chapel Road, Littlejohn Road, and Downing Creek Parkway under the C2 and C2A alternatives. Per the request of City of Durham staff, Triangle Transit, in coordination with NCDOT, will refine traffic analysis and mitigation recommendations in this area during the Engineering phase if the C2 or C2A Alternative is selected. Environmental consequences and mitigation related to safety at intersections and at-grade crossings are described in DEIS section 4.12.

3.2.4.2 US 15-501

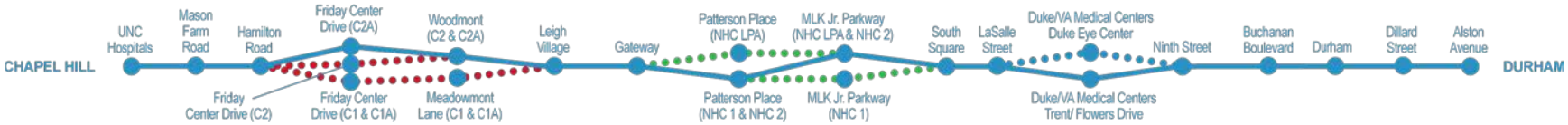
The University Drive corridor is an area that is expected to be designated as a Compact Neighborhood prior to construction of the NEPA Preferred Alternative. As such, Triangle Transit will further evaluate this area in the Engineering phase to attempt to balance the currently proposed roadway modifications in existing transportation policies and land uses with the need to provide a more comprehensive transportation network to support compact development. A Compact Neighborhood contains higher-density development in which a variety of land uses are located such that residents and workers are within walking distance of many destinations.

Coordination with the City of Durham and NCDOT will continue during the Engineering phase to refine the recommended roadway modifications currently identified for the University Drive corridor in this DEIS, particularly as the City develops transportation standards for the areas designated as Compact Neighborhoods. If new transportation design strategies or evaluation policies emerge that are more supportive of the Compact Neighborhood land use designations, then mitigation strategies may be refined. Examples of refined mitigation measures may include: provision of fewer travel or turn lanes; incorporation of additional bicycle and pedestrian infrastructure, where practicable; and the development of Travel Demand Management programs to further encourage mode shifts from personal automobiles to transit and non-motorized travel in the station areas.

3.2.4.3 Erwin Road

The City of Durham is expected to designate parts of Erwin Road as a Compact Neighborhood prior to construction of the NEPA Preferred Alternative. As such, mitigation recommendations in this area may be further evaluated as noted above.

At the intersection of Erwin Road and Anderson Street, the analysis documented in appendix K.10 indicates that the maximum queue lengths for the southbound approaches may exceed the available storage space. In addition, the maximum queue length would potentially extend beyond the signalized intersection at Main Street and Anderson Street, although the average queue length for the southbound

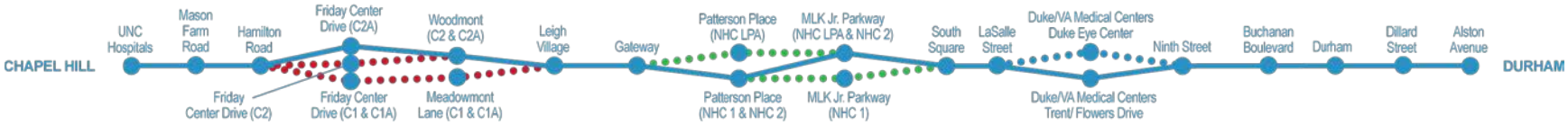


movements is far shorter than the available storage space. There are required “Do Not Stop on Tracks” signs in place to prohibit vehicles from queuing on the railroad tracks between NC 147 and Main Street. Additionally, the southbound left turn is forecasted to have a low demand (20 vehicles per hour) in the p.m. peak hour. Southbound through movement vehicles impact left turning vehicles by adding to the queue that forms in the shared through/left lane. A second eastbound Erwin Road left turn bay was added as part of the proposed roadway modifications for this intersection, which then required two receiving lanes on the north leg of Anderson Street. Due to the physical constraints of the bridge crossing NC 147 and the forecasted volumes, the southbound lane configuration was recommended to be a dedicated southbound right lane and a shared through/left lane. To address the remaining impacts caused by the D-O LRT Project, two additional roadway modification options could be considered during the Engineering phase: (1) prohibit the low volume southbound Anderson Street left turn onto Erwin Road and reroute this traffic, or (2) reconstruct the bridge over NC 147 to provide five lanes with dedicated lanes for the southbound left, through, and right movements.

The analysis also indicates that under certain circumstances, the queue that originates at the westbound Elba Drive left turn to southbound Fulton Street may combine with the upstream queue at the westbound Elba Drive left turn to the Duke Medical Center parking deck. This would result in a maximum queue that extends beyond the proposed roundabout at Trent Drive and Elba Drive/NC 147 on/off-Ramps. This queue could also potentially reach the NC 147 off-ramp. This is an unlikely event; however, to mitigate this compounded maximum queue, the intersection of Elba Drive and the Duke Medical Center parking deck could be investigated further to determine whether traffic can be rerouted from this parking deck entrance or whether the intersection may require signalization.

3.2.4.4 Downtown Durham

All intersections in the Downtown Durham segment would meet the respective overall LOS criteria and the average queues would be accommodated by the available storage, except at Main Street and Mangum Street in the p.m. peak hour. Widening the roadway in this location is infeasible due to existing adjacent buildings. The addition of a third southbound travel lane on Magnum Street could be investigated as a potential mitigation measure if the City of Durham were to allow the existing parking lane to be rededicated as a travel lane.



3.3 Parking

This section of the DEIS documents the potential direct, physical impacts to existing parking facilities from the NEPA Preferred and Project Element Alternatives in comparison to the No Build Alternative. It does not include impacts to existing parking associated with acquired and/or displaced businesses affected by the proposed project. Those impacts are described in DEIS section 4.14.

3.3.1 Methodology

Parking surveys were performed using a combination of reviews of aerial imagery and field visits in the study area. The surveys inventoried existing on-street and off-street parking. The parking study area is defined as follows:

- Within the anticipated limits of construction of the proposed D-O LRT Project
- Within ¼-mile of the proposed stations

The assessment of physical effects examined the NEPA Preferred and Project Element Alternatives in comparison to the No Build Alternative, including the alignments, stations, park-and-ride facilities, and ROMF. Potential impacts were determined by overlaying the anticipated limits of construction of the proposed D-O LRT Project design elements on aerial images. Triangle Transit examined the existing parking facilities within the construction limits for changes in access and direct physical impacts then tallied the number of affected parking. The assessment of potential mitigation used GIS-based information supported by engineering to identify opportunities to replace affected parking in close proximity to the proposed impact area.

An assessment of other effects such as additional demand for parking in the vicinity of proposed stations was performed for the area within ¼-mile of proposed stations. The locations and sizes of the park-and-ride lots proposed as part of the proposed D-O LRT Project were developed in coordination with local governments using parking demand data obtained from the travel demand model described in appendix K.2.

3.3.2 Affected Environment

Table 3.3-1 identifies the approximate number of parking spaces (either within a parking deck, surface lot, or on-street) within the ¼-mile radius of each proposed station.

3.3.3 Environmental Consequences

The potential effects to existing public and private parking facilities by the NEPA Preferred and Project Element Alternatives in comparison to the No Build Alternative are detailed below. **Figures 3.3-1** through **3.3-3** illustrate the locations of potential parking impacts. The NEPA Preferred and Project Element Alternatives would include a number of park-and-ride facilities associated with stations. **Table 3.3-2** summarizes the proposed park-and-ride facilities for NEPA Preferred and Project Element Alternatives.

In the No Build Alternative, the demand for parking in the study area would increase as additional growth in population, employment, and vehicular traffic occur. New residential, commercial, and institutional development would be obligated to provide parking according to the current local zoning and development requirements. No future public parking decks or surface lots were identified in local capital improvement programs or through discussions with local planning staff.

3.3.3.1 NEPA Preferred Alternative

The NEPA Preferred Alternative would affect existing parking facilities at proposed stations and along the alignment. The locations where parking would be affected are illustrated on **Figures 3.3-1** through **3.3-3** and summarized in **Table 3.3-3**.

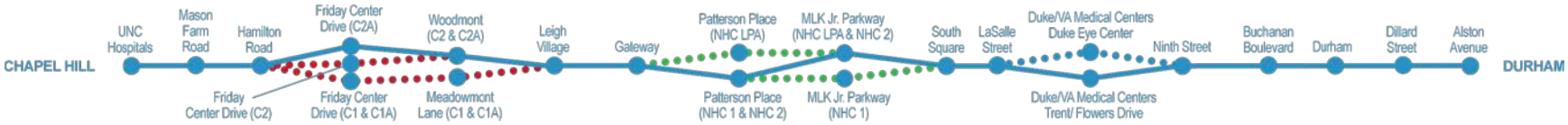


Table 3.3-1: Existing Parking Spaces

Station	Approximate Number of Spaces	Parking Type
UNC Hospitals	4,600	Parking decks, surface lots, and on-street
Mason Farm Road	750	Surface lots
Hamilton Road	600	Parking decks, surface lots, and on-street
Friday Center (3 alternatives)	2,200	Surface lots
Meadowmont Lane [a] (C1/C1A)	750	Surface lots
Woodmont [a] (NEPA Preferred/C2)	50	Surface lots
Leigh Village	0	N/A
Gateway	100	Surface lots
Patterson Place (2 alternatives)	1,400	Surface lots
Martin Luther King Jr. Parkway (2 alternatives)	3,400	Surface lots
South Square	3,900	Surface lots
LaSalle Street	2,500	Surface lots
Duke/VA Medical Centers: Duke Eye Center [a]	8,300	Parking decks, surface lots, and on-street
Duke/VA Medical Centers: Trent/Flowers Drive* (NEPA Preferred)	5,900	Parking decks, surface lots and on-street
Ninth Street	1,000	Surface lots and on-street
Buchanan Boulevard	800	Surface lots and on-street
Durham	3,700	Parking decks, surface lots, and on-street
Dillard Street	1,100	Surface lots
Alston Avenue	350	Surface lots

Source: STV 2015.

[a] Station alternatives.

Table 3.3-2: Summary of D-O LRT Project Park-and-Ride Facilities

Station	Proposed Number of Park-and-Ride Spaces	Parking Type
UNC Hospitals	0	N/A
Mason Farm Road	0	N/A
Hamilton Road	0	N/A
Friday Center (3 alternatives)	860	Existing surface lot
Meadowmont Lane [a]	0	N/A
Woodmont [a]	0	N/A
Leigh Village	990	Surface lot

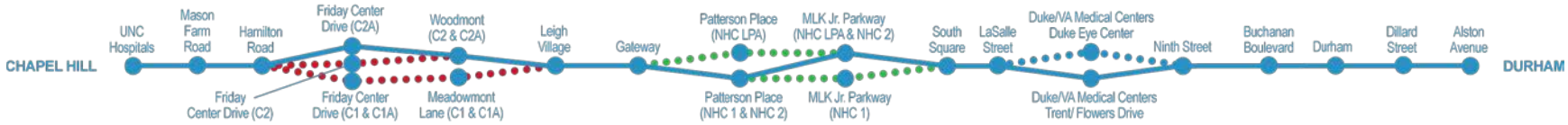


Table 3.3-2: Summary of D-O LRT Project Park-and-Ride Facilities

Station	Proposed Number of Park-and-Ride Spaces	Parking Type
Gateway	470	Surface lot
Patterson Place (2 alternatives)	0	N/A
Martin Luther King Jr. Parkway (2 alternatives)	500	Surface lot
South Square	250	Surface lot
LaSalle Street	0	N/A
Duke/VA Medical Centers: Duke Eye Center [a]	0	N/A
Duke/VA Medical Centers: Trent/Flowers Drive [a]	0	N/A
Ninth Street	0	N/A [b]
Buchanan Boulevard	0	N/A
Durham	150	Existing parking deck
Dillard Street	950	Surface lot
Alston Avenue	980	Parking deck

Source: STV and AECOM 2015.

