Stantec Consulting Services Inc.
801 Jones Franklin Road, Suite 300
Raleigh, North Carolina 27606-3563

August 5, 2020

File: 171002240

Attention: Mr. Chuck Edwards, PE, District Engineer

NCDOT Division 7, District 1
115 East Crescent Square Drive
P. O. Box 766
Graham, NC 27253

Dear Mr. Edwards,

Reference: Research Triangle Logistics Park TIA Supplement

This supplement is to respond to a memo dated 7/31/2020 providing NCDOT comments on the Research Triangle Logistics Park TIA. Based on the comments, we are recommending a change in the proposed access at the intersection of SR 1009 (Old NC 86) and the service road. Instead of operating with the existing condition, an unsignalized full movement intersection, this memorandum will summarize the impacts of converting the service road to a right in / right out with a left over. Therefore, all traffic exiting the site heading north to access I-40 or continue north will have to turn left out of Davis Road.

The following sections respond directly to the comments in the NCDOT Memorandum.

Committed NCDOT Projects

As noted, there are two proposed State Transportation Improvement Program (STIP) Projects in proposed development's study area, U-5845 and I-3306A.

According to the ***2020 – 2029 STIP***, project U-5845 (South Churton Street Widening) is proposed to start right of way acquisition in State Fiscal Year (SFY) 2022 and construction would be started in SFY 2025. This project will install traffic signals at the Old NC 86 ramps (eastbound and westbound) accessing I-40. A southbound right turn lane is recommended at the westbound on-ramp and an additional southbound left turn lane and a northbound right turn lane are recommended at the eastbound on-ramp. These improvements are noted in the attached figure from the U-5845 Capacity Analysis Report prepared by Kimley-Horn and Associates (Figure ES-1). Due to current NCDOT funding issues, most projects are currently on hold and this project schedule is subject to change. This project is funded with $15 Million in Build NC Bonds that were noted to be paid back in 2025 – 2039.

Project I-3306 will widen Interstate 40 to six-lanes and install ITS along a 20.7-mile corridor. The section of the project in the vicinity of the proposed development, I-3306 AA (I-40 from I-85 to NC 86), is scheduled to start right of way acquisition and utilities in SFY 2021 with construction scheduled to start in SFY 2023. As noted earlier, schedules are being re-evaluated as a result of the funding crisis, but this project is reported to be a top priority for Orange County. As part of this study, improvements are recommended at the I-40 /

Old NC 86 interchange. The I-3306 Traffic Capacity Analysis prepared by Kimley-Horn and Associates recommends that signals be installed at both ramps with an additional southbound left turn lane and an exclusive northbound right turn lane at the eastbound ramp. The improvements are illustrated in the attached Figure 7A. The I-3306A Public Meeting Map (Sheet 2 of 6) from the January 24, 2019 illustrates improvements at the intersection, but they are not consistent with the recommendations in the Capacity Report. According to this figure, traffic signals are not being shown at the ramps. A southbound right turn at the I-40 westbound on-ramp is shown on the plan as well as a northbound right turn lane and an additional receiving lane on the I-40 eastbound ramp. Although there will be two receiving lanes on the ramp, the plan does not show dual southbound left turns even though the volume of traffic making this movement is extremely high. The interchange portion of the Public Hearing Map is attached to this supplement.

Analysis Results and Mitigation Requirements:

Old NC 86 and Waterstone Drive / Rippy Lane Intersection:

All parties are all in agreement that no improvements are required.

Old NC 86 & I-40 Westbound Ramps

According to the TIA that was completed for Settler's Point, signal warrant analyses were conducted for this intersection and it was noted that warrants were met for signalization in the no build condition. Due to the data collection restrictions caused by the Covid Pandemic, the same data were used for the Research Triangle Logistics Park, so the same results would apply to this study. The section of Settler's Pointe discussing signal warrants is attached.

As noted in the TIA, we recognize that there is an increase in delay for the westbound approach at the Old NC 86 intersection with the I-40 WB ramp. It is not unusual for a minor approach at an unsignalized intersection to have an unacceptable level of service. According to the NCDOT Congestion Management Capacity Analysis Guidelines, "a poor level of service on a side street does not always result in a recommendation for signalization if v/c ratios and queuing are acceptable". The v/c ratio for the westbound left turn is 0.59 and 0.65 in the AM and PM peak hours, respectively. Based on SimTraffic models, although there will be delay on the ramp, there is sufficient storage to ensure that traffic accessing Old NC 86 will be stored on the ramp with no impacts on I-40. Additionally, it should be noted that the TIA assumed full build out of Waterstone while the development is only partially built out. Therefore, delay estimates are very conservative. The U-5845 project will install a signal at this location.

Therefore, based on this additional information, we do not recommend improvements at this location as a result of the proposed development.

Old NC 86 & I-40 Eastbound Ramps

Similar to the adjacent ramp intersection, the TIA that for Settler's Point included a signal warrant analyses for this intersection. It was noted that warrants were met for signalization in the no build condition. Due to the data collection restrictions caused by the Covid Pandemic, the same data were used for the Research Triangle Logistics Park, so the same results would apply to this study.

A signal was recommended at this location due to the excessive delays for the overall intersection and the eastbound approach in the no-build condition. There is a significant southbound left turn movement (exceeds 500 under the existing condition) coming from Hillsborough and the Waterstone Development. The reported delays and queues from Synchro are assuming a very conservative analysis with protected only movements and optimized splits. With the proposed left-over at the Service Road, a greater amount of green time can be given to the southbound left since it will not be an issue to queue beyond the Service Road. Additionally, it should be noted that the TIA assumed full build out of Waterstone while the development is only partially built out. Therefore, delay estimates are very conservative. The I-3306A project will install additional lanes while the U-5845 project will install a traffic signal and additional turn lanes at this location.

Therefore, based on this additional information, we recommend that the developer install a temporary signal with wood poles at this location to accommodate traffic until the planned projects construct additional turn lanes and a signal in the final configuration can be installed.

Old NC 86 and Service Road Intersection:

Based on the current spacing of intersections and issues noted , the development will revise the access at this location to provide a right in / right out with a left over into the site. Just north of the service road, there is a residential parcel that has a property line which appears to extend almost to the edge of pavement and may prohibit widening of pavement in this area. This is shown on the attached public hearing map. Therefore, the following improvements are recommended at this location assuming that they can be accomplished within the existing right of way by shifting the existing lanes and restriping the pavement.

- Restripe Old NC 86 in the vicinity of the Service Road to provide the following within the existing edges of pavement:
  - An exclusive northbound left-turn lane with the amount of full-width storage with appropriate transitions to the greatest extent possible within the existing pavement.
  - An exclusive southbound right-turn lane with 100 feet of full-width storage or a lesser amount to the greatest extent possible with appropriate transitions within the existing pavement.

Old NC 86 and Davis Road Intersection:

Since we only have peak hour traffic volumes for this location, it was verified that this location will meet the peak hour warrant for signalization. Based on this, a traffic signal should be installed at this location. With the traffic signal, all approaches operate at a Level of Service C or better in both peak hours and there are no excessive queues. Additional turn lanes were noted in the TIA review, but based on the results, the traffic signal mitigates the impact of the proposed development with acceptable levels of service on all approaches.

Service Road and Site Driveways A, B, and C:

NCDOT concurred with the recommendations in the TIA. It is noted that a 100' minimum internal protected stem should be provided at each driveway.

Davis Road and Site Driveway D:

It is anticipated that almost all commercial vehicles will enter via the Service Road, so most vehicles entering at Driveway D will be employees in personal vehicles. Due to the very low volume of westbound through traffic, we are requesting that this location have a shared through / right turn lane on Davis Road. In the morning, it is anticipated that there will be 24 vehicles turning right at this location with 81 vehicles going through. In the afternoon, 8 vehicles are expected to turn right with 176 travelling through. It is noted that a 100' minimum internal protected stem should be provided at this driveway.

Multi-modal and Streetscape Enhancements:

These were not included in the TIA. Any enhancements required by Orange County will be coordinated with NCDOT.

An updated traffic analysis has been performed and is included in the attachments.

Reference: **Research Triangle Logistics Park TIA Supplement**

Regards,

Stantec Consulting Services, Inc.

