# Executive Summary

# Volume 1: Detailed Definition of Alternatives Technical Report

## Wake County Corridor Alternatives Analysis

Triangle Regional Transit Program
our transit future

JULY 2011

Prepared for: Triangle Transit

Prepared by: URS Team

# Executive Summary

The 2035 Long Range Transportation Plan adopted by the Durham-Chapel Hill-Carrboro and Capital Area Metropolitan Planning Organizations in April 2009 identified corridors for major investments in fixed guideway transit over the next 30 years. Through a Transitional Analysis, the first step in the Alternatives Analysis (AA) process which was begun in March 2010, three priority corridors were selected for further consideration: the Durham-Orange Corridor; the Durham-Wake Corridor and the Wake Corridor. In order to identify the most appropriate initial investment or Locally Preferred Alternative (LPA) for each corridor, a broad range of transit technology and alignment alternatives were examined through the Conceptual Evaluation of Alternatives.

This Detailed Definition of Alternatives Technical Report presents the results of the Conceptual Evaluation of Alternatives and a recommendation for the Locally Preferred Alternative (LPA) which includes the preferred alignment, transit technology and station locations for the Wake Corridor.

## Alternatives Considered

In addition to the No-Build and TSM Alternatives automatically advanced from the conceptual alternatives screening, the evaluation considered an LRT Alternative that follows the existing NCRR and CSX railroad rights-of-way for most of the corridor between NW Cary Parkway and I-540. The detailed evaluation focuses on identifying the most suitable alignment alternatives in downtown Raleigh and in the Northeast Regional Center (NERC), primarily where the Light Rail Transit (LRT) Alternative would deviate from the rail corridor. These alignment alternatives are:

- Downtown Raleigh Alignment Alternatives.
  - Harrington Street Alignment (D2)
  - West Street Alignment (D3)
  - Wilmington/Salisbury Couplet via South Street (D5)
  - Morgan Street Alignment (D6)

- Northeast Regional Center Alignment Alternatives.
  - Railroad Corridor Alignment (F1)
  - Triangle Town Center Alignment (F2)

***LRT Characteristics*** Table ES-1 shows characteristics for the full length of the LRT alignments between Northwest Cary and the NERC. Ridership, travel time, and capital cost ranges represent variations based on downtown Raleigh and NERC alignment alternatives.

**Table ES-1 LRT Alternative Characteristics**

| Characteristic | LRT |
|---|---|
| Daily Boardings* | 14,300 – 15,300 |
| Travel Time | 34 – 38 minutes |
| Capital Cost | $1.42B – $1.59B |
| Annual O&M Cost | $15.6M |

**See Section 3.1.1 for information on Uncertainties in Ridership Forecasting. The table is based on F1 alternative in combination with all downtown alternatives which then creates the range.*

## Evaluation Results

A separate evaluation was conducted for alignment alternatives through downtown Raleigh and the NERC area. In general, the alternatives were evaluated based on seven evaluation criteria directly relating to the project goals, including System Performance, Destinations Served, Transportation Operations and Access, Public and Agency Support, Potential to Support Redevelopment Efforts, Environmental Impacts, and Cost. Criteria were adjusted as necessary to fit the unique characteristics of the two areas.

***Downtown Raleigh Alignment Alternatives*** Table ES-2 summarizes the evaluation results for the downtown Raleigh alignment alternatives.[1]

**Table ES-2 Summary of Evaluation Results for Downtown Raleigh Alignment Alternatives**

| Detailed Evaluation Criteria *(Corresponding Report Section)* | Downtown Raleigh Alignment Alternatives | | | |
|---|---|---|---|---|
| | D2 Harrington | D3 West | D5 Wilmington/ Salisbury via South | D6 Morgan |
| Corridor-Wide Ridership Forecast (daily boardings) *(Section 3.3.1)* | 14,400* | 14,300* | 15,300* | 14,500* |
| End-to-End Travel Time* *(Section 3.3.1)* | 34 min. | 34 min. | 38 min. | 35 min. |
| Destinations Served *(Section 3.3.2)* | Consistent with Union Station Redevelopment plans but tends to bifurcate the Union Station site at the Dillon Property; Serves high population and employment concentrations and limited number of activity centers | Consistent with Union Station Redevelopment plans but tends to bifurcate the Union Station site at the Dillon Property; Serves high population and employment concentrations and limited number of activity centers | Does not directly serve Union Station; Serves highest population and employment concentrations and number of activity centers | Consistent with Union Station redevelopment plans; Serves high population and employment concentrations and limited number of activity centers |
| Traffic Impacts *(Section 3.3.3)* | Low | Moderate | High | Low-Moderate |
| Economic Development *(Section 3.3.4)* | High potential to support redevelopment efforts | High potential to support redevelopment efforts | Moderate potential to support redevelopment efforts | High potential to support redevelopment efforts |