[a] Station alternatives.

[b] Nominal ADA-only parking may be provided if feasible.

Table 3.3-3: Parking Impacts

	No Build Alternative	NEPA Preferred Alternative [a]	Little Creek Alternatives			New Hope Creek Alternatives		Duke/VA Medical Centers
			C1	C1A	C2	NHC LPA	NHC 1	Duke Eye Center
Approximate number of parking spaces removed	0	705	245	245	85	55	180	20
Approximate number of spaces removed compared to the NEPA Preferred Alternative			+190	+190	+30	-50	+75	+5

Source: STV 2015.

[a] The NEPA Preferred Alternative includes C2A, NHC 2, Trent/Flowers Drive Station, and the Farrington Road ROMF.

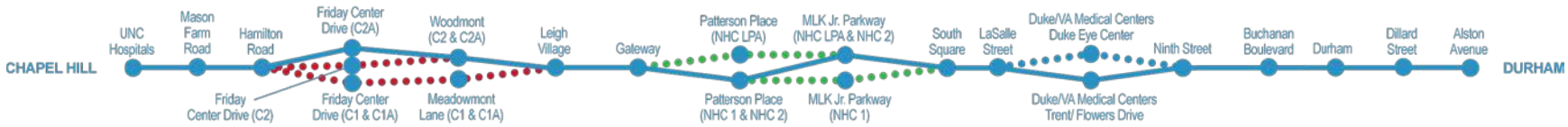
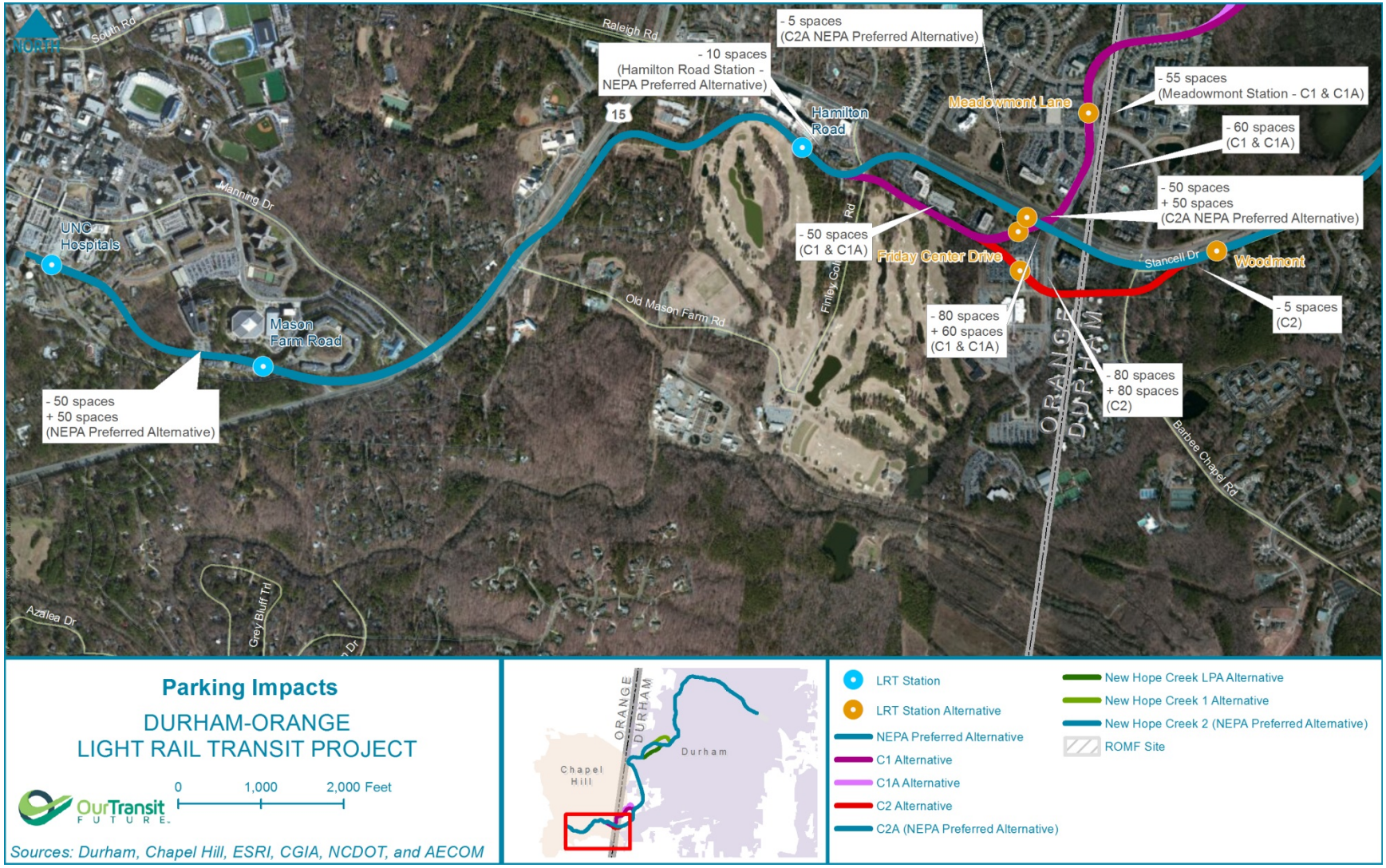


Figure 3.3-1: Parking Impacts



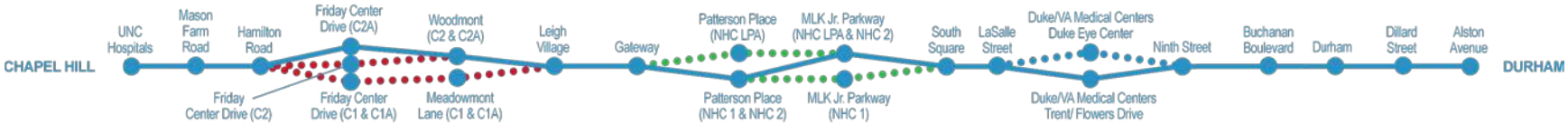


Figure 3.3-2: Parking Impacts

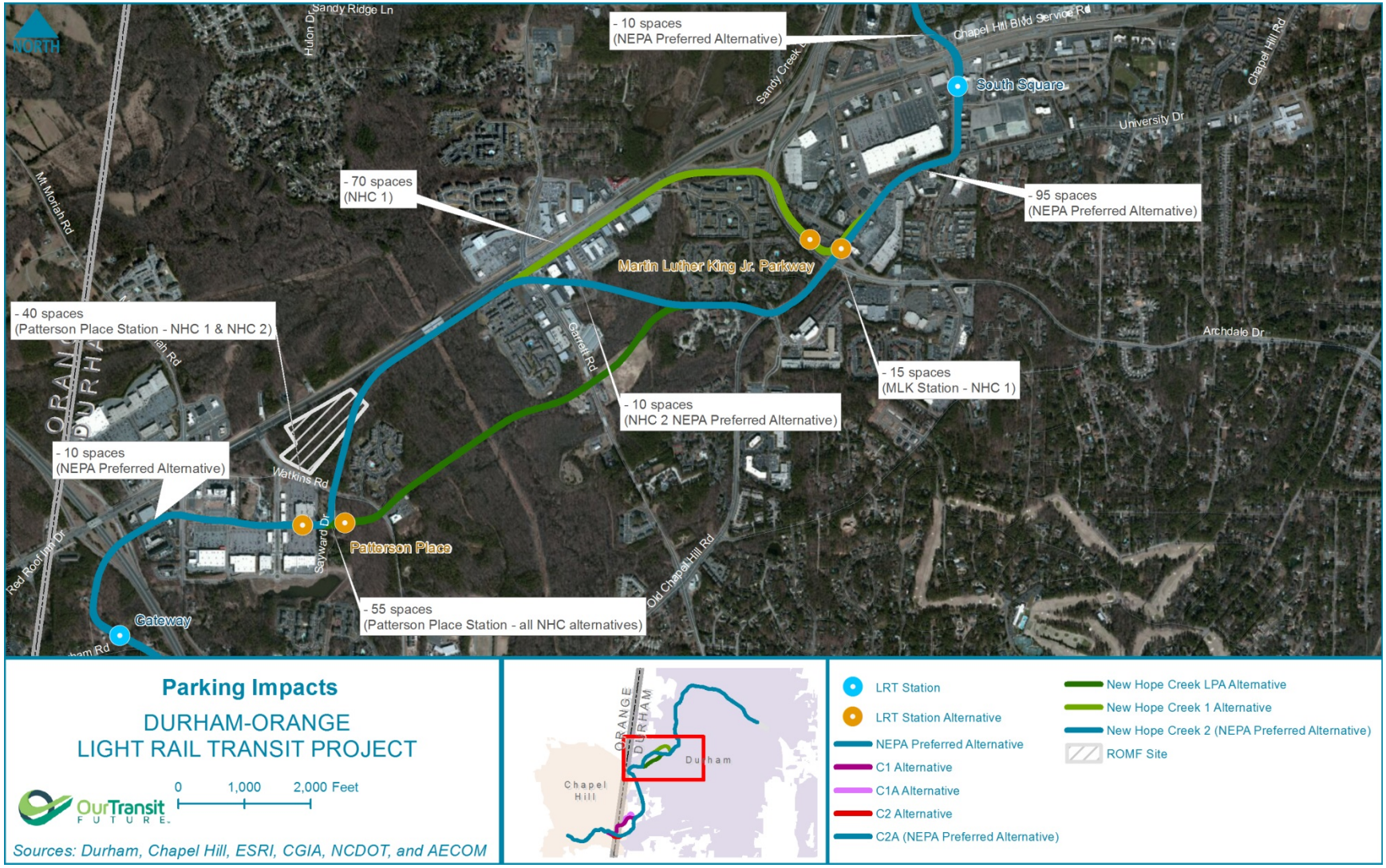
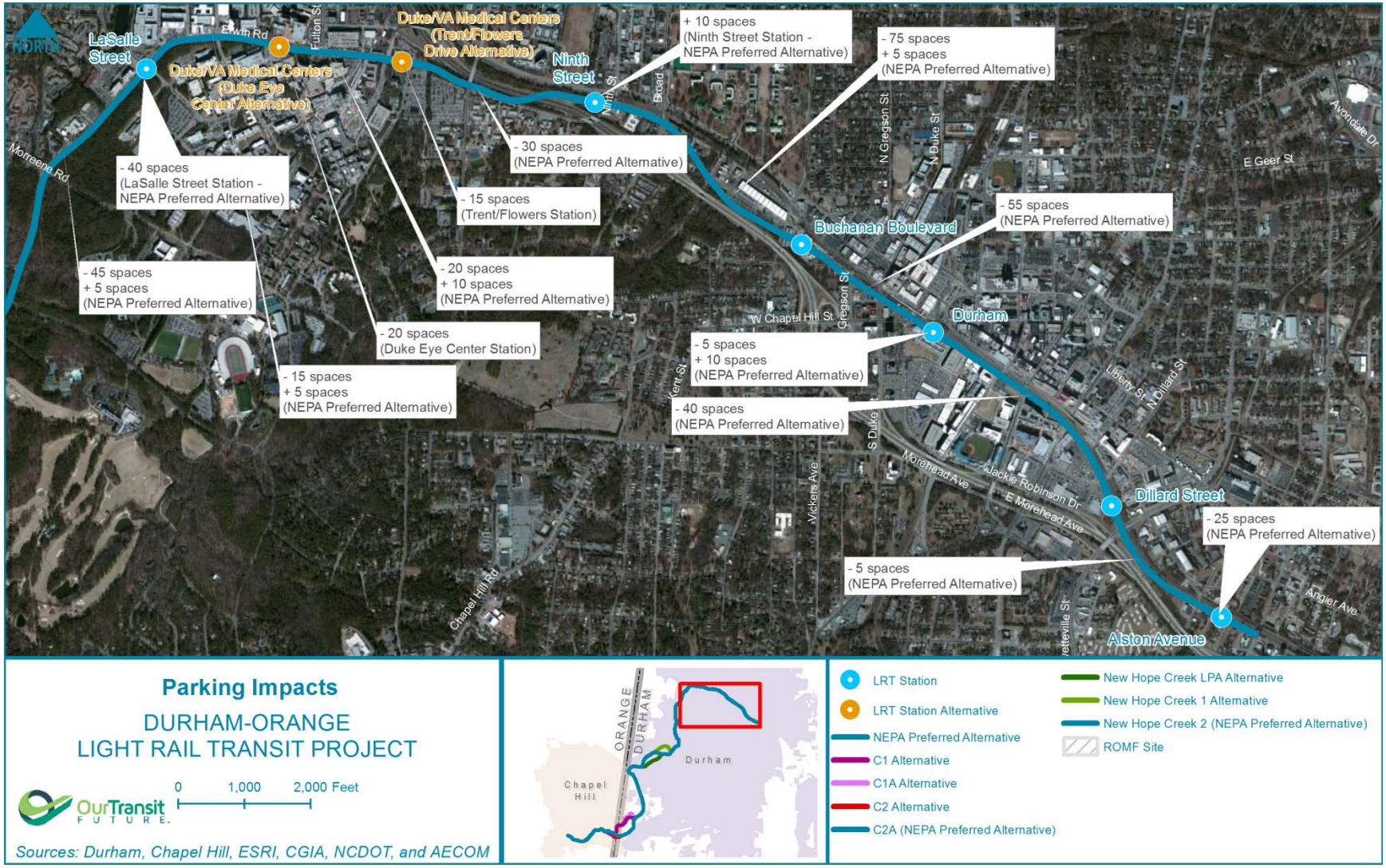
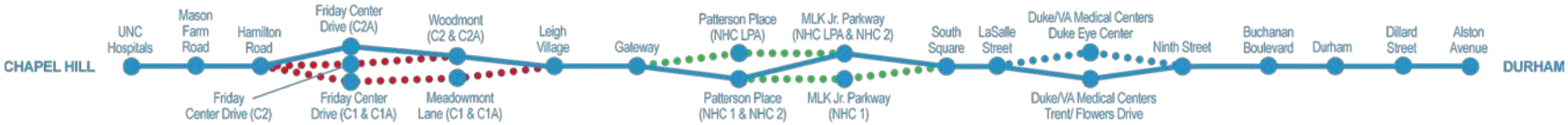