Matt Peach, PE, PTOE
Senior Transportation Engineer
Phone: 919-865-7375
Matt.Peach@Stantec.com

Attachement:
1. Improvements Figure from U-5845,
2. U-5845 Public Hearing Map,
3. Improvements Figure From I-3306A,
4. I-3306 A Public Hearing Map,
5. Signal Warrants Section from Settler's Pointe TIA,
6. Revised Site Trip Distribution as result of Revised Access,
7. Revised Site Trips as a result of Revised Access,
8. Revised Recommended Improvements
9. Synchro Reports
10. Revised LOS Summary Table

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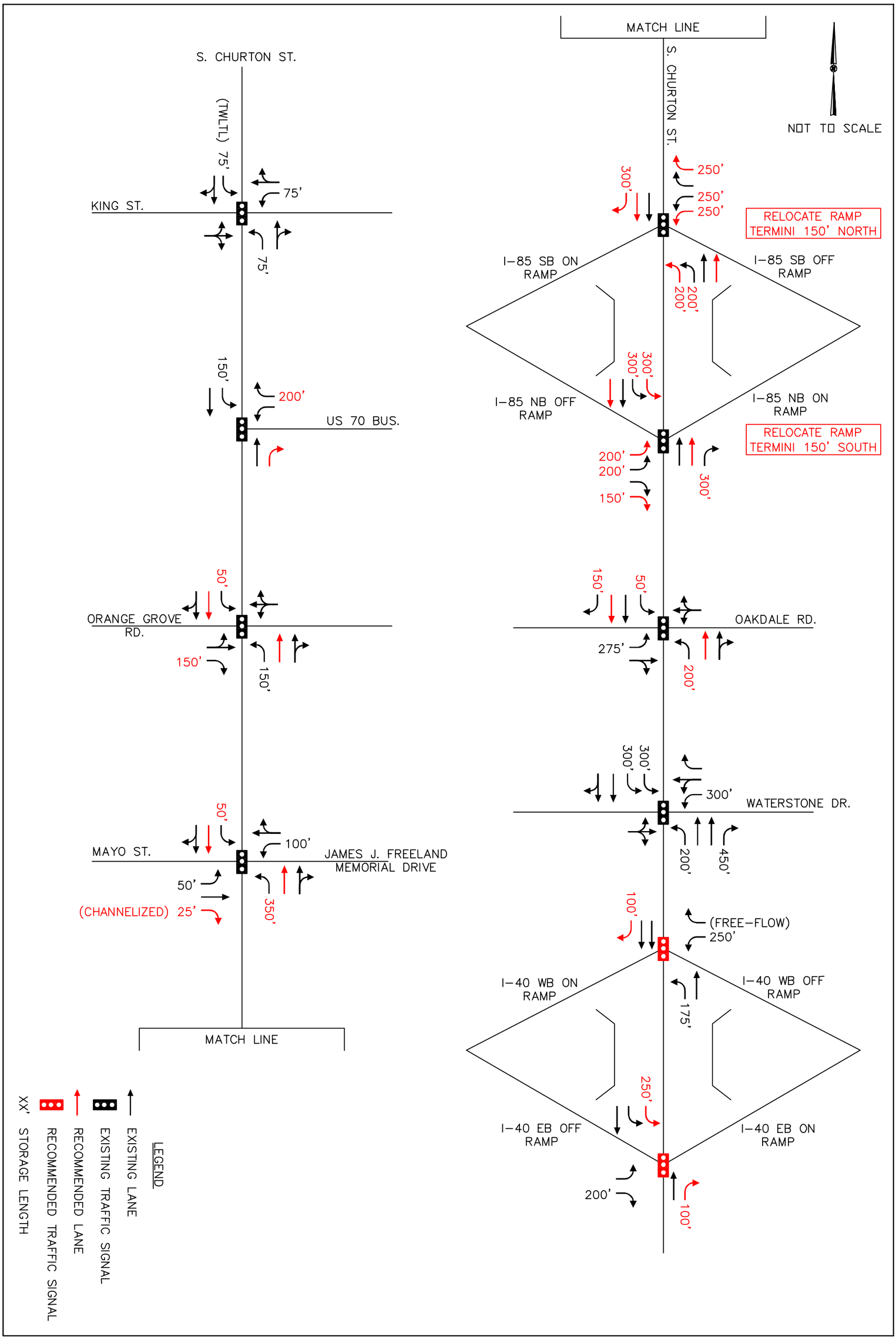
Raleigh, North Carolina 27606-3563

Attachment 1: Improvements Figure from U-5845

K:\RAL_TPTO_Traffic\011036311 U-5845 & U-5848 Hillsborough\T5 - Report-Submittals\Figures\U-5845 & U-5848_2-23-17.dwg



Kimley»Horn	U-5845 (S. CHURTON STREET WIDENING)	BUILD WITHOUT ORANGE GROVE ROAD EXTENSION RECOMMENDED ROADWAY LANEAGE	FIGURE ES-1

THIS DOCUMENT, TOGETHER WITH THE CONCEPTS AND DESIGNS PRESENTED HEREIN, AS AN INSTRUMENT OF SERVICE, IS INTENDED ONLY FOR THE PURPOSE AND CLIENT FOR WHICH IT WAS PREPARED. REUSE OF AND IMPROPER RELIANCE ON THIS DOCUMENT WITHOUT WRITTEN AUTHORIZATION AND ADAPTATION BY KIMLEY-HORN AND ASSOCIATES, INC. SHALL BE WITHOUT LIABILITY TO KIMLEY-HORN AND ASSOCIATES, INC.

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Attachment 2: U-5845 Public Hearing Map

Kimley»Horn

PUBLIC MEETING MAP

PROJECT U-5845

ORANGE COUNTY

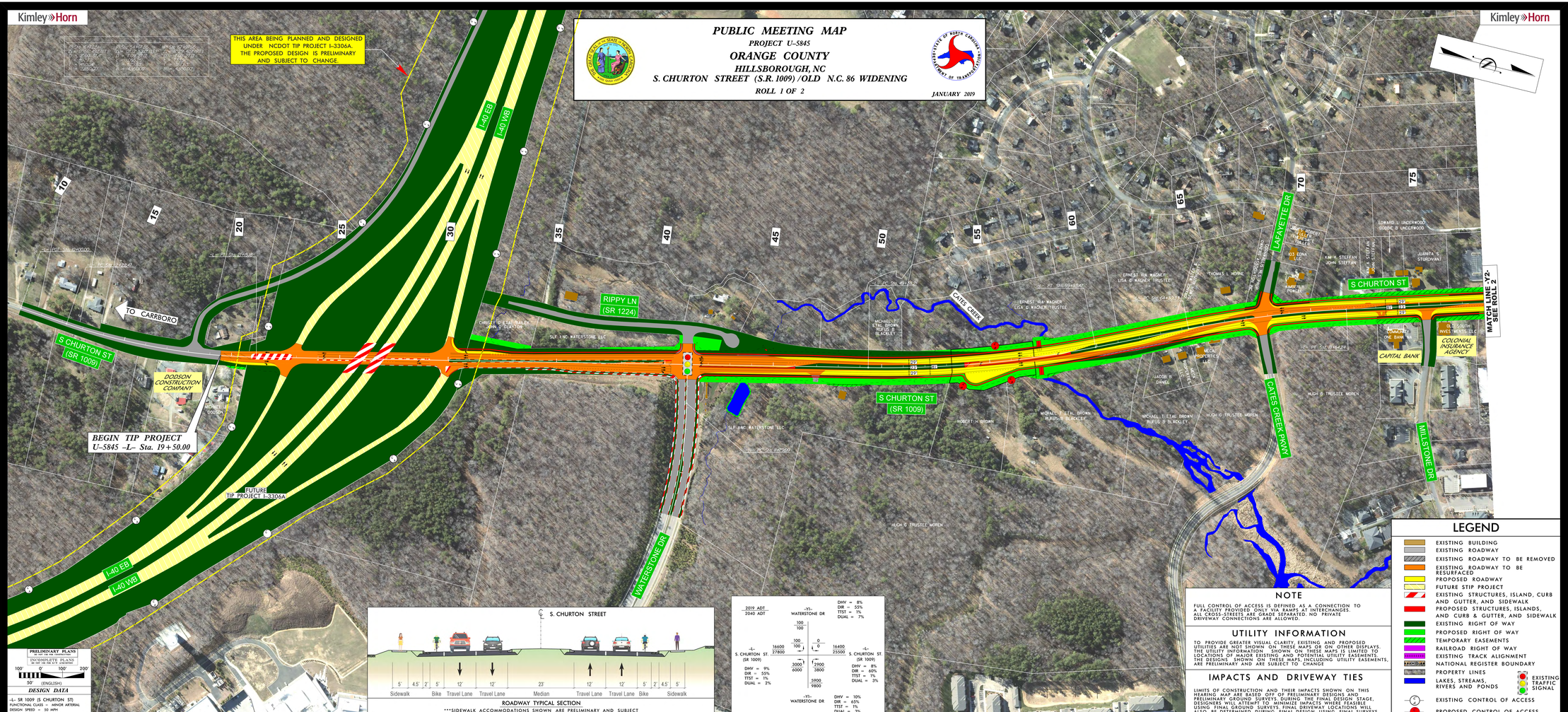
HILLSBOROUGH, NC

S. CHURTON STREET (S.R. 1009) /OLD N.C. 86 WIDENING

ROLL 1 OF 2

JANUARY 2019

THIS AREA BEING PLANNED AND DESIGNED UNDER NCDOT TIP PROJECT I-3306A. THE PROPOSED DESIGN IS PRELIMINARY AND SUBJECT TO CHANGE.



ROADWAY TYPICAL SECTION

***SIDEWALK ACCOMMODATIONS SHOWN ARE PRELIMINARY AND SUBJECT TO A MUNICIPAL AGREEMENT WITH TOWN OF HILLSBOROUGH

PRELIMINARY PLANS
NOT FOR CONSTRUCTION
UNCOMPLETE PLANS
NOT FOR CONSTRUCTION

100' 0' 100' 200'
50' (ENGLISH)

DESIGN DATA

-L- SR 1009 (S CHURTON ST)
FUNCTIONAL CLASS = MINOR ARTERIAL
DESIGN SPEED = 50 MPH
MAX SUPERELEVATION = 0.04

NOTE

FULL CONTROL OF ACCESS IS DEFINED AS A CONNECTION TO A FACILITY PROVIDED ONLY VIA RAMPS AT INTERCHANGES. ALL CROSS-STREETS ARE GRADE SEPARATED. NO PRIVATE DRIVEWAY CONNECTIONS ARE ALLOWED.