[1] Public and agency support is excluded from the summary table because of the limited amount of data available for evaluation. See Sections 3.3 and 3.5 of the Detailed Definition of Alternatives Technical Report for more information.

| Detailed Evaluation Criteria *(Corresponding Report Section)* | Downtown Raleigh Alignment Alternatives | | | |
|---|---|---|---|---|
| | D2 Harrington | D3 West | D5 Wilmington/ Salisbury via South | D6 Morgan |
| Environmental Impacts *(Section 3.3.6)* | Moderate property impacts, low construction impacts, moderate visual impacts, moderate potential for Section 4(f) impacts, low visual impacts | Low property impacts, low construction impacts, moderate visual impacts, low potential for Section 4(f) impacts, low visual impacts | High property impacts, high construction impacts, high visual impacts, high potential for Section 4(f) impacts, high visual impacts | Moderate property impacts, moderate construction impacts, low visual impacts, moderate potential for Section 4(f) impacts, moderate visual impacts |
| Capital Cost - 2011 dollars *(Section 3.5.7)* | $270M | $270M | $435M | $265M |

**Assumes Alternative F1 between Spring Forest and NERC for LRT. See Table D-1 in Volume 3, Ridership Summaries.*

The evaluation results reveal that there are several differentiating factors when comparing the western alignments (Alternatives D2, D3 and D6) to the Wilmington/Salisbury alignment (Alternative D5). While Alternative D5 has the highest ridership (about 900 more riders), it also has the highest estimated capital cost (approximately $165 to $170M more) and longest travel time, adding 3 to 4 minutes of travel time from one end of the corridor to the other. Other significant issues with the D5 alternative include:

- Impacts to traffic operations. Right turn movements from traffic lanes that are shared with through lanes would likely cause excessive delays each time a right turn automobile was required to yield to the LRT vehicle, thus impacting following traffic during a green signal phase.
- Loss of Parking on both sides of the street where stations are located and loss of parking on one side of the street where stations are not located.
- Impacts to businesses during construction create an economic hardship.
- Impacts to driveways, parking facilities and loading zones.
- Potential impacts to multiple historic districts and properties including two National Historic Landmark sites.

Key findings for Alternatives D2, D3, and D6 can be summarized as follows:

- The major differentiator for the D3 alternative is the traffic volume on West Street, and the plans that the City of Raleigh has to further expand the use of West Street with an underpass extension from downtown to the south, under the freight track corridor. With mixed traffic operations and the added projected traffic on West Street compared to Harrington Street, D3 becomes much less favorable. The D2 and D6 alignments on Harrington Street provide a location that is one-block closer to downtown and this too is more favorable.
- The differentiating factors between D2 and D6 include traffic, safety, aesthetics, and integration with the overall future planning of the western downtown area. There has also been much

discussion about the aesthetic issue with an aerial structure over Boylan Avenue; however, at this point there have been few documented comments regarding this issue.

- Neither D2 nor D6 is expected to have an adverse impact on safety or traffic operations, but with D6 proposed as a mixed traffic type of operation along West Morgan Street from the western end to Harrington Street, D2 is more favorable with respect to safety and traffic operations. If D6 is selected as the LPA, it is recommended that the traffic lanes on Morgan Street be reconfigured to a similar situation that exists on Harrington Street: two lanes (one in each direction) with parking on each side. This would provide space for right turning vehicles to negotiate the right turns more effectively, thus reducing the potential for turning vehicles impede traffic.

