Appendix A

Planning-Level Traffic Analyses

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Memorandum

To: Mr. Zack Haney, PE
Mead & Hunt

From: Ryan Eckenrode, P.E., PTOE, Traffic Engineer, AECOM

Date: July 29, 2016

Reference: S-48 (Columbia Avenue) Corridor Improvement Project – Arterial LOS

A detailed SYNCHRO model was developed for the project to evaluate existing, No-Build and Build conditions at the intersections along the proposed corridor of S-48/Columbia Ave. This analysis included evaluating 9 intersections along the existing S-48/Columbia Ave. As a result of this analysis it was recommended that the intersections of Lexington Ave, Proposed New Road, Chapin High School Driveway and Woodthrush Road be signalized, therefore signalized intersections at these four locations were included in the future Build and No-Build Scenarios.

To evaluate how these intersections function as a corridor, an arterial level of service (LOS) analysis was completed using the SYNCHRO model built in the detailed traffic analysis. Table 1 below summarizes the arterial level of service analysis for S-48/Columbia Ave. In the existing condition the corridor along S-48/Columbia Ave does not have sufficient signalized intersections to evaluate the Arterial LOS using SYNCHRO, therefore the existing conditions were analyzed using Highway Capacity Software (HCS). This analysis indicated S-48/Columbia Ave (Eastbound and Westbound) operates at a LOS D. Without implementing any future improvements (other than the installation of signals), the arterial LOS for eastbound S-48/Columbia Ave would decrease to a LOS F with average speeds of 5.3 mph or greater in the year 2040. However if the future build improvements are implemented and signals are coordinated, eastbound S-48/Columbia Ave would operate at a LOS C with average speeds of 18.9 mph or greater and westbound S-48/Columbia Ave would be a LOS C or better with average speeds of 23.9 mph or greater.

Table 1: S-48/Columbia Ave Arterial Level of Service Analysis

	Eastbound S-48 (EB)				Westbound S-48 (WB)			
	Arterial Speed (MPH)		Arterial Level of Service		Arterial Speed (MPH)		Arterial Level of Service	
	AM	PM	AM	PM	AM	PM	AM	PM
2040 No-Build	5.3	15.2	F	D	18.2	6.7	C	F
2040 Build	18.9	20.5	C	C	28.6	23.9	B	C

Average daily traffic (ADT) was also estimated along S-48 (Columbia Avenue). The existing 2014 daily volume is 14,160 from a 24 hour traffic count. The opening year 2020 daily volume is 15,260 which includes the simple 1.25% annual growth rate applied for six years. The design year 2040 daily volume is 24,490 which includes the Chapin Tech Park and Chapin Commerce Village at full buildout.

HCS 2010: Two-Lane Highways Release 6.80

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	AECOM
Agency/Co.	
Date Performed	7/29/2016
Analysis Time Period	Existing 2014 AM
Highway	Columbia Avenue
From/To	Lexington Ave to Woodthrush Rd
Jurisdiction	
Analysis Year	2014

Description S-48 (Columbia Avenue)

Input Data

Highway class	Class 3		Peak hour factor, PHF	0.90	
Shoulder width	2.0	ft	% Trucks and buses	2	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.3	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	2	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	16	/mi

Analysis direction volume, Vd 845 veh/h
Opposing direction volume, Vo 670 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	1.000		0.998	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	939	pc/h	746	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	45.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	2.6	mi/h
Adj. for access point density,(note-3) fA	4.0	mi/h
Free-flow speed, FFSd	38.4	mi/h
Adjustment for no-passing zones, fnp	1.4	mi/h
Average travel speed, ATSd	24.0	mi/h
Percent Free Flow Speed, PFFS	62.4	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	939	pc/h	744	pc/h

Base percent time-spent-following,(note-4) BPTSFd	74.0	%
Adjustment for no-passing zones, fnp	23.2	
Percent time-spent-following, PTSFd	86.9	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.55	
Peak 15-min vehicle-miles of travel, VMT15	305	veh-mi
Peak-hour vehicle-miles of travel, VMT60	1098	veh-mi
Peak 15-min total travel time, TT15	12.7	veh-h
Capacity from ATS, CdATS	1697	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1697	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.3	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	24.0	mi/h
Percent time-spent-following, PTSFd (from above)	86.9	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	938.9
Effective width of outside lane, We	14.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	4.73
Bicycle LOS	E

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

HCS 2010: Two-Lane Highways Release 6.80

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Phone:                                   Fax:
E-Mail:

_________________Directional Two-Lane Highway Segment Analysis________________

Analyst                  AECOM
Agency/Co.
Date Performed           7/29/2016
Analysis Time Period     Existing 2014 AM
Highway                  Columbia Avenue
From/To                  Lexington Ave to Woodthrush Rd
Jurisdiction
Analysis Year            2014
Description  S-48 (Columbia Avenue)

__________________________________Input Data__________________________________

Highway class  Class 3              Peak hour factor, PHF    0.90
Shoulder width       2.0     ft     % Trucks and buses       2       %
Lane width           12.0    ft     % Trucks crawling        0.0     %
Segment length       1.3     mi     Truck crawl speed        0.0     mi/hr
Terrain type         Level          % Recreational vehicles  2       %
Grade:  Length       -       mi     % No-passing zones       100     %
        Up/down      -       %      Access point density     16      /mi

Analysis direction volume, Vd  634     veh/h
Opposing direction volume, Vo  854     veh/h

____________________________Average Travel Speed______________________________

Direction                                Analysis(d)         Opposing (o)
PCE for trucks, ET                          1.1                 1.0
PCE for RVs, ER                             1.0                 1.0
Heavy-vehicle adj. factor,(note-5) fHV      0.998               1.000
Grade adj. factor,(note-1) fg               1.00                1.00
Directional flow rate,(note-2) vi           706     pc/h        949     pc/h

Free-Flow Speed from Field Measurement:
Field measured speed,(note-3) S FM               -      mi/h
Observed total demand,(note-3) V                 -      veh/h
Estimated Free-Flow Speed:
Base free-flow speed,(note-3) BFFS              45.0    mi/h
Adj. for lane and shoulder width,(note-3) fLS  2.6     mi/h
Adj. for access point density,(note-3) fA      4.0     mi/h

Free-flow speed, FFSd                           38.4    mi/h

Adjustment for no-passing zones, fnp            1.1     mi/h
Average travel speed, ATSd                      24.4    mi/h
Percent Free Flow Speed, PFFS                   63.6    %
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Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.0	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		1.000	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	704	pc/h	949	pc/h

Base percent time-spent-following,(note-4) BPTSFd	67.0	%
Adjustment for no-passing zones, fnp	23.4	
Percent time-spent-following, PTSFd	77.0	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.42	
Peak 15-min vehicle-miles of travel, VMT15	229	veh-mi
Peak-hour vehicle-miles of travel, VMT60	824	veh-mi
Peak 15-min total travel time, TT15	9.4	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.3	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	24.4	mi/h
Percent time-spent-following, PTSFd (from above)	77.0	
Level of service, LOSd (from above)	E	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	704.4
Effective width of outside lane, We	14.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	4.58
Bicycle LOS	E

Notes:

1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

Arterial Level of Service: EB Columbia Avenue

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Lexington Avenue	III	35	37.7	69.4	107.1	0.31	10.6	E
E Boundary Street	III	34	27.4	209.0	236.4	0.23	3.5	F
Chapin High E Drivew	III	35	56.2	108.2	164.4	0.47	10.3	E
Woodthrush Road	III	35	20.2	269.5	289.7	0.16	2.0	F
Total	III		141.5	656.1	797.6	1.17	5.3	F

Arterial Level of Service: WB Columbia Avenue

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Woodthrush Road	III	35	38.6	62.6	101.2	0.32	11.5	E
Chapin High E Drivew	III	35	20.2	14.4	34.6	0.16	16.5	D
E Boundary Street	III	35	56.2	8.2	64.4	0.47	26.2	B
Lexington Avenue	III	32	29.0	4.2	33.2	0.23	24.8	B
Total	III		144.0	89.4	233.4	1.18	18.2	C

Arterial Level of Service: EB Columbia Avenue

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Lexington Avenue	III	35	37.7	6.4	44.1	0.31	25.7	B
E Boundary Street	III	34	27.4	24.8	52.2	0.23	15.8	D
Chapin High E Drivew	III	35	56.2	17.4	73.6	0.47	22.9	C
Woodthrush Road	III	35	20.2	86.9	107.1	0.16	5.3	F
Total	III		141.5	135.5	277.0	1.17	15.2	D

Arterial Level of Service: WB Columbia Avenue

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Woodthrush Road	III	35	38.6	192.0	230.6	0.32	5.0	F
Chapin High E Drivew	III	35	20.2	109.1	129.3	0.16	4.4	F
E Boundary Street	III	35	56.2	182.5	238.7	0.47	7.1	F
Lexington Avenue	III	32	29.0	5.1	34.1	0.23	24.1	B
Total	III		144.0	488.7	632.7	1.18	6.7	F

Arterial Level of Service: EB Columbia Avenue

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Lexington Avenue	III	35	37.7	5.0	42.7	0.31	26.5	B
New Road	III	34	39.5	65.7	105.2	0.33	11.3	E
Chapin High E Drivew	III	35	44.2	3.5	47.7	0.37	27.8	B
Woodthrush Road	III	35	20.2	7.4	27.6	0.16	20.6	C
Total	III		141.6	81.6	223.2	1.17	18.9	C

Arterial Level of Service: WB Columbia Avenue

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Woodthrush Road	III	35	56.1	11.3	67.4	0.55	29.1	B
Chapin High E Drivew	III	35	20.2	4.2	24.4	0.16	23.3	C
New Road	III	35	44.2	0.5	44.7	0.37	29.7	B
Lexington Avenue	III	33	39.5	0.3	39.8	0.33	29.8	B
Total	III		160.0	16.3	176.3	1.40	28.6	B

Arterial Level of Service: EB Columbia Avenue

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Lexington Avenue	III	35	37.7	4.8	42.5	0.31	26.6	B
New Road	III	34	39.5	43.9	83.4	0.33	14.2	D
Chapin High E Drivew	III	35	44.2	7.0	51.2	0.37	25.9	B
Woodthrush Road	III	35	20.2	8.4	28.6	0.16	19.9	C
Total	III		141.6	64.1	205.7	1.17	20.5	C

Arterial Level of Service: WB Columbia Avenue

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Woodthrush Road	III	35	56.1	36.6	92.7	0.55	21.2	C
Chapin High E Drivew	III	35	20.2	4.1	24.3	0.16	23.4	C
New Road	III	35	44.2	8.6	52.8	0.37	25.1	B
Lexington Avenue	III	33	39.5	2.1	41.6	0.33	28.5	B
Total	III		160.0	51.4	211.4	1.40	23.9	C

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Memorandum

To:	Berry Still, PE
	Mead & Hunt
From:	Ryan Eckenrode, P.E., PTOE, Traffic Engineer, AECOM
Date:	April 2, 2015
Reference:	S-48 (Columbia Avenue) Corridor Improvement Project – Alternative Selection

This memo is to document a proposed approach to evaluating the 12 remaining alternatives on the S-48 (Columbia Avenue) project from a volume to capacity perspective. In its planning applications, SCDOT uses the attached tables addressing roadway characteristics, Level of Service (LOS) C , Average Daily Traffic (ADT) volumes, and volume to capacity (v/c) ratios to determine the LOS of a roadway with a given ADT. This methodology was applied to the 12 future alternatives (9, 9A, 10, 18, 18A, 20, 22, 24, 25, 26, 30, and 31) on the S-48 (Columbia Avenue) project to determine the projected traffic operation for 2040 (worst case scenario). For each segment along these alternatives, traffic volumes were projected and compared to the anticipated roadway typical cross section to obtain a volume to capacity ratio. Since the typical cross section varied for the entire length of each alternative, a weighted average was used. A spreadsheet has been developed summarizing each alternative and their segments. Once projected volumes, capacity (based on typical cross section), and length of each segment have been determined, a weighted (v/c) and the associated LOS was calculated. In addition, a calculation of the vehicle miles traveled (VMT) was also totaled for each alternative for opening year 2020 and design year 2040 as shown in the spreadsheet tables below.

As an example, the LOS C ADT for a two-lane, undivided minor arterial such as Columbia Avenue is 10,800. The linear annual growth rate for Columbia Avenue is estimated to be 1.25 percent per year. Using these tables and this growth rate, the future LOS of the existing S-48/Columbia Avenue if no improvements are made is projected to be:

West of Peak Street
2013 ADT = 8,900
2040 ADT = 11,900
V/C = 1.10 = LOS D

East of Peak Street
2013 ADT = 12,500
2040 ADT = 16,700
V/C = 1.55 = LOS F

ALTERNATIVE SUMMARY				New Y - T - Q Operation		Weighted Average
ALTERNATIVE	WEIGHTED V/C	WEIGHTED LOS	Total Length (mi)	WEIGHTED V/C	WEIGHTED LOS	
Alternative No-Build - Y-T-Q	1.565	F	1.13	1.565	F	1.565
Alternative 9 - A-G-K-L-I-J-Q	0.718	B	1.83	0.856	C	0.770
Alternative 9A - A-G-K-L-I-J-Q	0.714	B	1.81	0.878	C	0.777
Alternative 10 - A-G-K-L-P-Q	0.637	B	1.79	1.078	D	0.807
Alternative 18 - D-X-E-F-K-L-I-J-Q	0.727	B	1.81	0.850	C	0.774
Alternative 18A - D-X-E-F-K-L-I-J-Q	0.721	B	1.76	0.872	C	0.780
Alternative 20 - D-X-E-F-K-L-P-Q	0.648	B	1.78	1.069	D	0.812
Alternative 22 - D-X-K-L-I-J-Q	0.748	B	1.83	0.850	C	0.787
Alternative 24 - D-X-K-L-P-Q	0.670	B	1.80	1.069	D	0.824
Alternative 25 - Y-T-Q	0.825	C	1.13	0.825	C	0.825
Alternative 26 - B-G-W-Q	0.795	C	1.44	0.788	C	0.792
Alternative 30 - B-G-K-L-I-J-Q	0.723	B	1.69	0.856	C	0.776
Alternative 31 - B-G-K-L-P-Q	0.636	B	1.66	1.078	D	0.815

ALTERNATIVE 9, 9A, 10, 18, 18A, 20, 22, 24, 25, 26, 30, 31 VMT COMPARISON

AECOM

Alternative No-Build - Y-T-Q

Segment	2020 Volume (ADT)	2020 (VMT)	2040 Volume (ADT)	2040 (VMT)	Total L (mi)
YW	9400	3100	12,000	4000	0.33
WJ	12600	2000	16,100	2600	0.16
JQ	15400	9700	19,700	12400	0.63
Q to I-26	15400	15600	19,700	19900	1.01
Total	52,800	30,400	67,500	38,900	2.14

Alternative 9 - A-G-K-L-I-J-Q

Segment	2020 Volume (ADT)	2020 (VMT)	2040 Volume (ADT)	2040 (VMT)	Total L (mi)
AG	6400	2900	8,200	3700	0.46
GK	7900	1500	10,100	1900	0.19
KL	7900	1200	10,100	1600	0.16
LI	5500	1200	7,100	1500	0.22
IJ	5500	900	7,100	1200	0.17
JQ	15400	9700	19,700	12400	0.63
Q to I-26	15400	15600	19,700	19900	1.01
Total	64,000	33,000	82,000	42,200	2.84

Alternative 9A - A-G-K-L-I-J-Q

Segment	2020 Volume (ADT)	2020 (VMT)	2040 Volume (ADT)	2040 (VMT)	Total L (mi)
AG	6400	2900	8,200	3700	0.46
GK	7900	1500	10,100	1900	0.19
KL	7900	1500	10,100	1900	0.19
LI	5500	1400	7,100	1800	0.25
IJ	5500	900	7,100	1200	0.17
JQ	15400	8500	19,700	10800	0.55
Q to I-26	15400	15600	19,700	19900	1.01
Total	64,000	32,300	82,000	41,200	2.82

Alternative 10 - A-G-K-L-P-Q

Segment	2020 Volume (ADT)	2020 (VMT)	2040 Volume (ADT)	2040 (VMT)	Total L (mi)
AG	6400	2900	8,200	3700	0.46
GK	7900	1500	10,100	1900	0.19
KL	7900	1200	10,100	1600	0.16
LP	5300	3700	6,800	4700	0.70
PQ	5800	1700	7,400	2200	0.29
Q to I-26	15400	15600	19,700	19900	1.01
Total	48,700	26,600	62,300	34,000	2.80

Alternative 18 - D-X-E-F-K-L-I-J-Q

Segment	2020 Volume (ADT)	2020 (VMT)	2040 Volume (ADT)	2040 (VMT)	Total L (mi)
DX	6500	1100	8,300	1300	0.16
XE	6500	1600	8,300	2000	0.24
EF	8000	400	10,200	600	0.06
FK	8000	1300	10,200	1700	0.17
KL	8000	1300	10,200	1700	0.17
LI	5600	1200	7,200	1600	0.22
IJ	5600	1000	7,200	1200	0.17
JQ	15400	9700	19,700	12400	0.63
Q to I-26	15400	15600	19,700	19900	1.01
Total	79,000	33,200	101,000	42,400	2.82

Alternative 18A - D-X-E-F-K-L-I-J-Q

Segment	2020 Volume (ADT)	2020 (VMT)	2040 Volume (ADT)	2040 (VMT)	Total L (mi)
DX	6500	1100	8,300	1300	0.16
XE	6500	1600	8,300	2000	0.24
EF	8000	400	10,200	600	0.06
FK	8000	1300	10,200	1700	0.17
KL	8000	1300	10,200	1700	0.17
LI	5600	1400	7,200	1800	0.25
IJ	5600	1000	7,200	1200	0.17
JQ	15400	8500	19,700	10800	0.55
Q to I-26	15400	15600	19,700	19900	1.01
Total	79,000	32,200	101,000	41,000	2.77

Alternative 20 - D-X-E-F-K-L-P-Q

Segment	2020 Volume (ADT)	2020 (VMT)	2040 Volume (ADT)	2040 (VMT)	Total L (mi)
DX	6500	1100	8,300	1300	0.16
XE	6500	1600	8,300	2000	0.24
EF	8000	400	10,200	600	0.06
FK	8000	1300	10,200	1700	0.17
KL	8000	1300	10,200	1700	0.17
LP	5400	3800	6,900	4800	0.70
PQ	5900	1700	7,500	2200	0.29
Q to I-26	15400	15600	19,700	19900	1.01
Total	63,700	26,800	81,300	34,200	2.79

Alternative 22 - D-X-K-L-I-J-Q

Segment	2020 Volume (ADT)	2020 (VMT)	2040 Volume (ADT)	2040 (VMT)	Total L (mi)
DX	6500	1100	8,300	1300	0.16
XK	8000	3900	10,200	4900	0.48
KL	8000	1300	10,200	1700	0.17
LI	5600	1200	7,200	1600	0.22
IJ	5600	1000	7,200	1200	0.17
JQ	15400	9700	19,700	12400	0.63
Q to I-26	15400	15600	19,700	19900	1.01
Total	64,500	33,800	82,500	43,000	2.84

Alternative 24 - D-X-K-L-P-Q

Segment	2020 Volume (ADT)	2020 (VMT)	2040 Volume (ADT)	2040 (VMT)	Total L (mi)
DX	6500	1100	8,300	1300	0.16
XK	8000	3900	10,200	4900	0.48
KL	8000	1300	10,200	1700	0.17
LP	5400	3800	6,900	4800	0.70
PQ	5900	1700	7,500	2200	0.29
Q to I-26	15400	15600	19,700	19900	1.01
Total	49,200	27,400	62,800	34,800	2.81

Alternative 25 - Y-T-Q

Segment	2020 Volume (ADT)	2020 (VMT)	2040 Volume (ADT)	2040 (VMT)	Total L (mi)
YW	9400	3100	12,000	4000	0.33
WJ	12600	2000	16,100	2600	0.16
JQ	15400	9700	19,700	12400	0.63
Q to I-26	15400	15600	19,700	19900	1.01
Total	52,800	30,400	67,500	38,900	2.14

Alternative 26 - B-G-W-Q

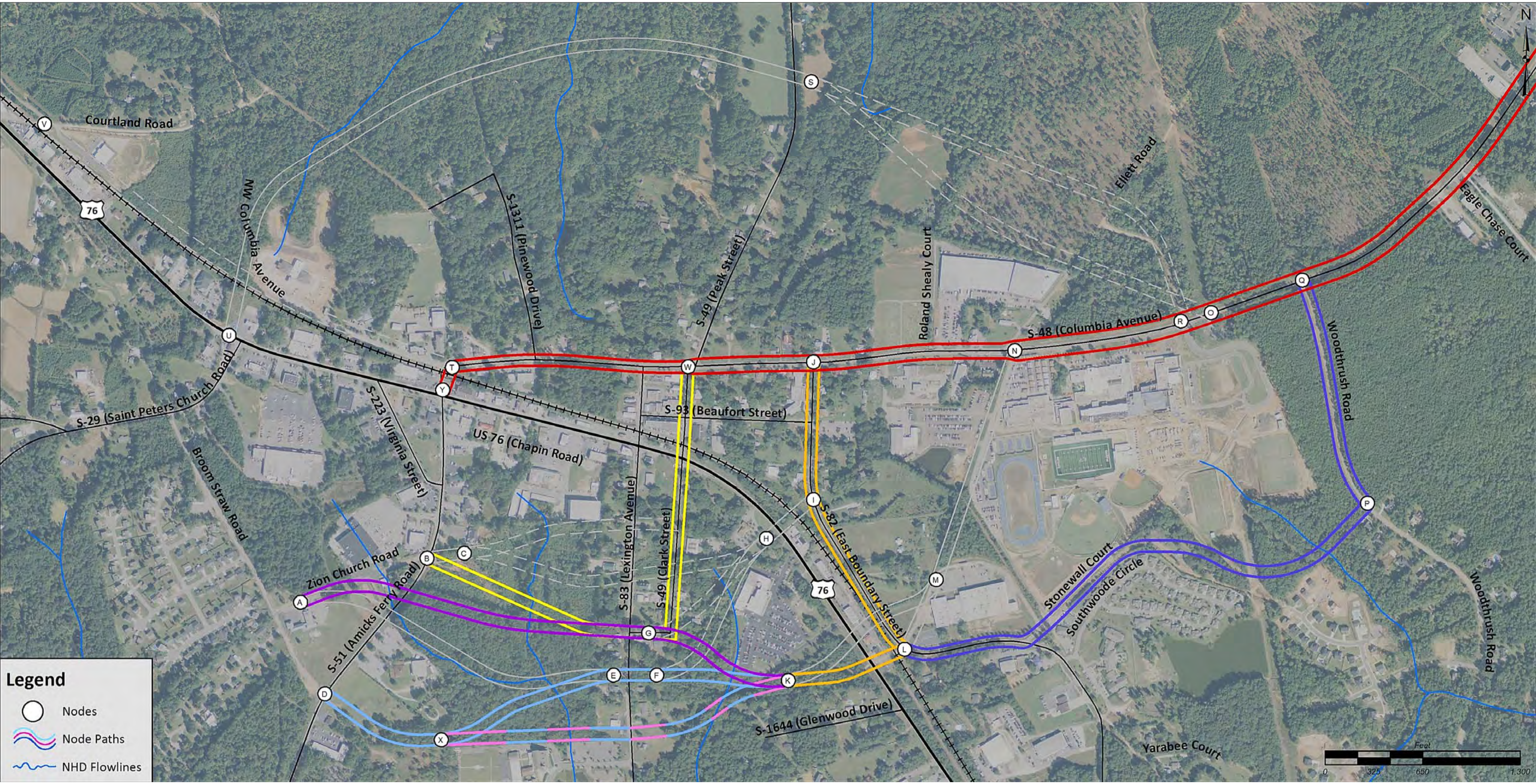
Segment	2020 Volume (ADT)	2020 (VMT)	2040 Volume (ADT)	2040 (VMT)	Total L (mi)
BG	6400	1900	8,200	2400	0.30
GW	9400	3400	12,000	4400	0.36
WJ	12600	2000	16,100	2500	0.16
JQ	15400	9500	19,700	12200	0.62
Q to I-26	15400	15600	19,700	19900	1.01
Total	59,200	32,400	75,700	41,400	2.45

Alternative 30 - B-G-K-L-I-J-Q

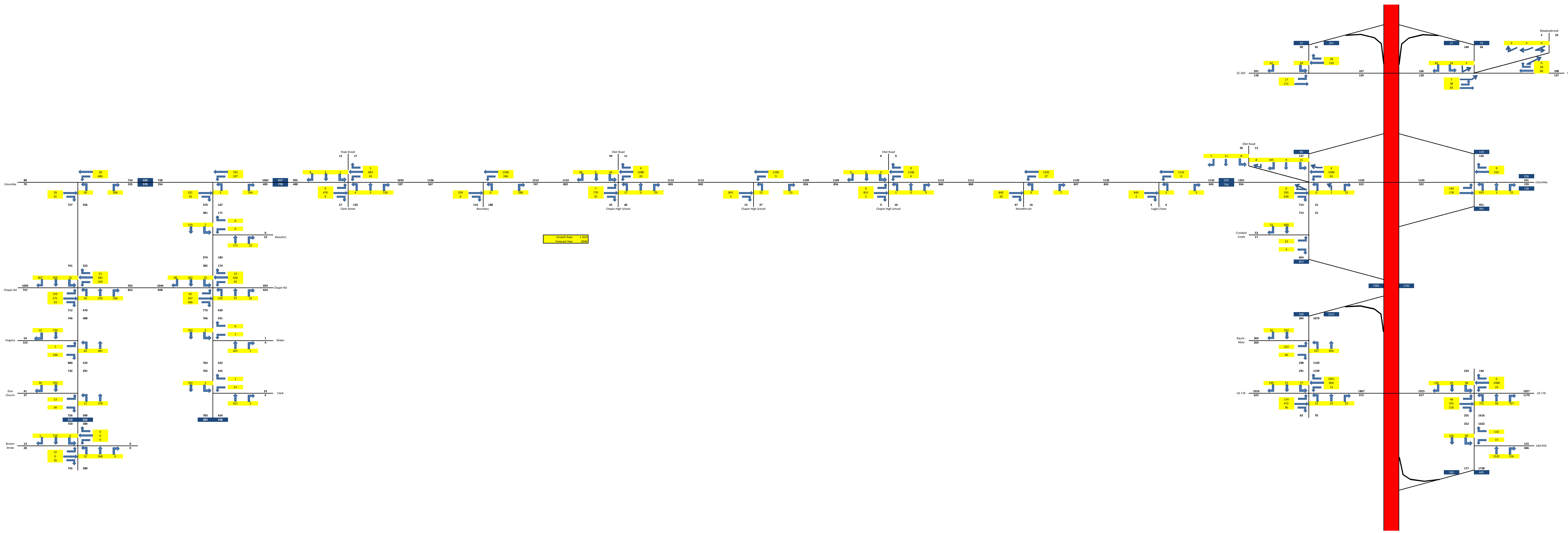
Segment	2020 Volume (ADT)	2020 (VMT)	2040 Volume (ADT)	2040 (VMT)	Total L (mi)
BG	6400	2000	8,200	2500	0.31
GK	7900	1500	10,100	2000	0.19
KL	7900	1300	10,100	1700	0.17
LI	5500	1200	7,100	1500	0.22
IJ	5500	900	7,100	1200	0.17
JQ	15400	9700	19,700	12400	0.63
Q to I-26	15400	15600	19,700	19900	1.01
Total	64,000	32,200	82,000	41,200	2.70

Alternative 31 - B-G-K-L-P-Q

Segment	2020 Volume (ADT)	2020 (VMT)	2040 Volume (ADT)	2040 (VMT)	Total L (mi)
BG	6400	2000	8,200	2500	0.31
GK	7900	1500	10,100	2000	0.19
KL	7900	1300	10,100	1700	0.17
LP	5300	3700	6,800	4700	0.70
PQ	5800	1700	7,400	2200	0.29
Q to I-26	15400	15600	19,700	19900	1.01
Total	48,700	25,800	62,300	33,000	2.67



Courtland Road
76
NW Columbia Avenue
S-1311 (Pinewood Drive)
S-49 (Peak Street)
Roland Shealy Court
Ellett Road
Eagle Chase Court
S-48 (Columbia Avenue)
Woodthrush Road
S-29 (Saint Peters Church Road)
S-223 (Virginia Street)
S-93 (Beaufort Street)
US 76 (Chapin Road)
Broom Straw Road
S-83 (Lexington Avenue)
S-49 (Clark Street)
S-82 (East Boundary Street)
Stonewall Court
Southwoode Circle
Zion Church Road
S-51 (Amicks Ferry Road)
S-1644 (Glenwood Drive)
Yarabee Court
Legend
Nodes
Node Paths
NHD Flowlines
Feet
0
325
650
1,300
N



S-48 Traffic Assumptions

- 2014 ADT Locations were grown at annual 1.25% for 26 years to obtain 2040 volumes
- 2040 TMC locations from the January 2015 deliverable for the PM peak hour were multiplied by 10 to obtain ADT
- Each alternative was assumed 25% diversion of traffic despite the alignment

- <u>Alt 9</u>
  - AG
    - 90% of 329 (WB left from Chapin Rd onto Amicks Ferry) x 10
    - 25% of 306 (NB Right from Amicks Ferry Rd onto Columbia Ave) x 10
    - 90% of 266 (NB right from Amick Ferry Rd onto Chapin Rd) x 10
    - 25% of 686 (WB left from Columbia Ave onto Amicks Ferry Rd) x 10
    - Zion Church to / from Amicks Ferry Rd (13 EB Left, and 30 SB Right) x 10 = 400
    - Total = 8,200
  - GKL
    - 90% of 45 (WB left from Chapin Rd onto Lexington Ave) x 10
    - 25% of 164 (NB Right from Lexington Ave onto Columbia Ave) x 10
    - 90% of 32 (NB right from Lexington Ave onto Chapin Rd) x 10
    - 25% of 337 (WB left from Columbia Ave onto Lexington Ave) x 10
    - Total = 1,900 + 8,200 = 10,100
  - LIJ
    - E. Boundary Street = 3,000
    - 25% of 306 (NB Right from Amicks Ferry Rd onto Columbia Ave) x 10
    - 25% of 686 (WB left from Columbia Ave onto Amicks Ferry Rd) x 10
    - 25% of 164 (NB Right from Lexington Ave onto Columbia Ave) x 10
    - 25% of 337 (WB left from Columbia Ave onto Lexington Ave) x 10
    - Zion Church to / from Amicks Ferry Rd (13 EB Left, and 30 SB Right) x 10 = 400
    - Total = 3,000 + 4,100 = 7,100
  - JQ
    - Columbia Ave Total = 19,700
- <u>Alt 9A</u>
  - AG
    - 90% of 329 (WB left from Chapin Rd onto Amicks Ferry) x 10
    - 25% of 306 (NB Right from Amicks Ferry Rd onto Columbia Ave) x 10
    - 90% of 266 (NB right from Amick Ferry Rd onto Chapin Rd) x 10
    - 25% of 686 (WB left from Columbia Ave onto Amicks Ferry Rd) x 10
    - Zion Church to / from Amicks Ferry Rd (13 EB Left, and 30 SB Right) x 10 = 400
    - Total = 8,200

- GKL
  - 90% of 45 (WB left from Chapin Rd onto Lexington Ave) x 10
  - 25% of 164 (NB Right from Lexington Ave onto Columbia Ave) x 10
  - 90% of 32 (NB right from Lexington Ave onto Chapin Rd) x 10
  - 25% of 337 (WB left from Columbia Ave onto Lexington Ave) x 10
  - Total = 1,900 + 8,200 = 10,100
- LIJ
  - E. Boundary Street = 3,000
  - 25% of 306 (NB Right from Amicks Ferry Rd onto Columbia Ave) x 10
  - 25% of 686 (WB left from Columbia Ave onto Amicks Ferry Rd) x 10
  - 25% of 164 (NB Right from Lexington Ave onto Columbia Ave) x 10
  - 25% of 337 (WB left from Columbia Ave onto Lexington Ave) x 10
  - Zion Church to / from Amicks Ferry Rd (13 EB Left, and 30 SB Right) x 10 = 400
  - Total = 3,000 + 4,100 = 7,100
- JQ
  - Columbia Ave Total = 19,700

- <u>Alt 10</u>
  - AG
    - 90% of 329 (WB left from Chapin Rd onto Amicks Ferry) x 10
    - 25% of 306 (NB Right from Amicks Ferry Rd onto Columbia Ave) x 10
    - 90% of 266 (NB right from Amick Ferry Rd onto Chapin Rd) x 10
    - 25% of 686 (WB left from Columbia Ave onto Amicks Ferry Rd) x 10
    - Zion Church to / from Amicks Ferry Rd (13 EB Left, and 30 SB Right) x 10 = 400
    - Total = 8,200
  - GKL
    - 90% of 45 (WB left from Chapin Rd onto Lexington Ave) x 10
    - 25% of 164 (NB Right from Lexington Ave onto Columbia Ave) x 10
    - 90% of 32 (NB right from Lexington Ave onto Chapin Rd) x 10
    - 25% of 337 (WB left from Columbia Ave onto Lexington Ave) x 10
    - Total = 1,900 + 8,200 = 10,100
  - LP
    - 90% of 188 (NB right from E. Boundary St onto Columbia Ave) x 10
    - 90% of 106 (WB left from Columba Ave onto E. Boundary St) x 10
    - 25% of 306 (NB Right from Amicks Ferry Rd onto Columbia Ave) x 10
    - 25% of 686 (WB left from Columbia Ave onto Amicks Ferry Rd) x 10
    - 25% of 164 (NB Right from Lexington Ave onto Columbia Ave) x 10
    - 25% of 337 (WB left from Columbia Ave onto Lexington Ave) x 10
    - Zion Church to / from Amicks Ferry Rd (13 EB Left, and 30 SB Right) x 10 = 400
    - Total = 6,800

- o PQ
  - Woodthrush Rd = 600
  - Total = 600 + 6,800 = 7,400
- Alt 18

  - o DX
    - 90% of 329 (WB left from Chapin Rd onto Amicks Ferry) x 10
    - 25% of 306 (NB Right from Amicks Ferry Rd onto Columbia Ave) x 10
    - 90% of 266 (NB right from Amick Ferry Rd onto Chapin Rd) x 10
    - 25% of 686 (WB left from Columbia Ave onto Amicks Ferry Rd) x 10
    - Zion Church to / from Amicks Ferry Rd (13 EB Left, and 30 SB Right) x 10 = 400
    - Broom Straw Rd to / from Amicks Ferry Rd (12 EB Left, and 1 SB Right) x 10 = 100
    - Total = 8,300
  - o EFKL
    - 90% of 45 (WB left from Chapin Rd onto Lexington Ave) x 10
    - 25% of 164 (NB Right from Lexington Ave onto Columbia Ave) x 10
    - 90% of 32 (NB right from Lexington Ave onto Chapin Rd) x 10
    - 25% of 337 (WB left from Columbia Ave onto Lexington Ave) x 10
    - Total = 1,900 + 8,300 = 10,200
  - o LIJ
    - E. Boundary Street = 3,000
    - 25% of 306 (NB Right from Amicks Ferry Rd onto Columbia Ave) x 10
    - 25% of 686 (WB left from Columbia Ave onto Amicks Ferry Rd) x 10
    - 25% of 164 (NB Right from Lexington Ave onto Columbia Ave) x 10
    - 25% of 337 (WB left from Columbia Ave onto Lexington Ave) x 10
    - Zion Church to / from Amicks Ferry Rd (13 EB Left, and 30 SB Right) x 10 = 400
    - Broom Straw Rd to / from Amicks Ferry Rd (12 EB Left, and 1 SB Right) x 10 = 100
    - Total = 3,000 + 4,200 = 7,200
  - o JQ
    - Columbia Ave Total = 19,700
- Alt 18A
  - o DX
    - 90% of 329 (WB left from Chapin Rd onto Amicks Ferry) x 10
    - 25% of 306 (NB Right from Amicks Ferry Rd onto Columbia Ave) x 10
    - 90% of 266 (NB right from Amick Ferry Rd onto Chapin Rd) x 10
    - 25% of 686 (WB left from Columbia Ave onto Amicks Ferry Rd) x 10
    - Zion Church to / from Amicks Ferry Rd (13 EB Left, and 30 SB Right) x 10 = 400
    - Broom Straw Rd to / from Amicks Ferry Rd (12 EB Left, and 1 SB Right) x 10 = 100
    - Total = 8,300

- EFKL
  - 90% of 45 (WB left from Chapin Rd onto Lexington Ave) x 10
  - 25% of 164 (NB Right from Lexington Ave onto Columbia Ave) x 10
  - 90% of 32 (NB right from Lexington Ave onto Chapin Rd) x 10
  - 25% of 337 (WB left from Columbia Ave onto Lexington Ave) x 10
  - Total = 1,900 + 8,300 = 10,200
- LIJ
  - E. Boundary Street = 3,000
  - 25% of 306 (NB Right from Amicks Ferry Rd onto Columbia Ave) x 10
  - 25% of 686 (WB left from Columbia Ave onto Amicks Ferry Rd) x 10
  - 25% of 164 (NB Right from Lexington Ave onto Columbia Ave) x 10
  - 25% of 337 (WB left from Columbia Ave onto Lexington Ave) x 10
  - Zion Church to / from Amicks Ferry Rd (13 EB Left, and 30 SB Right) x 10 = 400
  - Broom Straw Rd to / from Amicks Ferry Rd (12 EB Left, and 1 SB Right) x 10 = 100
  - Total = 3,000 + 4,200 = 7,200
- JQ
  - Columbia Ave Total = 19,700

- <u>Alt 20</u>
  - DX
    - 90% of 329 (WB left from Chapin Rd onto Amicks Ferry) x 10
    - 25% of 306 (NB Right from Amicks Ferry Rd onto Columbia Ave) x 10
    - 90% of 266 (NB right from Amick Ferry Rd onto Chapin Rd) x 10
    - 25% of 686 (WB left from Columbia Ave onto Amicks Ferry Rd) x 10
    - Zion Church to / from Amicks Ferry Rd (13 EB Left, and 30 SB Right) x 10 = 400
    - Broom Straw Rd to / from Amicks Ferry Rd (12 EB Left, and 1 SB Right) x 10 = 100
    - Total = 8,300
  - EFKL
    - 90% of 45 (WB left from Chapin Rd onto Lexington Ave) x 10
    - 25% of 164 (NB Right from Lexington Ave onto Columbia Ave) x 10
    - 90% of 32 (NB right from Lexington Ave onto Chapin Rd) x 10
    - 25% of 337 (WB left from Columbia Ave onto Lexington Ave) x 10
    - Total = 1,900 + 8,300 = 10,200
  - LP
    - 90% of 188 (NB right from E. Boundary St onto Columbia Ave) x 10
    - 90% of 106 (WB left from Columba Ave onto E. Boundary St) x 10
    - 25% of 686 (WB left from Columbia Ave onto Amicks Ferry Rd) x 10
    - 25% of 337 (WB left from Columbia Ave onto Lexington Ave) x 10
    - 25% of 150 (NB Thru from Amicks Ferry onto Chapin Rd) x 10
    - 25% of 97 (NB Thru from Lexington Ave onto Chapin Rd) x 10
    - Zion Church to / from Amicks Ferry Rd (13 EB Left, and 30 SB Right) x 10 = 400

    - Broom Straw Rd to / from Amicks Ferry Rd (12 EB Left, and 1 SB Right) x 10 = 100
    - Total = 6,900
  - PQ
    - Woodthrush Rd = 600
    - Total = 600 + 6,900= 7,500
- Alt 22
  - DX
    - 90% of 329 (WB left from Chapin Rd onto Amicks Ferry) x 10
    - 25% of 306 (NB Right from Amicks Ferry Rd onto Columbia Ave) x 10
    - 90% of 266 (NB right from Amick Ferry Rd onto Chapin Rd) x 10
    - 25% of 686 (WB left from Columbia Ave onto Amicks Ferry Rd) x 10
    - Zion Church to / from Amicks Ferry Rd (13 EB Left, and 30 SB Right) x 10 = 400
    - Broom Straw Rd to / from Amicks Ferry Rd (12 EB Left, and 1 SB Right) x 10 = 100
    - Total = 8,300
  - XKL
    - 90% of 45 (WB left from Chapin Rd onto Lexington Ave) x 10
    - 25% of 164 (NB Right from Lexington Ave onto Columbia Ave) x 10
    - 90% of 32 (NB right from Lexington Ave onto Chapin Rd) x 10
    - 25% of 337 (WB left from Columbia Ave onto Lexington Ave) x 10
    - Total = 1,900 + 8,300 = 10,200
  - LIJ
    - E. Boundary Street = 3,000
    - 25% of 306 (NB Right from Amicks Ferry Rd onto Columbia Ave) x 10
    - 25% of 686 (WB left from Columbia Ave onto Amicks Ferry Rd) x 10
    - 25% of 164 (NB Right from Lexington Ave onto Columbia Ave) x 10
    - 25% of 337 (WB left from Columbia Ave onto Lexington Ave) x 10
    - Zion Church to / from Amicks Ferry Rd (13 EB Left, and 30 SB Right) x 10 = 400
    - Broom Straw Rd to / from Amicks Ferry Rd (12 EB Left, and 1 SB Right) x 10 = 100
    - Total = 3,000 + 4,200 = 7,200
  - JQ
    - Columbia Ave Total = 19,700
- Alt 24
  - DX
    - 90% of 329 (WB left from Chapin Rd onto Amicks Ferry) x 10
    - 25% of 306 (NB Right from Amicks Ferry Rd onto Columbia Ave) x 10
    - 90% of 266 (NB right from Amick Ferry Rd onto Chapin Rd) x 10
    - 25% of 686 (WB left from Columbia Ave onto Amicks Ferry Rd) x 10
    - Zion Church to / from Amicks Ferry Rd (13 EB Left, and 30 SB Right) x 10 = 400

        - Broom Straw Rd to / from Amicks Ferry Rd (12 EB Left, and 1 SB Right) x 10 = 100
        - Total = 8,300
    - XKL
        - 90% of 45 (WB left from Chapin Rd onto Lexington Ave) x 10
        - 25% of 164 (NB Right from Lexington Ave onto Columbia Ave) x 10
        - 90% of 32 (NB right from Lexington Ave onto Chapin Rd) x 10
        - 25% of 337 (WB left from Columbia Ave onto Lexington Ave) x 10
        - Total = 1,900 + 8,300 = 10,200
    - LP
        - 90% of 188 (NB right from E. Boundary St onto Columbia Ave) x 10
        - 90% of 106 (WB left from Columba Ave onto E. Boundary St) x 10
        - 25% of 686 (WB left from Columbia Ave onto Amicks Ferry Rd) x 10
        - 25% of 337 (WB left from Columbia Ave onto Lexington Ave) x 10
        - 25% of 150 (NB Thru from Amicks Ferry onto Chapin Rd) x 10
        - 25% of 97 (NB Thru from Lexington Ave onto Chapin Rd) x 10
        - Zion Church to / from Amicks Ferry Rd (13 EB Left, and 30 SB Right) x 10 = 400
        - Broom Straw Rd to / from Amicks Ferry Rd (12 EB Left, and 1 SB Right) x 10 = 100
        - Total = 6,900
    - PQ
        - Woodthrush Rd = 600
        - Total = 600 + 6,900= 7,500
- <u>Alt 25</u>
    - YTQ
        - Use 2040 volumes
- <u>Alt 26</u>
    - BG
        - 90% of 329 (WB left from Chapin Rd onto Amicks Ferry) x 10
        - 25% of 306 (NB Right from Amicks Ferry Rd onto Columbia Ave) x 10
        - 90% of 266 (NB right from Amick Ferry Rd onto Chapin Rd) x 10
        - 25% of 686 (WB left from Columbia Ave onto Amicks Ferry Rd) x 10
        - Zion Church to / from Amicks Ferry Rd (13 EB Left, and 30 SB Right) x 10 = 400
        - Total = 8,200
    - GW
        - 90% of 45 (WB left from Chapin Rd onto Lexington Ave) x 10
        - 25% of 164 (NB Right from Lexington Ave onto Columbia Ave) x 10
        - 90% of 32 (NB right from Lexington Ave onto Chapin Rd) x 10
        - 25% of 337 (WB left from Columbia Ave onto Lexington Ave) x 10
        - Clark Street = 1,900
        - Total = 1,900 + 8,200 +1,900 = 12,000

- WQ
  - Columbia Ave Total = 19,700
- Alt 30
  - BG
    - 90% of 329 (WB left from Chapin Rd onto Amicks Ferry) x 10
    - 25% of 306 (NB Right from Amicks Ferry Rd onto Columbia Ave) x 10
    - 90% of 266 (NB right from Amick Ferry Rd onto Chapin Rd) x 10
    - 25% of 686 (WB left from Columbia Ave onto Amicks Ferry Rd) x 10
    - Zion Church to / from Amicks Ferry Rd (13 EB Left, and 30 SB Right) x 10 = 400
    - Total = 8,200
  - GKL
    - 90% of 45 (WB left from Chapin Rd onto Lexington Ave) x 10
    - 25% of 164 (NB Right from Lexington Ave onto Columbia Ave) x 10
    - 90% of 32 (NB right from Lexington Ave onto Chapin Rd) x 10
    - 25% of 337 (WB left from Columbia Ave onto Lexington Ave) x 10
    - Total = 1,900 + 8,200 = 10,100
  - LIJ
    - E. Boundary Street = 3,000
    - 25% of 306 (NB Right from Amicks Ferry Rd onto Columbia Ave) x 10
    - 25% of 686 (WB left from Columbia Ave onto Amicks Ferry Rd) x 10
    - 25% of 164 (NB Right from Lexington Ave onto Columbia Ave) x 10
    - 25% of 337 (WB left from Columbia Ave onto Lexington Ave) x 10
    - Zion Church to / from Amicks Ferry Rd (13 EB Left, and 30 SB Right) x 10 = 400
    - Total = 3,000 + 4,100 = 7,100
  - JQ
    - Columbia Ave Total = 19,700
- Alt 31
  - BG
    - 90% of 329 (WB left from Chapin Rd onto Amicks Ferry) x 10
    - 25% of 306 (NB Right from Amicks Ferry Rd onto Columbia Ave) x 10
    - 90% of 266 (NB right from Amick Ferry Rd onto Chapin Rd) x 10
    - 25% of 686 (WB left from Columbia Ave onto Amicks Ferry Rd) x 10
    - Zion Church to / from Amicks Ferry Rd (13 EB Left, and 30 SB Right) x 10 = 400
    - Total = 8,200
  - GKL
    - 90% of 45 (WB left from Chapin Rd onto Lexington Ave) x 10
    - 25% of 164 (NB Right from Lexington Ave onto Columbia Ave) x 10
    - 90% of 32 (NB right from Lexington Ave onto Chapin Rd) x 10
    - 25% of 337 (WB left from Columbia Ave onto Lexington Ave) x 10
    - Total = 1,900 + 8,200 = 10,100

- LP
  - 90% of 188 (NB right from E. Boundary St onto Columbia Ave) x 10
  - 90% of 106 (WB left from Columba Ave onto E. Boundary St) x 10
  - 25% of 306 (NB Right from Amicks Ferry Rd onto Columbia Ave) x 10
  - 25% of 686 (WB left from Columbia Ave onto Amicks Ferry Rd) x 10
  - 25% of 164 (NB Right from Lexington Ave onto Columbia Ave) x 10
  - 25% of 337 (WB left from Columbia Ave onto Lexington Ave) x 10
  - Zion Church to / from Amicks Ferry Rd (13 EB Left, and 30 SB Right) x 10 = 400
  - Total = 6,800
- PQ
  - Woodthrush Rd = 600
  - Total = 600 + 6,800 = 7,400

Attachment 1

SCDOT ROADWAY CAPACITY AND LEVEL OF SERVICE

SCDOT ROADWAY ADT CAPACITIES

LOS "C"

LANES

LG CODE	FUNCTIONAL CLASS	1	2	3	4	5	6	7	8
1	FREEWAY	N/A	29300	44000	58600	73250	87800	102550	117200
2	EXPRESSWAY	N/A	21000	24100	42000	48250	63000	72400	84000
	PRINCIPAL ARTERIAL								
11	DIVIDED	8400	16800	N/A	33600	N/A	50400	N/A	67200
12	UNDIVIDED	7300	14600	16800	29200	33600	43800	50400	58400
	MINOR ARTERIAL								
13	DIVIDED	6200	12400	N/A	24800	N/A	37200	N/A	49600
14	UNDIVIDED	5400	10800	12400	21600	24800	32400	37200	43200
	COLLECTORS								
21	DIVIDED	4900	9800	N/A	19600	N/A	29400	N/A	39200
22	UNDIVIDED	4300	8600	9800	17200	19600	25800	29400	34400
0	CENTROID CONN	0	0	0	0	0	0	0	0
0	EXTERNAL STATIONS	0	0	0	0	0	0	0	0

Appendix B

Interchange Modification Report (IMR)

AECOM

Interchange Modification Report

I-26 at S-48 (Columbia Avenue)
Interchange Improvements

Lexington County, South Carolina
Project No. R4035500-121734.01
Project ID P042383

December 2016

Prepared For:
South Carolina Department of Transportation
&
Lexington County

SCDOT
South Carolina Department of Transportation

AECOM

INTERCHANGE MODIFICATION REPORT

I-26 AT S-48 (COLUMBIA AVENUE) INTERCHANGE IMPROVEMENTS

LEXINGTON COUNTY, SOUTH CAROLINA
PROJECT NO. R4035500-121734.01
PROJECT ID P042383

DECEMBER 2016

PREPARED FOR:
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
&
LEXINGTON COUNTY

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER No. 28083 RYAN T. ECKENRODE

12-16-16

SCDOT
South Carolina Department of Transportation

Lexington County South Carolina

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION AECOM TECHNICAL SERVICES, INC NO. 1473

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1.0 EXECUTIVE SUMMARY

To obtain approval from the Federal Highway Administration (FHWA), the following Interstate 26 at S-48 (Columbia Avenue) Interchange Modification Report (IMR) was developed for the South Carolina Department of Transportation (SCDOT). The I-26 at S-48 (Columbia Avenue) diamond interchange is located at Exit 91 in Lexington County, South Carolina. The S-48 (Columbia Avenue) portion of the interchange is just within the Town of Chapin limits, which is located approximately 20 miles northwest of Columbia, SC.

The purpose of the project is to improve operational efficiency and safety of the existing interchange and to accommodate future volumes. The current interchange design is approaching capacity as a two-lane bridge along with no turn lanes to / from S-48 and is functionally obsolete. Operation is expected to worsen with more daily traffic volumes based on past census data indicating the population has been increasing by approximately twenty (20) percent per decade since 1990. With this anticipated growth along with the recently approved Chapin Technology Park and a planned commercial development north of the interchange, modifications to the existing diamond interchange are needed.

The traffic analysis included the evaluation of Existing year 2014, Future year 2020, and Future year 2040 traffic volumes during the AM and PM peak hours. The future year analyses included a No-Build Alternative with the existing interchange / intersection layout and three Build Alternatives:

1. Diverging Diamond Interchange
2. Partial Clover Leaf
3. Dual Roundabout

Geometric design improvements to the adjacent intersections to the interchange are also addressed in this Interchange Modification Report (IMR). Plans to realign Crooked Creek Road (S-232) , currently intersecting with the I-26 Eastbound On Ramp, and Ellett Road (less than 50 feet from the I-26 Westbound Ramps) are expected to be realigned directly with S-48 approximately 1000 feet to the south under signal control. This report focuses on the interchange; however, plans are being conducted along S-48 (Columbia Avenue) to widen the existing two-lane highway to five-lanes. Traffic volumes used in this IMR were referenced from the S-48 (Columbia Avenue) Corridor Improvement Project Traffic Study dated October 17, 2016.

Adjacent interchanges Exit 85 (SC 202) and Exit 97 (US 176) were also studied even though both interchanges are more than 5 miles from the study interchange. As expected, Exit 97 (14 miles from Columbia and more developed) carries more traffic than the Exit 85, which is rural and 12 additional miles further away from Columbia. It should be noted, that there an I-26 widening project underway that extends from Exit 85 to Exit 101 which also includes some interchange improvements.

Analysis using Synchro 9.1 indicated that interchange alternatives 1 and 2 operated at an acceptable level-of-service (LOS) C; however, the diverging diamond interchange was selected based its minimal right-of-way acquisition and impact to future development as opposed to other study alternatives. The preferred alternative was also modeled using the microsimulation software VISSIM 7.0. Alternative 3 (dual roundabouts) did not provide an acceptable level-of-service (see **Appendix N**); therefore, it should be not be considered as a viable alternative.

Operation at Exit 97 (US 176 east of the study interchange) is expected to fail by 2040 with no improvements to the interchange. Consideration for widening of I-26 and a review of the interchange is recommended to accommodate projected traffic volumes. Operation at Exit 85 (SC 202 west of the study interchange) is expected to operate an acceptable level-of-service during the year 2040 with its existing design. **Figure 15** summarizes the Level-of-Service and delay for the projected 2040 preferred alternative.

This study recommends the best alternative to meet current and future surrounding area needs for Lexington County, South Carolina. SCDOT will submit this report for a validation of engineering and operational feasibility. Final approval of the IMR will be requested once all National Environmental Policy Act (NEPA) requirements have been met.

2.0 INTRODUCTION

2.1 BACKGROUND

Interstate 26 is a rolling four-lane East-West highway that is divided by a grassy median. The study area for the proposed project begins at Exit 85 (SC 202) and ends at Exit 97 (US 176). The interchange of emphasis in this report is Exit 91, which provides access to S-48 (Columbia Avenue) in Chapin, South Carolina. S-48 is a two lane minor arterial with future widening plans to accommodate future growth as part of this project. The approved Chapin Technology Park (a phased 2019 and 2024 Build-out) is approximately 1 mile south of the interchange and the planned commercial development just north of the interchange (northwest quadrant) was included in the traffic projections. The existing interchange at S-48 currently has minor queuing issues at the signalized I-26 westbound ramp and is expected to be over capacity based on the projected annual growth in the area and the added traffic volumes from the two large developments. The preferred alternative is to replace the existing diamond interchange design with a diverging diamond interchange (DDI) and to realign Crooked Creek Road and Ellett Road 1000 feet south of interchange under signal control improving the access management of S-48.

2.2 SCOPE

This report focuses on traffic analysis of existing and future conditions and provides recommendations for mitigating Level-of Service (LOS) and queuing. AECOM was tasked with studying traffic conditions in the vicinity of the proposed project during the weekday AM and PM peak hours for three scenarios:

- 2014 Existing: An analysis of existing conditions in the year 2014.
- 2020/2040 No-Build: An analysis of conditions in the years 2020 and 2040 with no changes to the interchange.
- 2020/2040 Project Build-Out: An analysis of conditions in the years 2020 and 2040 if a an interchange is modified, S-48 is widened to 5 lanes to the south, and Crooked Creek Road and Ellett Road are realigned 1000 feet to the south.