UTILITY INFORMATION

TO PROVIDE GREATER VISUAL CLARITY, EXISTING AND PROPOSED UTILITIES ARE NOT SHOWN ON THESE MAPS OR ON OTHER DISPLAYS. THE UTILITY INFORMATION SHOWN ON THESE MAPS IS LIMITED TO LOCATIONS OF MAJOR EXISTING AND POTENTIAL UTILITY EASEMENTS. THE DESIGNS SHOWN ON THESE MAPS, INCLUDING UTILITY EASEMENTS, ARE PRELIMINARY AND ARE SUBJECT TO CHANGE.

IMPACTS AND DRIVEWAY TIES

LIMITS OF CONSTRUCTION AND THESE IMPACTS SHOWN ON THIS MAP ARE BASED ON THE BEST AVAILABLE INFORMATION FROM PRELIMINARY GROUND SURVEYS. DURING THE FINAL DESIGN STAGE, DESIGNERS WILL ATTEMPT TO MINIMIZE IMPACTS WHERE FEASIBLE USING FINAL GROUND SURVEYS. FINAL DRIVEWAY LOCATIONS WILL ALSO BE DETERMINED DURING FINAL DESIGN USING FINAL SURVEYS.

LEGEND

- EXISTING BUILDING
- EXISTING ROADWAY
- EXISTING ROADWAY TO BE REMOVED
- EXISTING ROADWAY TO BE RESURFACED
- PROPOSED ROADWAY
- FUTURE STIP PROJECT
- EXISTING STRUCTURES, ISLAND, CURB AND GUTTER, AND SIDEWALK
- PROPOSED STRUCTURES, ISLANDS, AND CURB & GUTTER, AND SIDEWALK
- EXISTING RIGHT OF WAY
- PROPOSED RIGHT OF WAY
- TEMPORARY EASEMENTS
- RAILROAD RIGHT OF WAY
- EXISTING TRACK ALIGNMENT
- NATIONAL REGISTER BOUNDARY
- PROPERTY LINES
- LAKES, STREAMS, RIVERS AND PONDS
- EXISTING TRAFFIC SIGNAL
- EXISTING CONTROL OF ACCESS
- PROPOSED CONTROL OF ACCESS

PUBLIC MEETING MAP
PROJECT U-5845
ORANGE COUNTY
HILLSBOROUGH, NC
S. CHURTON STREET (S.R. 1009) /OLD N.C. 86 WIDENING
ROLL 1 OF 2
JANUARY 2019

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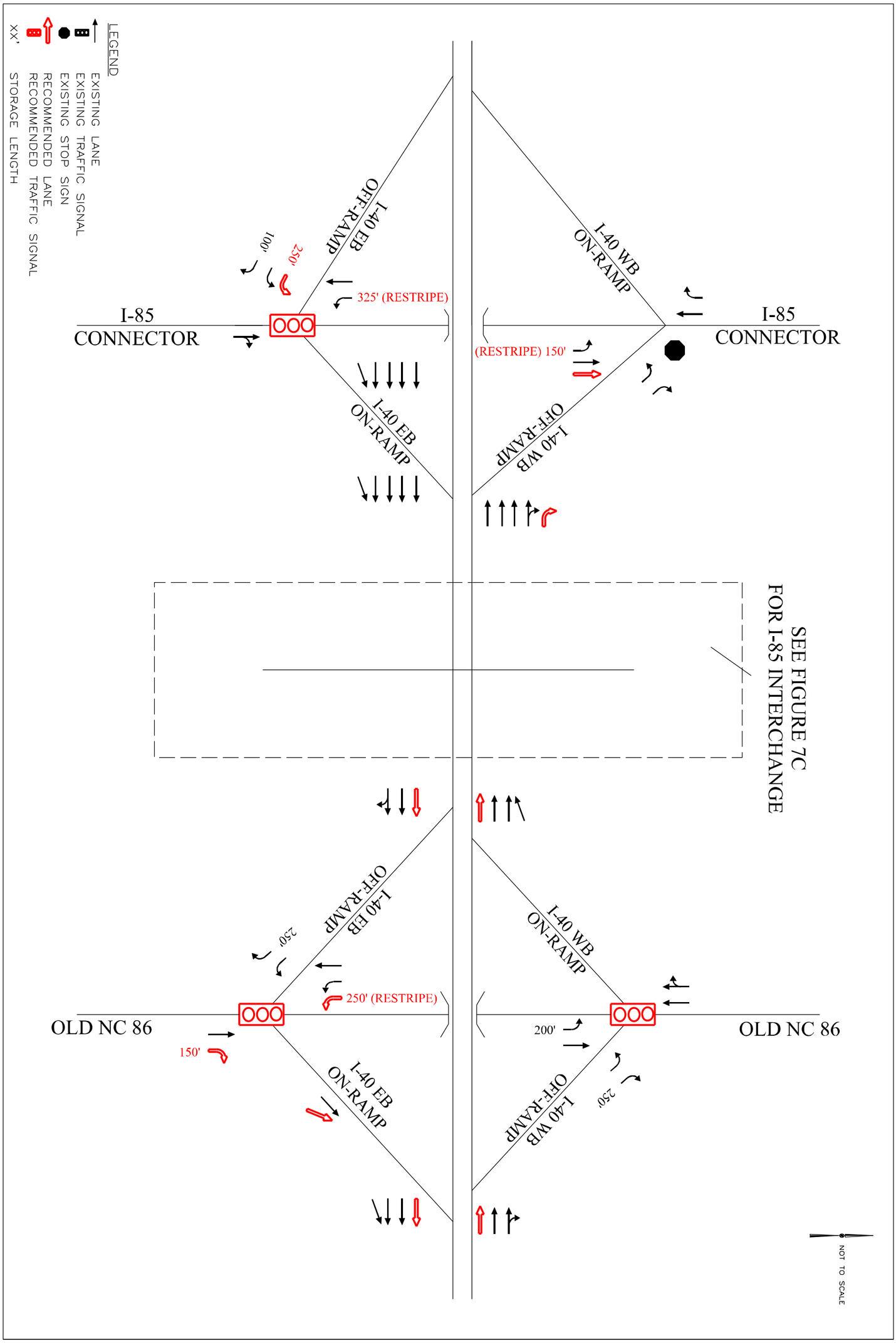
Attachment 3: Improvements Figure from I-3306A



Kimley-Horn and Associates, Inc.

I-3306: I-40 WIDENING
ORANGE COUNTY, NC
TRAFFIC CAPACITY ANALYSIS

RECOMMENDED ROADWAY
LANEAGE
(1 OF 4)

FIGURE
7A

THIS DOCUMENT, TOGETHER WITH THE CONCEPTS AND DESIGNS PRESENTED HEREIN, AS AN INSTRUMENT OF SERVICE, IS INTENDED ONLY FOR THE SPECIFIC PURPOSE AND CLIENT FOR WHICH IT WAS PREPARED. REUSE OF AND IMPROPER RELIANCE ON THIS DOCUMENT WITHOUT WRITTEN AUTHORIZATION AND ADAPTATION BY KIMLEY-HORN AND ASSOCIATES, INC. SHALL BE WITHOUT LIABILITY TO KIMLEY-HORN AND ASSOCIATES, INC.

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Attachment 4: I-3306A Public Hearing Map

LEGEND

- BUILDINGS
- EXISTING RIGHT OF WAY
- PROPOSED RIGHT OF WAY
- PROPOSED EASEMENTS (DRAINAGE, CONSTRUCTION, AND UTILITY)
- EXISTING ROADWAY
- EXISTING ROADWAY TO BE REMOVED
- EXISTING ROADWAY TO BE RESURFACED
- PROPOSED ROADWAY
- PROPOSED STRUCTURES, ISLAND, CURB AND GUTTER
- EXISTING STRUCTURES, ISLAND, CURB AND GUTTER TO BE RETAINED
- EXISTING STRUCTURES, ISLAND, CURB AND GUTTER TO BE REMOVED
- LAKES, RIVER, STREAMS AND PONDS
- RAILROAD RIGHT OF WAY
- PROPOSED FULL CONTROL OF ACCESS
- EXISTING CONTROL OF ACCESS
- 0000/0000 PRESENT ADT / FUTURE ADT
- PROPERTY LINES
- EXISTING UTILITY EASEMENT
- LIMITS OF CONSTRUCTION
- EXISTING TRAFFIC SIGNAL
- WLB WETLAND LIMITS BOUNDARY
- WETLAND

(4) SHAKHLOUL AMANDA B
(5) SCARLETT LOUISE J
(6) SCARLETT LOUISE J

UTILITY INFORMATION:
TO PROVIDE GREATER VISUAL CLARITY, EXISTING AND PROPOSED UTILITES ARE NOT SHOWN ON THESE MAPS OR ON OTHER DISPLAYS. THE DESIGNS SHOWN ON THESE MAPS ARE FUNCTIONAL AND ARE SUBJECT TO CHANGE.