  For the D2 and D6 alternatives, it will be necessary to close the at-grade crossing of Harrington Street with the CSX tracks. This will address a safety issue with the light rail train movement into and out of the CSX corridor to and from Harrington Street. To further avoid and minimize safety issues, the study team recommends constructing a retaining wall between the CSX tracks and the LRT tracks to accommodate the higher elevation of the LRT tracks. Harrington Street could remain open to traffic between Jones Street and Lane Street; however, it would be better if this section of Harrington Street were closed to automobile traffic altogether, eliminating possible automobile/LRT conflicts on Harrington Street. A potential mitigation to closing Harrington Street between Lane Street and Jones Street would be to extend Lane Street to West Street, a connection that does not currently exist.

- Both the D2 and D6 alternatives are considered compatible with the multi-modal development plans for Union Station and surrounding area. The D2 alignment places the station location diagonally across the planned Union Station site. The D6 alternative has a station on West Morgan Street between Boylan Avenue and Glenwood Avenue. A pedestrian overpass would allow for a convenient pedestrian connection between the LRT station platform and the multi-modal site. A bus transfer facility could be situated immediately adjacent to the West Morgan Street platform for ease of transfer and the Union Station site would be open for full re-development. A pedestrian walkway could be integrated within the redeveloped Union Station site for transfers to Amtrak and commuter rail.

- While Alternative D2 could be integrated into the site of the planned Union Station, the proposed platform location for this alternative would tend to bifurcate the site. The grade of the proposed station requires construction of a high aerial structure to get over Boylan Avenue and the existing freight track corridor. This aerial structure would be an imposition to the view shed of the area. D6 also has more potential for redevelopment along West Morgan Street and adjacent to the West Morgan Street station at Boylan Avenue and Glenwood Avenue. This in turn frees up more real estate for redevelopment at the original Union Station site west of West St and north of Hargett Street. This Union Station site would remain the transfer site for all rail modes of rail transit traffic (LRT, commuter rail, SEHSR, and Amtrak service).

- Alternatives D2 and D6 have the greatest potential to catalyze the redevelopment of underutilized sites, which is a key policy of the City's Comprehensive Plan.

Based on these findings, the Project Team's recommendation is to carry forward Alternative D6 through the downtown Raleigh area as part of the LPA.

***NERC Alignment Alternatives*** Table ES-3 summarizes the evaluation results for NERC alignment alternatives.[2]

**Table ES-3 Summary of Evaluation Results for NERC Alignment Alternatives**

| Detailed Evaluation Criteria | NERC Alignment Alternatives | |
|---|---|---|
| | F1<br>Rail Corridor | F2<br>Triangle Town Center |
| Corridor-Wide Ridership Forecast (daily boardings)* *(Section 3.5.1)* | 14,400 | 14,600 |
| End-to-End Travel Time**(Section 3.5.1)* | 34 min. | 37 min. |
| Destinations Served *(Section 3.5.2)* | Located on the periphery of major employment center | Located central to major employment center |
| Traffic Impacts *(Section 3.5.3)* | High | Moderate |
| Economic Development *(Section 3.5.4)* | Moderate potential to support redevelopment efforts | High potential to support redevelopment efforts |
| Environmental Impacts *(Section 3.5.6)* | Low property impacts, moderate construction impacts, low visual impacts, low wetland and stream impacts | High property impacts, moderate construction impacts, high visual impacts, low wetland and stream impacts |
| Capital Cost - 2011 dollars *(Section 3.5.7)* | $105M | $145M |

**Assumes Alternative D2 between West Morgan and Whitaker Mill for LRT.| **Assumes Alternative F2 between Spring Forest and NERC for LRT. Boardings rounded to the nearest hundred.*

The evaluation results reveal that Alternative F2 presents slightly higher ridership (200 more boardings) than Alternative F1; hence, daily boardings are not a key differentiator between the NERC alignment alternatives. And, while Alternative F2 adds 3 minutes to the end-to-end travel time, travel time is also not a key differentiator, given that the additional travel time does not result in fewer riders. While Alternative F2 would not add considerably more riders to the LRT system, it does cost approximately $42.3M more to construct due to the longer length of the guideway, the need for two spans of aerial structure, additional right-of-way requirements, and an additional station. Therefore, the cost-effectiveness of this additional investment for Alternative F2 is limited.

