Memorandum

December 7, 2017

To: NCDOT Feasibility Studies Unit

From: RS&H Project Team Regina P Bowman, PE

Subject: H150335 – FS-1602A: Greenville – Arlington Blvd. from NC 43 (W. 5th St.) to SR 2235 (Old Firetower Road)

This memo summarizes traffic operations analysis along Arlington Boulevard in the project area performed for 2040 Build Year Conditions.

During the design phase of this project, it was determined that traffic operations analysis would be needed to aid in the determination of the design typical section for Arlington Boulevard. This memo summarizes those traffic operations analysis results.

1.0 Traffic Volume Data

The Project Team received a traffic forecast for the study area from NCDOT dated July 2017, completed by VHB Engineering NC. It should be noted that for the 2040 Build Year Conditions, three sets of volumes were provided: 2040 No Build Scenario, 2040 4-lane widening Build Scenario, and 2040 6-lane widening Build Scenario. An unconstrained build forecast was not provided, however, it is the Project Teams opinion that a 2040 8-lane widening Build Scenario forecast would not see much of an increase in volumes from the 2040 6-lane widening Build Scenario. The forecast was used to generate AM Peak and PM Peak Hour volumes for the 2040 6-lane widening Build Scenario. The resulting traffic volumes were balanced along Arlington Boulevard and used for all of the traffic operations analysis summarized in this memo.

2.0 Capacity Analysis Methodology

The capacity analysis was performed using Synchro (Version 9.1 Build 912 Revision 4) software, and in accordance with the *Capacity Analysis Guidelines* (NCDOT Congestion Management Section, July 1, 2015). For this analysis, through lanes were added and signal timing was optimized; turn lane improvements were not made. It should be noted that storage bay lengths were not determined with this analysis.

For this memo, three build scenarios were analyzed: 2040 4-lane median divided section (using the 6-lane volumes), 2040 6-lane median divided section (using the 6-lane volumes), and 2040 4-lane superstreet at a few intersections (using the 6-lane volumes).

3.0 Traffic Operations Analysis Results Summary

The capacity analysis indicates that Arlington Boulevard as a 4-lane median divided section would approach or exceed the roadway capacity (Level of Service E or F) in both directions during at least one peak hour of the day. In addition, eight of the sixteen mainline segments would exceed the roadway capacity (Level of Service F), and three of the sixteen mainline segments would approach the roadway capacity (Level of Service E) during at least one peak hour of the day.

The capacity analysis indicates that Arlington Boulevard as a 6-lane median divided section would operate at an acceptable rate of flow (Level of Service D) in both directions during both peak hours of the day. In addition, four of the sixteen mainline segments would exceed the roadway capacity (Level of Service F), and three of the sixteen mainline segments would approach the roadway capacity (Level of Service E) during at least one peak hour of the day.

Mainline capacity analysis for signalized corridors relies heavily on the operations of the signalized intersections. For this analysis, through lanes were added and signal timing was optimized; turn lane improvements were not made. The following six intersections would exceed capacity (Level of Service F) during at least one peak hour as a 6-lane median divided section: SR 1467 (Stantonsburg Rd), US 13 (Dickinson Ave), SR 1702 (S Evans St), US 264 Alt E (Greenville Blvd SE), Red Banks, and SR 1708 (Fire Tower Rd). Dual left-turn lanes and exclusive right-turn lanes would improve level of service at these intersections. A more in depth analysis may provide intersection improvements that could improve the corridor as well. It should be noted that storage bay lengths were not determined with this analysis.

In addition to the above scenarios, there was a desire to analyze the project as a 4-lane superstreet corridor along Arlington Boulevard. At a glance, many of the side streets have substantial volumes that do not appear to make this corridor a good candidate for a 4-lane superstreet corridor. The following intersections are a few that were analyzed that are not expected to function well as superstreet intersections with a 4-lane typical section: SR 1467 (Stantonsburg Rd), NC 11 (Memorial Dr), US 264 Alt E (Greenville Blvd SE), and SR 1708 (Fire Tower Rd). Simulations at these intersections showed traffic locking up and coming to a complete stop because they could not move further. Not all intersections were analyzed as a superstreet, only several intersections with high volumes on the side streets.

4.0 Conclusion

Based on this analysis, a 6-lane median divided section operates at the better level of service.

SP-1602A: Widening of Arlington Boulevard from NC 43 to Firetower Road

	4 lane **Alternative 1**	4 lane with RR Grade separations **Alternative 1A**	6 lane **Alternative 2**	6 lane with RR Grade Separations **Alternative 2a**
UTILITY RELOCATION	$200,000	$200,000	$200,000	$200,000
RIGHT OF WAY	$170,000,000	$200,000,000	$260,000,000	$290,000,000
CONSTRUCTION	$48,600,000	$61,500,000	$53,500,000	$72,900,000
TOTAL ESTIMATED COST:	$218,800,000	$261,700,000	$313,700,000	$363,100,000

Final Report

NCDOT State TIP Project No. SP-1602A

Arlington Boulevard Widening from

NC 43 (W 5th Street) to SR 2235(Old Firetower Road)

Greenville, Pitt County
WBS # 34263.1.1

AUGUST

JULY 2017

PREPARED FOR

Nothing Compares

PREPARED BY

vhb

July 14, 2017

MEMORANDUM TO: Lynnise Hawes, PE
Feasibility Studies Engineer
Feasibility Studies Unit, Planning and Programming
NC Department of Transportation

FROM: Taruna Tayal, PMP
VHB Engineering NC, P.C.

SUBJECT: Traffic Forecast for SP-1602A Widening Arlington Boulevard from NC 43 (W 5th Street) to Old Firetower Road (SR 2235), Greenville, Pitt County.

Please find attached the 2016 / 2040 Traffic Forecast for the above-mentioned project. NCDOT Division 2 is proposing STIP No. SP-1602A, which includes widening W. Arlington Boulevard from NC 43 (W 5th Street) to Old Firetower Road (SR 2235). The 5.2-mile project is in Pitt County (NCDOT Division 2) within the City of Greenville and the Greenville Metropolitan Planning Organization.

This forecast has been reviewed and approved by the Transportation Planning Branch on July 10, 2017.

There is no previous traffic forecast for SP-1602A. Two previous traffic forecasts performed for TIP Project No. FS-1002B as listed below were reviewed during the development of this forecast:

- TIP Project No. FS-1002B: Feasibility study for the widening of US 264 (Greenville Blvd.) from NC 11 to NC 33 by NCDOT, April 2012 with base year as 2012 and future year as 2035.
- TIP Project No. FS-1002B: Feasibility study for the widening of US 264 (Greenville Blvd.) from NC 11 to NC 33 by NCDOT, February 2016 with base year as 2015 and future year as 2040.

Daryl Vreeland, AICP the Transportation Planner for Greenville MPO and Reza Jafari, Eastern Planning Unit, Transportation Planning Branch were consulted during the development of this forecast.

The following scenarios are provided in this forecast:

1. Scenario 1- 2016 Base Year No-Build Scenario
2. Scenario 2 - 2016 Base Year 4-lane widening Build Scenario
3. Scenario 3 - 2016 Base Year 6-lane widening Build Scenario
4. Scenario 4 - 2040 Design Year No-Build Scenario
5. Scenario 5 – 2040 Design Year 4-lane widening Build Scenario
6. Scenario 6 – 2040 Design Year 6-lane widening Build Scenario

Fiscal Constraint: Within an MPO, the future year forecasts assume construction of projects as listed within the MPO's Metropolitan Transportation Plan (MTP, previously called LRTP). This forecast is

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consistent with Greenville Urban Area MPO's current MTP, adopted in December 2013 and amended August 2015. Projects in the MTP which may affect this facility include:

- The Southwest Bypass (NCDOT STIP Project U-2250);
- Fire Tower Road extension to southwest bypass (NCDOT STIP Project U-5006);
- NC 43 South Widening; and
- Widening and Improvements to SR 1700 (Evans Street/Old Tar Road)

Future Conditions and Development Activity: No information was available on the specific planned and approved developments in the area. There is moderate growth and development proposed in the study corridor between 2015 and 2040. Based on the household and employment data from the Greenville Travel Demand Model, household growth is expected to be between 40% - 65% between these years and employment growth will be less.

Forecast Methodology: The Base Year No-Build traffic forecasts were developed primarily based upon traffic counts taken for this forecast, as well as historic traffic counts and trends. The Design Year 2040 traffic forecasts are developed based upon the modeling results and existing traffic data, as well as the expected traffic pattern change due to the proposed project. The Greenville 2010 Travel Demand Model (adopted in December 2013) was used as a tool in the development of the traffic forecasts.

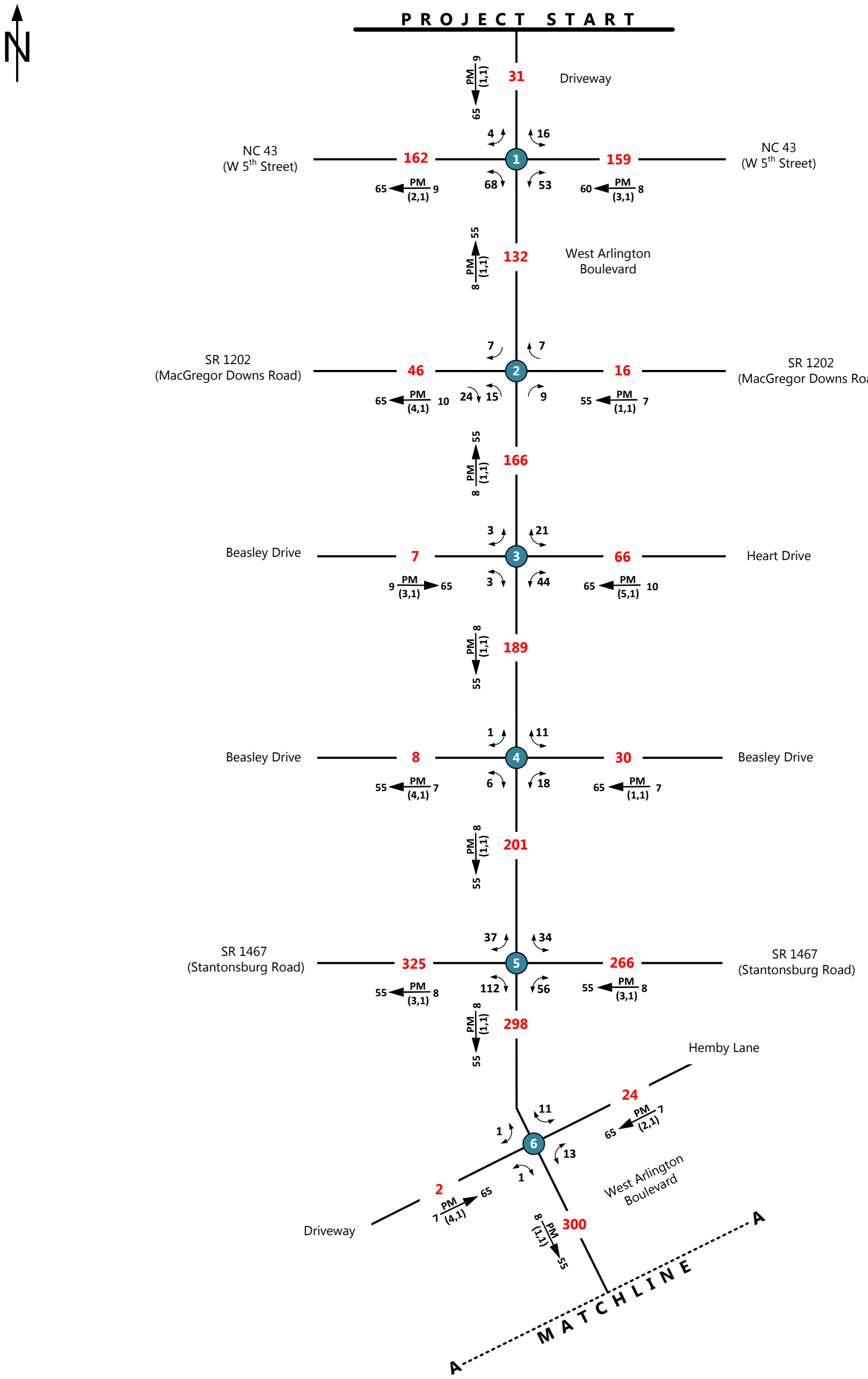
Interpolation: To determine volumes during any intermediate years straight-line interpolation may be used. AADT volumes may be extrapolated for up to two years immediately following 2040. If it is determined that any of these assumptions have become inconsistent with the project and surrounding area activity, request should be made for updated projections at this location.

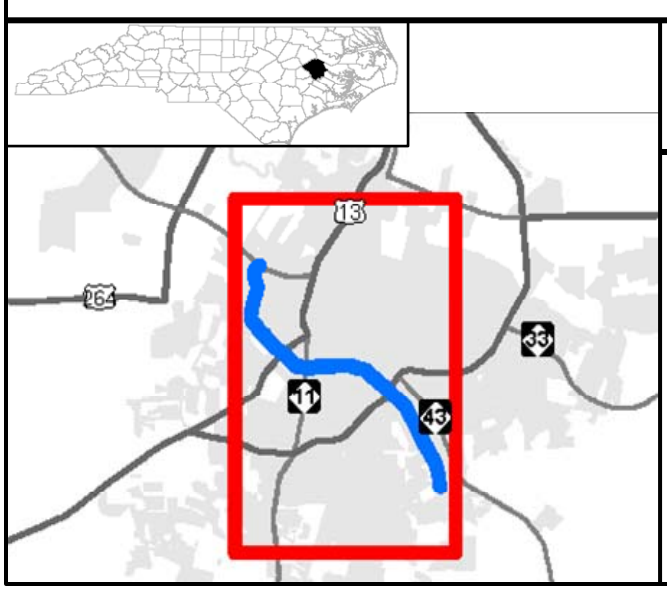
For future reference this forecast will be saved in Project Store in the LongRangePlanning\Traffic Forecasts folder, under project SP-1602A.

If you have any questions or I can be of further assistance, please do not hesitate to call me at 919.741.5525, or e-mail me at ttayal@vhb.com.

cc: (Final distribution for your records via e-mail as PDF attachments):
Michael P. Reese, PE, CPM, Congestion Management
Glen Mumford, PE, Highway Design Branch
Clark Morrison, PhD, PE, Pavement Management
Jeff Cabaniss, PE, Division 2 Planning Engineer
Scott Walston, PE, Transportation Planning Branch
Ryan Purtle, AICP, Greenville MPO Transportation Planner
Keith G. Dixon, Transportation Planning Branch

File Copy: SP-1602A, Pitt





2016 Average Annual Daily Traffic

No-Build Alternative

(Scenario 1) SHEET 1 OF 4

LEGEND

D PM (d,t) K

###	No. of Vehicles per Day (VPD) in 100s
—	Existing Roadway

PM	PM Peak Hour
D	Peak Hour Directional Split (%)
→	Indicates Direction of D
(d,t)	Duals, TTSTs (%)
K	Design Hour Factor (%)
X	Movement Prohibited
1-	Less than 50 VPD