IMPACTS AND DRIVEWAY TIES:
LIMITS OF CONSTRUCTION AND THEIR IMPACTS SHOWN ON THIS MEETING MAP ARE BASED OFF OF FUNCTIONAL DESIGNS AND LIDAR GROUND SURVEYS. DURING THE FINAL DESIGN STAGE, DESIGNERS WILL ATTEMPT TO MINIMIZE IMPACTS WHERE FEASIBLE USING FINAL GROUND SURVEYS. FINAL DRIVEWAY LOCATIONS WILL ALSO BE DETERMINED DURING FINAL DESIGN USING FINAL SURVEYS.

NOTES:
FULL CONTROL OF ACCESS IS DEFINED AS A CONNECTION TO A FACILITY PROVIDED ONLY VIA RAMPS AT INTERCHANGES. ALL CROSS-STREETS ARE GRADE-SEPERATED. NO PRIVATE DRIVEWAY CONNECTIONS ALLOWED.

NOTE:
NC ONEMAP ORTHOIMAGERY DATED FEBRUARY 4, 2017
ORANGE COUNTY PROPERTY OWNER INFORMATION CURRENT AS OF AUGUST 28, 2018

100' 0' 100' 200'
50'
(ENGLISH)

DESIGN DATA -L-

Functional Class.	=	Interstate
Design Speed	=	70 mph
Max. Superelev.	=	10%

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

LEGEND

- BUILDINGS
- EXISTING RIGHT OF WAY
- PROPOSED RIGHT OF WAY
- PROPOSED EASEMENTS (DRAINAGE, CONSTRUCTION, AND UTILITY)
- EXISTING ROADWAY
- EXISTING ROADWAY TO BE REMOVED
- EXISTING ROADWAY TO BE RESURFACED
- PROPOSED ROADWAY
- PROPOSED STRUCTURES, ISLAND, CURB AND GUTTER
- EXISTING STRUCTURES, ISLAND, CURB AND GUTTER TO BE RETAINED
- EXISTING STRUCTURES, ISLAND, CURB AND GUTTER TO BE REMOVED
- LAKES, RIVER, STREAMS AND PONDS
- RAILROAD RIGHT OF WAY
- PROPOSED FULL CONTROL OF ACCESS
- EXISTING CONTROL OF ACCESS
- PRESENT ADT / FUTURE ADT
- PROPERTY LINES
- EXISTING UTILITY EASEMENT
- LIMITS OF CONSTRUCTION
- EXISTING TRAFFIC SIGNAL
- WETLAND LIMITS BOUNDARY
- WETLAND

DESIGN PUBLIC MEETING MAP

PROJECT 34178.1.3 (I-3306A)
F. A. PROJECT: IMS-40-4(148)259

ORANGE COUNTY

WIDENING OF I-40 FROM I-85 TO THE DURHAM COUNTY LINE

SHEET 2 OF 6

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Attachment 5: Signal Warrants Section from Settler's Pointe TIA

6.0 SIGNAL WARRANT ANALYSIS

As outlined in the Manual of Uniform Traffic Control Devices (MUTCD), a traffic signal should not be installed unless traffic volumes and intersection characteristics meet a set of warrants or requirements. The MUTCD outlines nine warrants, which are listed below.

Warrant 1: Eight-Hour Traffic Volume
Warrant 2: Four-Hour Traffic Volume
Warrant 3: Peak Hour
Warrant 4: Pedestrian Volume
Warrant 5: School Crossing
Warrant 6: Coordinated Signal System
Warrant 7: Crash Experience
Warrant 8: Roadway Network
Warrant 9: Intersection Near Roadway Grade Crossing

An analysis was conducted at two major intersections north of the Settler's Pointe development as part of the 2020 Build Analysis:

- I-40 Westbound Ramps and Old NC 86
- I-40 Eastbound Ramps and Old NC 86

For both intersections, thirteen-hour (6 AM to 7 PM) traffic counts were completed on October 18, 2016. Using Highway Capacity Software (HCS) with 2016 existing traffic conditions, the intersection of Old NC 86 at I-40 Westbound Ramps meets the following signal warrants:

- Warrant 1: Eight-Hour Vehicular Volume
- Warrant 2: Four-Hour Vehicular Volume
- Warrant 3B: Peak Hour (Peak-Hour Vehicular Volumes)
- Warrant 6: Coordinated Signal System

Additionally, the I-40 Eastbound Ramps meet Warrant 3B: Peak Hour (Peak-Hour Vehicular Volumes), and Warrant 6 (Coordinated Signal System) under the 2016 existing traffic conditions.

Traffic volumes were then grown out to 2020 with a 1% annual growth rate and the adjacent development volumes were added to the AM and PM peak hours. The following signal warrants were met at both intersections in 2020 and should be considered for signalization based on projected adjacent development traffic:

- Warrant 1B: Eight-Hour Vehicular Volume (Interruption in Continuous Traffic)
- Warrant 2: Four-Hour Vehicular Volume
- Warrant 3B: Peak Hour (Peak-Hour Vehicular Volumes)
- Warrant 6: Coordinated Signal System

Also, an analysis was conducted at the Service Road intersection at Old NC 86 for the 2020 Build Analysis; however, since trip generation practices only provide peak hour turn movements, the only data available for a warrant analysis was for AM and PM peak hours. For this intersection, the 2020 Build volumes generated by the proposed site were utilized for the AM and PM peak hour traffic. Data was not formally collected at this intersection with the other study intersections, but the turn counts collected at the nearby I-40 eastbound ramps were provided via a video recording, and a review of the video indicated that there were no peak hour turn movements in or out of the Service Road. The Service Road provides public street access to tracts of land that are presently vacant, so this is a reasonable conclusion.

Using HCS with 2020 projected traffic conditions, the intersection of Old NC 86 at the Service Road met the following signal warrants:

- Warrant 3B: Peak Hour (Peak-Hour Vehicular Volumes)
- Warrant 6: Coordinated Signal System

In similar fashion, the 2022 Build volumes generated by the proposed site were utilized for the AM and PM peak hour traffic for the following intersections:

- Old NC 86 and proposed Retail Drive
- Old NC 86 and Davis Road

Peak hour (AM and PM) turn movement count data was collected for the Davis Road and Old NC 86 intersection on the same day as the other study intersections, October 18, 2016. The existing turn movement counts were then grown out to 2022 using a 1% annual growth rate, and the proposed trips generated by the residential retirement driveway connection to the existing intersection added to form the basis for the AM and PM count data. For the proposed retail driveway, the projected volumes for the through movements represent the 2022 background traffic, plus the trips generated by the site itself. Similar to the scenario with the Service Road, the only data used for the warrant analysis at the Retail Drive intersection and Davis Road intersection warrant analysis was the peak hour turn movement counts.

Using HCS with 2022 projected traffic conditions, the intersection of Old NC 86 at the Retail Drive met the following signal warrants:

- Warrant 3B: Peak Hour (Peak-Hour Vehicular Volumes)
- Warrant 6: Coordinated Signal System

Additionally, the intersection of Old NC 86 at Davis Road met the following signal warrant:

- Warrant 3B: Peak Hour (Peak-Hour Vehicular Volumes)

HCS reports for the signal warrant analysis are located in **Appendix D**.