Both Alternatives are located in planned growth centers with convenient regional access. However, because Alternative F2 penetrates the core of the Triangle Town Center and a planned redevelopment area, it serves greater concentrations of people and jobs and is more centrally located to support redevelopment in the area.

The station location for Alternative F1 does not have any means for a direct access from I-540 and the traffic route to get to the platform is circuitous. As such, Alternative F1 would have considerably more severe traffic impacts than Alternative F2 because it requires a vast majority of the station trips to go through three high volume intersections of Old Wake Forest Road (at Sumner Boulevard, Ruritania Street, and Capital Boulevard).

[2] Public and agency support is excluded from the summary table because of the limited amount of data available for evaluation. See Sections 3.3 and 3.5 of the Detailed Definition of Alternatives Technical Report for more information.

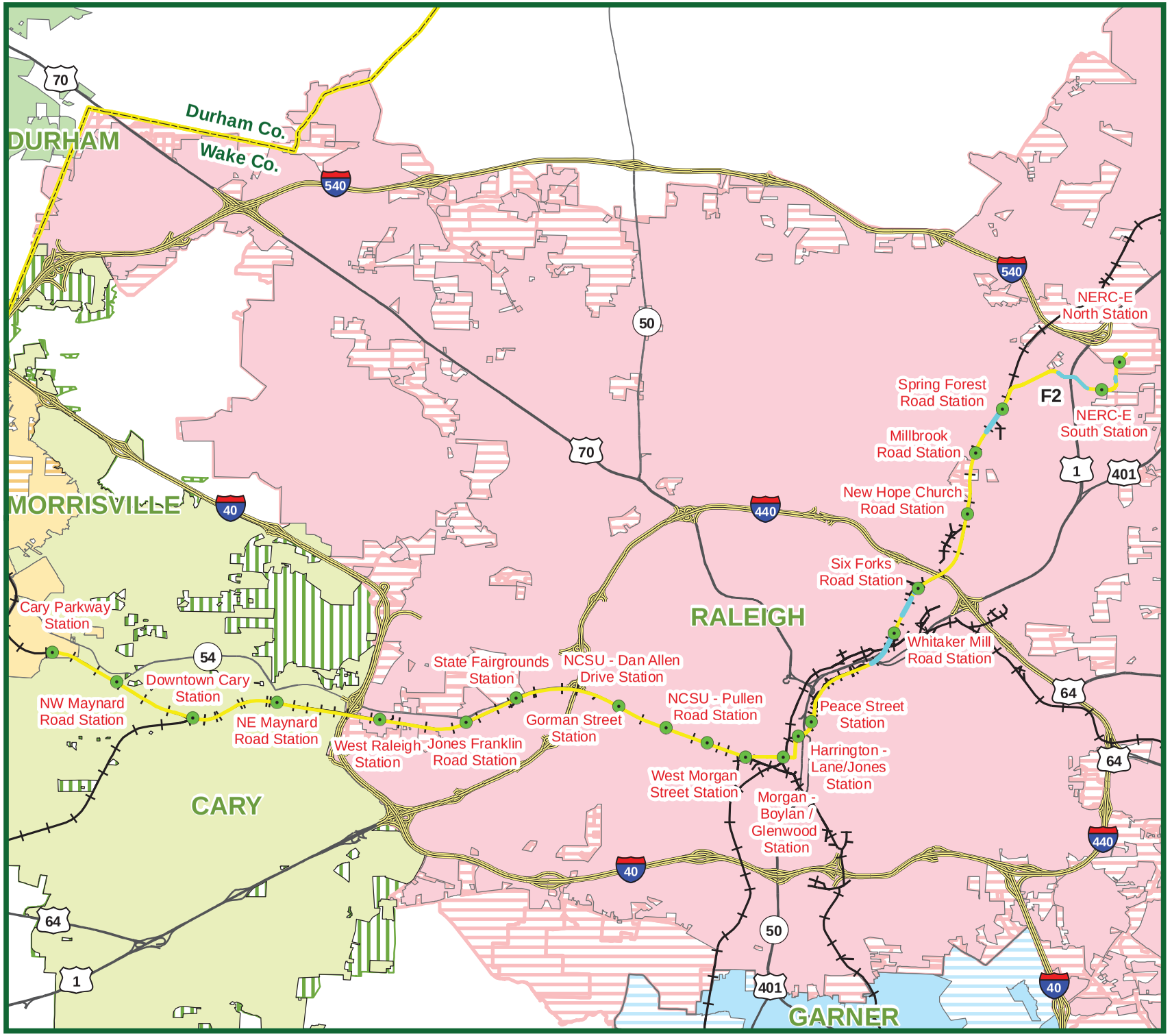
Based on these findings, the Project Team's recommendation is to carry forward Alternative F2 through the NERC area as part of the LPA.