TIP: SP-1602A

WBS: 34263.1.1

DIVISION: 2

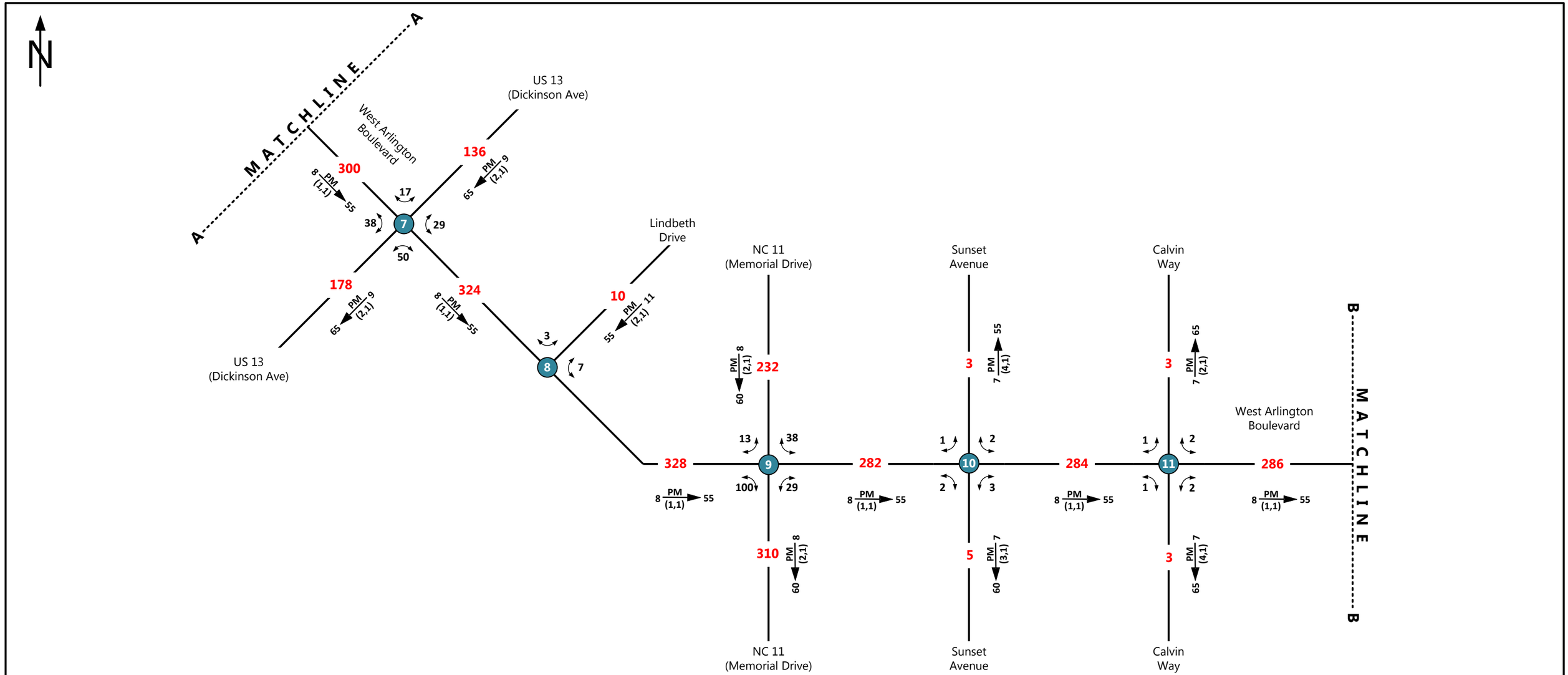
COUNTY: Pitt

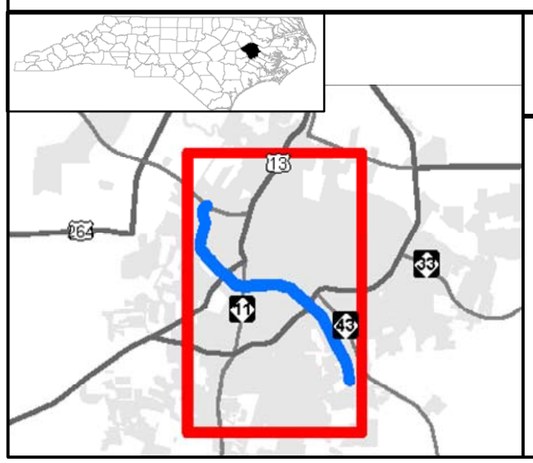
DATE: 07/10/2017

PREPARED BY: VHB Engineering NC, P.C.

LOCATION: Arlington Blvd from NC 43 (W 5th Street) to SR 2235 (Old Firetower Road)

PROJECT: Arlington Boulevard Feasibility Study





2016 Average Annual Daily Traffic

No-Build Alternative

(Scenario 1) SHEET 2 OF 4

LEGEND

D ← PM (d,t) K

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——	Existing Roadway

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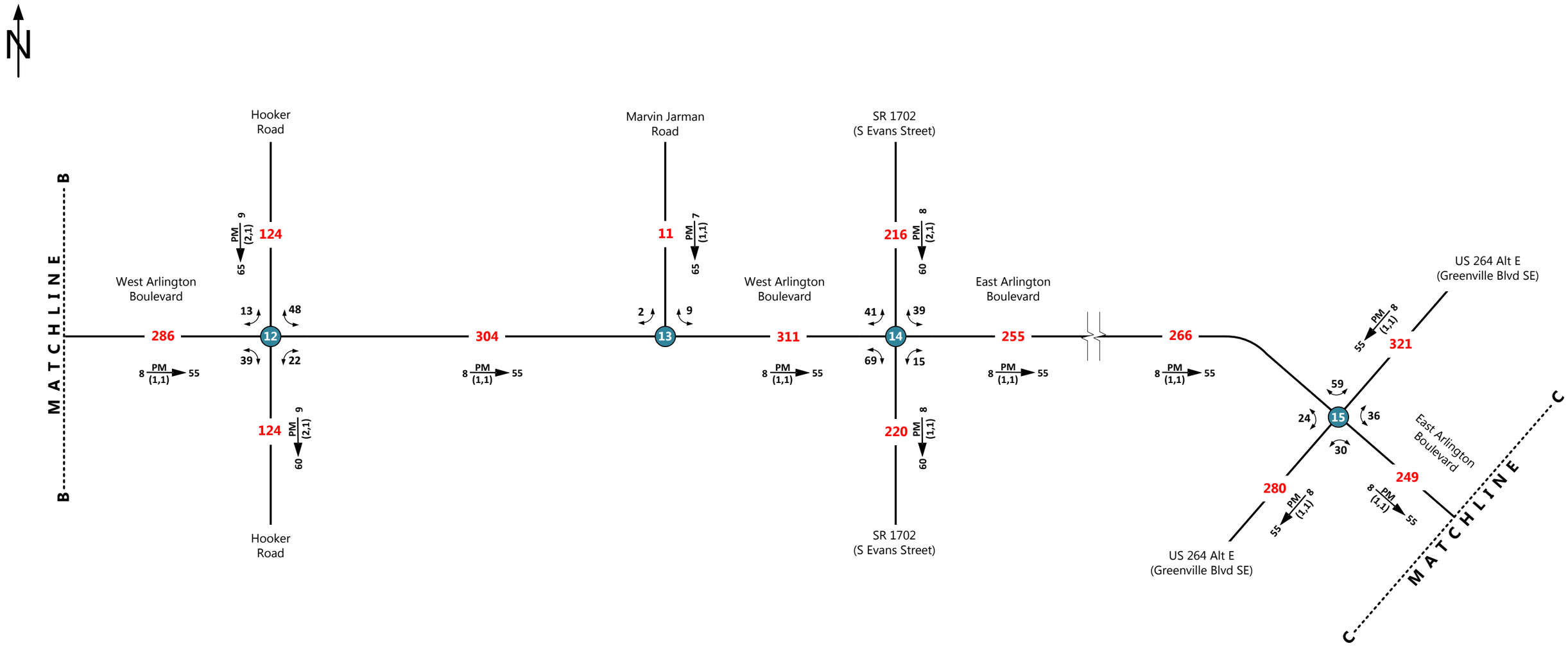

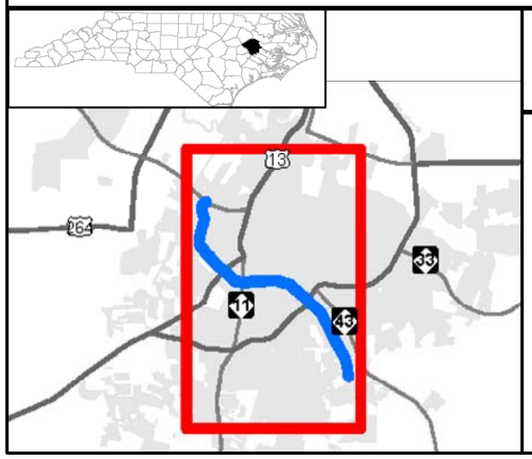

2016 Average Annual Daily Traffic

No-Build Alternative

(Scenario 1) SHEET 3 OF 4

LEGEND

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——	Existing Roadway

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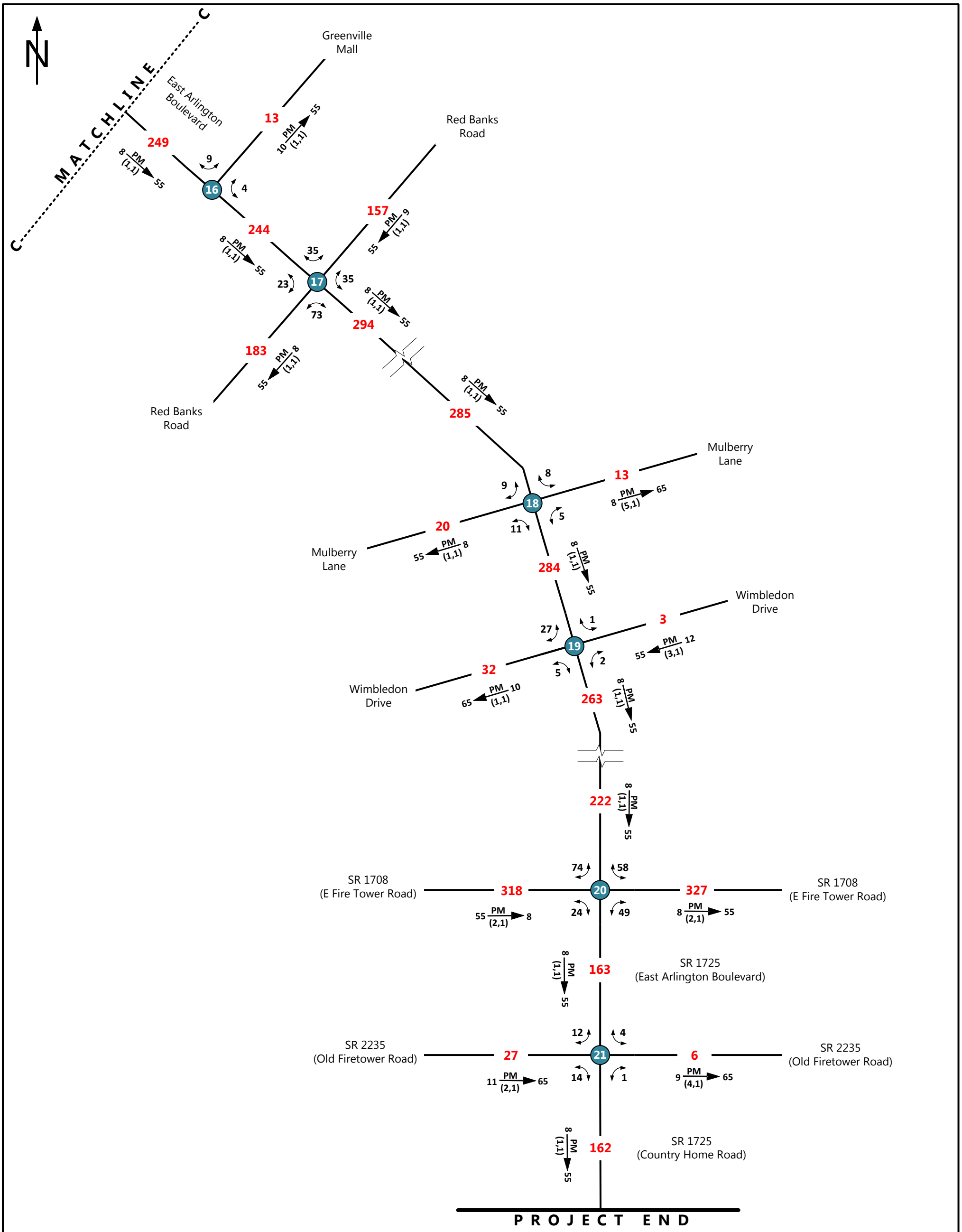

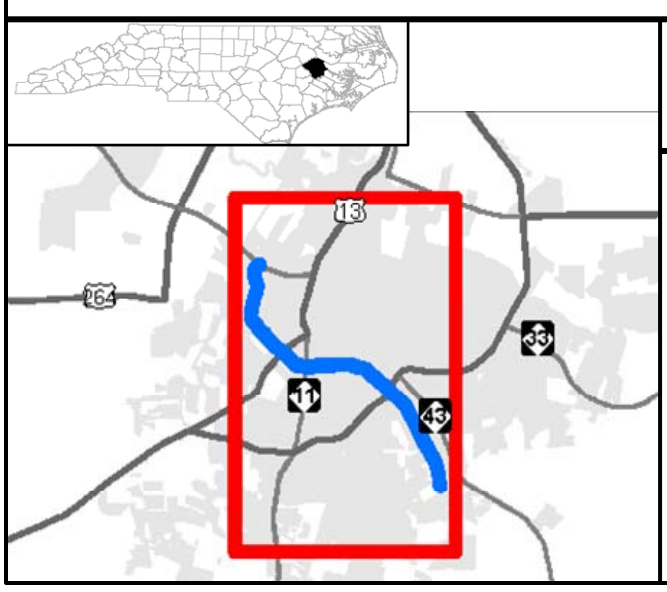

2016 Average Annual Daily Traffic

No-Build Alternative

(Scenario 1) SHEET 4 OF 4

LEGEND

D PM (d,t) K

No. of Vehicles per Day (VPD) in 100s

Existing Roadway

PM	PM Peak Hour
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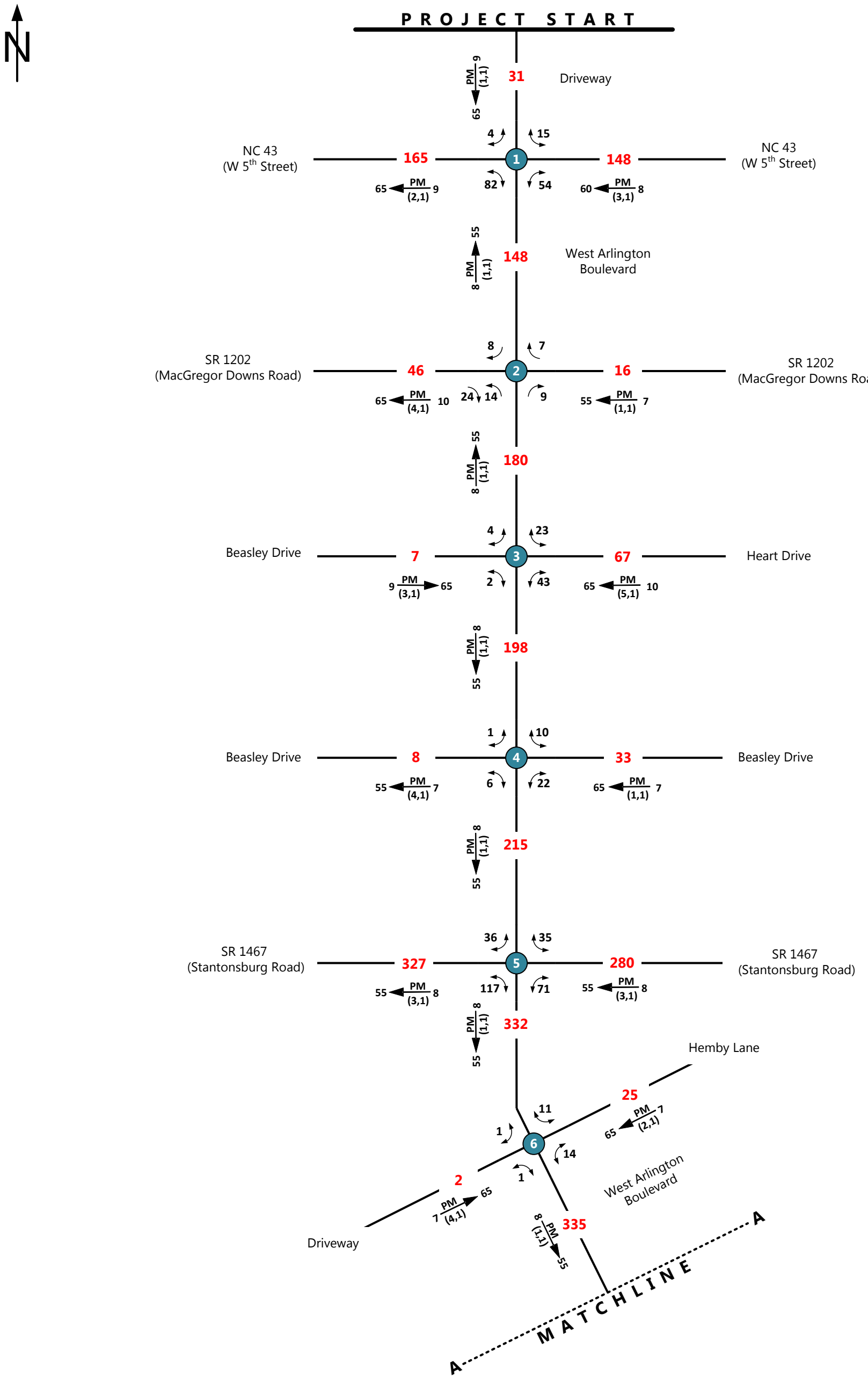
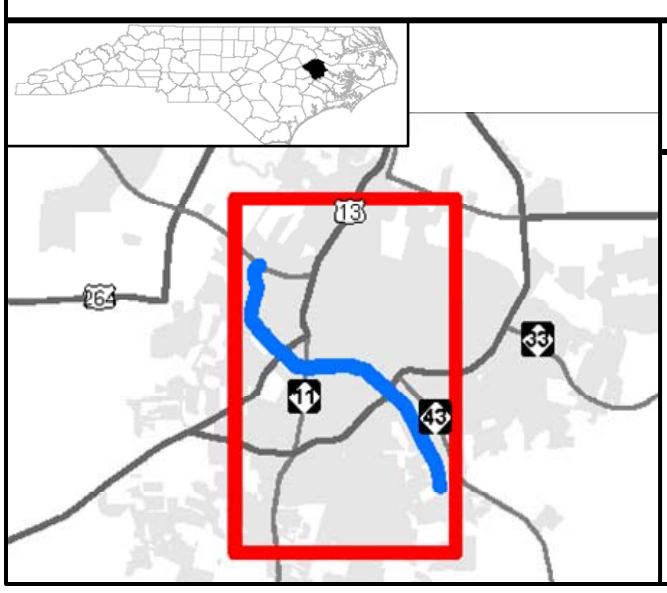