Figure 3.3-3: Parking Impacts





Efforts to minimize the loss of parking were taken into consideration throughout the design process. The potential physical impacts on parking caused by the NEPA Preferred and Project Element Alternatives are depicted in the *Basis for Engineering Design* (appendix L). The NEPA Preferred Alternative would physically remove approximately 705 parking spaces where the proposed alignment would cross existing parking lots and where roadway modifications to accommodate the alignment would affect parking.

3.3.3.2 Project Element Alternatives

Little Creek Alternatives

For the Little Creek alternatives, the C1 and C1A alternatives would remove 190 additional parking spaces over those removed by the NEPA Preferred Alternative, while the C2 Alternative would remove 30 additional spaces.

New Hope Creek Alternatives

For the New Hope Creek Alternatives, the NHC LPA Alternative would remove 50 fewer spaces compared to the NEPA Preferred Alternative, while the NHC 1 Alternative would remove 75 additional spaces.

Duke/VA Medical Centers Station: Duke Eye Center

The Duke Eye Center Station Alternative would remove 5 additional spaces over the amount identified for the NEPA Preferred Alternative.

ROMF

None of the ROMF alternatives would affect existing parking.

3.3.4 Mitigation Measures

Mitigation measures to address parking impacts were considered during the proposed D-O LRT Project development. **Table 3.3-4** summarizes the new or reconfigured parking spaces that are proposed as mitigation based on the level of engineering completed to date. The quantities expressed in this section do not include the parking space counts for the proposed park-and-ride facilities planned for the D-O LRT Project. Despite the addition of park-and-ride spaces, there may be some spillover of parking onto nearby streets. Triangle Transit will work with the municipalities to develop appropriate mitigation measures if spillover parking becomes a concern.

3.3.4.1 NEPA Preferred Alternative

For the NEPA Preferred Alternative, approximately 160 replacement parking spaces would be provided, resulting in a net loss of 545 spaces due to the NEPA Preferred Alternative.

3.3.4.2 Project Element Alternatives

The C1 and C1A Little Creek alternatives would each provide 10 more replacement spaces, while the C2 Alternative would replace 30 additional spaces. The New Hope Creek alternatives would provide no replacement parking. The Duke Eye Center Alternative would replace the same number of parking spaces as the NEPA Preferred Alternative. None of the ROMF alternatives require mitigation because none cause any parking impacts.

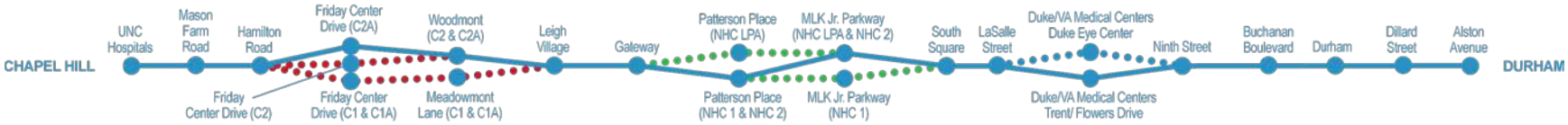


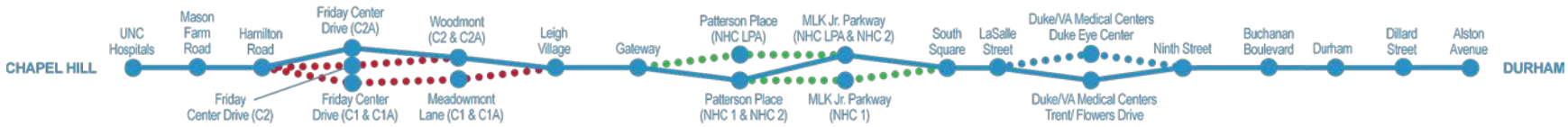
Table 3.3-4: Summary of Parking Impacts and Proposed Mitigation

	No Build Alternative	NEPA Preferred Alternative [a]	Little Creek Alternatives			New Hope Creek Alternatives		Duke/VA Medical Centers
			C1	C1A	C2	NHC LPA	NHC 1	Duke Eye Center
Approximate number of parking spaces removed	0	705	+190	+190	+30	-50	+75	+5
Approximate number of parking spaces replaced	0	160	+10	+10	+30	0	0	+0
Net parking loss with mitigation	0	545	+180	+180	+0	-50	+75	+5

Source: STV 2015.

Note: Does not include proposed park-and-ride lots.

[a] The NEPA Preferred Alternative includes C2A, NHC 2, Trent/Flowers Drive Station, and the Farrington Road ROMF.



3.4 Freight and Passenger Railroads

This section describes the existing freight and passenger rail infrastructure and service within the D-O Corridor and the potential impacts of the NEPA Preferred and Project Element Alternatives as compared to the No Build Alternative.

3.4.1 Methodology

Data collection efforts documented the existing railroad ownership and operating characteristics for both existing and future freight and passenger rail within the proposed D-O Corridor. This effort included discussions with the operating railroad, Norfolk Southern (NS) and review of 2011 NS track charts and valuation maps. In addition, the NCDOT Rail Division provided information that included a review of the Federal Railroad Administration database of inventory crossings and data collected on recent roadway and traffic separation studies. Triangle Transit conducted extensive consultation with NCRR (the owner of the rail corridor) through a series of management and technical meetings.

The study area for the freight and passenger railroads includes the portion of the NCRR right-of-way within 500 feet of the project D-O LRT Project.

3.4.2 Affected Environment

An approximately three-mile segment of active railroad track parallels the northern segment of the D-O Corridor. The right-of-way and track, owned by the NCRR, enters the corridor from the west just north of NC 147 near Erwin Road. From there it continues east, remaining just north of Pettigrew Street through downtown Durham, **Figure 3.4-1**.

Norfolk Southern Railway (NS) maintains railroad tracks in the D-O Corridor that are shared by intercity passenger trains. Federal Railroad Administration regulations provide requirements for track inspection and maintenance according to engineering standards for track geometry, track roadbed and drainage, proper inspection procedures, and any penalties for non-compliance. As the railroad responsible for track maintenance, NS must comply with these track safety regulations in order to maintain freight train speeds and for Amtrak/NCDOT Rail Division to operate at maximum authorized timetable speeds.

Railroad operations occur on the single mainline track through downtown Durham. NCRR leases the track to NS for freight operations and Amtrak operates daily passenger service through Durham on them.

3.4.2.1 Freight Railroads

Under a lease agreement with NCRR, NS operates mainline freight service in the NCRR Corridor with up to eight freight train movements per day through downtown Durham. The primary freight line passing through the study area is the NS “H” line. NS also maintains a siding track adjacent to the H line in Durham from Fayetteville Street to the east end the of the study area.

The 2040 MTP (2013) identifies the planned projects for forecast year 2040, which would include the grade separation of the current at-grade railroad crossings at Blackwell Street and Magnum Street. In addition to those projects, NCDOT Rail Division is working with NCRR and NS to improve the Raleigh-to-Charlotte rail corridor through a capital improvement program known as the Piedmont Improvement Program. This program provides infrastructure improvements to enhance capacity, allowing a reduction in travel times for both freight and passenger rail. The Piedmont Improvement Program has planned several improvements to rail infrastructure along the NCRR Corridor, although no infrastructure improvements funded under the Piedmont Improvement Program are within the D-O Corridor. All projects are expected to be complete by 2017 (NCDOT Rail Division 2015).