***Preliminary LPA Recommendation*** Based on the evaluation and findings summarized above, the Project Team recommendation is to carry forward the LRT Alternative as the LPA with Alternative D6 through downtown Raleigh and Alternative F2 through the NERC and the associated station locations.

Figure ES-1 shows the recommended LPA.

# FIGURE ES-1

WAKE CORRIDOR
PRELIMINARY LPA
RECOMMENDATION



# FIGURE 2-2
LRT ALTERNATIVE

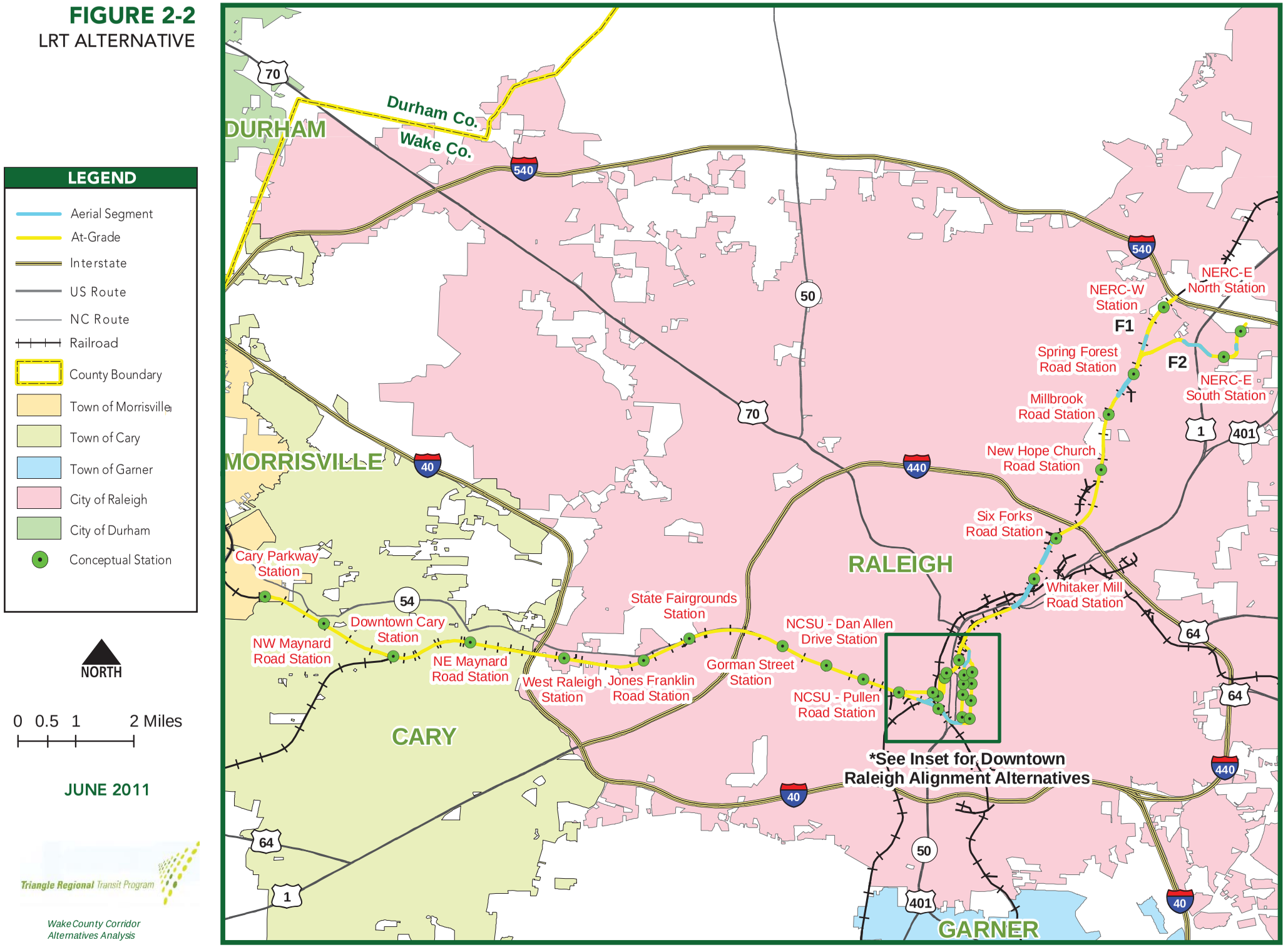
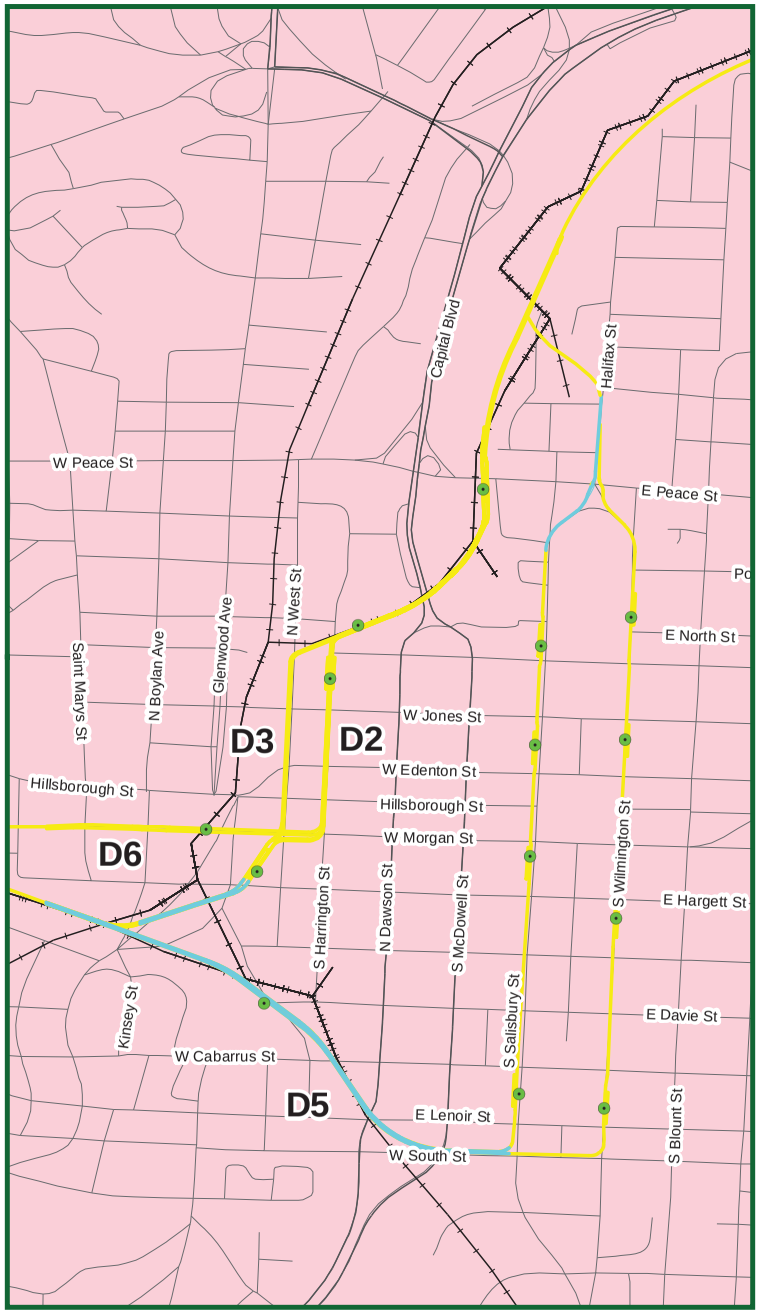
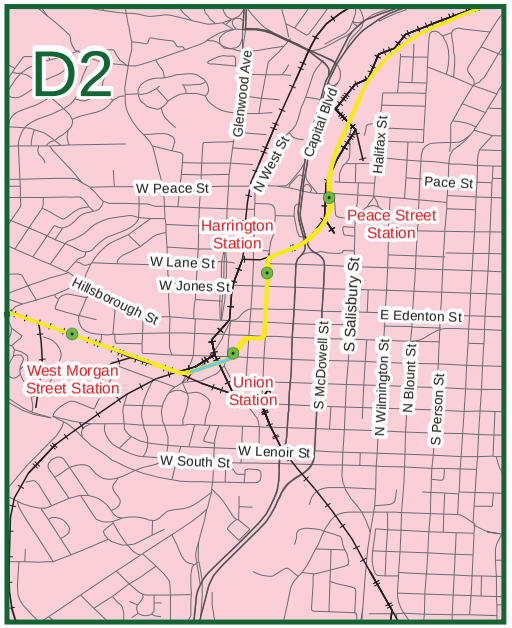