2016 Average Annual Daily Traffic

Build 4 Lanes Alternative

(Scenario 2) SHEET 1 OF 4

LEGEND

D ← PM (d,t) K

No. of Vehicles per Day (VPD) in 100s

Existing Roadway

PM	PM Peak Hour
D	Peak Hour Directional Split (%)
→	Indicates Direction of D
(d,t)	Duals, TTSTs (%)
K	Design Hour Factor (%)
X	Movement Prohibited
1-	Less than 50 VPD

TIP: SP-1602A

WBS: 34263.1.1

DIVISION: 2

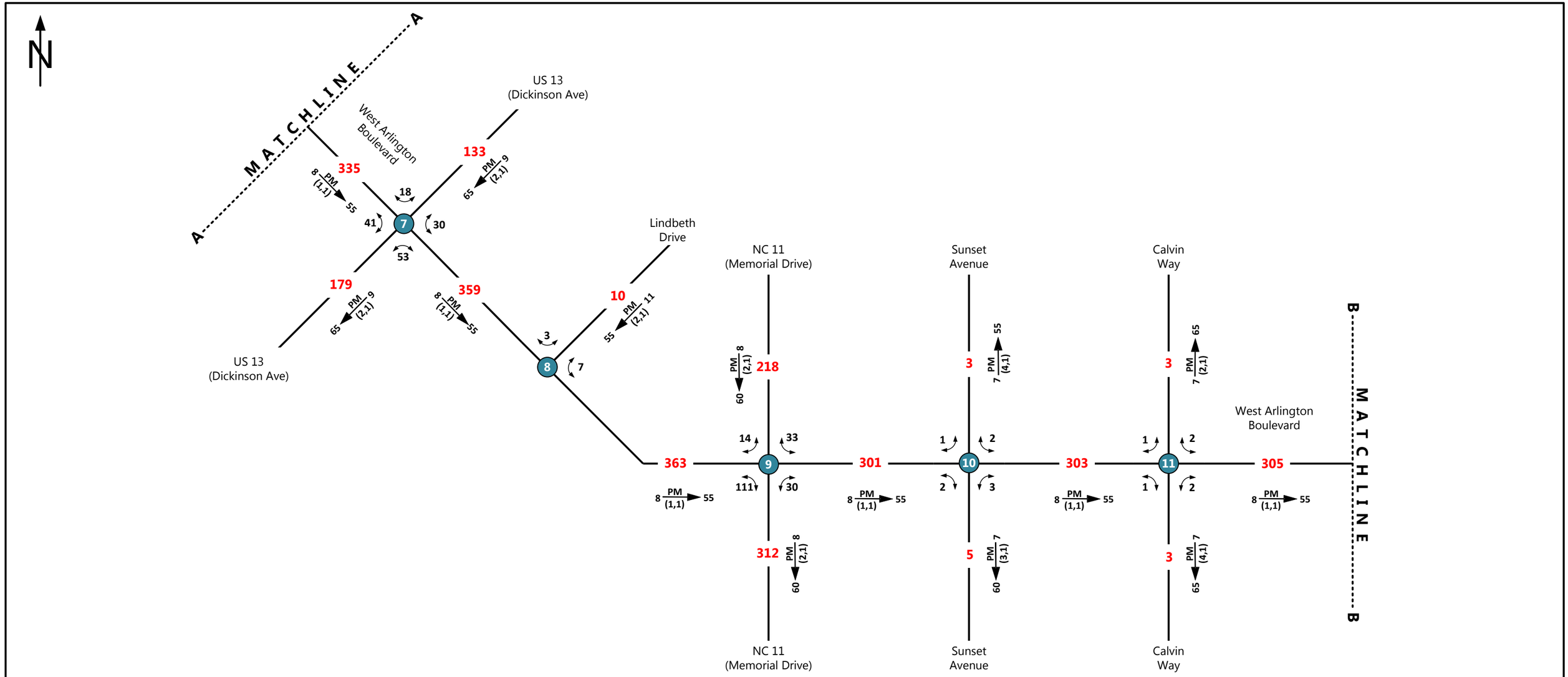
COUNTY: Pitt

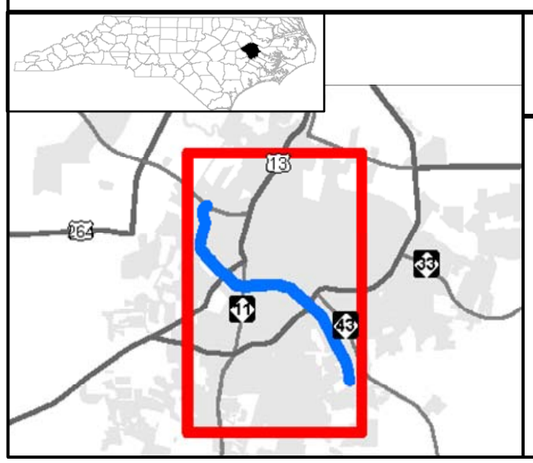
DATE: 07/10/2017

PREPARED BY: VHB Engineering NC, P.C.

LOCATION: Arlington Blvd from NC 43 (W 5th Street) to SR 2235 (Old Firetower Road)

PROJECT: Arlington Boulevard Feasibility Study





2016 Average Annual Daily Traffic

Build 4 Lanes Alternative

(Scenario 2) SHEET 2 OF 4

LEGEND

D ← PM (d,t) K

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		D	Peak Hour Directional Split (%)
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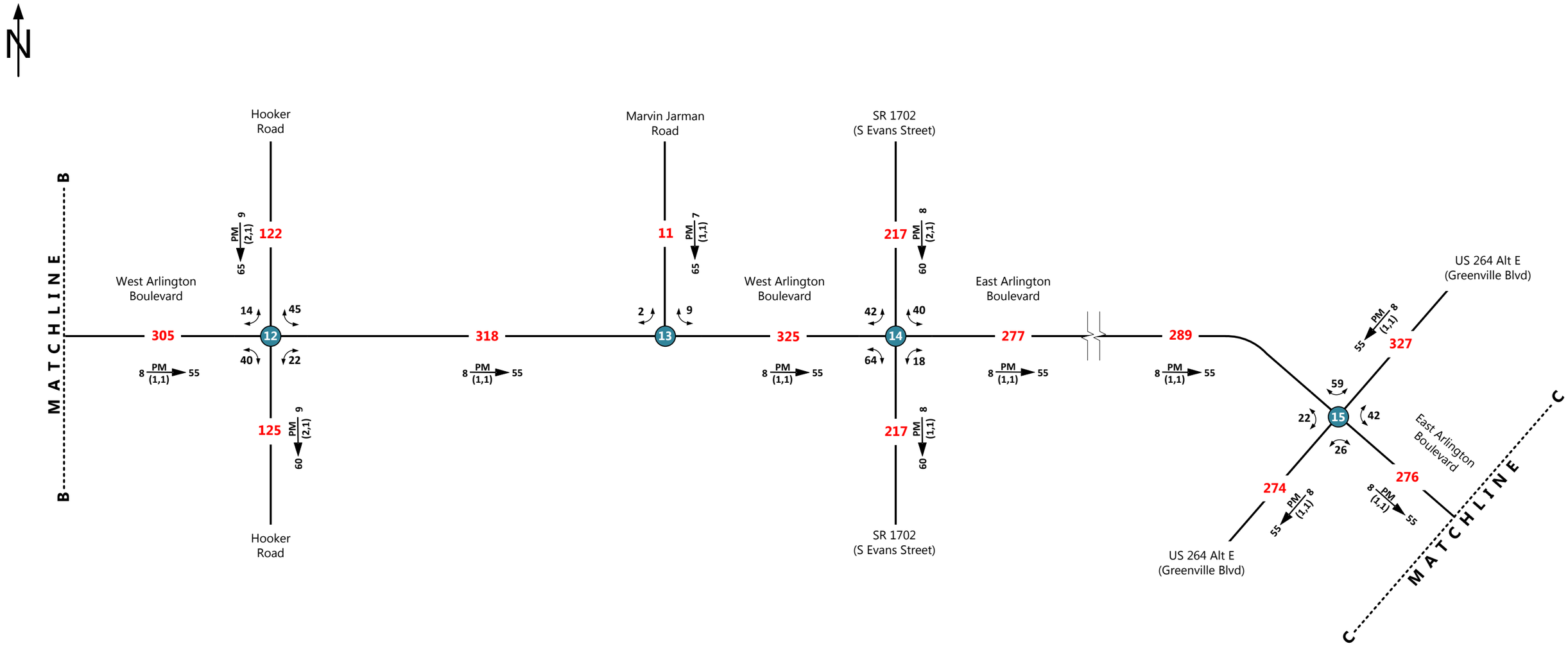

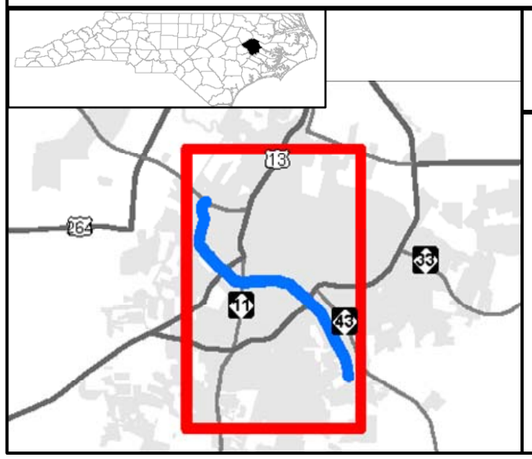

2016 Average Annual Daily Traffic

Build 4 Lanes Alternative

(Scenario 2) SHEET 3 OF 4

LEGEND

###	No. of Vehicles per Day (VPD) in 100s
——	Existing Roadway

D ◄ PM (d,t) K

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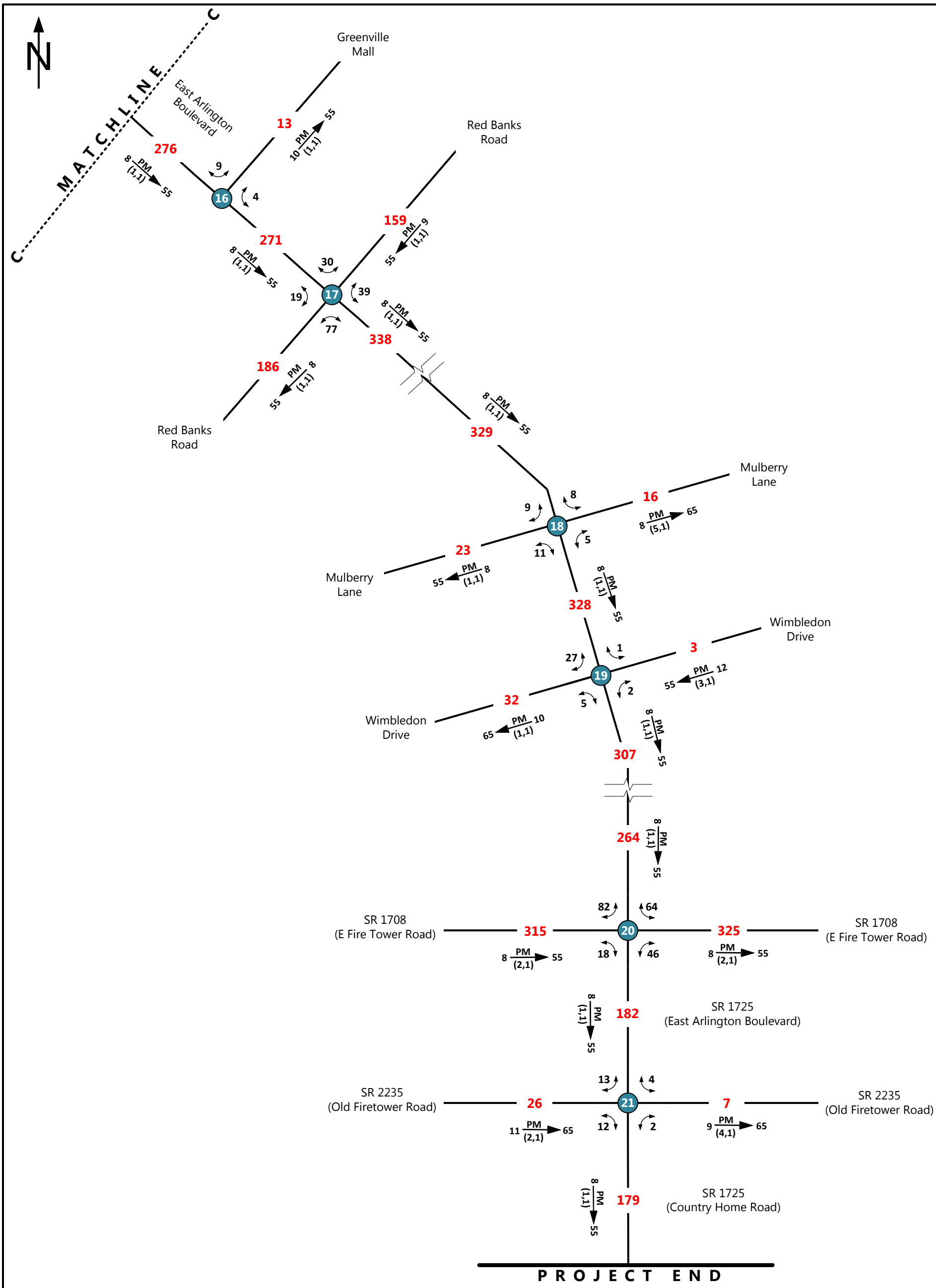

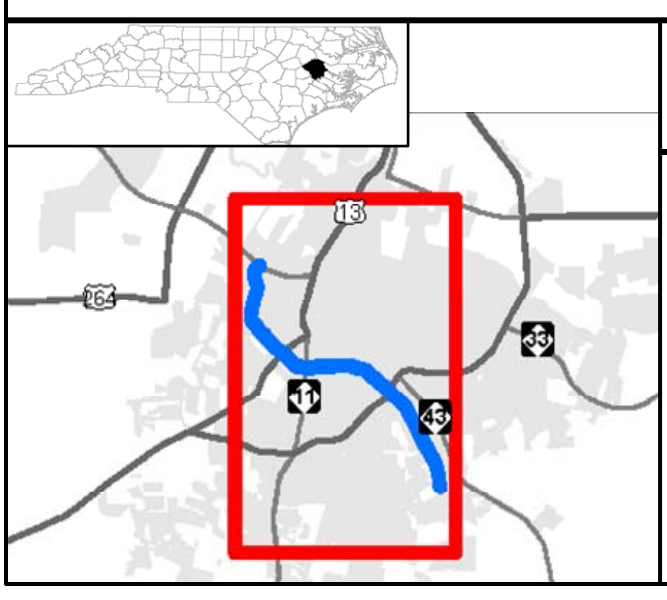

2016 Average Annual Daily Traffic

Build 4 Lanes Alternative

(Scenario 2) SHEET 4 OF 4

LEGEND

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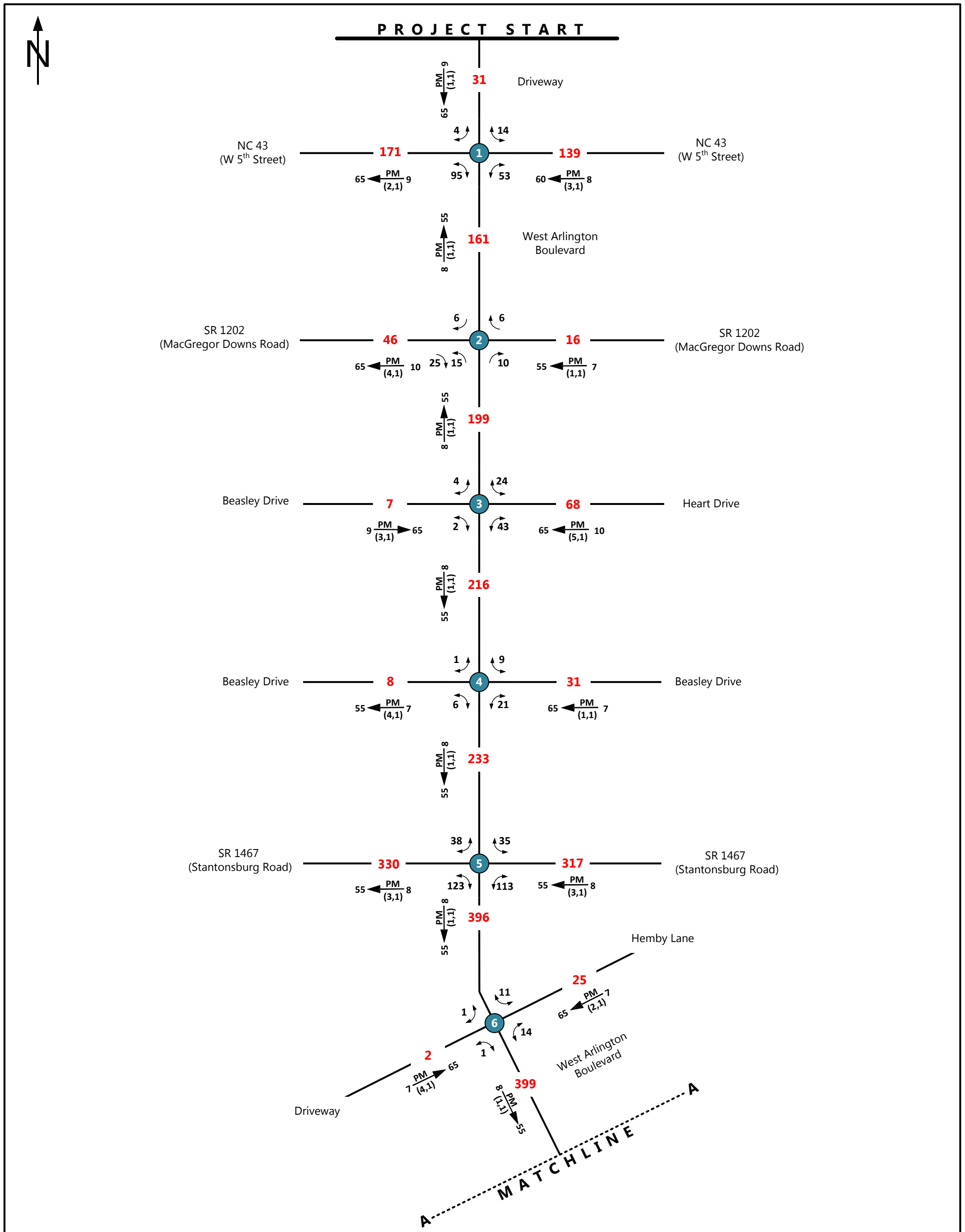