This study includes an analysis of the existing adjacent interchanges to the east and west of the proposed interchange modification of Exit 91. To the east is Exit 97 and to the west is Exit 85.

The scope of this interchange modification study included the following tasks:

1. Field visits to the study area were performed to collect data on the existing conditions such as lane configurations/geometry and current traffic control measures. Traffic counts and signal timing information at the interchanges were obtained from SCDOT.

2. Existing conditions of the interchanges were studied by utilizing the existing traffic volumes. Levels of service of the intersections at each interchange were determined using Synchro 9.1. I-26 freeway and interchange on / off ramps (segments, merges, and diverges, and off-ramps) were analyzed High Capacity Software 2010. VISSIM 7.0 was also used to model the entire network.

3. Two future design years were examined in this report. Build and No-Build scenarios were analyzed for the years 2020 and 2040. The No-Build scenario analyzed the conditions in both design years in which no modifications were made to the interchange or adjacent freeway and interchanges. The Build scenario analyzed the future conditions in both build years if the interchange modification and widening of S-48 (Columbia Avenue) were constructed. Adjacent merge and diverge areas (freeway segments, on-ramps, and off-ramps) were analyzed under the future design year (2020/2040) conditions of the study area.

4. The future design year conditions were analyzed for three (3) different interchange alternative scenarios. Adjacent merge and diverge areas (freeway segments, on-ramps, and off-ramps) were analyzed under the future design year (2020/2040) conditions of the study area. Only the preferred alternative was also modeled using VISSIM 7.0.

2.3 STUDY AREA

The study area is located in Lexington County, South Carolina. Specifically, the S-48 (Columbia Avenue) Widening project is located in the Town of Chapin, South Carolina. The study area of the IMR begins to the west of S-48 at Exit 85 of I-26 and ends to the east at Exit 97. The interchange of I-26 at S-48 is Exit 91. I-26 is an east-west four (4) lane freeway with two (2) travel lanes in each direction. The location of the project is shown in **Figure 1A** and **Figure1B.**

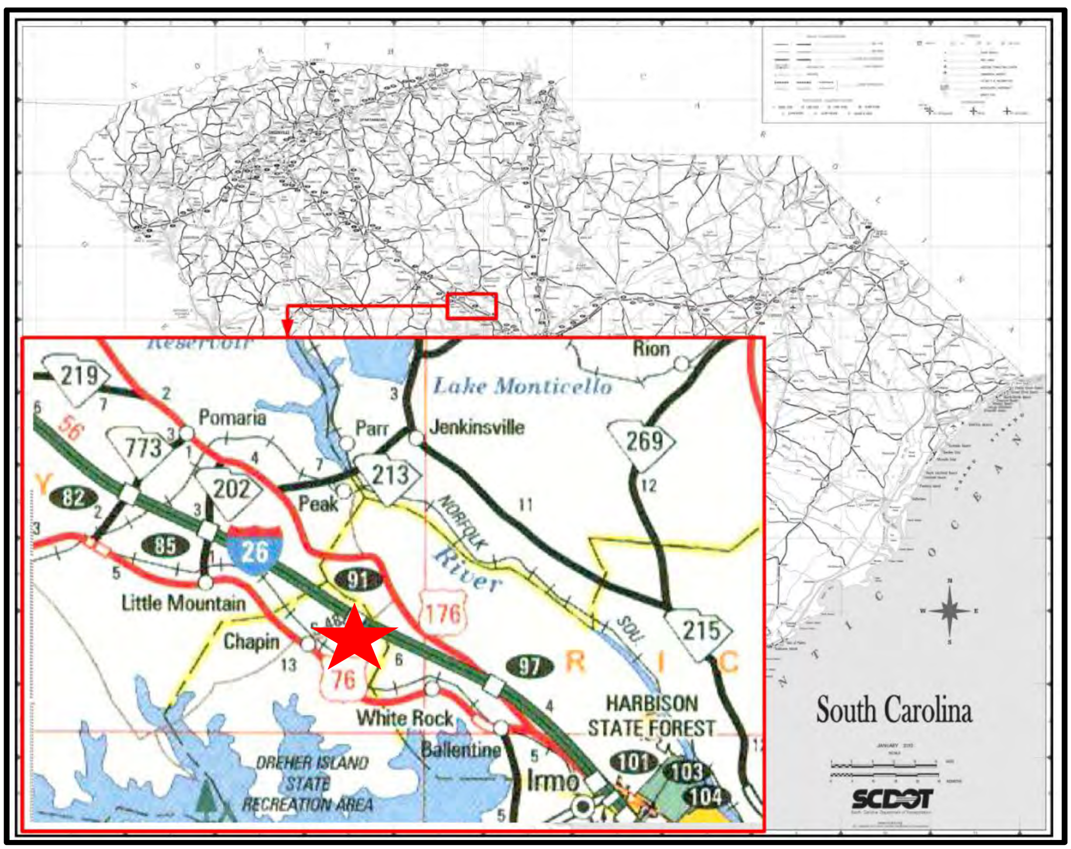


Figure 1A – Project Location

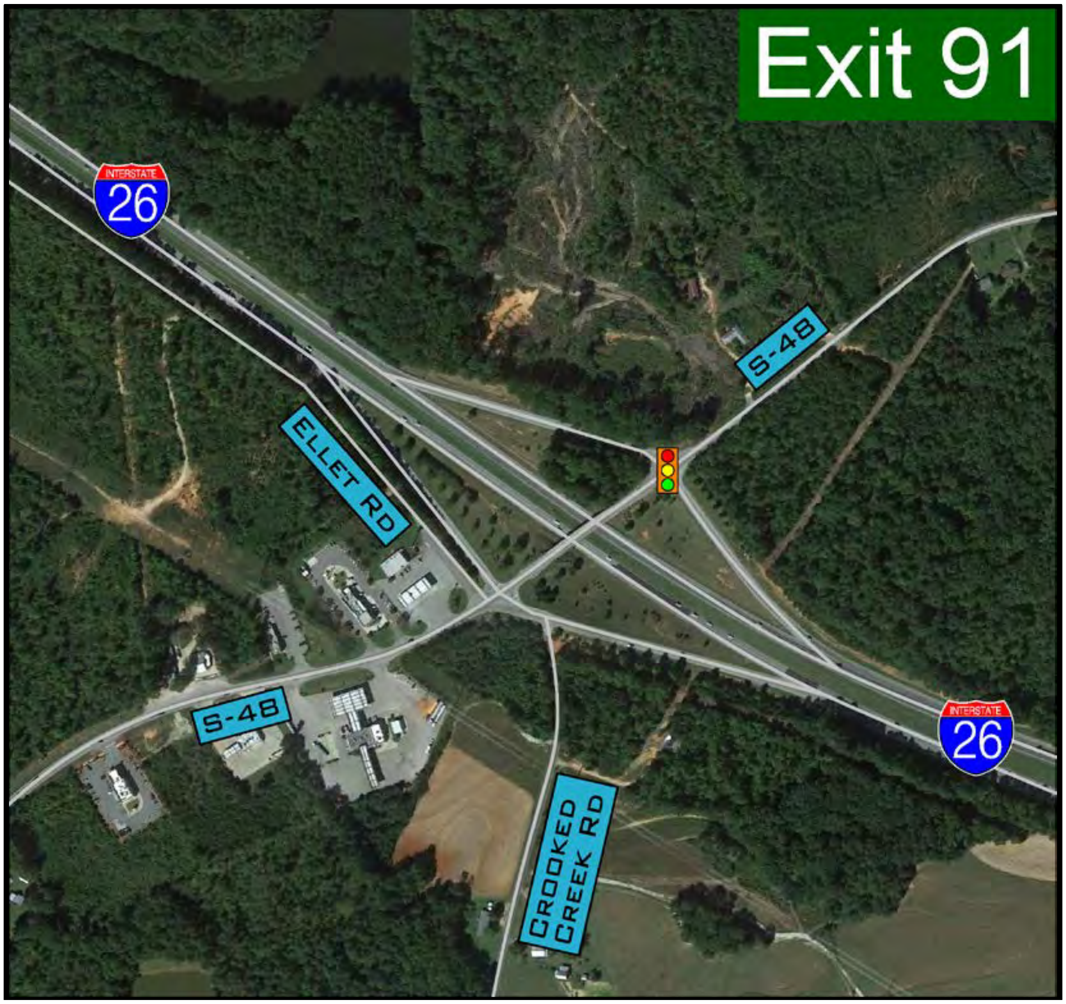


Figure 1B – Interchange Study Area

2.4 PURPOSE AND NEED STATEMENT

The purpose of this IMR is to study the impact of the modification of the interchange at Exit 91 on I-26 near Chapin, South Carolina. Chapin is located in Lexington County, northwest of Columbia. The population of Lexington County has been steadily increasing. In the 1990 Census, the population of Lexington County was 167,611. This grew to 216,014 (28.9% increase) in the 2000 Census and then reached 262,391 (21.5% increase) in 2010. Due to continual and anticipated growth in the area, improvements to the existing roadway network should be reviewed. This report is aimed at the potential improvements to the interchange from I-26 to Columbia Avenue in Chapin. The existing interchange is currently over capacity and the Frontage Road connection with S-48 and Crooked Creek Road connection with the I-26 EB On Ramp should be realigned for safety to meet SCDOT's latest criteria for access management. With new developments and construction in Chapin, such as the S-48 (Columbia Avenue) widening, there is a need for to modify the interchange to be able to accommodate this growth in terms of both capacity and safety.

2.5 EXISTING CONDITIONS FOR STUDY AREA

Currently S-48 is a 2-lane undivided minor arterial roadway with a 35 mile per hour (mph) posted speed limit that runs from US 76 at its intersection with S-51 (Amick Ferry Road) to the I-26 interchange. In the study area, I-26 is a 4-lane divided freeway with a 70 mph posted speed limit running in the east-west direction.

The AM peak hour studied was from 7:30-8:30 AM and the PM peak hour was from 4:45 – 5:45 PM based on the peak hour turning movement traffic counts. Heavy truck percentage for the peak hours varied; however, 4% was used for I-26 and 2% was used on the other studied roadways. It should be noted that SCDOT records indicate the daily heavy truck percentage on S-48 is 7% while I-26 is approximately 15%. Descriptions of the interchanges and a complete list of the study area are described below and shown in **Figure 2**:

1. I-26 Eastbound Ramps at S-48
2. I-26 Westbound Ramps at S-48
3. I-26 Eastbound Ramps at SC 202
4. I-26 Westbound Ramps at SC 202
5. I-26 Eastbound Ramps/ Exxon Driveway at US 176
6. I-26 Westbound Ramps at US 176

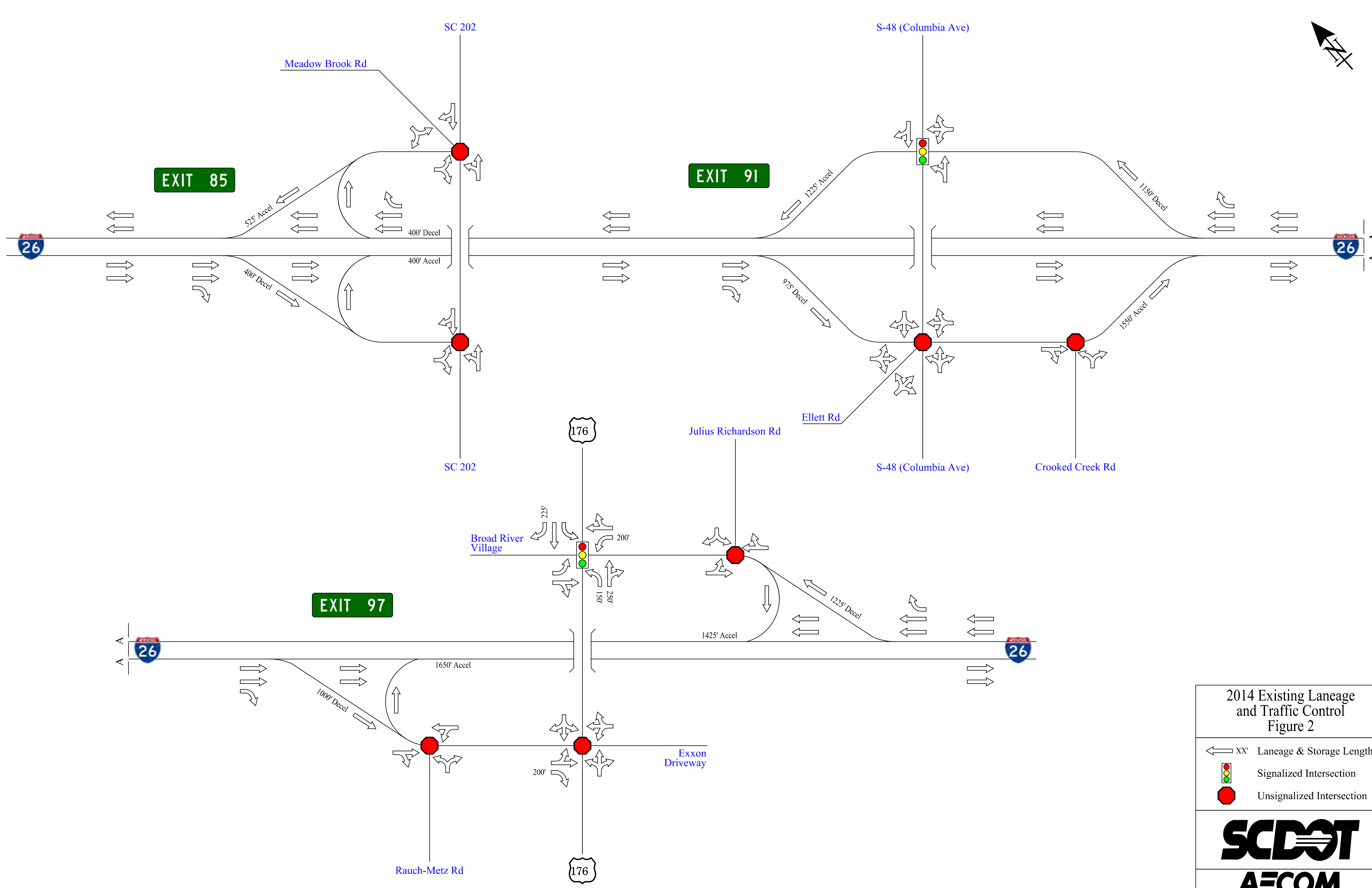
<u>Exit 85</u>
Approximately 6 miles to the west of Exit 91 on I-26 is Exit 85, a folded diamond/partial cloverleaf interchange. This interchange provides access to SC 202, a north-south 2-lane undivided roadway with a bridge over I-26. The eastbound off-ramp from I-26 is a stop controlled intersection where vehicles have the ability to turn left or right on to SC 202. The westbound off-ramp also has a stop controlled left turn onto SC 202 while the right turn from the ramp is yield controlled. A frontage road (Meadow Brook Road), less than 100 feet north of the I-26 westbound ramps, runs parallel to I-26 westbound, which is accessible from SC 202.

<u>Exit 91</u>
The interchange that intersects with S-48 is Exit 91 as a diamond interchange. This interchange provides access to S-48, which leads directly into Chapin. The eastbound off-ramp provides stop controlled access to S-48. The westbound off-ramp is signalized at the intersection with S-48. A frontage road (Ellett Road) intersects with S-48 approximately 50 feet to the southwest of the eastbound off-ramp. This road runs parallel to I-26 eastbound to the west of S-48. The eastbound on-ramp has access to Crooked Creek Road located on the ramp. There are multiple fast food restaurants and gas stations located west of the interchange on S-48.

<u>Exit 97</u>
Approximately 6 miles to the east of Exit 91 on I-26 is Exit 97. This interchange is a partial cloverleaf design for I-26 westbound and eastbound on ramp movements. The interchange

provides access to US 176, which has access to many residential developments near the interstate. The eastbound off-ramp leads to an intersection with US 176 that is stop controlled coming off the ramp. In addition to the intersection with US 176, the ramp intersects with Rauch Metz Road about half the distance between I-26 and US 176. Traffic traveling from Rauch Metz Road has the option to turn left to access the on-ramp to I-26 eastbound or turn right and head toward the intersection with US 176. The I-26 eastbound loop on-ramp also provides for vehicles to turn left onto Rauch Metz Road.

The I-26 westbound off-ramp intersects with US 176 at a signalized intersection. Through and left turn lane traffic approach the signal while the right turning traffic approaches a yield before continuing onto US 176. There is a driveway leading to a shopping center (Broad River Village) across from the off/on ramps at the signalized intersection.



2014 Existing Laneage and Traffic Control
Figure 2

3.0 OPERATIONAL ANALYSIS

3.1 ANALYSIS METHODOLOGY

The highway capacity analyses performed are based on methodologies from the Highway Capacity Manual (HCM 2010). Traffic modeling software used in the capacity analyses were Synchro 9.1 and SimTraffic 9.0, (Build 908, Rev 56), and VISSIM 7.0 for intersection analyses.

The traffic carrying ability of a roadway is described by levels of service (LOS) that range from LOS A to LOS F. LOS A represents unrestricted maneuverability and operating speeds. LOS B represents reduced maneuverability and operating speeds. LOS C represents restricted maneuverability and operating speeds closer to the speed limit. LOS D represents severely restricted maneuverability and unstable, low operating speeds. LOS E represents operating conditions at or near the capacity level. LOS F represents breakdown conditions characterized by stop and go travel. A visual representation of each LOS is shown below.

The Highway Capacity Manual (HCM) 2010 defines LOS at an unsignalized intersection by average control delay per vehicle, which includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. Several factors affect the controlled delay for unsignalized intersections, such as availability and distribution of gaps in the conflicting traffic stream, critical gaps, and follow-up time for a vehicle in the queue. The Highway Capacity Manual explains that drivers perceive that a signalized intersection is designed to carry higher traffic volumes and therefore expect to experience greater delays at signalized intersections. Unsignalized intersections are assigned a LOS for each minor movement. Typically, LOS C is considered the minimum acceptable level of service at an intersection for a suburban area. **Table 1** presents LOS thresholds for unsignalized intersections.

Table 1: LOS Thresholds for Unsignalized Intersections

Level of Service	Average Control Delay (sec/veh)
A	$\leq$ 10.0
B	> 10.0 and $\leq$ 15.0
C	> 15.0 and $\leq$ 25.0
D	> 25.0 and $\leq$ 35.0
E	> 35.0 and $\leq$ 50.0
F	> 50.0

LOS for a signalized intersection is defined in terms of average control delay per vehicle, which is composed of initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. A single LOS describes a signalized intersection. **Table 2** presents LOS thresholds for signalized intersections.

Table 2: LOS Thresholds Signalized Intersections

Level of Service	Average Control Delay (sec/veh)
A	$\leq$ 10.0
B	> 10.0 and $\leq$ 20.0
C	> 20.0 and $\leq$ 35.0
D	> 35.0 and $\leq$ 55.0
E	> 55.0 and $\leq$ 80.0
F	> 80.0

A basic freeway segment can be characterized by three performance measures: density in terms of passenger cars per mile per lane, speed in terms of mean passenger-car speed, and volume to capacity (v/c) ratio. Each of these measures is an indication of how well traffic flow is being accommodated by the freeway. The measure used to provide an estimate of level of service is density. **Table 3** defines the traffic density conditions at each level of service.

Traffic flow within a basic freeway segment can vary greatly depending on the conditions constricting flow at upstream and downstream bottleneck locations. Bottlenecks can be created by ramp merges or weaving segments, lane drops, maintenance and construction activities, accidents, and objects in the roadway.

Table 3: LOS Thresholds for Freeway Segments

Level of Service	Density Range (pc/mi/ln
A	≤ 11.0
B	> 11.0 and ≤ 18.0
C	> 18.0 and ≤ 26.0
D	> 26.0 and ≤ 35.0
E	> 35.0 and ≤ 45.0
F	> 45.0

A ramp is a length of roadway providing an exclusive connection between two highway facilities. On freeways, all entering and exiting maneuvers take place on ramps that are designed to facilitate smooth merging of on-ramp vehicles into the freeway traffic stream and smooth diverging of off-ramp vehicles from the freeway traffic stream onto the ramp.

A ramp consists of three geometric elements of interest: the ramp-freeway junction, the ramp roadway, and the ramp street junction. The ramp freeway junction is typically designed to permit high-speed merging and diverging with varying acceleration and deceleration lanes. Ramp roadways can vary between locations in terms of number of lanes, design speeds, grades, and horizontal curvature. The design of ramp roadways is seldom a source of operational difficulty unless a traffic incident causes disruption along the length of the ramp. Ramp-street terminal problems can cause queuing along the length of ramp, but this is generally not related to the design of the ramp roadway. **Table 4** defines the traffic density conditions at each level of service.

Table 4: LOS Thresholds for Merge / Diverge Areas

Level of Service	Density Range (pc/mi/ln
A B C D E F	≤ 10.0 > 10.0 and ≤ 20.0 > 20.0 and ≤ 28.0 > 28.0 and ≤ 35.0 > 35.0 Demand Exceeds Capacity

3.2 TRAFFIC VOLUMES

Traffic volumes were for this IMR were referenced from the S-48 (Columbia Avenue) Corridor Improvement Project Traffic Study dated 10-17-16. In summary, the 2014 existing traffic volumes were grown at a linear rate of 1.25% to obtain the base Opening Year (2020) and Design Year (2040) traffic projections. After these projections were complete, a traffic study for the Chapin Technology Park and Chapin Commerce Village Development became available. These two developments are significant in size and impact the S-48 corridor and interchange. At the direction of Lexington County and SCDOT, additional traffic volumes were added to the base volumes to be conservative and to better estimate the turning movement volumes to / from S-48. Additional volumes were generated using:

- Chapin Technology Park (120 acre industrial park, 450 single family houses, and 350,000 SF of commercial). Based on the final traffic study submitted and approved by SCDOT on October 13, 2015 for the Chapin Technology Park, the opening year is 2019. These new trips were added to the Opening Year (2020). The Chapin Technology Park is not expected to be complete until 2024 as these trips at full build-out were added to the Design Year (2040). The Technology Park is located north of Columbia Avenue near Woodthrush Road.

- Chapin Commerce Village (132,000 SF Specialty Retail, 8,350 SF Quality Restaurant, 8,350 SF General Office, 4,500 SF Fast Food Restaurant with Drive-Through, 8,350 High Turn-Over (Sit-Down) Restaurant, 4,050 SF Fast Food Restaurant with Drive-Through, 4,950 SF Convenience Market with Gasoline Pumps, 8,350 SF Quality Restaurant, 120 Room Hotel, 8,350 Quality Restaurant, and 4,050 SF General Office Building). This development has not had a traffic study and is only in the early planning stages. It is located just east of I-26 along S-48 (Columbia Avenue).

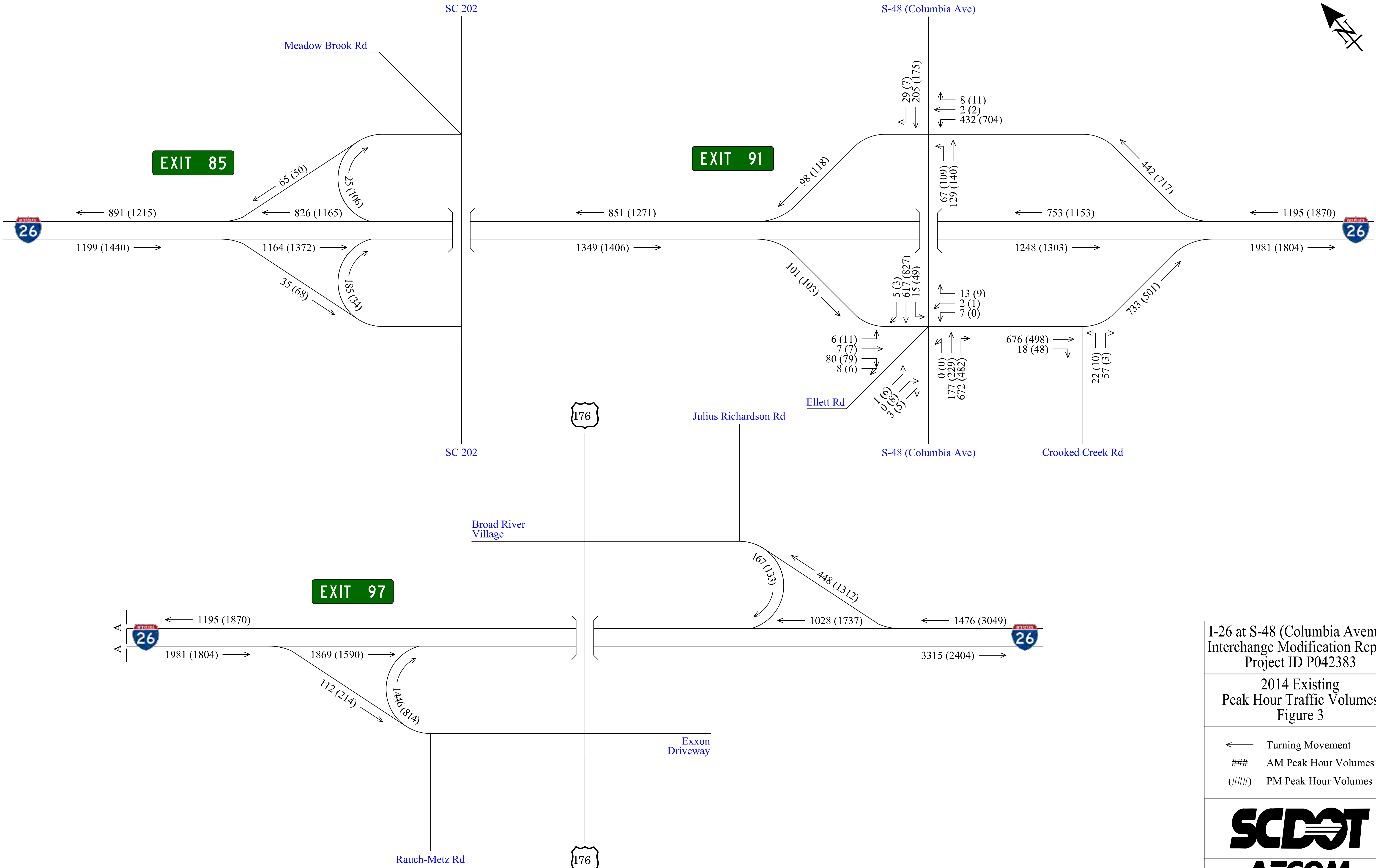
A complete memo describing the methodology with traffic figures can be referenced in **Appendix A**.

The memo does not provide volumes along I-26, therefore, AECOM used an I-26 traffic count located just east Exit 91 and determined other sections along I-26 in the study area by balancing with the known ramp volumes at Exit 85 and Exit 97. The raw traffic counts are located in **Appendix B**. Finalized traffic volumes (balanced) for all study scenarios are displayed in **Figures 3-9**.

3.3 CRASH ANALYSIS

Crash data collected over the last 3.4 years show low crash rates along I-26 within the Exit 91 interchange area. There was a total 40 crashes with 75 percent of the crashes consisting of either running off the road or rear end. Of the 40 crashes, 8 people were injured with 1 fatality. The one fatality appears to be pedestrian related occurring during the dusk hours. The crash data also indicates that there were 8 rear-end collisions between the on / off ramps (stack 6) over the 3.4 year period which may be attributed to queuing from the westbound off-ramp extending onto the interstate. Crash summaries can be found in **Appendix C**.

The preferred Alternative Diverging Diamond Interchange design is not expected change the existing diamond interchange as the ramp design and number of lanes on the freeway are expected to remain the same. A modification to the S-48 interchange is not expected to have a significant adverse effect on safety on I-26 but is expected to improve the safety on S-48 at the ramps with the fewer conflict points.



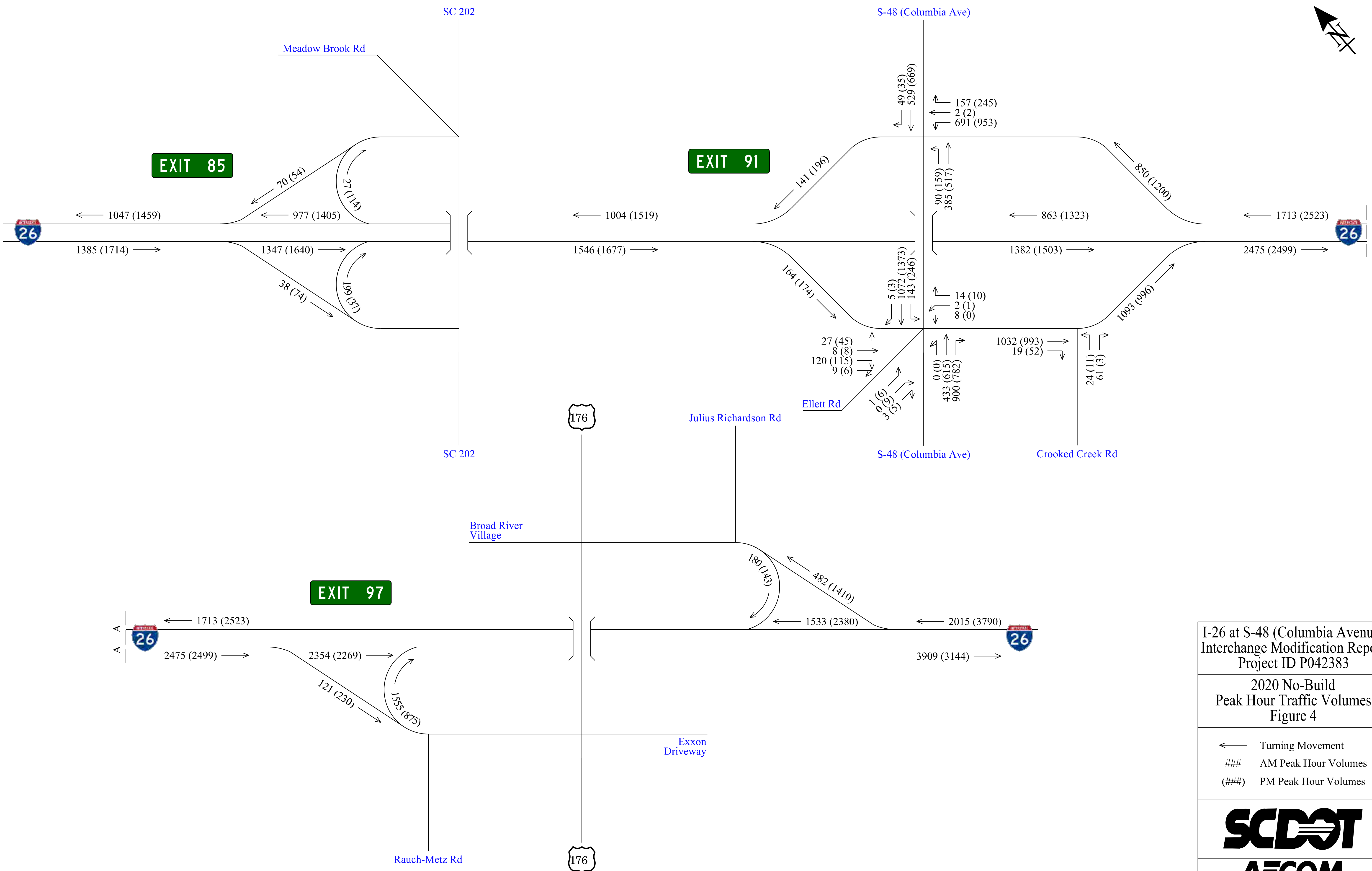
I-26 at S-48 (Columbia Avenue)
Interchange Modification Report
Project ID P042383

2014 Existing
Peak Hour Traffic Volumes
Figure 3

←	Turning Movement
###	AM Peak Hour Volumes
(###)	PM Peak Hour Volumes

SCDOT

AECOM

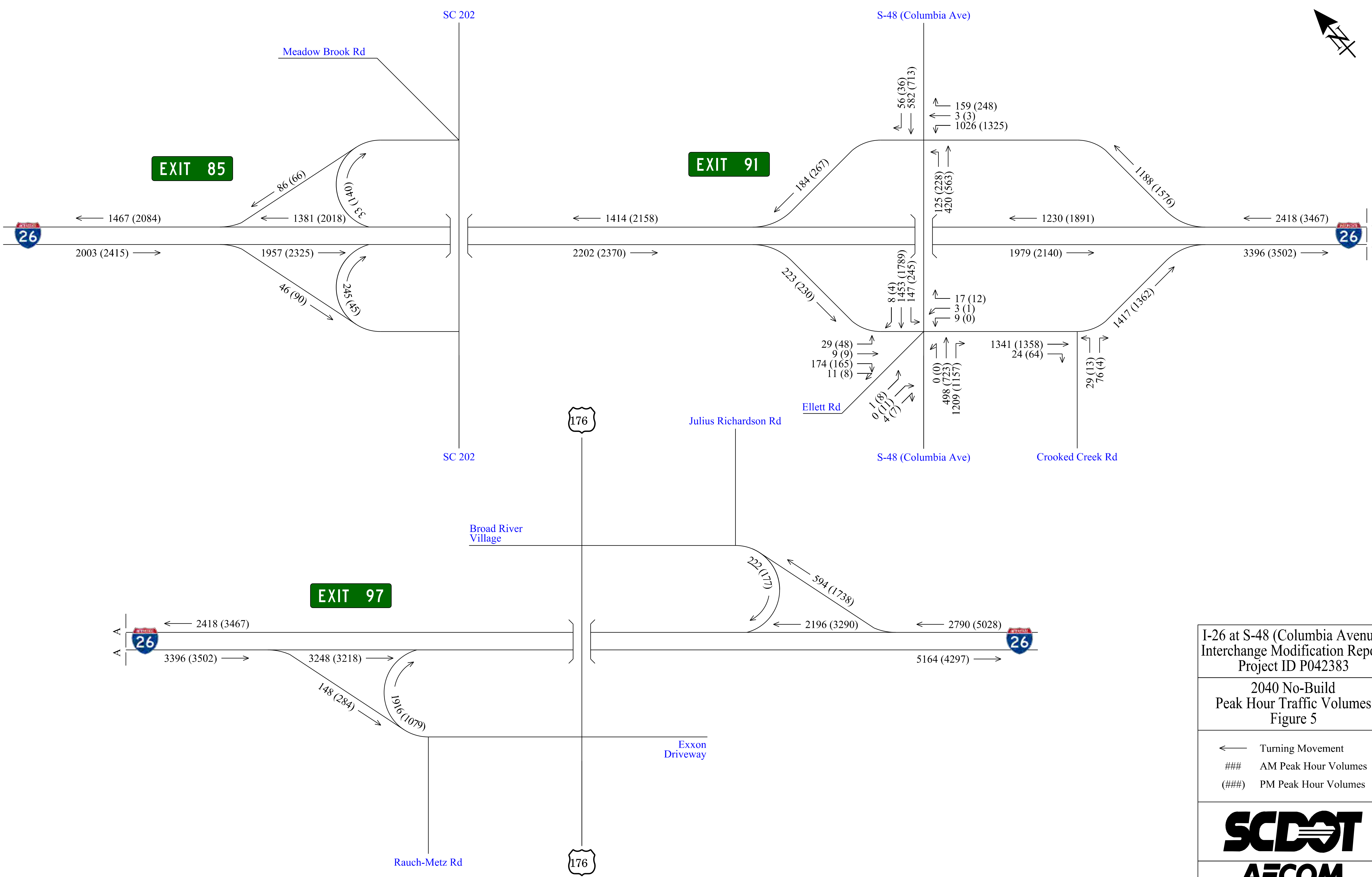


I-26 at S-48 (Columbia Avenue)
Interchange Modification Report
Project ID P042383

2020 No-Build
Peak Hour Traffic Volumes
Figure 4

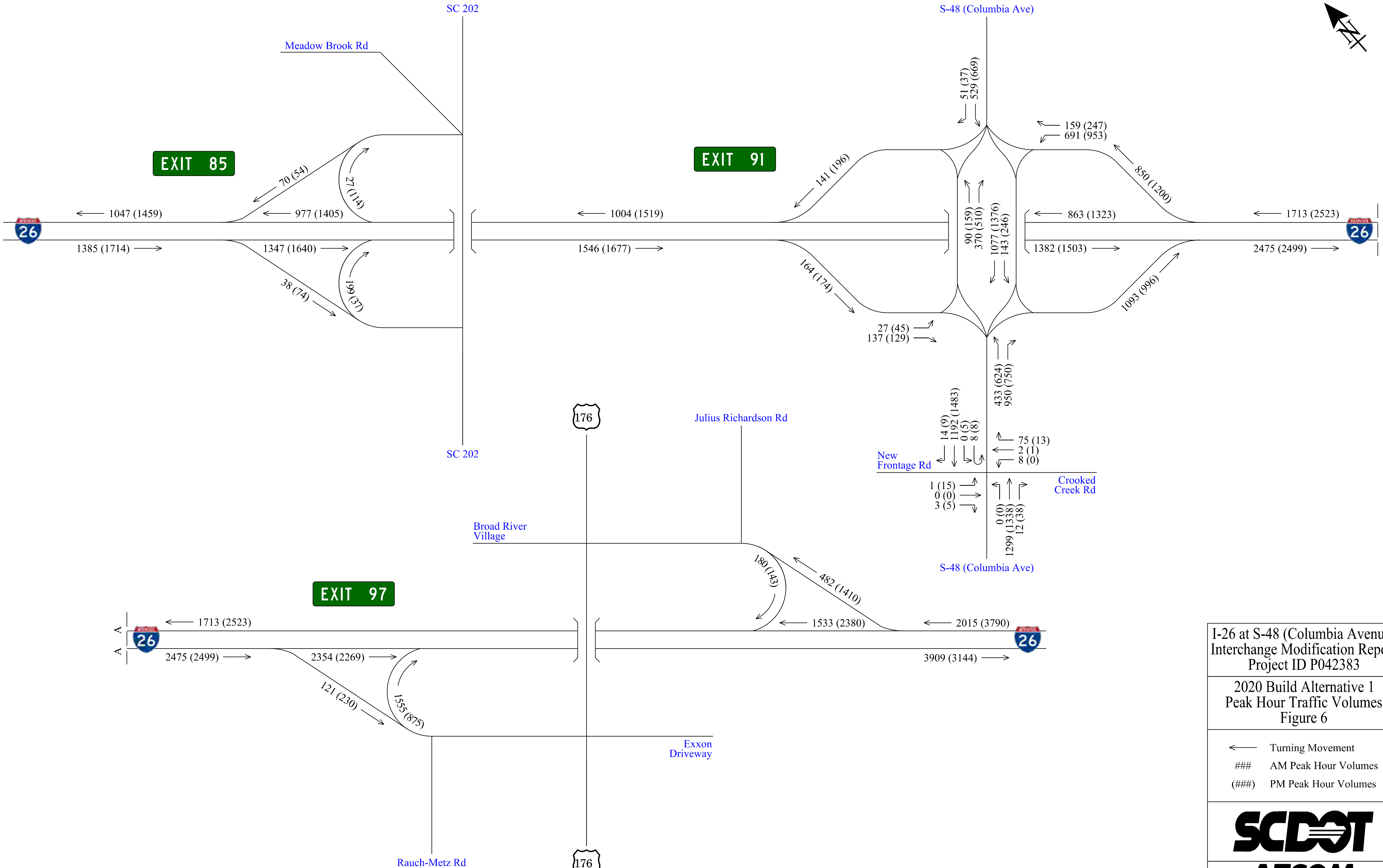
←	Turning Movement
###	AM Peak Hour Volumes
(###)	PM Peak Hour Volumes

SCDOT
AECOM



I-26 at S-48 (Columbia Avenue)
Interchange Modification Report
Project ID P042383

2040 No-Build
Peak Hour Traffic Volumes
Figure 5

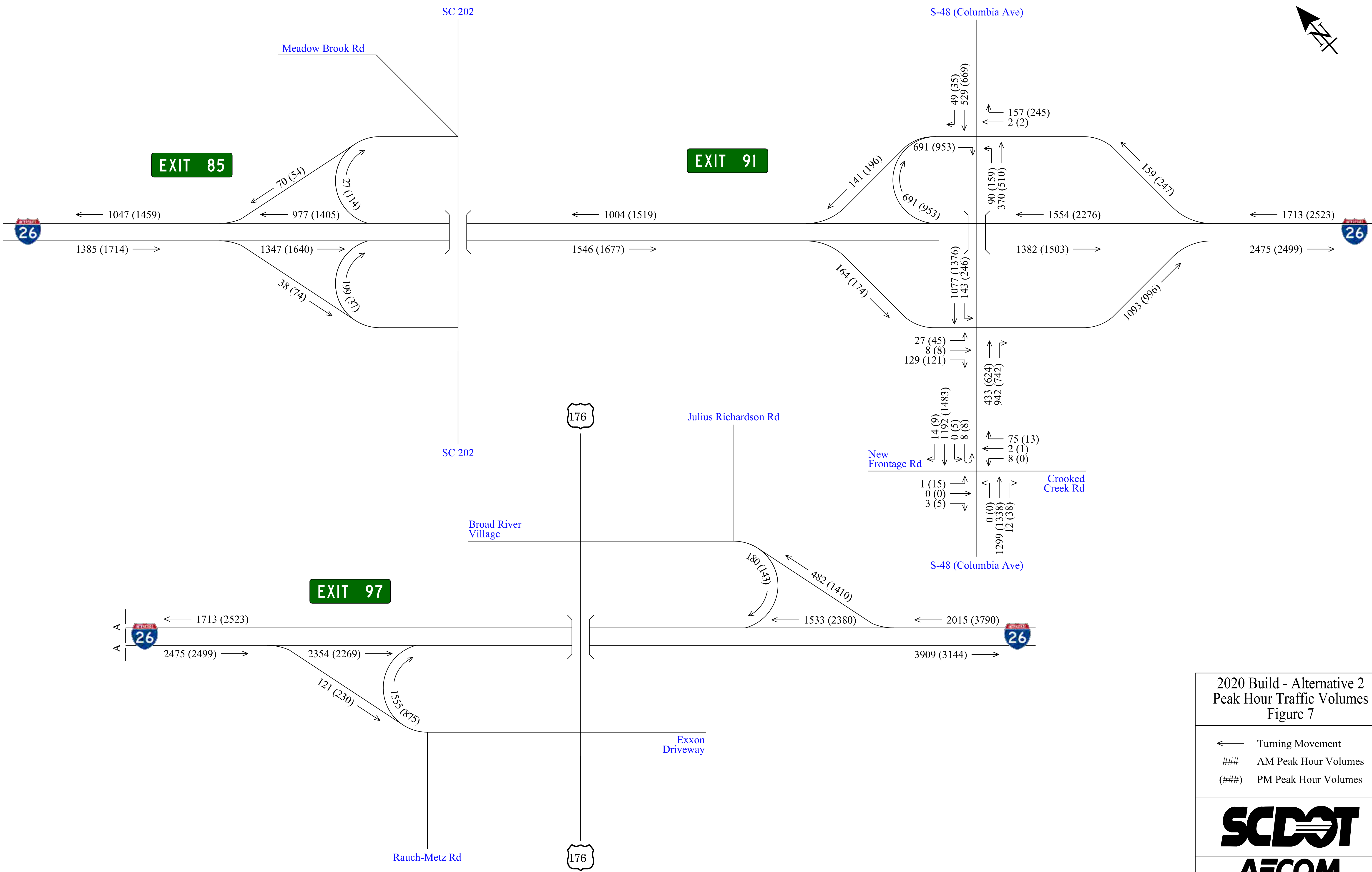


I-26 at S-48 (Columbia Avenue)
Interchange Modification Report
Project ID P042383

2020 Build Alternative 1
Peak Hour Traffic Volumes
Figure 6

←	Turning Movement
###	AM Peak Hour Volumes
(###)	PM Peak Hour Volumes

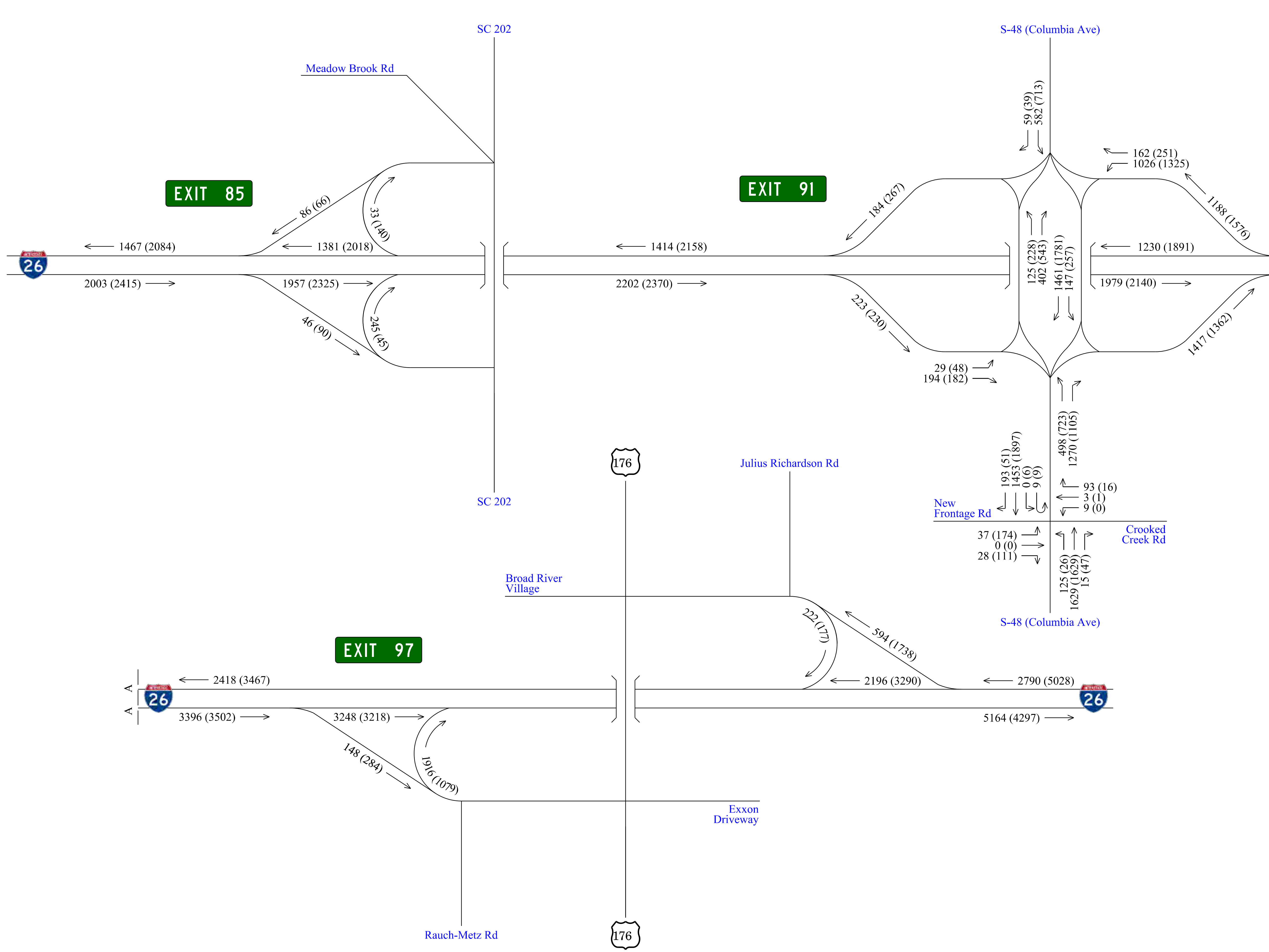
SCDOT
AECOM



2020 Build - Alternative 2
Peak Hour Traffic Volumes
Figure 7

Turning Movement
AM Peak Hour Volumes
(###) PM Peak Hour Volumes

SCDOT
AECOM



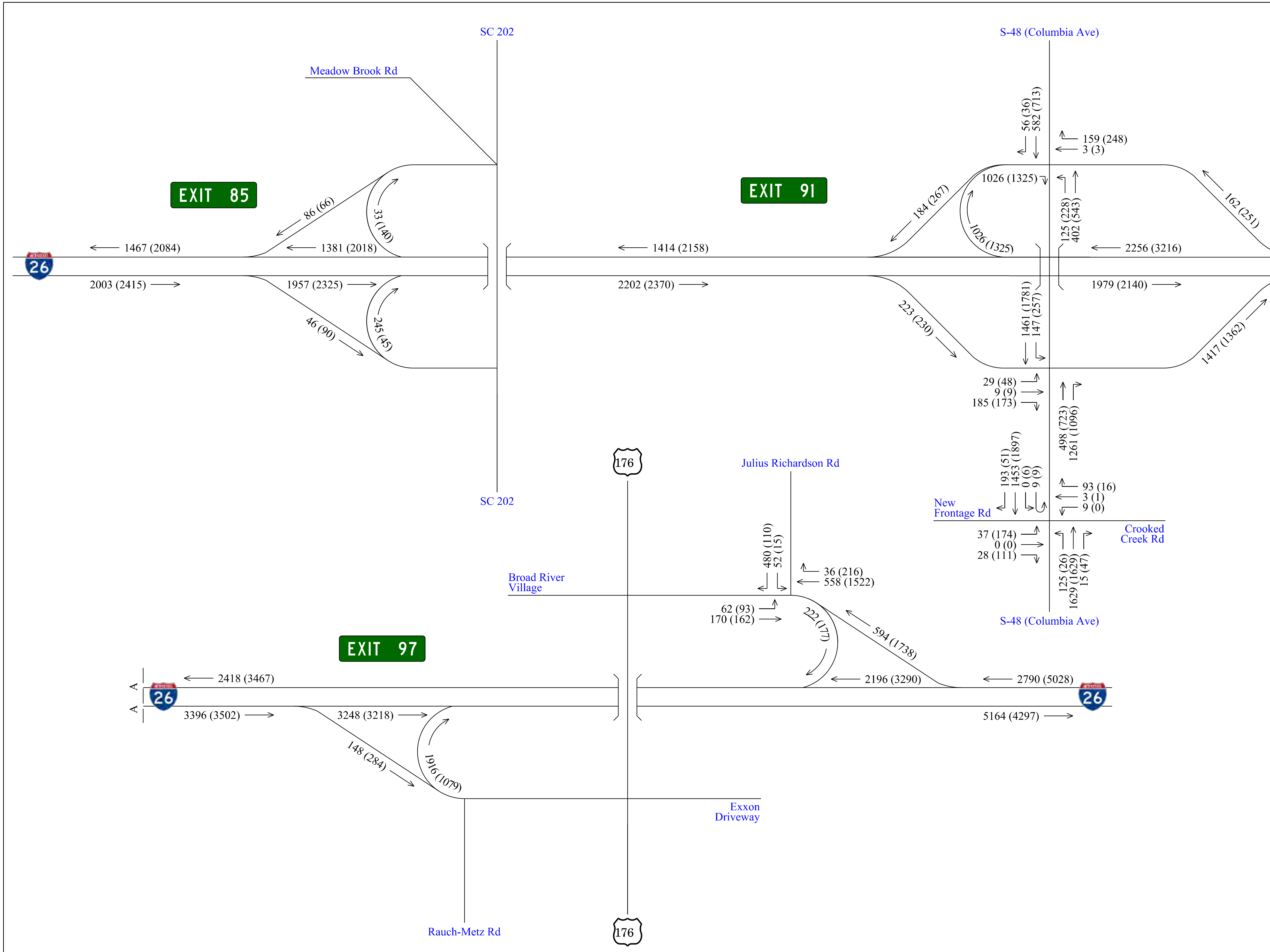
I-26 at S-48 (Columbia Avenue) Interchange Modification Report
Project ID P042383

2040 Build Alternative 1
Peak Hour Traffic Volumes
Figure 8

⟵	Turning Movement
###	AM Peak Hour Volumes
(###)	PM Peak Hour Volumes

SCDOT

AECOM



2040 Build Alternative 2
Peak Hour Traffic Volumes
Figure 9

Turning Movement
AM Peak Hour Volumes
(###) PM Peak Hour Volumes

SCDOT
AECOM

3.4 EXISTING 2014 TRAFFIC ANALYSIS

The results of the Existing 2014 intersection analysis using Synchro 9.1 indicate that S-48 at I-26 eastbound ramp is currently operating LOS D in the AM Peak hour and LOS E during PM for the minor street approaches. The westbound off ramp under signal control is operating at LOS B; however, queues from the signal may extend onto I-26.

Table 5 summarizes the LOS and delay for each of study intersections with detailed Synchro reports found in **Appendix D**.

Table 5: Existing 2014 Intersection LOS and Delay

ID	Intersection	Traffic Control	Approach	HCM 2010 Level of Service (LOS)		Control Delay (sec/veh)	
				AM	PM	AM	PM
Exit 91 (I-26 at S-48)							
1	I-26 Eastbound Off Ramp / Crook Creek Road at S-48	Unsignalized	WB (AM)* EB (PM)*	D	E	28.4	42.7
2	I-26 Westbound Ramps at S-48	Signalized	-	B	B	11.7	19.1

*Since vehicles from Crooked Creek Road can access the I-26 eastbound on ramp to S-48 (Columbia Avenue), the worst of the two minor approaches was reported.