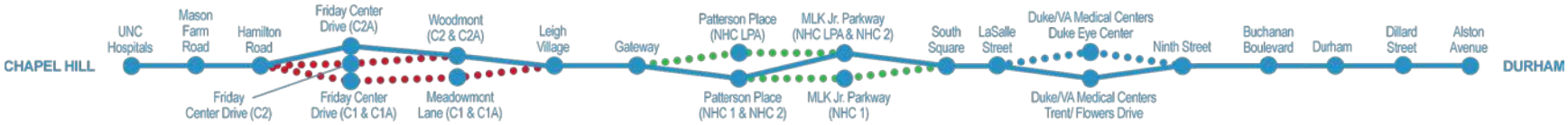
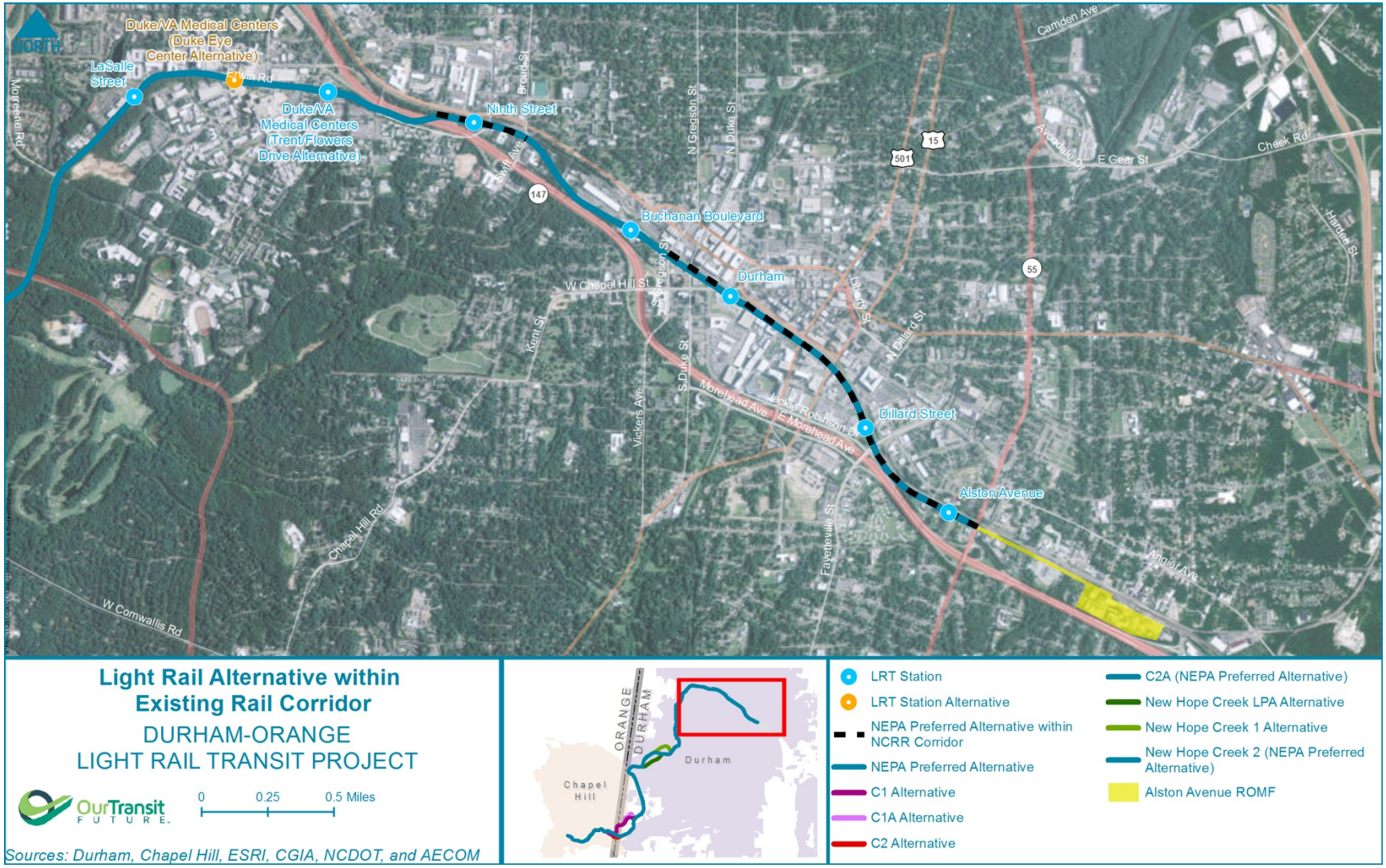
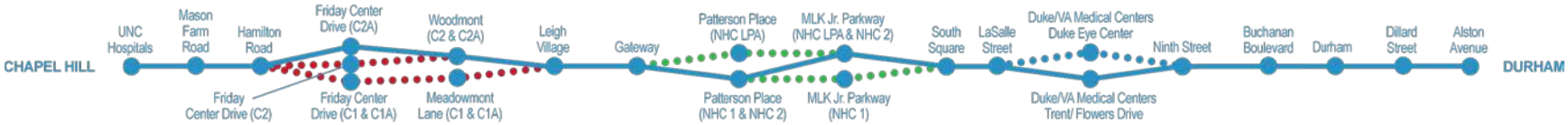


Figure 3.4-1: Light Rail Alternative Segment within the Existing Rail Corridor





As owner of the corridor, NCRR has developed conceptual plans for future tracks for freight, intercity passenger, and future commuter rail service through the study area (NCRR 2014). These concepts take into consideration the provision of anticipated freight traffic demands as well as future frequencies for intercity passenger and commuter rail.

3.4.2.2 Passenger Railroads

Amtrak passenger rail operates in North Carolina through agreements with NS and CSX Transportation (CSXT). Currently, two different Amtrak trains operate within the D-O Corridor: the Carolinian (New York – Charlotte) and the Piedmont (Charlotte – Raleigh). The NCDOT Rail Division manages the Piedmont, with operation by Amtrak. The service uses locomotives and coaches owned and maintained by the NCDOT Rail Division. As of April 2015, the Carolinian service consists of two trains daily through Durham, and the Piedmont service provides four trains daily through Durham, with plans to increase service to eight intercity passenger trains per day by 2017. The Durham Station is proposed to be located near the Durham Amtrak station, which is located within the NCRR Corridor along West Main Street. This is also near the Durham Transit Station, a multi-modal transportation facility for local and regional bus service and intercity buses (e.g., Greyhound, Megabus).

3.4.2.3 Grade Crossing Safety and Inventory

Through its Sealed Corridor Program, NCDOT has worked with NCRR, NS, and CSXT to improve safety between Raleigh and Charlotte by using enhanced traffic control devices, crossing closures, and grade separations to reduce conflicts between rail and vehicle traffic.

Where the D-O Corridor is within the NCRR Corridor, there are nine existing at-grade railroad crossings and six existing grade-separated railroad crossings. **Table 3.4-1** identifies the at-grade railroad crossings. These crossings are located on roadways that provide access to existing businesses and residential neighborhoods, and provide connectivity between neighborhoods, Duke University, and downtown Durham.

3.4.3 Environmental Consequences

The following section compares the environmental consequences of the NEPA Preferred and Project Element Alternatives on the existing and programmed future freight and passenger rail infrastructure in comparison to the No Build Alternative.

3.4.3.1 NEPA Preferred Alternative

The NEPA Preferred Alternative proposes constructing the light rail tracks along the southern portion of the existing NCRR right-of-way. The NEPA Preferred Alternative would run within the NCRR Corridor in two separate segments for a total distance of approximately 1.8 miles. The first segment parallels the NCRR Corridor from a point just west of Erwin Road for a distance of just over 0.3 mile continuing east until it crosses Swift Avenue. It then transitions southward leaving the NCRR Corridor until it returns to the southern margin of the corridor at S. Gregson Street. From this point, the NEPA Preferred Alternative continues within the NCRR corridor for a distance of approximately 1.5 miles to the proposed Alston Avenue Station located in east Durham. In May 2015, the NCRR Board of Directors authorized NCRR management to enter into lease agreement negotiations with Triangle Transit for the proposed D-O LRT Project based on the proposed D-O light rail alignment (appendix G).

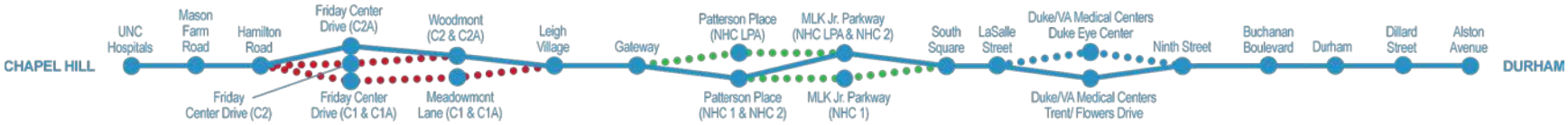


Table 3.4-1: Existing At-Grade Railroad Crossings within the Study Corridor

Crossing #	Crossing	Number of Tracks	Number of Travel Lanes
35223X	Swift Avenue	1	5
735225L	South Buchanan Boulevard	1	2
735227A	South Duke Street	1	3
735229N	Blackwell Street/S Corcoran Street	1	4
735231P	South Mangum Street	1	4
735389C	South Dillard Street	1	3
910505Y	Fayetteville Street	1	5
630474Y	Ramseur Street/Grant Street	2	2
630472K	South Plum Street (Alston Avenue ROMF)	5 [a]	2

Source: STV 2015.

[a] Of the five tracks, three CSXT tracks are part of the CSXT yard and two are NS tracks. All other tracks listed in Table 3.4 1 are NS tracks.

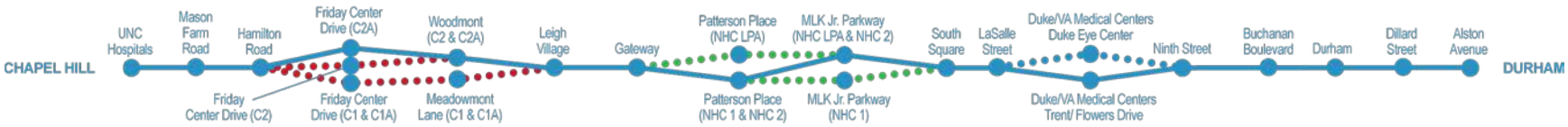
The current and proposed freight and intercity passenger rail service would continue to operate on the existing railroad tracks. The light rail tracks would be located on the southern side of the NCRR right-of-way on separate tracks largely within the existing Pettigrew Street cross-section, with a minimum distance of 40 feet from any potential future railroad track and a minimum of 55 feet from the nearest existing railroad track, as identified and required by NCRR. The proposed grade separation of Blackwell Street/South Corcoran Street and South Mangum Street to accommodate freight and passenger rail service is not applicable to the light rail tracks that are part of the proposed D-O LRT Project. Instead, the proposed D-O LRT alignment would be at-grade crossing Blackwell Street/South Corcoran Street and South Mangum Street and would be controlled by traffic signals.

