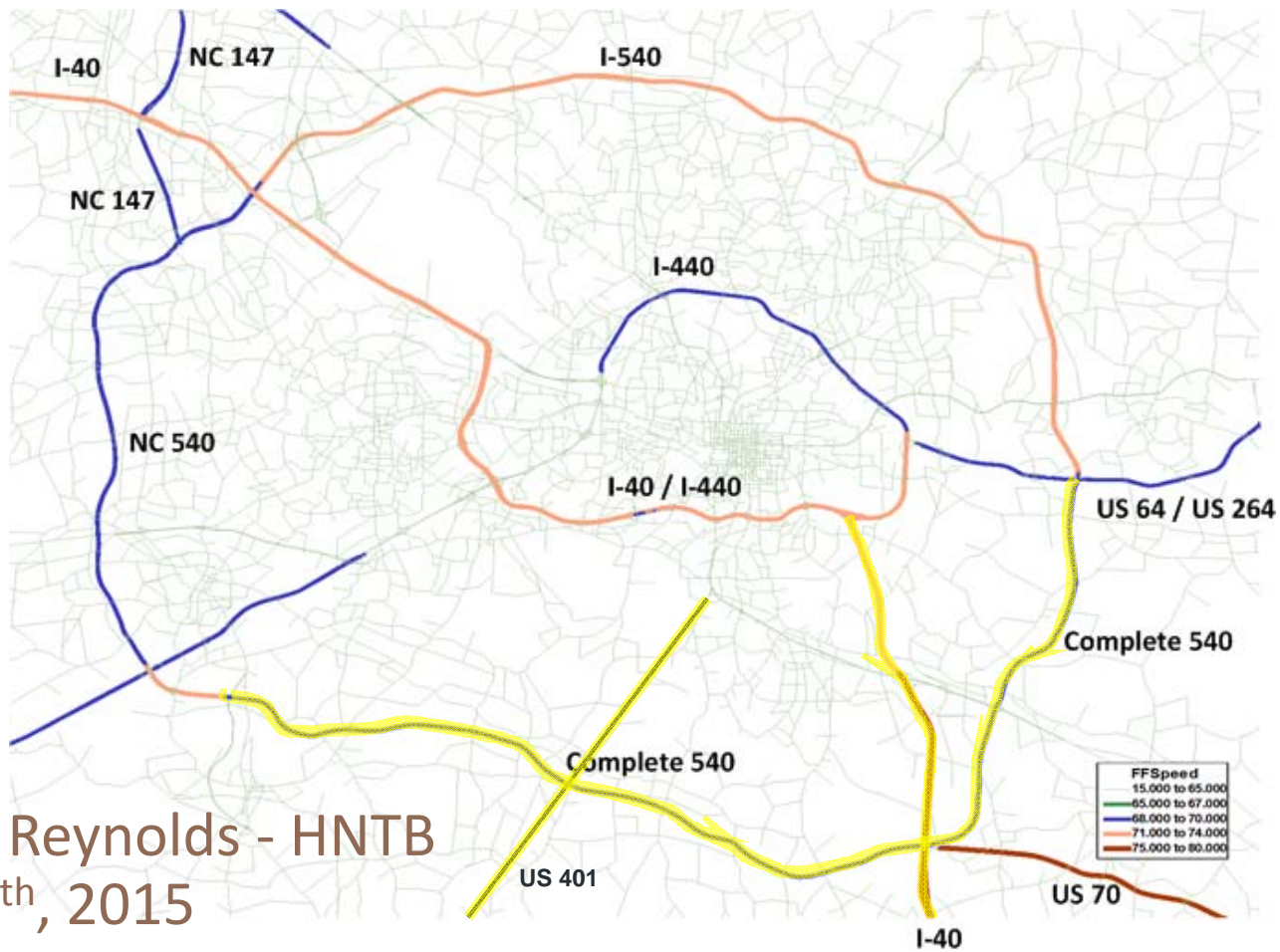


# Toll Forecasting - A Project-Level Modeling Approach (Complete 540 / I-40 Widening / US 401)



Bradley Reynolds - HNTB  
April 29<sup>th</sup>, 2015



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# Agenda

1. Purpose
2. Project Modeling & Traffic Forecast
3. Findings
4. Implementation



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# Purpose

Technical Review Team (TRT) established to better understand model output and provide guidance for project-level forecasting.

1. Review TRM, identify technical corrections, and present findings.
2. Gain a better understanding of the current & future project-specific modeling / forecast process.
3. Gain consensus on project-specific modeling / forecast approaches moving forward.
4. Discussion and address outstanding project-level traffic forecast questions.



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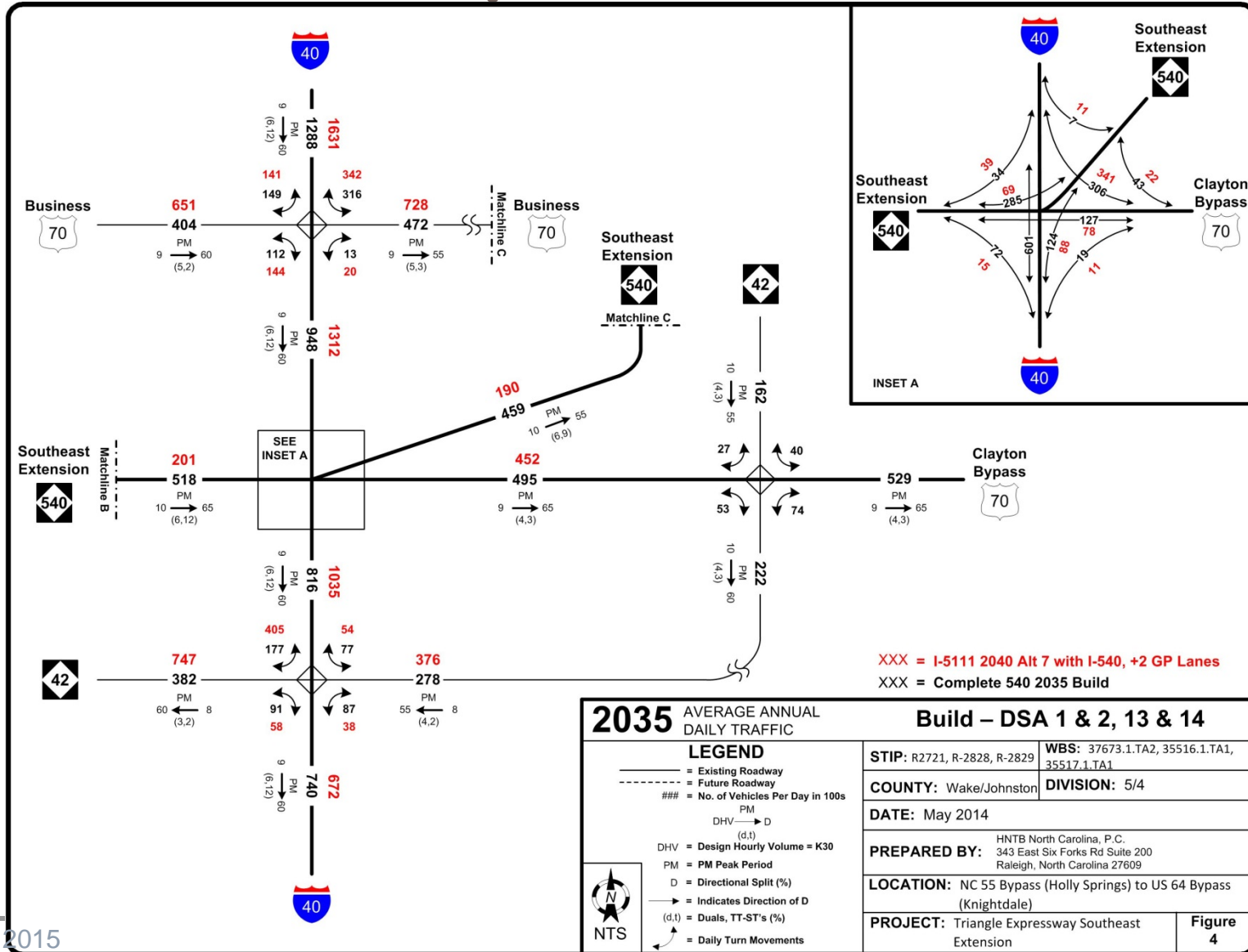
# Complete 540 & I-40 Widening Current Traffic Forecast Differences