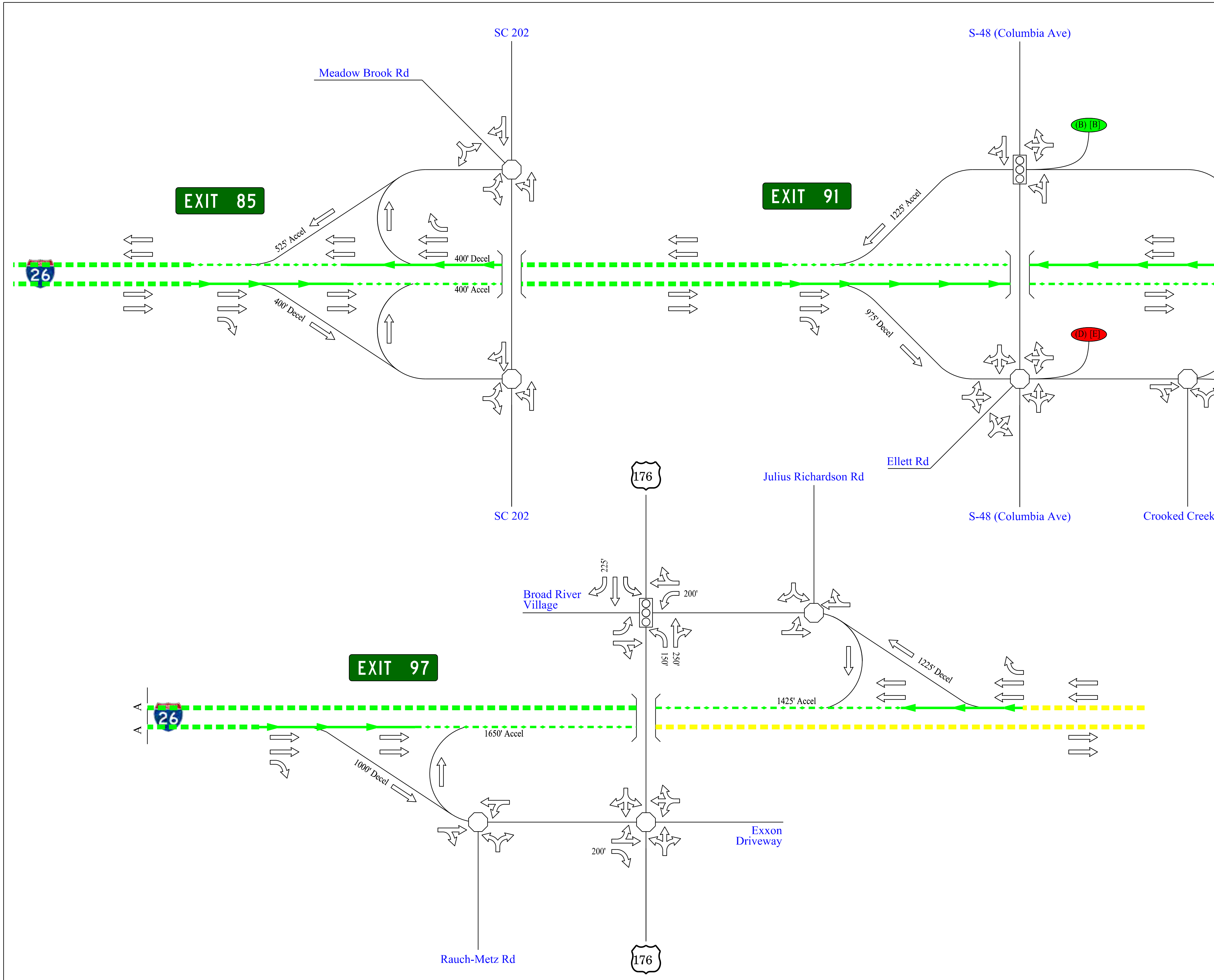
The results of the Existing 2014 Freeway / Merge / Diverge analysis using Highway Capacity Software (HCS) 2010 indicate that just east of Exit 97 (US 176), I-26 is operating at LOS D in the AM peak hour (eastbound) and during the PM peak hour (westbound). All other freeway segment / merge / diverge analyses are operating at LOS C or better.

Table 6 summarizes the LOS and density for each merge / diverge area with detailed HCS reports found in **Appendix E**.

Table 6: Existing 2014 Freeway / Merge / Diverge LOS and Density

Approach	Description	HCM 2010 Level of Service (LOS)		Density (pc/mi/ln)	
		AM	PM	AM	PM
Freeway Segment					
Eastbound	West of Exit 85	A	B	9.4	11.3
	Between Exit 85 and Exit 91	A	B	10.6	11.0
	Between Exit 91 and Exit 97	B	B	15.6	14.2
	East of Exit 97	D	C	30.0	19.4
Westbound	East of Exit 97	B	D	11.6	26.4
	Between Exit 91 and Exit 97	A	B	9.4	14.7
	Between Exit 85 and Exit 91	A	A	6.7	10.0
	West of Exit 85	A	A	7.0	9.5
Merge Area					
Eastbound	EB Exit 85 On-Ramp	B	B	15.2	15.9
	EB Exit 91 On-Ramp	B	B	13.7	12.2
	EB Exit 97 On-Ramp	C	B	25.4	17.5
Westbound	WB Exit 97 On-Ramp	A	B	7.4	13.6
	WB Exit 91 On-Ramp	A	A	5.5	9.4
	WB Exit 85 On-Ramp	B	B	10.3	13.3
Diverge Area					
Eastbound	EB Exit 85 Off-Ramp	B	B	12.8	15.2
	EB Exit 91 Off-Ramp	A	A	9.1	9.7
	EB Exit 97 Off-Ramp	B	B	15.3	13.5
Westbound	WB Exit 97 Off-Ramp	A	C	8.2	24.1
	WB Exit 91 Off-Ramp	A	B	5.3	12.2
	WB Exit 85 Off-Ramp	A	B	9.3	13.5

Figure 10 shows the LOS for the Existing 2014 conditions.



I-26 at S-48 (Columbia Avenue)
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2014 Existing
LOS and Laneage
Figure 10

Freeway Segment
Merge Segment
Diverge Segment
LOS A/B/C
LOS D
LOS E/F
XX' Laneage & Storage Length
(X) [X] Intersection AM Peak and PM Peak Level of Service
Signalized Intersection
Unsignalized Intersection

SCDOT
AECOM

3.5 NO-BUILD 2020 TRAFFIC ANALYSIS

The 2020 No-Build scenario analyzes the conditions if there were no improvements made to the interchange. The results of the No-Build 2020 intersection analysis using Synchro 9.1 indicate that S-48 at I-26 is expected to operate at LOS F in the AM and PM peak hours.

Table 7 summarizes the LOS and delay for each of study intersections with detailed Synchro reports found in **Appendix F**.

Table 7: No-Build 2020 Intersection LOS and Delay

ID	Intersection	Traffic Control	Approach	HCM 2010 Level of Service (LOS)		Control Delay (sec/veh)	
				AM	PM	AM	PM
Exit 91 (I-26 at S-48)							
1	I-26 Eastbound Off Ramp / Crook Creek Road at S-48	Unsignalized	WB (AM)* EB (PM)*	F	F	900+	900+
2	I-26 Westbound Ramps at S-48	Signalized	-	F	F	126.0	433.7

*Since vehicles from Crooked Creek Road can access the I-26 eastbound on ramp to S-48 (Columbia Avenue), the worst of the two minor approaches was reported.

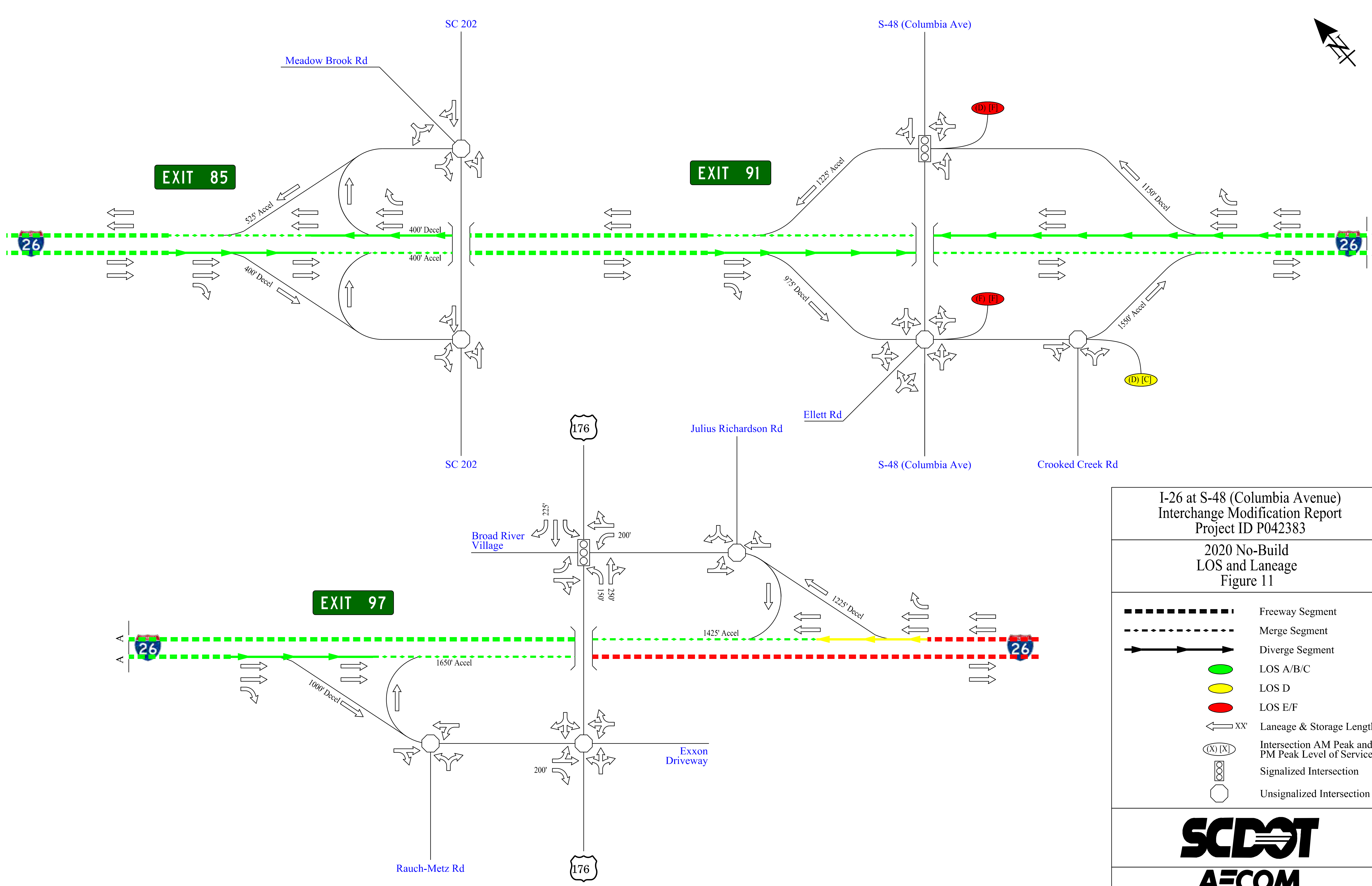
The results of the 2020 No-Build Freeway / Merge / Diverge analysis using Highway Capacity Software (HCS) 2010 indicate that just east of Exit 97 (US 176), I-26 is expected to operate at LOS E in the AM peak hour (eastbound) and during the PM peak hour (westbound). In addition the I-26 eastbound merge area from Exit 97 is expected to operate at LOS D along with the I-26 westbound diverge area during the PM peak hour. All other freeway segment / merge / diverge analyses are operating at LOS C or better.

Table 8 summarizes the LOS and density for each merge / diverge area with detailed HCS reports found in **Appendix G**.

Table 8: No-Build 2020 Freeway / Merge / Diverge LOS and Density

Approach	Description	HCM 2010 Level of Service (LOS)		Density (pc/mi/ln)	
		AM	PM	AM	PM
Freeway Segment					
Eastbound	West of Exit 85	A	B	10.9	13.5
	Between Exit 85 and Exit 91	B	B	12.1	13.2
	Between Exit 91 and Exit 97	C	C	20.1	20.3
	East of Exit 97	E	D	40.9	27.6
Westbound	East of Exit 97	B	E	15.9	38.4
	Between Exit 91 and Exit 97	B	C	13.5	20.5
	Between Exit 85 and Exit 91	A	B	7.9	11.9
	West of Exit 85	A	B	8.2	11.5
Merge Area					
Eastbound	EB Exit 85 On-Ramp	B	B	17.0	18.3
	EB Exit 91 On-Ramp	B	B	18.0	18.2
	EB Exit 97 On-Ramp	D	C	30.8	24.3
Westbound	WB Exit 97 On-Ramp	B	B	12.1	19.6
	WB Exit 91 On-Ramp	A	B	6.9	11.6
	WB Exit 85 On-Ramp	B	B	11.7	15.5
Diverge Area					
Eastbound	EB Exit 85 Off-Ramp	B	B	14.7	18.0
	EB Exit 91 Off-Ramp	B	B	11.1	12.5
	EB Exit 97 Off-Ramp	C	C	20.3	20.6
Westbound	WB Exit 97 Off-Ramp	B	D	13.6	31.6
	WB Exit 91 Off-Ramp	B	B	10.6	18.8
	WB Exit 85 Off-Ramp	B	B	10.8	16.0

Figure 11 shows the LOS for the No-Build 2020 conditions.



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2020 No-Build
LOS and Laneage
Figure 11

3.6 NO-BUILD 2040 TRAFFIC ANALYSIS

The 2040 No-Build scenario analyzes the conditions if there were no improvements made to the interchange. The results of the No-Build 2040 intersection analysis using Synchro 9.1 indicate that S-48 at I-26 is expected to continue to operate at LOS F in the AM and PM peak hours. **Table 9** summarizes the LOS and delay for each of study intersections with detailed Synchro reports found in **Appendix H**.

Table 9: No-Build 2040 Intersection LOS and Delay

ID	Intersection	Traffic Control	Approach	HCM 2010 Level of Service (LOS)		Control Delay (sec/veh)	
				AM	PM	AM	PM
Exit 91 (I-26 at S-48)							
1	I-26 Eastbound Off Ramp / Crook Creek Road at S-48	Unsignalized	WB (AM)* EB (PM)*	F	F	900+	900+
2	I-26 Westbound Ramps at S-48	Signalized	-	F	F	247.4	900+

*Since vehicles from Crooked Creek Road can access the I-26 eastbound on ramp to S-48 (Columbia Avenue), the worst of the two minor approaches was reported.

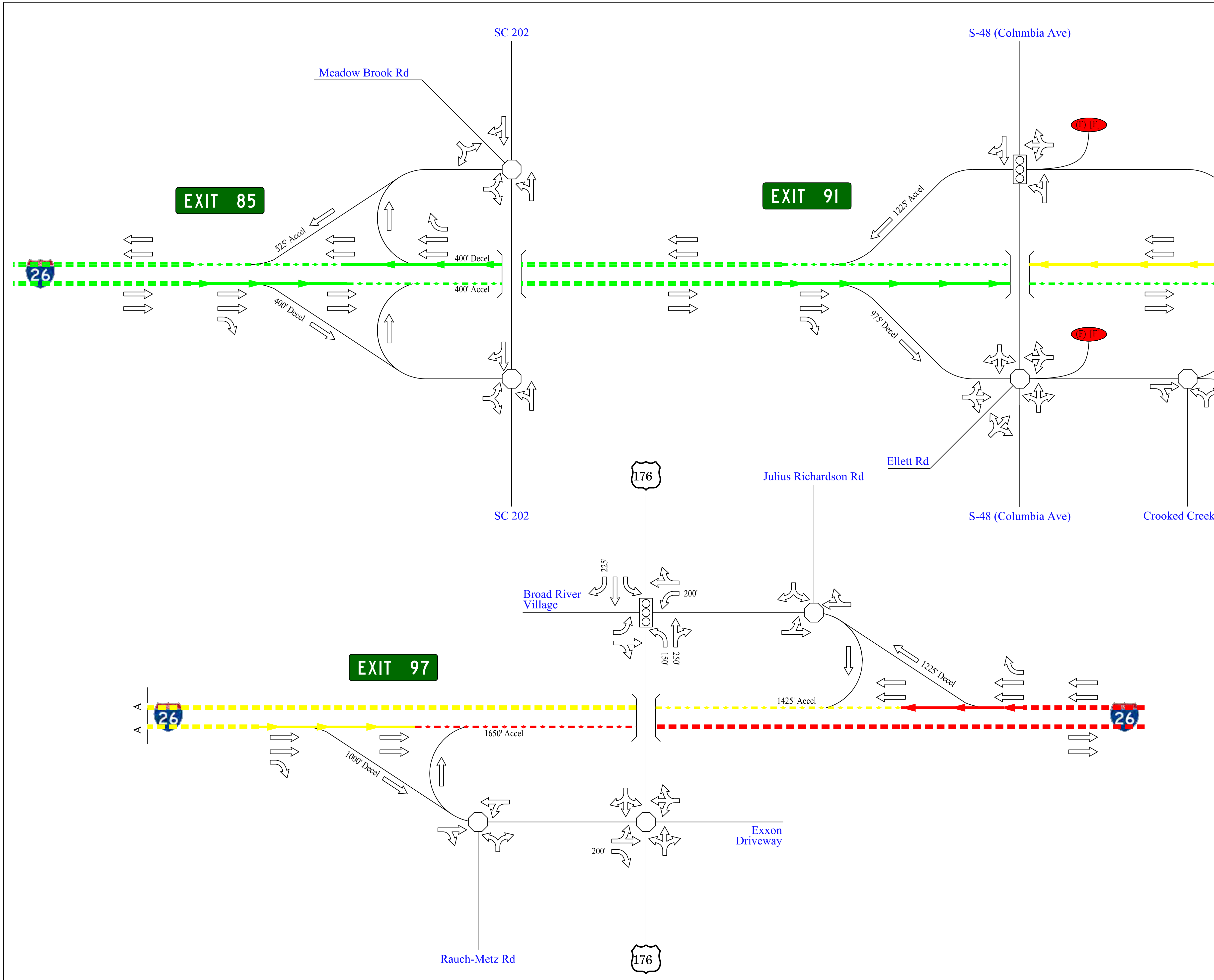
The results of the 2040 No-Build Freeway / Merge / Diverge analysis using Highway Capacity Software (HCS) 2010 indicate that just east of Exit 97 (US 176), I-26 is expected to operate at LOS F in the AM and PM peak hours. Between Exit 91 and Exit 97, the freeway is expected to operate at LOS D in the AM peak hour (eastbound) and PM peak hour (westbound). The PM hour diverge at Exit 91 is also LOS D. In addition the I-26 eastbound merge area from Exit 97 is expected to operate at LOS F along with the I-26 westbound diverge area during the PM peak hour. All other freeway segment / merge / diverge analyses are operating at LOS C or better.

Table 10 summarizes the LOS and density for each merge / diverge area with detailed HCS reports found in **Appendix I**.

Table 10: No-Build 2040 Freeway / Merge / Diverge LOS and Density

Approach	Description	HCM 2010 Level of Service (LOS)		Density (pc/mi/ln)	
		AM	PM	AM	PM
Freeway Segment					
Eastbound	West of Exit 85	B	C	15.8	19.5
	Between Exit 85 and Exit 91	B	C	17.5	19.1
	Between Exit 91 and Exit 97	D	D	31.3	33.0
	East of Exit 97	F	F	105.3	50.3
Westbound	East of Exit 97	C	F	23.3	91.3
	Between Exit 91 and Exit 97	C	D	19.5	32.4
	Between Exit 85 and Exit 91	B	B	11.1	17.1
	West of Exit 85	B	B	11.5	16.5
Merge Area					
Eastbound	EB Exit 85 On-Ramp	C	C	23.0	24.7
	EB Exit 91 On-Ramp	C	C	26.2	27.2
	EB Exit 97 On-Ramp	F	F	42.0	34.7
Westbound	WB Exit 97 On-Ramp	B	D	18.6	28.3
	WB Exit 91 On-Ramp	B	B	10.6	17.4
	WB Exit 85 On-Ramp	B	C	15.6	21.3
Diverge Area					
Eastbound	EB Exit 85 Off-Ramp	C	C	20.9	25.1
	EB Exit 91 Off-Ramp	B	B	17.8	19.5
	EB Exit 97 Off-Ramp	D	D	29.7	30.7
Westbound	WB Exit 97 Off-Ramp	C	F	21.5	44.2
	WB Exit 91 Off-Ramp	B	D	17.7	28.3
	WB Exit 85 Off-Ramp	B	C	15.0	22.5

Figure 12 shows the LOS for the 2040 No-Build Conditions



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2040 No-Build
LOS and Laneage
Figure 12

Freeway Segment
Merge Segment
Diverge Segment
LOS A/B/C
LOS D
LOS E/F
XX' Laneage & Storage Length
(X) [X] Intersection AM Peak and PM Peak Level of Service
Signalized Intersection
Unsignalized Intersection

SCDOT
AECOM

3.7 BUILD 2020 TRAFFIC ANALYSIS

The 2020 Build scenario analyzes the conditions for three-interchange alternatives at Exit 91. For all three Alternatives, the following changes were included in the 2020 Build scenario:

- A New Frontage Road approximately 1000 feet to the south of the I-26 eastbound ramps was included to carry the traffic of the proposed Chapin Technology Park. The new Frontage Road was assumed to be a signalized intersection.
- Ellet Road (old frontage road) was removed in the Build scenario. In the Build scenario, Ellet Road traffic redistributed and added to the New Frontage Road traffic.
- Crooked Creek Road was realigned to connect to the New Frontage Road intersection with S-48. In the Build scenario, it will not have direct access to the I-26 EB on ramp. Crooked Creek Road traffic was redistributed and added to the Frontage Road traffic.

The results of the Build 2020 analysis using Synchro 9.1 indicate that two of three alternatives are expected to operate at LOS C of better. Alternative 1 (DDI) is expected to have signals at both ramps; therefore, the LOS is balanced at both intersections to obtain proper signals timing. Alternative 2 (Partial Cloverleaf) has an expected LOS A at the I-26 eastbound ramps because no signal is recommended at the I-26 westbound ramps and signal can operate independently. Alternative 3 (Dual Roundabouts) is expected to operate at LOS F for the westbound ramps during the PM peak hour; therefore, it should not be considered as a viable alternative.

Table 11 summarizes the LOS and delay for each of study intersections with detailed Synchro reports found in **Appendix J and K**. Detailed Sidra output reports are found in **Appendix N**.

Table 11: Build 2020 Intersection LOS and Delay

ID	Intersection	Traffic Control	Approach	HCM 2010 Level of Service (LOS)		Control Delay (sec/veh)	
				AM	PM	AM	PM
Exit 91 (I-26 at S-48) – Diverging Diamond Interchange – Alt 1							
1	I-26 Eastbound Ramps at S-48	Signalized	-	C	C	20.9	22.3
21	I-26 WB Ramps at S-48	Signalized	-	B	C	17.2	23.6
22	S-48 at I-26 WB Off Ramp	Signalized	-	C	B	20.5	16.9
Exit 91 (I-26 at S-48) – Partial Cloverleaf – Alt 2							
1	I-26 Eastbound Ramps at S-48	Signalized	-	A	A	4.1	4.7
2	S-48 at I-26 WB Off Ramp	Unsignalized	WB	B	C	12.7	19.8

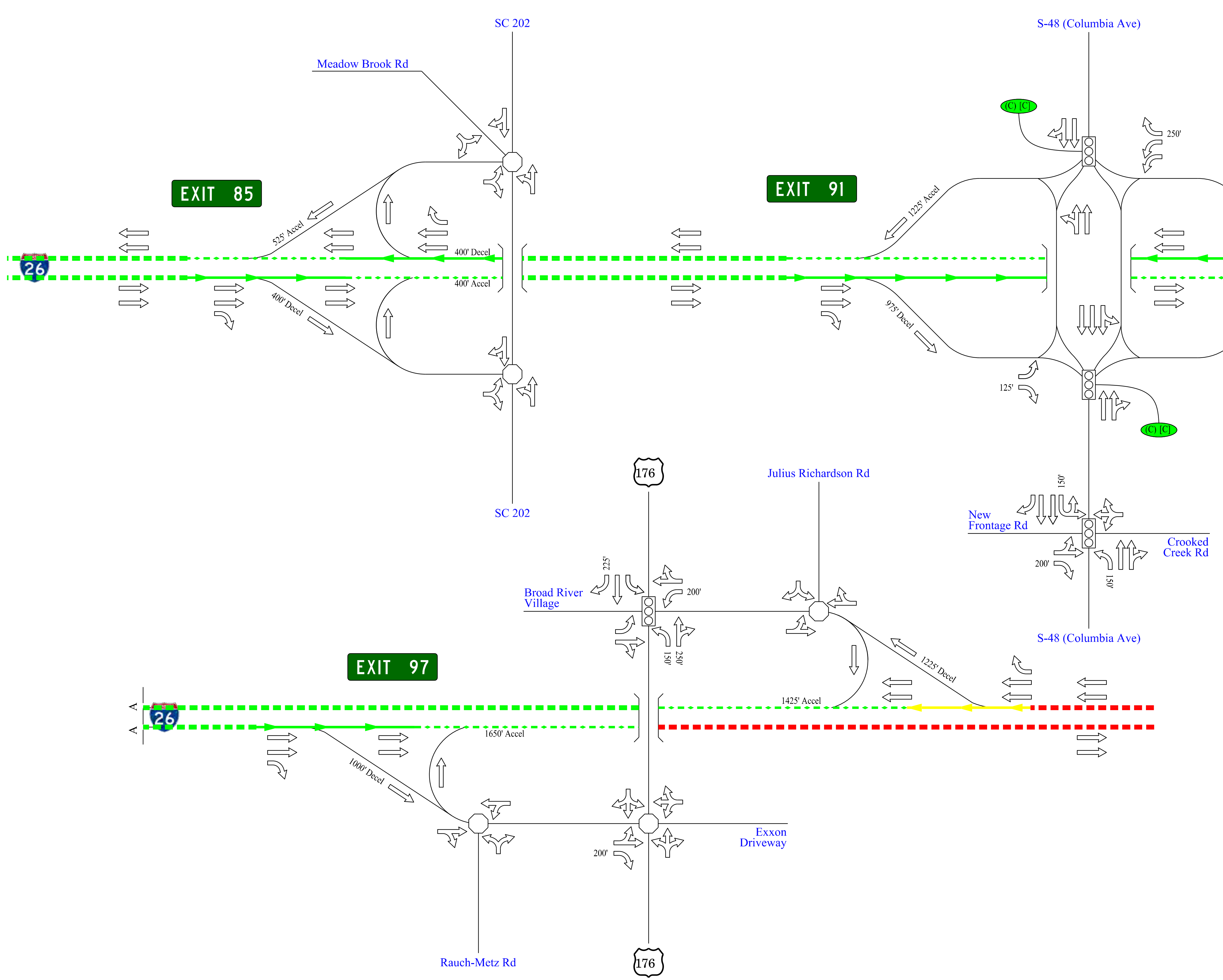
The results of the 2020 Build Freeway / Merge / Diverge analysis using Highway Capacity Software (HCS) 2010 indicate that just east of Exit 97 (US 176), I-26 is expected to operate at LOS E in the AM peak hour (eastbound) and during the PM peak hour (westbound). In addition the I-26 eastbound merge area from Exit 97 is expected to operate at LOS D along with the I-26 westbound diverge area during the PM peak hour. All other freeway segment / merge / diverge analyses are operating at LOS C or better.

Table 12 summarizes the LOS and density for each merge / diverge area with detailed HCS reports found in **Appendix G**.

Table 12: Build 2020 Freeway / Merge / Diverge LOS and Density

Approach	Description	HCM 2010 Level of Service (LOS)		Density (pc/mi/ln)	
		AM	PM	AM	PM
Freeway Segment					
Eastbound	West of Exit 85	A	B	10.9	13.5
	Between Exit 85 and Exit 91	B	B	12.1	13.2
	Between Exit 91 and Exit 97	C	C	20.1	20.3
	East of Exit 97	E	D	40.9	27.6
Westbound	East of Exit 97	B	E	15.9	38.4
	Between Exit 91 and Exit 97	B	C	13.5	20.5
	Between Exit 85 and Exit 91	A	B	7.9	11.9
	West of Exit 85	A	B	8.2	11.5
Merge Area					
Eastbound	EB Exit 85 On-Ramp	B	B	17.0	18.3
	EB Exit 91 On-Ramp	B	B	18.0	18.2
	EB Exit 97 On-Ramp	D	C	30.8	24.3
Westbound	WB Exit 97 On-Ramp	B	B	12.1	19.6
	WB Exit 91 On-Ramp	A	B	6.9	11.6
	WB Exit 85 On-Ramp	B	B	11.7	15.5
Diverge Area					
Eastbound	EB Exit 85 Off-Ramp	B	B	14.7	18.0
	EB Exit 91 Off-Ramp	B	B	11.1	12.5
	EB Exit 97 Off-Ramp	C	C	20.3	20.6
Westbound	WB Exit 97 Off-Ramp	B	D	13.6	31.6
	WB Exit 91 Off-Ramp – Alt 1	B	B	10.6	18.8
	WB Exit 91 Off- Ramp – Alt 2	B	B	10.6	16.3
	WB Exit 91 Off Loop Ramp – Alt 2	A	B	9.0	18.8
	WB Exit 85 Off-Ramp	B	B	10.8	16.0

Figure 13 and 14 shows the LOS for the 2020 Build Conditions for Alternative 1 and 2.



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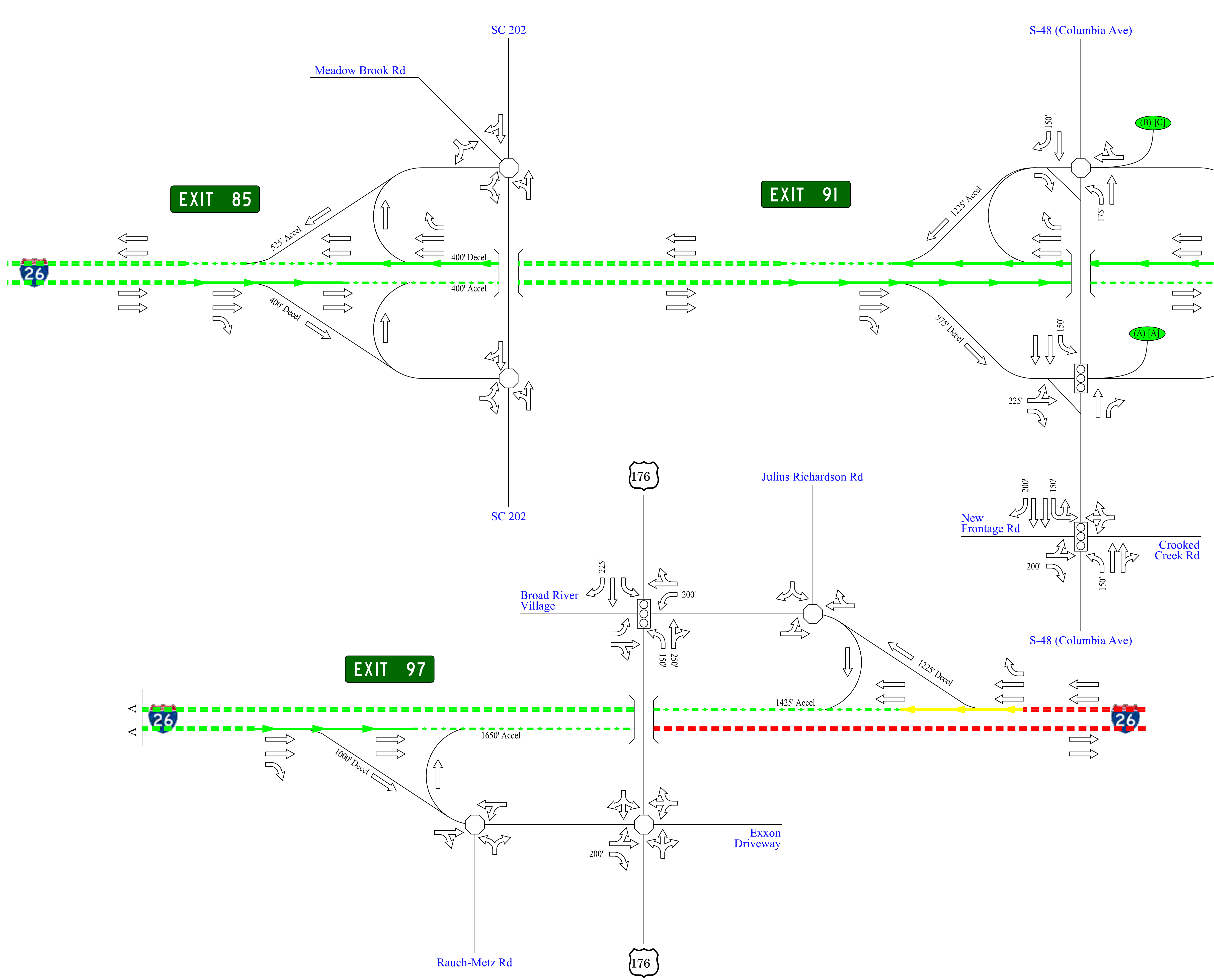
2020 Build Alternative 1
LOS and Laneage
Figure 13

- Freeway Segment
- Merge Segment
- Diverge Segment
- LOS A/B/C
- LOS D
- LOS E/F
- XX' Laneage & Storage Length
- (X) [X] Intersection AM Peak and PM Peak Level of Service
- Signalized Intersection
- Unsignalized Intersection

SCDOT
AECOM



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2020 Build Alternative 2
LOS and Laneage
Figure 14

	Freeway Segment
	Merge Segment
	Diverge Segment
	LOS A/B/C
	LOS D
	LOS E/F
XX'	Laneage & Storage Length
(X) [X]	Intersection AM Peak and PM Peak Level of Service
	Signalized Intersection
	Unsignalized Intersection

SCDOT
AECOM

3.8 BUILD 2040 TRAFFIC ANALYSIS

The 2040 Build scenario analyzes the conditions for three-interchange alternatives at Exit 91. For three Alternatives, the following changes were included in the 2040 Build scenario:

- A New Frontage Road approximately 1000 feet to the south of the I-26 eastbound ramps was included to carry the traffic of the proposed Chapin Technology Park. The new Frontage Road was assumed to be a signalized intersection.
- Ellet Road (old frontage road) was removed in the Build scenario. In the Build scenario, Ellet Road traffic redistributed and added to the New Frontage Road traffic.
- Crooked Creek Road was realigned to connect to the New Frontage Road intersection with S-48. In the Build scenario, it will not have direct access to the I-26 EB on ramp. Crooked Creek Road traffic was redistributed and added to the Frontage Road traffic.

The results of the Build 2040 analysis using Synchro 9.1 indicate that two of three alternatives are expected to operate at LOS C of better. Alternative 1 (DDI) is expected to have signals at both ramps; therefore, the LOS is balanced at both intersections to obtain proper signals timing. Alternative 2 (Partial Cloverleaf) has an expected LOS A at the I-26 eastbound ramps because no signal is recommended at the I-26 westbound ramps and signal can operate independently. Alternative 3 (Dual Roundabouts) is expected to operate at LOS F for the westbound ramps during the PM peak hour; therefore, it should not be considered as a viable alternative.

Table 13 summarizes the LOS and delay for each of study intersections with detailed Synchro reports found in **Appendix L and M**. Detailed Sidra output reports are found in **Appendix N**.

Table 13: Build 2040 Intersection LOS and Delay

ID	Intersection	Traffic Control	Approach	HCM 2010 Level of Service (LOS)		Control Delay (sec/veh)	
				AM	PM	AM	PM
Exit 91 (I-26 at S-48) – Diverging Diamond Interchange – Alt 1							
1	I-26 Eastbound Ramps at S-48	Signalized	-	C	C	24.3	25.1
21	I-26 WB Ramps at S-48	Signalized	-	C	C	26.6	29.2
22	S-48 at I-26 WB Off Ramp	Signalized	-	B	B	19.4	16.9
Exit 91 (I-26 at S-48) – Partial Cloverleaf – Alt 2							
1	I-26 Eastbound Ramps at S-48	Signalized	-	A	A	4.2	5.0
2	S-48 at I-26 WB Off Ramp	Unsignalized	WB	B	C	13.3	21.0

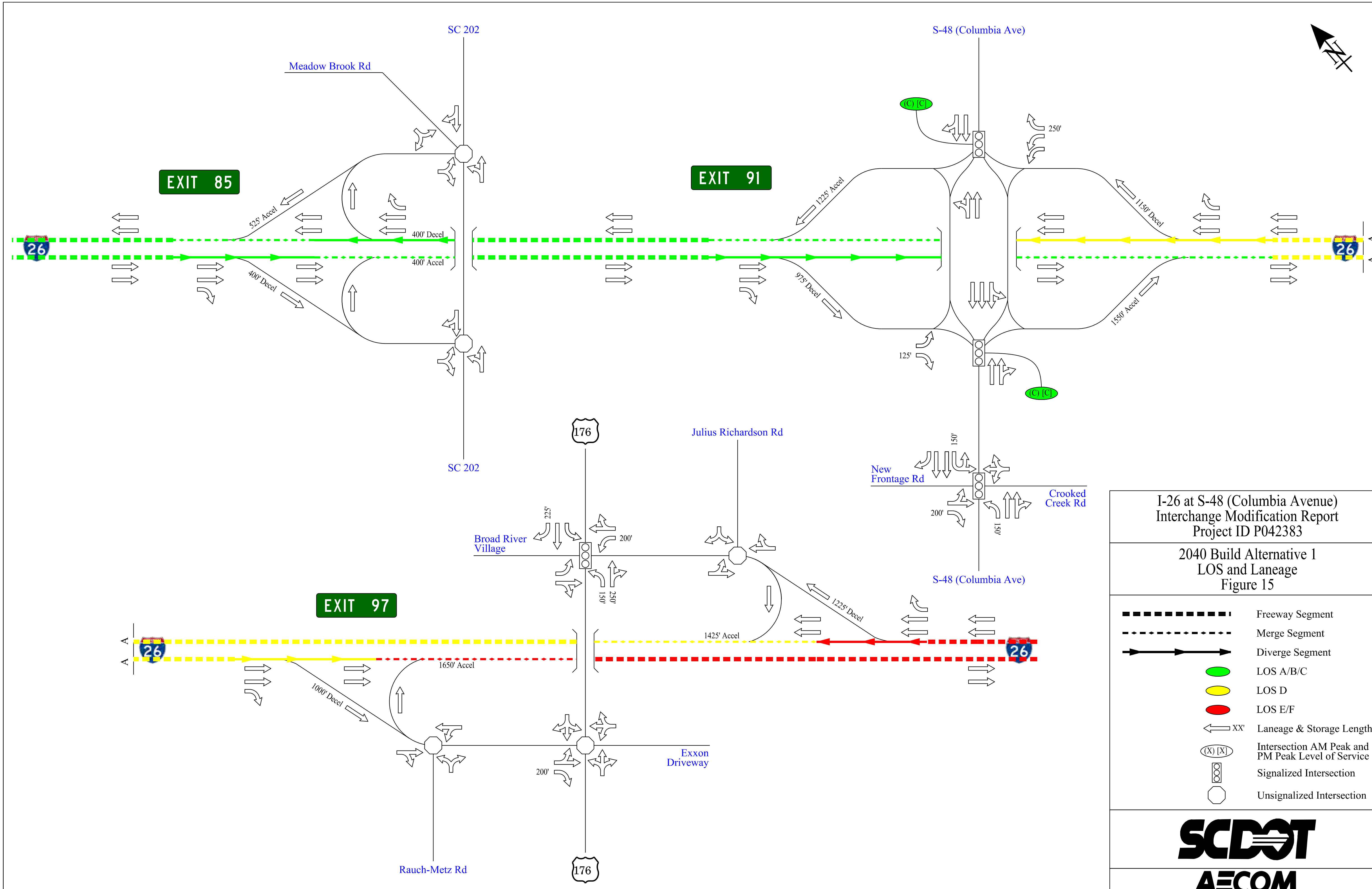
The results of the 2040 Build Freeway / Merge / Diverge analysis using Highway Capacity Software (HCS) 2010 indicate that just east of Exit 97 (US 176), I-26 is expected to operate at LOS F in the AM and PM peak hours. Between Exit 91 and Exit 97, the freeway is expected to operate at LOS D in the AM peak hour (eastbound) and PM peak hour (westbound). The PM hour diverge at Exit 91 is also LOS D. In addition the I-26 eastbound merge area from Exit 97 is expected to operate at LOS F along with the I-26 westbound diverge area during the PM peak hour. All other freeway segment / merge / diverge analyses are operating at LOS C or better.

Table 14 summarizes the LOS and density for each merge / diverge area with detailed HCS reports found in **Appendix I**.

Table 14: Build 2040 Freeway / Merge / Diverge LOS and Density

Approach	Description	HCM 2010 Level of Service (LOS)		Density (pc/mi/ln)	
		AM	PM	AM	PM
Freeway Segment					
Eastbound	West of Exit 85	B	C	15.8	19.5
	Between Exit 85 and Exit 91	B	C	17.5	19.1
	Between Exit 91 and Exit 97	D	D	31.3	33.0
	East of Exit 97	F	F	105.3	50.3
Westbound	East of Exit 97	C	F	23.3	91.3
	Between Exit 91 and Exit 97	C	D	19.5	32.4
	Between Exit 85 and Exit 91	B	B	11.1	17.1
	West of Exit 85	B	B	11.5	16.5
Merge Area					
Eastbound	EB Exit 85 On-Ramp	C	C	23.0	24.7
	EB Exit 91 On-Ramp	C	C	26.2	27.2
	EB Exit 97 On-Ramp	F	F	42.0	34.7
Westbound	WB Exit 97 On-Ramp	B	D	18.6	28.3
	WB Exit 91 On-Ramp	B	B	10.6	17.4
	WB Exit 85 On-Ramp	B	C	15.6	21.3
Diverge Area					
Eastbound	EB Exit 85 Off-Ramp	C	C	20.9	25.1
	EB Exit 91 Off-Ramp	B	B	17.8	19.5
	EB Exit 97 Off-Ramp	D	D	29.7	30.7
Westbound	WB Exit 97 Off-Ramp	C	F	21.5	44.2
	WB Exit 91 Off-Ramp – Alt 1	B	D	17.7	28.3
	WB Exit 91 Off- Ramp – Alt 2	B	A	10.6	6.7
	WB Exit 91 Off Loop Ramp – Alt 2	B	C	16.1	25.8
	WB Exit 85 Off-Ramp	B	C	15.0	22.5

Figure 15 and 16 shows the LOS for the 2040 Build Conditions for Alternative 1 and 2.



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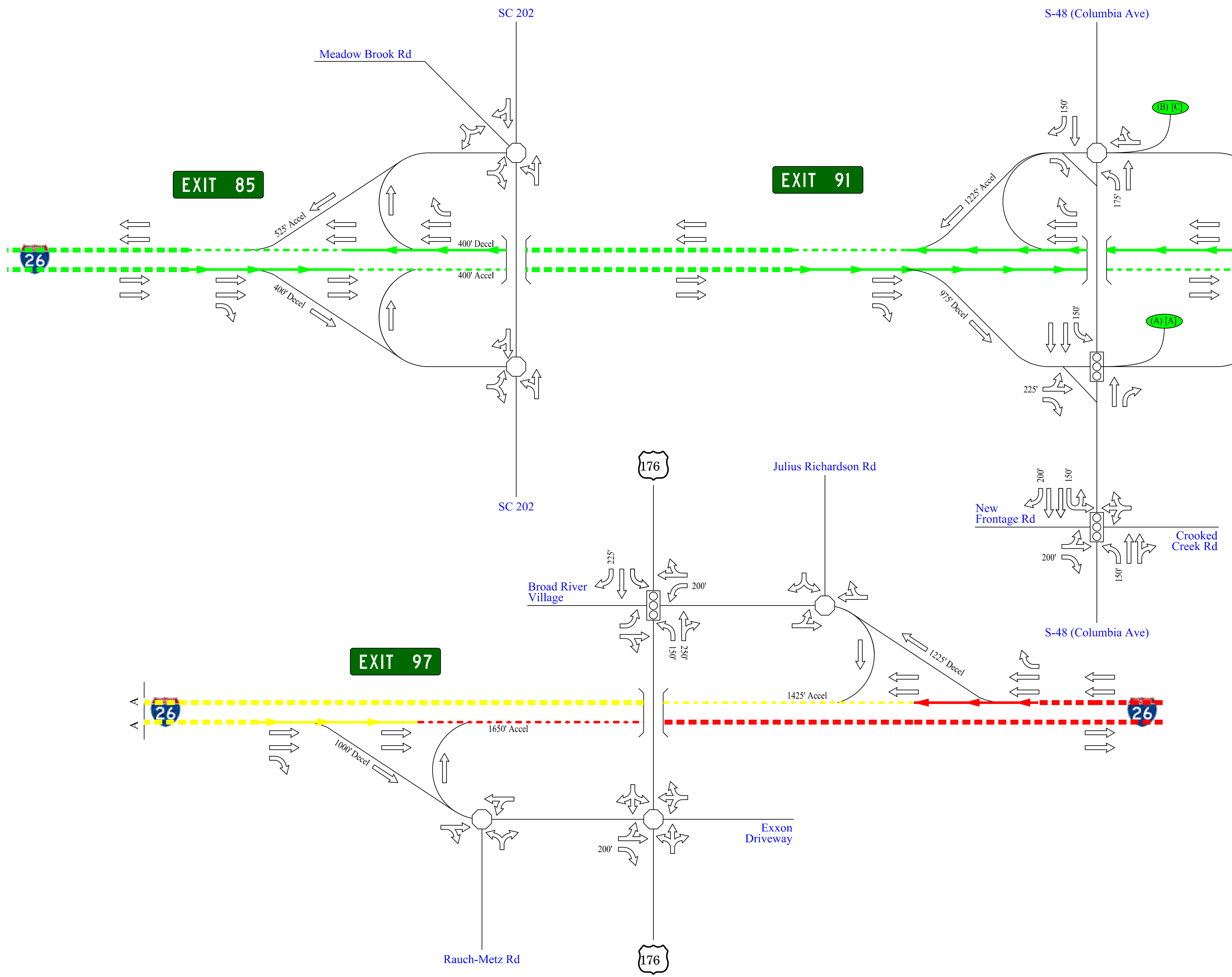
2040 Build Alternative 1
LOS and Laneage
Figure 15

SCDOT
AECOM



I-26 at S-48 (Columbia Avenue)
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2040 Build Alternative 2
LOS and Laneage
Figure 16

	Freeway Segment
	Merge Segment
	Diverge Segment
	LOS A/B/C
	LOS D
	LOS E/F
XX'	Laneage & Storage Length
(X) [X]	Intersection AM Peak and PM Peak Level of Service
	Signalized Intersection
	Unsignalized Intersection

4.0 VISSIM ANALYSIS

Simulation modeling is a very useful tool for designing improvements to the roadway system. It enables engineers and planners to predict and compare the outcomes of both No-Build and Build alternatives. For this project VISSIM 7.0 software was selected for the traffic operational analysis due to its powerful multi-model modeling capabilities. VISSIM is stochastic traffic simulation software that uses the psycho-physical driver behavior model developed by R. Wiedemann. It combines a perceptual model of the driver with a vehicle model. Every driver with his or her specific behavior characteristics is assigned to a specific vehicle. As a result, the driver behavior corresponds to the technical capabilities of his vehicle. In addition, the optional 3D visualization capability makes it easier to visualize the traffic flow patterns in the corridor. As a result the analyst can see the issues in the model and propose the appropriate solution

4.1 MODEL DEVELOPMENT

The following subsections summarize the data collection, field observations, traffic assignment, and other relevant inputs that were required for the development of the VISSIM models. First, the existing condition models were developed and calibrated, which then served as the base for the development of the future year No-Build and Build model networks.

4.1.1 Geometric Data

To assist in coding of the model network, aerial photography was obtained using VISSIM 7's built-in Bing Maps aerial feature. In addition, Google Maps was also used to for the geometrical information of the study corridor. Lane configurations were initially taken from the aerial pictures and confirmed with the field observations.

Grades (gradient) are an important element of the microsimulation models as they directly impact the vehicle acceleration and deceleration parameters. It is particularly very important for a heavy truck's acceleration and deceleration travelling at the higher speed. The field observations data suggested that grades are very slight in the study area. The study team utilized United States Geological Survey (USGS)[1] data to obtain grades for the model segments.

4.1.2 Traffic Control Data

4.1.2.1 Signal Controllers

VISSIM can model signalized intersections using either the built-in fixed-time control or various other external signal control logic formats. Among the available external logic formats is the Ring Barrier Controller (RBC), which was used in this model at the signalized intersection. The settings on this controller type are saved to an external data file with the extension *.rbc.

[1] http://viewer.nationalmap.gov/basic/

It should be noted that in the 2014, 2020 No-Build and 2040 No-Build scenarios the signals were coded as RBC – Actuated Uncoordinated.

For the 2020 and 2040 Build AM and PM scenarios, the signals on S-48 (Columbia Avenue) interchange (DDI) were coded as RBC- Actuated Coordinated. In addition, the signal at I-26 WB On & Off Ramps and US-176 are coded as Actuated Uncoordinated.

4.1.2.2 Signal Timings

Traffic signal timing plans for the two signalized intersections; I-26 westbound On-Off Ramps & Columbia Avenue intersection and I-26 WB On-Off Ramps & Columbia Avenue intersection were obtained from the South Carolina Department of Transportation. However, the plans only had minimum, maximum, yellow, red times and phase information. Based on this, 2014 AM and PM peak hour Synchro models were developed and optimized to calculate the splits and cycle lengths. Split and cycle length information was entered into the VISSIM models.

Similarly, 2020 and 2040 AM and PM peak hour No-Build and Build synchro models were developed to obtain the signal timing information, which was then used in the VISSIM models.

4.1.2.3 Stop Signs

Stop controlled intersections are modeled in VISSIM using a combination of stop signs and priority rules. The stop sign and stop line of the priority rule define the location at which vehicles must stop. The amount of time a vehicle is stopped is determined by the time distribution assigned to the respective vehicle class. In the absence of time distributions, a vehicle will stop for one time step. Priority rules are implemented to establish the minimum gap time and headway at which the stopped vehicle may proceed into the receiving traffic stream. Stop and yield signs were coded based on the aerial data.

4.1.3 Speed Data

The posted speed limits data on the roadways were collected from Google Maps' street view function. For the existing year model calibration, the average speed data for section along the interstate corridor was collected from INRIX. This data was used to develop the desired speed distribution for the I-26 segments. The desired speed distribution for the turning vehicles at an intersection was assumed to be 17 MPH and 14 MPH for cars and heavy vehicles respectively with a 1.5 MPH of standard deviation.

Table 15: Speed Distribution

SD No	Speed Limit (MPH)	Min	Max	15%	85%
3	15	10	20		
5	25	20	30		
7	35	30	40		
8	40	35	45		
9	45	40	50		
10	50	45	55		
15	65	40	75	60	70
18	65	60	85	70	78.8

Desired Speed Decision points are used for permanent speed changes within the network and are coded at locations where the speed change would typically occur (location of speed signs).

A new series of desired speed distributions are assigned to each vehicle class at the Desired Speed Decision point. Therefore, as a vehicle passes over a decision point, its speed is adjusted according to the new distribution.

Reduced Speed Areas were used to model short sections with reduced speeds (curves or turns). Similar to the Desired Speed Decision points, a new set of desired speed distributions (in this case 'reduced' speeds) are assigned to each vehicle class to account for slower speeds within the reduced speed area. However, unlike the Desired Speed Decision Point, when encountering a Reduced Speed Area, each vehicle begins to decelerate in advance to reach the lower desired speed as it enters the defined area. After leaving the reduced speed area, the vehicle returns to its actual desired speed.

The Reduced Speed Areas coded in the model correspond to turns (left and right) and locations that because of their geometry will impose a mandatory reduction on the speed of vehicles, independently of their originally desired speed.

4.1.4 Traffic Input

VISSIM supports two different forms of vehicle assignments; Dynamic and Static. In dynamic assignment, the vehicle travels from its origin to designation based on the best available route. Parking lots are used as the origin and destination points and generally there are multiple routes between each origin and destination.

Static assignment assumes that the vehicle will follow an assigned path or route from its origin to destination irrespective of the friction or cost. Route is a sequence of links and connectors from a routing decision point to the destination(s).

The study corridor does not have multiple routes option i.e. for a vehicle there is only one route available to travel between any origin and destination. Hence, it was determined that the static assignment would be the most suitable to replicate the existing conditions. Each vehicle input source on I-26 and cross-streets had its routing decision point. Route stretched to each on and off-ramp followed by another routing decision (origin) to eventually take the vehicles through interchange to reach its destination. No vehicles are taken out or added to the network automatically; therefore, it is important that balanced volume flows are entered.

4.1.4.1 Traffic Composition

The default vehicle types available in VISSIM are Car, HGV (truck), Bus, Tram (transit), Bike, and Pedestrian. These can be used to define traffic composition for a microsimulation model. For the purpose of this study, only two default vehicle types; Car and HGV (truck) were utilized.
Traffic compositions are the proportions of each vehicle type present in each of the vehicle input sources. Vehicle Inputs are time variable traffic volumes entered at the source node. For the modeling purpose, I-26 (East and West ends of the model) and the cross-streets were defined as source nodes.

4.1.4.2 Exiting Condition Volumes

The 2014 Existing Condition AM and PM peak hour turning movement volumes were developed from the (2014) collected counts. Most of the collected approach and receiving volumes were balanced. However, at some locations where the approach and receiving volumes were off, minor adjustments were done to get the balanced volumes. No vehicles were taken out or added to the network automatically; therefore, it was important that balanced volume flows were entered.

4.1.4.3 2020 and 2040 No-Build and Build Volumes

It was assumed that in 2020 or 2040 the traffic pattern i.e. origin and destination would remain unchanged between the No-Build and Build scenarios. Hence, the No-Build and Build condition traffic volumes were kept consistent.

4.1.5 Driving behavior Parameters

During the simulation, the driver behavior parameters are used to guide the vehicles through the model network. VISSIM uses five driving behavior models, out of which only two; Urban (Motorized) and Freeway (Free Lane Selection) were used for the development of the base year model network. The Urban (Motorized) parameter was used to model surface streets within the network. The Freeway (Free Lane Selection) parameter was used to model the freeway facilities within the project network.

4.1.5.1 Data Limitations

There were a few limitations associated with the collected data. Limitations and relevant logical solution are listed below:

- Traffic Signal Data:
  - Signal plans were obtained from the SCDOT, however, the signal timing, splits and offsets were not available.
    - VISSIM (RBC controller) requires various signal parameter inputs. Using the information provided in the signal plan, Synchro models were developed to develop and optimized to generate the splits and timings.
    - Using the base year Synchro model, 2020 and 2040 No-Build Synchro models and signal timing data were developed.

- Grade/Elevation Data:
    - Grade or Elevation is an important component of microsimulation as it can have a significant impact on the acceleration and deceleration parameter of a vehicle, especially on the heavy trucks. As mentioned in the **Section 4.2** elevation data was obtained from the United States Geological Survey (USGS) and grades were calculated using the best engineering judgement. Grades were then applied to the model segments.

- Traffic Volumes:
  - At some locations, including on I-26 mainline, traffic counts were not available such as west of Exit 91. The only 24-hour traffic count on I-26 that was conducted just east of Exit 91.
    - Using the engineering judgement, logical existing and future traffic volumes were back calculated and balanced.

4.2 BASE YEAR MODEL CALIBRATION AND VISUAL VALIDATION

In order to achieve logical microsimulation results, it is imperative to calibrate and validate the model using observed field data. It should be noted that there are no universally accepted or definitive methods for performing model calibration and validation. The responsibility lies with the modeler to adopt and implement a suitable procedure depending upon the scope and budget of the project that will provide an acceptable level of confidence in the model results. Once the calibration targets are achieved, the same parameters can then be applied to the future year models.