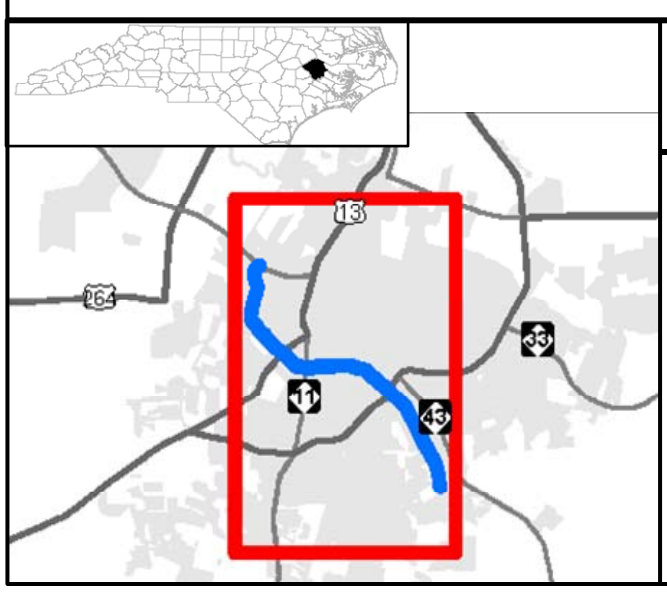

2016 Average Annual Daily Traffic

Build 6 Lanes Alternative

(Scenario 3) SHEET 1 OF 4

LEGEND

D PM (d,t) K

###	No. of Vehicles per Day (VPD) in 100s
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TIP: SP-1602a

WBS: 34263.1.1

DIVISION: 2

COUNTY: Pitt

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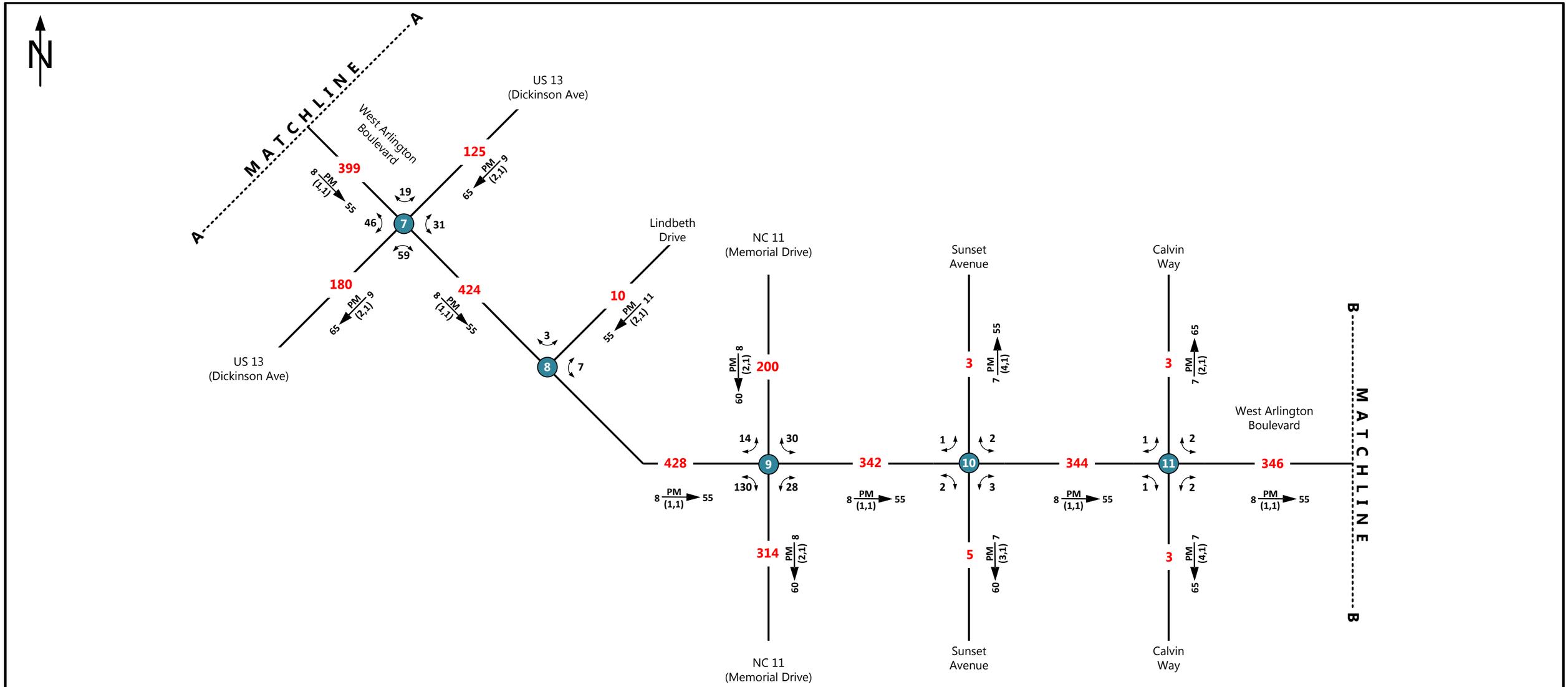

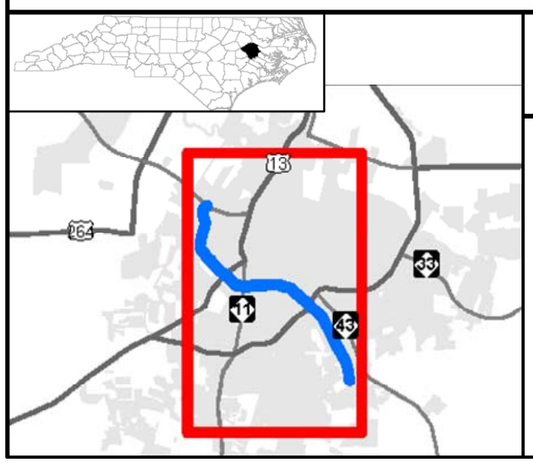

2016 Average Annual Daily Traffic

Build 6 Lanes Alternative

(Scenario 3) SHEET 2 OF 4

LEGEND

D ← PM (d,t) K

###	No. of Vehicles per Day (VPD) in 100s	PM	PM Peak Hour
		D	Peak Hour Directional Split (%)
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TIP: SP-1602a

WBS: 34263.1.1

DIVISION: 2

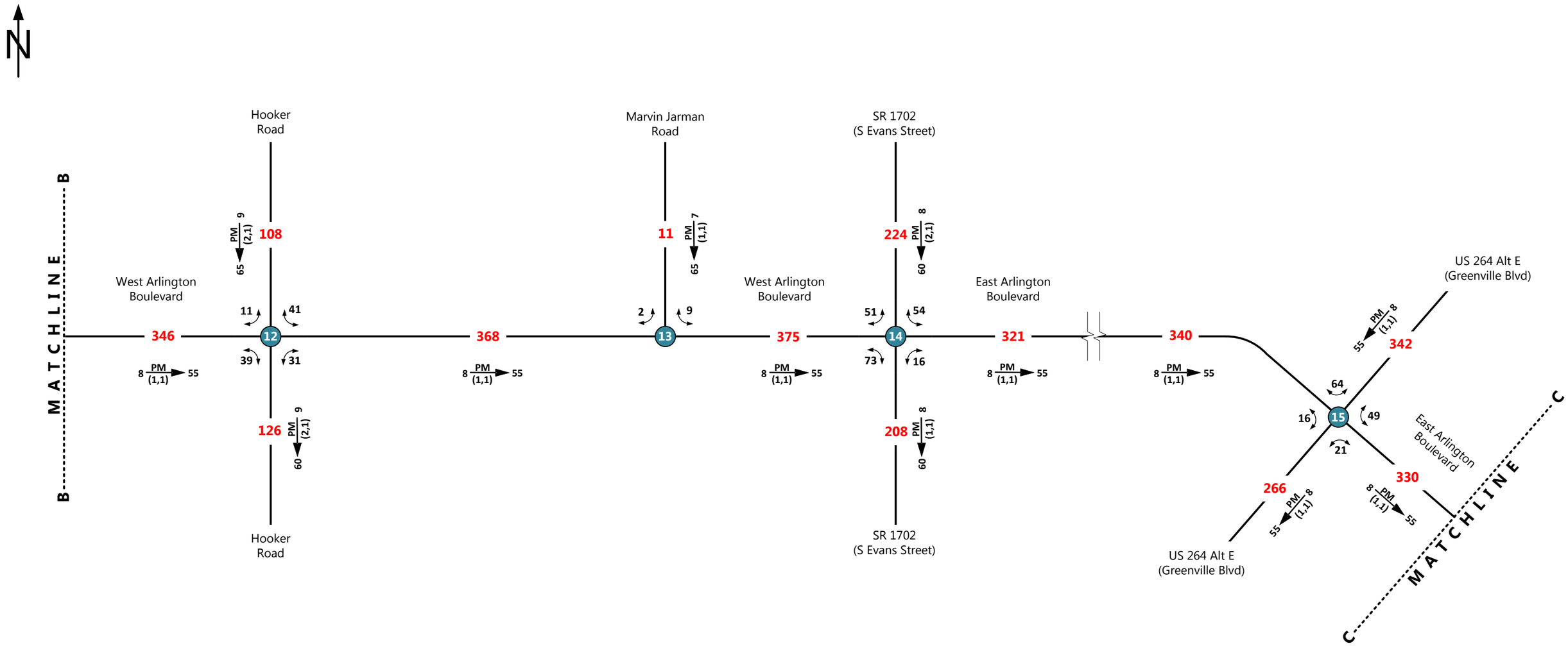
COUNTY: Pitt

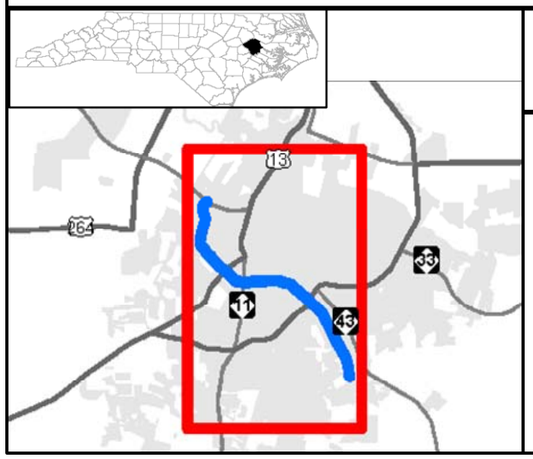
DATE: 07/10/2017

PREPARED BY: VHB Engineering NC, P.C.

LOCATION: Arlington Blvd from NC 43 (W 5th Street) to SR 2235 (Old Firetower Road)

PROJECT: Arlington Boulevard Feasibility Study





2016 Average Annual Daily Traffic

Build 6 Lanes Alternative

(Scenario 3) SHEET 3 OF 4

LEGEND

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——	Existing Roadway

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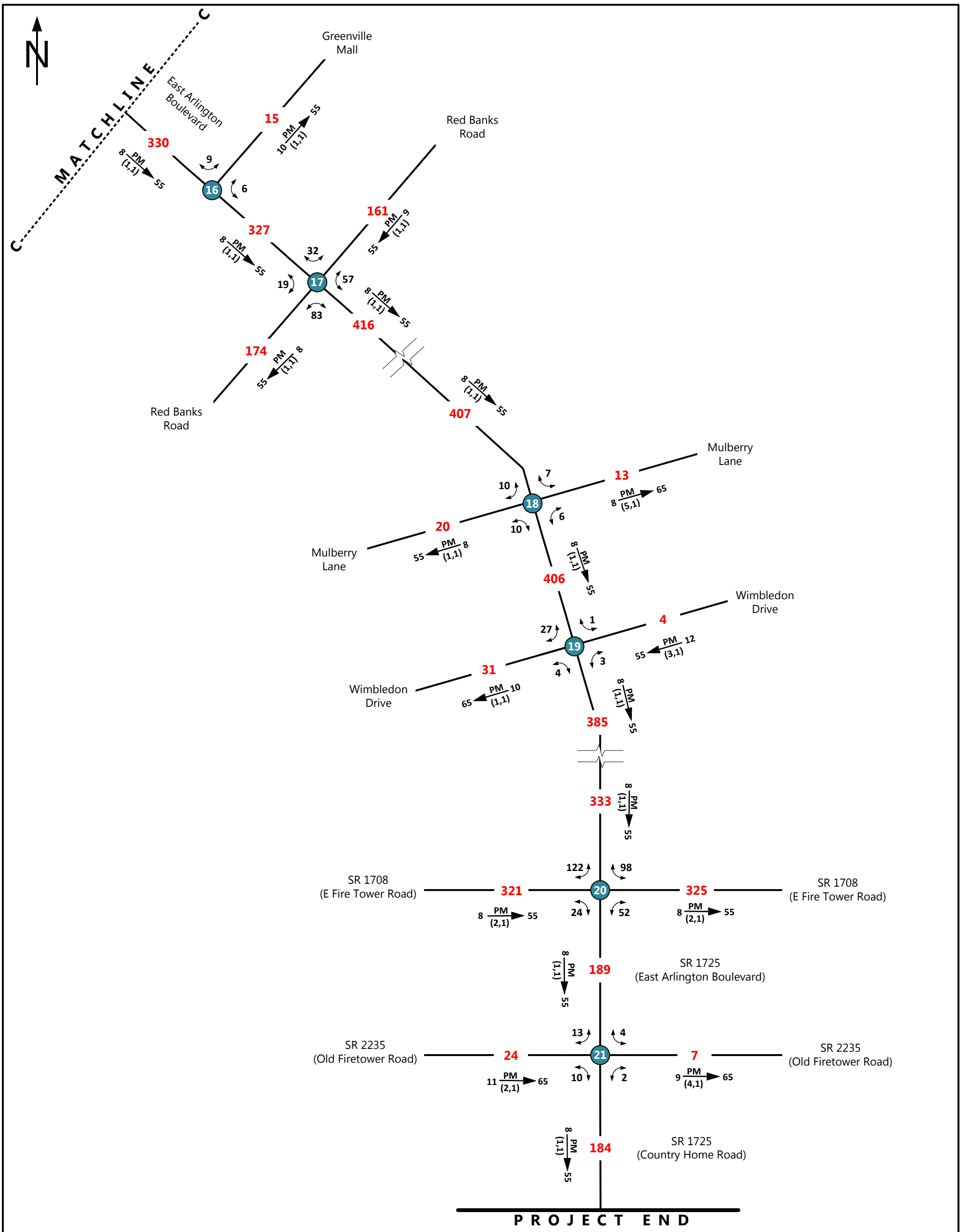
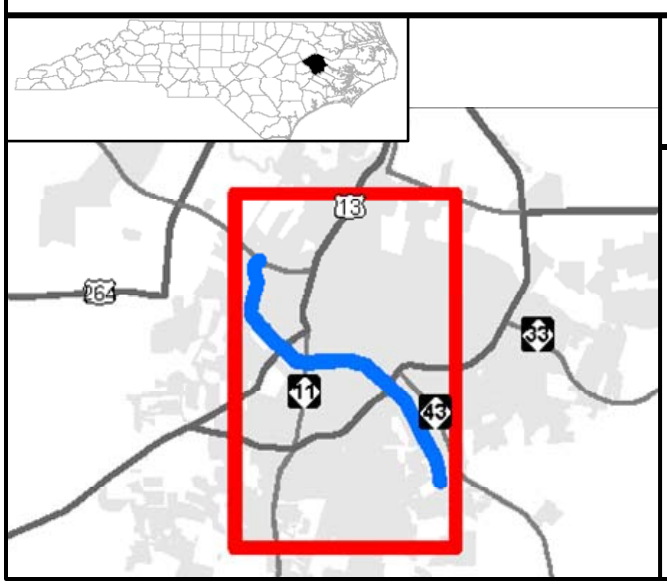
PROJECT: Arlington Boulevard Feasibility Study