- » Project purposes
- » Project / forecast start dates
- » **Model versions (TRM v4 vs. TRM v5)**
- » LRTP (2030 LRTP vs. 2040 MTP)
- » Socioeconomic data sets (2008 vs. TRM v5 set)
- » Design years (2035 vs. 2040)
- » TAZs and centroid connectors
- » Model assignment / loading characteristics
- » **Tolling component changes / Value of time**
- » Complete 540 and I-40 forecast volumes vary on overlapping facilities





# Complete 540 & I-40 Widening (Alt 7 with 540) Traffic Forecast Comparison



April 29, 2015

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# Technical Review Team Assignments / Findings

1. Set up consistent model data sets
2. **Test model toll sensitivity**
3. **Compare 2015 TRM v5 output to 2014 Triangle Expressway counts**
4. **Check arterial and freeway free flow speeds**
5. Check modeling of managed lanes
6. Check coding of ramps
7. **Check freeway and arterial volumes and speeds**
8. Conduct field travel time runs and compare to model
9. Check tolling versus managed lanes on I-40
10. Check the facility type lookup table for I-40 and I-540
11. Compare TRMv4 and TRMv5 inputs
12. **TRM “build-up” analysis**
13. **TRM v5 project-level model**



# Model Toll Sensitivity

**Primary observation** is the TRM is sensitive to both toll rate and value of time settings, more so on “toll only” facilities than managed lanes facilities.

	Toll		
	125%	75%	50%
User VOT	0.1875	0.1125	0.075
<b>TRM</b>	<b>1</b>	<b>3</b>	<b>4</b>
<b>ARC</b>		<b>6</b>	
<b>722</b>		<b>8</b>	

User Value of Time

Class	TRM	ARC	NCHRP 722v2
	\$/minute	\$/minute	\$/minute
SOV	0.5	0.25	0.30
HOV	0.75	0.33	0.50
CV	1.25	0.42	0.75

Comparison of Sensitivity for Sample Section:  
Complete 540 East of Holly Springs

Run	Run Description
1	Increase toll 25%
2	TRM toll and VOT
3	Decrease toll 25%
4	Decrease toll 50%
5	Use ARC VOT
6	Use ARC VOT, decrease toll 25%
7	Use NCHRP VOT
8	Use NCHRP VOT, decrease toll 25%

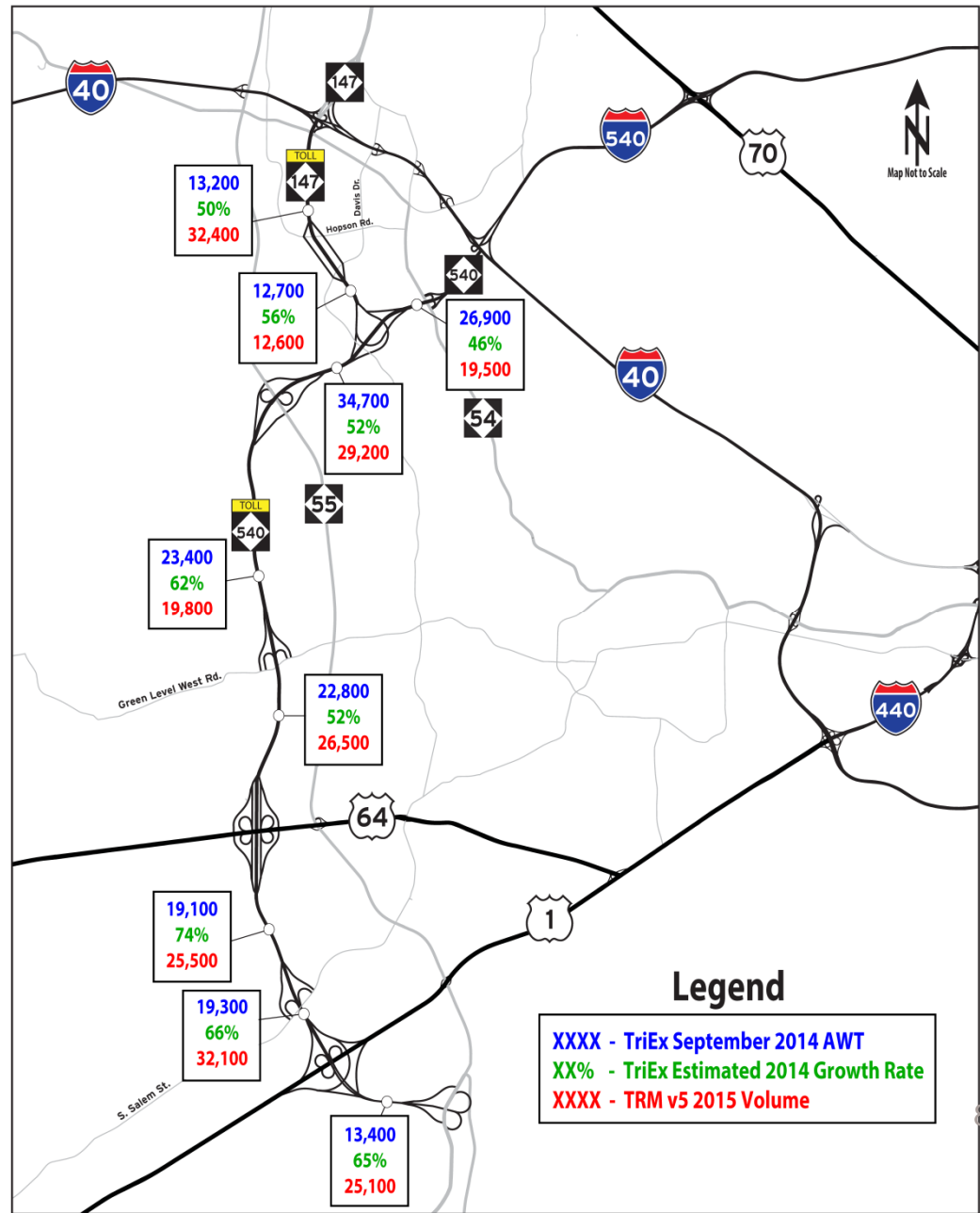
Toll Sensitivity Volume Ranges for Facility Segments

ID2	Road	Section	VOLUME RANGE of 8 RUNS
1	Complete 540	N of US 64 Apex	40,400 - 108,300
2	Complete 540	W of NC 55 Byp	49,300 - 100,400
3	Complete 540	E of Holly Springs	35,900 - 76,900
4	Complete 540	E of NC 50	20,100 - 49,400
5	Complete 540	E of I-40	13,500 - 42,500
6	I-540	N of US 64 Knightdale	78,700 - 90,600
7	I-540	W of US 1 N Raleigh	132,400 - 137,800
8	I-540	E of I-40 RTP	112,800 - 127,700
9	Triangle Parkway	S of I-40	48,000 - 80,800
10	NC 147	N of Alexander Dr	108,400 - 113,100
11	I-540	E of Aviation Pkwy	211,100 - 214,000
12	I-40	W of I-540 RTP	189,600 - 201,200
13	I-40	West of Gorman St	182,000 - 187,700
14	I-40	South of I-440	194,400 - 209,100
15	I-40	S of I-540/US 70	112,000 - 117,900
16	I-440	W of Capital Blvd	154,900 - 156,900

# Comparison of 2015 TRM v5 output and 2014 Triangle Expressway counts

*Primary observation* is the TRM v5 is reasonably estimating actual toll facility counts.