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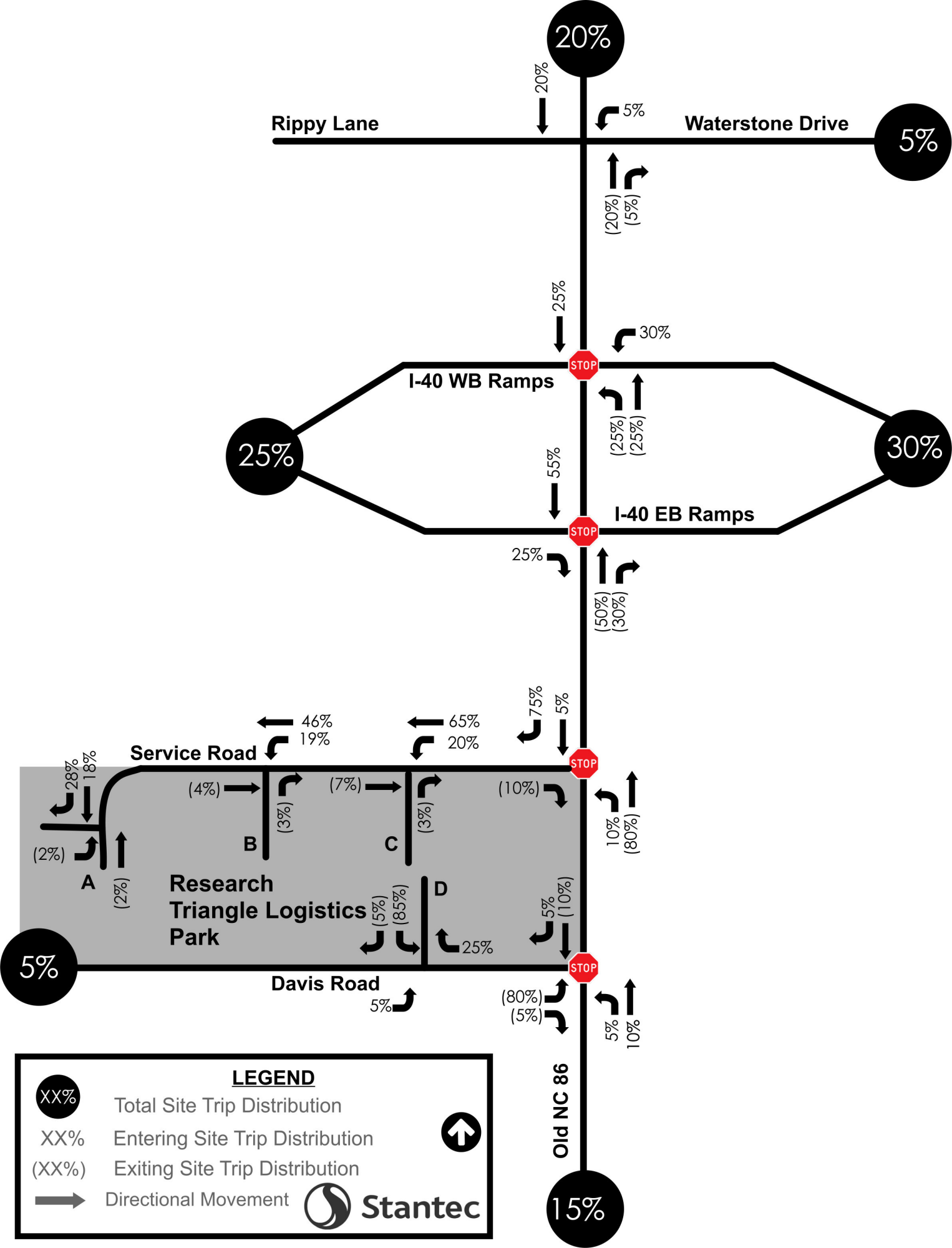
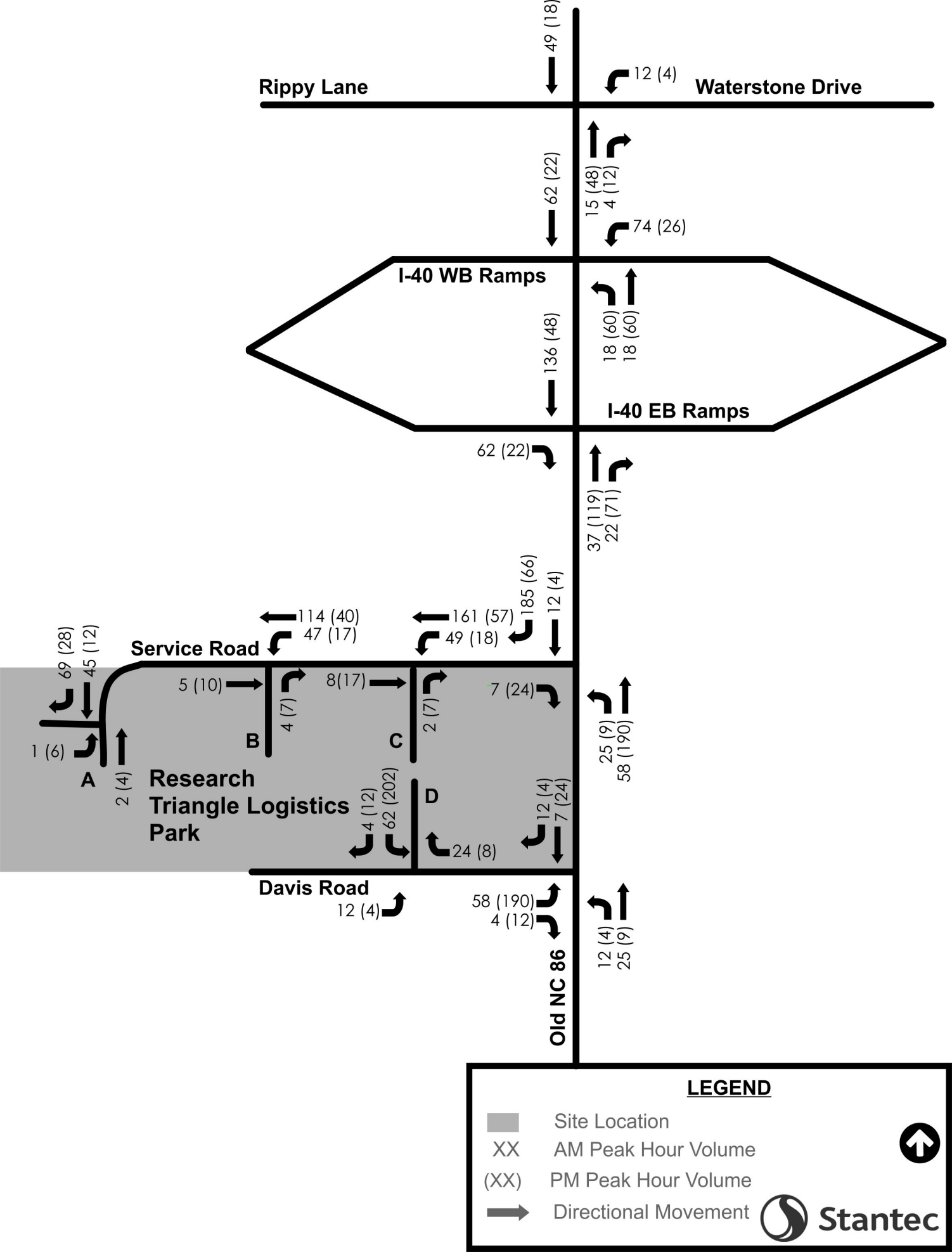
Attachment 6: Revised Site Trip Distribution as result of Revised Access


20%
20%
5%
Rippy Lane
Waterstone Drive
5%
(20%)
(5%)
25%
30%
STOP
I-40 WB Ramps
(25%)
(25%)
25%
30%
55%
I-40 EB Ramps
STOP
25%
(50%)
(30%)
75%
5%
46%
19%
65%
20%
Service Road
STOP
28%
18%
(4%)
(7%)
(10%)
(3%)
(3%)
10%
(80%)
(2%)
B
C
A
(2%)
Research
Triangle Logistics
Park
D
(5%)
(85%)
5%
(10%)
25%
5%
STOP
Davis Road
5%
(80%)
(5%)
5%
10%
LEGEND
XX%
Total Site Trip Distribution
XX%
Entering Site Trip Distribution
(XX%)
Exiting Site Trip Distribution
Directional Movement
Stantec
Old NC 86
15%

Stantec Consulting Services Inc.
801 Jones Franklin Road, Suite 300
Raleigh, North Carolina 27606-3563

Attachment 7: Revised Site Trips as a result of Revised Access


Rippy Lane
Waterstone Drive
49 (18)
12 (4)
62 (22)
15 (48)
4 (12)
74 (26)
I-40 WB Ramps
136 (48)
18 (60)
18 (60)
I-40 EB Ramps
62 (22)
37 (119)
22 (71)
185 (66)
12 (4)
114 (40)
47 (17)
161 (57)
49 (18)
Service Road
69 (28)
45 (12)
5 (10)
4 (7)
8(17)
2 (7)
7 (24)
25 (9)
58 (190)
1 (6)
B
C
A
2 (4)
Research
Triangle Logistics
Park
4 (12)
62 (202)
D
12 (4)
7 (24)
24 (8)
Davis Road
12 (4)
58 (190)
4 (12)
12 (4)
25 (9)
Old NC 86
LEGEND
Site Location
XX AM Peak Hour Volume
(XX) PM Peak Hour Volume
Directional Movement
Stantec

Stantec Consulting Services Inc.
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Raleigh, North Carolina 27606-3563