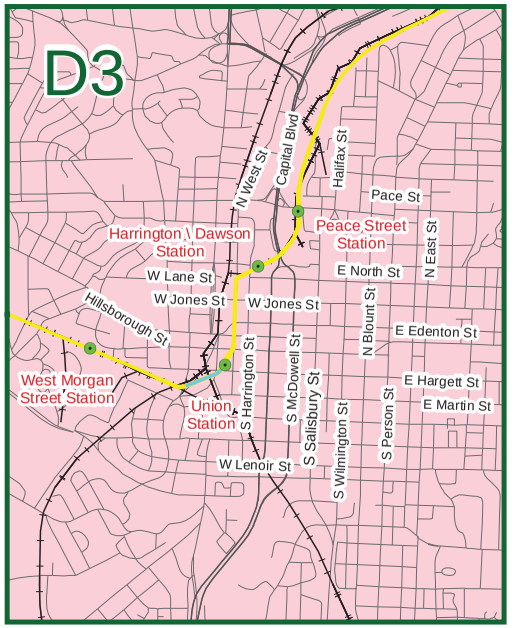
**FIGURE 2-2a**
DOWNTOWN RALEIGH
ALIGNMENT
ALTERNATIVES

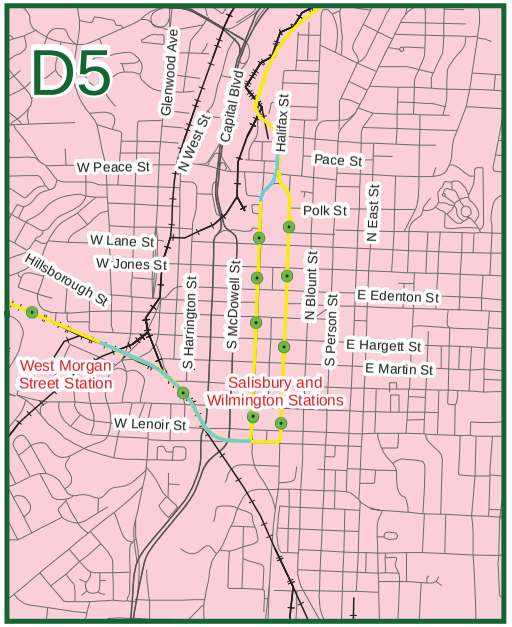
**LEGEND**

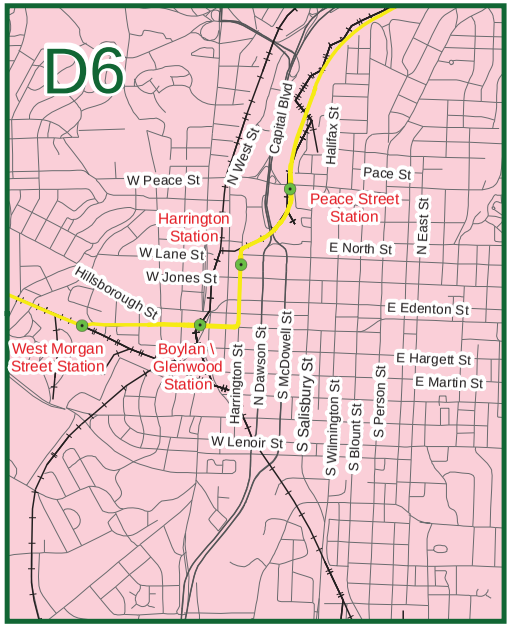
- Aerial Segment
- At-Grade
- Interstate
- US Route
- NC Route
- Railroad
- City of Raleigh
- Conceptual Station