However, this is a relatively small sample size and the toll facility is still in “ramp up” period (experiencing higher annual growth rates).



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# TRM “Build Up” Analysis

*Primary observations* are TRM v5 population growth, employment growth and desired trip paths contribute heavily to existing Triangle Expressway and I-40 corridor but much less to southern/southeast Wake County and Complete 540.

Tested and compared inputs into TRM v4 Air Quality, TRM v4 “NCTA” and TRM v5 Air Quality models

- Changes in Employment
- Changes in Population

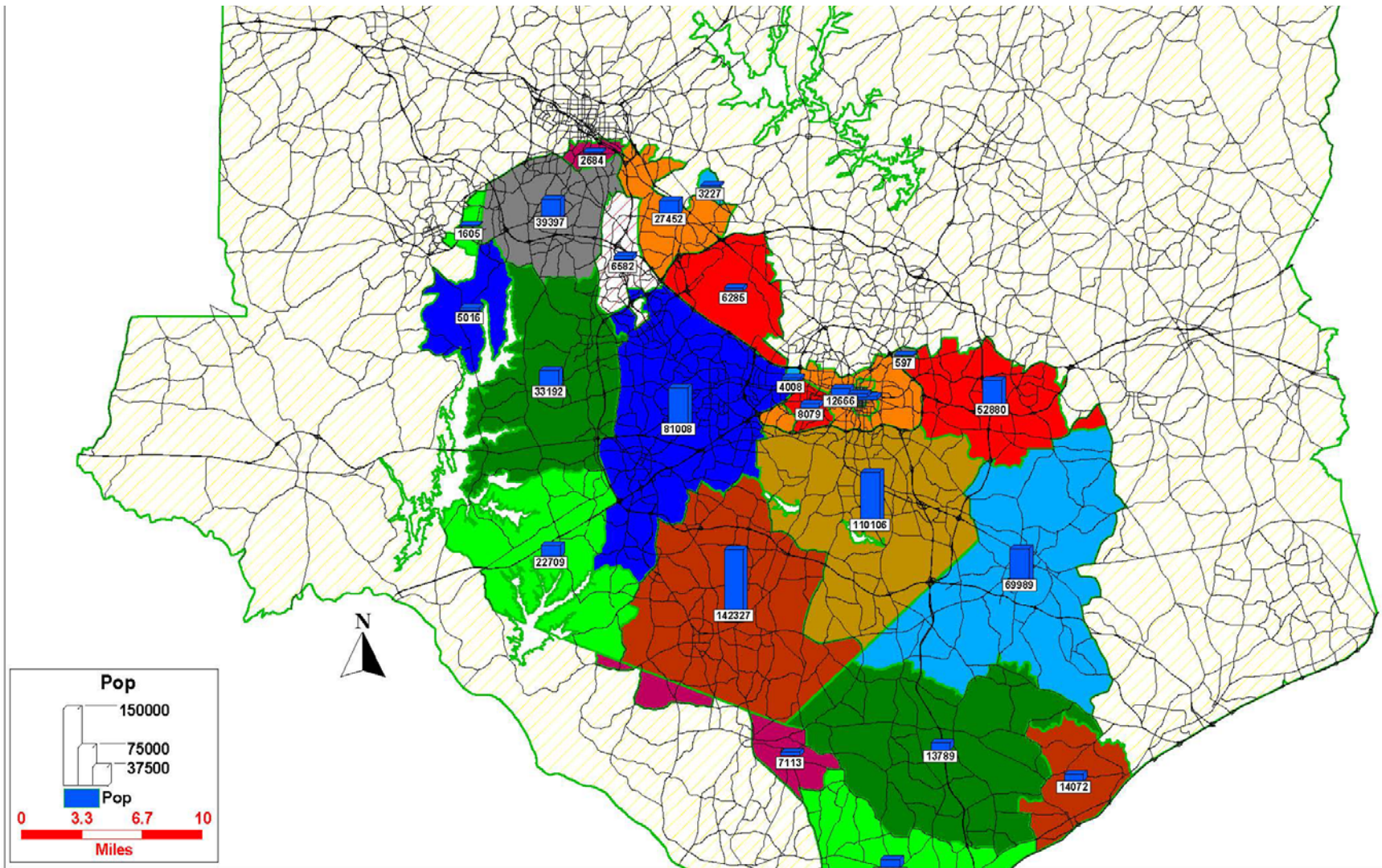
Reviewed TRM v5 Air Quality model

- Population Growth
- Employment Growth
- Desire Lines (Raleigh/RTP, 2010/2040)
- Flow Differential (Infrastructure/Congestion/Tolls, 2010/2040)





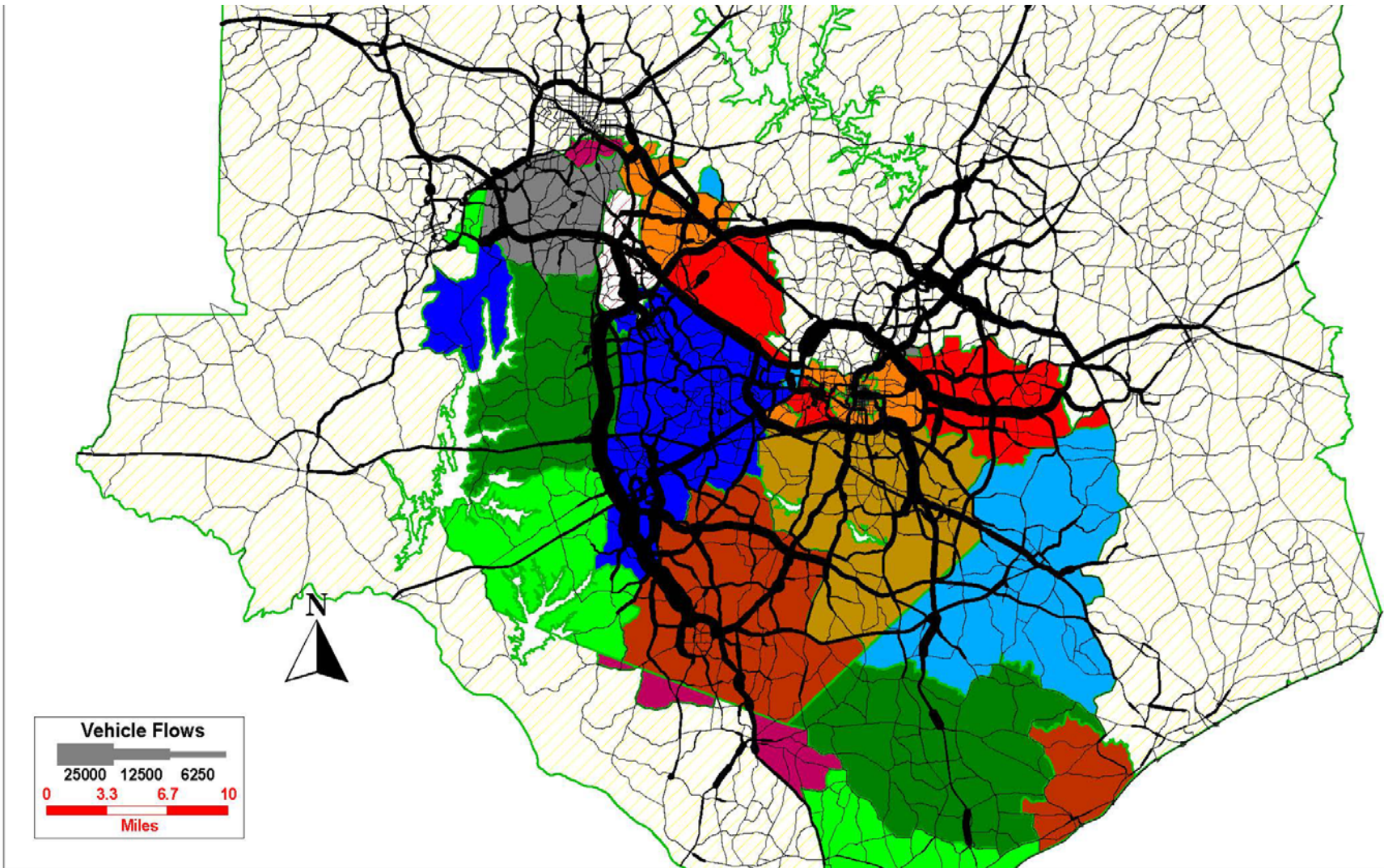
# TRM "Build Up" Analysis



Population Growth In Study Area



# TRM "Build Up" Analysis



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**Flow Differential (2010/2040 Infrastructure)**