An **at-grade crossing** is an intersection of a rail line and a roadway at the same elevation (grade).

A **grade-separated crossing** is a location where a rail line passes either over or under a roadway on a bridge or underpass.

The proposed track design and layout within or adjacent to the NCRR Corridor has been the subject of numerous coordination meetings between NCRR and Triangle Transit. The primary focus of these meetings was to determine the appropriate offset distance between the NEPA Preferred Alternative and the railroad tracks so that additional future tracks for freight, passenger, and/or commuter rail service through downtown Durham could be accommodated if needed. As a result of this coordination, the NEPA Preferred Alternative plans have incorporated both requests from NCRR of allowing space for future additional railroad tracks and for providing appropriate distance between the NEPA Preferred Alternative tracks and existing and potential future railroad tracks.

Under the NEPA Preferred Alternative, the railroad-roadway at-grade and grade-separated crossings would remain as in the No Build Alternative. No changes to the railroad-roadway at-grade crossings are proposed for the project with any of the NEPA Preferred and Project Element Alternatives.



The NEPA Preferred Alternative will not have direct effects on the daily rail operations for freight or passenger rail service. Both the current and proposed freight and passenger rail service would continue to operate on separate tracks, while the portion of the NEPA Preferred Alternative located within the NCRR Corridor would be located on the southern side of the NCRR right-of-way largely within the existing Pettigrew Street. The NEPA Preferred Alternative would not cross existing railroad tracks at any location within the study area.

3.4.3.2 Project Element Alternatives

Similar to the NEPA Preferred Alternative, there would be no impacts on freight or passenger rail service or facilities associated with the Little Creek Alternatives, New Hope Creek Alternatives, or the Duke Eye Center Station Alternative, as there is no existing freight or passenger rail service in these portions of the corridor.

Similar to the NEPA Preferred Alternative, three of the other ROMF alternatives (Leigh Village, Patterson Place, and Cornwallis Road) would also have no impacts on freight or passenger rail service. However, the Alston Avenue ROMF Alternative is located on a property with a rail spur that provides freight rail access from NS to the business located on the site. As a result, the selection of the Alston Avenue ROMF would result in the displacement and relocation of one existing freight rail customer and the elimination or relocation of the rail spur that provides freight service access to the business.

In addition, the Alston Avenue ROMF Alternative would require approximately 0.5 mile of additional light rail track within the NCRR corridor from the Alston Avenue Station to the Alston Avenue ROMF site east of Bacon Street.

3.4.4 Mitigation Measures

Mitigation measures for the NEPA Preferred and Project Element Alternatives are contained in the following sections.

3.4.4.1 NEPA Preferred Alternative

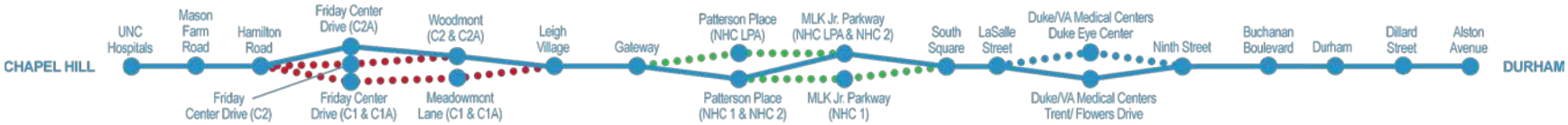
The NEPA Preferred Alternative would operate at-grade in the vicinity of the following at-grade railroad crossings: Buchanan Boulevard, South Duke Street, Blackwell/Corcoran Street, Mangum Street, Dillard Street, Fayetteville Street, and Grant Street. Light rail operations in these locations would be designed so as not to affect railroad operations and would be controlled by a separate train control system. Additional discussion of the design and control of at-grade light rail crossings and light rail operations within the right-of-way of existing streets under the NEPA Preferred Alternative is provided in DEIS sections 3.2 and 4.12.

Mitigation would not be warranted for the implementation of the NEPA Preferred and Project Element Alternatives; however, coordination with NCRR, NS, and NCDOT Rail Division will continue through design and construction for use of the NCRR right-of-way.

3.4.4.2 Project Element Alternatives

No mitigation of freight and passenger rail operations is associated with the Little Creek, New Hope Creek, the Duke Eye Center Station, Leigh Village ROMF, Patterson Place ROMF, or Cornwallis Road ROMF alternatives as there is no existing freight or passenger rail service in these portions of the corridor.

Mitigation measures associated with the Alston Avenue ROMF Alternative would require the acquisition of the property of an existing rail customer and removal of the existing spur track. As discussed in DEIS section 4.14, Triangle Transit would work with the existing business and the railroads to find a new location for the business and any rail spur required for operations. Mitigation measures for the other three ROMF alternatives would not be warranted.



3.5 Airports

This section contains information regarding the proximity of airports to the proposed D-O LRT Project. This section discusses three topics: the safe use of navigable air space, impacts to airport-owned property, and the potential of the elements or facilities associated with the alternatives considered to attract wildlife that is hazardous to aircraft operations.

The Federal Aviation Administration (FAA) is a participating agency for the proposed D-O LRT Project. In May 2012, the FAA participated in an inter-agency meeting as part of NEPA project scoping, and coordination has continued to date. The FAA noted the following:

- The proposed D-O LRT Project is within 5 miles of Horace Williams Airport and Womble Field
- NEPA analysis should ensure that all elements of the project design and construction, including any proposed mitigation measures, consider and incorporate the guidance found in FAA Advisory Circular 150/5200-33B
- If the proposed D-O LRT Project will affect airspace, a Notice of Proposed Construction or Alteration (Form 7460-1) would be required

As a result, the FAA requested the DEIS evaluate potential impacts to airports.

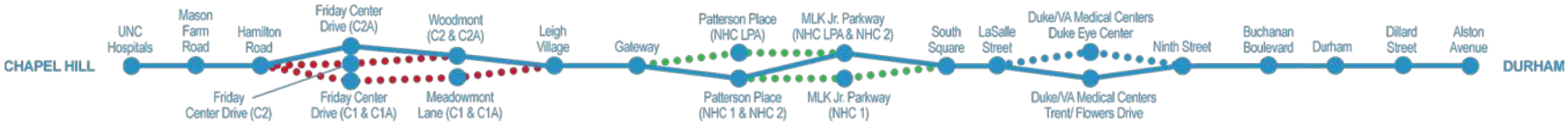
The following terminology is used in this section.

- **Airport**: an area of land or water that is used or intended to be used for the landing and takeoff of aircraft, including its buildings and facilities, if any
- **Airport Layout Plan (ALP)**: an FAA-approved plan showing boundaries and proposed additions, location and nature of existing and proposed airport facilities, and airport location of existing and proposed non-aviation areas
- **Helipad**: a designated land area or roof structure used for the pickup or discharge of passengers and cargo, and that does not provide helicopter maintenance and repair facilities or fueling services
- **Helipad protection zone (HPZ)**: an area off and under the end of the approach and takeoff areas intended to enhance the protection of people and property on the ground
- **Heliport**: a designated land area used for helicopter operations and any appurtenant areas, including fueling facilities, terminal buildings, and maintenance and repair facilities
- **Public use airport**: an airport used or intended to be used for public purposes, and of which the area used or intended to be used for landing, taking off, or surface maneuvering of aircraft may be under the control of a public agency or privately owned and used for public purposes
- **Runway protection zone (RPZ)**: an area at ground level off the runway end to enhance the safety and protection of people and property on the ground

3.5.1 FAA Policies and Guidance

The FAA regulates how the navigable airspace may be safely and efficiently used and preserved, 14 C.F.R. §§ 77.1-77.41. These FAA regulations establish: the requirements to provide notice to the FAA of certain proposed construction; to detail the standards used to determine obstructions to air navigation, and navigational and communication facilities; the process for aeronautical studies of obstructions to air navigation or navigational facilities to determine the effect on the safe and efficient use of navigable air space, air navigation facilities or equipment; and the process to petition the FAA for discretionary review of determinations, revisions, and extension of determinations (14 C.F.R. § 77.1).

Based on the standards and practices contained in FAA Advisory Circular



150/5200-33B (2007 Revision), FAA recommends this Circular for land use planners and developers of projects, facilities, and activities on or near airports. More specifically, planners and developers must take into account whether the proposed land uses would increase wildlife hazards for the airport facilities. The FAA recommends a separation distance of 5,000 feet, 10,000 feet, and 5 miles based on the presence of either piston-powered or turbine-powered aircraft and to protect the approach, departure, and circling of airspace. In particular, the land use practices that could potentially attract wildlife hazards include retention ponds, stormwater treatment facilities, artificial marshes, and constructed wetlands.

According to Section 4.1(b) of the Advisory Circular: “For projects that are located outside the 5,000/10,000-foot criteria but within 5 statute miles of the airport’s area of authority, the FAA may review development plans, proposed land-use changes, operational changes, or wetland mitigation plans to determine if such changes present potential wildlife hazards to aircraft operations.”

3.5.2 Methodology

The evaluation used the latest information from NCDOT Aviation Division, FAA, airnav.com, and coordination with project stakeholders to identify any heliports, helipads, airports, and airfields located near the project and any specific information (facilities, measurements, location, etc.). Research and evaluation based on FAA policies and regulations were conducted to determine the relative impacts of the project on these facilities. Buffers were developed of both project features and relevant facilities to evaluate potential impacts. Mitigation measures were developed using FAA guidance and helped inform the engineering phase.

3.5.3 Affected Environment

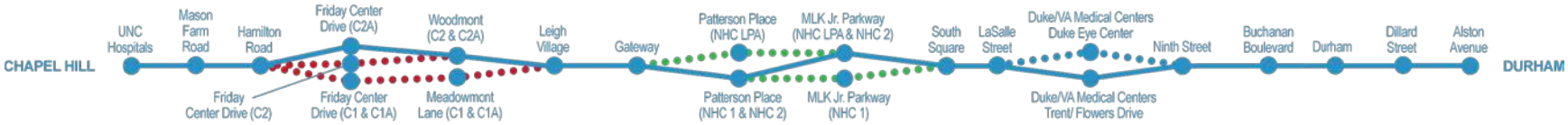
According to the FAA Airport/Facility Directory, there are currently four FAA-identified airports (two airports and two helipads) located within 5 miles of the proposed D-O LRT Project: Horace Williams Airport, Womble Field, Holly Green Heliport, and Duke University North Heliport. UNC has two marked helipads, maintained as part of the operations of the UNC Hospitals; however, they are not classified under the FAA location identifier system.

Horace Williams Airport (IGX) is located in Chapel Hill and is owned and operated by UNC. It is open to the public between dawn and dusk, has no tower, and the airport beacon is lighted from dusk until dawn. The facility was opened in November 1937 with one asphalt runway (9/27) that is approximately 4,005 feet long and 75 feet wide. IGX currently averages 61 flights per week, with a permanently based aircraft fleet of 17. Currently the airport is closed to aircraft greater than 12,500 pounds, gliders, balloons, miniature aircraft, and ultralights. There have been plans to close IGX since 2002; however, currently there is no indication that this airport will be closed in the immediate future.