4.2.1 Calibration Criteria

To ensure satisfactory calibration of the model, standards were used to establish targets regarding traffic flows and travel times. The targets of this calibration effort were set at the values included in Traffic Analysis Toolbox Volume III –Guidelines for Applying Traffic Microsimulation Modeling Software[2] published by the Federal Highway Administration (FHWA) shown below:

Criteria and Measures	Calibration Acceptance Targets
Hourly Flows, Model Versus Observed	
Individual Link Flows	
Within 15%, for 700 veh/h < Flow < 2700 veh/h	> 85% of cases
Within 100 veh/h, for Flow < 700 veh/h	> 85% of cases
Within 400 veh/h, for Flow > 2700 veh/h	> 85% of cases
Sum of All Link Flows	Within 5% of sum of all link counts
GEH Statistic < 5 for Individual Link Flows*	> 85% of cases
GEH Statistic for Sum of All Link Flows	GEH < 4 for sum of all link counts
Travel Times, Model Versus Observed	
Journey Times, Network	
Within 15% (or 1 min, if higher)	> 85% of cases
Visual Audits	
Individual Link Speeds	
Visually Acceptable Speed-Flow Relationship	To analyst's satisfaction
Bottlenecks	
Visually Acceptable Queuing	To analyst's satisfaction

GEH measure is a formula used in traffic modeling to compare two sets of traffic volumes (Observed and Modeled). Its mathematical formulation is similar to the Chi-Squared test, but it is not a true statistical test but rather an empirical formula. The formulation for the GEH Statistic is as follows:

$$GEH = \sqrt{\frac{2 * (M - O)^2}{(M + O)}}$$

Where M represents model estimate volume and O represents field counts.

[2] http://ops.fhwa.dot.gov/trafficanalysistools/tat_vol3/vol3_guidelines.pdf, page64

This statistic is typically used to offset the discrepancies that occur when using only simple percentages, as traffic volumes vary over a wide range. In other words, if using only percentages, small absolute discrepancies have no impact on large volumes but a large percent impact in smaller numbers, and vice versa. It has been shown that for traffic volumes smaller than 10,000 a five percent variation yields smaller numbers than a GEH of five. Beyond 10,000, five percent differences keep growing linearly whereas GEH=5 follows a decaying curve.

Based on the scope and purpose of this study it was determined that base year model calibration will be based on the link flows, travel time and speed criteria. For the link volume calibration, 2014 traffic counts and turning movements were used to compare with the model link volumes.

For the link speed comparison, it was recommended to use the INRIX speed data against the model link speeds. In the study area, INRIX only provided speeds on the I-26 links, therefore only I-26 model link speeds were used for the calibration and validation purposes. Data collection points were placed on I-26 corridor in areas upstream and downstream of merge and diverge at the locations of the INRIX speed data collection.

4.2.2 Simulation Setting and Random Seed Variation

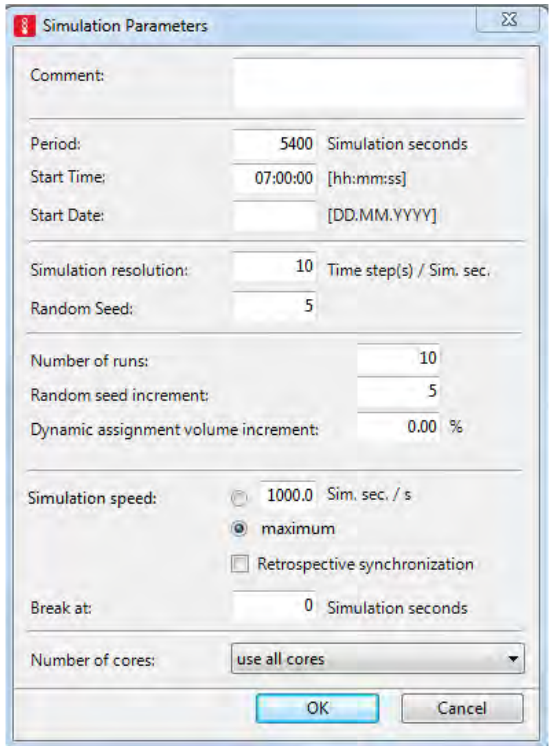
The AM peak hour model was set run from 7:00-8:30 AM with 30 minutes of seeding time. Hence, the actual analysis period was 7:30-8:30AM. Similarly, the PM peak hour model was set to run from 4:15 – 5:45PM with 30 minutes of seeding time. The actual PM analysis period was from 4:45 – 5:45PM. The model was ran ten times starting with a random seed at five with five seed increments. Simulation parameter settings are pictorially shown on the following page.

4.2.3 Visual Validation

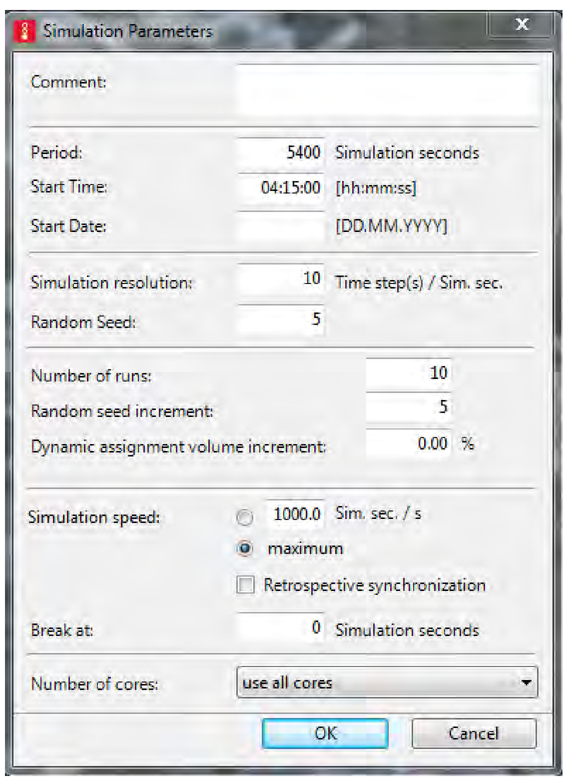
Visual validation of the models is an imperative step in the development and calibration of the model. It is essential for the modeler to perform a thorough visual validation to eliminate any coding errors and achieving logical results.

After coding, the models were ran and visually inspected multiple times. The errors pertaining to the lane change decision, yield, conflict area, etc. were then addressed to achieve realistic vehicle movements. The validation process was performed for all the existing, no-build and build models.

Simulation Settings – AM



Simulation Settings – PM



4.2.4 Calibration Results

2014 Existing Condition AM and PM peak hour models were run with the VISSIM's default simulation parameters settings. It was observed that with the default simulation parameters the models' link volumes were within the desired ranges for the calibration. However, the model link speeds were less than the observed INRIX speeds on the I-26 links. Hence, some minor adjustments to the desired speed distribution and speed curve were performed to account for the higher speeds observed in the INRIX data.

4.2.4.1 Link Volumes and Speed

A model is assumed to be reasonably calibrated, if:

- Link flows satisfy modeled versus observed flow thresholds for 85% of the individual links.
- Sum of all link flows is within 5% of sum of all link counts.
- 85% of the network link flows have a GEH less than 5.
- Model link speeds fall within ±2.5MPH of INRIX Speeds.

Table 16 and 17 shows overall calibration results under AM and PM peak hours.

Table 16: 2014 AM Peak Hour Calibration Results

Calibration Summary			
Speed Data			
MOE Criteria	**Target**	**Actual**	**Calibrated**
Within Acceptable Range (±5 MPH of INRIX Speed)	90%	100.0%	Calibrated
Within Desirable Range(±2.5 MPH of INRIX Speed)	75%	100.0%	Calibrated
Flow (Count) Data			
MOE Criteria	**Target**	**Actual**	**Calibrated**
Individual Link Flow	85%	99.1%	Calibrated
Sum of All Link Flows	5%	1.4%	Calibrated
GEH Individual Link	85%	98.0%	Calibrated
GEH - All Links	5.00	2.40	Calibrated

Table 17: 2014 PM Peak Hour Calibration Results

Calibration Summary			
Speed Data			
MOE Criteria	**Target**	**Actual**	**Calibrated**
Within Acceptable Range (±5 MPH of INRIX Speed)	90%	100.0%	Calibrated
Within Desirable Range(±2.5 MPH of INRIX Speed)	75%	100.0%	Calibrated
Flow (Count) Data			
MOE Criteria	**Target**	**Actual**	**Calibrated**
Individual Link Flow	85%	100.0%	Calibrated
Sum of All Link Flows	5%	1.2%	Calibrated
GEH Individual Link	85%	100.0%	Calibrated
GEH - All Links	5.00	2.26	Calibrated

4.2.4.2 Travel Time

A model is reasonably calibrated when the modeled travel times are within 15% (or one minute if higher) of the average field collected travel time for 85% of the cases. **Table 18** shows the AM and PM peak hour travel time calibration results.

Table 18: Travel Time Calibration Results

Time	Percentage	Calibrated
7:30 AM - 8:30 AM	100%	Calibrated
4:45 PM - 5:45 PM	100%	Calibrated

Percentage of Travel Times within 15% (or one minute)

4.3 MEASURES OF EFFECTIVENESS

4.3.1 95th Percentile (Worst Case) Methodology

For the AM and PM peak hourly analysis, *95 percent Worst Case Result method*[3] as described in the FHWA Tool Box was utilized for the worst case (density) determination. The equation below shows the 95th percentile density equation:

95 percent Worst Result = $M + 1.64 * S$
Where,
M = Mean observed result (weighted density) in the model runs;
S = Standard deviation of the result (weighted density) in the model runs

Weighted delay results from the 10 batch runs were compiled by each intersection. Further, average and standard deviation in the model runs were calculated. The resultant weighted delay was calculated utilizing the 95 percent worst case result method. Error! Reference source not found.**Table 19** below shows the 95th percentile delay calculation method.

Table 19: 95th Percentile Calculation Method

Time	Calibrated
Model Runs	Intersection Average Delay
Run 1	D1
Run 2	D2
Run 3	D3
…	…
Run 10	D16
Average Wt. Delay (D_a)	D_a = (D1+D2+D3+……..+D10) / 10
St. Deviation (S_d)	S_d = Stand. Dev (D1, D2, D3, …..,D10)

[3] http://ops.fhwa.dot.gov/trafficanalysistools/tat_vol3/Vol3_Guidelines.pdf page 77

4.3.2 Delay Reporting for Stop and Signal Controlled Intersections

Stop Controlled Intersection

Most of the stop controlled intersections in the study corridor are “1-Way Stop”. Because the main approach is generally a free-flow with heavy traffic movement, the stop controlled movement is weighted out. As a result, even though the stop controlled approach operated at LOS E or F but overall the intersection reported as operating at LOS D or better. It was determined that for stop controlled intersections, worst approach delay should be reported.

Signalized (or Signal Controlled Intersection)

For the signal controlled intersections, the 95th percentile of the overall (weighted) delays were calculated.

MOEs for the all the No-Build and Build models are compiled in the following subsections.

4.3.3 2014 Existing Condition AM and PM Peak Hour MOEs

After the existing conditions VISSIM model was calibrated, the measures of effectiveness (MOEs) for existing conditions were obtained for the AM and PM peak hours.

Table 20 shows the intersection delay and Level of Service for the both the peak periods.

Table 20: 2014 Existing AM / PM Peak Hour Delay and LOS (VISSIM)

Intersection	2014 Existing Condition					
	Exit #	Intersection Traffic Controller	AM		PM	
			Avg. Delay (Sec. / Veh.)	LOS*	Avg. Delay (Sec. / Veh.)	LOS*
S-48 and I-26 WB Ramps	91	Signalized	14.1	B	19.5	B
S-48 and I-26 EB Ramps		Stop	14.5	B	19.7	C

*Delay and LOS for the stop controlled intersection is the worst case approach delay and LOS observed. It is not the overall delay and LOS for the stop controlled intersection.

4.3.4 2020 No-Build AM and PM Peak Hour MOEs

Table 21 shows the intersection delay and level of service for the AM and PM peak hours under 2020 No-Build scenario.

Table 21: 2020 No-Build AM / PM Peak Hour Delay and LOS (VISSIM)

Intersection	2020 No-Build Condition					
	Exit #	Intersection Traffic Controller	AM		PM	
			Avg. Delay (Sec. / Veh.)	LOS*	Avg. Delay (Sec. / Veh.)	LOS*
S-48 and I-26 WB Ramps	91	Signalized	51.6	D	81.0	F
S-48 and I-26 EB Ramps		Stop	>300.0	F	>300.0	F

*Delay and LOS for the stop controlled intersection is the worst case approach delay and LOS observed. It is not the overall delay and LOS for the stop controlled intersection.

4.3.5 2020 Build (DDI) AM and PM Peak Hour MOEs

In addition to the DDI project, the following changes were included in the 2020 Build scenario:

- A New Frontage was included to carry the traffic of the proposed future developments. It was connected to the Columbia Avenue around Shell Gas Station, south of the I-26 EB Ramps intersection. It coded and analyzed as a signalized intersection.
- Ellet Road was removed in the built scenario. In the build scenario, Ellet Road traffic redistributed and added to the New Frontage Road traffic.
- Crooked Creek Road was realigned to connect to the New Frontage Road intersection with Columbia Avenue. In the build scenario, it will not have direct access to the I-26 EB on ramp. Crooked Creek Road traffic was redistributed and added to the Frontage Road traffic.

Table 22 shows the intersection delay and level of service for the AM and PM peak hours under 2020 Build scenario. The build scenario would be a Diverging Diamond Interchange (DDI) at I-26 and Columbia Avenue interchange.

Table 22: 2020 Build (DDI) AM / PM Peak Hour Delay and LOS (VISSIM)

Intersection	2020 Build Condition					
	Exit #	Intersection Traffic Controller	AM		PM	
			Avg. Delay (Sec. / Veh.)	LOS*	Avg. Delay (Sec. / Veh.)	LOS*
S-48 and I-26 WB Ramps	91	Signalized	15.5	B	16.3	B
S-48 and I-26 EB Ramps		Signalized	12.0	B	12.6	B

*Delay and LOS for the stop controlled intersection is the worst case approach delay and LOS observed. It is not the overall delay and LOS for the stop controlled intersection.

4.3.6 2040 No-Build AM and PM Peak Hour MOEs

Table 23 shows the intersection delay and level of service for the 2040 No-Build AM and PM peak hour scenario.

Table 23: 2040 No-Build AM / PM Peak Hour Delay and LOS (VISSIM)

Intersection	2040 No-Build Condition					
	Exit #	Intersection Traffic Controller	AM		PM	
			Avg. Delay (Sec. / Veh.)	LOS*	Avg. Delay (Sec. / Veh.)	LOS*
S-48 and I-26 WB Ramps	91	Signalized	74.2	E	90.9	F
S-48 and I-26 EB Ramps		Stop	>300.0	F	>300.0	F
*Delay and LOS for the stop controlled intersection is the worst case approach delay and LOS observed. It is not the overall delay and LOS for the stop controlled intersection.						

4.3.7 2040 Build (DDI) AM and PM Peak Hour MOEs

In 2040 Build scenario, in addition to the DDI project, the following changes were included in the 2040 Build scenario:

- A New Frontage was included to carry the traffic of the proposed future developments. It was connected to the Columbia Avenue around Shell Gas Station, south of the I-26 EB Ramps intersection. It coded and analyzed as a signalized intersection.
- Ellet Road was removed in the built scenario. In the build scenario, Ellet Road traffic redistributed and added to the New Frontage Road traffic.
- Crooked Creek Road was realigned to connect to the New Frontage Road intersection with Columbia Avenue. In the build scenario, it will not have direct access to the I-26 EB on ramp. Crooked Creek Road traffic was redistributed and added to the Frontage Road traffic.

Table 24 shows the intersection delay and level of service for the 2040 Build AM and PM peak hour scenario.

Table 24: 2040 Build (DDI) AM / PM Peak Hour Delay and LOS (VISSIM)

Intersection	2040 Build Condition					
	Exit #	Intersection Traffic Controller	AM		PM	
			Avg. Delay (Sec. / Veh.)	LOS*	Avg. Delay (Sec. / Veh.)	LOS*
S-48 and I-26 WB Ramps	91	Signalized	17.8	B	15.7	B
S-48 and I-26 EB Ramps		Signalized	24.5	C	27.5	C
*Delay and LOS for the stop controlled intersection is the worst case approach delay and LOS observed. It is not the overall delay and LOS for the stop controlled intersection.						

5.0 SUMMARY OF FINDINGS

The following is a summary of the results for the analysis of the project to provide interchange improvements at Exit 91 – S-48 (Columbia Avenue). As shown in this analysis, under the No-Build conditions, by 2020 the level of service begins to fail (LOS E/F) at the I-26 ramps. In the 2040 No-Build scenario, all intersections of concern at Exit 91 are at failing level of service conditions.

1. I-26 Eastbound Ramps at S-48
2. I-26 Westbound Ramps at S-48

The scenario in which the diverging diamond interchange alternative is constructed, the 2020 and 2040 Build conditions show an acceptable level of service (C or higher) at all intersections.

The HCS analysis of the freeway, merge, and diverge segments reach similar conclusions regarding acceptable levels of service. The freeway segments directly adjacent to Exit 91 in the Existing, No-Build, and Build scenarios operate at level of service D or better. Merge and diverge analysis at Exit 91 also indicates a level of service of D or better in the existing and 2020/2040 No-Build and Build years.

It should be noted that at Exit 97, to the East of Exit 91, intersections reach a failing level of service by 2020. Freeway segments reach failing conditions in 2040.

5.1 FINDINGS

2014 Existing Condition
The 2014 analysis results show that most of the intersections in the study area operate at LOS C or better.

2020 No-Build Condition
In the 2020 No-Build AM and PM scenarios, only a few stop controlled approaches operate at LOS D or better. The signalized intersections and stop controlled approaches listed below operate at a LOS E or worse.

- I-26 EB Ramps & S-48 Intersection ; Stop Controlled Approach
- I-26 WB Ramps & S-48 Intersection; Signalized Intersection

2020 Build (DDI) Condition
In the 2020 Build (DDI) AM and PM scenarios, both the intersections on S-48 (Columbia Avenue) operate well at LOS B. The signalized intersections listed below operate at a LOS E or worse:

- I-26 WB Off-Ramp & US-176; Signalized Intersection

2040 No-Build Condition
Under the 2040 No-Build condition the signalized intersections and stop controlled approaches listed below operate at a LOS E or worse:

- I-26 EB Ramps & S-48 Intersection ; Stop Controlled Approach
- I-26 WB Ramps & S-48 Intersection; Signalized Intersection

2040 Build (DDI) Condition
All the signalized intersections on S-48 (Columbia Avenue) operate at LOS C or better.

5.2 CONCLUSION AND RECOMMENDATION

The traffic analysis presented in this report suggests that the proposed diverging diamond alternative at S-48 (Columbia Avenue) interchange will operate acceptably in both the 2020 and 2040 build scenarios and does not adversely impact the adjacent interchanges.

6.0 FEDERAL HIGHWAY ADMINISTRATION (FHWA) POLICY

It is in the national interest to maintain the Interstate System to provide the highest level of service on terms of safety and mobility. Adequate control of access is critical to providing such service. Therefore FHWA has developed policy points that must be addressed prior to granting a new or modified access point to the interstate system. The policy points were originally detailed in the Federal Register on October 22, 1990 955 FR 42670), and updated in the Federal Register: February 11, 1998 (Volume 63, Number 28). On August 27, 2009 FHWA published a new policy in the Federal Register (Volume 74, Number 165. The following section details how the proposed action meets the requirements for the new or revised access points to the existing Interstate System.

Policy Point #1: *The need being addressed by the request cannot be adequately satisfied by existing interchanges to the Interstate, and/or local roads and streets in the corridor can neither provide the desired access, nor can they be reasonably improved (such as access control along surface streets, improving traffic control, modifying ramp terminals and intersections, adding turn bays or lengthening storage) to satisfactorily accommodate the design-year traffic demands (23 CFR 625.2(a)).*

Interstate 26 is an east / west main route of the interstate highway system in the southeastern United States. It spans from US 17 in Charleston, South Carolina to US 23 in Kingsport, Tennessee. I-26 is a 4-lane divided highway with a posted speed limit of 70 mile per hour. S-48 (Columbia Avenue) is a two lane minor arterial that connects downtown Chapin with I-26 at Exit 91. The existing Exit 91 interchange is a diamond interchange approximately 20 miles from Columbia, South Carolina. The eastbound off ramp is under stop control while westbound off ramp is signalized. No turn lanes are present to / from I-26. Access management concerns include Ellett Road which is less than 100 feet south of the I-26 eastbound off ramp and Crooked Creek Road which intersects with I-26 eastbound on ramp.

Access management along S-48 is also expected to improve with the proposed DDI. There are plans to consolidate closely spaced driveways adjacent to the interchange termini ramps to one frontage road intersecting S-48 over 1000 feet south of the interchange under signal control.

The purpose of the interchange modification is to improve the operational efficiency and safety of the existing interchange configuration and to accommodate projected traffic volumes. Based on 2020 and 2040 projection traffic volumes, both interstate off-ramps are expected to operate at LOS F with the current interchange configuration. Safety concerns include I-26 westbound off ramp queuing onto I-26 and unsignalized traffic control for the I-26 eastbound off ramp.

Policy Point #2: *The need being addressed by the request cannot be adequately satisfied by reasonable transportation system management (such as ramp metering, mass transit, and HOV facilities), geometric design, and alternative improvements to the Interstate without the proposed change(s) in access (23 CFR 625.2(a)).*

The diverging diamond interchange and partial cloverleaf alternatives were analyzed as part of this report. Results from the analysis indicates both alternatives are expected to provide a LOS C or better for the 2040 projected design volumes. The preferred alternative was the diverging diamond interchange due its right-of-way costs and location of the planned development north of the interchange. Ramp metering, mass transit, and HOV facilities are not warranted based on existing or design year volumes and are not expected to improve operations for this suburban interchange.

Policy Point #3: *An operational and safety analysis has concluded that the proposed change in access does not have a significant adverse impact on the safety and operation of the Interstate facility (which includes mainline lanes, existing, new, or modified ramps, ramp intersections with crossroad) or on the local street network based on both the current and the planned future traffic projections. The analysis shall, particularly in urbanized areas, include at least the first adjacent existing or proposed interchange on either side of the proposed change in access (23 CFR 625.2(a), 655.603(d) and 771.111(f)). The crossroads and the local street network, to at least the first major intersection on either side of the proposed change in access, shall be included in this analysis to the extent necessary to fully evaluate the safety and operational impacts that the proposed change in access and other transportation improvements may have on the local street network (23 CFR 625.2(a) and 655.603(d)).*

Requests for a proposed change in access must include a description and assessment of the impacts and ability of the proposed changes to safely and efficiently collect, distribute and accommodate traffic on the Interstate facility, ramps, intersection of ramps with crossroad, and local street network (23 CFR 625.2(a) and 655.603(d)). Each request must also include a conceptual plan of the type and location of the signs proposed to support each design alternative (23 U.S.C. 109(d) and 23 CFR 655.603(d)).

An operational analysis was performed for Existing 2014, Opening 2020, and Design 2040 years along I-26 between Exit 85 (SC 202) and Exit 97 (US 176). All mainline segments, merge and diverge ramp junctions as well as surface street intersection were studied. Synchro 9.1 was used for the intersections, HCS 2010 for the mainline segments and merge / diverge areas, and VISSIM 7.0 to model everything together.

The Existing 2014 traffic analysis indicates as shown in Figure 10 that majority of the study is operating at LOS C or better with following exceptions:

- US 176 at I-26 westbound off ramp (Exit 97)
- I-26 freeway segment east of Exit 97

The No-Build 2020 and 2040 traffic analysis indicates, as shown in Figure 11 and 12, that basically everything east of Exit 91 (S-48) is not operating at an acceptable LOS C. Please note the intersections on Exit 91 (S-48) are expected to operate at LOS F while the I-26 westbound segment prior to Exit 91 and off-ramp are projected to operate at LOS D.

The Build 2020 and 2040 traffic analysis indicates, as shown in Figure 13 and 15, that overall operations at the interchange of I-26 at S-48 (Columbia Avenue) would be improved when comparing to the No-Build scenario. East of Exit 91 (S-48) would continue to operate at LOS D until Exit 97 where the LOS worsens to F due to capacity on the mainline. Operation at the intersections on the surface streets at Exit 97 would not be impacted with the proposed interchange modification due to the 6-mile distance to the study interchange and would continue to operate the same as in the No-Build scenario.

Policy Point #4: *The proposed access connects to a public road only and will provide for all traffic movements. Less than "full interchanges" may be considered on a case-by-case basis for applications requiring special access for managed lanes (e.g., transit, HOVs, HOT lanes) or park and ride lots. The proposed access will be designed to meet or exceed current standards (23 CFR 625.2(a), 625.4(a)(2), and 655.603(d)).*

The proposed interchange modification for this project would provide all relevant traffic movements at the I-26 and S-48 interchange. The proposed interchange design concept will meet or exceed all applicable SCDOT, AASHTO, and FHWA design standards.

It should be noted that the proposed design plans to remove the existing Crooked Creek Road access with the I-26 eastbound on ramp and realign it with S-48 (Columbia Avenue) to the south. In addition, the closely spaced Ellett Road just south of the I-26 eastbound off ramp is expected to be realigned with this new Crooked Creek Road.

Policy Point #5: *The proposal considers and is consistent with local and regional land use and transportation plans. Prior to receiving final approval, all requests for new or revised access must be included in an adopted Metropolitan Transportation Plan, in the adopted Statewide or Metropolitan Transportation Improvement Program (STIP or TIP), and the Congestion Management Process within transportation management areas, as appropriate, and as specified in 23 CFR part 450, and the transportation conformity requirements of 40 CFR parts 51 and 93.*

The proposed project is consistent with the COATS 2035 Long Range Transportation Plan, and lists the S-48 (Columbia Avenue) project as a Prioritized Road Widening Project. The project is also included as a system upgrade in SCDOT's Statewide Transportation Improvement Program (STIP) for Lexington County. The STIP covers all federally funded transportation improvements for which funding has been approved and that are expected to be undertaken in the six-year period the STIP covers. The fiscally-constrained STIP includes approximately $13,000,000 for preliminary design services, right-of-way acquisition, and project construction through 2019. Full funding is reasonably anticipated to be available for its completion.

Policy Point #6: *In corridors where the potential exists for future multiple interchange additions, a comprehensive corridor or network study must accompany all requests for new or revised access with recommendations that address all of the proposed and desired access changes within the context of a longer-range system or network plan (23 U.S.C. 109(d), 23 CFR 625.2(a), 655.603(d), and 771.111).*

There are currently no planned or programmed additional interchanges within the study area for the project or the expanded study area for analysis of the adjacent interchanges in the SCDOT STIP or the Central Midland Council of Governments (CMCOG) Long Range Plan.

In the event that a project to construct an interchange is initiated in the future it will also be subject to the FHWA policy for additional access to the Interstate System, and an Interchange Justification Report will be required.

Policy Point #7: *When a new or revised access point is due to a new, expanded, or substantial change in current or planned future development or land use, requests must demonstrate appropriate coordination has occurred between the development and any proposed transportation system improvements (23 CFR 625.2(a) and 655.603(d)). The request must describe the commitments agreed upon to assure adequate collection and dispersion of the traffic resulting from the development with the adjoining local street network and Interstate access point (23 CFR 625.2(a) and 655.603(d)).*

The current report incorporates planned traffic volumes from two major developments in the area. The Chapin Technology Park (approved) and Chapin Commerce Village (planned). Chapin Technology Park is located south of the interchange along S-48 (Columbia Avenue) and Chapin Commerce Village (planned), located north of the interchange. Both development are planned generate a significant number of vehicles and were accounted for with the proposed design of diverging diamond interchange alternative. There have been a series of public meetings that have taken place.

Policy Point #8: *The proposal can be expected to be included as an alternative in the required environmental evaluation, review and processing. The proposal should include supporting information and current status of the environmental processing (23 CFR 771.111).*

The proposed alternative is expected to have minimal impact on natural environment such was water quality, floodplains, farmland, and cultural resources as a result retrofitting the existing diamond to a diverging diamond interchange.

A draft Environmental Assessment (EA) is currently being prepared for SCDOT and submitted to FHWA. Effects on human and natural environment was assessed.

Approval of this IMR can only be given by FHWA with the completion of a successful NEPA document.

APPENDIX A

S-48 TRAFFIC PROJECTIONS MEMO

AECOM

AECOM
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Memorandum

To: Mrs. Gaye Sprague, PE
Sprague & Sprague Consulting Engineers

From: Ryan Eckenrode, P.E., PTOE, Traffic Engineer, AECOM

Date: June 14, 2016

Reference: S-48 (Columbia Avenue) Corridor Improvement Project – Traffic Projections

As directed by Mead & Hunt / Lexington County and SCDOT, AECOM developed a traffic forecast for Opening Year (2020) and Design Year (2040) for the S-48 (Columbia Avenue) Corridor Improvement Project. AECOM originally recommended a 1.64% linear growth rate; however, SCDOT approved a 1.25% linear growth rate at the following intersections on July 24, 2014:

1. Columbia Avenue and I-26 Eastbound Ramps
2. Columbia Avenue and I-26 Westbound Ramps
3. I-26 Eastbound ramp and Crooked Creek Road
4. Ellet Road and Columbia Avenue
5. Columbia Avenue and Eagle Chase Court
6. Columbia Avenue and Woodthrush Road
7. Columbia Avenue and Ellet Road/Chapin High School (1)
8. Columbia Avenue and Chapin High School (2)
9. Columbia Avenue and Ellet Road/Chapin High School (3)
10. Columbia Avenue and East Boundary Street
11. Columbia Avenue and Clark Street/Peak Street
12. Lexington Street and Columbia Avenue
13. Lexington Street and Beaufort Street
14. Lexington Street and Chapin Road
15. Lexington Street and Water Street
16. Lexington Street and Clark Street
17. Amicks Ferry Road and Columbia Avenue
18. Amicks Ferry Road and Chapin Road
19. Amicks Ferry Road and Zion Church Road
20. Amicks Ferry Road and Broomstraw Road
21. Amicks Ferry Road and Virginia Street

AECOM used the 2014 existing traffic volumes and grew them at a linear rate of 1.25% to obtain the base Opening Year (2020) and Design Year (2040) traffic projections. After these projections were complete, a traffic study for the Chapin Technology Park and Chapin Commerce Village Development became available. These two developments are significant in size and impact the S-48 corridor. At the direction of Prime Consultant Mead & Hunt, Lexington County and SCDOT, AECOM added additional traffic volumes to the base volumes previously presented to be conservative and to better estimate the turning movement volumes to / from Columbia Avenue. The following describes the methods AECOM used to add the additional volumes:

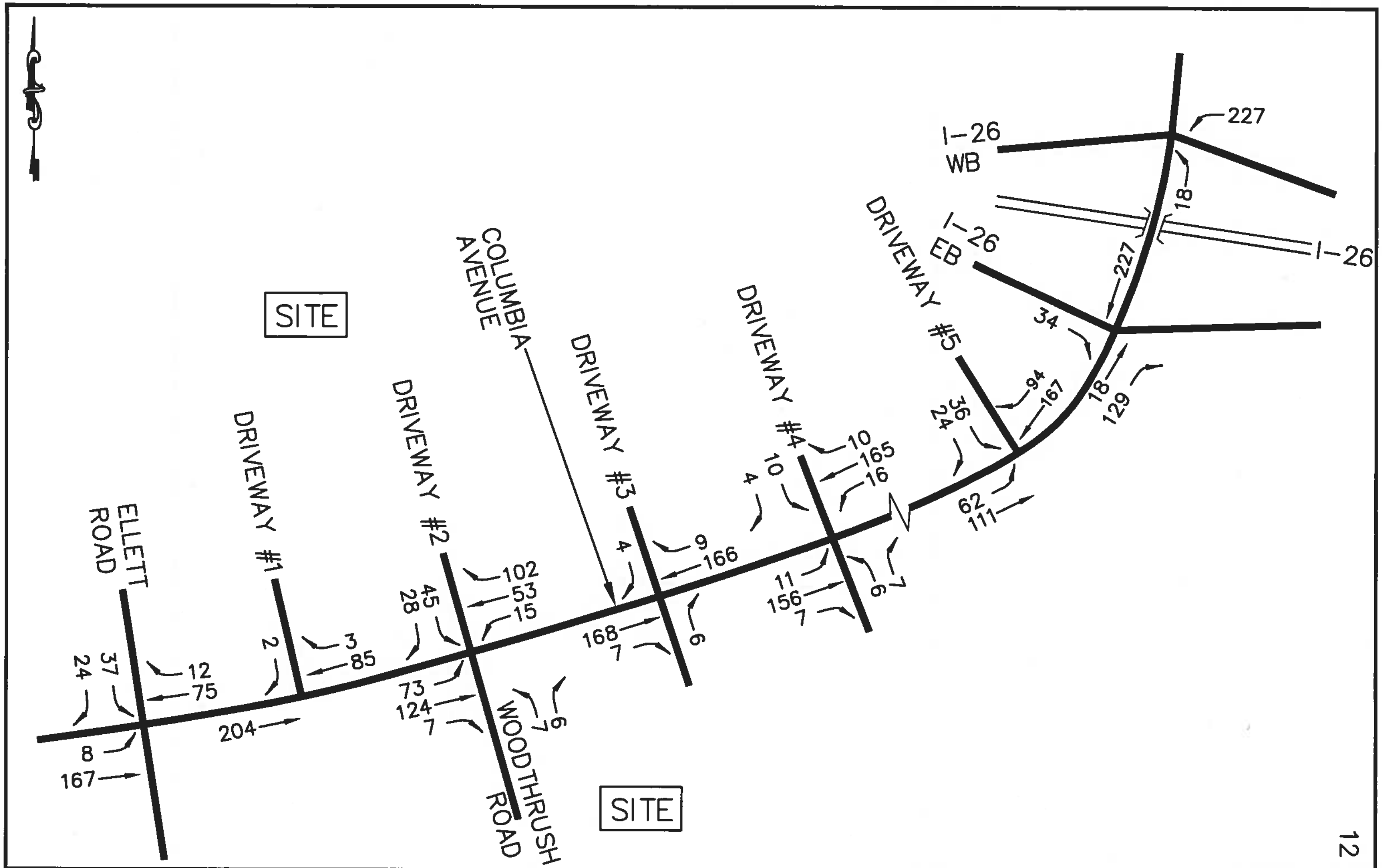
- Chapin Technology Park (120 acre industrial park, 450 single family houses, and 350,000 SF of commercial). Based on the final traffic study submitted and approved by SCDOT on October 13, 2015 for the Chapin Technology Park, the opening year is 2019. AECOM added these new trips to the Opening Year (2020). The Chapin Technology Park is not expected to be complete until 2024 as these trips at full build-out were added to the Design Year (2040). The Technology Park is located north of Columbia Avenue near Woodthrush Road.
- Chapin Commerce Village (132,000 SF Specialty Retail, 8,350 SF Quality Restaurant, 8,350 SF General Office, 4,500 SF Fast Food Restaurant with Drive-Through, 8,350 High Turn-Over (Sit-Down) Restaurant, 4,050 SF Fast Food Restaurant with Drive-Through, 4,950 SF Convenience Market with Gasoline Pumps, 8,350 SF Quality Restaurant, 120 Room Hotel, 8,350 Quality Restaurant, and 4,050 SF General Office Building). This development has not had a traffic study and is only in the early planning stages. It is located just east of I-26 along S-48/Columbia Avenue.

Traffic volume figures showing how both of these developments were distributed within the study area are attached to this document. Once the 2020 and 2040 No-Build traffic volumes projections were developed, AECOM rerouted traffic for Alternative 9A. AECOM looked at the existing traffic patterns and the path of the new road to determine the percentage of traffic that would use the new facility. Based on these two criterions, the following engineering assumptions were made:

- 25% of Westbound Left-turns from Columbia Avenue onto Lexington Avenue are expected to use New Road as shown in alternative 9A.
- 25% of Westbound Left-turns from Columbia Avenue onto Amicks Ferry Road is expected to use New Road as shown in Alternative 9A.
- 25% of Northbound Right-turns from Lexington Avenue on Columbia Avenue is expected to use New Road as shown in Alternative 9A.
- 25% of Northbound Right-turns from Amicks Ferry Road on Columbia Avenue is expected to use New Road as shown in Alternative 9A.
- 50% of Westbound Left-turns from Chapin Road onto Amicks Ferry Road is expected to use New Road as shown in Alternative 9A.
- 50% of Westbound Left-turns from Chapin Road onto Lexington Avenue is expected to use New Road as shown in Alternative 9A.
- 50% of Northbound Right-turns from Amicks Ferry Road onto Chapin Road is expected to use New Road as shown in Alternative 9A.
- 50% of Northbound Right-turns from Lexington Road onto Chapin Road is expected to use New Road as shown in Alternative 9A.
- E. Boundary Street at Columbia Avenue becomes a Right-in Right-out, so 75% Eastbound Right-turns move to New Road / Clark Street. Also 75% of the Northbound Right turns move to New Road / Clark Street.

Each one of these engineering assumptions is documented in the attached figures with its own color to carefully track the new traffic patterns. It is to be noted that the traffic volume assumptions are likely to change if Columbia Avenue (between Boundary Street and Amicks Ferry Road) becomes over capacity. The New Road is not expected to be at capacity using these assumptions and therefore can handle additional traffic if necessary.

Volume Development Figures



12

2019 MORNING PEAK HOUR PRIMARY SITE TRIP TOTALS

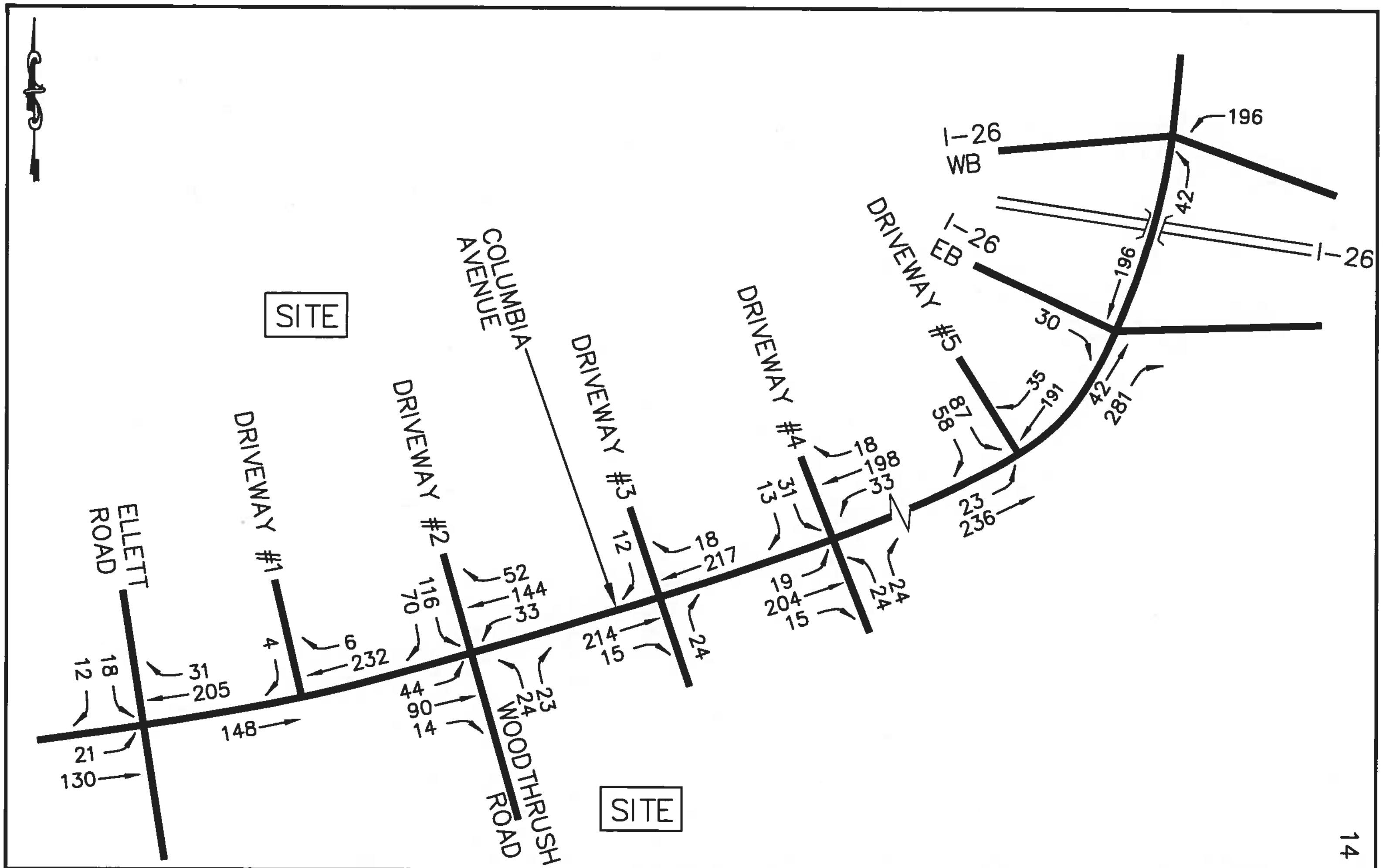
14-020ST-GGS.DWG

Figure 8

10/16/14

CHAPIN TECHNOLOGY PARK TRAFFIC IMPACT STUDY
CHAPIN, SOUTH CAROLINA

Sprague & Sprague
Consulting Engineers



2019 AFTERNOON PEAK HOUR PRIMARY SITE TRIP TOTALS

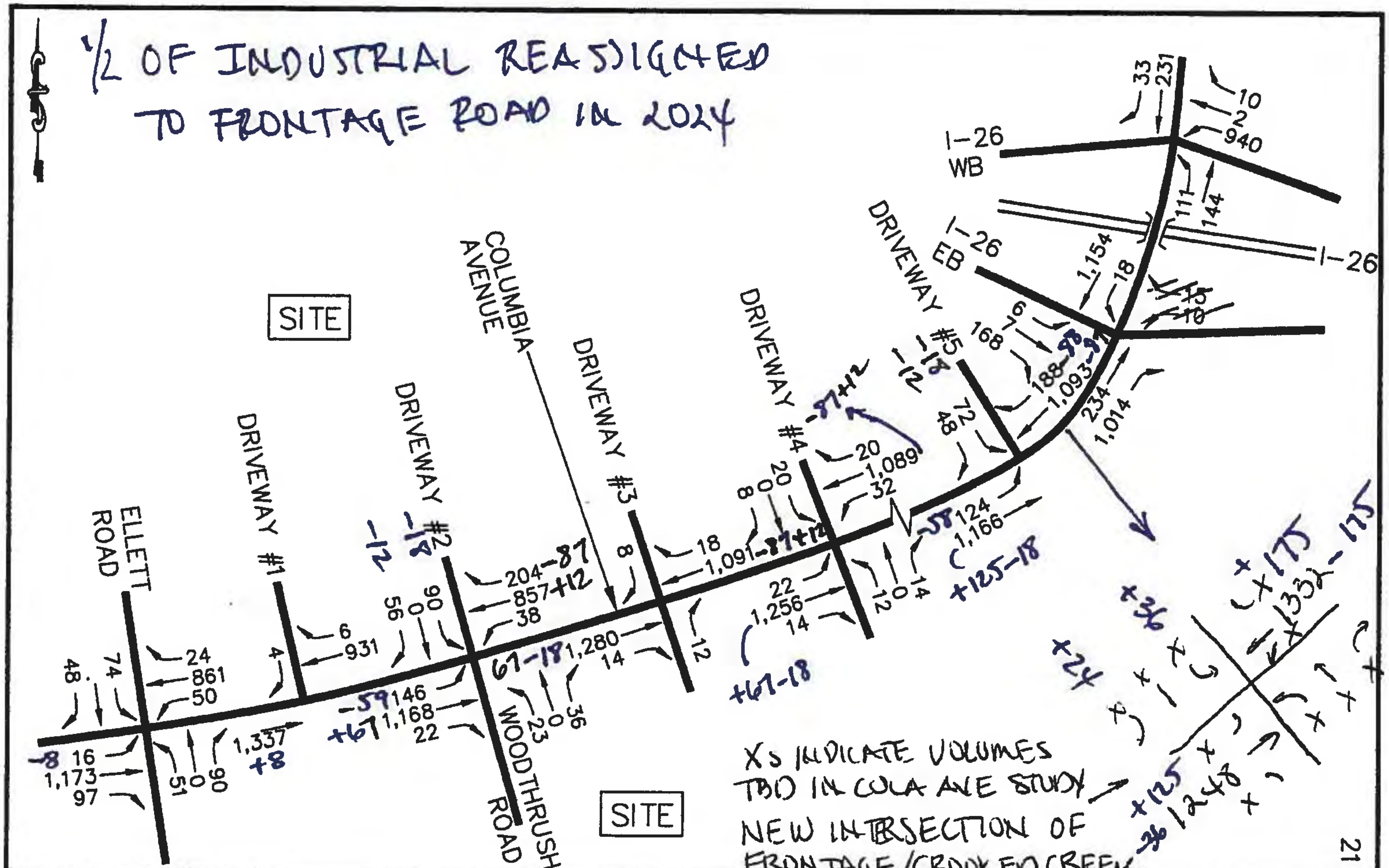
14-020ST-GGS.DWG

Figure 10

10/16/14

CHAPIN TECHNOLOGY PARK TRAFFIC IMPACT STUDY
CHAPIN, SOUTH CAROLINA

Sprague & Sprague
Consulting Engineers



21

2024 MORNING PEAK HOUR BUILD VOLUMES

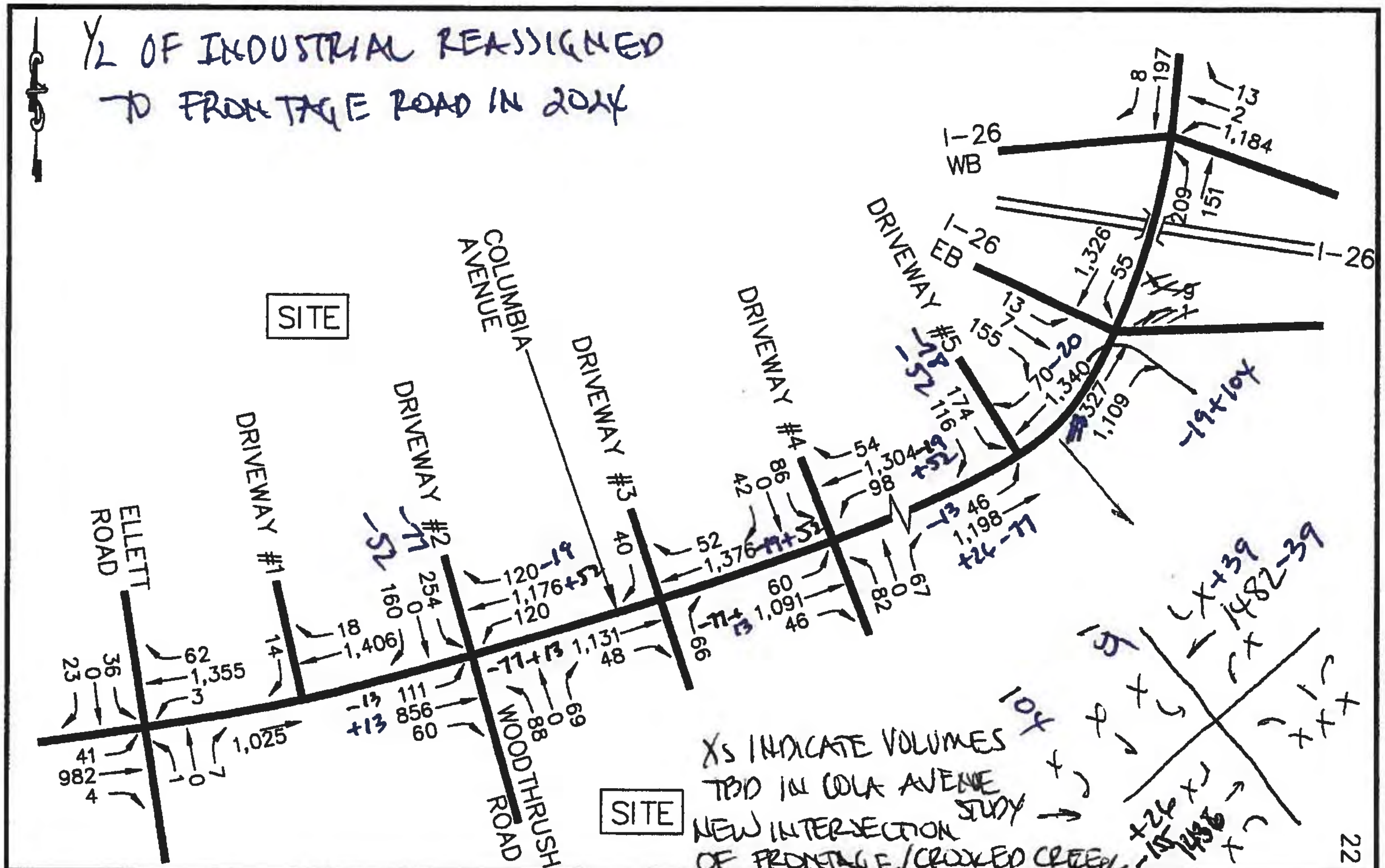
14-020ST-GGS.DWG

Figure ~~17~~ A-1

10/16/14

CHAPIN TECHNOLOGY PARK TRAFFIC IMPACT STUDY
CHAPIN, SOUTH CAROLINA

Sprague & Sprague
Consulting Engineers



2024 AFTERNOON PEAK HOUR BUILD VOLUMES

14-020ST-CGS.DWG

Figure ~~18~~ A-3

10/16/14

CHAPIN TECHNOLOGY PARK TRAFFIC IMPACT STUDY
CHAPIN, SOUTH CAROLINA

Sprague & Sprague
Consulting Engineers

Project: Chapin Commerce Village
Date: 10/22/2014

Location	Description of Use	Units		Trips/Unit	PM Peak Hours Trips
North Parcel A	Specialty Retail Center	132000	SF	0.00271	358
North Parcel B	Quality Restaurant	8350	SF	0.00749	63
North Parcel C	General Office Building	8350	SF	0.00149	12
North Parcel D	Fast Food Restaurant with Drive-Through	4500	SF	0.03384	152
			Total PM Peak Hour Trips		**585**

Location	Description of Use	Units		Trips/Unit	PM Peak Hours Trips
South Parcel E	High-Turnover (Sit-Down) Restaurant	8350	SF	0.01115	93
South Parcel F	Fast Food Restaurant with Drive-Through	4050	SF	0.03384	137
South Parcel G	Convenience Market with Gasoline Pumps	4950	SF	0.05092	252
South Parcel H	Quality Restaurant	8350	SF	0.00749	63
South Parcel I	Hotel	120	Rooms	0.6	72
South Parcel J	Quality Restaurant	8350	SF	0.00749	63
South Parcel K	General Office Building	4050	SF	0.00149	6
			Total PM Peak Hour Trips		**685**

SITE ELEMENTS

- TOTAL AREA - 25 ACRES (NORTH PARCELS)
  TOTAL AREA - 20.9 ACRES (SOUTH PARCELS)
- PARCEL A - 17 ACRES
  (131,500 SF BUILDING & 476 PARKING SPACES SHOWN)
- PARCEL B - 2.1 ACRES
- PARCEL C - 3.7 ACRES
- PARCEL D - 2.2 ACRES
- PARCEL E - 2.0 ACRES
  (7,500 SF BUILDING & 121 PARKING SPACES SHOWN)
- PARCEL F - 1.2 ACRES
  (4,000 SF BUILDING & 55 PARKING SPACES SHOWN)
- PARCEL G - 2.0 ACRES
  (12,500 SF BUILDING & 60 PARKING SPACES SHOWN)
- PARCEL H - 2.2 ACRES
  (7,500 SF BUILDING & 123 PARKING SPACES SHOWN)
- PARCEL I - 2.8 ACRES
  (FOUR STORY HOTEL & 135 PARKING SPACES SHOWN)
- PARCEL J - 2.0 ACRES
- PARCEL K - 1.1 ACRES

DEVELOPER

M & R ASSOCIATES, LLC.
DEVELOPERS AND CONSULTANTS
P.O. BOX 1053
CHAPIN, SOUTH CAROLINA 29036

CONTACTS: MARK BOLDING 803-429-1023
RUSSELL COOK 803-730-7201

HYBRID engineering, inc.
hybrideng.com

NORTH

0' 50' 100' 200'
GRAPHIC SCALE: 1" = 100'

CHAPIN COMMERCE VILLAGE

January 2014

P13019-32

Chapin Commerce Village
Table 1 - Trip Generation

Land Use		Intensity		Daily			AM Peak Hour			PM Peak Hour		
				Total	In	Out	Total	In	Out	Total	In	Out
310	Hotel	120	rooms	702	351	351	64	38	26	72	37	35
710	General Office Building*	8,350	s.f.	92	46	46	13	11	2	12	2	10
710	General Office Building*	4,050	s.f.	46	23	23	6	5	1	6	1	5
826	Speciality Retail	132,000	s.f.	5,686	2,843	2,843	-	-	-	338	149	189
853	Convenience Market with Gasoline Pumps	4,950	s.f.	4,186	2,093	2,093	203	102	101	252	126	126
931	Quality Restaurant	8,350	s.f.	752	376	376	7	6	1	63	52	11
931	Quality Restaurant	8,350	s.f.	752	376	376	7	6	1	63	52	11
931	Quality Restaurant	8,350	s.f.	752	376	376	7	6	1	63	52	11
932	High-Turnover (Sit Down) Restaurant	8,350	s.f.	1,062	531	531	90	50	40	82	49	33
934	Fast Food Restaurant with Drive-Through	4,500	s.f.	2,234	1,117	1,117	204	104	100	147	76	71
934	Fast Food Restaurant with Drive-Through	4,050	s.f.	2,010	1,005	1,005	184	94	90	132	69	63
	Subtotal			**18,274**	**9,137**	**9,137**	**785**	**422**	**363**	**1,230**	**665**	**565**

***Rate was used due to the small square footage**

AECOM

JOB TITLE

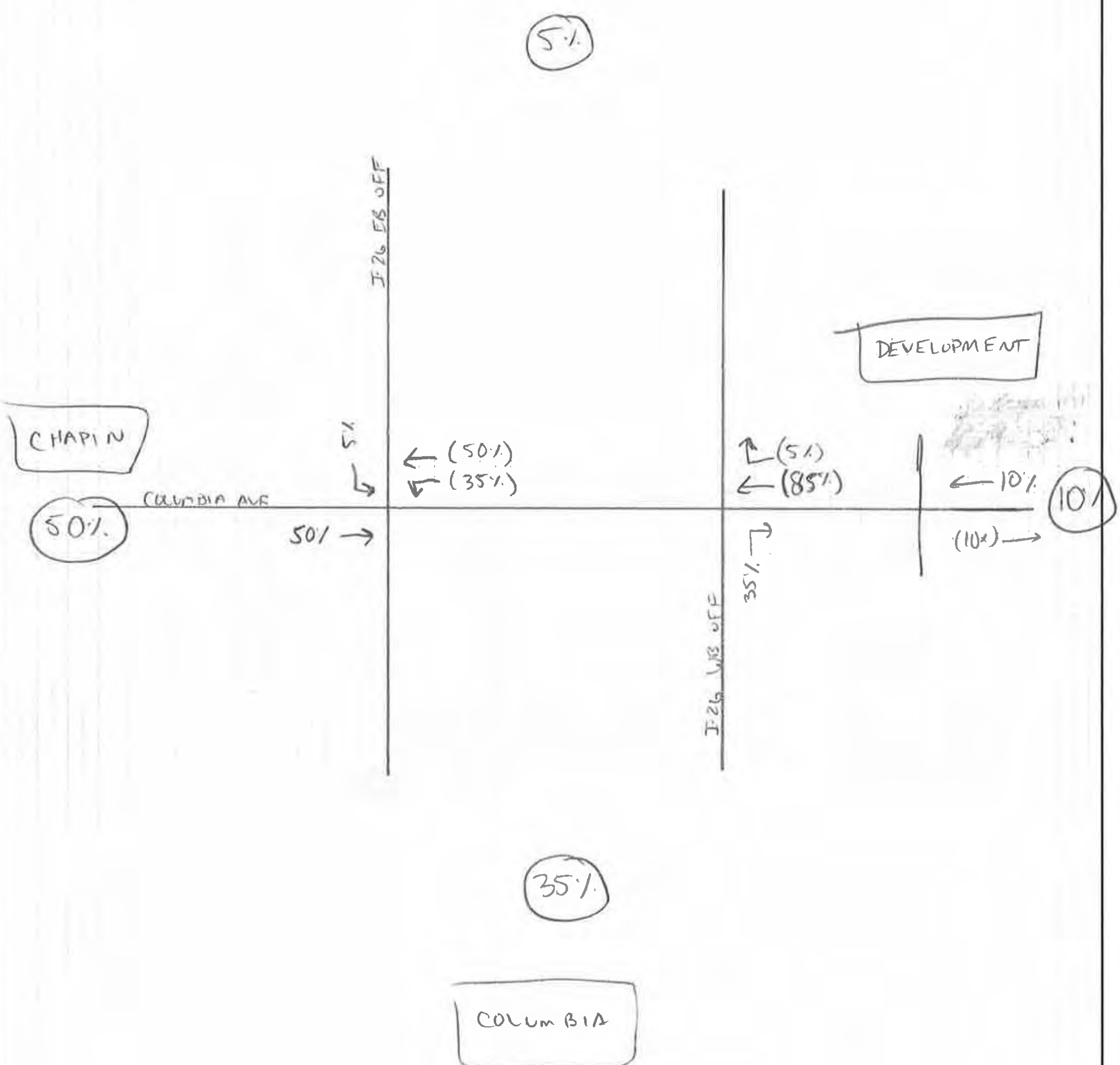
JOB NO. CALCULATION NO.