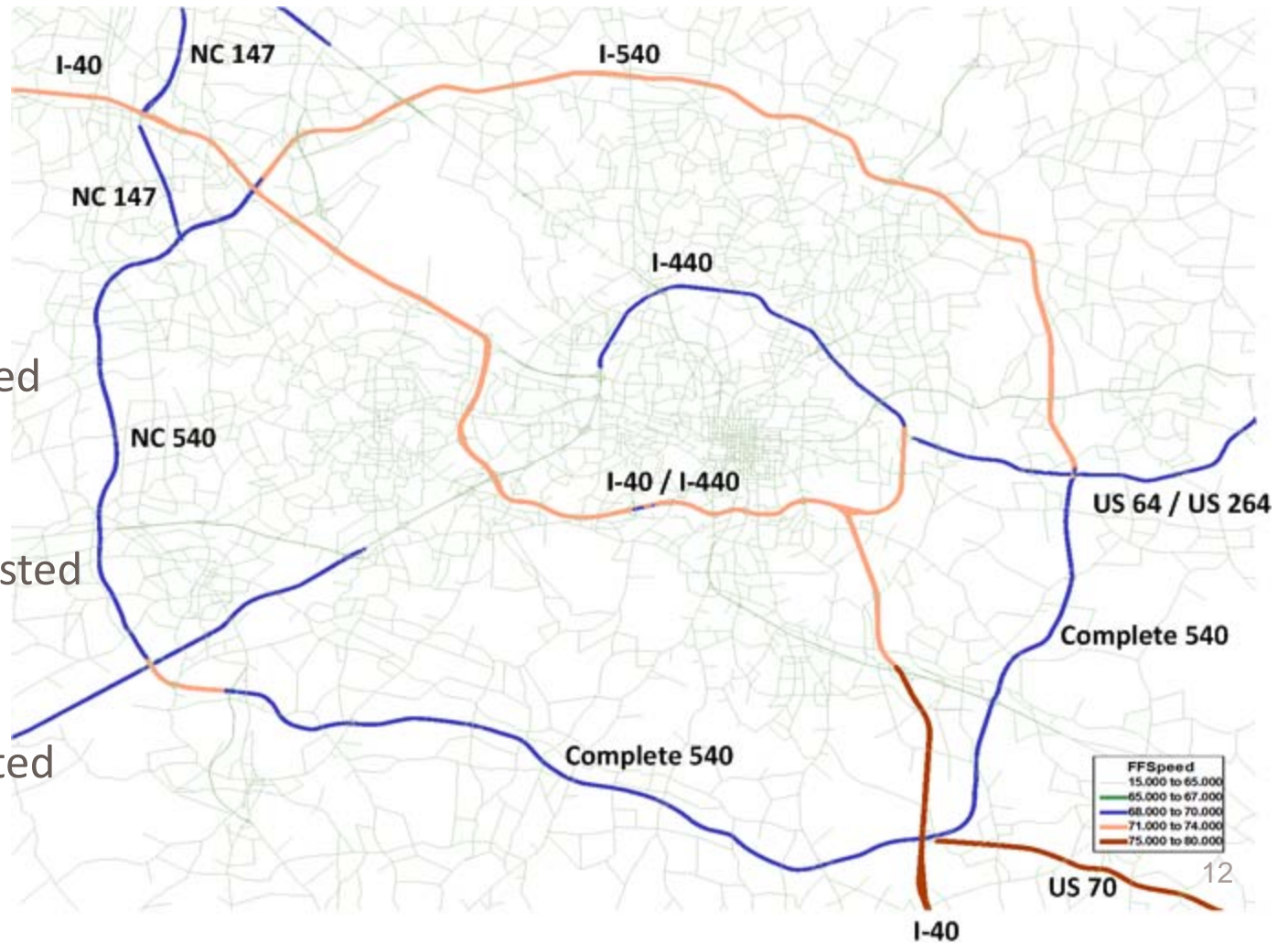
# Arterial and Freeway Free Flow Speeds Check

- I-40 posted as 65 - 70 mph (73.5 - 80 FFS)

- Existing I-540 posted as 70 mph (75 FFS)

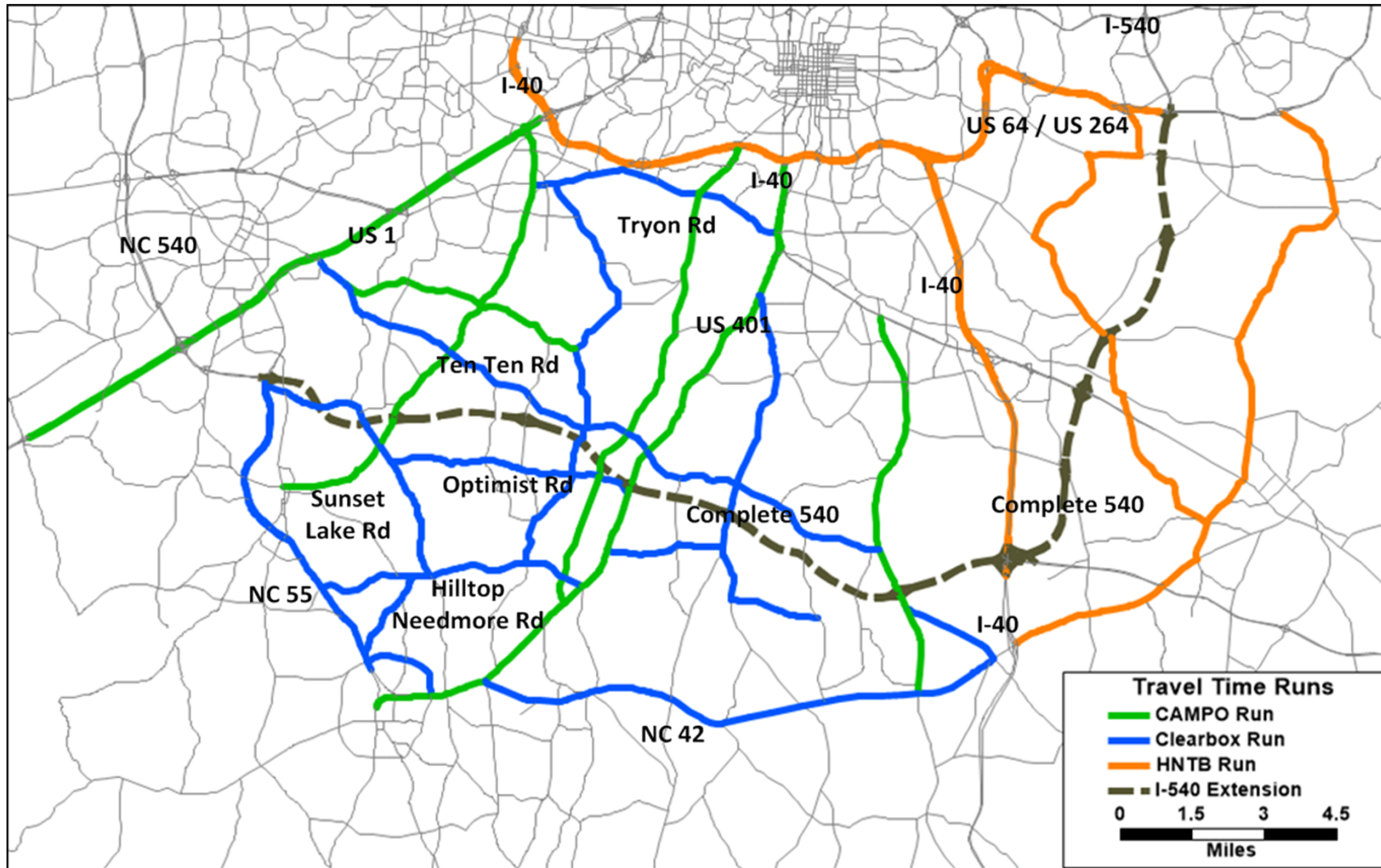
- Existing NC 540 posted as 65 mph (70 FFS)

- Complete 540 posted as 65 mph (70 FFS)





# Arterial and Freeway Volume and Speed Check



# Arterial and Freeway Volume and Speed Check

*Primary observation* is non-interstate facility travel times are overly optimistic in TRM 2040 AQ.