2016 Average Annual Daily Traffic

Build 6 Lanes Alternative

(Scenario 3) SHEET 4 OF 4

LEGEND

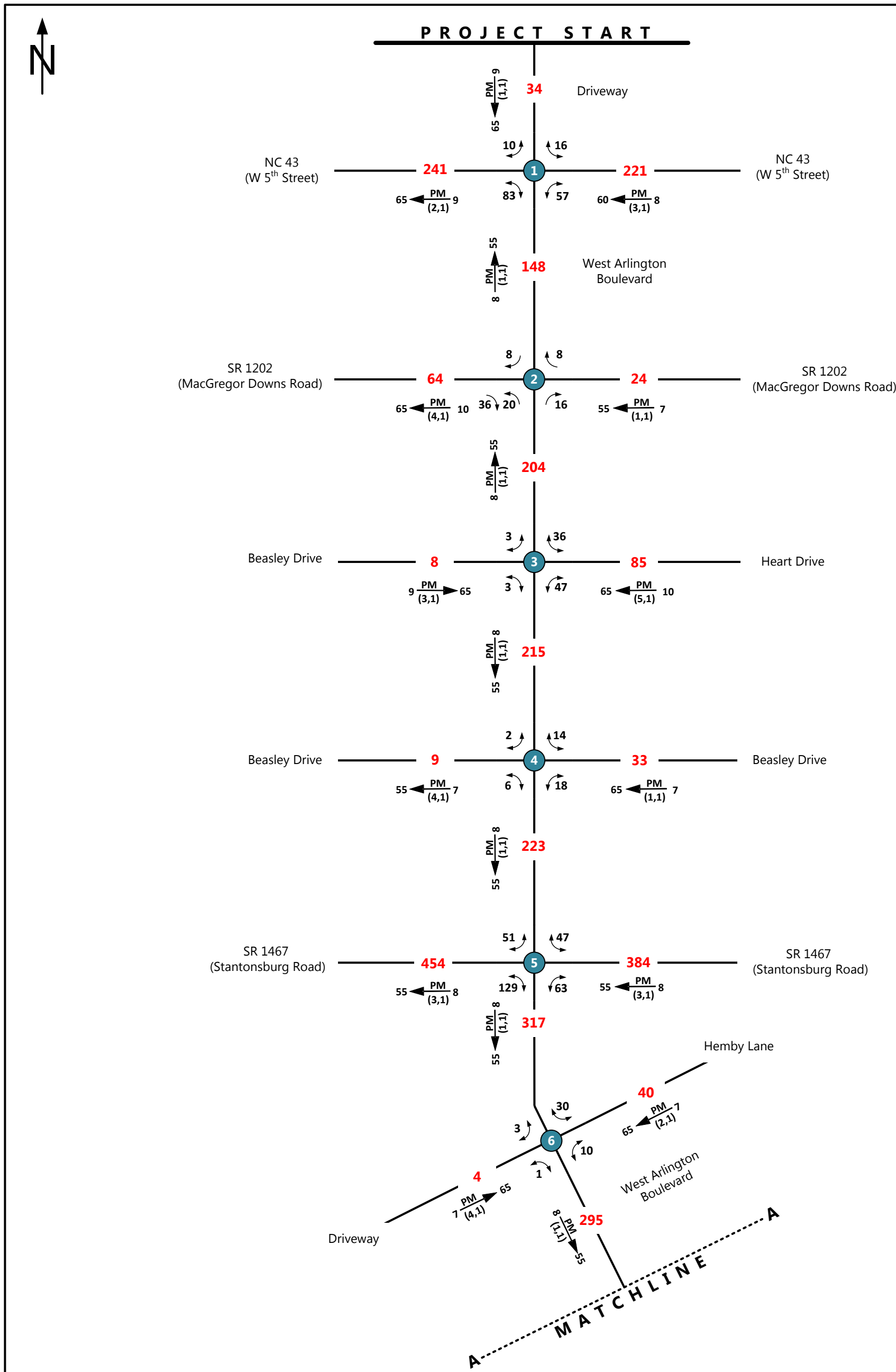
D PM K (d,t)

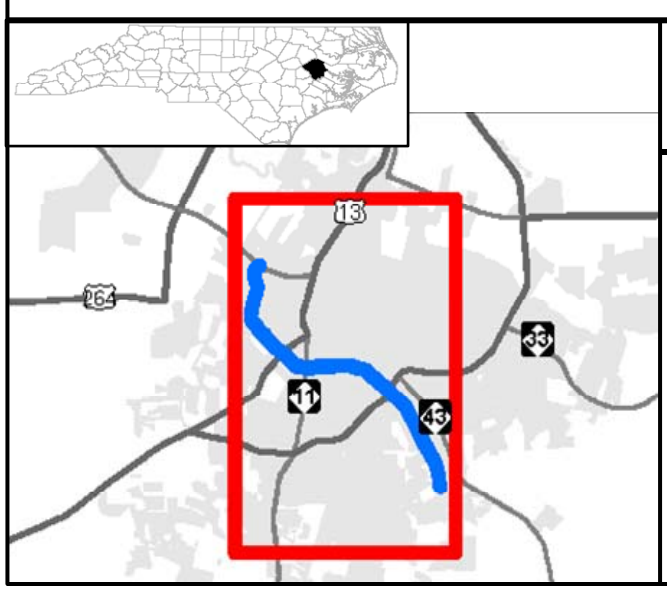
No. of Vehicles per Day (VPD) in 100s

Existing Roadway

PM	PM Peak Hour
D	Peak Hour Directional Split (%)
→	Indicates Direction of D
(d,t)	Duals, TTSTs (%)
K	Design Hour Factor (%)
X	Movement Prohibited
1-	Less than 50 VPD

TIP: SP-1602A
WBS: 34263.1.1
DIVISION: 2
COUNTY: Pitt
DATE: 07/10/2017
PREPARED BY: VHB Engineering NC, P.C.
LOCATION: Arlington Blvd from NC 43 (W 5th Street) to SR 2235 (Old Firetower Road)
PROJECT: Arlington Boulevard Feasibility Study





2040 Average Annual Daily Traffic

No-Build Alternative

(Scenario 4) SHEET 1 OF 4

LEGEND

D PM (d,t) K

###	No. of Vehicles per Day (VPD) in 100s
—	Existing Roadway

PM	PM Peak Hour
D	Peak Hour Directional Split (%)
→	Indicates Direction of D
(d,t)	Duals, TTSTs (%)
K	Design Hour Factor (%)
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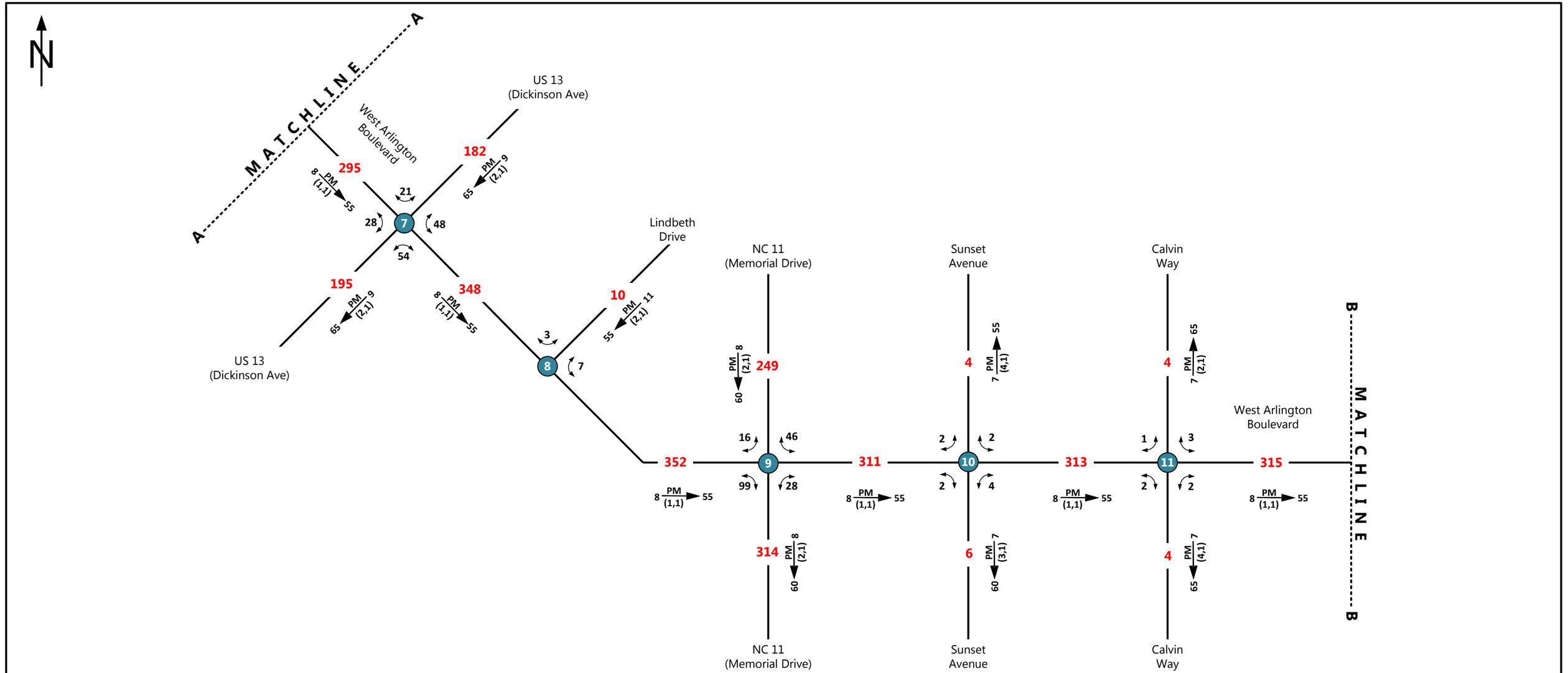

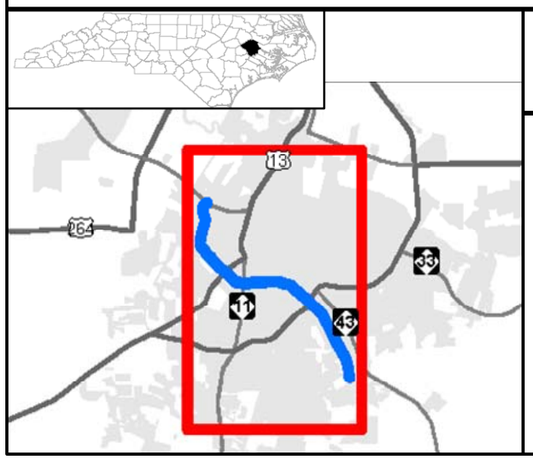

2040 Average Annual Daily Traffic

No-Build Alternative

(Scenario 4) SHEET 2 OF 4

LEGEND

D ← PM (d,t) K

###	No. of Vehicles per Day (VPD) in 100s
——	Existing Roadway

PM	PM Peak Hour
D	Peak Hour Directional Split (%)
→	Indicates Direction of D
(d,t)	Duals, TTSTs (%)
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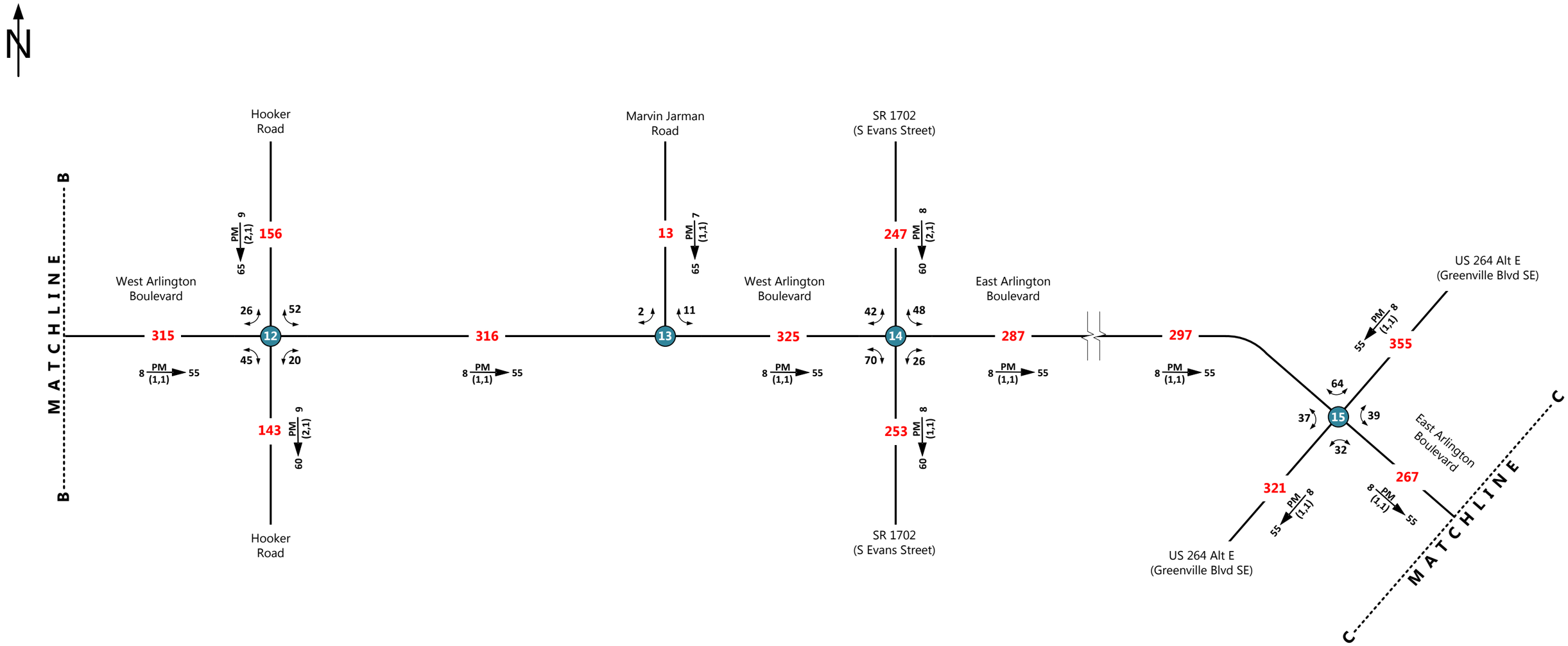

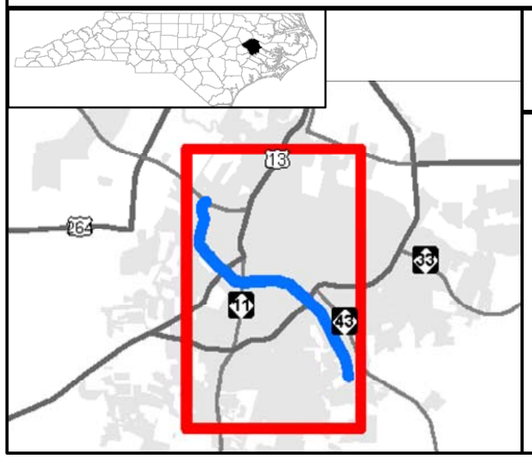

2040 Average Annual Daily Traffic

No-Build Alternative

(Scenario 4) SHEET 3 OF 4

LEGEND

###	No. of Vehicles per Day (VPD) in 100s	PM	PM Peak Hour
		D	Peak Hour Directional Split (%)
——	Existing Roadway	→	Indicates Direction of D
		(d,t)	Duals, TTSTs (%)
		K	Design Hour Factor (%)
		X	Movement Prohibited
		1-	Less than 50 VPD