Attachment 8: Revised Recommended Improvements

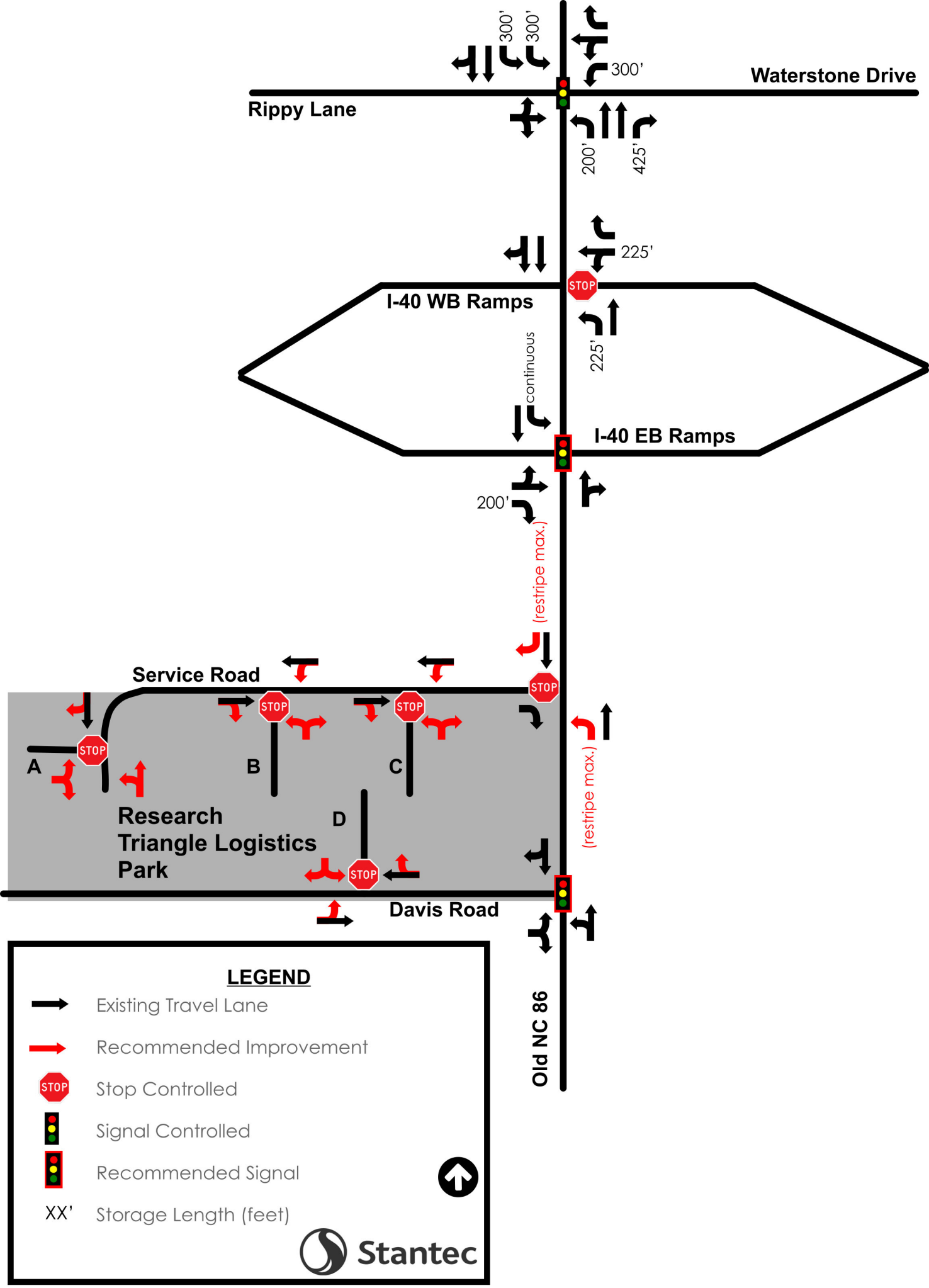

Figure is Not To Scale

Stantec Consulting Services Inc.
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Raleigh, North Carolina 27606-3563

Attachment 9: Synchro Reports

Intersection	
Int Delay, s/veh	5.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	93	4	470	93	517	0	0	915	95
Future Vol, veh/h	0	0	0	93	4	470	93	517	0	0	915	95
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	None
Storage Length	-	-	-	225	-	0	225	-	-	-	-	-
Veh in Median Storage, #	-	2	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	103	4	522	103	574	0	0	1017	106

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	1289	1903	-	1123	0	-	-	-	0
Stage 1	780	780	-	-	-	-	-	-	-
Stage 2	509	1123	-	-	-	-	-	-	-
Critical Hdwy	6.63	6.53	-	4.13	-	-	-	-	-
Critical Hdwy Stg 1	5.43	5.53	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.83	5.53	-	-	-	-	-	-	-
Follow-up Hdwy	3.519	4.019	-	2.219	-	-	-	-	-
Pot Cap-1 Maneuver	168	68	0	620	-	0	0	-	-
Stage 1	451	405	0	-	-	0	0	-	-
Stage 2	569	280	0	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	140	0	-	620	-	-	-	-	-
Mov Cap-2 Maneuver	140	0	-	-	-	-	-	-	-
Stage 1	376	0	-	-	-	-	-	-	-
Stage 2	569	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	86.6	1.8	0
HCM LOS	F		

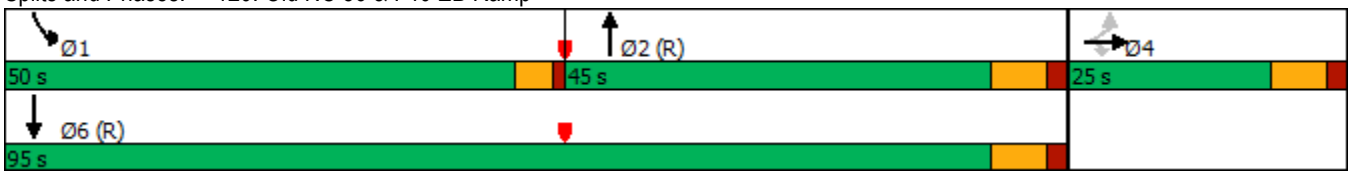
Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	620	-	140	-	-	-
HCM Lane V/C Ratio	0.167	-	0.77	-	-	-
HCM Control Delay (s)	12	-	86.6	0	-	-
HCM Lane LOS	B	-	F	A	-	-
HCM 95th %tile Q(veh)	0.6	-	4.7	-	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	157	4	153	0	0	0	0	453	99	631	377	0
Future Volume (vph)	157	4	153	0	0	0	0	453	99	631	377	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		200	0		0	0		0	0		0
Storage Lanes	0		1	0		0	0		0	1		0
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850					0.976				
Flt Protected		0.953								0.950		
Satd. Flow (prot)	0	1775	1583	0	0	0	0	1818	0	1770	1863	0
Flt Permitted		0.953								0.950		
Satd. Flow (perm)	0	1775	1583	0	0	0	0	1818	0	1770	1863	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		55			55			45			45	
Link Distance (ft)		1173			557			452			723	
Travel Time (s)		14.5			6.9			6.8			11.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	174	4	170	0	0	0	0	503	110	701	419	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	178	170	0	0	0	0	613	0	701	419	0
Enter Blocked Intersection	No	No	No	No	No	No	No	Yes	No	No	Yes	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1					2		1	2	
Detector Template	Left	Thru	Right					Thru		Left	Thru	
Leading Detector (ft)	20	100	20					100		20	100	
Trailing Detector (ft)	0	0	0					0		0	0	
Detector 1 Position(ft)	0	0	0					0		0	0	
Detector 1 Size(ft)	20	6	20					6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0		0.0	0.0	
Detector 2 Position(ft)		94						94			94	
Detector 2 Size(ft)		6						6			6	
Detector 2 Type		Cl+Ex						Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0						0.0			0.0	
Turn Type	Perm	NA	Perm					NA		Prot	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4		4									

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4	4					2		1	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0					12.0		7.0	12.0	
Minimum Split (s)	25.0	25.0	25.0					25.0		11.5	25.0	
Total Split (s)	25.0	25.0	25.0					45.0		50.0	95.0	
Total Split (%)	20.8%	20.8%	20.8%					37.5%		41.7%	79.2%	
Maximum Green (s)	18.0	18.0	18.0					38.0		45.5	88.0	
Yellow Time (s)	5.0	5.0	5.0					5.0		3.5	5.0	
All-Red Time (s)	2.0	2.0	2.0					2.0		1.0	2.0	
Lost Time Adjust (s)		-2.0	-2.0					-2.0		-2.0	-2.0	
Total Lost Time (s)		5.0	5.0					5.0		2.5	5.0	
Lead/Lag								Lag		Lead		
Lead-Lag Optimize?								Yes		Yes		
Vehicle Extension (s)	3.0	3.0	3.0					3.0		3.0	3.0	
Recall Mode	None	None	None					C-Min		None	C-Min	
Walk Time (s)	7.0	7.0	7.0					7.0			7.0	
Flash Dont Walk (s)	11.0	11.0	11.0					11.0			11.0	
Pedestrian Calls (#/hr)	0	0	0					0			0	
Act Effct Green (s)		18.1	18.1					40.0		49.4	91.9	
Actuated g/C Ratio		0.15	0.15					0.33		0.41	0.77	
v/c Ratio		0.67	0.71					1.01		0.96	0.29	
Control Delay		60.5	65.2					76.7		57.7	3.7	
Queue Delay		0.0	0.0					0.0		0.0	0.0	
Total Delay		60.5	65.2					76.7		57.7	3.7	
LOS		E	E					E		E	A	
Approach Delay		62.7						76.7			37.5	
Approach LOS		E						E			D	

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 1 (1%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle: 120	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.01	
Intersection Signal Delay: 53.3	Intersection LOS: D
Intersection Capacity Utilization 85.4%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 120: Old NC 86 & I-40 EB Ramp



Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	11	29	552	340	189
Future Vol, veh/h	0	11	29	552	340	189
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	50	-	-	100
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	12	32	613	378	210

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	378	588	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.22	4.12	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	0	669	987	-	-	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	669	987	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.5	0.4	0
HCM LOS	B		

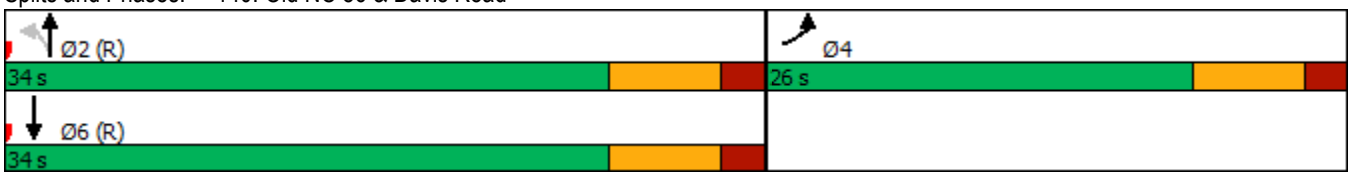
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	987	-	669	-	-
HCM Lane V/C Ratio	0.033	-	0.018	-	-
HCM Control Delay (s)	8.8	-	10.5	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.1	-	-