Womble Field (3NC9) is located approximately 2 miles southwest of Chapel Hill and is a privately owned landing field (permission required prior to landing). Opened in March 1985, the field is owned and managed by Warren G. Womble. The facility has one turf runway (7/25) that is approximately 1,600 feet long and 50 feet wide (note: runway 25 is closed to landing), with no tower. There are currently four permanently-based planes at the landing field, with no published instrument procedures.

Duke University North Heliport (NC92) is located in Durham, North Carolina, on the campus of Duke University. This private facility is owned and operated by the Duke University Medical Center. There is no control tower, but operation is continuous. The helipad is approximately 60 feet by 60 feet and houses two permanent general aviation helicopters.

Holly Green Heliport (83NC) is located in Durham County, along Farrington Road, between NC 54 and I 40. The turf heliport is



privately owned, with permission for use as medical transportation. There is no control tower; however, there are perimeter lights on the edge of the helipad. The helipad measures 110 feet by 100 feet and currently houses one permanent general aviation helicopter.

UNC Hospitals currently maintains two helipads atop the UNC Hospitals Neurosciences Hospital Building. The helipads are used solely for the drop-off and pickup of hospital patients. UNC does not maintain any facilities, permanently house any aircraft (aircraft are housed in Siler City and Fayetteville, North Carolina), or provide staff assistance or landing services.

3.5.4 Environmental Consequences

This section describes the potential impacts of the NEPA Preferred and Project Element Alternatives in comparison to the No Build Alternative on aviation facilities in the vicinity of the proposed D-O LRT Project. Information in this section is based on FAA Plans, Policies, and Guidance, as well as the *Basis for Engineering Design* (appendix L).

The No Build Alternative would neither include any improvements within the RPZs or navigable airspace, nor affect any airport-owned property.

3.5.4.1 NEPA Preferred Alternative

As part of FAA Advisory Circular 150/5300-13A, the FAA regulates particular activities and projects within the airport's RPZ and HPZ. The RPZs for both Womble Field and Horace Williams are approximately 1,700 feet × 500 feet × 700 feet, extending from both ends of the runways. RPZs are trapezoidal in shape, accounting for the varying widths. The NEPA Preferred Alternative would not be located within the RPZ for either Womble Field or Horace Williams.

FAA Orders 1050.1E and 5050.4B require projects to avoid impacting airport-owned property, which would in turn change the ALP, requiring additional environmental review. The NEPA Preferred Alternative would not affect airport-owned property.

The FAA's Safe, Efficient Use, and Preservation of the Navigable Airspace guidance (14 C.F.R. 77.9(e)(1)) details the requirements needed to provide notice to the FAA of certain proposed construction activities. Triangle Transit is not required to file Form 7460-1: Notice of Proposed Construction or Alteration as the project constitutes "any object that will be shielded by existing structures of a permanent and substantial nature or by natural terrain or topographic features of equal or greater height, and will be located in the congested area of a city, town, or settlement where the shielded structure will not adversely affect safety in air navigation" and is thus exempt from filing Form 7460-1.

Construction of the NEPA Preferred Alternative would not directly affect any airport-owned property; thus, no changes to the ALPs are anticipated. Eight of the proposed 17 stations (UNC Hospitals, Mason Farm, Hamilton, Friday Center, Woodmont, Leigh Village, Gateway, and Patterson Place), three park–and-ride lots (Friday Center, Leigh Village, and Gateway), the Farrington Road ROMF, and several aerial structures would be located outside of the 5,000/10,000 foot protection zones as well as the RPZs, but would be within the 5 mile protection zone (**Figure 3.5-1** and **Figure 3.5-2**). However, no impacts are expected because these facilities would be shielded by existing structures of a permanent and substantial nature or by natural terrain or topographic features of equal or greater height, and will be located in the congested area of a city, town, or settlement where the shielded structure will not adversely affect safety in air navigation.

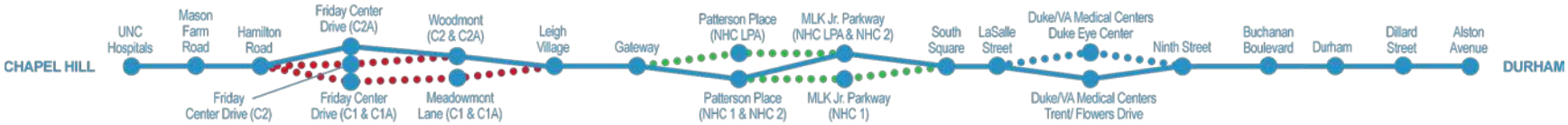


Figure 3.5-1: Airport Locations

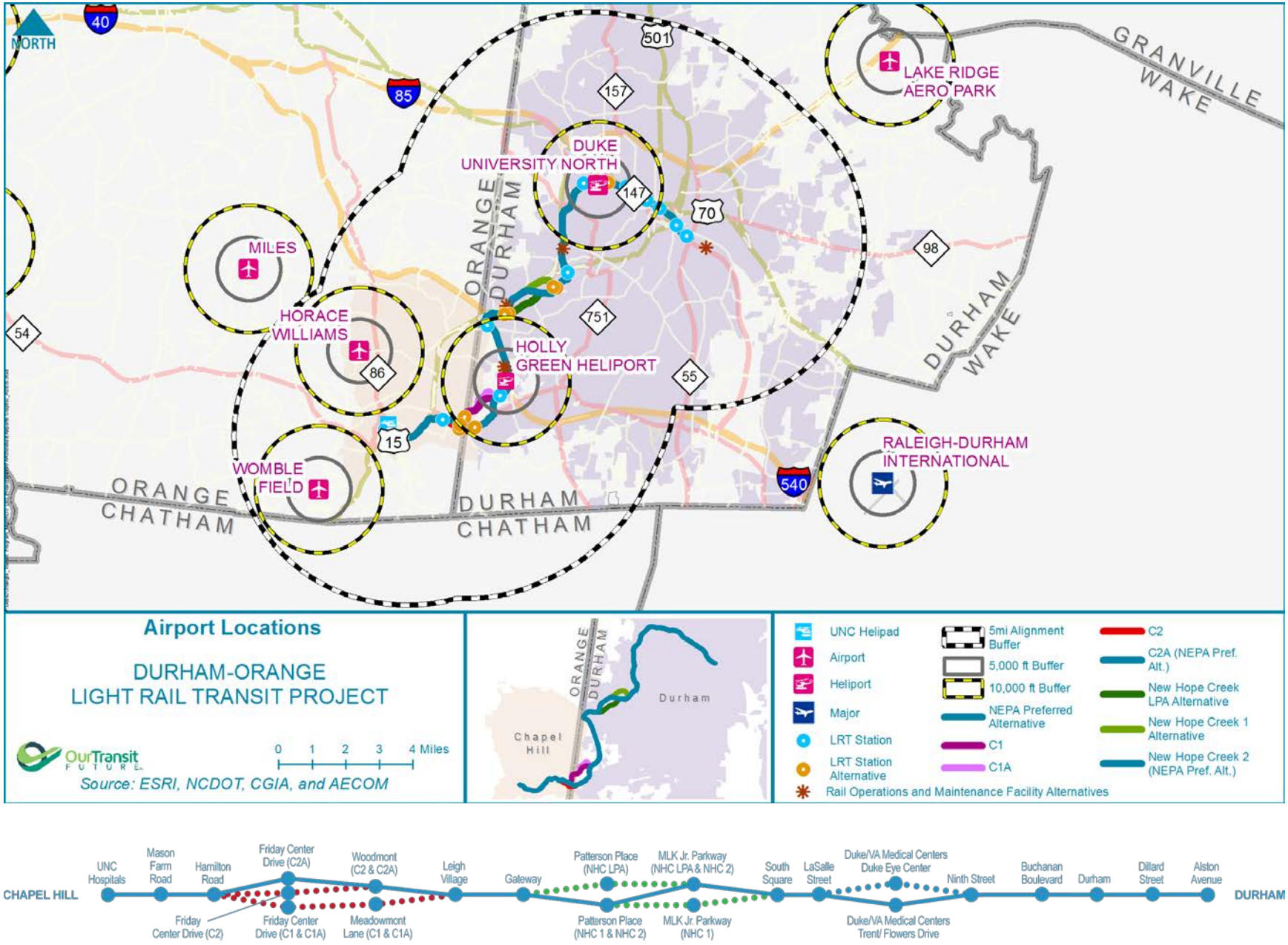
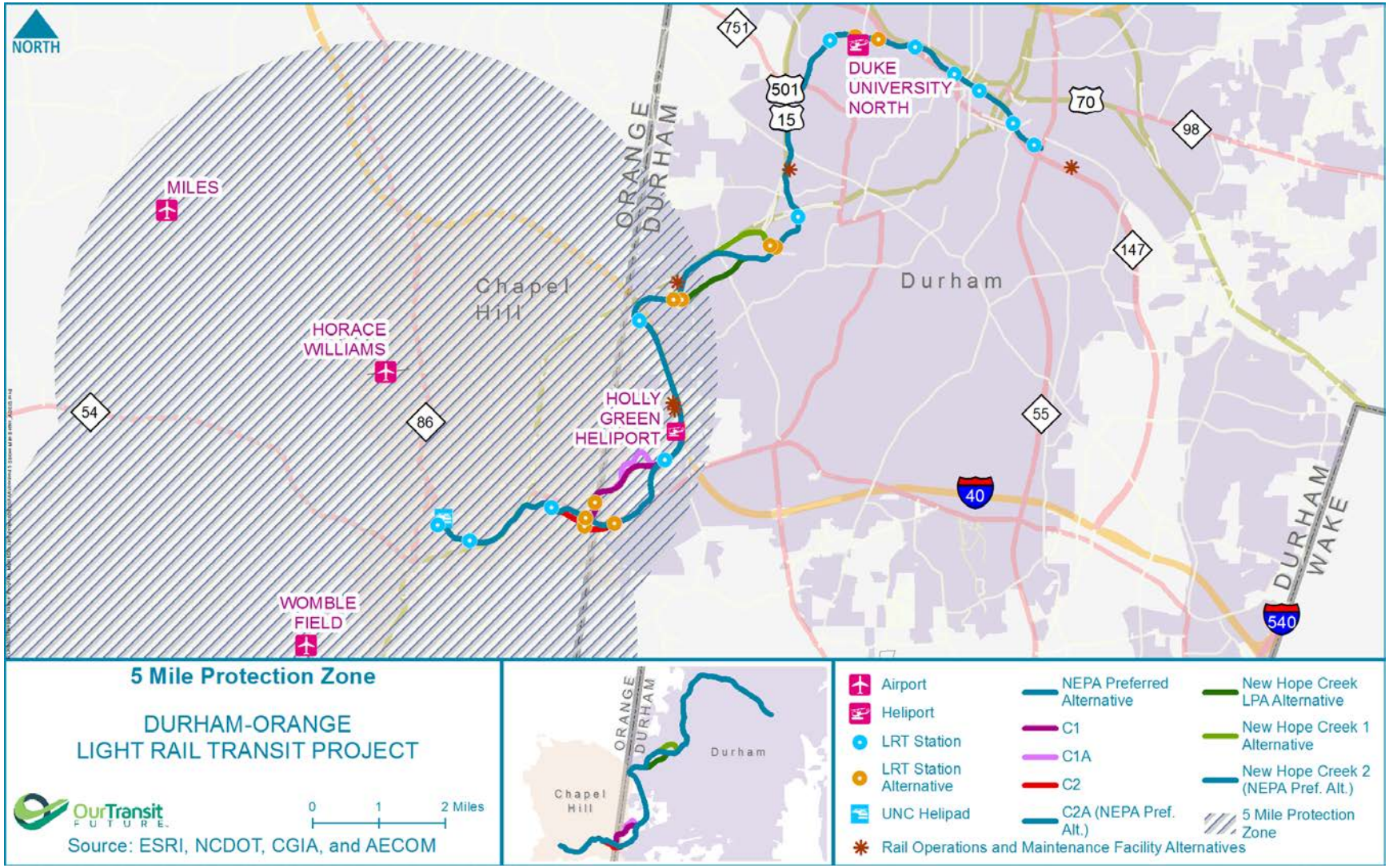
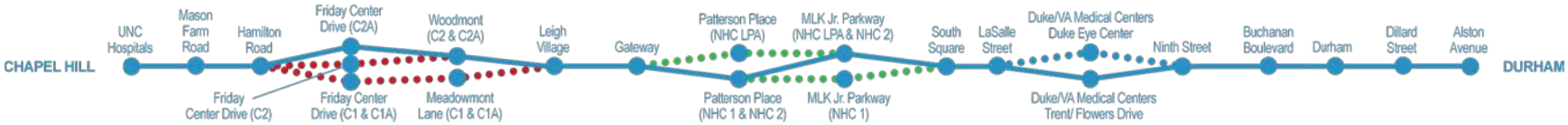