ORIGINATOR DATE

REVIEWER DATE

SCALE SHEET NO. OF

TRIP DISTRIBUTION



Grid: 10x10 = 1"

AECOM

JOB TITLE ____________________

JOB NO. ____________________ CALCULATION NO. ____________________

ORIGINATOR ____________________ DATE ____________________

REVIEWER ____________________ DATE ____________________

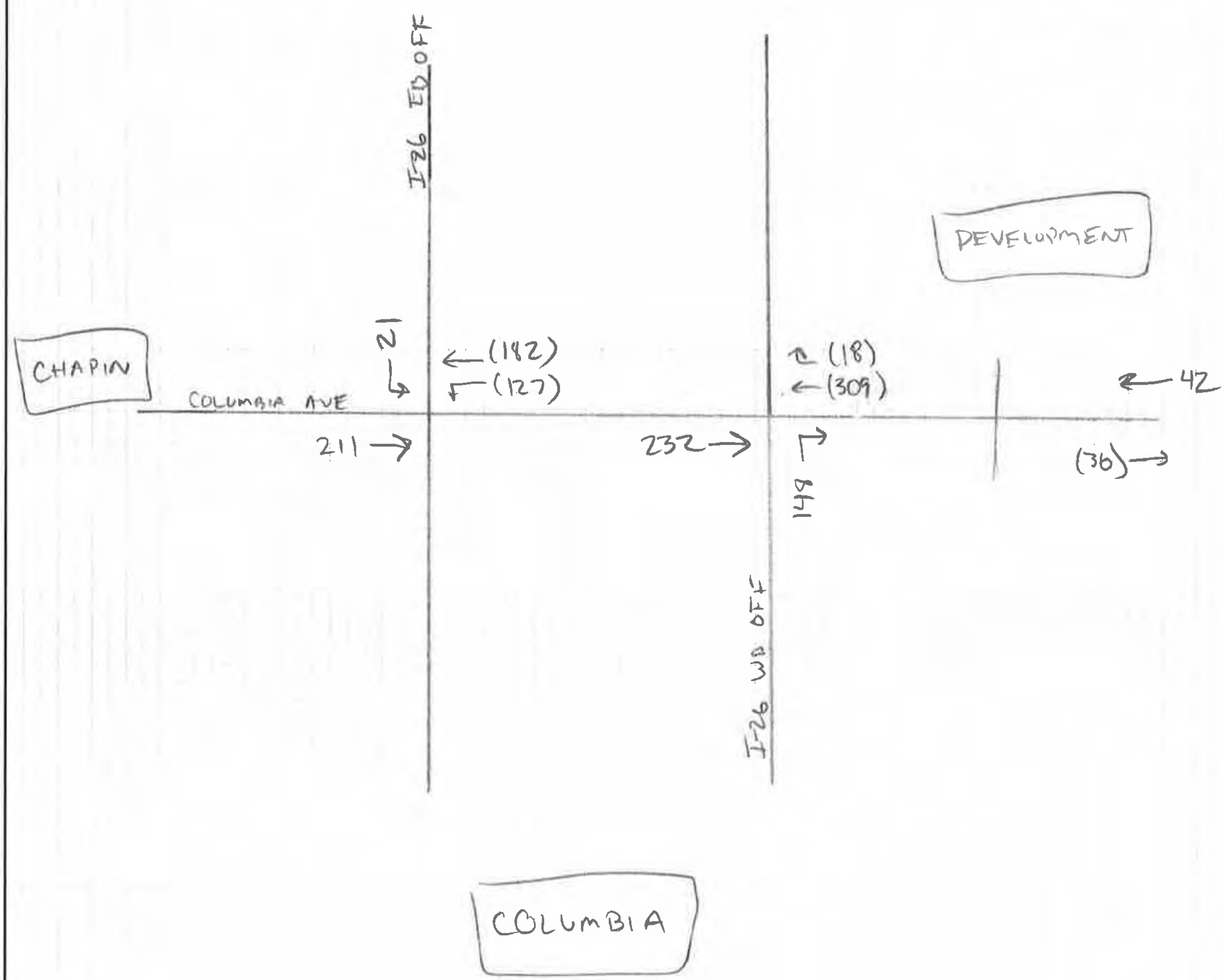
SCALE ____________________ SHEET NO. __________ OF __________

AM PEAK

TOTAL TRIP = 785

ENTER = 422

EXIT = 363



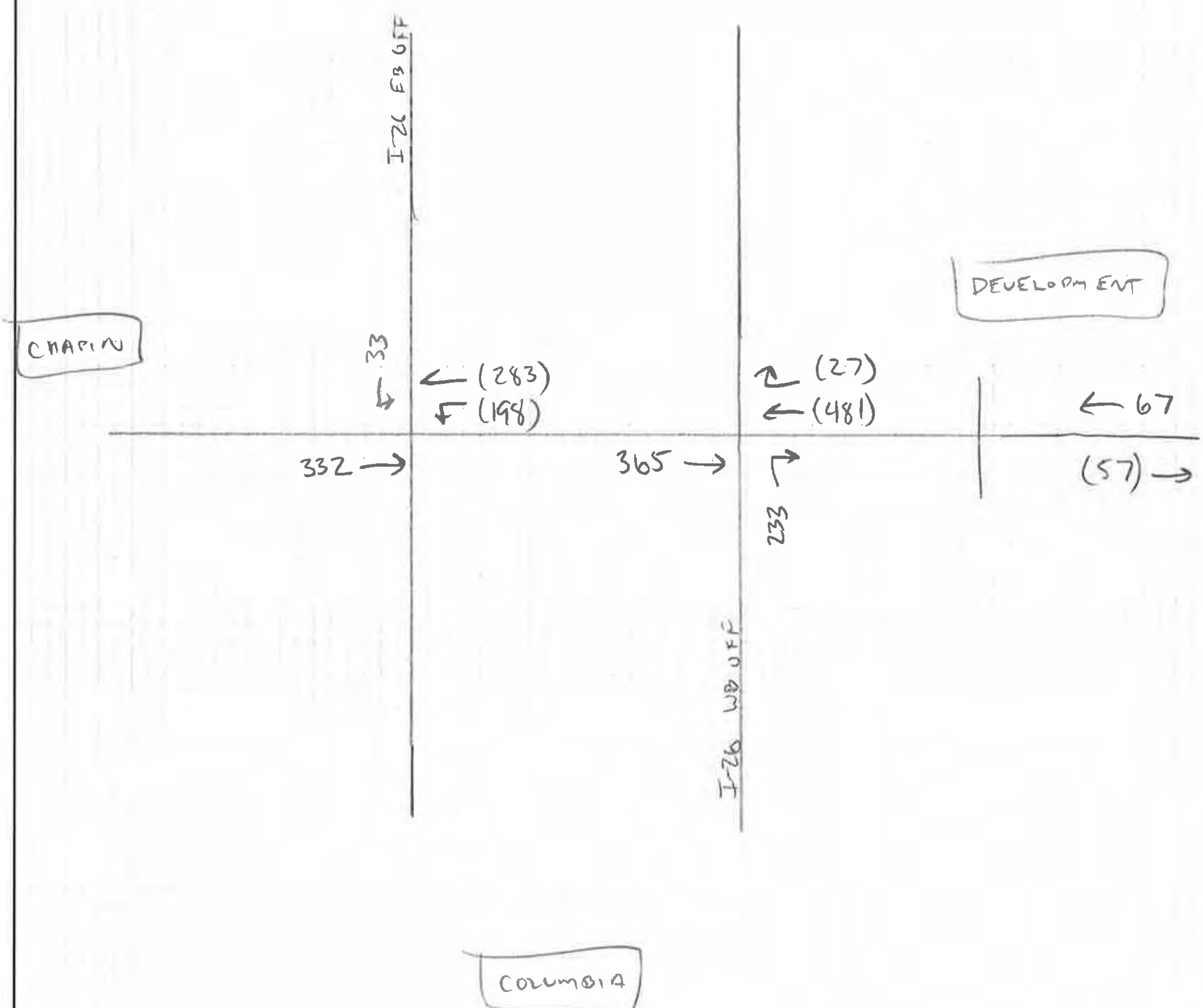
Grid: 10x10 = 1"

AECOM

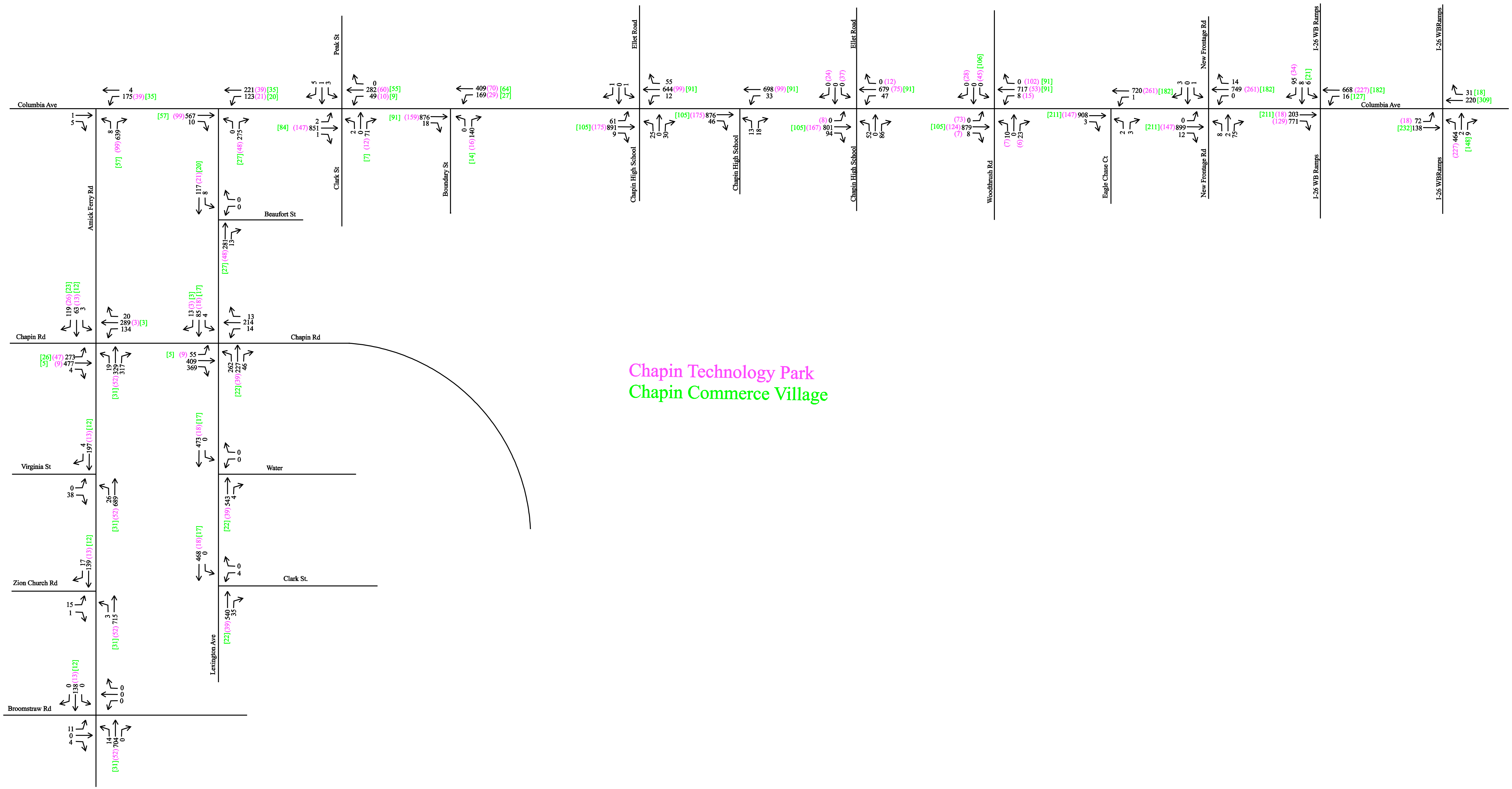
JOB TITLE ______
JOB NO. ______ CALCULATION NO. ______
ORIGINATOR ______ DATE ______
REVIEWER ______ DATE ______
SCALE ______ SHEET NO. ______ OF ______

PM PEAK

TOTAL TRIPS = 1,230
ENTER = 665
EXIT = 565



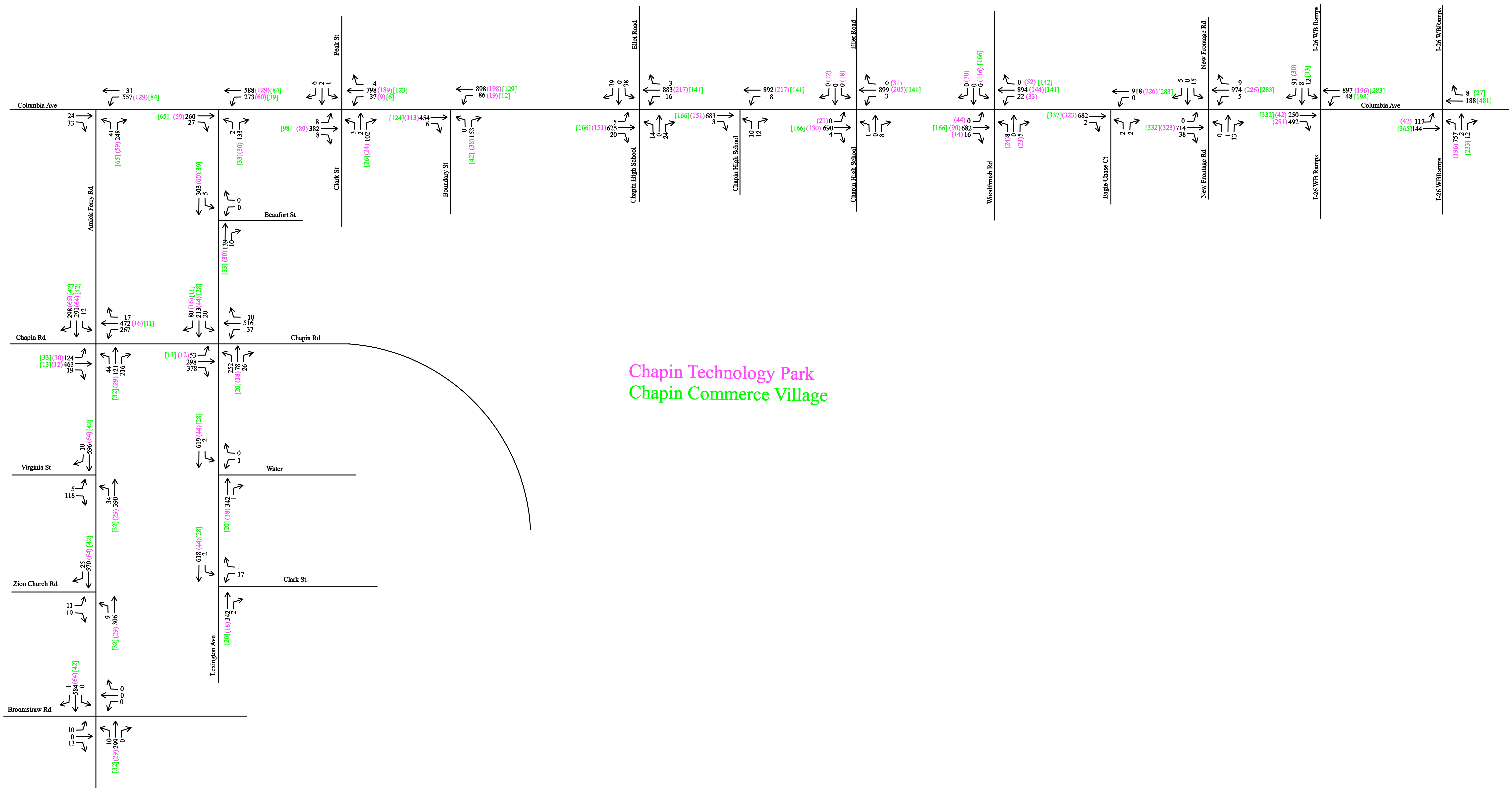
Grid: 10x10 = 1"



2020 No-Build AM Peak
Traffic Forecast Development

SCDOT Project ID: P042383
S-48 (Columbia Avenue)
Corridor Improvement Project

N
Not to Scale



AECOM

2020 No-Build PM Peak Traffic Forecast Development

SCDOT Project ID: P042383
S-48 (Columbia Avenue)
Corridor Improvement Project

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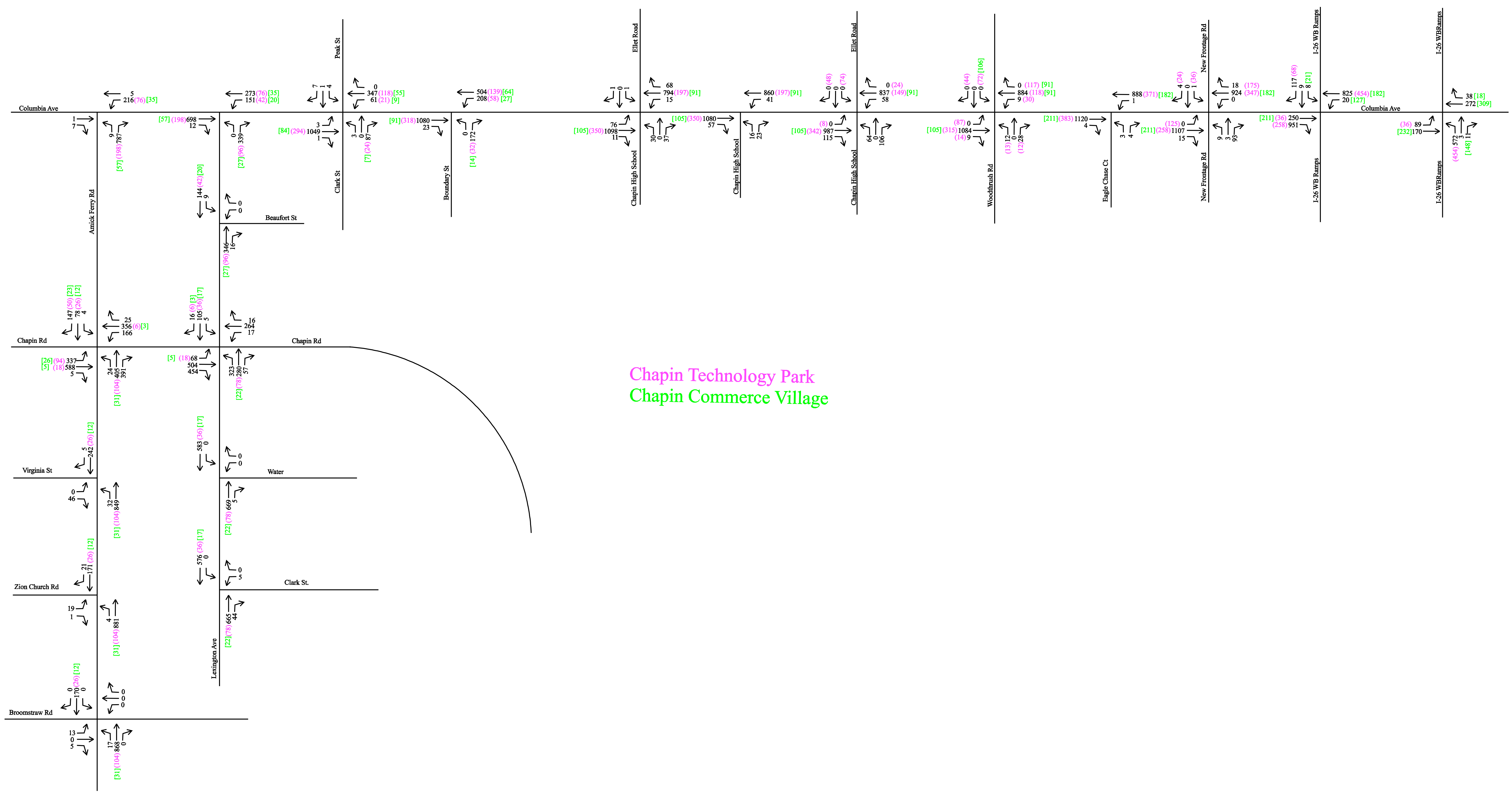

2040 No-Build AM Peak Traffic Forecast Development

SCDOT Project ID: P042383
S-48 (Columbia Avenue)
Corridor Improvement Project

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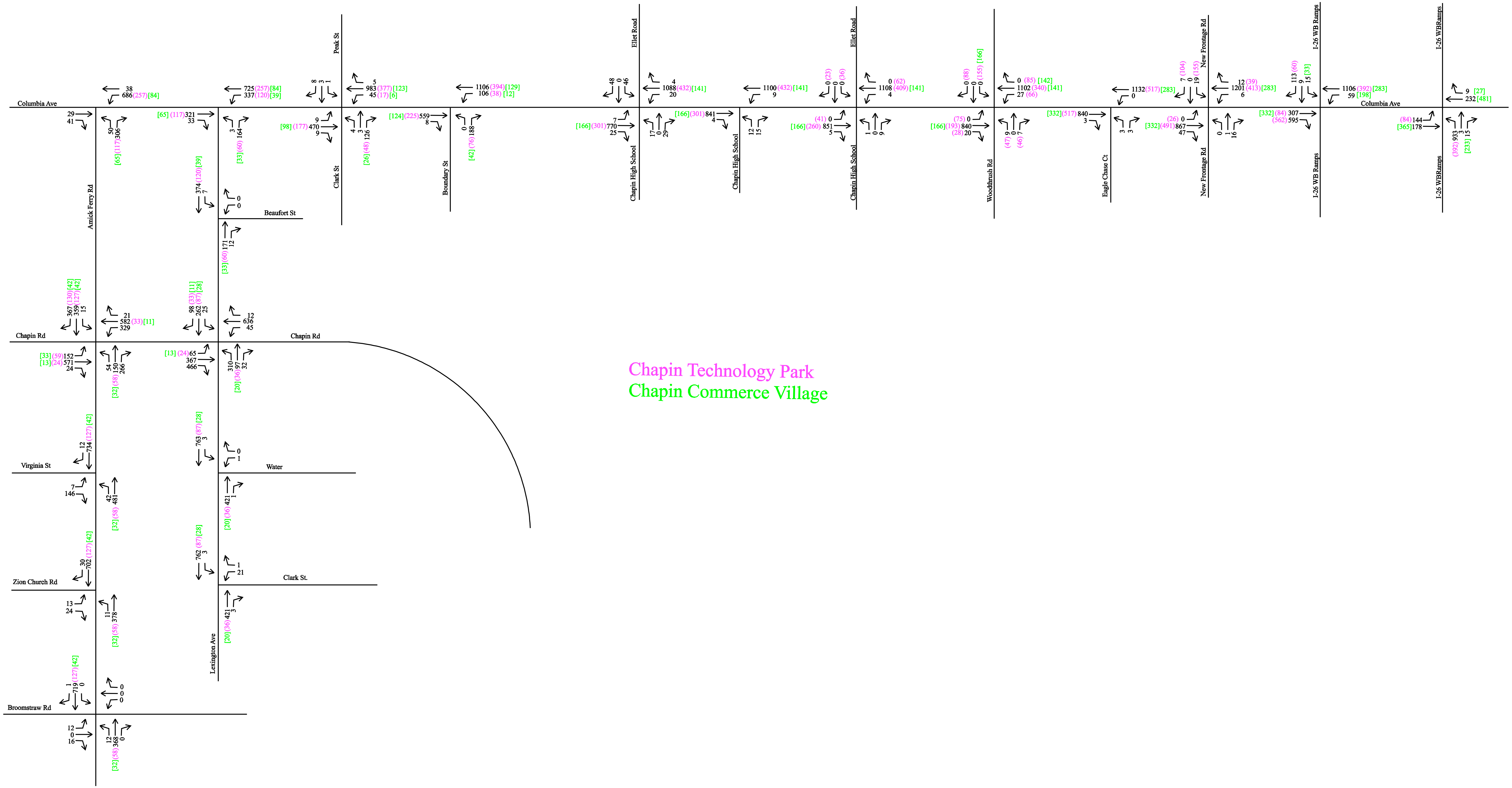
Not to Scale



AECOM

2040 No-Build PM Peak Traffic Forecast Development

SCDOT Project ID: P042383
S-48 (Columbia Avenue)
Corridor Improvement Project

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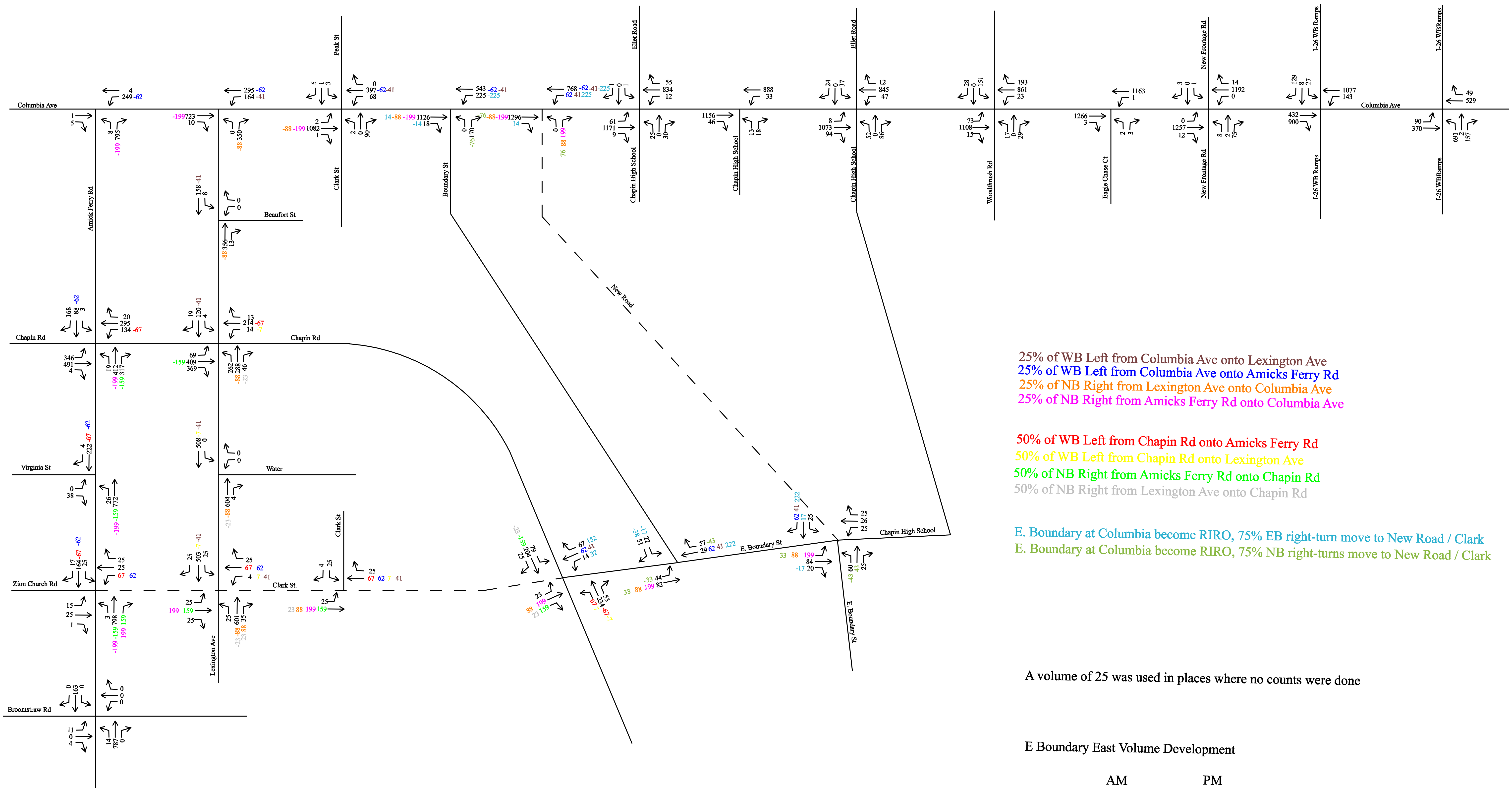
Not to Scale



25% of WB Left from Columbia Ave onto Lexington Ave
25% of WB Left from Columbia Ave onto Amicks Ferry Rd
25% of NB Right from Lexington Ave onto Columbia Ave
25% of NB Right from Amicks Ferry Rd onto Columbia Ave

50% of WB Left from Chapin Rd onto Amicks Ferry Rd
50% of WB Left from Chapin Rd onto Lexington Ave
50% of NB Right from Amicks Ferry Rd onto Chapin Rd
50% of NB Right from Lexington Ave onto Chapin Rd

E. Boundary at Columbia become RIRO, 75% EB right-turn move to New Road / Clark
E. Boundary at Columbia become RIRO, 75% NB right-turns move to New Road / Clark

A volume of 25 was used in places where no counts were done

E Boundary East Volume Development

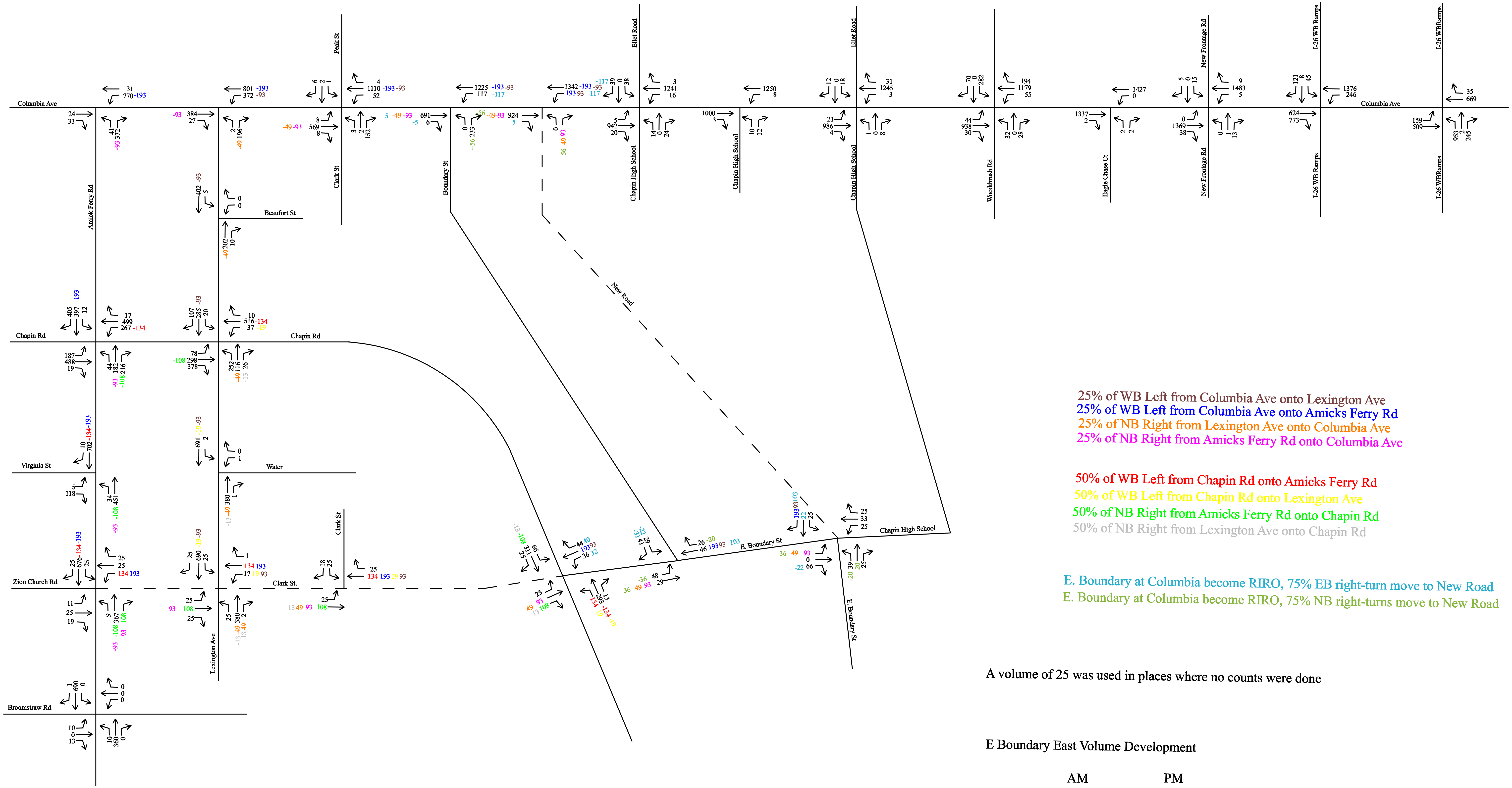
	AM	PM
100 houses	20 in, 60 out	66 in, 39 out

AECOM

2020 Alternative 9A
AM Peak Traffic Forecast Development

SCDOT Project ID: P042383
S-48 (Columbia Avenue)
Corridor Improvement Project

N
Not to Scale



25% of WB Left from Columbia Ave onto Lexington Ave
25% of WB Left from Columbia Ave onto Amicks Ferry Rd
25% of NB Right from Lexington Ave onto Columbia Ave
25% of NB Right from Amicks Ferry Rd onto Columbia Ave

50% of WB Left from Chapin Rd onto Amicks Ferry Rd
50% of WB Left from Chapin Rd onto Lexington Ave
50% of NB Right from Amicks Ferry Rd onto Chapin Rd
50% of NB Right from Lexington Ave onto Chapin Rd

E. Boundary at Columbia become RIRO, 75% EB right-turn move to New Road
E. Boundary at Columbia become RIRO, 75% NB right-turns move to New Road

A volume of 25 was used in places where no counts were done

E Boundary East Volume Development

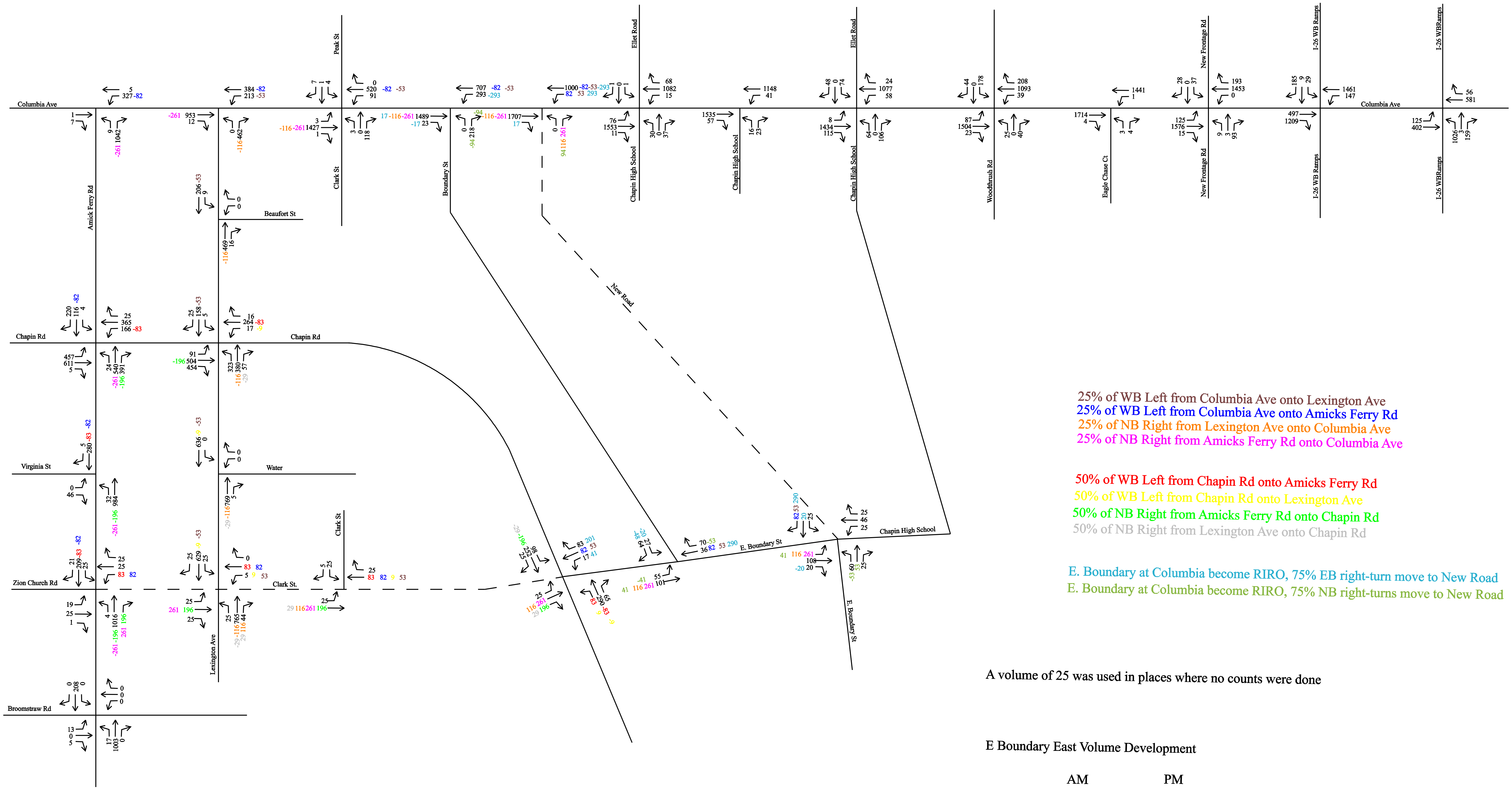
	AM	PM
100 houses	20 in, 60 out	66 in, 39 out

AECOM

2020 Alternative 9A
PM Peak Traffic Forecast Development

SCDOT Project ID: P042383
S-48 (Columbia Avenue)
Corridor Improvement Project

N
Not to Scale

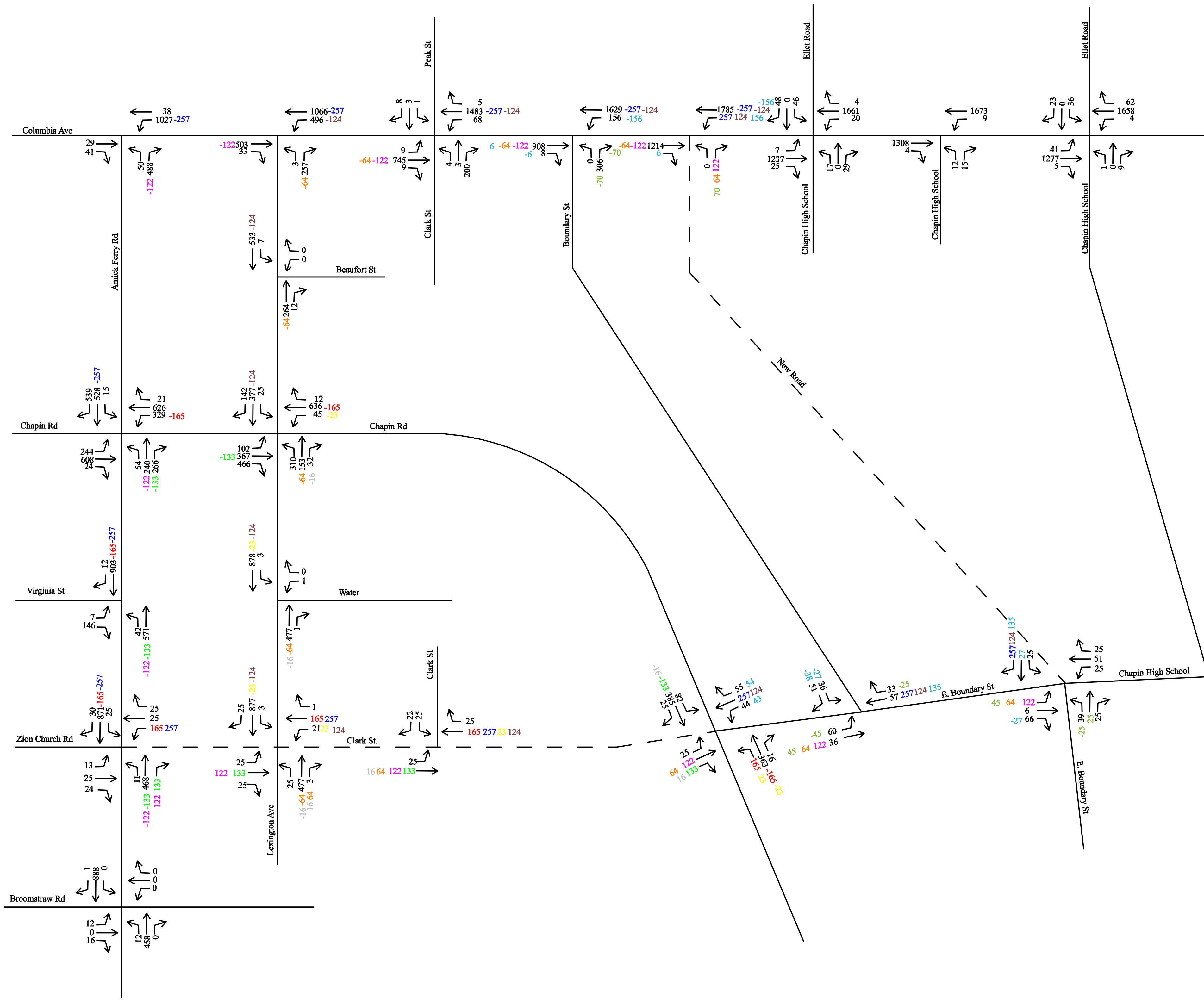


AECOM

2040 Alternative 9A
AM Peak Traffic Forecast Development

SCDOT Project ID: P042383
S-48 (Columbia Avenue)
Corridor Improvement Project

N
Not to Scale



25% of WB Left from Columbia Ave onto Lexington Ave
25% of WB Left from Columbia Ave onto Amicks Ferry Rd
25% of NB Right from Lexington Ave onto Columbia Ave
25% of NB Right from Amicks Ferry Rd onto Columbia Ave

50% of WB Left from Chapin Rd onto Amicks Ferry Rd
50% of WB Left from Chapin Rd onto Lexington Ave
50% of NB Right from Amicks Ferry Rd onto Chapin Rd
50% of NB Right from Lexington Ave onto Chapin Rd

E. Boundary at Columbia become RIRO, 75% EB right-turn move to New Road
E. Boundary at Columbia become RIRO, 75% NB right-turns move to New Road

A volume of 25 was used in places where no counts were done

E Boundary East Volume Development

	AM	PM
100 houses	20 in, 60 out	66 in, 39 out

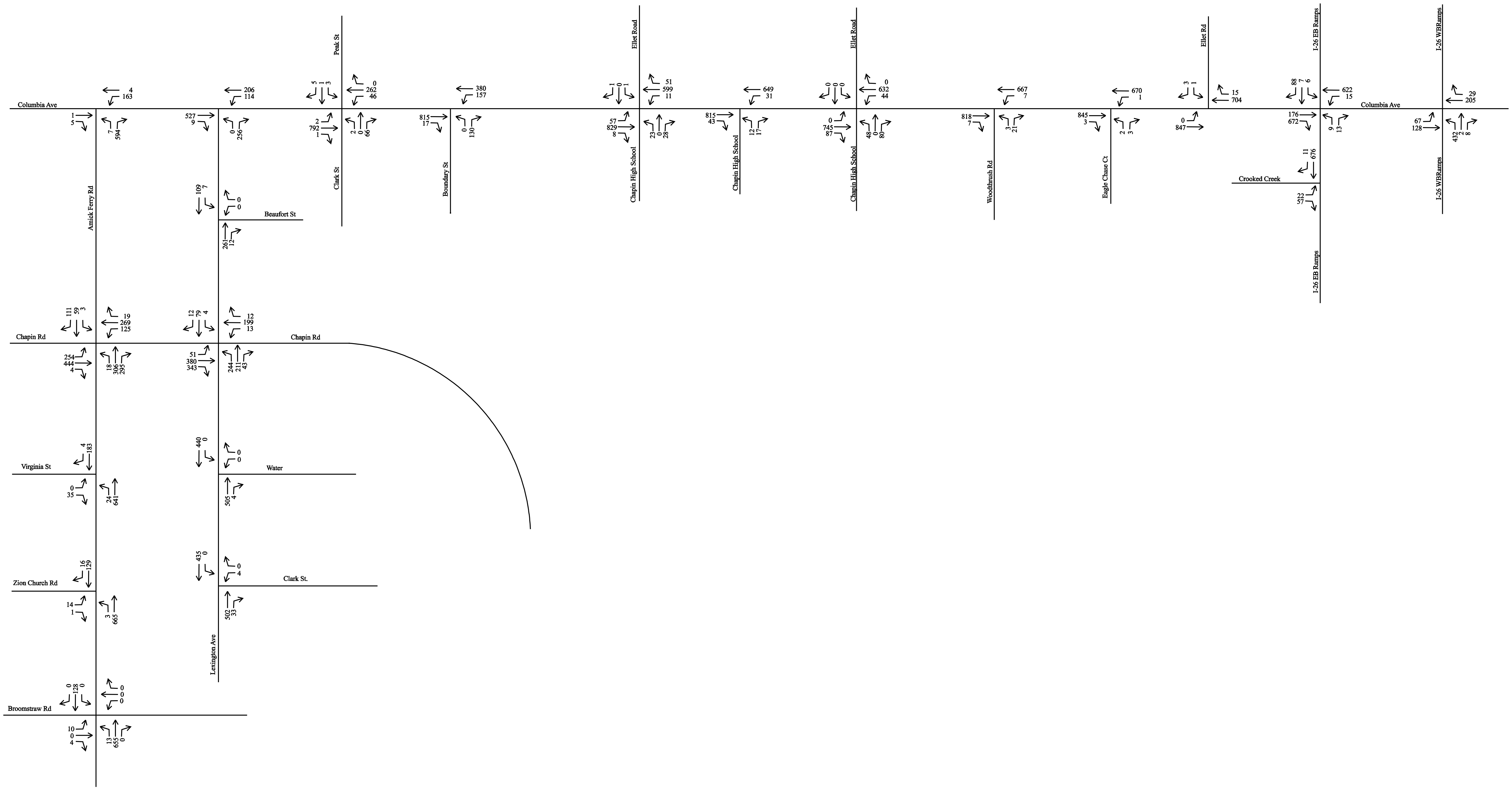
AECOM

2040 Alternative 9A
PM Peak Traffic Forecast Development

SCDOT Project ID: P042383
S-48 (Columbia Avenue)
Corridor Improvement Project

N
Not to Scale

Final Traffic Projection Figures

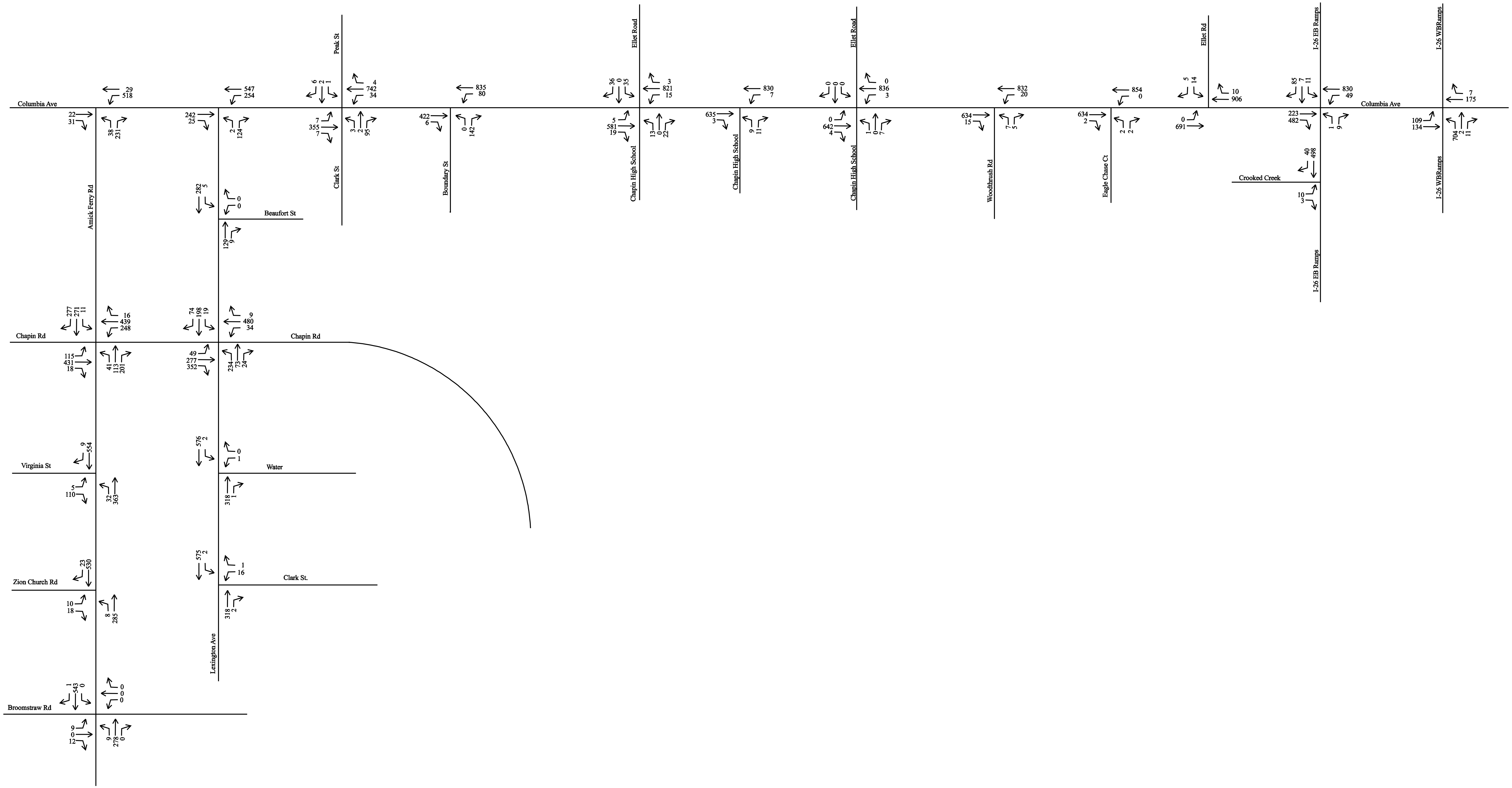


AECOM

2014 Existing AM Peak Traffic Volumes

SCDOT Project ID: P042383
S-48 (Columbia Avenue)
Corridor Improvement Project

N
Not to Scale



AECOM

2014 Existing PM Peak Traffic Volumes

SCDOT Project ID: P042383
S-48 (Columbia Avenue)
Corridor Improvement Project

N
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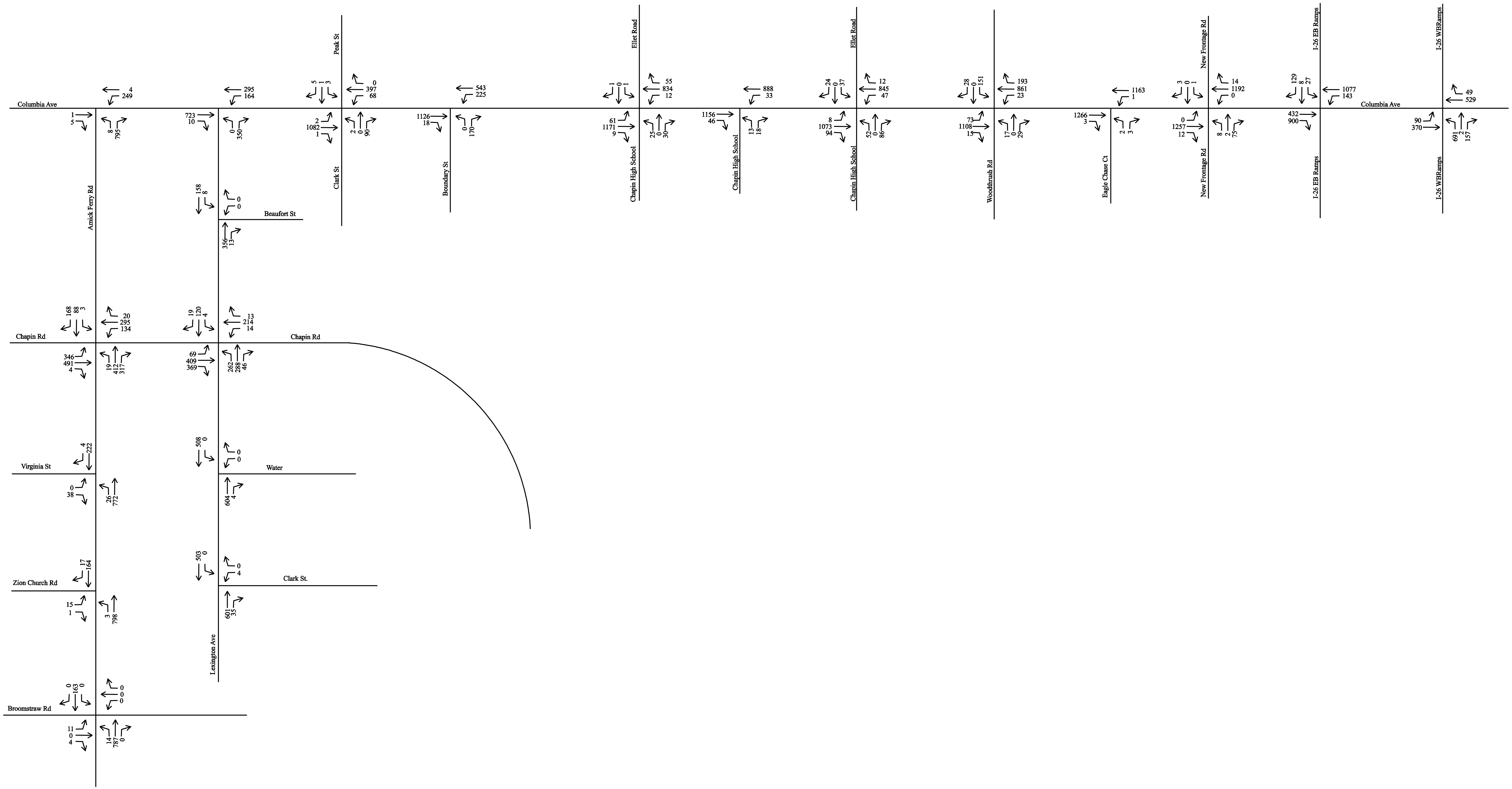
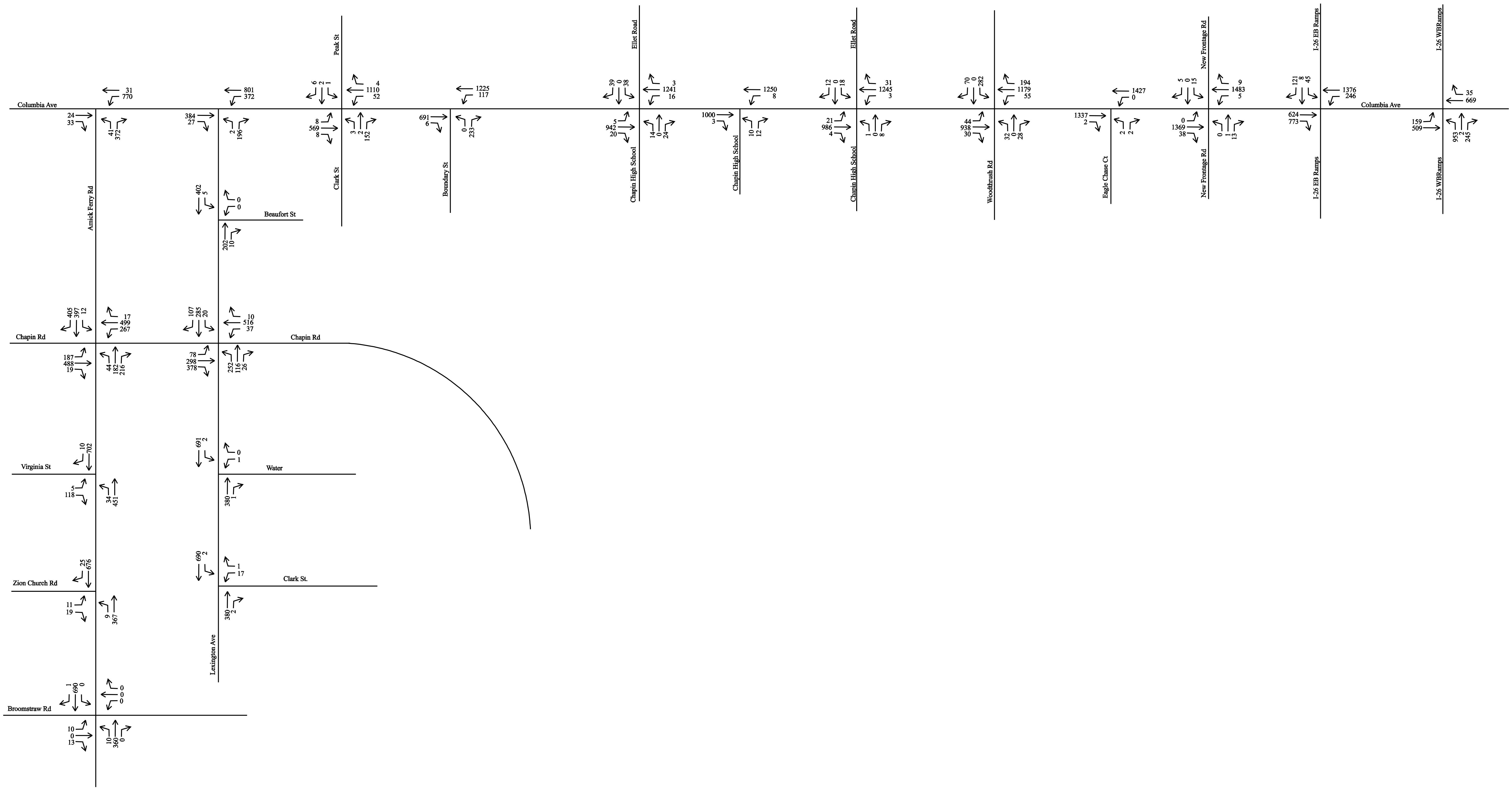