NORTH

0 0.10.2 0.4 Miles

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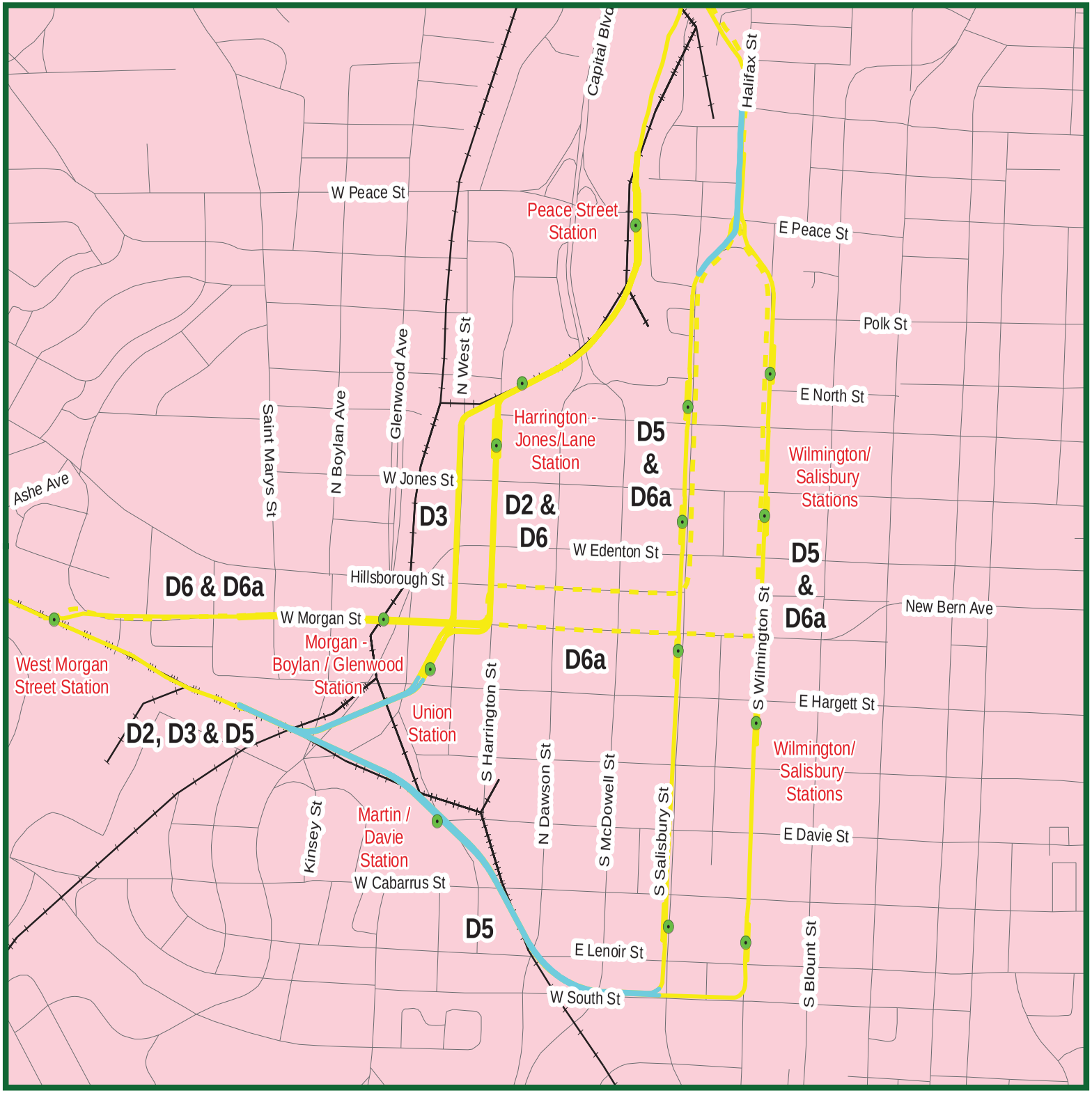
# FIGURE 2-2b

DOWNTOWN RALEIGH ALTERNATIVES AND D6a ALIGNMENT

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