D ← PM (d,t) K

TIP: SP-1602A

WBS: 34263.1.1

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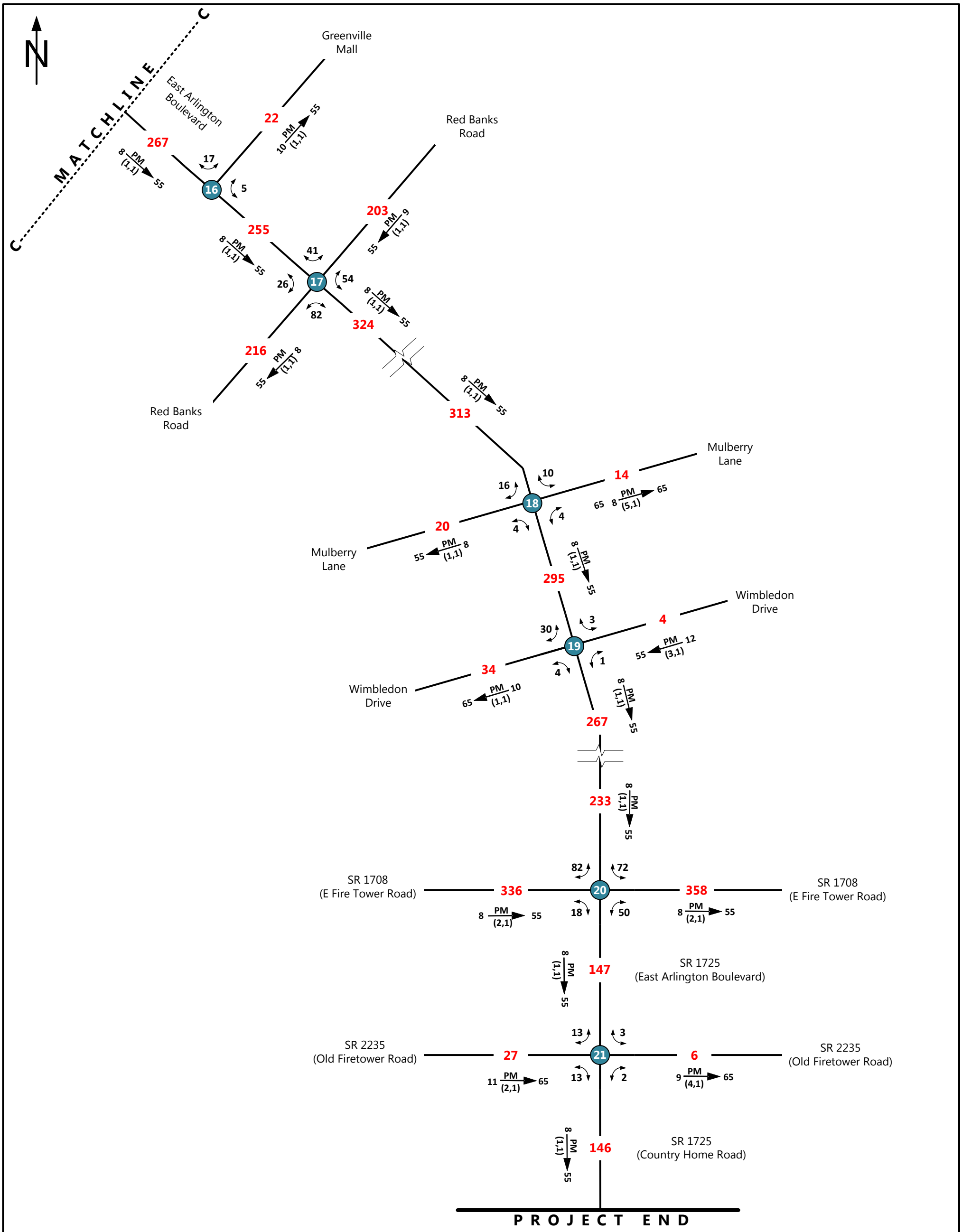

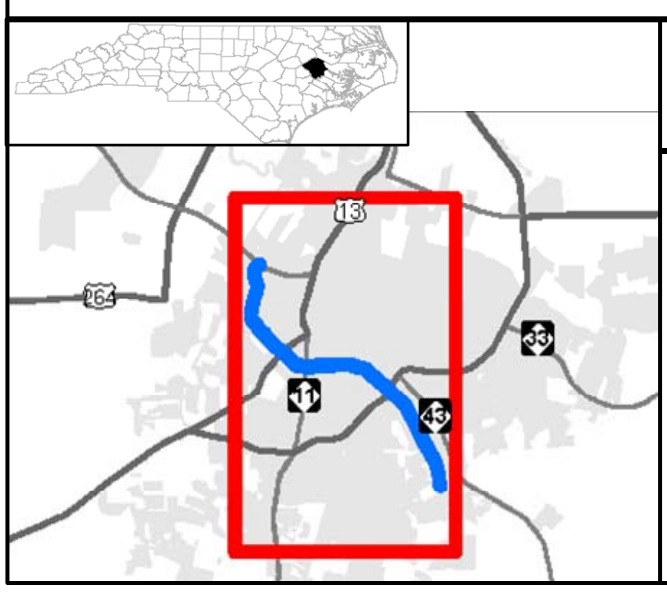

2040 Average Annual Daily Traffic

No-Build Alternative

(Scenario 4) SHEET 4 OF 4

LEGEND

D ← PM (d,t) → K

No. of Vehicles per Day (VPD) in 100s

Existing Roadway

PM	PM Peak Hour
D	Peak Hour Directional Split (%)
→	Indicates Direction of D
(d,t)	Duals, TTSTs (%)
K	Design Hour Factor (%)
X	Movement Prohibited
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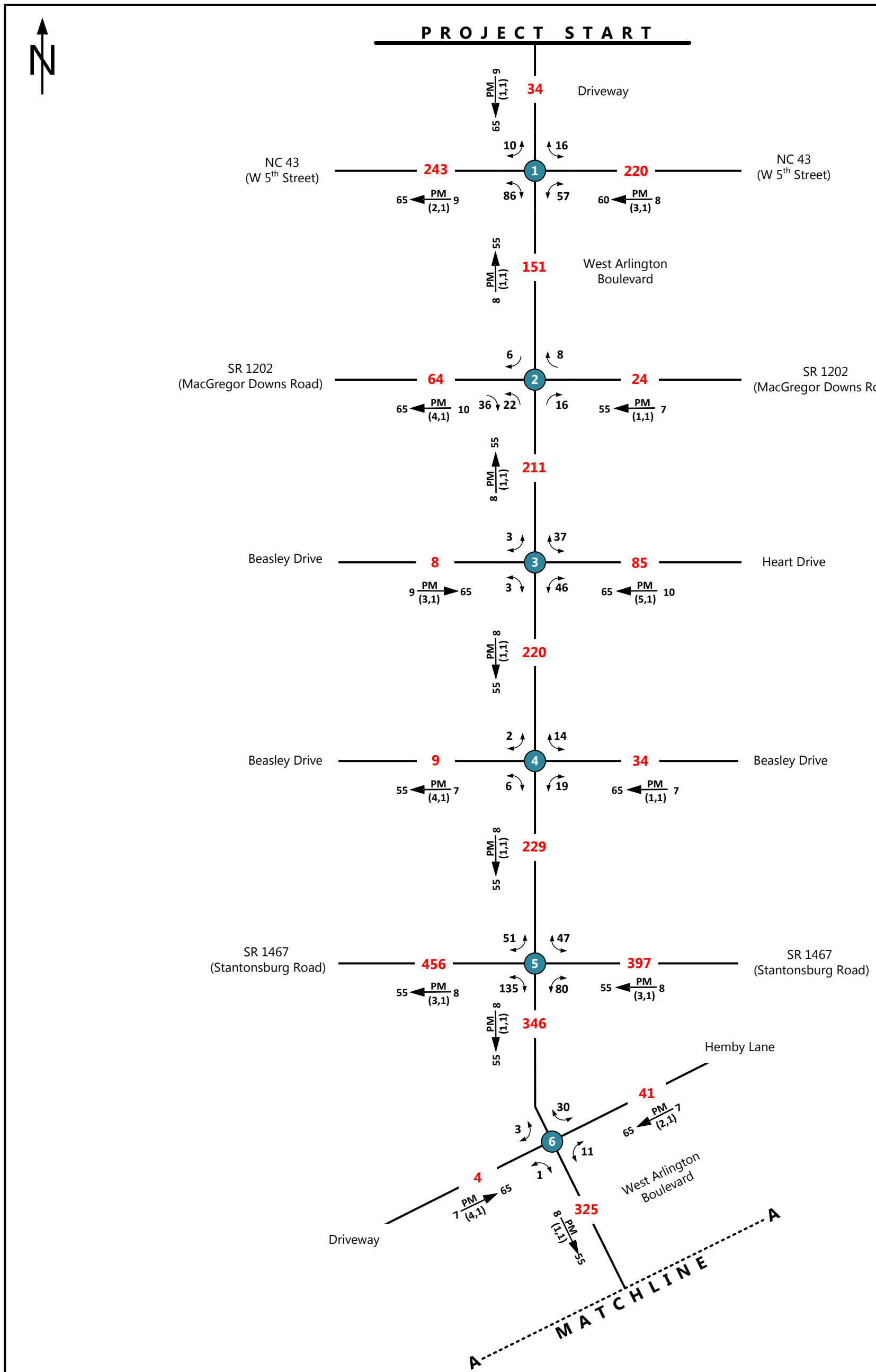
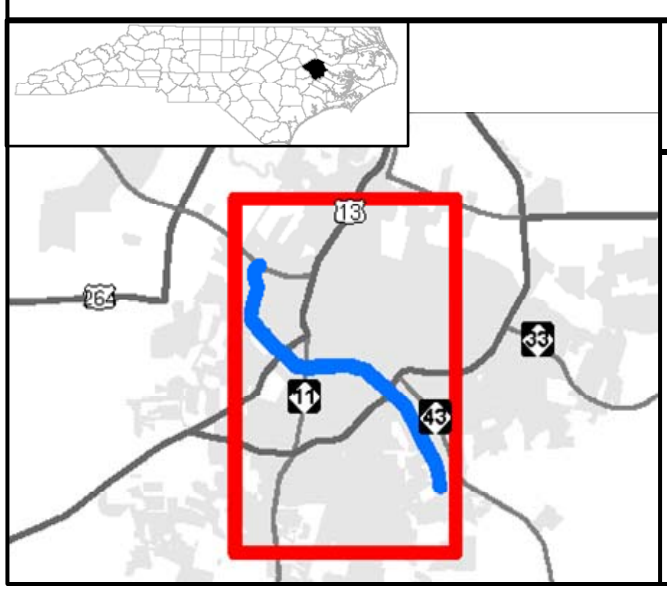




2040 Average Annual Daily Traffic

Build 4 Lanes Alternative

(Scenario 5) SHEET 1 OF 4

LEGEND

D PM (d,t) K

###	No. of Vehicles per Day (VPD) in 100s
—	Existing Roadway

PM	PM Peak Hour
D	Peak Hour Directional Split (%)
→	Indicates Direction of D
(d,t)	Duals, TTSTs (%)
K	Design Hour Factor (%)
X	Movement Prohibited
1-	Less than 50 VPD

TIP: SP-1602A

WBS: 34263.1.1

DIVISION: 2

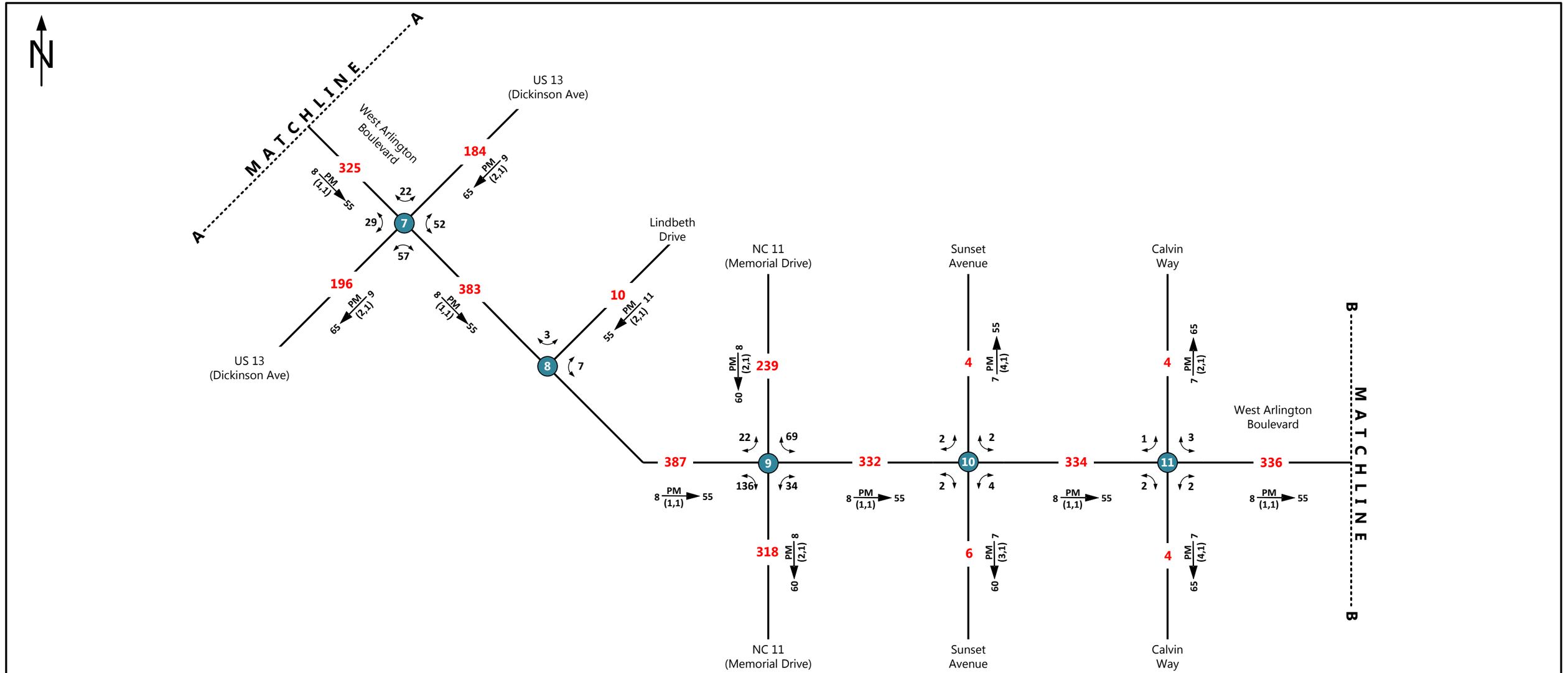
COUNTY: Pitt

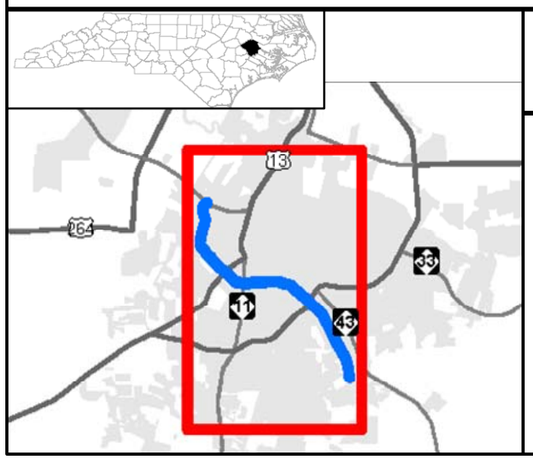
DATE: 07/10/2017

PREPARED BY: VHB Engineering NC, P.C.