AECOM

2020 No-Build
AM Peak Traffic Forecast

SCDOT Project ID: P042383
S-48 (Columbia Avenue)
Corridor Improvement Project

N
Not to Scale

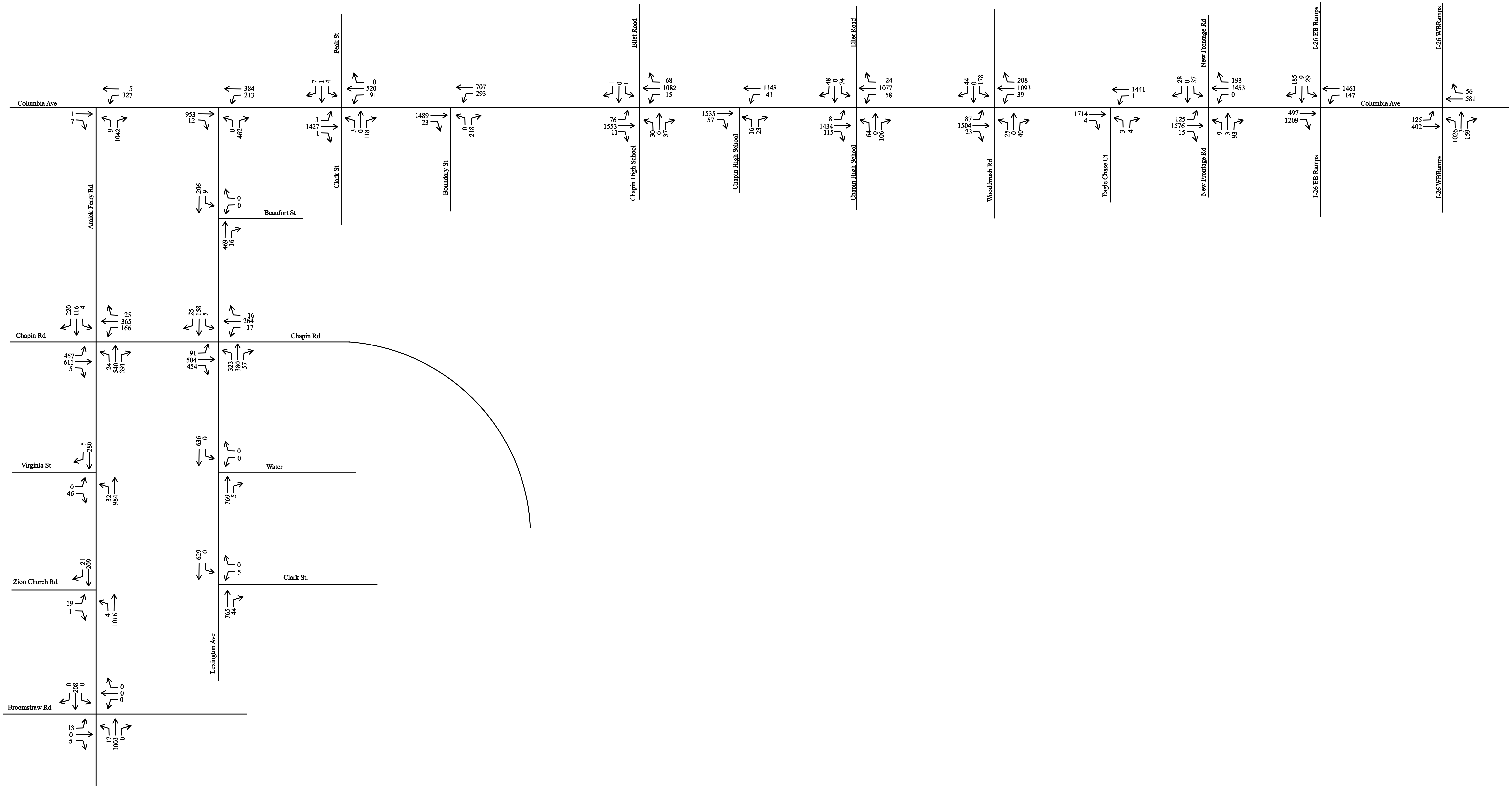


AECOM

2020 No-Build
PM Peak Traffic Forecast

SCDOT Project ID: P042383
S-48 (Columbia Avenue)
Corridor Improvement Project

Not to Scale

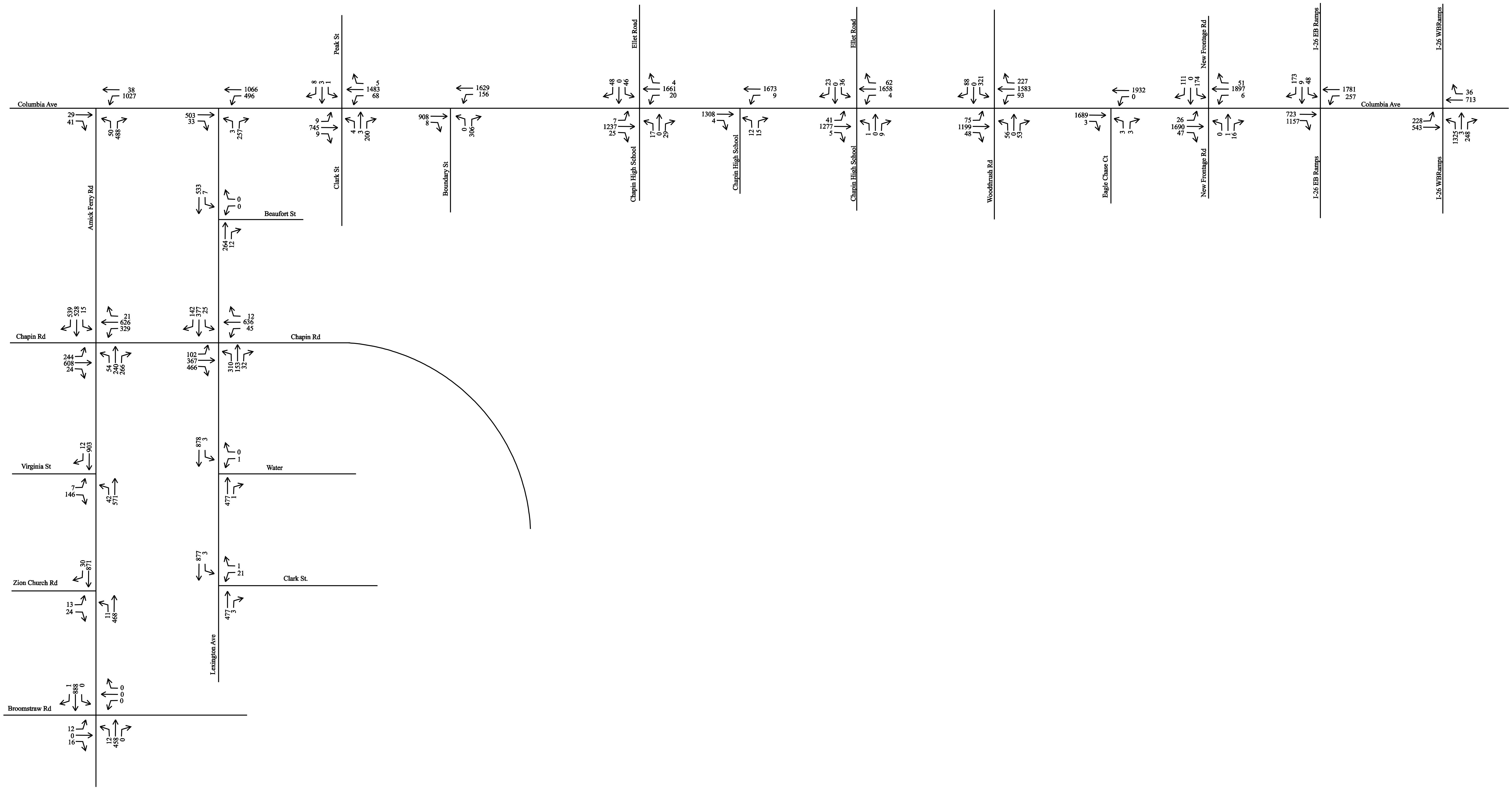


AECOM

2040 No-Build
AM Peak Traffic Forecast

SCDOT Project ID: P042383
S-48 (Columbia Avenue)
Corridor Improvement Project

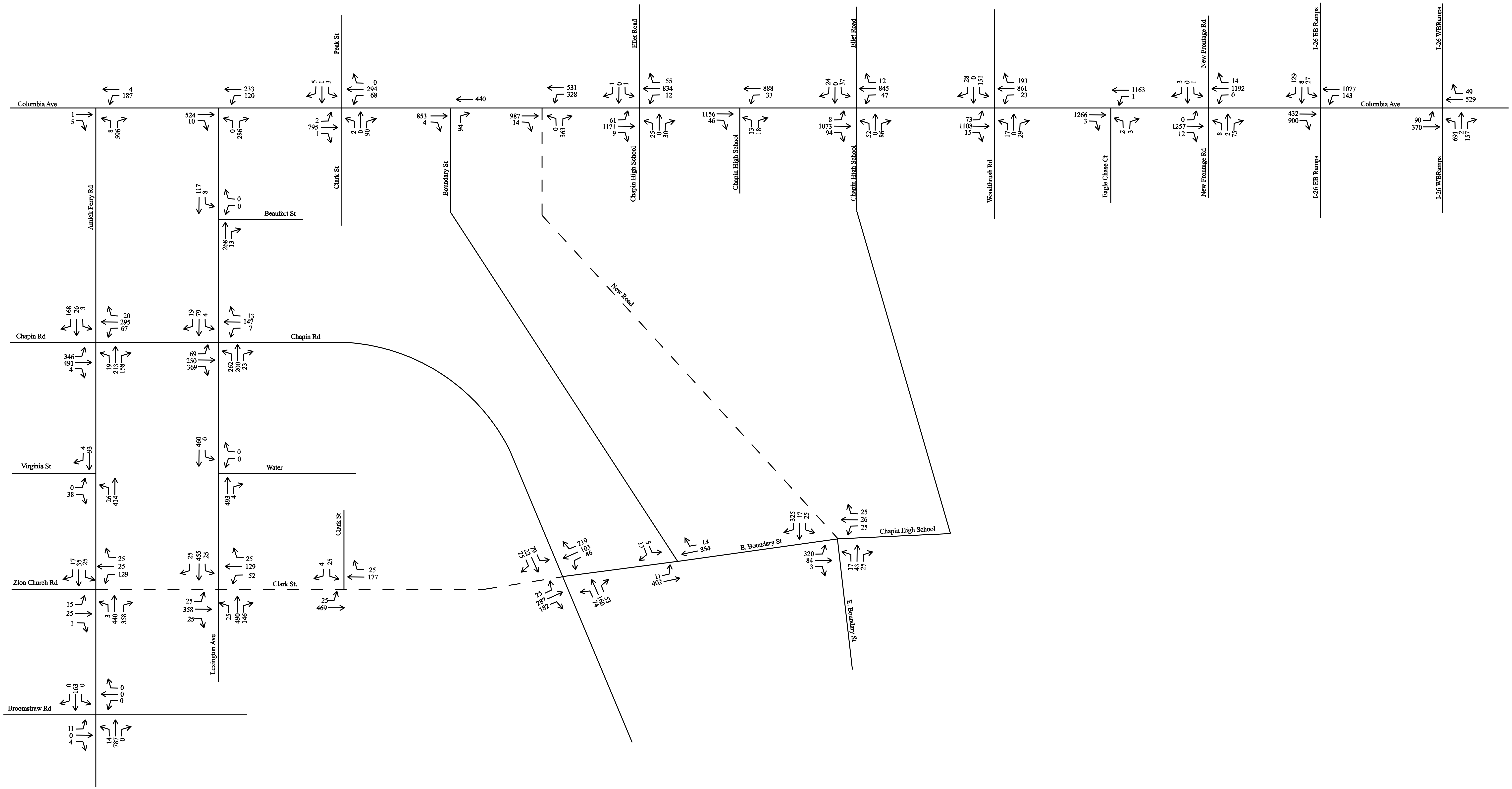
N
Not to Scale



2040 No-Build
PM Peak Traffic Forecast

SCDOT Project ID: P042383
S-48 (Columbia Avenue)
Corridor Improvement Project

Not to Scale



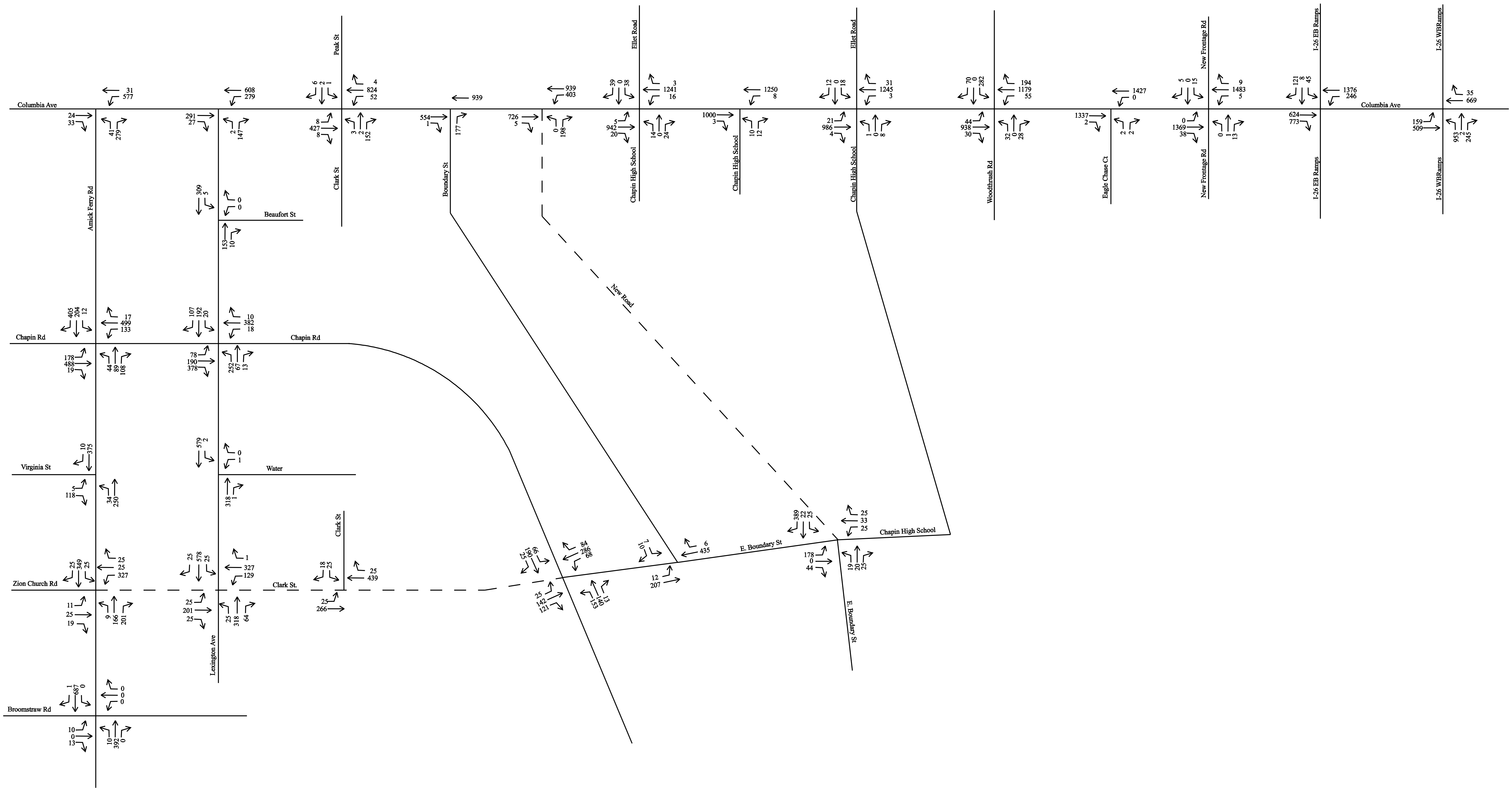
AECOM

2020 Alternative 9A
AM Peak Traffic Forecast

SCDOT Project ID: P042383
S-48 (Columbia Avenue)
Corridor Improvement Project

N

Not to Scale

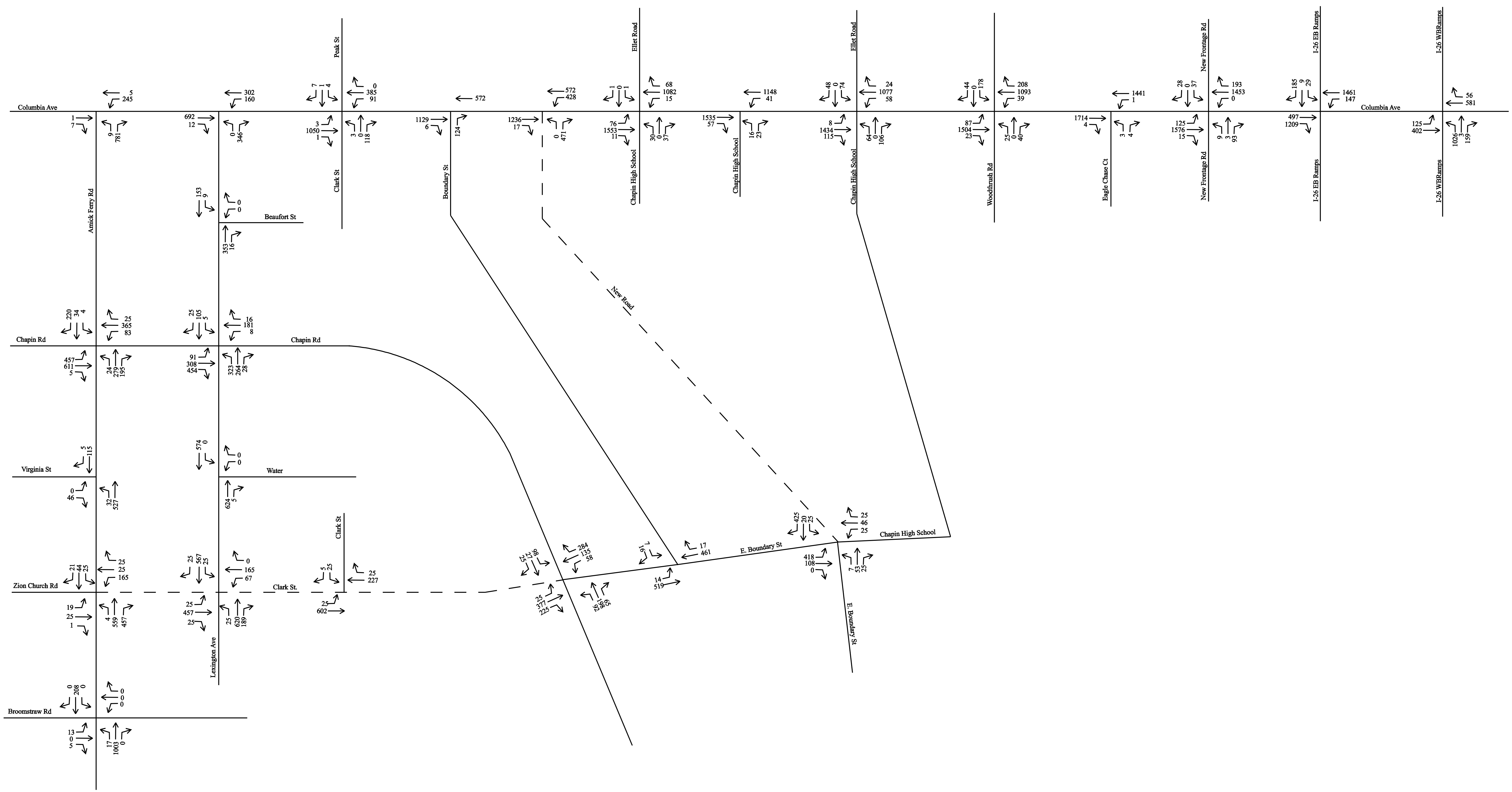


AECOM

2020 Alternative 9A
PM Peak Traffic Forecast

SCDOT Project ID: P042383
S-48 (Columbia Avenue)
Corridor Improvement Project

N
Not to Scale

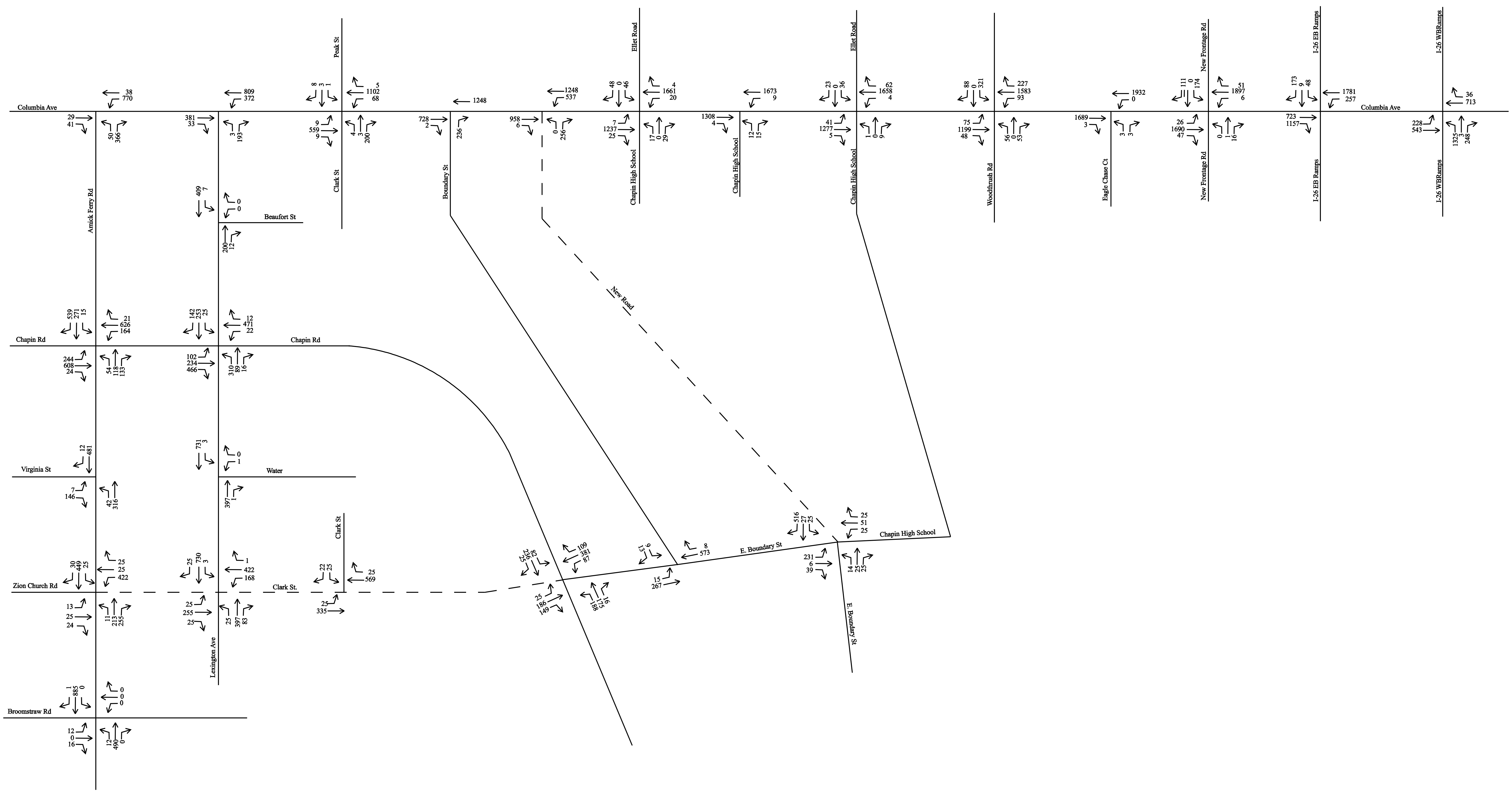


AECOM

2040 Alternative 9A
AM Peak Traffic Forecast

SCDOT Project ID: P042383
S-48 (Columbia Avenue)
Corridor Improvement Project

N
Not to Scale



2040 Alternative 9A
PM Peak Traffic Forecast

SCDOT Project ID: P042383
S-48 (Columbia Avenue)
Corridor Improvement Project

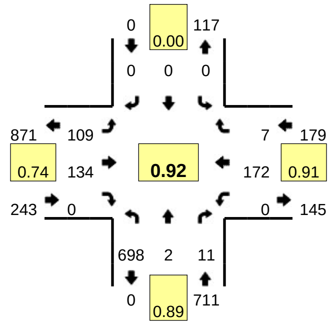
N
Not to Scale

APPENDIX B

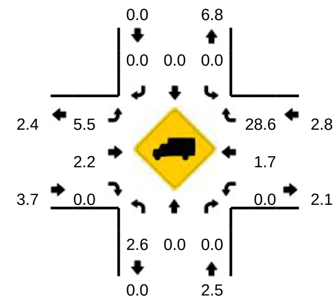
TRAFFIC COUNTS

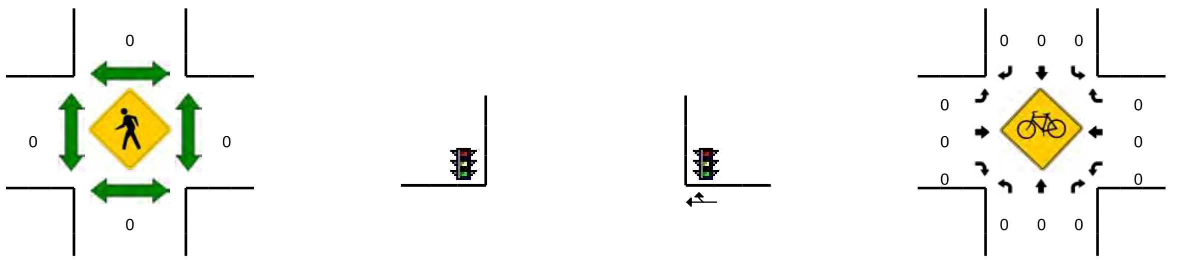
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

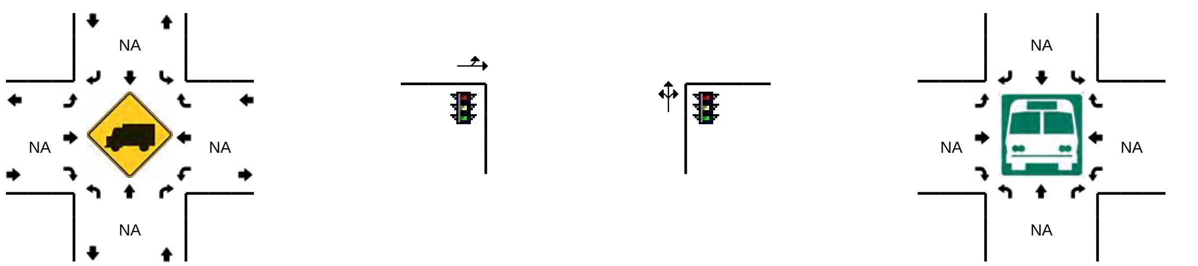
LOCATION: I-26 WB Ramps -- Columbia Ave | **QC JOB #:** 12491433
CITY/STATE: Chapin, SC | **DATE:** Tue, May 13 2014



Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 5:15 PM -- 5:30 PM







15-Min Count Period Beginning At	I-26 WB Ramps (Northbound) Left	Thru	Right	U	I-26 WB Ramps (Southbound) Left	Thru	Right	U	Columbia Ave (Eastbound) Left	Thru	Right	U	Columbia Ave (Westbound) Left	Thru	Right	U	Total	Hourly Totals
12:30 PM	75	0	1	0	0	0	0	0	17	13	0	0	0	16	0	0	122	525
12:45 PM	68	0	3	0	0	0	0	0	17	15	0	0	0	16	4	0	123	509
1:00 PM	83	1	2	0	0	0	0	0	10	21	0	0	0	17	0	0	134	498
1:15 PM	71	0	2	0	0	0	0	0	17	14	0	0	0	15	1	0	120	499
1:30 PM	82	0	3	0	0	0	0	0	18	9	0	0	0	26	0	0	138	515
1:45 PM	74	0	3	0	0	0	0	0	15	23	0	0	0	22	4	0	141	533
2:00 PM	74	2	3	0	0	0	0	0	23	24	0	0	0	14	3	0	143	542
2:15 PM	94	1	4	0	0	0	0	0	21	19	0	0	0	18	2	0	159	581
2:30 PM	89	0	1	0	0	0	0	0	18	14	0	0	0	19	1	0	142	585
2:45 PM	97	0	0	0	0	0	0	0	19	18	0	0	0	22	1	0	157	601
3:00 PM	97	0	1	0	0	0	0	0	14	23	0	0	0	23	2	0	160	618
3:15 PM	105	0	2	0	0	0	0	0	18	19	0	0	0	24	4	0	172	631
3:30 PM	90	1	2	0	0	0	0	0	16	24	0	0	0	59	4	0	196	685
3:45 PM	101	0	2	0	0	0	0	0	25	68	0	0	0	40	2	0	238	766
4:00 PM	120	0	2	0	0	0	0	0	23	60	0	0	0	22	5	0	232	838
4:15 PM	150	0	2	0	0	0	0	0	16	30	0	0	0	32	2	0	232	898
4:30 PM	155	0	2	0	0	0	0	0	22	31	0	0	0	38	5	0	253	955
4:45 PM	166	1	2	0	0	0	0	0	27	37	0	0	0	39	1	0	273	990
5:00 PM	177	1	4	0	0	0	0	0	29	31	0	0	0	41	1	0	284	1042
5:15 PM	200	0	3	0	0	0	0	0	24	35	0	0	0	44	1	0	307	1117
5:30 PM	155	0	2	0	0	0	0	0	28	31	0	1	0	48	4	0	269	1133
5:45 PM	172	3	2	0	0	0	0	0	22	32	0	0	0	39	1	0	271	1131
6:00 PM	142	0	2	0	0	0	0	0	16	23	0	0	0	33	1	0	217	1064
6:15 PM	147	0	4	0	0	0	0	0	16	17	0	0	0	24	0	0	208	965

Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	800	0	12	0	0	0	0	0	96	140	0	0	0	176	4	0	1228
Heavy Trucks	8	0	0		0	0	0		4	0	0		0	8	0		20
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

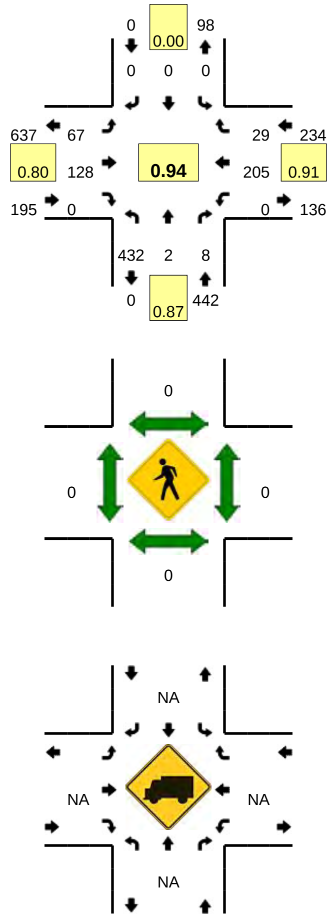
Comments:

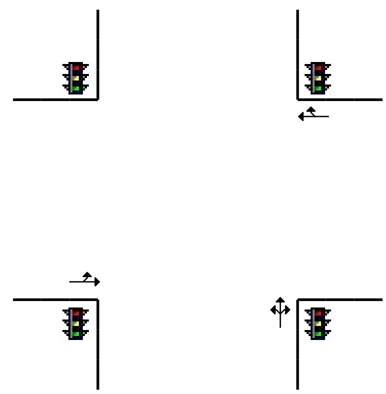
Report generated on 5/27/2014 8:30 AM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

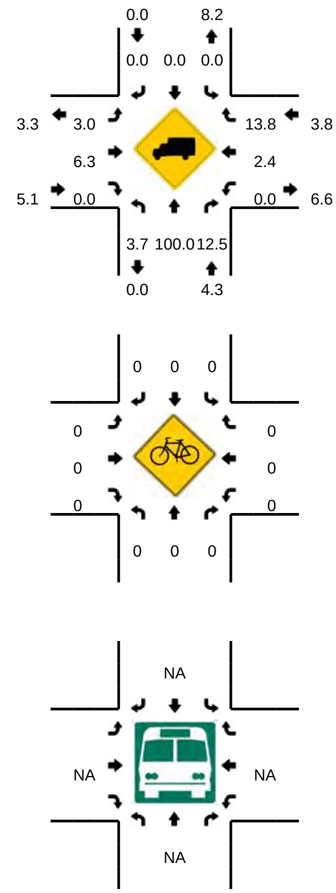
Type of peak hour being reported: Intersection Peak — Method for determining peak hour: Total Entering Volume

LOCATION: I-26 WB Ramps -- Columbia Ave — **QC JOB #:** 12491434
CITY/STATE: Chapin, SC — **DATE:** Tue, May 13 2014

Peak-Hour: 7:30 AM -- 8:30 AM
Peak 15-Min: 7:45 AM -- 8:00 AM







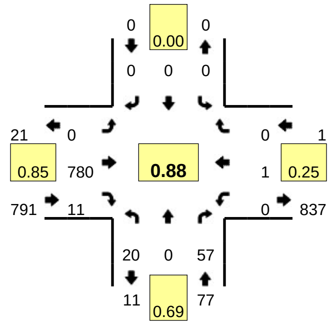
15-Min Count Period Beginning At	I-26 WB Ramps (Northbound) Left	Thru	Right	U	I-26 WB Ramps (Southbound) Left	Thru	Right	U	Columbia Ave (Eastbound) Left	Thru	Right	U	Columbia Ave (Westbound) Left	Thru	Right	U	Total	Hourly Totals
6:30 AM	56	1	2	0	0	0	0	0	16	15	0	0	0	18	3	0	111	
6:45 AM	76	1	1	0	0	0	0	0	6	19	0	0	0	34	6	0	143	
7:00 AM	48	0	0	0	0	0	0	0	18	16	0	0	0	23	8	0	113	
7:15 AM	85	2	1	0	0	0	0	0	12	14	0	0	0	40	9	0	163	530
7:30 AM	103	0	1	0	0	0	0	0	25	22	0	0	0	52	14	0	217	636
7:45 AM	125	1	1	0	0	0	0	0	18	25	0	0	0	53	8	0	231	724
8:00 AM	106	1	4	0	0	0	0	0	16	28	0	0	0	61	4	0	220	831
8:15 AM	98	0	2	0	0	0	0	0	8	53	0	0	0	39	3	0	203	871
8:30 AM	90	0	3	0	0	0	0	0	19	24	0	0	0	28	3	0	167	821
8:45 AM	84	0	0	0	0	0	0	0	22	11	0	0	0	25	5	0	147	737
9:00 AM	77	1	1	0	0	0	0	0	17	15	0	0	0	13	5	0	129	646
9:15 AM	70	1	1	0	0	0	0	0	18	9	0	0	0	13	2	0	114	557
9:30 AM	71	0	0	0	0	0	0	0	20	7	0	0	0	17	4	0	119	509
9:45 AM	91	0	0	0	0	0	0	0	20	11	0	0	0	27	3	0	152	514
10:00 AM	53	0	0	0	0	0	0	0	16	15	0	0	0	11	0	0	95	480
10:15 AM	45	0	0	0	0	0	0	0	16	16	0	0	0	12	0	1	90	456
10:30 AM	63	0	1	0	0	0	0	0	13	8	0	0	0	20	4	0	109	446
10:45 AM	55	0	2	0	0	0	0	0	15	22	0	0	0	20	11	0	125	419
11:00 AM	60	1	2	0	0	0	0	0	10	10	0	0	0	15	3	0	101	425
11:15 AM	68	0	0	0	0	0	0	0	19	18	0	0	0	45	0	0	150	485
11:30 AM	50	0	1	0	0	0	0	0	11	27	0	0	0	24	2	0	115	491
11:45 AM	66	4	1	0	0	0	0	0	16	27	0	0	0	23	2	0	139	505
12:00 PM	79	0	0	0	0	0	0	0	26	24	0	0	0	15	1	0	145	549
12:15 PM	59	0	3	0	0	0	0	0	19	27	0	0	0	11	0	0	119	518

Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	500	4	4	0	0	0	0	0	72	100	0	0	0	212	32	0	924
Heavy Trucks	28	4	0		0	0	0		4	0	0		0	4	4		44
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

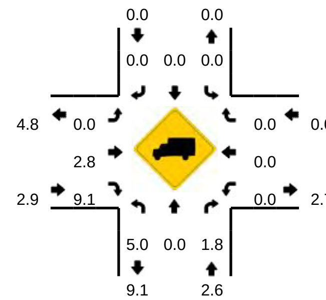
Comments:

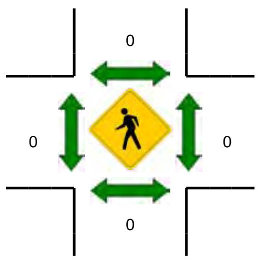
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

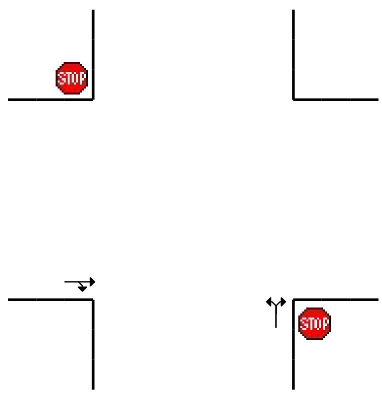
LOCATION: Crooked Creek Rd -- I-26 EB Ramps | **QC JOB #:** 12491448
CITY/STATE: Chapin, SC | **DATE:** Tue, May 13 2014

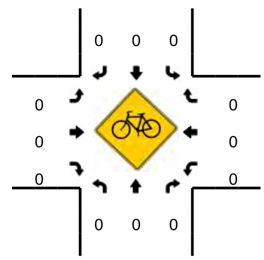


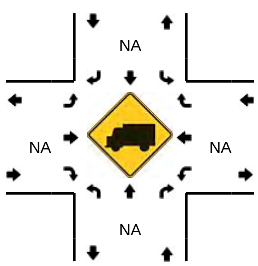
Peak-Hour: 7:00 AM -- 8:00 AM
Peak 15-Min: 7:00 AM -- 7:15 AM

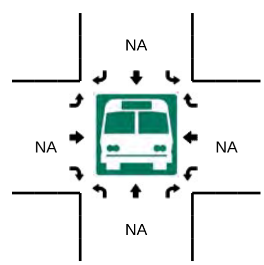












15-Min Count Period Beginning At	Crooked Creek Rd (Northbound) Left	Thru	Right	U	Crooked Creek Rd (Southbound) Left	Thru	Right	U	I-26 EB Ramps (Eastbound) Left	Thru	Right	U	I-26 EB Ramps (Westbound) Left	Thru	Right	U	Total	Hourly Totals
6:30 AM	3	0	0	0	0	0	0	0	0	134	0	0	0	0	0	0	137	
6:45 AM	3	0	3	0	0	0	0	0	0	152	4	0	0	0	0	0	162	
7:00 AM	2	0	10	0	0	0	0	0	0	233	1	0	0	1	0	0	247	
7:15 AM	4	0	9	0	0	0	0	0	0	182	1	0	0	0	0	0	196	742
7:30 AM	7	0	14	0	0	0	0	0	0	200	7	0	0	0	0	0	228	833
7:45 AM	7	0	24	0	0	0	0	0	0	165	2	0	0	0	0	0	198	869
8:00 AM	6	0	14	0	0	0	0	0	0	152	6	0	0	0	0	0	178	800
8:15 AM	3	0	2	0	0	0	0	0	0	147	4	0	0	0	0	0	156	760
8:30 AM	3	0	1	0	0	0	0	0	0	116	5	0	0	0	0	0	125	657
8:45 AM	1	0	0	0	0	0	0	0	0	104	8	0	0	0	0	0	113	572
9:00 AM	1	0	4	0	0	0	0	0	0	97	3	0	0	0	0	0	105	499
9:15 AM	2	0	1	0	0	0	0	0	0	107	1	0	0	0	0	0	111	454
9:30 AM	2	0	2	0	0	0	0	0	0	102	2	0	0	0	0	0	108	437
9:45 AM	2	0	1	0	0	0	0	0	0	95	2	0	0	0	0	0	100	424
10:00 AM	4	0	2	0	0	0	0	0	0	88	2	0	0	0	0	0	96	415
10:15 AM	1	0	3	0	0	0	0	0	0	71	2	0	0	0	0	0	77	381
10:30 AM	1	0	4	0	0	0	0	0	0	59	2	0	0	0	0	0	66	339
10:45 AM	4	0	0	0	0	0	0	0	0	69	3	0	0	0	0	0	76	315
11:00 AM	2	0	0	0	0	0	0	0	0	88	4	0	0	0	0	0	94	313
11:15 AM	3	0	1	0	0	0	0	0	0	84	2	0	0	0	0	0	90	326
11:30 AM	1	0	0	0	0	0	0	0	0	71	4	0	0	0	0	0	76	336
11:45 AM	1	0	1	0	0	0	0	0	0	77	4	0	0	0	0	0	83	343
12:00 PM	4	0	1	0	0	0	0	0	0	70	5	0	0	0	0	0	80	329
12:15 PM	3	0	2	0	0	0	0	0	0	85	2	0	0	0	0	0	92	331

Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	8	0	40	0	0	0	0	0	0	932	4	0	0	4	0	0	988
Heavy Trucks	0	0	0		0	0	0		0	20	0		0	0	0		20
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

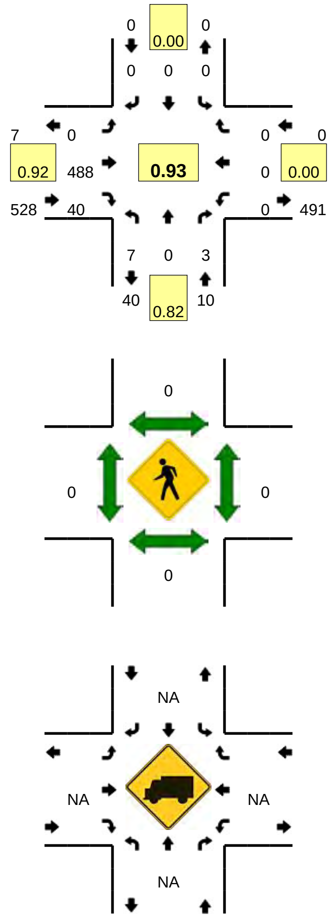
Comments:

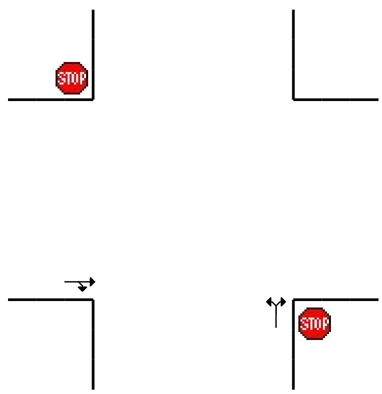
Report generated on 6/19/2014 9:26 AM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

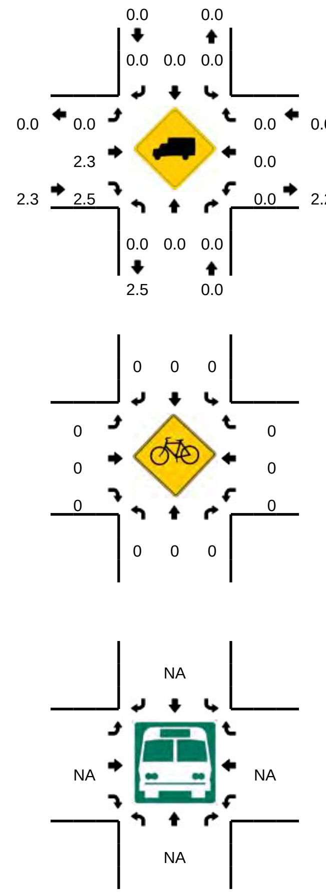
Type of peak hour being reported: Intersection Peak — Method for determining peak hour: Total Entering Volume

LOCATION: Crooked Creek Rd -- I-26 EB Ramp — **QC JOB #:** 12491449
CITY/STATE: Chapin, SC — **DATE:** Tue, May 13 2014

Peak-Hour: 5:00 PM -- 6:00 PM
Peak 15-Min: 5:00 PM -- 5:15 PM







15-Min Count Period Beginning At	Crooked Creek Rd (Northbound) Left	Thru	Right	U	Crooked Creek Rd (Southbound) Left	Thru	Right	U	I-26 EB Ramp (Eastbound) Left	Thru	Right	U	I-26 EB Ramp (Westbound) Left	Thru	Right	U	Total	Hourly Totals
12:30 PM	1	0	0	0	0	0	0	0	0	77	2	0	0	0	0	0	80	
12:45 PM	2	0	0	0	0	0	0	0	0	72	4	0	0	0	0	0	78	
1:00 PM	3	0	1	0	0	0	0	0	0	74	5	0	0	0	0	0	83	
1:15 PM	0	0	2	0	0	0	0	0	0	74	2	0	0	0	0	0	78	319
1:30 PM	0	0	1	0	0	0	0	0	0	75	4	0	0	0	0	0	80	319
1:45 PM	0	0	1	0	0	0	0	0	0	63	5	0	0	0	0	0	69	310
2:00 PM	1	0	1	0	0	0	0	0	0	71	5	0	0	0	0	0	78	305
2:15 PM	2	0	0	0	0	0	0	0	0	72	6	0	0	0	0	0	80	307
2:30 PM	3	0	0	0	0	0	0	0	0	64	5	0	0	0	0	0	72	299
2:45 PM	3	0	1	0	0	0	0	0	0	66	4	0	0	0	0	0	74	304
3:00 PM	0	0	2	0	0	0	0	0	0	80	6	0	0	0	0	0	88	314
3:15 PM	0	0	0	0	0	0	0	0	0	69	3	0	0	0	0	0	72	306
3:30 PM	0	0	1	0	0	0	0	0	0	72	4	0	0	0	0	0	77	311
3:45 PM	3	0	3	0	0	0	0	0	0	111	14	0	0	0	0	0	131	368
4:00 PM	6	0	0	0	0	0	0	0	0	119	7	0	0	0	0	0	132	412
4:15 PM	6	0	1	0	0	0	0	0	0	68	8	0	0	0	0	0	83	423
4:30 PM	4	0	0	0	0	0	0	0	0	100	2	0	0	0	0	0	106	452
4:45 PM	2	0	1	0	0	0	0	0	0	88	7	0	0	0	0	0	98	419
5:00 PM	1	0	0	0	0	0	0	0	0	139	4	0	0	0	0	0	144	431
5:15 PM	3	0	0	0	0	0	0	0	0	121	9	0	0	0	0	0	133	481
5:30 PM	0	0	3	0	0	0	0	0	0	115	9	0	0	0	0	0	127	502
5:45 PM	3	0	0	0	0	0	0	0	0	113	18	0	0	0	0	0	134	538
6:00 PM	3	0	5	0	0	0	0	0	0	96	7	0	0	0	0	0	111	505
6:15 PM	1	0	1	0	0	0	0	0	0	79	6	0	0	0	0	0	87	459

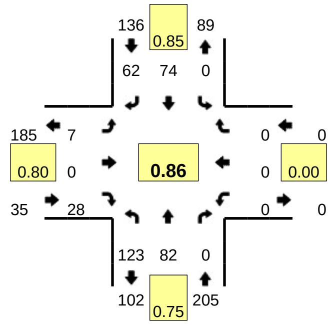
Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	4	0	0	0	0	0	0	0	0	556	16	0	0	0	0	0	576
Heavy Trucks	0	0	0		0	0	0		0	20	0		0	0	0		20
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

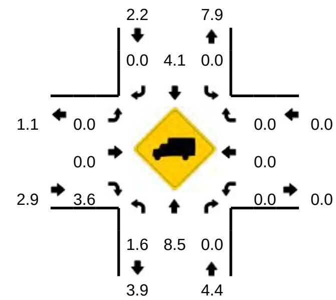
Report generated on 6/19/2014 9:26 AM — SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