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	219	23	40	362	287	65
Future Volume (vph)	219	23	40	362	287	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.987				0.975	
Flt Protected	0.957			0.995		
Satd. Flow (prot)	1759	0	0	1853	1816	0
Flt Permitted	0.957			0.935		
Satd. Flow (perm)	1759	0	0	1742	1816	0
Right Turn on Red		No				No
Satd. Flow (RTOR)						
Link Speed (mph)	45			45	45	
Link Distance (ft)	1029			1406	754	
Travel Time (s)	15.6			21.3	11.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	243	26	44	402	319	72
Shared Lane Traffic (%)						
Lane Group Flow (vph)	269	0	0	446	391	0
Enter Blocked Intersection	No	No	No	Yes	Yes	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Number of Detectors	1		1	2	2	
Detector Template	Left		Left	Thru	Thru	
Leading Detector (ft)	20		20	100	100	
Trailing Detector (ft)	0		0	0	0	
Detector 1 Position(ft)	0		0	0	0	
Detector 1 Size(ft)	20		20	6	6	
Detector 1 Type	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)	0.0		0.0	0.0	0.0	
Detector 1 Queue (s)	0.0		0.0	0.0	0.0	
Detector 1 Delay (s)	0.0		0.0	0.0	0.0	
Detector 2 Position(ft)				94	94	
Detector 2 Size(ft)				6	6	
Detector 2 Type				Cl+Ex	Cl+Ex	
Detector 2 Channel						
Detector 2 Extend (s)				0.0	0.0	
Turn Type	Prot		Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases			2			
Detector Phase	4		2	2	6	
Switch Phase						
Minimum Initial (s)	7.0		12.0	12.0	12.0	

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Minimum Split (s)	25.0		25.0	25.0	25.0	
Total Split (s)	26.0		34.0	34.0	34.0	
Total Split (%)	43.3%		56.7%	56.7%	56.7%	
Maximum Green (s)	19.0		27.0	27.0	27.0	
Yellow Time (s)	5.0		5.0	5.0	5.0	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lost Time Adjust (s)	-2.0			-2.0	-2.0	
Total Lost Time (s)	5.0			5.0	5.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Recall Mode	None		C-Min	C-Min	C-Min	
Walk Time (s)	7.0		7.0	7.0	7.0	
Flash Dont Walk (s)	11.0		11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0		0	0	0	
Act Effct Green (s)	16.2			33.8	33.8	
Actuated g/C Ratio	0.27			0.56	0.56	
v/c Ratio	0.57			0.45	0.38	
Control Delay	23.1			10.6	8.3	
Queue Delay	0.0			0.0	0.0	
Total Delay	23.1			10.6	8.3	
LOS	C			B	A	
Approach Delay	23.1			10.6	8.3	
Approach LOS	C			B	A	

Intersection Summary	
Area Type: Other	
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 50	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.57	
Intersection Signal Delay: 12.8	Intersection LOS: B
Intersection Capacity Utilization 66.4%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 140: Old NC 86 & Davis Road



Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	12	176	81	24	66	4
Future Vol, veh/h	12	176	81	24	66	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	13	196	90	27	73	4

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	117	0	-	0	326	104
Stage 1	-	-	-	-	104	-
Stage 2	-	-	-	-	222	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1471	-	-	-	668	951
Stage 1	-	-	-	-	920	-
Stage 2	-	-	-	-	815	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1471	-	-	-	661	951
Mov Cap-2 Maneuver	-	-	-	-	661	-
Stage 1	-	-	-	-	911	-
Stage 2	-	-	-	-	815	-

Approach	EB	WB	SB
HCM Control Delay, s	0.5	0	11
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1471	-	-	-	673
HCM Lane V/C Ratio	0.009	-	-	-	0.116
HCM Control Delay (s)	7.5	0	-	-	11
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.4

Intersection	
Int Delay, s/veh	5.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	70	4	580	144	500	0	0	868	159
Future Vol, veh/h	0	0	0	70	4	580	144	500	0	0	868	159
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	None
Storage Length	-	-	-	225	-	0	225	-	-	-	-	-
Veh in Median Storage, #	-	2	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	78	4	644	160	556	0	0	964	177

Major/Minor	Minor1		Major1			Major2			
Conflicting Flow All	1358	2017	-	1141	0	-	-	-	0
Stage 1	876	876	-	-	-	-	-	-	-
Stage 2	482	1141	-	-	-	-	-	-	-
Critical Hdwy	6.63	6.53	-	4.13	-	-	-	-	-
Critical Hdwy Stg 1	5.43	5.53	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.83	5.53	-	-	-	-	-	-	-
Follow-up Hdwy	3.519	4.019	-	2.219	-	-	-	-	-
Pot Cap-1 Maneuver	152	58	0	610	-	0	0	-	-
Stage 1	406	366	0	-	-	0	0	-	-
Stage 2	588	275	0	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	112	0	-	610	-	-	-	-	-
Mov Cap-2 Maneuver	112	0	-	-	-	-	-	-	-
Stage 1	300	0	-	-	-	-	-	-	-
Stage 2	588	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	96.5	2.9	0
HCM LOS	F		

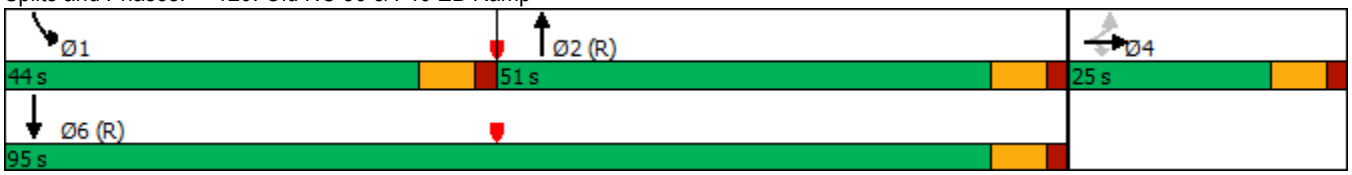
Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	610	-	112	-	-	-
HCM Lane V/C Ratio	0.262	-	0.734	-	-	-
HCM Control Delay (s)	13	-	96.5	0	-	-
HCM Lane LOS	B	-	F	A	-	-
HCM 95th %tile Q(veh)	1	-	4	-	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	121	4	66	0	0	0	0	522	92	511	426	0
Future Volume (vph)	121	4	66	0	0	0	0	522	92	511	426	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		200	0		0	0		0	0		0
Storage Lanes	0		1	0		0	0		0	1		0
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850					0.980				
Flt Protected		0.954								0.950		
Satd. Flow (prot)	0	1777	1583	0	0	0	0	1825	0	1770	1863	0
Flt Permitted		0.954								0.950		
Satd. Flow (perm)	0	1777	1583	0	0	0	0	1825	0	1770	1863	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		55			55			45			45	
Link Distance (ft)		1173			557			452			723	
Travel Time (s)		14.5			6.9			6.8			11.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	134	4	73	0	0	0	0	580	102	568	473	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	138	73	0	0	0	0	682	0	568	473	0
Enter Blocked Intersection	No	No	No	No	No	No	No	Yes	No	No	Yes	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1					2		1	2	
Detector Template	Left	Thru	Right					Thru		Left	Thru	
Leading Detector (ft)	20	100	20					100		20	100	
Trailing Detector (ft)	0	0	0					0		0	0	
Detector 1 Position(ft)	0	0	0					0		0	0	
Detector 1 Size(ft)	20	6	20					6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0		0.0	0.0	
Detector 2 Position(ft)		94						94			94	
Detector 2 Size(ft)		6						6			6	
Detector 2 Type		Cl+Ex						Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0						0.0			0.0	
Turn Type	Perm	NA	Perm					NA		Prot	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4		4									

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4	4					2		1	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0					12.0		7.0	12.0	
Minimum Split (s)	25.0	25.0	25.0					25.0		14.0	25.0	
Total Split (s)	25.0	25.0	25.0					51.0		44.0	95.0	
Total Split (%)	20.8%	20.8%	20.8%					42.5%		36.7%	79.2%	
Maximum Green (s)	18.0	18.0	18.0					44.0		37.0	88.0	
Yellow Time (s)	5.0	5.0	5.0					5.0		5.0	5.0	
All-Red Time (s)	2.0	2.0	2.0					2.0		2.0	2.0	
Lost Time Adjust (s)		-2.0	-2.0					-2.0		-2.0	-2.0	
Total Lost Time (s)		5.0	5.0					5.0		5.0	5.0	
Lead/Lag								Lag		Lead		
Lead-Lag Optimize?								Yes		Yes		
Vehicle Extension (s)	3.0	3.0	3.0					3.0		3.0	3.0	
Recall Mode	None	None	None					C-Min		None	C-Min	
Walk Time (s)	7.0	7.0	7.0					7.0			7.0	
Flash Dont Walk (s)	11.0	11.0	11.0					11.0			11.0	
Pedestrian Calls (#/hr)	0	0	0					0			0	
Act Effct Green (s)		16.2	16.2					47.0		41.9	93.8	
Actuated g/C Ratio		0.14	0.14					0.39		0.35	0.78	
v/c Ratio		0.58	0.34					0.96		0.92	0.32	
Control Delay		58.0	50.5					58.0		59.2	5.6	
Queue Delay		0.0	0.0					0.0		0.0	0.0	
Total Delay		58.0	50.5					58.0		59.2	5.6	
LOS		E	D					E		E	A	
Approach Delay		55.4						58.0			34.8	
Approach LOS		E						E			C	