LOCATION: Arlington Blvd from NC 43 (W 5th Street) to SR 2235 (Old Firetower Road)

PROJECT: Arlington Boulevard Feasibility Study





2040 Average Annual Daily Traffic

Build 4 Lanes Alternative

(Scenario 5) SHEET 2 OF 4

LEGEND

###	No. of Vehicles per Day (VPD) in 100s
——	Existing Roadway

D ← PM (d,t) K

PM	PM Peak Hour
D	Peak Hour Directional Split (%)
→	Indicates Direction of D
(d,t)	Duals, TTSTs (%)
K	Design Hour Factor (%)
X	Movement Prohibited
1-	Less than 50 VPD

TIP: SP-1602A

WBS: 34263.1.1

DIVISION: 2

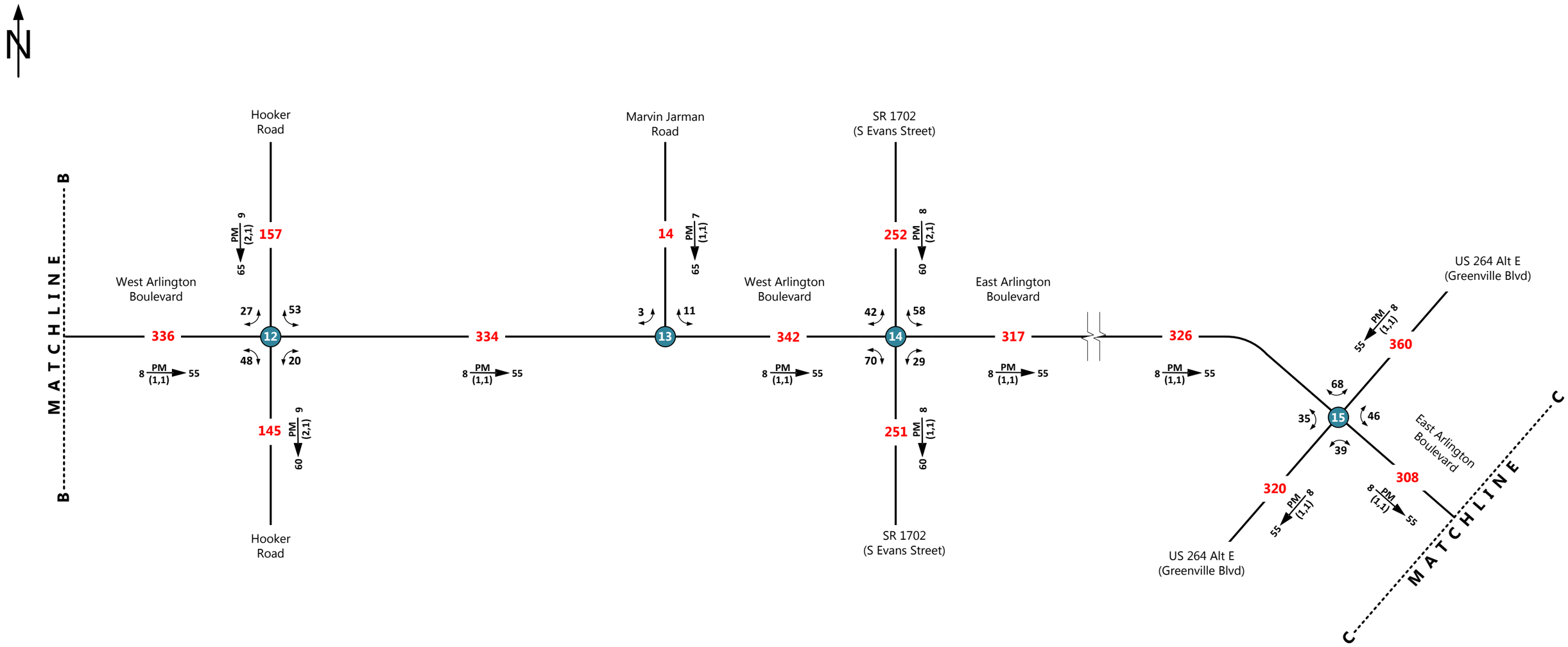
COUNTY: Pitt

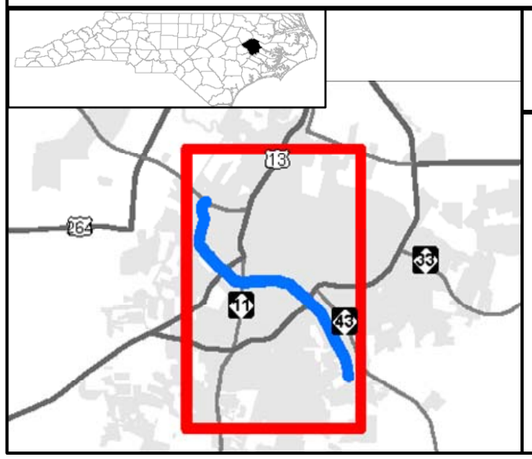
DATE: 07/10/2017

PREPARED BY: VHB Engineering NC, P.C.

LOCATION: Arlington Blvd from NC 43 (W 5th Street) to SR 2235 (Old Firetower Road)

PROJECT: Arlington Boulevard Feasibility Study





2040 Average Annual Daily Traffic

Build 4 Lanes Alternative

(Scenario 5) SHEET 3 OF 4

LEGEND

###	No. of Vehicles per Day (VPD) in 100s	PM	PM Peak Hour
		D	Peak Hour Directional Split (%)
—	Existing Roadway	→	Indicates Direction of D
		(d,t)	Duals, TTSTs (%)
		K	Design Hour Factor (%)
		X	Movement Prohibited
		1-	Less than 50 VPD

D ← PM (d,t) K

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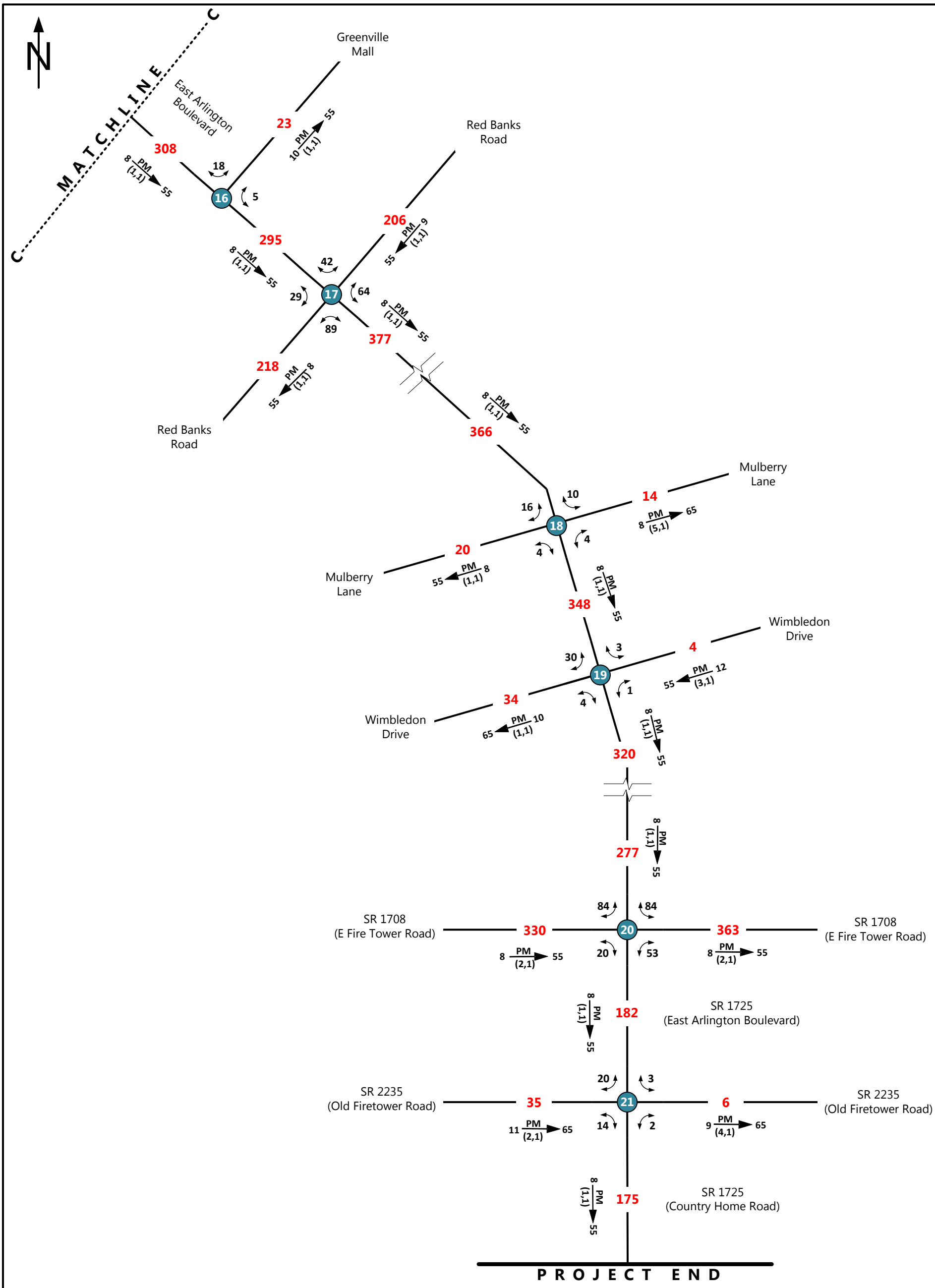

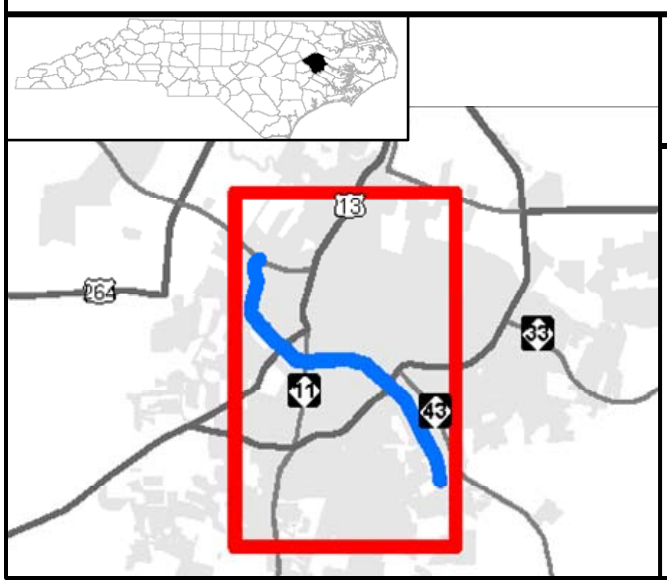

2040 Average Annual Daily Traffic

Build 4 Lanes Alternative

(Scenario 5) SHEET 4 OF 4

LEGEND

D PM (d,t) K

###	No. of Vehicles per Day (VPD) in 100s
——	Existing Roadway

PM	PM Peak Hour
D	Peak Hour Directional Split (%)
→	Indicates Direction of D
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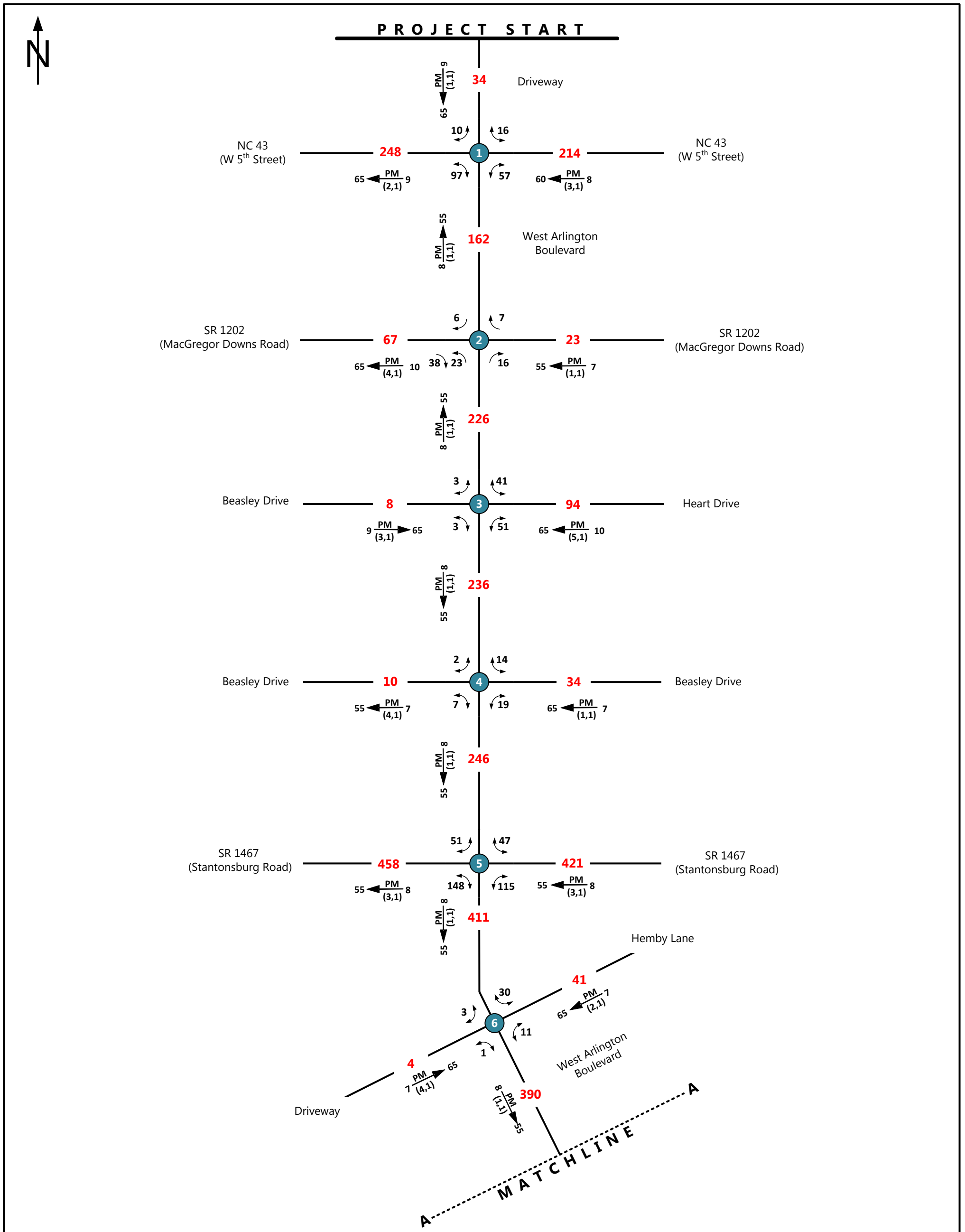

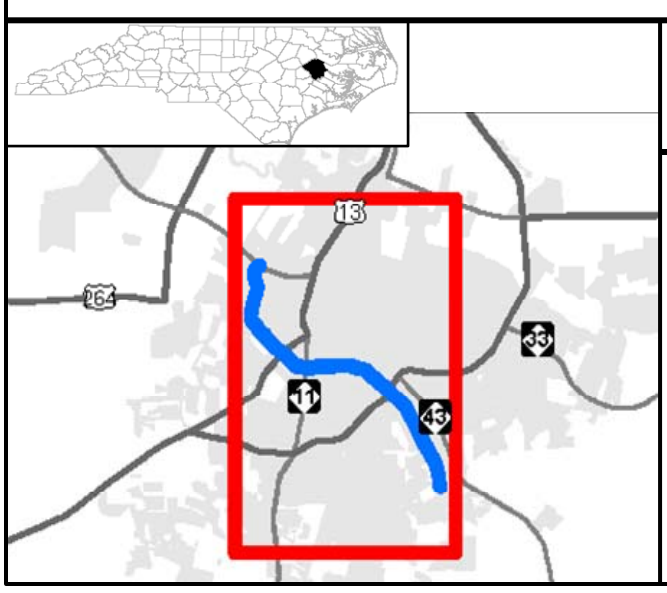

2040 Average Annual Daily Traffic

Build 6 Lanes Alternative

(Scenario 6) SHEET 1 OF 4

LEGEND

D PM (d,t) K

###	No. of Vehicles per Day (VPD) in 100s
—	Existing Roadway

PM	PM Peak Hour
D	Peak Hour Directional Split (%)
→	Indicates Direction of D
(d,t)	Duals, TTSTs (%)
K	Design Hour Factor (%)
X	Movement Prohibited
1-	Less than 50 VPD