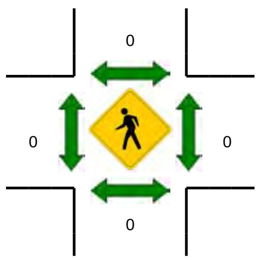
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

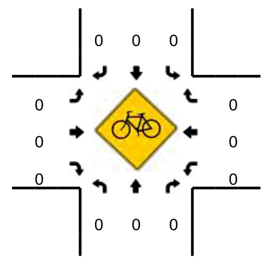
LOCATION: SC Hwy 202 -- I-26 EB Ramps | **QC JOB #:** 12491432
CITY/STATE: Little Mountain, SC | **DATE:** Tue, May 13 2014

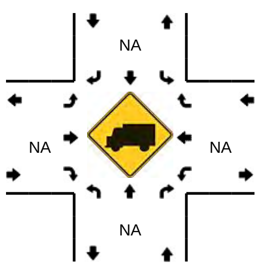


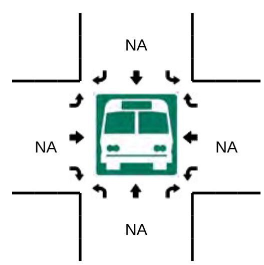
Peak-Hour: 7:00 AM -- 8:00 AM
Peak 15-Min: 7:30 AM -- 7:45 AM











15-Min Count Period Beginning At	SC Hwy 202 (Northbound) Left	Thru	Right	U	SC Hwy 202 (Southbound) Left	Thru	Right	U	I-26 EB Ramps (Eastbound) Left	Thru	Right	U	I-26 EB Ramps (Westbound) Left	Thru	Right	U	Total	Hourly Totals
7:00 AM	33	9	0	0	0	14	14	0	2	0	9	0	0	0	0	0	81	
7:15 AM	30	18	0	0	0	24	16	0	1	0	5	0	0	0	0	0	94	
7:30 AM	39	29	0	0	0	17	17	0	0	0	7	0	0	0	0	0	109	
7:45 AM	21	26	0	0	0	19	15	0	4	0	7	0	0	0	0	0	92	376
8:00 AM	23	19	0	0	0	13	13	0	2	0	1	1	0	0	0	0	72	367
8:15 AM	16	10	0	0	0	9	5	0	2	0	3	0	0	0	0	0	45	318
8:30 AM	10	13	0	0	0	11	9	0	4	0	4	0	0	0	0	0	51	260
8:45 AM	7	3	0	0	0	4	6	0	0	0	4	0	0	0	0	0	24	192

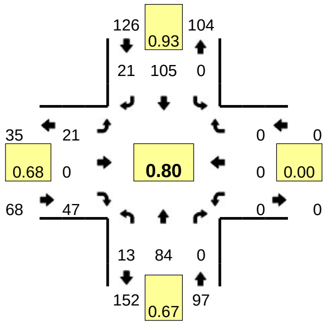
Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	156	116	0	0	0	68	68	0	0	0	28	0	0	0	0	0	436
Heavy Trucks	0	12	0		0	0	0		0	0	0		0	0	0		12
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

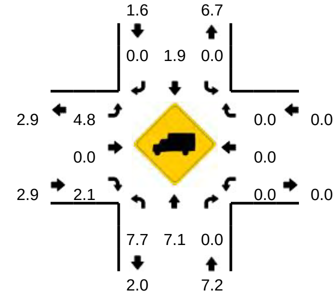
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

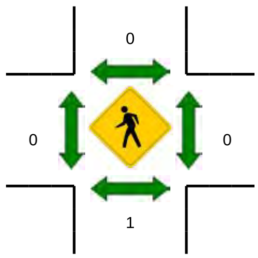
LOCATION: SC Hwy 202 -- I-26 EB Ramps | **QC JOB #:** 12491442

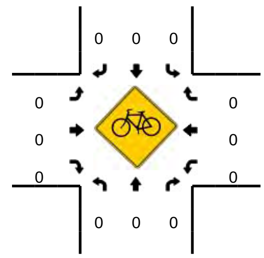
CITY/STATE: Little Mountain, SC | **DATE:** Tue, May 13 2014

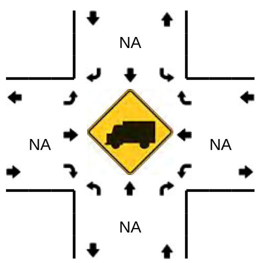


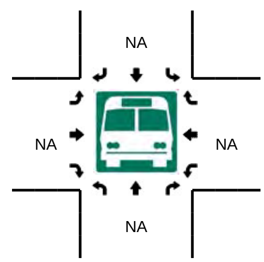
Peak-Hour: 5:00 PM -- 6:00 PM
Peak 15-Min: 5:15 PM -- 5:30 PM











15-Min Count Period Beginning At	SC Hwy 202 (Northbound)				SC Hwy 202 (Southbound)				I-26 EB Ramps (Eastbound)				I-26 EB Ramps (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	4	12	0	0	0	16	5	0	2	0	10	0	0	0	0	0	49	
4:15 PM	8	19	0	0	0	25	3	0	6	0	13	0	0	0	0	0	74	
4:30 PM	5	14	0	0	0	27	6	0	1	0	13	0	0	0	0	0	66	
4:45 PM	5	13	0	0	0	33	2	0	1	0	8	0	0	0	0	0	62	251
5:00 PM	7	16	0	0	0	27	3	0	1	0	9	0	0	0	0	0	63	265
5:15 PM	3	33	0	0	0	26	4	0	6	0	18	1	0	0	0	0	91	282
5:30 PM	2	14	0	0	0	25	10	0	4	0	8	0	0	0	0	0	63	279
5:45 PM	1	21	0	0	0	27	4	0	9	0	12	0	0	0	0	0	74	291

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	12	132	0	0	0	104	16	0	24	0	72	4	0	0	0	0	364
Heavy Trucks	0	4	0		0	0	0		4	0	0		0	0	0		8
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

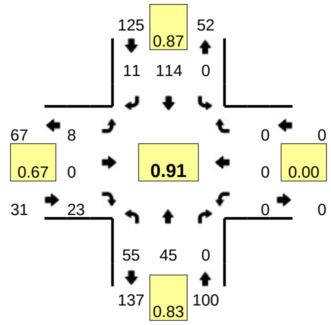
Comments:

Report generated on 5/27/2014 8:30 AM

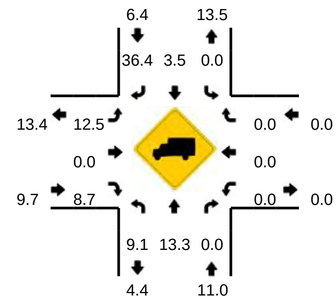
SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

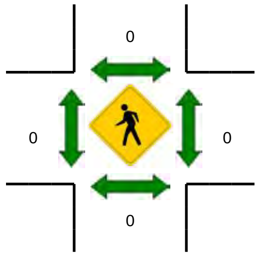
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

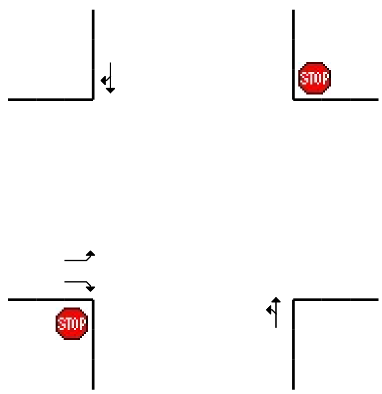
LOCATION: SC Hwy 202 -- I-26 WB Ramps/Meadow Brook Rd | **QC JOB #:** 12491446
CITY/STATE: Pomaria, SC | **DATE:** Tue, May 13 2014

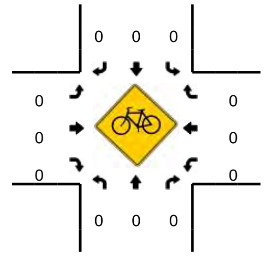


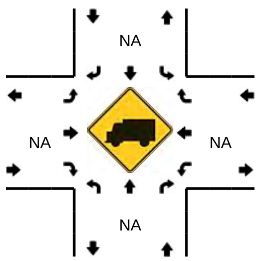
Peak-Hour: 7:15 AM -- 8:15 AM
Peak 15-Min: 7:30 AM -- 7:45 AM

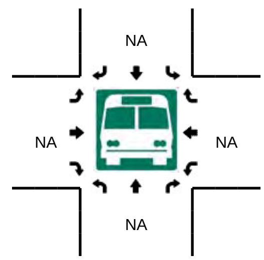












15-Min Count Period Beginning At	SC Hwy 202 (Northbound) Left	Thru	Right	U	SC Hwy 202 (Southbound) Left	Thru	Right	U	I-26 WB Ramps/Meadow Brook Rd (Eastbound) Left	Thru	Right	U	I-26 WB Ramps/Meadow Brook Rd (Westbound) Left	Thru	Right	U	Total	Hourly Totals
7:00 AM	7	3	0	0	0	23	1	0	2	0	5	0	0	0	0	0	41	
7:15 AM	10	10	0	0	0	30	6	0	2	0	10	0	0	0	0	0	68	
7:30 AM	20	10	0	0	0	30	2	0	1	0	7	0	0	0	0	0	70	
7:45 AM	16	13	0	0	0	31	2	0	2	0	3	0	0	0	0	0	67	246
8:00 AM	9	12	0	0	0	23	1	0	2	0	3	1	0	0	0	0	51	256
8:15 AM	7	5	0	0	0	10	2	0	2	0	4	0	0	0	0	0	30	218
8:30 AM	7	11	0	0	0	20	1	0	3	0	0	1	0	0	0	0	43	191
8:45 AM	1	1	0	0	0	10	0	0	0	0	1	0	0	0	0	0	13	137

Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	80	40	0	0	0	120	8	0	4	0	28	0	0	0	0	0	280
Heavy Trucks	8	4	0		0	0	4		0	0	0		0	0	0		16
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Quality Counts, LLC

920 Blairhill Rd Ste B106
Charlotte, NC 28217

File Name : 12491446 - SC Hwy 202 & I-26 WB Ramps-Meadowbrook Rd
Site Code : 12491446
Start Date : 5/13/2014

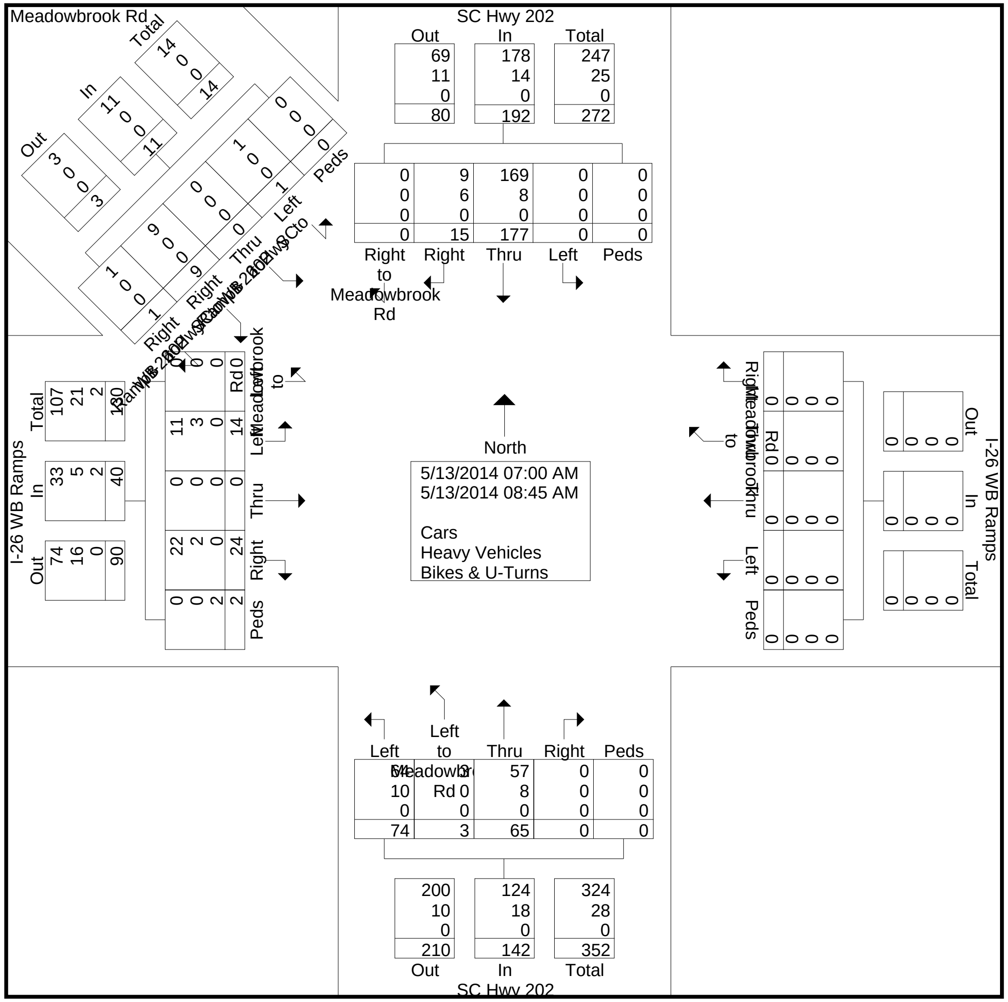
Groups Printed- Cars - Heavy Vehicles - Turns

	SC Hwy 202 From North						I-26 WB Ramps From East						SC Hwy 202 From South						I-26 WB Ramps From West						Meadowbrook Rd From Northwest						
Start Time	Left	Thru	Right	Right to Meadow brook Rd	Peds	App. Total	Left	Thru	Thru to Meadow brook Rd	Right	Peds	App. Total	Left	Left to Meadow brook Rd	Thru	Right	Peds	App. Total	Left to Meadow brook Rd	Left	Thru	Right	Peds	App. Total	Left to SC Hwy 202	Thru to I-26 WB Ramps	Right to SC Hwy 202	Right to I-26 WB Ramps	Peds	App. Total	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0		
07:00 AM	0	23	1	0	0	24	0	0	0	0	0	0	7	0	3	0	0	10	0	2	0	2	0	4	0	0	3	0	0	3	41
07:15 AM	0	30	6	0	0	36	0	0	0	0	0	0	10	0	10	0	0	20	0	2	0	7	0	9	0	0	3	0	0	3	68
07:30 AM	0	30	2	0	0	32	0	0	0	0	0	0	19	1	10	0	0	30	0	1	0	6	0	7	0	0	1	0	0	1	70
07:45 AM	0	31	2	0	0	33	0	0	0	0	0	0	16	0	13	0	0	29	0	2	0	2	0	4	0	0	1	0	0	1	67
Total	0	114	11	0	0	125	0	0	0	0	0	0	52	1	36	0	0	89	0	7	0	17	0	24	0	0	8	0	0	8	246
08:00 AM	0	23	1	0	0	24	0	0	0	0	0	0	8	1	12	0	0	21	0	2	0	3	1	6	0	0	0	1	0	1	52
08:15 AM	0	10	2	0	0	12	0	0	0	0	0	0	7	0	5	0	0	12	0	2	0	4	0	6	1	0	0	0	0	1	31
08:30 AM	0	20	1	0	0	21	0	0	0	0	0	0	7	0	11	0	0	18	0	3	0	0	1	4	0	0	0	0	0	0	43
08:45 AM	0	10	0	0	0	10	0	0	0	0	0	0	0	1	1	0	0	2	0	0	0	0	0	0	0	0	1	0	0	1	13
Total	0	63	4	0	0	67	0	0	0	0	0	0	22	2	29	0	0	53	0	7	0	7	2	16	1	0	1	1	0	3	139
Grand Total	0	177	15	0	0	192	0	0	0	0	0	0	74	3	65	0	0	142	0	14	0	24	2	40	1	0	9	1	0	11	385
Apprch %	0	92.2	7.8	0	0		0	0	0	0	0		52.1	2.1	45.8	0	0		0	35	0	60	5		9.1	0	81.8	9.1	0		
Total %	0	46	3.9	0	0	49.9	0	0	0	0	0	0	19.2	0.8	16.9	0	0	36.9	0	3.6	0	6.2	0.5	10.4	0.3	0	2.3	0.3	0	2.9	
Cars	0	169	9	0	0	178	0	0	0	0	0	0	64	3	57	0	0	124	0	11	0	22	0	33	1	0	9	1	0	11	346
% Cars	0	95.5	60	0	0	92.7	0	0	0	0	0	0	86.5	100	87.7	0	0	87.3	0	78.6	0	91.7	0	82.5	100	0	100	100	0	100	89.9
Heavy Vehicles																															
% Heavy Vehicles	0	4.5	40	0	0	7.3	0	0	0	0	0	0	13.5	0	12.3	0	0	12.7	0	21.4	0	8.3	0	12.5	0	0	0	0	0	0	9.6
Bikes & U-Turns																															
% Bikes & U-Turns	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	5	0	0	0	0	0	0	0.5

Quality Counts, LLC

920 Blairhill Rd Ste B106
Charlotte, NC 28217

File Name : 12491446 - SC Hwy 202 & I-26 WB Ramps-Meadowbrook Rd
Site Code : 12491446
Start Date : 5/13/2014
Page No : 2



Quality Counts, LLC

920 Blairhill Rd Ste B106
Charlotte, NC 28217

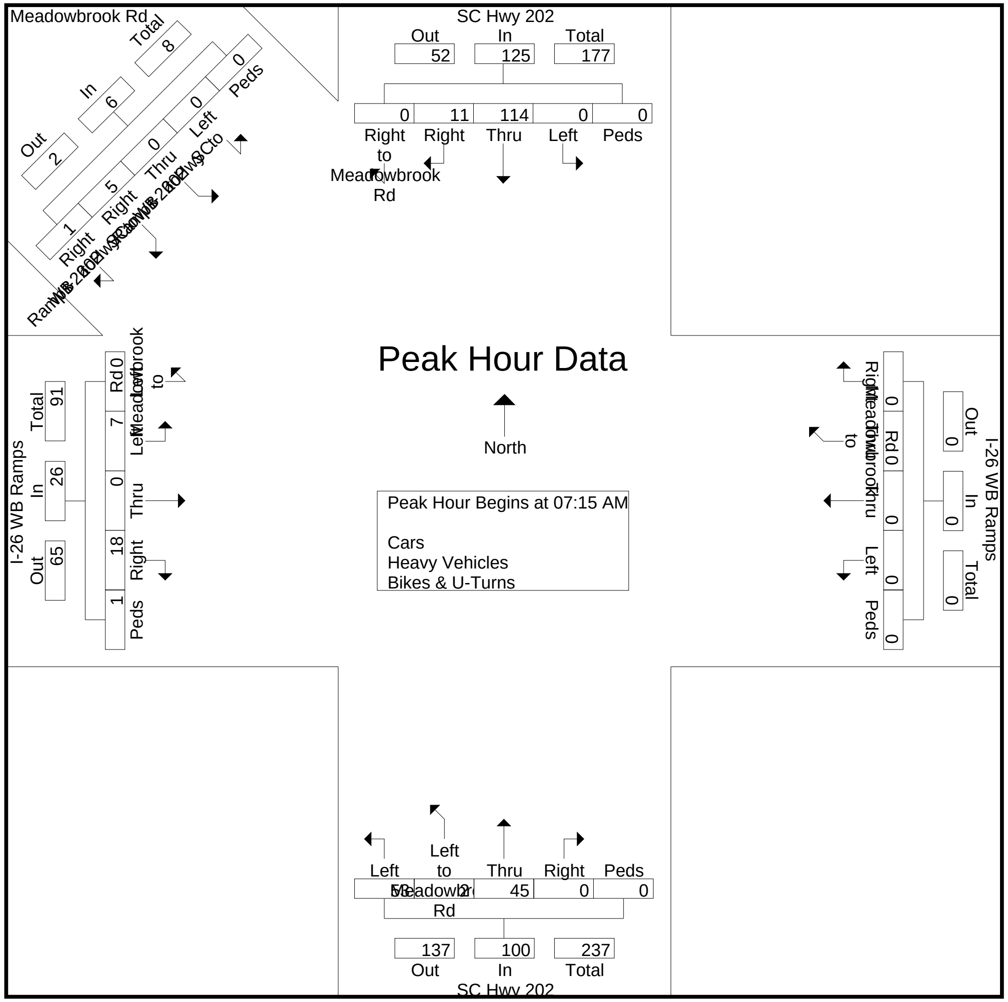
File Name : 12491446 - SC Hwy 202 & I-26 WB Ramps-Meadowbrook Rd
Site Code : 12491446
Start Date : 5/13/2014
Page No : 3

	SC Hwy 202 From North						I-26 WB Ramps From East						SC Hwy 202 From South						I-26 WB Ramps From West						Meadowbrook Rd From Northwest						
Start Time	Left	Thru	Right	Right to Meadowbrook Rd	Peds	App. Total	Left	Thru	Thru to Meadowbrook Rd	Right	Peds	App. Total	Left	Left to Meadowbrook Rd	Thru	Right	Peds	App. Total	Left to Meadowbrook Rd	Left	Thru	Right	Peds	App. Total	Left to SC Hwy 202	Thru to I-26 WB Ramps	Right to SC Hwy 202	Right to I-26 WB Ramps	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																															
Peak Hour for Entire Intersection Begins at 07:15 AM																															
07:15 AM	0	30	**6**	0	0	**36**	0	0	0	0	0	0	10	0	10	0	0	20	0	**2**	0	**7**	0	**9**	0	0	**3**	0	0	**3**	68
07:30 AM	0	30	2	0	0	32	0	0	0	0	0	0	**19**	**1**	10	0	0	**30**	0	1	0	6	0	7	0	0	1	0	0	1	**70**
07:45 AM	0	**31**	2	0	0	33	0	0	0	0	0	0	16	0	**13**	0	0	29	0	2	0	2	0	4	0	0	1	0	0	1	67
08:00 AM	0	23	1	0	0	24	0	0	0	0	0	0	8	1	12	0	0	21	0	2	0	3	**1**	6	0	0	0	**1**	0	1	52
Total Volume	0	114	11	0	0	125	0	0	0	0	0	0	53	2	45	0	0	100	0	7	0	18	1	26	0	0	5	1	0	6	257
% App. Total	0	91.2	8.8	0	0		0	0	0	0	0		53	2	45	0	0		0	26.9	0	69.2	3.8		0	0	83.3	16.7	0		
PHF	.000	.919	.458	.000	.000	.868	.000	.000	.000	.000	.000	.000	.697	.500	.865	.000	.000	.833	.000	.875	.000	.643	.250	.722	.000	.000	.417	.250	.000	.500	.918

Quality Counts, LLC

920 Blairhill Rd Ste B106
Charlotte, NC 28217

File Name : 12491446 - SC Hwy 202 & I-26 WB Ramps-Meadowbrook Rd
Site Code : 12491446
Start Date : 5/13/2014
Page No : 4



Quality Counts, LLC

920 Blairhill Rd Ste B106
Charlotte, NC 28217

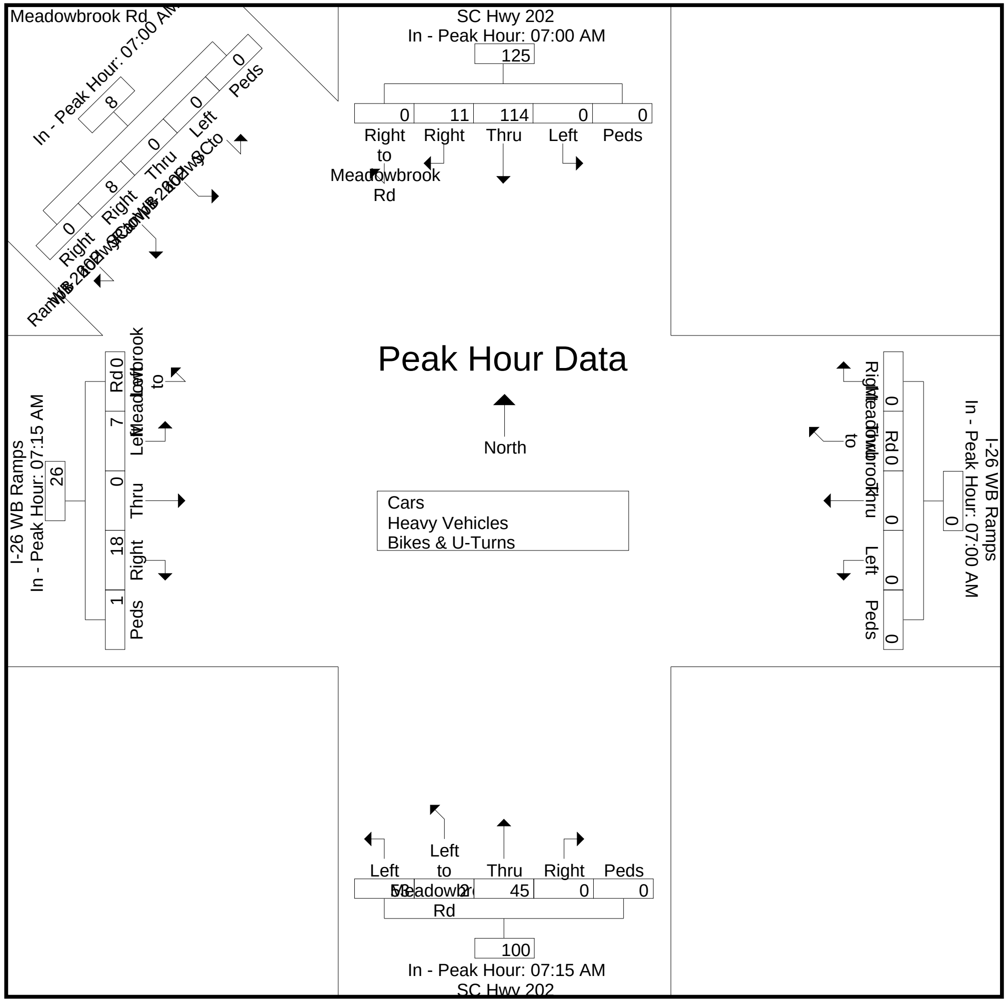
File Name : 12491446 - SC Hwy 202 & I-26 WB Ramps-Meadowbrook Rd
Site Code : 12491446
Start Date : 5/13/2014
Page No : 5

	SC Hwy 202 From North						I-26 WB Ramps From East						SC Hwy 202 From South						I-26 WB Ramps From West						Meadowbrook Rd From Northwest						
Start Time	Left	Thru	Right	Right to Meadow brook Rd	Peds	App. Total	Left	Thru	Thru to Meadow brook Rd	Right	Peds	App. Total	Left	Left to Meadow brook Rd	Thru	Right	Peds	App. Total	Left to Meadow brook Rd	Left	Thru	Right	Peds	App. Total	Left to SC Hwy 202	Thru to I-26 WB Ramps	Right to SC Hwy 202	Right to I-26 WB Ramps	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																															
Peak Hour for Each Approach Begins at:																															
	07:00 AM						07:00 AM						07:15 AM						07:15 AM						07:00 AM						
+0 mins.	0	23	1	0	0	24	0	0	0	0	0	0	10	0	10	0	0	20	0	**2**	0	**7**	0	**9**	0	0	**3**	0	0	**3**	
+15 mins.	0	30	**6**	0	0	**36**	0	0	0	0	0	0	**19**	**1**	10	0	0	**30**	0	1	0	6	0	7	0	0	3	0	0	3	
+30 mins.	0	30	2	0	0	32	0	0	0	0	0	0	16	0	**13**	0	0	29	0	2	0	2	0	4	0	0	1	0	0	1	
+45 mins.	0	**31**	2	0	0	33	0	0	0	0	0	0	8	1	12	0	0	21	0	2	0	3	**1**	6	0	0	1	0	0	1	
Total Volume	0	114	11	0	0	125	0	0	0	0	0	0	53	2	45	0	0	100	0	7	0	18	1	26	0	0	8	0	0	8	
% App. Total	0	91.2	8.8	0	0		0	0	0	0	0		53	2	45	0	0		0	26.9	0	69.2	3.8		0	0	100	0	0		
PHF	.000	.919	.458	.000	.000	.868	.000	.000	.000	.000	.000	.000	.697	.500	.865	.000	.000	.833	.000	.875	.000	.643	.250	.722	.000	.000	.667	.000	.000	.667	

Quality Counts, LLC

920 Blairhill Rd Ste B106
Charlotte, NC 28217

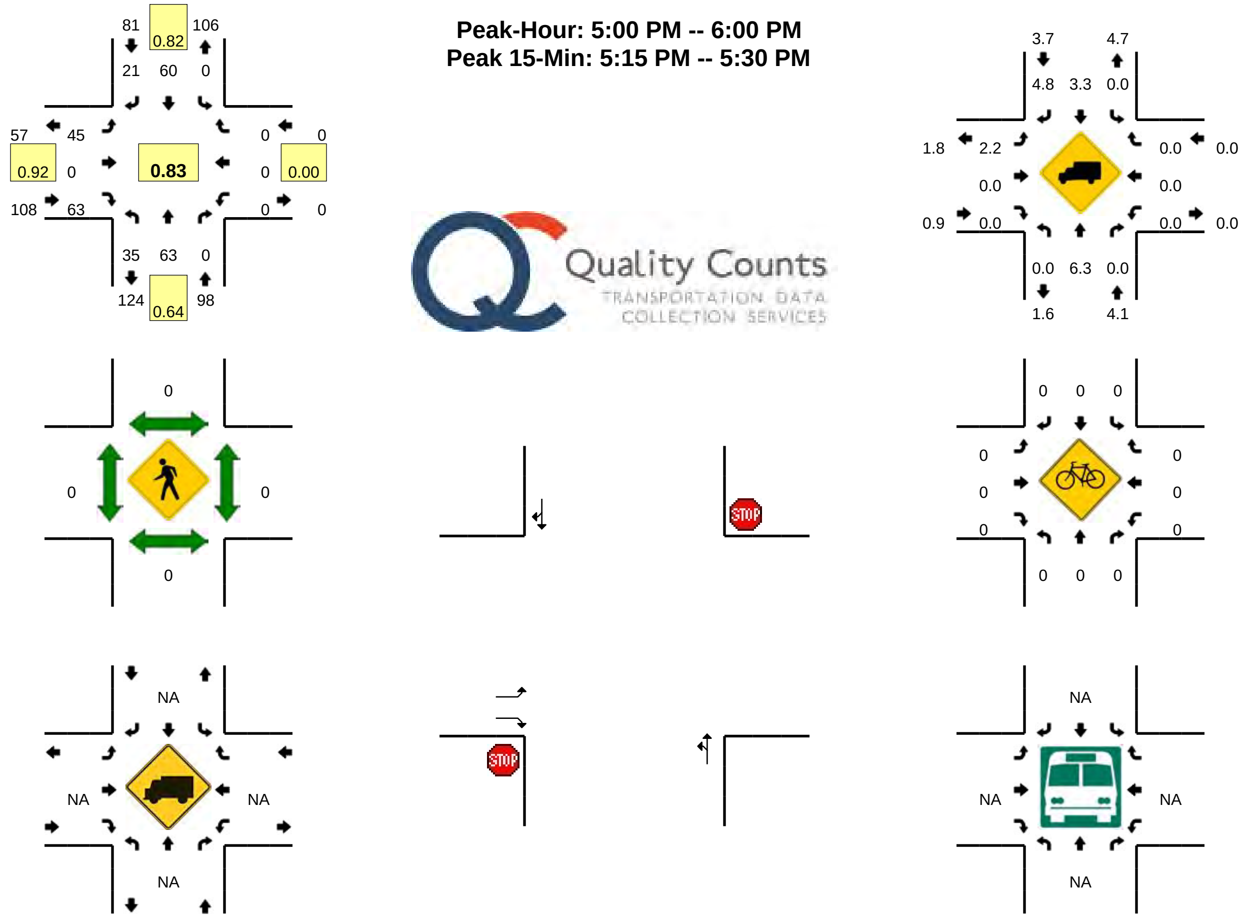
File Name : 12491446 - SC Hwy 202 & I-26 WB Ramps-Meadowbrook Rd
Site Code : 12491446
Start Date : 5/13/2014
Page No : 6



Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

LOCATION: SC Hwy 202 -- I-26 WB Ramps/Meadow Brook Rd | **QC JOB #:** 12491447
CITY/STATE: Pomaria, SC | **DATE:** Tue, May 13 2014

Peak-Hour: 5:00 PM -- 6:00 PM
Peak 15-Min: 5:15 PM -- 5:30 PM



15-Min Count Period Beginning At	SC Hwy 202 (Northbound) Left	Thru	Right	U	SC Hwy 202 (Southbound) Left	Thru	Right	U	I-26 WB Ramps/Meadow Brook Rd (Eastbound) Left	Thru	Right	U	I-26 WB Ramps/Meadow Brook Rd (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	5	9	0	0	0	12	2	0	4	0	9	1	0	0	0	0	42	
4:15 PM	3	21	0	0	0	13	3	0	9	0	15	1	0	0	0	0	65	
4:30 PM	7	8	0	0	0	14	5	0	10	0	19	0	0	0	0	0	63	
4:45 PM	5	9	0	0	0	12	9	0	6	0	24	0	0	0	0	0	65	235
5:00 PM	5	10	0	0	0	16	7	0	7	0	13	1	0	0	0	0	59	252
5:15 PM	13	25	0	0	0	13	5	0	13	0	17	0	0	0	0	0	86	273
5:30 PM	9	9	0	0	0	22	5	0	17	0	12	0	0	0	0	0	74	284
5:45 PM	7	19	0	1	0	9	4	0	6	0	21	1	0	0	0	0	68	287

Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	52	100	0	0	0	52	20	0	52	0	68	0	0	0	0	0	344
Heavy Trucks	0	8	0		0	0	0		0	0	0		0	0	0		8
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 5/27/2014 8:30 AM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Quality Counts, LLC

920 Blairhill Rd Ste B106
Charlotte, NC 28217

File Name : 12491447 - SC Hwy 202 & I-26 WB Ramps-Meadowbrook Rd
Site Code : 12491447
Start Date : 5/13/2014
Page No : 1

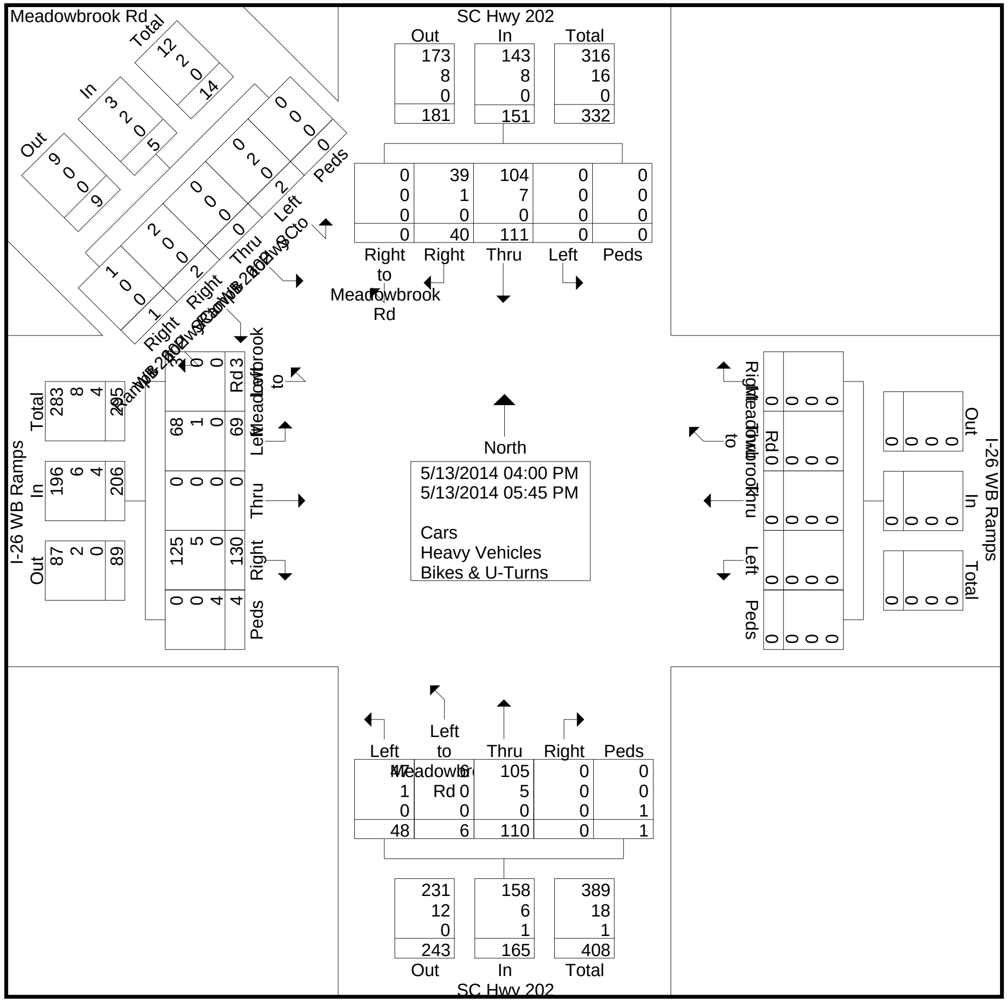
Groups Printed- Cars - Heavy Vehicles - Turns

	SC Hwy 202 From North						I-26 WB Ramps From East						SC Hwy 202 From South						I-26 WB Ramps From West						Meadowbrook Rd From Northwest						
Start Time	Left	Thru	Right	Right to Meadow brook Rd	Peds	App. Total	Left	Thru	Thru to Meadow brook Rd	Right	Peds	App. Total	Left	Left to Meadow brook Rd	Thru	Right	Peds	App. Total	Left to Meadow brook Rd	Left	Thru	Right	Peds	App. Total	Left to SC Hwy 202	Thru to I-26 WB Ramps	Right to SC Hwy 202	Right to I-26 WB Ramps	Peds	App. Total	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0		
04:00 PM	0	12	2	0	0	14	0	0	0	0	0	0	5	0	9	0	0	14	1	3	0	9	1	14	0	0	0	0	0	0	42
04:15 PM	0	13	3	0	0	16	0	0	0	0	0	0	3	0	21	0	0	24	0	9	0	15	1	25	1	0	0	0	0	1	66
04:30 PM	0	14	5	0	0	19	0	0	0	0	0	0	6	1	8	0	0	15	0	10	0	19	0	29	1	0	0	1	0	2	65
04:45 PM	0	12	9	0	0	21	0	0	0	0	0	0	5	0	9	0	0	14	0	6	0	24	0	30	0	0	0	0	0	0	65
Total	0	51	19	0	0	70	0	0	0	0	0	0	19	1	47	0	0	67	1	28	0	67	2	98	2	0	0	1	0	3	238
05:00 PM	0	16	7	0	0	23	0	0	0	0	0	0	5	0	10	0	0	15	0	7	0	13	1	21	0	0	0	0	0	0	59
05:15 PM	0	13	5	0	0	18	0	0	0	0	0	0	12	1	25	0	0	38	0	13	0	17	0	30	0	0	1	0	0	1	87
05:30 PM	0	22	5	0	0	27	0	0	0	0	0	0	5	4	9	0	0	18	0	17	0	12	0	29	0	0	1	0	0	1	75
05:45 PM	0	9	4	0	0	13	0	0	0	0	0	0	7	0	19	0	1	27	2	4	0	21	1	28	0	0	0	0	0	0	68
Total	0	60	21	0	0	81	0	0	0	0	0	0	29	5	63	0	1	98	2	41	0	63	2	108	0	0	2	0	0	2	289
Grand Total	0	111	40	0	0	151	0	0	0	0	0	0	48	6	110	0	1	165	3	69	0	130	4	206	2	0	2	1	0	5	527
Apprch %	0	73.5	26.5	0	0		0	0	0	0	0		29.1	3.6	66.7	0	0.6		1.5	33.5	0	63.1	1.9		40	0	40	20	0		
Total %	0	21.1	7.6	0	0	28.7	0	0	0	0	0	0	9.1	1.1	20.9	0	0.2	31.3	0.6	13.1	0	24.7	0.8	39.1	0.4	0	0.4	0.2	0	0.9	
Cars	0	104	39	0	0	143	0	0	0	0	0	0	47	6	105	0	0	158	3	68	0	125	0	196	0	0	2	1	0	3	500
% Cars	0	93.7	97.5	0	0	94.7	0	0	0	0	0	0	97.9	100	95.5	0	0	95.8	100	98.6	0	96.2	0	95.1	0	0	100	100	0	60	94.9
Heavy Vehicles																															
% Heavy Vehicles	0	6.3	2.5	0	0	5.3	0	0	0	0	0	0	2.1	0	4.5	0	0	3.6	0	1.4	0	3.8	0	2.9	100	0	0	0	0	40	4.2
Bikes & U-Turns	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	4	4	0	0	0	0	0	0	5
% Bikes & U-Turns	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0.6	0	0	0	0	100	1.9	0	0	0	0	0	0	0.9

Quality Counts, LLC

920 Blairhill Rd Ste B106
Charlotte, NC 28217

File Name : 12491447 - SC Hwy 202 & I-26 WB Ramps-Meadowbrook Rd
Site Code : 12491447
Start Date : 5/13/2014
Page No : 2



Quality Counts, LLC

920 Blairhill Rd Ste B106
Charlotte, NC 28217

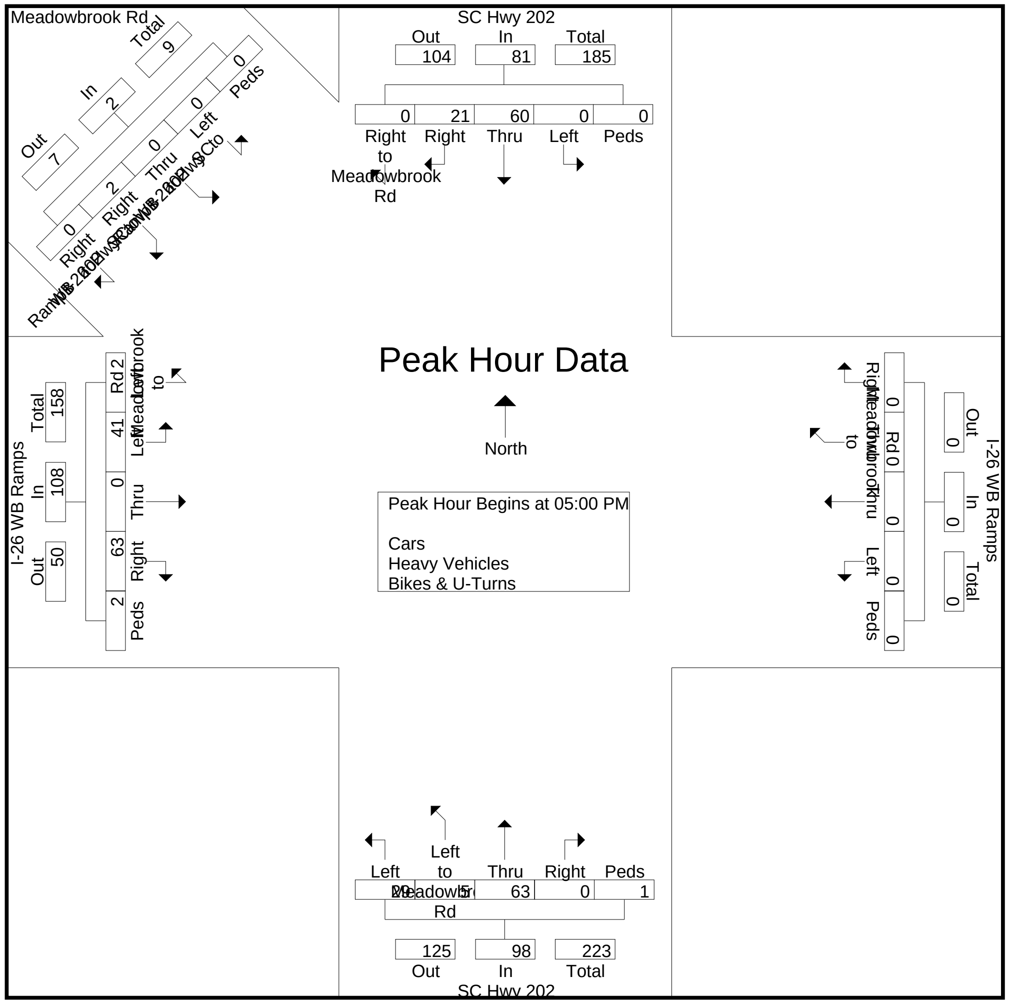
File Name : 12491447 - SC Hwy 202 & I-26 WB Ramps-Meadowbrook Rd
Site Code : 12491447
Start Date : 5/13/2014

	SC Hwy 202 From North						I-26 WB Ramps From East						SC Hwy 202 From South						I-26 WB Ramps From West						Meadowbrook Rd From Northwest						
Start Time	Left	Thru	Right	Right to Meadowbrook Rd	Peds	App. Total	Left	Thru	Thru to Meadowbrook Rd	Right	Peds	App. Total	Left	Left to Meadowbrook Rd	Thru	Right	Peds	App. Total	Left to Meadowbrook Rd	Left	Thru	Right	Peds	App. Total	Left to SC Hwy 202	Thru to I-26 WB Ramps	Right to SC Hwy 202	Right to I-26 WB Ramps	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																															
Peak Hour for Entire Intersection Begins at 05:00 PM																															
05:00 PM	0	16	**7**	0	0	23	0	0	0	0	0	0	5	0	10	0	0	15	0	7	0	13	**1**	21	0	0	0	0	0	0	59
05:15 PM	0	13	5	0	0	18	0	0	0	0	0	0	**12**	1	**25**	0	0	**38**	0	13	0	17	0	**30**	0	0	**1**	0	0	**1**	**87**
05:30 PM	0	**22**	5	0	0	**27**	0	0	0	0	0	0	5	**4**	9	0	0	18	0	**17**	0	12	0	29	0	0	1	0	0	1	75
05:45 PM	0	9	4	0	0	13	0	0	0	0	0	0	7	0	19	0	**1**	27	**2**	4	0	**21**	1	28	0	0	0	0	0	0	68
Total Volume	0	60	21	0	0	81	0	0	0	0	0	0	29	5	63	0	1	98	2	41	0	63	2	108	0	0	2	0	0	2	289
% App. Total	0	74.1	25.9	0	0		0	0	0	0	0		29.6	5.1	64.3	0	1		1.9	38	0	58.3	1.9		0	0	100	0	0		
PHF	.000	.682	.750	.000	.000	.750	.000	.000	.000	.000	.000	.000	.604	.313	.630	.000	.250	.645	.250	.603	.000	.750	.500	.900	.000	.000	.500	.000	.000	.500	.830

Quality Counts, LLC

920 Blairhill Rd Ste B106
Charlotte, NC 28217

File Name : 12491447 - SC Hwy 202 & I-26 WB Ramps-Meadowbrook Rd
Site Code : 12491447
Start Date : 5/13/2014
Page No : 4



Quality Counts, LLC

920 Blairhill Rd Ste B106
Charlotte, NC 28217

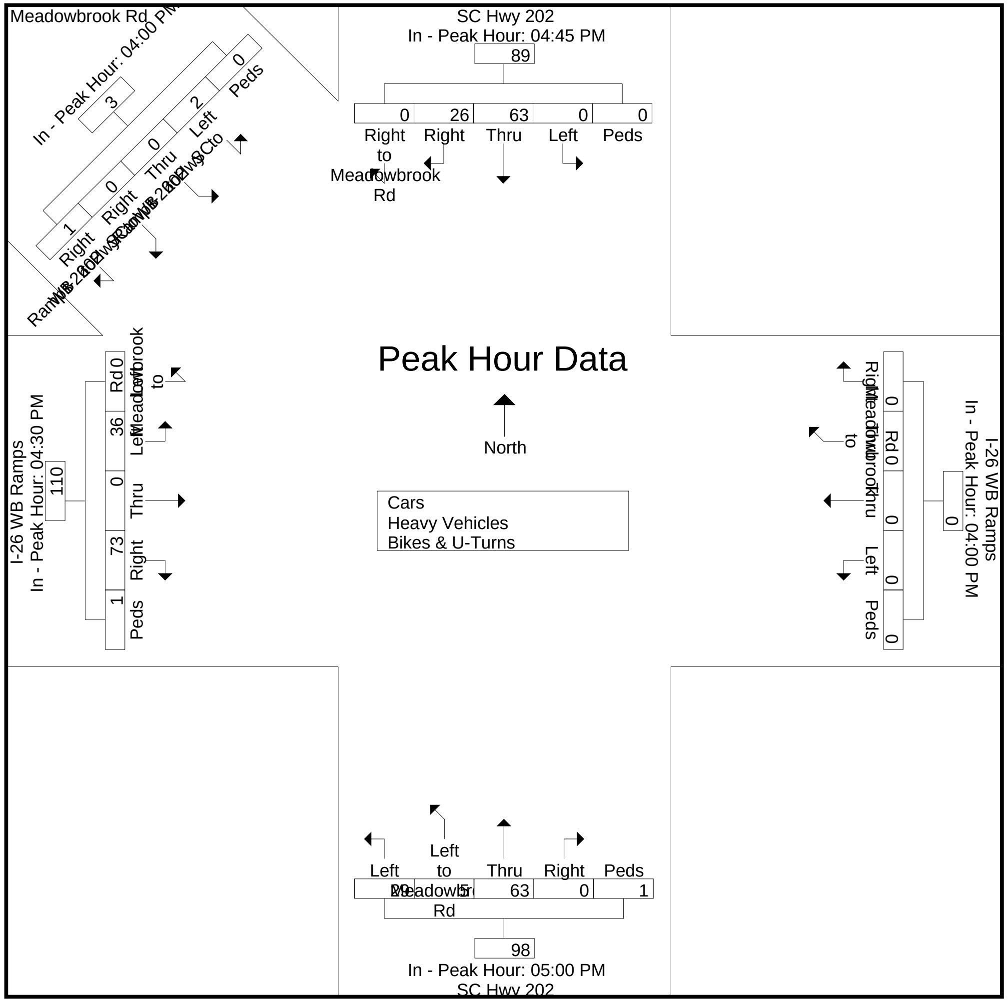
File Name : 12491447 - SC Hwy 202 & I-26 WB Ramps-Meadowbrook Rd
Site Code : 12491447
Start Date : 5/13/2014
Page No : 5

	SC Hwy 202 From North						I-26 WB Ramps From East						SC Hwy 202 From South						I-26 WB Ramps From West						Meadowbrook Rd From Northwest						
Start Time	Left	Thru	Right	Right to Meadowbrook Rd	Peds	App. Total	Left	Thru	Thru to Meadowbrook Rd	Right	Peds	App. Total	Left	Left to Meadowbrook Rd	Thru	Right	Peds	App. Total	Left to Meadowbrook Rd	Left	Thru	Right	Peds	App. Total	Left to SC Hwy 202	Thru to I-26 WB Ramps	Right to SC Hwy 202	Right to I-26 WB Ramps	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																															
Peak Hour for Each Approach Begins at:																															
	04:45 PM						04:00 PM						05:00 PM						04:30 PM						04:00 PM						
+0 mins.	0	12	**9**	0	0	21	0	0	0	0	0	0	5	0	10	0	0	15	0	10	0	19	0	29	0	0	0	0	0	0	
+15 mins.	0	16	7	0	0	23	0	0	0	0	0	0	**12**	1	**25**	0	0	**38**	0	6	0	**24**	0	**30**	**1**	0	0	0	0	1	
+30 mins.	0	13	5	0	0	18	0	0	0	0	0	0	5	**4**	9	0	0	18	0	7	0	13	**1**	21	1	0	0	**1**	0	**2**	
+45 mins.	0	**22**	5	0	0	**27**	0	0	0	0	0	0	7	0	19	0	**1**	27	0	**13**	0	17	0	30	0	0	0	0	0	0	
Total Volume	0	63	26	0	0	89	0	0	0	0	0	0	29	5	63	0	1	98	0	36	0	73	1	110	2	0	0	1	0	3	
% App. Total	0	70.8	29.2	0	0		0	0	0	0	0		29.6	5.1	64.3	0	1		0	32.7	0	66.4	0.9		66.7	0	0	33.3	0		
PHF	.000	.716	.722	.000	.000	.824	.000	.000	.000	.000	.000	.000	.604	.313	.630	.000	.250	.645	.000	.692	.000	.760	.250	.917	.500	.000	.000	.250	.000	.375	

Quality Counts, LLC

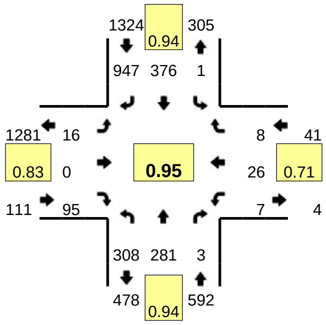
920 Blairhill Rd Ste B106
Charlotte, NC 28217

File Name : 12491447 - SC Hwy 202 & I-26 WB Ramps-Meadowbrook Rd
Site Code : 12491447
Start Date : 5/13/2014
Page No : 6

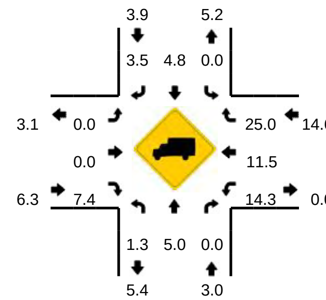


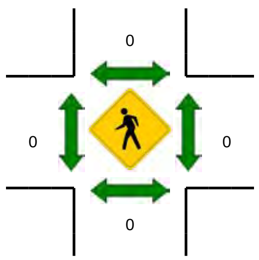
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

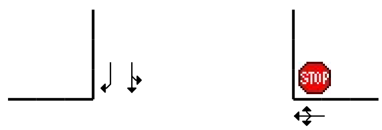
LOCATION: US 176/Broad River Rd -- I-26 EB Ramps | **QC JOB #:** 12491427
CITY/STATE: Irmo, SC | **DATE:** Tue, May 13 2014

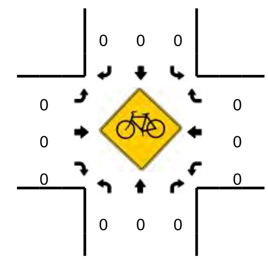


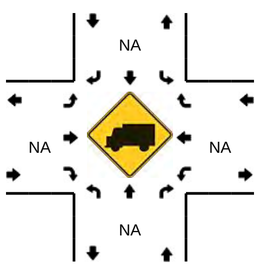
Peak-Hour: 7:00 AM -- 8:00 AM
Peak 15-Min: 7:15 AM -- 7:30 AM