## Comparison of Arterial Free-Flow Times

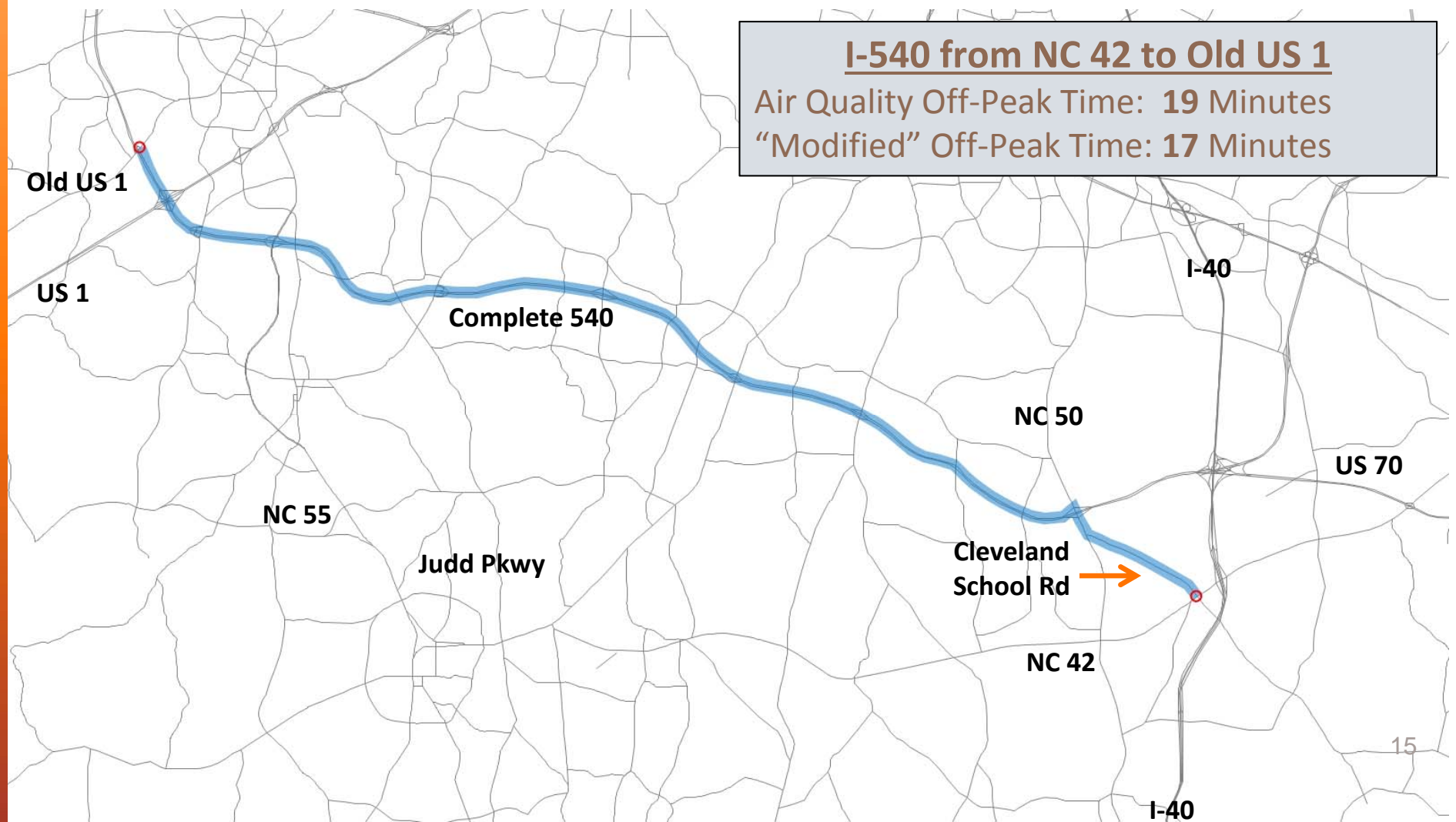
Route	Direction	Off-Peak (OP) Field Time (Minutes)	TRM v5 2040 AQ			TRM v5 2040 "Modified"		
			OP TRM (Minutes)	OP Difference (Minutes)	OP % Difference (Minutes)	OP TRM (Minutes)	OP Difference (Minutes)	OP % Difference (Minutes)
1) I-40 from NC 147 to NC 42	EB	28	29	1	4%	29	1	4%
	WB	28	29	0	2%	29	0	2%
2) I-440/US 264 from I-40 to I-540	EB	6	6	0	-4%	6	0	-4%
	WB	7	6	-1	-8%	6	-1	-8%
NC 55 to NC 42 via Judd Parkway from NC 540 to I-40	EB	29	25	-5	-16%	28	-1	-5%
	WB	30	25	-5	-17%	28	-2	-5%
4) Holly Springs Road/Hilltop Needmore/Banks <sup>1</sup>	EB		13			13		
	WB		13			13		
5) Optimist/Donny Brook from US 401 to Sunset Lake Road	EB	9	7	-2	-26%	10	0	5%
	WB	9	7	-2	-23%	10	1	9%
6) Penny Road from Ten-Ten Road to Blaney Franks Road	EB	9	7	-2	-23%	9	0	-1%
	WB	8	7	-1	-17%	9	1	6%
7) Tryon Road <sup>2</sup> from US 1 to Garner Road	EB	21	13	-8	-38%	13	-8	-38%
	WB	19	13	-6	-33%	13	-6	-33%
8) Sunset Lake Road from Holly Springs Road to US 401	EB	14	12	-2	-14%	13	-1	-6%
	WB	15	12	-3	-18%	13	-1	-10%
9) Ten-Ten Road/Cleveland School Rd from US 1 to NC 42	EB	25	23	-2	-9%	26	1	3%
	WB	29	23	-6	-21%	26	-3	-10%