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DIVISION: 2

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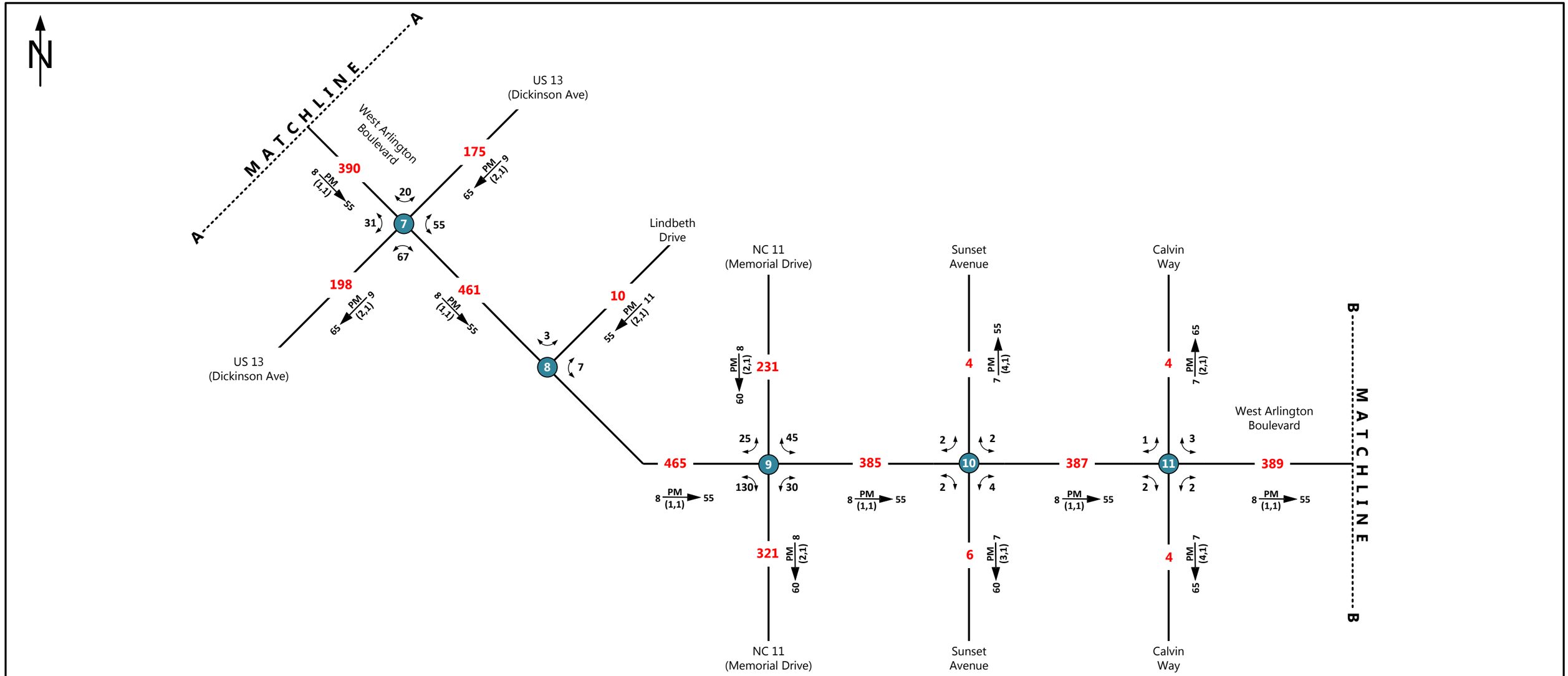

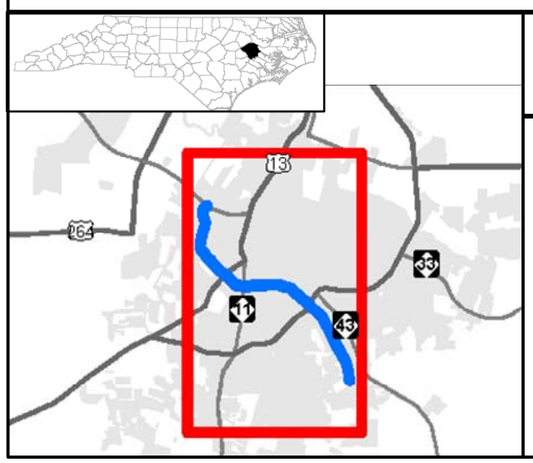

2040 Average Annual Daily Traffic

Build 6 Lanes Alternative

(Scenario 6) SHEET 2 OF 4

LEGEND

###	No. of Vehicles per Day (VPD) in 100s
——	Existing Roadway

D ← PM (d,t) K

PM	PM Peak Hour
D	Peak Hour Directional Split (%)
→	Indicates Direction of D
(d,t)	Duals, TTSTs (%)
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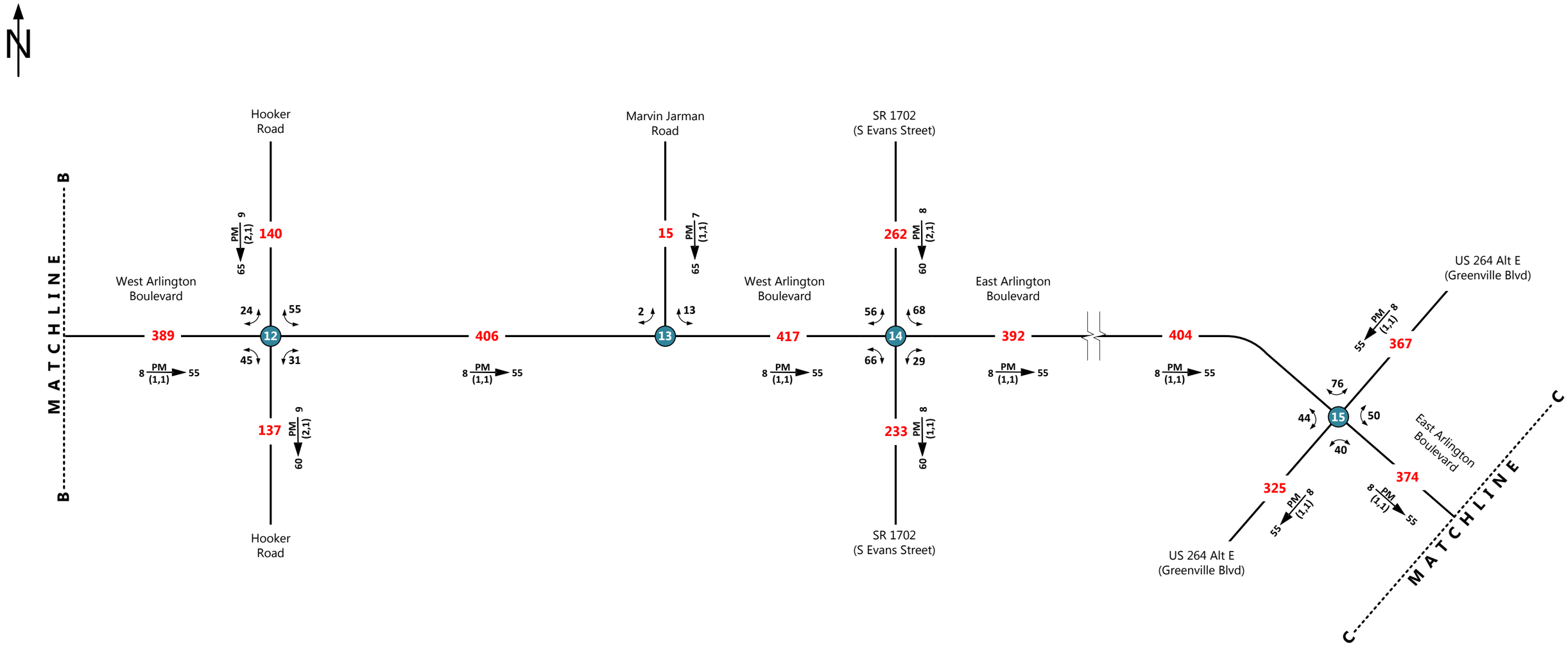

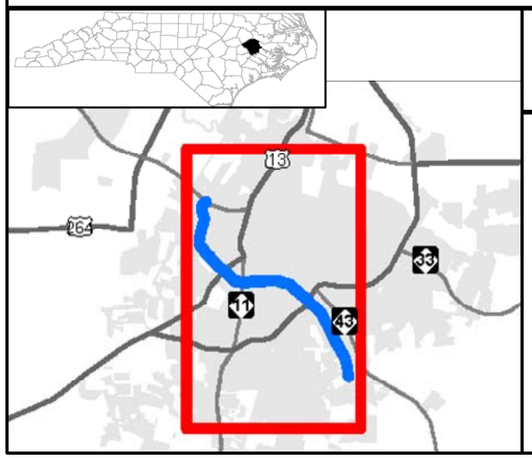

2040 Average Annual Daily Traffic

Build 6 Lanes Alternative

(Scenario 6) SHEET 3 OF 4

LEGEND

###	No. of Vehicles per Day (VPD) in 100s
——	Existing Roadway

D ← PM (d,t) K

PM	PM Peak Hour
D	Peak Hour Directional Split (%)
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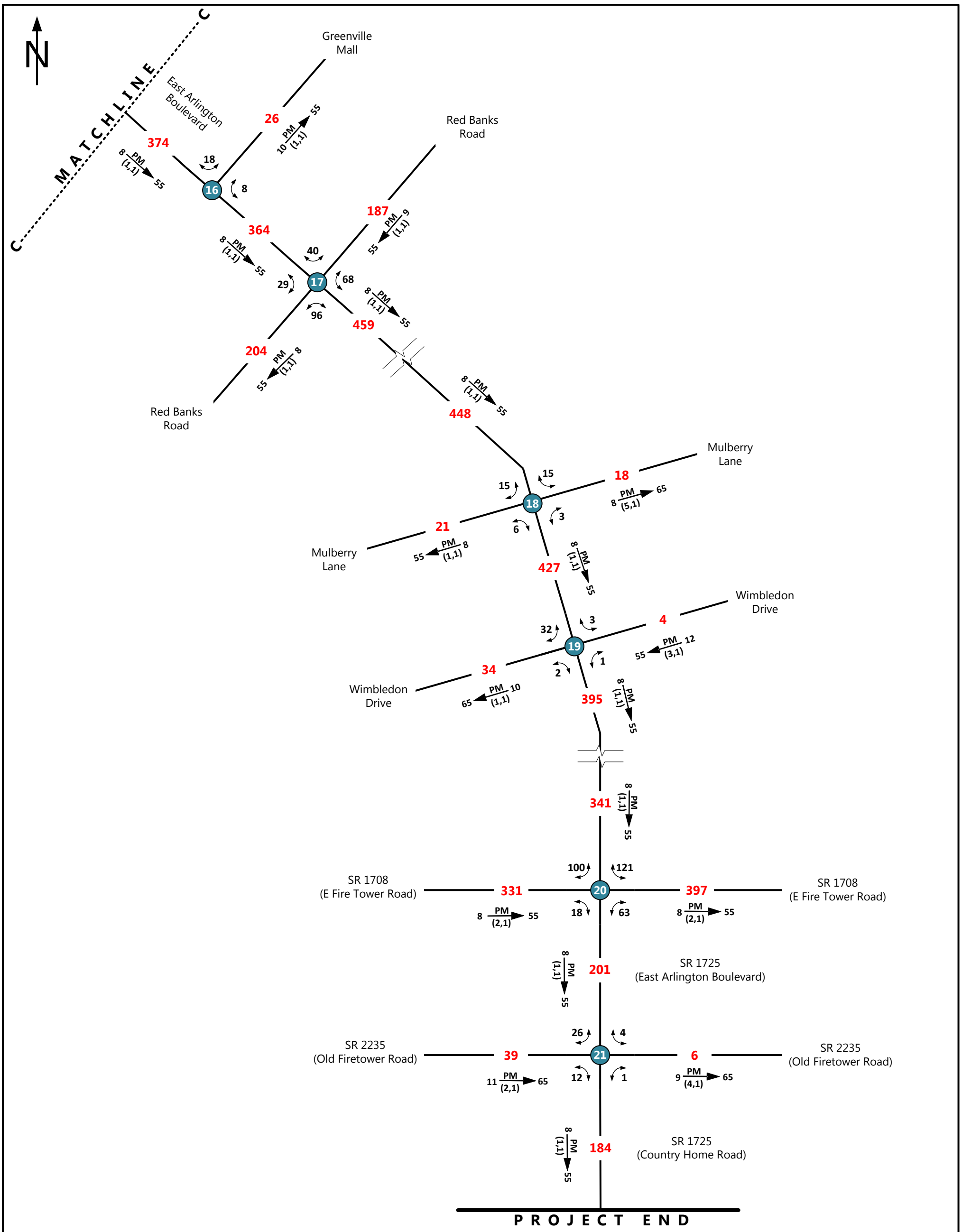

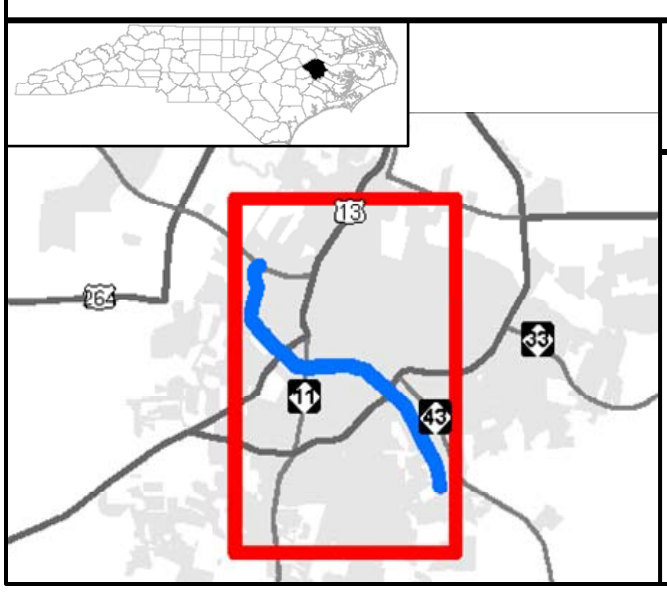

2040 Average Annual Daily Traffic

Build 6 Lanes Alternative

(Scenario 6) SHEET 4 OF 4

LEGEND

D PM (d,t) K

###	No. of Vehicles per Day (VPD) in 100s
——	Existing Roadway

PM	PM Peak Hour
D	Peak Hour Directional Split (%)
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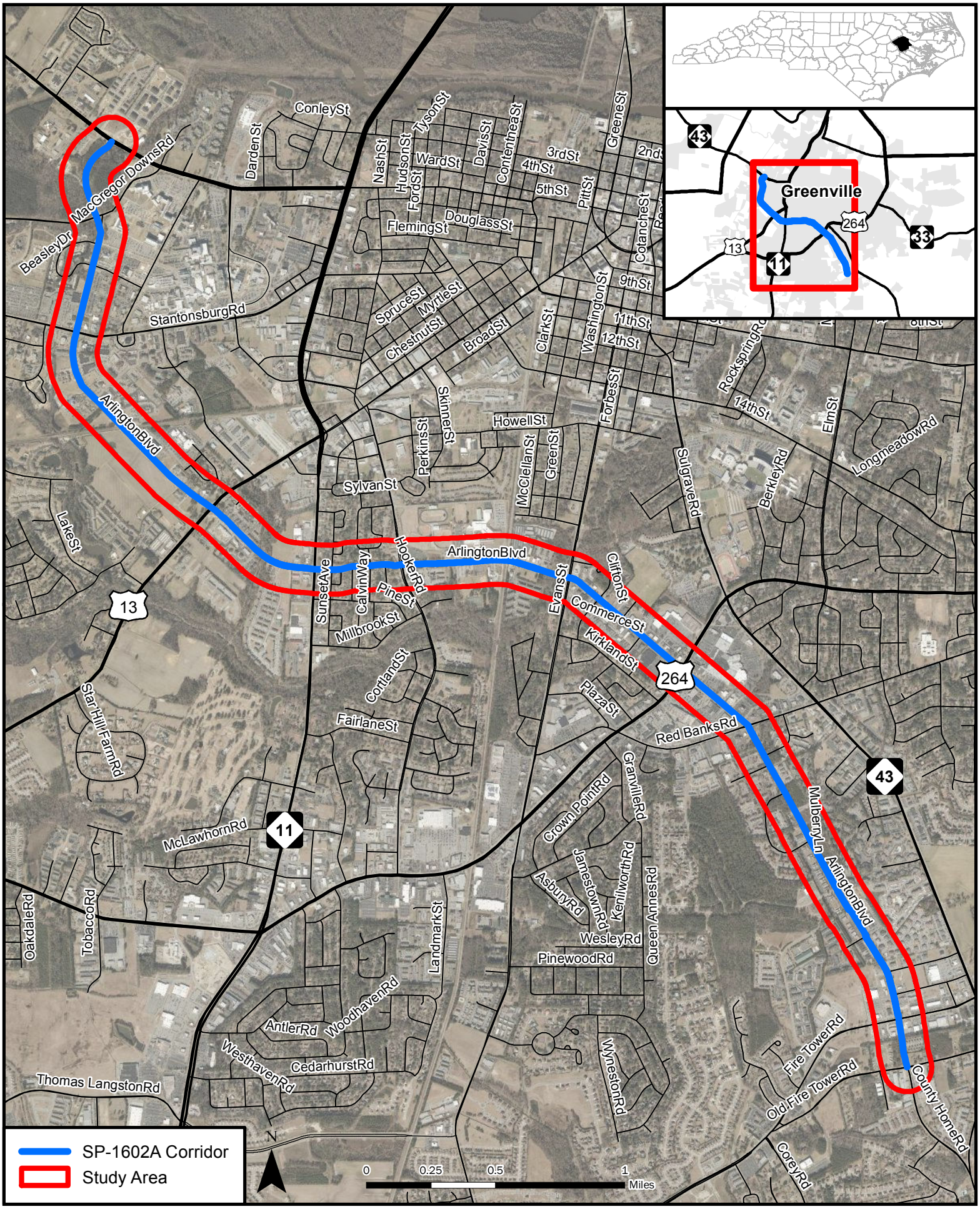

STUDY AREA VICINITY

SP-1602A Arlington Boulevard Widening

May 2017

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