Figure 3.5-2: Five Statute Mile Radius





Stormwater retention features are proposed to mitigate the need for additional impervious coverage due to the construction of the NEPA Preferred Alternative. The exact location and design of these sites has not been determined at this time; however, wet pond treatment sites are preferred for the proposed large park-and-ride facilities, and will be developed in accordance with FAA Advisory Circular 150/5200-33B (2007 Revision), which provides guidance for the design of facilities that have the potential to attract hazardous wildlife on or near public-use airports.

The NEPA Preferred Alternative would be located within the 5,000 foot buffer for the Holly Green Heliport and the Duke University North Heliport as well as the UNC Air Care helipads; however, since they are privately owned and operated, the criteria within the previously listed plans, policies, and guidance do not apply. Coordination with FAA has continued throughout the development of the DEIS and will continue throughout the design and construction phases of the project.

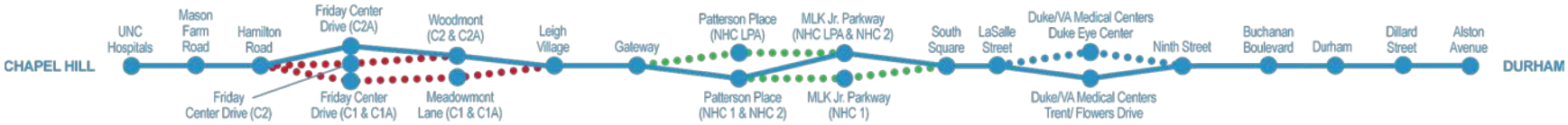
3.5.4.2 Project Element Alternatives

The Little Creek alternatives, NHC alternatives, Duke Eye Center, Leigh Village ROMF and Patterson Place ROMF alternatives would have similar impacts to the airports as the NEPA Preferred Alternative. The Cornwallis Road ROMF and the Alston Avenue ROMF would not be located within the 5 mile protection zone of any airport.

3.5.5 Mitigation Measures

The FAA Advisory Circular 150/5200-33B, section 2-3 (B) notes that the FAA strongly recommends that stormwater detention ponds are constructed, that they do not create above-ground standing water, have a maximum 48-hour detention period, and remain completely dry between storms. Furthermore, the use of steep-sided, riprap-lined, narrow, linearly shaped water detention basins is preferred. Physical barriers including bird balls, wires, pillow, or netting should also be considered.

When stormwater best management practices (BMP) are necessary along the alignment within 5 miles of Womble Field and Horace Williams Airport, the D-O LRT Project proposes the use of a combination of wet detention, dry detention, or bio retention type BMPs to help avoid wildlife attractant habitat and comply with the criteria listed above and contained within FAA Advisory Circular 150/5200-33B. All required mitigation measures will be coordinated with the FAA throughout the design, and construction phases of the project.



3.6 Pedestrian and Bicycle Facilities

This section describes the condition of existing transportation-related pedestrian and bicycle facilities located in the D-O Corridor. (Recreational pedestrian and bicycle infrastructure is discussed in DEIS section 4.6.) This section also discusses potential environmental consequences that would result from implementation of the NEPA Preferred and Project Element Alternatives in comparison to the No Build Alternative.

3.6.1 Methodology

The existing and planned pedestrian and bicycle conditions were assessed in the D-O Corridor through field visits, aerial photography, and reviews of the following local pedestrian and bicycle plans:

- *Chapel Hill Bicycle & Pedestrian Action Plan* (2004)
- *Chapel Hill Bike Plan* (2014)
- *Town of Chapel Hill Greenways Master Plan* (2013)
- CAMPO and DCHC MPO 2040 MTP (2013)
- *Duke University Illustrative Master Plan Update* (2013)
- *DurhamWalks! Pedestrian Plan* (2006)
- *Durham Comprehensive Bicycle Transportation Plan* (2006)
- *Durham Trails and Greenways Master Plan* (2011)
- UNC *Campus Master Plan Update* (2007)

Existing and planned pedestrian and bicycle infrastructure within 150 feet of the D-O LRT Project were evaluated. This study area was consistent for the entire length of the corridor and was organized by station areas.

The specific facility recommendations from these plans were assessed in the context of the proposed D-O LRT Project to minimize effects to those facilities and to encourage linkages between the proposed light rail stations and the existing and planned pedestrian and bicycle network.

3.6.2 Affected Environment

The different station areas show substantial variation in pedestrian infrastructure, ranging from no pedestrian infrastructure to extensive sidewalk networks with marked crosswalks, curb ramps, pedestrian signals, and multi-use paths. Existing pedestrian infrastructure is extensive in the vicinity of most proposed stations, except for the Woodmont, Leigh Village, Gateway, and Alston Avenue stations.

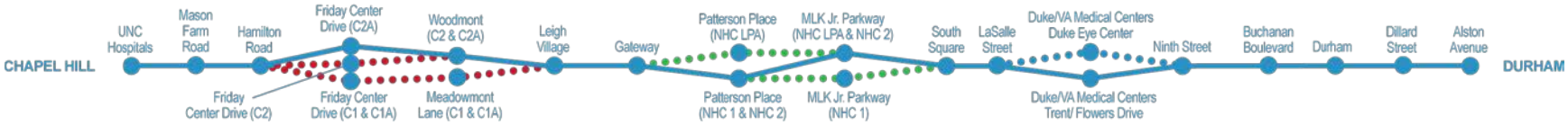
Existing bicycle infrastructure includes sharrows (shared lanes), wide shoulders, bicycle lanes, and multi-use paths. As with pedestrian infrastructure, there is substantial variation among station areas. There is an extensive bicycle network in the vicinity of the proposed Friday Center Drive and Meadowmont Lane Stations. There are existing bicycle lanes near the proposed Martin Luther King Jr. Parkway and Durham Stations.

Appendix K.12, Table 4-1 summarizes the existing pedestrian and bicycle conditions, while appendix K.12, Table 4-2 and Table 4-3 list the existing and planned facilities within 150 feet of the proposed D-O LRT Project.

3.6.3 Environmental Consequences

This section discusses the potential environmental consequences to existing and planned pedestrian and bicycle infrastructure resulting from the NEPA Preferred and Project Element Alternatives when compared against the No Build Alternative.

The No Build Alternative assumes the existing pedestrian and bicycle infrastructure discussed in appendix K.12, Table 4-2 would remain. Further, the planned infrastructure identified in appendix K.12, Table 4-3 will be implemented as the associated development and roadway projects are built.



3.6.3.1 NEPA Preferred Alternative

Impacts to existing and planned pedestrian and bicycle infrastructure are described in this section.

Planned Bicycle Lanes

The NEPA Preferred Alternative includes reconstruction of three roadways to accommodate median-running or side-running light rail within the roadway: University Drive, Erwin Road, and Pettigrew Street. As shown in appendix K.12 Table 4-3, bicycle lanes are planned on these three facilities. As shown in the *Basis for Engineering Design* (appendix L), the proposed D-O LRT Project would include bicycle lanes on University Drive. However, the planned bicycle lanes on Erwin Road and Pettigrew Street are not included in the proposed reconstruction of those roadways due to constraints on the further widening of those roads.

Light Rail Crossings of Pedestrian and Bicycle Infrastructure

Both existing and planned at-grade crossings of pedestrian and bicycle infrastructure are identified and shown on Figures 1 through 8 of appendix K.12. The number of crossings differs by Project Element Alternative. The NEPA Preferred Alternative would have 80 crossings as displayed in **Table 3.6 1**. Selecting different alternatives for crossing Little Creek or New Hope Creek would increase or decrease the number of crossings from this total (as indicated by + or – under each alternative in the table). Thus, the fewest crossings would be 70 while the most would be 87.

The preferred ROMF location at Farrington Road would not impact any existing or planned pedestrian or bicycle infrastructure.

Bicycle Parking

The NEPA Preferred Alternative would not impact existing or planned bicycle parking but instead would create the benefit of new bicycle parking at the light rail stations. There are three bicycle parking designations: small (10 to 16 spaces), medium (14 to 34 spaces), and large (32 to 50 spaces). These designations were determined based on current and anticipated bicycle traffic, nearby bicycle infrastructure, and available right-of-way. Appendix K.12, Table 5-2 lists the bicycle parking designation by station. At stations with alternatives, each alternative would have the same bicycle parking designation.

Pedestrian and Bicycle Connections

Community residents have expressed a desire for improved pedestrian and bicycle access to stations.

The street adjacent to a station is considered a pedestrian connection if it has existing or planned sidewalks on one or both sides. Bicycle connections are defined as existing or planned bicycle lanes, shared lanes, paths, or greenways connecting to the station. Pedestrian and bicycle connections are summarized by alternative in **Table 3.6-2**.

A pedestrian bridge over Mason Farm Road is proposed at the UNC Hospitals station to connect the station directly to the existing network of elevated pedestrian paths between the adjacent parking decks and hospital buildings. These pathways provide safe and convenient access to the medical facilities and UNC provides golf cart shuttles for mobility-impaired patients and visitors.