Intersection Summary	
Area Type:	Other
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 4 (3%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle: 110	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.96	
Intersection Signal Delay: 45.2	Intersection LOS: D
Intersection Capacity Utilization 80.8%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 120: Old NC 86 & I-40 EB Ramp



Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	28	13	614	423	70
Future Vol, veh/h	0	28	13	614	423	70
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	50	-	-	100
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	31	14	682	470	78

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	470	548	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.22	4.12	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	0	594	1021	-	-	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	594	1021	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.4	0.2	0
HCM LOS	B		

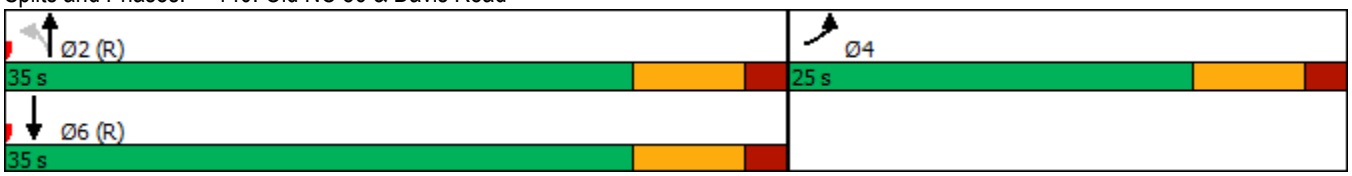
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1021	-	594	-	-
HCM Lane V/C Ratio	0.014	-	0.052	-	-
HCM Control Delay (s)	8.6	-	11.4	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	261	39	45	367	312	139
Future Volume (vph)	261	39	45	367	312	139
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.983				0.959	
Flt Protected	0.958			0.995		
Satd. Flow (prot)	1754	0	0	1853	1786	0
Flt Permitted	0.958			0.911		
Satd. Flow (perm)	1754	0	0	1697	1786	0
Right Turn on Red		No				No
Satd. Flow (RTOR)						
Link Speed (mph)	45			45	45	
Link Distance (ft)	1029			1406	754	
Travel Time (s)	15.6			21.3	11.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	290	43	50	408	347	154
Shared Lane Traffic (%)						
Lane Group Flow (vph)	333	0	0	458	501	0
Enter Blocked Intersection	No	No	No	Yes	Yes	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Number of Detectors	1		1	2	2	
Detector Template	Left		Left	Thru	Thru	
Leading Detector (ft)	20		20	100	100	
Trailing Detector (ft)	0		0	0	0	
Detector 1 Position(ft)	0		0	0	0	
Detector 1 Size(ft)	20		20	6	6	
Detector 1 Type	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)	0.0		0.0	0.0	0.0	
Detector 1 Queue (s)	0.0		0.0	0.0	0.0	
Detector 1 Delay (s)	0.0		0.0	0.0	0.0	
Detector 2 Position(ft)				94	94	
Detector 2 Size(ft)				6	6	
Detector 2 Type				Cl+Ex	Cl+Ex	
Detector 2 Channel						
Detector 2 Extend (s)				0.0	0.0	
Turn Type	Prot		Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases			2			
Detector Phase	4		2	2	6	
Switch Phase						
Minimum Initial (s)	7.0		12.0	12.0	12.0	

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Minimum Split (s)	25.0		25.0	25.0	25.0	
Total Split (s)	25.0		35.0	35.0	35.0	
Total Split (%)	41.7%		58.3%	58.3%	58.3%	
Maximum Green (s)	18.0		28.0	28.0	28.0	
Yellow Time (s)	5.0		5.0	5.0	5.0	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lost Time Adjust (s)	-2.0			-2.0	-2.0	
Total Lost Time (s)	5.0			5.0	5.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Recall Mode	None		C-Min	C-Min	C-Min	
Walk Time (s)	7.0		7.0	7.0	7.0	
Flash Dont Walk (s)	11.0		11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0		0	0	0	
Act Effct Green (s)	17.5			32.5	32.5	
Actuated g/C Ratio	0.29			0.54	0.54	
v/c Ratio	0.65			0.50	0.52	
Control Delay	24.6			11.8	15.3	
Queue Delay	0.0			0.0	0.0	
Total Delay	24.6			11.8	15.3	
LOS	C			B	B	
Approach Delay	24.6			11.8	15.3	
Approach LOS	C			B	B	

Intersection Summary	
Area Type: Other	
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 52 (87%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 50	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.65	
Intersection Signal Delay: 16.5	Intersection LOS: B
Intersection Capacity Utilization 76.0%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 140: Old NC 86 & Davis Road



Intersection	
Int Delay, s/veh	5.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	4	94	176	8	206	12
Future Vol, veh/h	4	94	176	8	206	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	104	196	9	229	13

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	205	0	-	0	313	201
Stage 1	-	-	-	-	201	-
Stage 2	-	-	-	-	112	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1366	-	-	-	680	840
Stage 1	-	-	-	-	833	-
Stage 2	-	-	-	-	913	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1366	-	-	-	678	840
Mov Cap-2 Maneuver	-	-	-	-	678	-
Stage 1	-	-	-	-	831	-
Stage 2	-	-	-	-	913	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	13.1
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1366	-	-	-	685
HCM Lane V/C Ratio	0.003	-	-	-	0.354
HCM Control Delay (s)	7.6	0	-	-	13.1
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	1.6

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Attachment 10: Revised LOS Summary Table

Table ES-1: Level of Service & Delay Summary for Revised Access Scenario

Intersection	Approach	Existing Intersection Control	Proposed Intersection Control	2020 Existing		2023 No-Build		2023 Build		2023 Build-Improved	
				AM Peak LOS (Delay in sec./veh.)	PM Peak LOS (Delay in sec./veh.)	AM Peak LOS (Delay in sec./veh.)	PM Peak LOS (Delay in sec./veh.)	AM Peak LOS (Delay in sec./veh.)	PM Peak LOS (Delay in sec./veh.)	AM Peak LOS (Delay in sec./veh.)	PM Peak LOS (Delay in sec./veh.)
Old NC 86 at I-40 WB Ramps	**Overall Intersection**	One-Way Stop Controlled	Signalized	**A (1.0)**	**A (1.6)**	**A (1.0)**	**A (1.7)**	**A (5.5)**	**A (5.2)**		
	WB Approach			C (21.9)	C (22.0)	D (30.2)	D (34.3)	F (86.6)	F (96.5)		
	NB Left-Turn			A (9.9)	A (9.9)	B (11.3)	B (11.8)	B (12.0)	B (13.0)		
	SB Approach			A (0.0)	A (0.0)	A (0.0)	A (0.0)	A (0.0)	A (0.0)		
Old NC 86 at I-40 EB Ramps	**Overall Intersection**	One-Way Stop Controlled	Signalized	**F (51.2)**	**A (7.0)**	**F (###)**	**F (158.3)**	**F (###)**	**F (268.2)**	**D (53.3)**	**D (45.2)**
	EB Approach			F (###)	F (54.6)	F (###)	F (###)	F (###)	F (###)	E (62.7)	E (55.4)
	NB Approach			A (0.0)	A (0.0)	A (0.0)	A (0.0)	A (0.0)	A (0.0)	E (76.7)	E (58.0)
	SB Left-Turn (unsignalizid) SB Approach (Signalized)			B (12.1)	A (9.8)	C (15.9)	B (3.1)	C (17.9)	C (15.3)	D (37.5)	C (34.8)
Old NC 86 at Service Road	**Overall Intersection**	One-Way Stop Controlled	One-Way Stop Controlled	**A (0.2)**	**A (0.2)**	**A (0.2)**	**A (0.2)**	**A (1.6)**	**A (7.5)**	**A (0.3)**	**A (0.4)**
	EB Approach			B (13.1)	B (13.5)	B (13.8)	B (14.4)	D (25.2)	E (48.5)	B (10.4)	B (11.2)
	NB Left-Turn			A (8.0)	A (8.2)	A (8.0)	A (8.3)	A (8.8)	A (8.6)	A (8.8)	A (8.6)
Old NC 86 at Davis Road	**Overall Intersection**	One-Way Stop Controlled	Signalized	**A (4.8)**	**A (2.3)**	**A (5.2)**	**A (2.4)**	**A (7.2)**	**A (4.6)**	**B (12.8)**	**B (16.5)**
	EB Approach			C (21.1)	C (17.2)	C (24.8)	C (19.4)	D (34.7)	D (28.5)	C (23.1)	C (24.6)
	NB Left-Turn (unsignalized) NB Approach (Signalized)			A (8.0)	A (8.3)	A (8.1)	A (8.4)	A (8.3)	A (8.6)	B (10.6)	B (11.8)
	SB Approach			A (0.0)	A (0.0)	A (0.0)	A (0.0)	A (0.0)	A (0.0)	A (8.3)	B (15.3)
Davis Road at Warehouse D Driveway	**Overall Intersection**		One-Way Stop Controlled							**A (2.4)**	**A (5.8)**
	EB Approach									A (0.5)	A (0.3)
	SB Approach									B (11.0)	B (13.1)

###: Delay exceeds 300 seconds / vehicle