1. Insufficient data collected to compute off-peak travel time

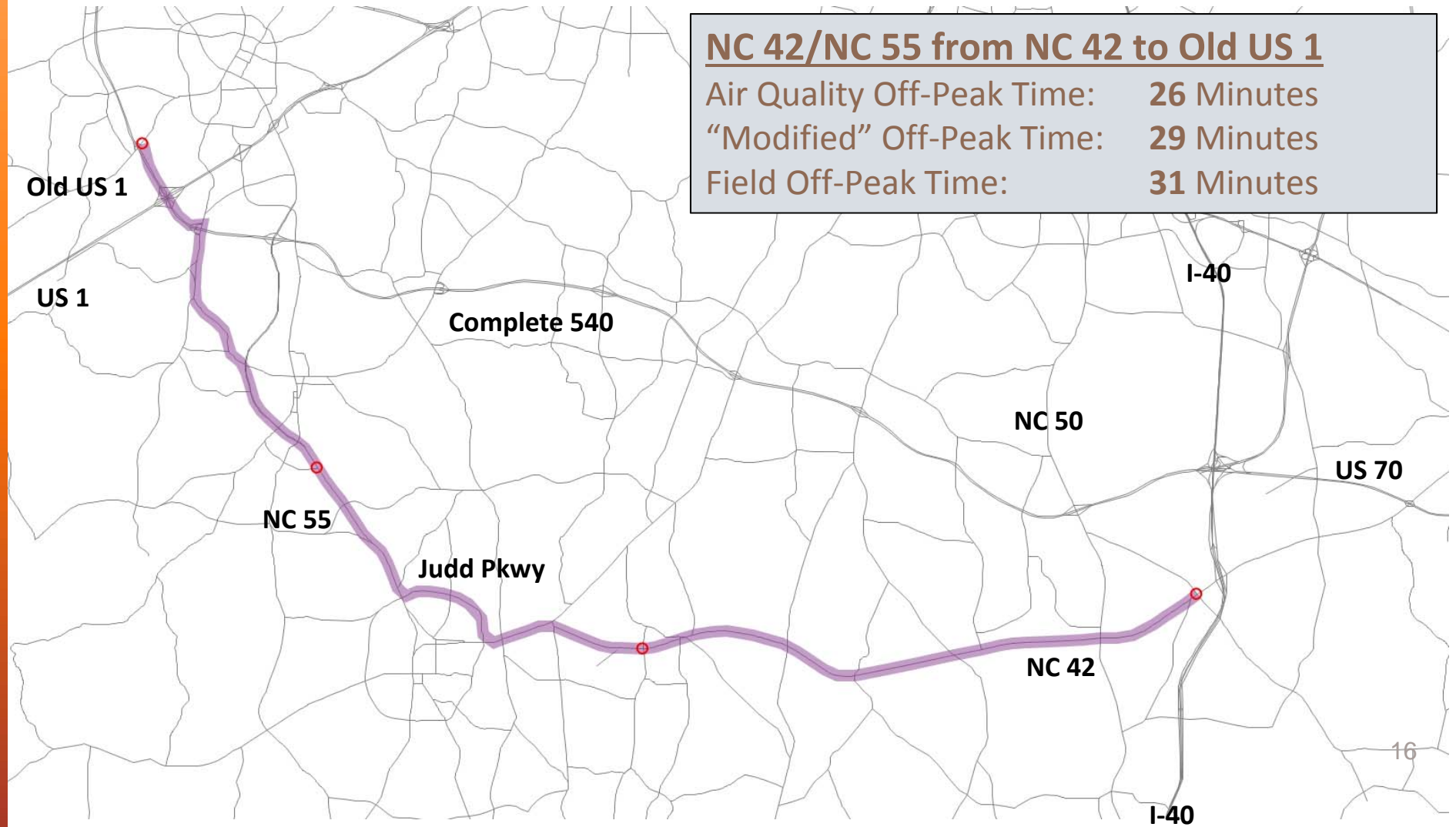
2. Insufficient data collected to modify link speeds

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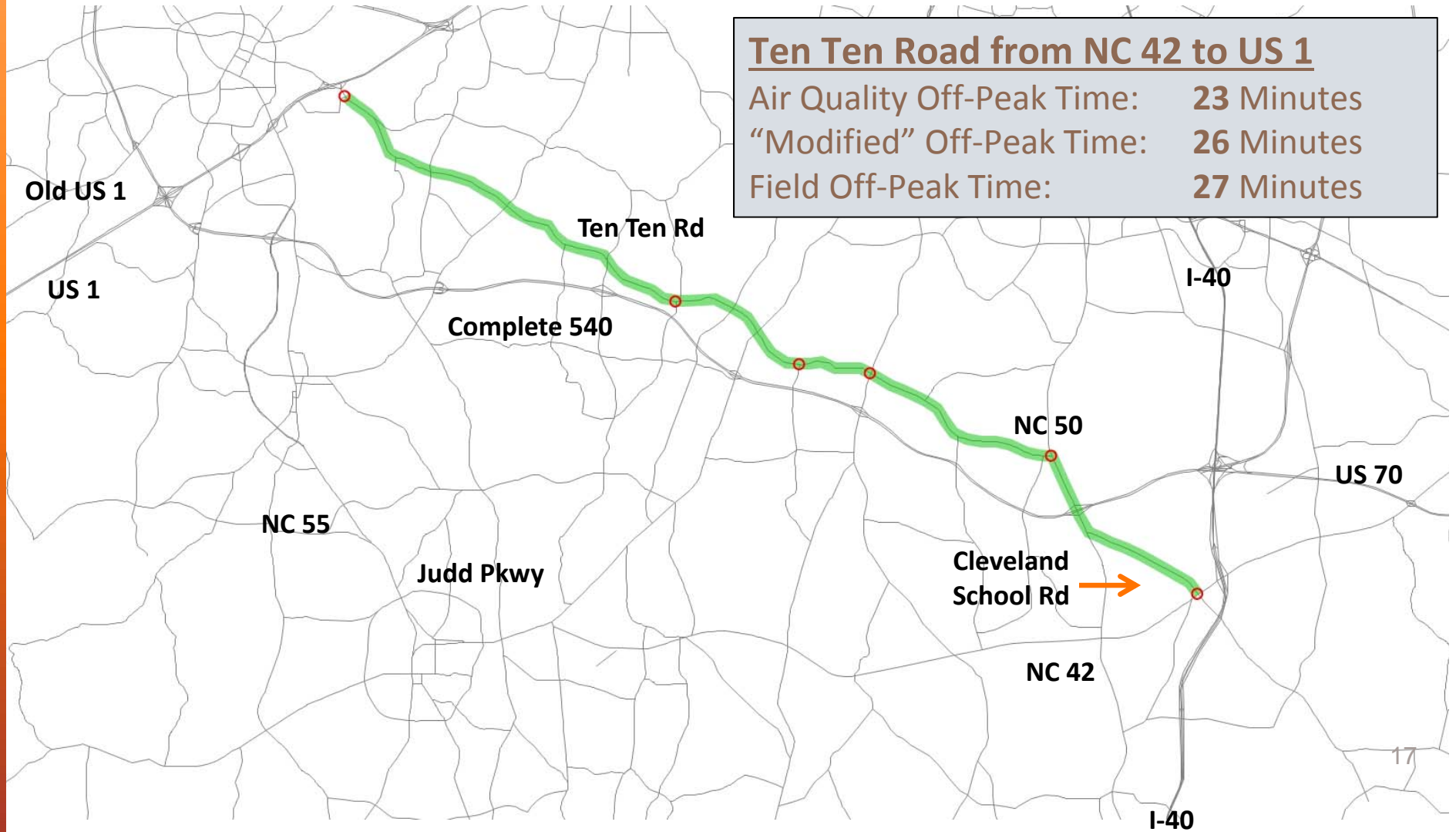
# Arterial and Freeway Volume and Speed Check