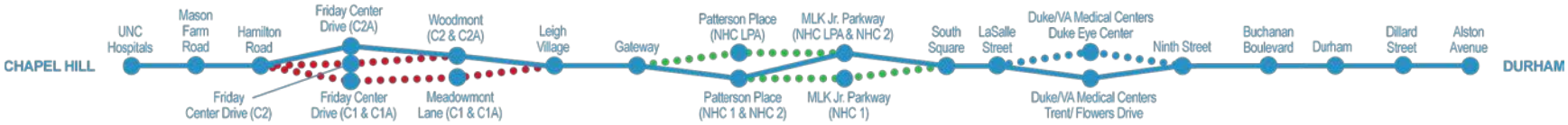


Table 3.6-1: At-Grade Crossings of Existing and Planned Pedestrian and Bicycle Infrastructure

At-Grade Crossings	No Build Alternative	NEPA Preferred Alternative [a]	Little Creek Alternatives			New Hope Creek Alternatives		Duke/VA Medical Centers
			C1	C1A	C2	NHC LPA	NHC 1	Duke Eye Center
Existing Pedestrian and Bicycle facilities	0	46	+1	+3	-6	+3	-3	0
Planned Pedestrian and Bicycle facilities	0	34	-1	+1	0	0	-1	0
Total Pedestrian and Bicycle Crossings	0	80	0	+4	-6	+3	-4	0

Source: AECOM 2015.

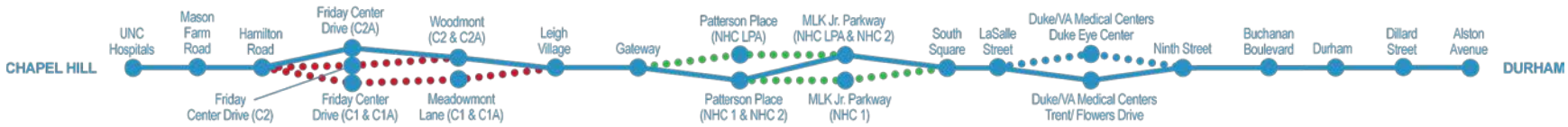
[a] The NEPA Preferred Alternative includes C2A, NHC 2, Trent/Flowers Drive Station, and the Farrington Road ROMF.

Table 3.6-2: Pedestrian and Bicycle Connections at Stations

Pedestrian and Bicycle Connections	No Build Alternative	NEPA Preferred Alternative [a]	Little Creek Alternatives			New Hope Creek Alternatives		Duke/VA Medical Centers
			C1	C1A	C2	NHC LPA	NHC 1	Duke Eye Center
Pedestrian Connections	0	34	+2	+2	0	0	0	0
Bicycle Connections	0	14	+2	+2	0	0	0	-1
Total Connections	0	48	+4	+4	0	0	0	-1

Source: AECOM 2015.

[a] The NEPA Preferred Alternative includes C2A, NHC 2, Trent/Flowers Drive Station, and the Farrington Road ROMF.



Widening Streets to Accommodate Light Rail

As part of the NEPA Preferred Alternative, light rail would be located in the median of University Drive and Erwin Road requiring widening of these streets, adding to the time it would take to cross the street. Stations would be located at: Martin Luther King Jr. Parkway and University Drive, LaSalle Street and Erwin Road, and between Trent Drive and Flowers Drive, and along Erwin Road. An added pedestrian refuge at the stations will allow pedestrians to cross the street in two stages. In addition, the existing pedestrian underpass at the intersection of Erwin Road and Fulton Street will remain. In the NEPA Preferred Alternative the existing NC 54 pedestrian underpass would be extended under the light rail tracks.

3.6.3.2 Project Element Alternatives

The Project Element Alternatives also include reconstruction of three roadways to accommodate median-running or side-running light rail within the roadway and would have similar impacts as the NEPA Preferred Alternative on planned bicycle lanes and bicycle parking.

Pedestrian and Bicycle Connections

Under the NHC 1 Alternative, park-and-ride spaces cannot be located adjacent to the platform at the Martin Luther King Jr. Parkway Station due to space constraints. A pedestrian bridge over University Drive, which is proposed to be an eight lane road with a bus pull out, is proposed to provide grade-separated access from the proposed park-and-ride lot south of University Drive to the proposed Martin Luther King Jr. Parkway station north of University Drive.

Widening Streets to Accommodate Light Rail

Similar to the NEPA Preferred Alternative if the Duke/VA Medical Centers Station: Duke Eye Center Alternative is selected, a pedestrian refuge would be added at Duke Eye Center and Erwin Road. The NHC LPA Alternative would also have a pedestrian refuge at the intersection of Martin Luther King Jr. Parkway and University Drive, while NHC 1 would include a pedestrian bridge across University Drive. The alignment near the Little Creek Alternatives is not within the roadway. As a result, roadways would not be widened to accommodate the light rail and pedestrian refuges would not be added. For any Project Element Alternative, the existing NC 54 pedestrian underpass would remain unchanged since the alignment would not affect it.

Walk Distances from Station Alternatives

The overall walking environment directly adjacent to stations is expected to improve, due to the pedestrian and bicycle improvements that would be constructed as a part of this project.

Walking distances (defined as the shortest ADA accessible path) to key destinations would differ based on the station alternative; however access to all the key destinations would increase with the implementation of the NEPA Preferred Alternative or any of the Project Element Alternatives.

Table 3.6-3 compares the walking distances from the NEPA Preferred Alternative stations to destinations in the vicinity. Destinations are organized according to the alternative section: Little Creek, New Hope Creek, and Duke/VA Medical Centers.

ROMF

Four alternatives for a proposed ROMF were evaluated and are not included in the NEPA Preferred Alternative. The only ROMF alternative that would result in at-grade crossings of pedestrian and bicycle infrastructure is the Alston Avenue ROMF. The alternative would cross the following facilities:

- Planned sidewalks and bicycle lanes on Pettigrew Street (DCHC 2040 MTP [2013])
- Planned bicycle lanes on Bacon Street (DCHC 2040 MTP [2013] and *Durham Comprehensive Bicycle Transportation Plan* [2006])

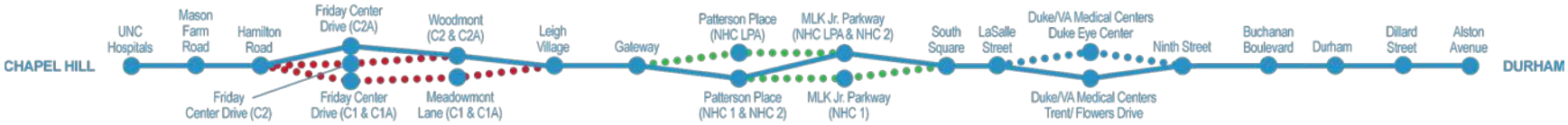
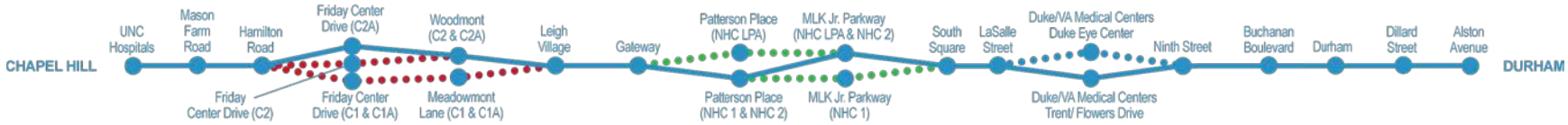


Table 3.6-3: Approximate Distances to Destinations (feet)

Destination	No Build Alternative	NEPA Preferred Alternative [a]	Little Creek Alternatives			New Hope Creek Alternatives		Duke/VA Medical Centers
			C1	C1A	C2	NHC LPA	NHC 1	Duke Eye Center
Little Creek Alternative Stations								
Friday Center	0	1,400	-450	-450	-1,000	n/a	n/a	n/a
Meadowmont Village	0	1,700	-1,000	-1,000	+600	n/a	n/a	n/a
The Exchange	0	1,800	+300	+300	+100	n/a	n/a	n/a
Downing Creek Neighborhood	0	1,300	+2,700	+2,700	0	n/a	n/a	n/a
New Hope Creek Alternative Stations								
Patterson Place (commercial development)	0	850	n/a	n/a	n/a	+750	0	n/a
Colonial Grand at Patterson Place (apartments)	0	2,000	n/a	n/a	n/a	-300	0	n/a
Blue Cross Blue Shield	0	1,800	n/a	n/a	n/a	0	+400	n/a
ITT Technical Institute Durham campus	0	1,000	n/a	n/a	n/a	0	+300	n/a
Martin Luther King Jr. Station park-and-ride lot	0	1,000	n/a	n/a	n/a	0	+400	n/a
Apartment Complexes (Alden Place at South Square, Mission University Pines, Westgate Condos)	0	1,800	n/a	n/a	n/a	0	+300	n/a
Duke/VA Medical Centers Alternatives								
Durham VA Medical Center	0	1,600	n/a	n/a	n/a	n/a	n/a	-300
Duke University Medical Center	0	1,200	n/a	n/a	n/a	n/a	n/a	-250
Duke University (Duke University Chapel)	0	3,900	n/a	n/a	n/a	n/a	n/a	-500

Source: AECOM 2015.

[a] The NEPA Preferred Alternative includes C2A, NHC 2, Trent/Flowers Drive Station, and the Farrington Road ROMF.



- Planned Plum Street Trail (*Durham Trails and Greenways Master Plan* [2011])

3.6.4 Mitigation Measures

Sidewalks, crosswalks, curb ramps, and other pedestrian infrastructure that the light rail alignment would impact would be rebuilt or enhanced as depicted in the *Basis for Engineering Design* (appendix L). Examples of enhancements that would be anticipated as part of project-related roadway reconstruction include installing wider replacement sidewalks along some segments, and installing new sidewalks where there are currently gaps.

As noted in DEIS section 3.6.3.2, planned bicycle lanes would not be accommodated with the reconstruction of Erwin Road and Pettigrew Street by the NEPA Preferred Alternative. To mitigate this loss of opportunity for on-street bicycle facilities on these two roadways, Triangle Transit will work with the City of Durham, NCDOT, and local advocates to identify the potential for off-street facilities or on-street facilities on parallel or nearby roadways.

Pedestrian crossings of light rail tracks would be designed in accordance with current ADA design requirements and standards to ensure access and mobility for all users. Station areas would be designed according to best management practices for pedestrian and bicycle safety. Measures would be taken to discourage pedestrians from crossing the tracks outside of designated track crossings and to enhance safety at permitted crossing locations, such as by providing pedestrian signals and well-marked crosswalks.

If the project cannot avoid impacts to pedestrian and bicycle facilities, Triangle Transit will discuss potential reconstruction options and design guidelines with agencies that have jurisdiction over those facilities. If pedestrian and bicycle facilities have restrictive covenants due to funds used for construction, these requirements would also be addressed.

During Engineering, Triangle Transit will work with the City of Durham, Town of Chapel Hill and NCDOT, the Durham Bicycle and Pedestrian Advisory Commission, the Chapel Hill Transportation and Connectivity Board, and representatives from station area neighborhoods to identify ways to improve pedestrian and bicycle connections to stations. Triangle Transit will continue to coordinate with the City of Durham's Station Area Strategic Infrastructure Program. In certain areas, these improvements may be incorporated into the design of the D-O LRT Project. In particular, Triangle Transit will design and implement a sidewalk or multi-use path connection from the proposed Alston Avenue Station to the existing R. Kelly Bryant Pedestrian Bridge in consultation with the City of Durham, NCDOT, the Durham Bicycle and Pedestrian Advisory Commission, and representatives from the Alston Avenue neighborhood.