# Arterial and Freeway Volume and Speed Check

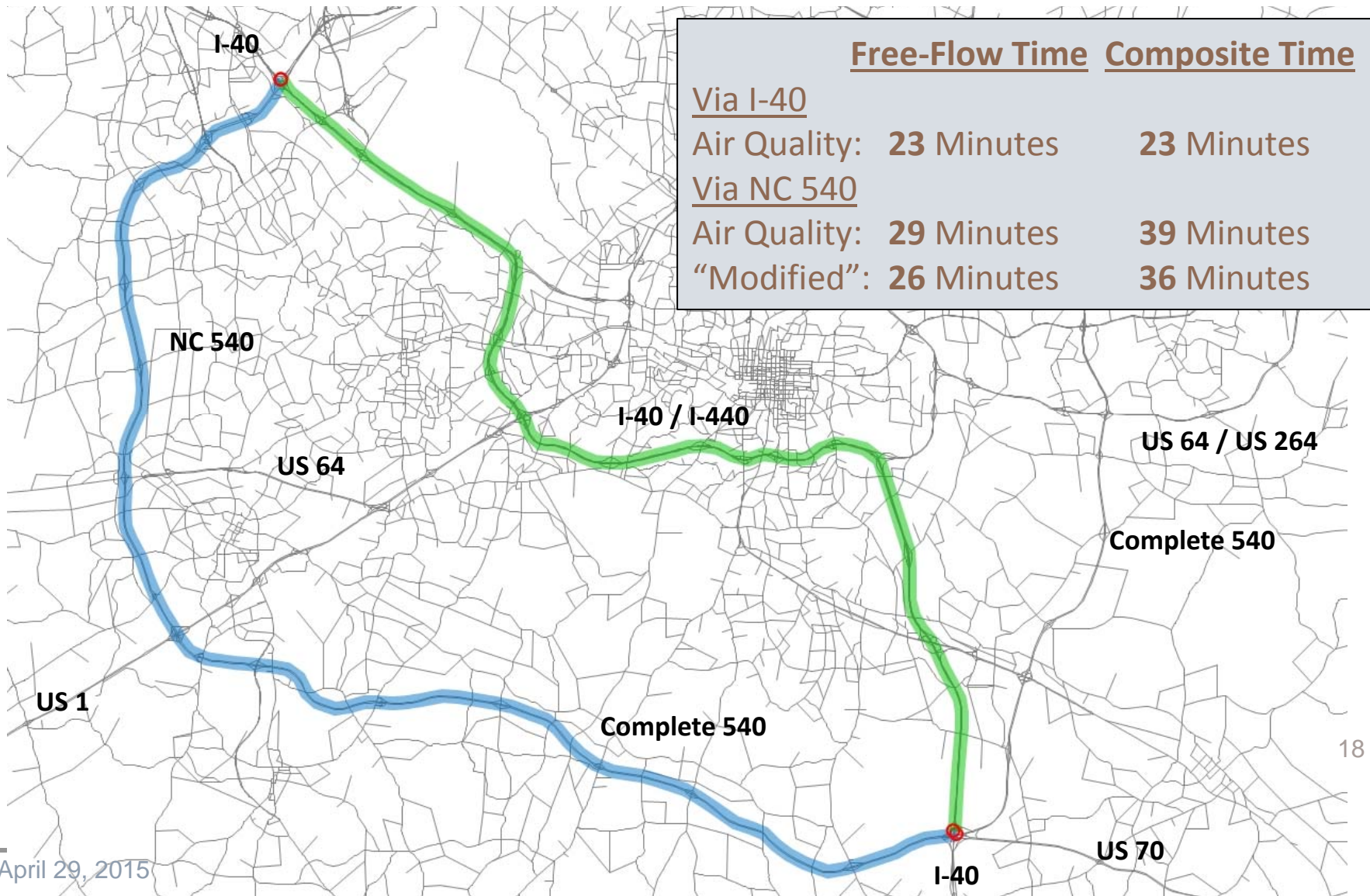


# Arterial and Freeway Volume and Speed Check

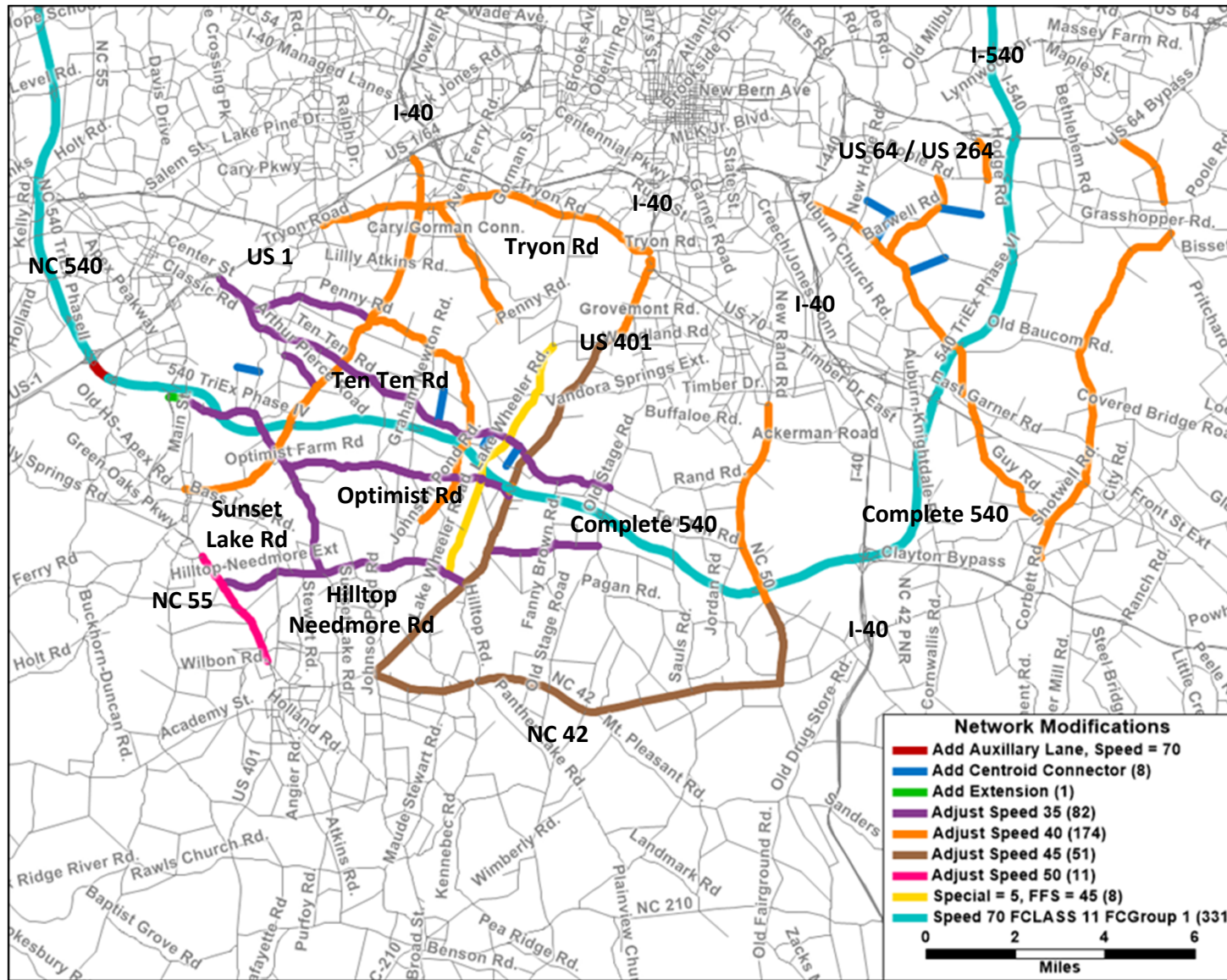




# Travel Time Versus Composite Time (From I-40 at US 70 to I-540 at I-40)

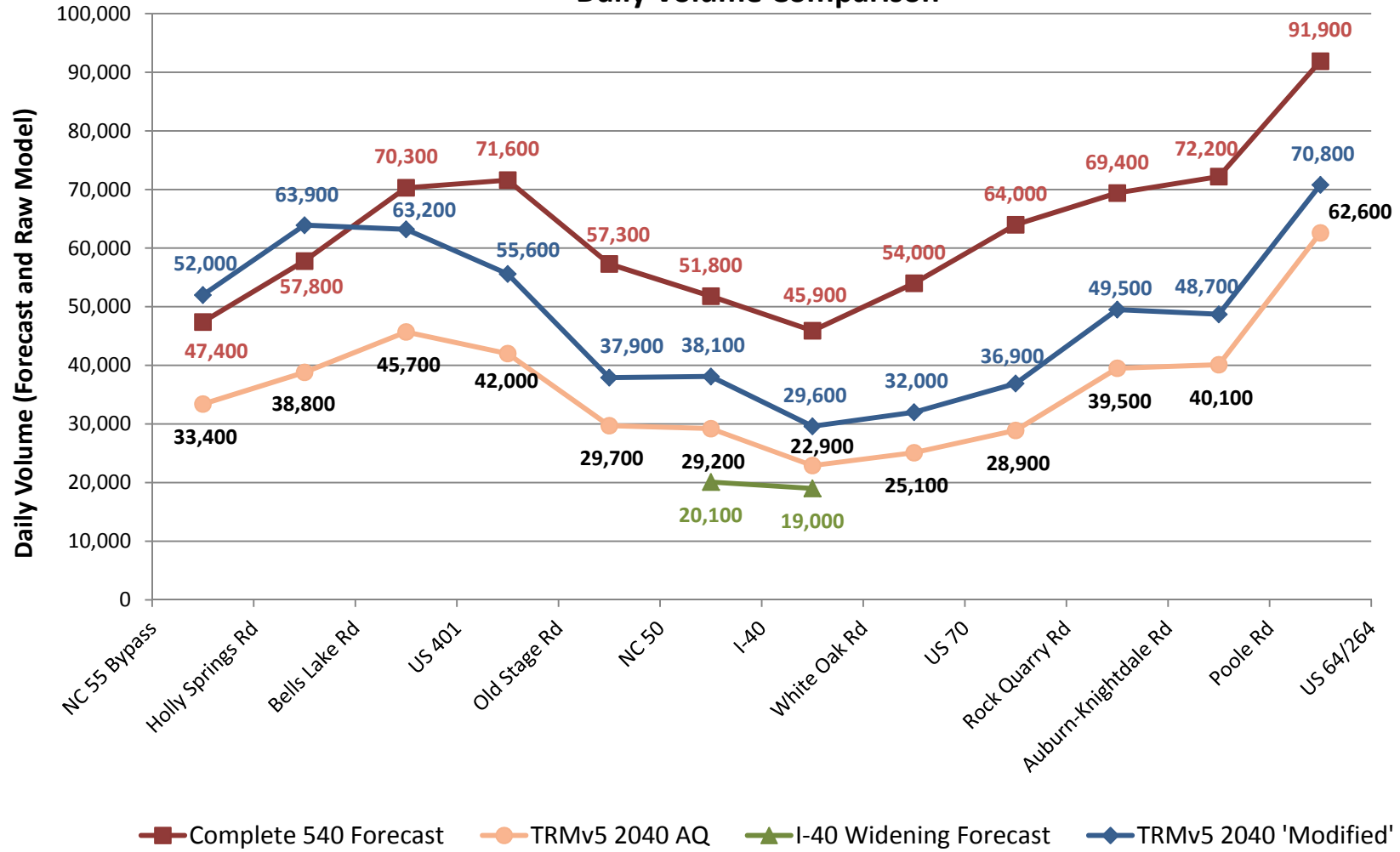


# TRM v5.2 2040 Network Modifications



# TRM v5.2 Model Output

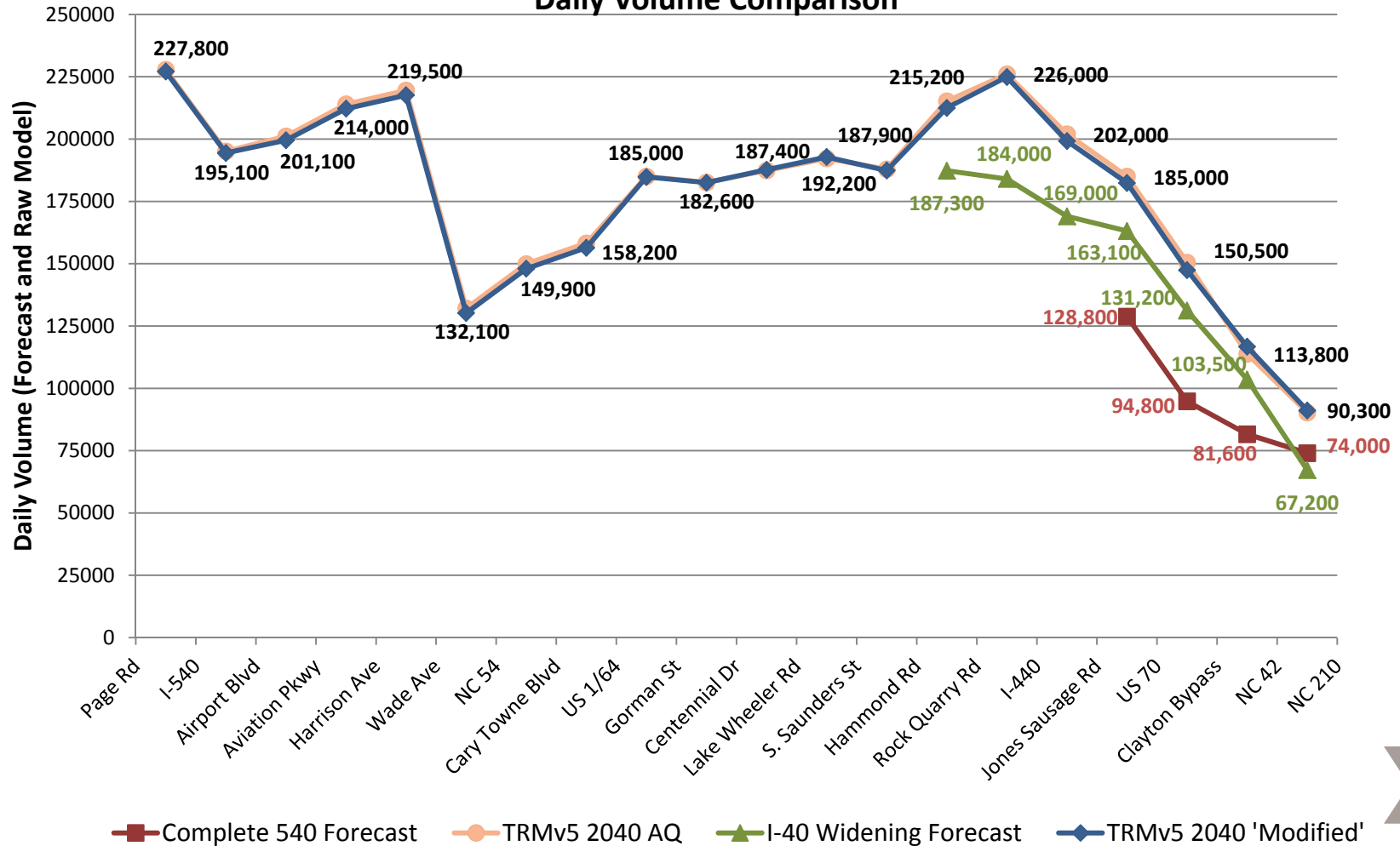
Complete 540 Corridor  
 Complete 540 Forecast, I-40 Widening Forecast and TRM v5 2040  
 Daily Volume Comparison





# TRM v5.2 Model Output

I-40 Corridor  
 Complete 540 Forecast, I-40 Widening Forecast and TRM v5 2040  
 Daily Volume Comparison



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# Project-Specific Options

Complete 540 for future project-level traffic forecasts for preferred alternative:

1. Continue using previous TRM v4 “NCTA” model,
2. Use the TRM v5 model
3. Use the TRM v5.2 model with technical corrections.

US 401 for future project-level traffic forecasts:

1. Use the TRM v5 model,
2. Use the TRM v5.2 model with technical corrections.

I-40 Widening for existing/future project-level traffic forecasts:

1. Use current forecasts and conduct reasonableness check of model output at I-40/Complete 540/US 70 system interchange ramps to determine potential geometric impacts,
2. Use the TRM v5.2 model with technical corrections to update I-40/Complete 540/US 70 system interchange forecast and conduct sensitivity checks of other forecasted facilities.



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## Next Steps

- CAMPO / ITRE to continue investigating value of time, toll sensitivity, facility characteristics and additional modeling items for implementation into TRM v6.

Questions?

THANK YOU!