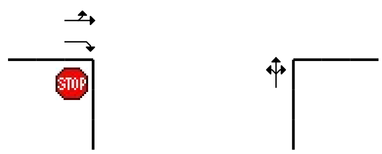


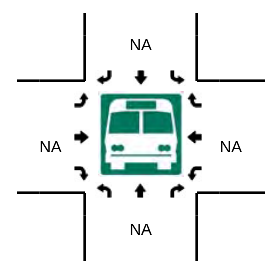












15-Min Count Period Beginning At	US 176/Broad River Rd (Northbound)				US 176/Broad River Rd (Southbound)				I-26 EB Ramps (Eastbound)				I-26 EB Ramps (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	84	47	0	0	1	81	261	0	4	0	16	0	0	11	1	0	506	
7:15 AM	92	66	0	0	0	88	264	0	1	0	25	0	3	3	3	0	545	
7:30 AM	70	79	0	0	0	138	216	0	4	0	28	0	2	3	2	0	542	
7:45 AM	62	89	3	0	0	69	206	0	7	0	26	0	2	9	2	0	475	2068
8:00 AM	51	65	11	0	0	58	161	0	10	0	15	0	0	9	8	0	388	1950
8:15 AM	38	82	5	0	0	51	152	0	7	0	32	0	1	1	3	0	372	1777
8:30 AM	33	45	5	0	0	71	150	0	7	1	15	0	4	7	2	0	340	1575
8:45 AM	27	37	5	0	0	67	124	0	9	2	13	1	2	5	5	0	297	1397

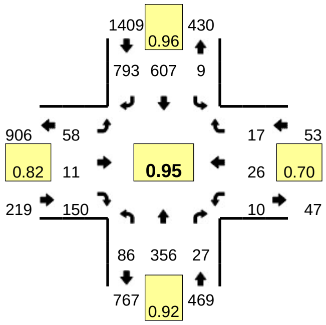
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	368	264	0	0	0	352	1056	0	4	0	100	0	12	12	12	0	2180
Heavy Trucks	4	12	0		0	4	28		0	0	8		4	0	4		64
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

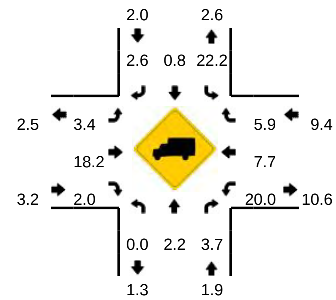
Comments:

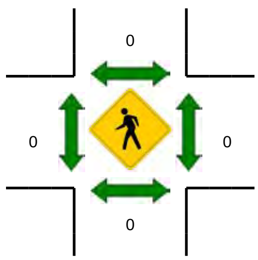
Type of peak hour being reported: Intersection Peak — Method for determining peak hour: Total Entering Volume

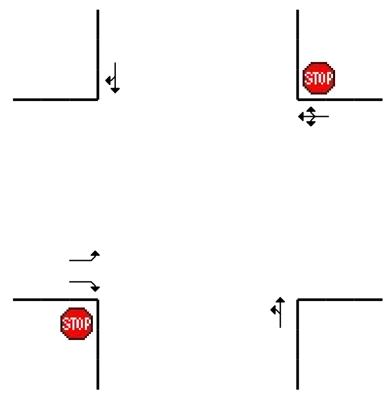
LOCATION: US 176/Broad River Rd -- I-26 EB Ramps — **QC JOB #:** 12491428
CITY/STATE: Irmo, SC — **DATE:** Tue, May 13 2014

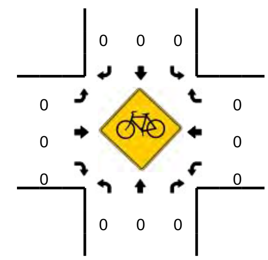
Peak-Hour: 5:00 PM -- 6:00 PM
Peak 15-Min: 5:15 PM -- 5:30 PM

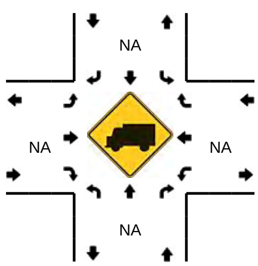


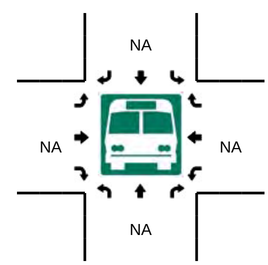












15-Min Count Period Beginning At	US 176/Broad River Rd (Northbound) Left	Thru	Right	U	US 176/Broad River Rd (Southbound) Left	Thru	Right	U	I-26 EB Ramps (Eastbound) Left	Thru	Right	U	I-26 EB Ramps (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	23	74	5	0	1	116	99	0	17	2	35	0	1	6	4	0	383	
4:15 PM	19	83	9	0	1	119	113	0	11	3	32	0	3	0	8	0	401	
4:30 PM	20	89	4	0	2	134	131	0	8	3	26	0	3	5	0	0	425	
4:45 PM	20	109	7	0	0	150	156	0	12	3	26	0	2	11	1	0	497	1706
5:00 PM	19	95	3	0	2	158	179	0	11	4	33	0	3	9	3	0	519	1842
5:15 PM	30	97	10	0	3	165	188	0	16	4	47	0	0	5	3	0	568	2009
5:30 PM	18	78	8	0	1	143	224	0	18	0	39	1	4	4	3	0	541	2125
5:45 PM	19	86	6	0	3	141	202	0	12	3	31	0	3	8	8	0	522	2150

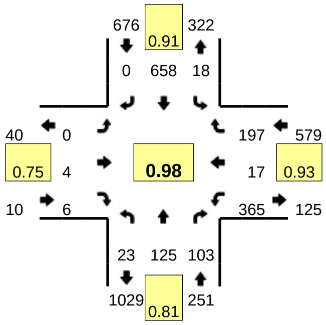
Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	120	388	40	0	12	660	752	0	64	16	188	0	0	20	12	0	2272
Heavy Trucks	0	4	0		4	8	12		0	4	0		0	0	0		32
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

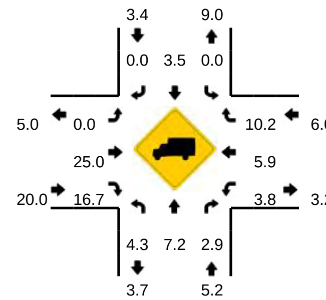
Comments:

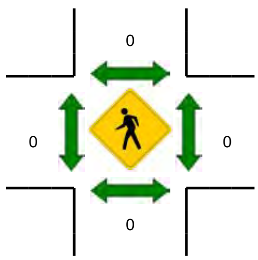
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

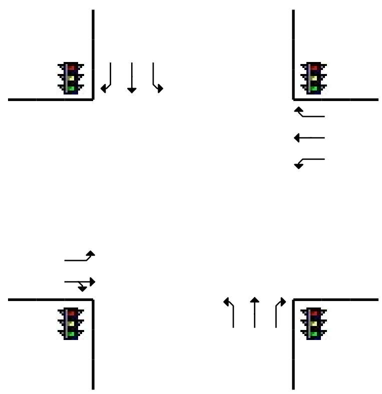
LOCATION: US 176/Broad River Rd -- I-26 WB Ramps | **QC JOB #:** 12491430
CITY/STATE: Irmo, SC | **DATE:** Thu, Jun 26 2014

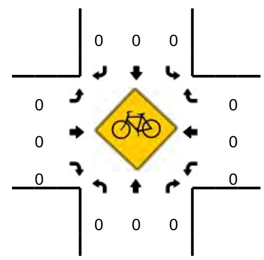
Peak-Hour: 7:00 AM -- 8:00 AM
Peak 15-Min: 7:30 AM -- 7:45 AM

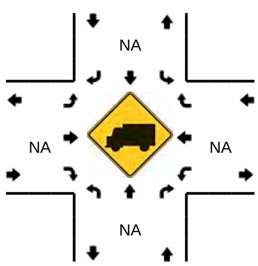


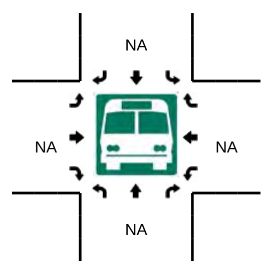












15-Min Count Period Beginning At	US 176/Broad River Rd (Northbound)				US 176/Broad River Rd (Southbound)				I-26 WB Ramps (Eastbound)				I-26 WB Ramps (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	5	26	17	0	7	179	0	0	0	1	1	0	87	2	43	0	368	
7:15 AM	4	16	31	0	5	168	0	0	0	0	3	0	93	6	57	0	383	
7:30 AM	9	38	36	0	4	151	0	0	0	1	0	0	98	3	47	0	387	
7:45 AM	5	45	19	0	2	160	0	0	0	2	2	0	87	6	50	0	378	1516
8:00 AM	3	32	25	0	6	131	0	0	1	1	5	0	88	5	33	1	331	1479
8:15 AM	4	30	22	0	4	131	0	0	0	0	3	0	104	3	21	0	322	1418
8:30 AM	7	29	22	0	3	125	0	0	0	1	6	0	91	4	27	0	315	1346
8:45 AM	7	34	31	0	3	120	0	0	0	0	4	0	86	2	44	1	332	1300

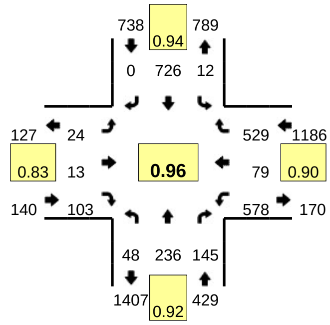
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	36	152	144	0	16	604	0	0	0	4	0	0	392	12	188	0	1548
Heavy Trucks	0	8	4		0	16	0		0	4	0		44	4	8		88
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

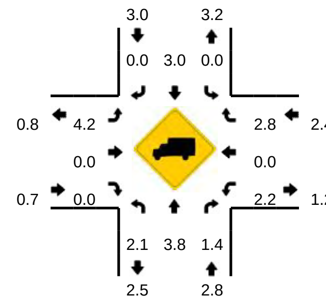
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

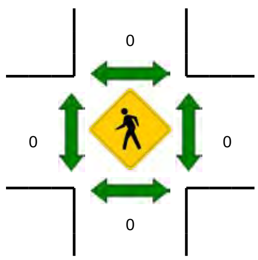
LOCATION: US 176/Broad River Rd -- I-26 WB Ramps | **QC JOB #:** 12491431

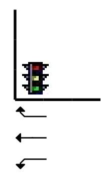
CITY/STATE: Irmo, SC | **DATE:** Wed, Jun 25 2014

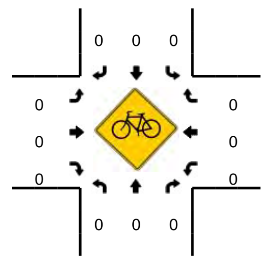


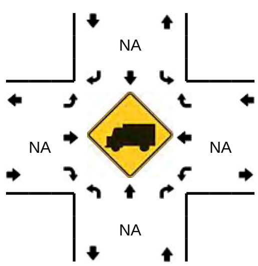
Peak-Hour: 5:00 PM -- 6:00 PM
Peak 15-Min: 5:15 PM -- 5:30 PM

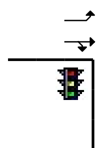


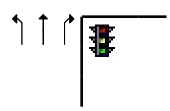


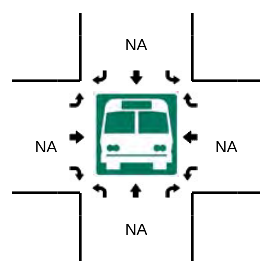












15-Min Count Period Beginning At	US 176/Broad River Rd (Northbound) Left	Thru	Right	U	US 176/Broad River Rd (Southbound) Left	Thru	Right	U	I-26 WB Ramps (Eastbound) Left	Thru	Right	U	I-26 WB Ramps (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	11	41	27	0	2	95	0	0	2	2	6	0	100	12	74	0	372	
4:15 PM	16	30	33	0	9	105	0	0	4	2	10	0	116	13	99	0	437	
4:30 PM	5	40	23	0	5	122	0	0	0	1	7	0	118	15	112	0	448	
4:45 PM	13	53	30	0	3	194	0	0	2	3	10	0	128	14	97	1	548	1805
5:00 PM	10	55	37	0	4	185	0	0	1	5	26	0	110	18	116	0	567	2000
5:15 PM	9	55	29	0	3	181	0	0	7	4	31	0	151	25	155	0	650	2213
5:30 PM	16	62	39	0	1	172	0	0	10	2	26	0	160	17	133	0	638	2403
5:45 PM	13	64	40	0	4	188	0	0	6	2	20	0	157	19	125	0	638	2493

Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	36	220	116	0	12	724	0	0	28	16	124	0	604	100	620	0	2600
Heavy Trucks	4	4	0		0	28	0		0	0	0		16	0	20		72
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

APPENDIX C

CRASH DATA

Crash Summary

I- 26 (26 E) from MPT 90.557 to MPT 91.670

LEXINGTON County

01/01/2012 - 05/31/2015 (3.4 years)

Length = 1.113 miles

AADT = 43,975

Functional Class = Rural -- Principal Arterial - Interstate

Crashes by Injury Class

Fatality Crashes	1
Injury Crashes	8
PDO Crashes	31
Total Crashes	**40**

Crashes by Manner Of Collision

Rear End	14
Angle	2
Sideswipe	4
Head On	0
Run Off Road	15
Other	5
Total Crashes	**40**

Special Contributing Factors

Animal	2
Bicycle	0
Pedestrian	1

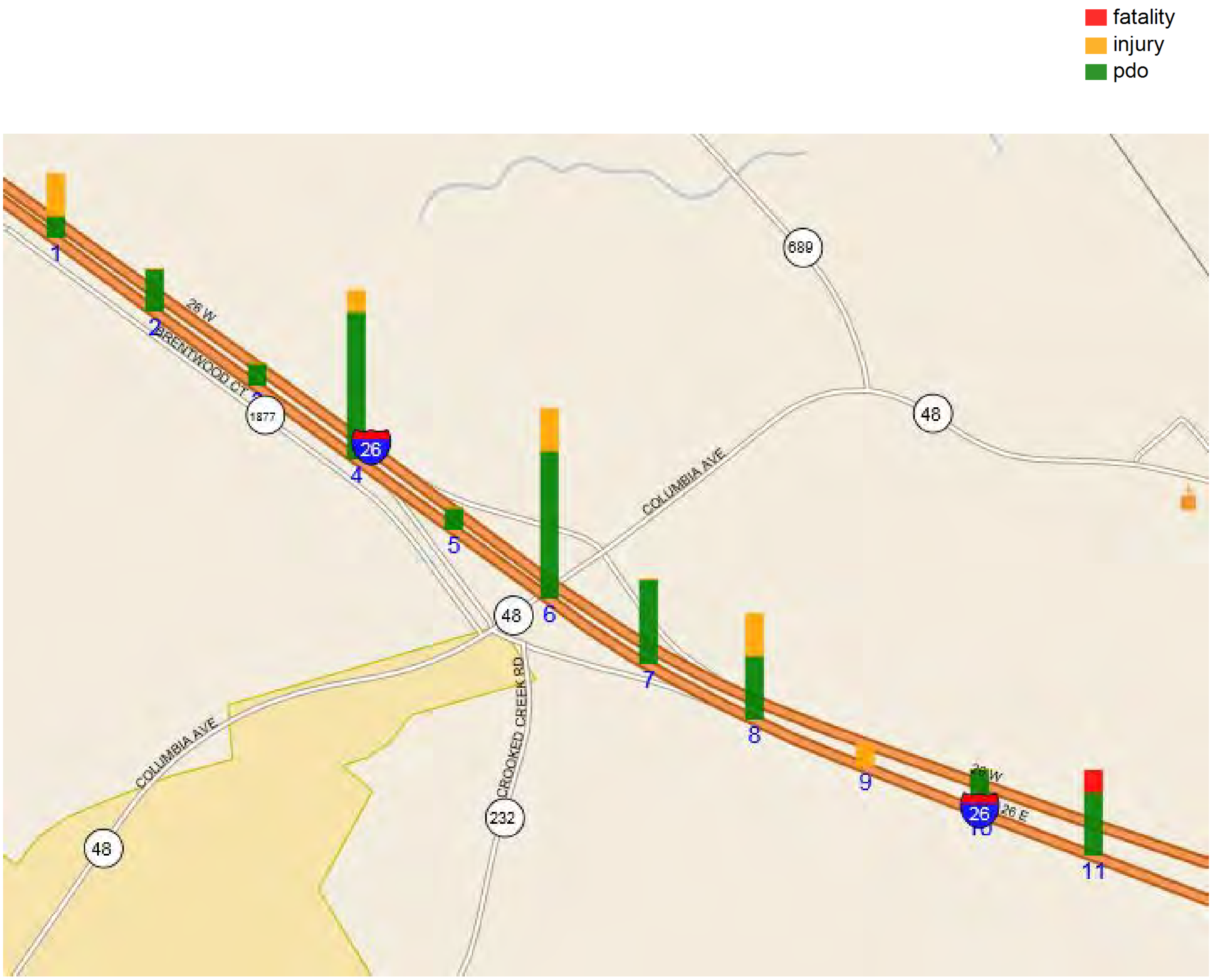
I- 26 (26 E) from MPT 90.557 to MPT 91.670

LEXINGTON County

01/01/2012 - 05/31/2015 (3.4 years)

Length = 1.113 miles   AADT = 43,975

Functional Class = Rural -- Principal Arterial - Interstate



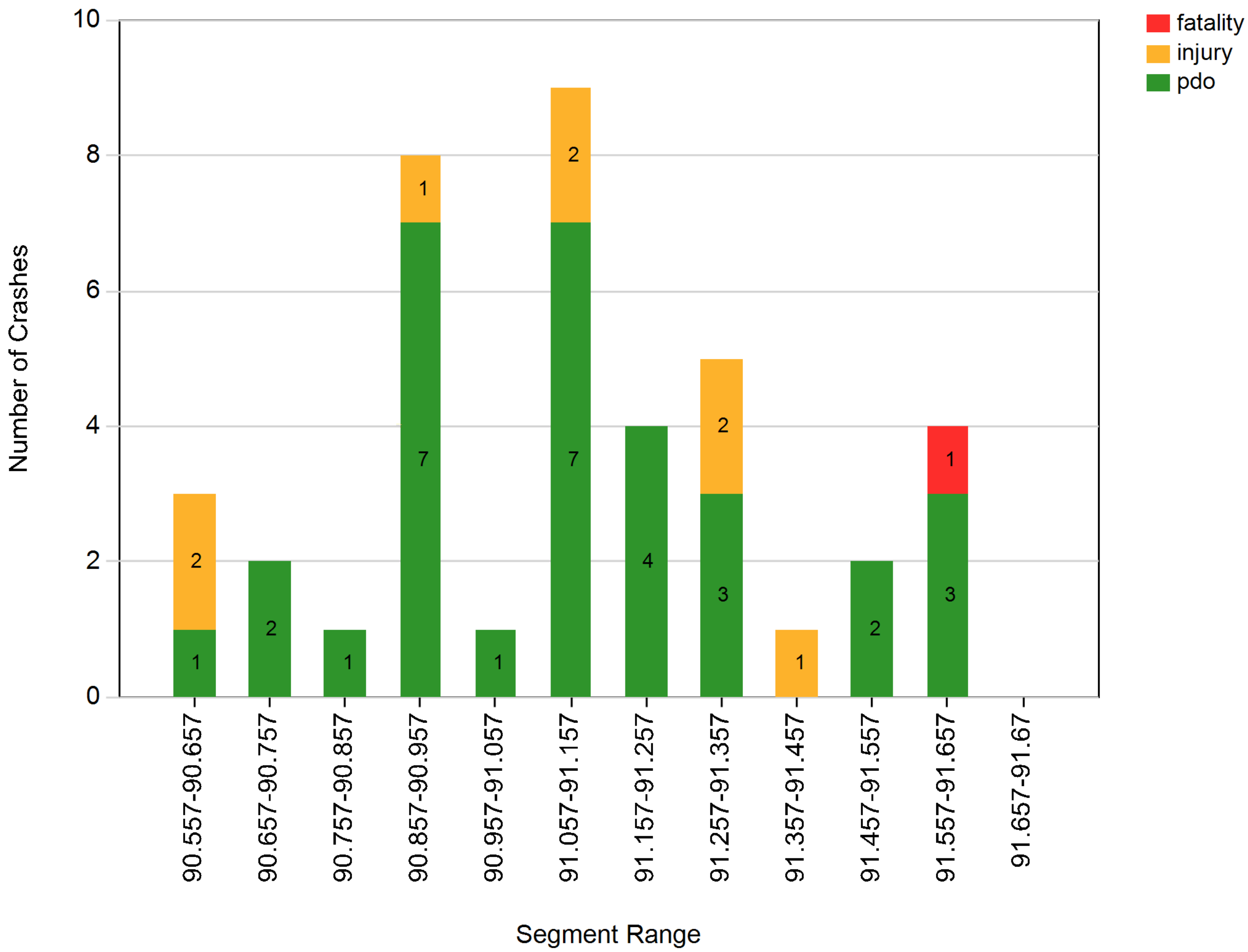
I- 26 (26 E) from MPT 90.557 to MPT 91.670

LEXINGTON County

01/01/2012 - 05/31/2015 (3.4 years)

Length = 1.113 miles AADT = 43,975

Functional Class = Rural -- Principal Arterial - Interstate



Section Crashes

MPT 90.557 to 90.657 (Stack #1)

Total Crashes: 3 Light: 3 Dark: 0 Dry: 1 Wet: 2 Fatalities: 0 Injuries: 2 PDO: 1

1	13535244	90.573	INJ1	DAY	WET	MOTOR VEHICLE (IN TRANSPORT)	REAR END
2	12573088	90.583	INJ0	DAY	DRY	MOTOR VEHICLE (IN TRANSPORT)	REAR END
3	13532800	90.642	INJ1	DAY	WET	MOTOR VEHICLE (STOPPED)	REAR END

MPT 90.657 to 90.757 (Stack #2)

Total Crashes: 2 Light: 1 Dark: 1 Dry: 1 Wet: 1 Fatalities: 0 Injuries: 0 PDO: 2

1	14623574	90.712	INJ0	DAY	WET	MEDIAN BARRIER	NO COLLISION W/MV
2	14606230	90.726	INJ0	DARK	DRY	ANIMAL (DEER ONLY)	NO COLLISION W/MV

MPT 90.757 to 90.857 (Stack #3)

Total Crashes: 1 Light: 0 Dark: 1 Dry: 0 Wet: 1 Fatalities: 0 Injuries: 0 PDO: 1

1	14508930	90.773	INJ0	DARK	WET	MOTOR VEHICLE (IN TRANSPORT)	SIDESWIPE SAME DIR

MPT 90.857 to 90.957 (Stack #4)

Total Crashes: 8 Light: 6 Dark: 2 Dry: 7 Wet: 1 Fatalities: 0 Injuries: 1 PDO: 7

1	14506828	90.876	INJ0	DARK	SNOW	TREE	NO COLLISION W/MV
2	14592718	90.877	INJ0	DAY	DRY	MEDIAN BARRIER	NO COLLISION W/MV
3	13554860	90.901	INJ0	DAY	DRY	DITCH	NO COLLISION W/MV
4	14592689	90.917	INJ0	DAY	DRY	EMBANKMENT	NO COLLISION W/MV
5	12549186	90.918	INJ2	DAY	DRY	SPILL (TWO-WHEELED VEH)	NO COLLISION W/MV
6	12568711	90.920	INJ0	DAY	DRY	MOTOR VEHICLE (IN TRANSPORT)	SIDESWIPE SAME DIR
7	12506514	90.921	INJ0	DARK	DRY	ANIMAL (DEER ONLY)	NO COLLISION W/MV
8	14505005	90.923	INJ0	DAY	DRY	OTHER MOVABLE OBJECT	NO COLLISION W/MV

MPT 90.957 to 91.057 (Stack #5)

Total Crashes: 1 Light: 1 Dark: 0 Dry: 0 Wet: 1 Fatalities: 0 Injuries: 0 PDO: 1

1	15527428	90.994	INJ0	DAY	WET	TREE	NO COLLISION W/MV

MPT 91.057 to 91.157 (Stack #6)

Total Crashes: 9 Light: 6 Dark: 3 Dry: 7 Wet: 2 Fatalities: 0 Injuries: 2 PDO: 7

1	14580416	91.107	INJ0	DAY	DRY	MOTOR VEHICLE (IN TRANSPORT)	REAR END
2	12576226	91.122	INJ0	DARK	DRY	MOTOR VEHICLE (STOPPED)	NO COLLISION W/MV
3	13509164	91.123	INJ0	DAY	WET	MOTOR VEHICLE (STOPPED)	REAR END
4	14620354	91.126	INJ0	DARK	DRY	MOTOR VEHICLE (STOPPED)	REAR END

Section Crashes

5	14560207	91.134	INJ1	DAY	DRY	MOTOR VEHICLE (STOPPED)	REAR END
6	15545968	91.138	INJ0	DAY	DRY	MOTOR VEHICLE (STOPPED)	REAR END
7	13621256	91.141	INJ0	DAY	WET	MOTOR VEHICLE (STOPPED)	REAR END
8	12522173	91.151	INJ2	DARK	DRY	MOTOR VEHICLE (STOPPED)	REAR END
9	13028770	91.151	INJ0	DAY	DRY	MOTOR VEHICLE (IN TRANSPORT)	REAR END

MPT 91.157 to 91.257 (Stack #7)

Total Crashes: 4 Light: 2 Dark: 2 Dry: 3 Wet: 1 Fatalities: 0 Injuries: 0 PDO: 4

1	14512428	91.169	INJ0	DAY	DRY	MOTOR VEHICLE (IN TRANSPORT)	ANGLE
2	13607832	91.170	INJ0	DARK	DRY	MOTOR VEHICLE (STOPPED)	REAR END
3	14576684	91.196	INJ0	DAY	WET	OVERHEAD SIGN SUPPORT	NO COLLISION W/MV
4	14004663	91.220	INJ0	DARK	SNOW	MEDIAN BARRIER	NO COLLISION W/MV

MPT 91.257 to 91.357 (Stack #8)

Total Crashes: 5 Light: 4 Dark: 1 Dry: 4 Wet: 1 Fatalities: 0 Injuries: 2 PDO: 3

1	13615213	91.291	INJ2	DAY	DRY	MOTOR VEHICLE (IN TRANSPORT)	SIDESWIPE SAME DIR
2	13541303	91.301	INJ0	DAY	DRY	MOTOR VEHICLE (IN TRANSPORT)	SIDESWIPE SAME DIR
3	13536711	91.310	INJ2	DAWN	WET	TREE	NO COLLISION W/MV
4	15560792	91.320	INJ0	DAY	DRY	MEDIAN BARRIER	NO COLLISION W/MV
5	12565324	91.334	INJ0	DARK	DRY	OTHER NONCOLLISION	NO COLLISION W/MV

MPT 91.357 to 91.457 (Stack #9)

Total Crashes: 1 Light: 1 Dark: 0 Dry: 1 Wet: 0 Fatalities: 0 Injuries: 1 PDO: 0

1	14519195	91.381	INJ1	DAWN	DRY	OVERTURN/ROLLOVER	NO COLLISION W/MV

MPT 91.457 to 91.557 (Stack #10)

Total Crashes: 2 Light: 2 Dark: 0 Dry: 2 Wet: 0 Fatalities: 0 Injuries: 0 PDO: 2

1	12589179	91.496	INJ0	DAY	DRY	MOTOR VEHICLE (IN TRANSPORT)	REAR END
2	13523409	91.525	INJ0	DUSK	DRY	JACKKNIFE	NO COLLISION W/MV

MPT 91.557 to 91.657 (Stack #11)

Total Crashes: 4 Light: 3 Dark: 1 Dry: 3 Wet: 1 Fatalities: 1 Injuries: 0 PDO: 3

1	14605635	91.577	INJ4	DARK	DRY	PEDESTRIAN	NO COLLISION W/MV
2	15536619	91.577	INJ0	DAY	WET	MOTOR VEHICLE (IN TRANSPORT)	ANGLE
3	13551630	91.581	INJ0	DAY	DRY	MOTOR VEHICLE (STOPPED)	REAR END
4	14541624	91.645	INJ0	DAY	DRY	EMBANKMENT	NO COLLISION W/MV

APPENDIX D

EXISTING 2014 SYNCHRO AND SIM TRAFFIC REPORTS

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	6	7	88	9	0	13	0	177	672	15	622	0
Future Vol, veh/h	6	7	88	9	0	13	0	177	672	15	622	0
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	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	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	7	8	98	10	0	14	0	197	747	17	691	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1301	1667	691	1347	1294	570	-	0	0	943	0	0
Stage 1	724	724	-	570	570	-	-	-	-	-	-	-
Stage 2	577	943	-	777	724	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	-	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	-	-	-	2.218	-	-
Pot Cap-1 Maneuver	138	96	445	128	163	521	0	-	-	727	-	0
Stage 1	417	430	-	506	505	-	0	-	-	-	-	0
Stage 2	502	341	-	390	430	-	0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	130	92	445	91	157	521	-	-	-	727	-	-
Mov Cap-2 Maneuver	130	92	-	91	157	-	-	-	-	-	-	-
Stage 1	417	414	-	506	505	-	-	-	-	-	-	-
Stage 2	488	341	-	287	414	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	22.5	28.4	0	0.2
HCM LOS	C	D		

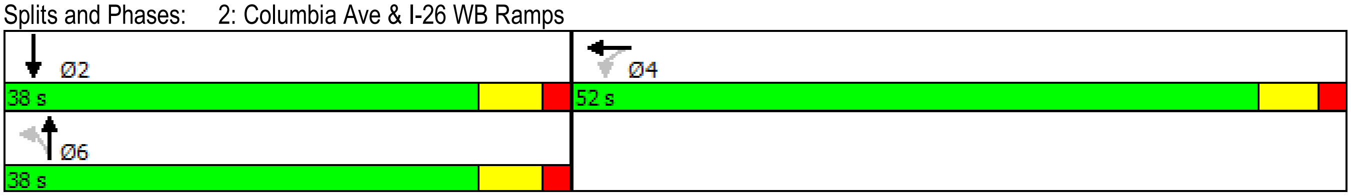
Minor Lane/Major Mvmt	NBT	NBR	EBLn1	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	316	178	727	-
HCM Lane V/C Ratio	-	-	0.355	0.137	0.023	-
HCM Control Delay (s)	-	-	22.5	28.4	10.1	0
HCM Lane LOS	-	-	C	D	B	A
HCM 95th %tile Q(veh)	-	-	1.6	0.5	0.1	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	432	2	8	67	129	0	0	205	29
Future Volume (vph)	0	0	0	432	2	8	67	129	0	0	205	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	0	0	0	1772	0	0	1831	0	0	1831	0
Flt Permitted					0.953			0.784				
Satd. Flow (perm)	0	0	0	0	1772	0	0	1460	0	0	1831	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					2						9	
Link Speed (mph)		45			45			35			35	
Link Distance (ft)		883			668			593			885	
Travel Time (s)		13.4			10.1			11.6			17.2	
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
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	491	0	0	217	0	0	260	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
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
Turn Type				Perm	NA		Perm	NA			NA	
Protected Phases					4			6			2	
Permitted Phases				4			6					
Detector Phase				4	4		6	6			2	
Switch Phase												
Minimum Initial (s)				10.0	10.0		10.0	10.0			10.0	
Minimum Split (s)				22.0	22.0		22.0	22.0			22.0	
Total Split (s)				52.0	52.0		38.0	38.0			38.0	
Total Split (%)				57.8%	57.8%		42.2%	42.2%			42.2%	
Maximum Green (s)				46.0	46.0		31.7	31.7			31.7	
Yellow Time (s)				4.0	4.0		4.3	4.3			4.3	
All-Red Time (s)				2.0	2.0		2.0	2.0			2.0	
Lost Time Adjust (s)					0.0			0.0			0.0	
Total Lost Time (s)					6.0			6.3			6.3	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				4.0	4.0		3.0	3.0			3.0	
Recall Mode				None	None		Min	Min			Min	
Act Effct Green (s)					19.7			13.6			13.6	
Actuated g/C Ratio					0.43			0.29			0.29	
v/c Ratio					0.65			0.51			0.48	
Control Delay					15.3			19.8			17.6	
Queue Delay					0.0			0.0			0.0	
Total Delay					15.3			19.8			17.6	
LOS					B			B			B	
Approach Delay					15.3			19.8			17.6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS					B			B			B	
Queue Length 50th (ft)					88			45			52	
Queue Length 95th (ft)					211			125			137	
Internal Link Dist (ft)		803			588			513			805	
Turn Bay Length (ft)												
Base Capacity (vph)					1634			1053			1323	
Starvation Cap Reductn					0			0			0	
Spillback Cap Reductn					0			0			0	
Storage Cap Reductn					0			0			0	
Reduced v/c Ratio					0.30			0.21			0.20	

Intersection Summary	
Area Type: Other	
Cycle Length: 90	
Actuated Cycle Length: 46.3	
Natural Cycle: 45	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.65	
Intersection Signal Delay: 16.9	Intersection LOS: B
Intersection Capacity Utilization 63.1%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 2: Columbia Ave & I-26 WB Ramps



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	432	2	8	67	129	0	0	205	29
Future Volume (veh/h)	0	0	0	432	2	8	67	129	0	0	205	29
Number				7	4	14	1	6	16	5	2	12
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln				1900	1863	1900	1900	1863	0	0	1863	1900
Adj Flow Rate, veh/h				480	2	9	74	143	0	0	228	32
Adj No. of Lanes				0	1	0	0	1	0	0	1	0
Peak Hour Factor				0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %				0	2	0	2	2	0	0	2	2
Cap, veh/h				697	3	13	206	303	0	0	441	62
Arrive On Green				0.40	0.40	0.40	0.28	0.28	0.00	0.00	0.28	0.28
Sat Flow, veh/h				1731	7	32	291	1098	0	0	1599	224
Grp Volume(v), veh/h				491	0	0	217	0	0	0	0	260
Grp Sat Flow(s),veh/h/ln				1770	0	0	1389	0	0	0	0	1823
Q Serve(g_s), s				8.8	0.0	0.0	1.0	0.0	0.0	0.0	0.0	4.6
Cycle Q Clear(g_c), s				8.8	0.0	0.0	5.7	0.0	0.0	0.0	0.0	4.6
Prop In Lane				0.98		0.02	0.34		0.00	0.00		0.12
Lane Grp Cap(c), veh/h				713	0	0	509	0	0	0	0	503
V/C Ratio(X)				0.69	0.00	0.00	0.43	0.00	0.00	0.00	0.00	0.52
Avail Cap(c_a), veh/h				2129	0	0	1348	0	0	0	0	1511
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00
Uniform Delay (d), s/veh				9.4	0.0	0.0	11.6	0.0	0.0	0.0	0.0	11.7
Incr Delay (d2), s/veh				1.7	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.8
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				4.6	0.0	0.0	2.1	0.0	0.0	0.0	0.0	2.4
LnGrp Delay(d),s/veh				11.1	0.0	0.0	12.2	0.0	0.0	0.0	0.0	12.5
LnGrp LOS				B			B					B
Approach Vol, veh/h					491			217			260	
Approach Delay, s/veh					11.1			12.2			12.5	
Approach LOS					B			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		16.8		21.4		16.8		
Change Period (Y+Rc), s		6.3		6.0		6.3		
Max Green Setting (Gmax), s		31.7		46.0		31.7		
Max Q Clear Time (g_c+I1), s		6.6		10.8		7.7		
Green Ext Time (p_c), s		2.9		4.7		2.9		

Intersection Summary	
HCM 2010 Ctrl Delay	11.7
HCM 2010 LOS	B

Summary of All Intervals

Run Number	1	2	3	Avg
Start Time	7:20	7:20	7:20	7:20
End Time	8:30	8:30	8:30	8:30
Total Time (min)	70	70	70	70
Time Recorded (min)	60	60	60	60
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	3756	3731	3647	3712
Vehs Exited	3764	3730	3631	3708
Starting Vehs	102	105	86	96
Ending Vehs	94	106	102	100
Travel Distance (mi)	4252	4192	4111	4185
Travel Time (hr)	94.5	100.1	87.0	93.9
Total Delay (hr)	16.8	23.7	12.6	17.7
Total Stops	935	948	837	907
Fuel Used (gal)	160.6	160.5	153.3	158.2

Interval #0 Information Seeding

Start Time	7:20
End Time	7:30
Total Time (min)	10

Volumes adjusted by Growth Factors.
No data recorded this interval.

Interval #1 Information Recording

Start Time	7:30
End Time	8:30
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	1	2	3	Avg
Vehs Entered	3756	3731	3647	3712
Vehs Exited	3764	3730	3631	3708
Starting Vehs	102	105	86	96
Ending Vehs	94	106	102	100
Travel Distance (mi)	4252	4192	4111	4185
Travel Time (hr)	94.5	100.1	87.0	93.9
Total Delay (hr)	16.8	23.7	12.6	17.7
Total Stops	935	948	837	907
Fuel Used (gal)	160.6	160.5	153.3	158.2

Intersection: 1: Columbia Ave & I-26 EB Ramps

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	TR	LT
Maximum Queue (ft)	284	47	51	438
Average Queue (ft)	97	16	12	86
95th Queue (ft)	265	40	37	321
Link Distance (ft)	743	38	20	508
Upstream Blk Time (%)		2	1	2
Queuing Penalty (veh)		0	6	12
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: Columbia Ave & I-26 WB Ramps

Movement	WB	NB	SB
Directions Served	LTR	LT	TR
Maximum Queue (ft)	343	193	204
Average Queue (ft)	119	78	81
95th Queue (ft)	279	157	153
Link Distance (ft)	537	508	858
Upstream Blk Time (%)	1		
Queuing Penalty (veh)	5		
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	11	7	85	1	0	9	0	229	490	49	830	0
Future Vol, veh/h	11	7	85	1	0	9	0	229	490	49	830	0
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	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	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	12	8	94	1	0	10	0	254	544	54	922	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1563	1830	922	1609	1558	527	-	0	0	799	0	0
Stage 1	1031	1031	-	527	527	-	-	-	-	-	-	-
Stage 2	532	799	-	1082	1031	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	-	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	-	-	-	2.218	-	-
Pot Cap-1 Maneuver	91	76	327	84	112	551	0	-	-	824	-	0
Stage 1	281	310	-	535	528	-	0	-	-	-	-	0
Stage 2	531	398	-	263	310	-	0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	80	66	327	49	97	551	-	-	-	824	-	-
Mov Cap-2 Maneuver	80	66	-	49	97	-	-	-	-	-	-	-
Stage 1	281	268	-	535	528	-	-	-	-	-	-	-
Stage 2	521	398	-	157	268	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	42.7	18.8	0	0.5
HCM LOS	E	C		

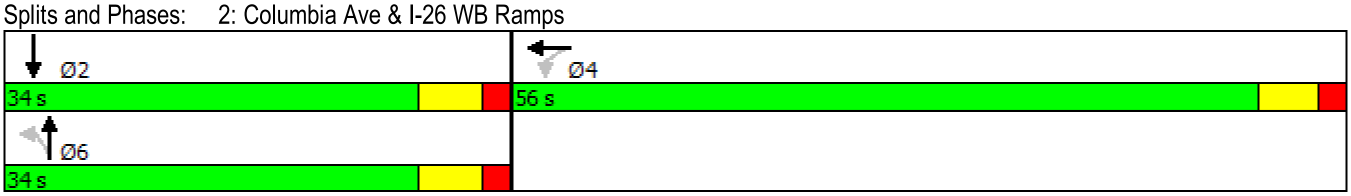
Minor Lane/Major Mvmt	NBT	NBR	EBLn1	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	205	272	824	-
HCM Lane V/C Ratio	-	-	0.558	0.041	0.066	-
HCM Control Delay (s)	-	-	42.7	18.8	9.7	0
HCM Lane LOS	-	-	E	C	A	A
HCM 95th %tile Q(veh)	-	-	3	0.1	0.2	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	704	2	11	109	140	0	0	175	7
Future Volume (vph)	0	0	0	704	2	11	109	140	0	0	175	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	0	0	0	1772	0	0	1824	0	0	1853	0
Flt Permitted					0.953			0.763				
Satd. Flow (perm)	0	0	0	0	1772	0	0	1421	0	0	1853	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					1						2	
Link Speed (mph)		45			45			35			35	
Link Distance (ft)		883			668			593			885	
Travel Time (s)		13.4			10.1			11.6			17.2	
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
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	796	0	0	277	0	0	202	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
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
Turn Type				Perm	NA		Perm	NA			NA	
Protected Phases					4			6			2	
Permitted Phases				4			6					
Detector Phase				4	4		6	6			2	
Switch Phase												
Minimum Initial (s)				10.0	10.0		10.0	10.0			10.0	
Minimum Split (s)				22.0	22.0		22.0	22.0			22.0	
Total Split (s)				56.0	56.0		34.0	34.0			34.0	
Total Split (%)				62.2%	62.2%		37.8%	37.8%			37.8%	
Maximum Green (s)				50.0	50.0		27.7	27.7			27.7	
Yellow Time (s)				4.0	4.0		4.3	4.3			4.3	
All-Red Time (s)				2.0	2.0		2.0	2.0			2.0	
Lost Time Adjust (s)					0.0			0.0			0.0	
Total Lost Time (s)					6.0			6.3			6.3	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				4.0	4.0		3.0	3.0			3.0	
Recall Mode				None	None		Min	Min			Min	
Act Effct Green (s)					38.1			19.9			19.9	
Actuated g/C Ratio					0.54			0.28			0.28	
v/c Ratio					0.84			0.70			0.39	
Control Delay					24.2			35.3			24.9	
Queue Delay					0.0			0.0			0.0	
Total Delay					24.2			35.3			24.9	
LOS					C			D			C	
Approach Delay					24.2			35.3			24.9	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS					C			D			C	
Queue Length 50th (ft)					274			111			73	
Queue Length 95th (ft)					519			217			147	
Internal Link Dist (ft)		803			588			513			805	
Turn Bay Length (ft)												
Base Capacity (vph)					1290			594			776	
Starvation Cap Reductn					0			0			0	
Spillback Cap Reductn					0			0			0	
Storage Cap Reductn					0			0			0	
Reduced v/c Ratio					0.62			0.47			0.26	

Intersection Summary	
Area Type: Other	
Cycle Length: 90	
Actuated Cycle Length: 71.2	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.84	
Intersection Signal Delay: 26.7	Intersection LOS: C
Intersection Capacity Utilization 78.3%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 2: Columbia Ave & I-26 WB Ramps



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	704	2	11	109	140	0	0	175	7
Future Volume (veh/h)	0	0	0	704	2	11	109	140	0	0	175	7
Number				7	4	14	1	6	16	5	2	12
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln				1900	1863	1900	1900	1863	0	0	1863	1900
Adj Flow Rate, veh/h				782	2	12	121	156	0	0	194	8
Adj No. of Lanes				0	1	0	0	1	0	0	1	0
Peak Hour Factor				0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %				0	2	0	2	2	0	0	2	2
Cap, veh/h				929	2	14	202	229	0	0	497	20
Arrive On Green				0.53	0.53	0.53	0.28	0.28	0.00	0.00	0.28	0.28
Sat Flow, veh/h				1740	4	27	443	821	0	0	1777	73
Grp Volume(v), veh/h				796	0	0	277	0	0	0	0	202
Grp Sat Flow(s),veh/h/ln				1771	0	0	1264	0	0	0	0	1850
Q Serve(g_s), s				25.1	0.0	0.0	8.4	0.0	0.0	0.0	0.0	5.8
Cycle Q Clear(g_c), s				25.1	0.0	0.0	14.3	0.0	0.0	0.0	0.0	5.8
Prop In Lane				0.98		0.02	0.44		0.00	0.00		0.04
Lane Grp Cap(c), veh/h				945	0	0	432	0	0	0	0	517
V/C Ratio(X)				0.84	0.00	0.00	0.64	0.00	0.00	0.00	0.00	0.39
Avail Cap(c_a), veh/h				1343	0	0	640	0	0	0	0	777
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00
Uniform Delay (d), s/veh				13.0	0.0	0.0	22.8	0.0	0.0	0.0	0.0	19.2
Incr Delay (d2), s/veh				4.2	0.0	0.0	1.6	0.0	0.0	0.0	0.0	0.5
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				13.3	0.0	0.0	4.9	0.0	0.0	0.0	0.0	3.0
LnGrp Delay(d),s/veh				17.2	0.0	0.0	24.4	0.0	0.0	0.0	0.0	19.7
LnGrp LOS				B			C					B
Approach Vol, veh/h					796			277			202	
Approach Delay, s/veh					17.2			24.4			19.7	
Approach LOS					B			C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		24.7		41.2		24.7		
Change Period (Y+Rc), s		6.3		6.0		6.3		
Max Green Setting (Gmax), s		27.7		50.0		27.7		
Max Q Clear Time (g_c+I1), s		7.8		27.1		16.3		
Green Ext Time (p_c), s		2.8		8.1		2.2		

Intersection Summary	
HCM 2010 Ctrl Delay	19.1
HCM 2010 LOS	B

Summary of All Intervals

Run Number	1	2	3	Avg
Start Time	4:35	4:35	4:35	4:35
End Time	5:45	5:45	5:45	5:45
Total Time (min)	70	70	70	70
Time Recorded (min)	60	60	60	60
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	4185	4108	4180	4157
Vehs Exited	4182	4112	4211	4168
Starting Vehs	110	111	108	113
Ending Vehs	113	107	77	96
Travel Distance (mi)	4855	4746	4877	4826
Travel Time (hr)	112.3	114.1	111.0	112.5
Total Delay (hr)	24.8	27.4	22.9	25.0
Total Stops	1154	1303	1116	1191
Fuel Used (gal)	180.7	179.3	182.6	180.9

Interval #0 Information Seeding

Start Time	4:35
End Time	4:45
Total Time (min)	10

Volumes adjusted by Growth Factors.
No data recorded this interval.

Interval #1 Information Recording

Start Time	4:45
End Time	5:45
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	1	2	3	Avg
Vehs Entered	4185	4108	4180	4157
Vehs Exited	4182	4112	4211	4168
Starting Vehs	110	111	108	113
Ending Vehs	113	107	77	96
Travel Distance (mi)	4855	4746	4877	4826
Travel Time (hr)	112.3	114.1	111.0	112.5
Total Delay (hr)	24.8	27.4	22.9	25.0
Total Stops	1154	1303	1116	1191
Fuel Used (gal)	180.7	179.3	182.6	180.9

Intersection: 1: Columbia Ave & I-26 EB Ramps

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	TR	LT
Maximum Queue (ft)	293	32	57	519
Average Queue (ft)	87	5	10	197
95th Queue (ft)	223	23	35	522
Link Distance (ft)	743	38	20	508
Upstream Blk Time (%)		0	1	4
Queuing Penalty (veh)		0	4	33
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: Columbia Ave & I-26 WB Ramps

Movement	WB	NB	SB
Directions Served	LTR	LT	TR
Maximum Queue (ft)	696	252	222
Average Queue (ft)	256	110	91
95th Queue (ft)	529	198	175
Link Distance (ft)	537	508	858
Upstream Blk Time (%)	5		
Queuing Penalty (veh)	33		
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

APPENDIX E

EXISTING 2014 HCS REPORTS

HCS 2010: Basic Freeway Segments Release 6.80

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	AM Peak
Freeway/Direction:	I-26 EB
From/To:	West of SC 202
Jurisdiction:	
Analysis Year:	2014
Description:	S-48 IMR

Flow Inputs and Adjustments

Volume, V	1199	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	333	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	706	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	706	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	75.0	mi/h
Number of lanes, N	2	
Density, D	9.4	pc/mi/ln
Level of service, LOS	A	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	AM Peak
Freeway/Direction:	I-26 EB
From/To:	Between S-48 and SC 202
Jurisdiction:	
Analysis Year:	2014
Description: S-48 IMR	

Flow Inputs and Adjustments

Volume, V	1349	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	375	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	794	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	794	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	75.0	mi/h
Number of lanes, N	2	
Density, D	10.6	pc/mi/ln
Level of service, LOS	A	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS 2010: Basic Freeway Segments Release 6.80

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	AM Peak
Freeway/Direction:	I-26 EB
From/To:	Between S-48 and US 176
Jurisdiction:	
Analysis Year:	2014
Description: S-48 IMR	

Flow Inputs and Adjustments

Volume, V	1981	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	550	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	1167	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	1167	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	74.7	mi/h
Number of lanes, N	2	
Density, D	15.6	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS 2010: Basic Freeway Segments Release 6.80

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	AM Peak
Freeway/Direction:	I-26 EB
From/To:	East of US176
Jurisdiction:	
Analysis Year:	2014

Description: S-48 IMR

Flow Inputs and Adjustments

Volume, V	3315	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	921	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	1952	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	1952	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	65.0	mi/h
Number of lanes, N	2	
Density, D	30.0	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS 2010: Basic Freeway Segments Release 6.80

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	AM Peak
Freeway/Direction:	I-26 WB
From/To:	East of US 176
Jurisdiction:	
Analysis Year:	2014
Description: S-48 IMR	

Flow Inputs and Adjustments

Volume, V	1476	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	410	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	869	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	869	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	75.0	mi/h
Number of lanes, N	2	
Density, D	11.6	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	AM Peak
Freeway/Direction:	I-26 WB
From/To:	Between S-48 and US 176
Jurisdiction:	
Analysis Year:	2014
Description: S-48 IMR	

Flow Inputs and Adjustments

Volume, V	1195	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	332	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	704	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	704	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	75.0	mi/h
Number of lanes, N	2	
Density, D	9.4	pc/mi/ln
Level of service, LOS	A	

Overall results are not computed when free-flow speed is less than 55 mph.

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Phone: Fax:
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Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	AM Peak
Freeway/Direction:	I-26 WB
From/To:	Between S-48 and SC 202
Jurisdiction:	
Analysis Year:	2014

Description: S-48 IMR

Flow Inputs and Adjustments

Volume, V	851	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	236	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	501	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	501	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	75.0	mi/h
Number of lanes, N	2	
Density, D	6.7	pc/mi/ln
Level of service, LOS	A	

Overall results are not computed when free-flow speed is less than 55 mph.

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E-mail:

Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	AM Peak
Freeway/Direction:	I-26 WB
From/To:	West of SC 202
Jurisdiction:	
Analysis Year:	2014

Description: S-48 IMR

Flow Inputs and Adjustments

Volume, V	891	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	248	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	525	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	525	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	75.0	mi/h
Number of lanes, N	2	
Density, D	7.0	pc/mi/ln
Level of service, LOS	A	

Overall results are not computed when free-flow speed is less than 55 mph.

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E-mail:

Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	PM Peak
Freeway/Direction:	I-26 EB
From/To:	West of SC 202
Jurisdiction:	
Analysis Year:	2014
Description: S-48 IMR	

Flow Inputs and Adjustments

Volume, V	1440	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	400	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	848	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	848	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	75.0	mi/h
Number of lanes, N	2	
Density, D	11.3	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

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Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	PM Peak
Freeway/Direction:	I-26 EB
From/To:	Between S-48 and SC 202
Jurisdiction:	
Analysis Year:	2014

Description: S-48 IMR

Flow Inputs and Adjustments

Volume, V	1406	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	391	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	828	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	828	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	75.0	mi/h
Number of lanes, N	2	
Density, D	11.0+	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

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Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	PM Peak
Freeway/Direction:	I-26 EB
From/To:	Between S-48 and US 176
Jurisdiction:	
Analysis Year:	2014
Description:	S-48 IMR

Flow Inputs and Adjustments

Volume, V	1804	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	501	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	1062	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	1062	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	75.0	mi/h
Number of lanes, N	2	
Density, D	14.2	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS 2010: Basic Freeway Segments Release 6.80

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Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	PM Peak
Freeway/Direction:	I-26 EB
From/To:	East of US176
Jurisdiction:	
Analysis Year:	2014
Description:	S-48 IMR

Flow Inputs and Adjustments

Volume, V	2404	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	668	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	1416	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	1416	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	73.1	mi/h
Number of lanes, N	2	
Density, D	19.4	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	PM Peak
Freeway/Direction:	I-26 WB
From/To:	East of US 176
Jurisdiction:	
Analysis Year:	2014
Description: S-48 IMR	

Flow Inputs and Adjustments

Volume, V	3049	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	847	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	1796	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	1796	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	68.0	mi/h
Number of lanes, N	2	
Density, D	26.4	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS 2010: Basic Freeway Segments Release 6.80

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Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	PM Peak
Freeway/Direction:	I-26 WB
From/To:	Between S-48 and US 176
Jurisdiction:	
Analysis Year:	2014

Description: S-48 IMR

Flow Inputs and Adjustments

Volume, V	1870	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	519	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	1101	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	1101	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	74.9	mi/h
Number of lanes, N	2	
Density, D	14.7	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS 2010: Basic Freeway Segments Release 6.80

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	PM Peak
Freeway/Direction:	I-26 WB
From/To:	Between S-48 and SC 202
Jurisdiction:	
Analysis Year:	2014
Description:	S-48 IMR

Flow Inputs and Adjustments

Volume, V	1271	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	353	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	748	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	748	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	75.0	mi/h
Number of lanes, N	2	
Density, D	10.0	pc/mi/ln
Level of service, LOS	A	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	PM Peak
Freeway/Direction:	I-26 WB
From/To:	West of SC 202
Jurisdiction:	
Analysis Year:	2014
Description: S-48 IMR	

Flow Inputs and Adjustments

Volume, V	1215	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	338	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	716	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	716	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	75.0	mi/h
Number of lanes, N	2	
Density, D	9.5	pc/mi/ln
Level of service, LOS	A	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	6/30/2016
Analysis time period:	AM Peak
Freeway/Dir of Travel:	I-26 EB
Junction:	SC-202 EB On-Ramp
Jurisdiction:	
Analysis Year:	2014

Description: S-48 IMR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1164	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25.0	mph
Volume on ramp	185	vph
Length of first accel/decel lane	400	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	35	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	1050	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1164	185	35	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	323	51	10	v
Trucks and buses	4	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          1371        212         40         pcph

_________________________Estimation of V12 Merge Areas_________________________

                  L  =            (Equation 13-6 or 13-7)
                   EQ
                  P  =    1.000   Using Equation  0
                   FM
                  v  = v  (P  ) =  1371   pc/h
                   12   F   FM

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v                     1583          4800            No
      FO
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 1371                   (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

________________________Flow Entering Merge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                1583          4600                  No
      R12
_________________Level of Service Determination (if not F)_____________________

Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   15.2    pc/mi/ln
          R                   R           12            A
Level of service for ramp-freeway junction areas of influence  B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                M  = 0.320
                                             S
Space mean speed in ramp influence area,    S  = 64.4    mph
                                             R
Space mean speed in outer lanes,            S  =  N/A    mph
                                             0
Space mean speed for all vehicles,          S  = 64.4    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Merge Analysis

Analyst: AECOM
Agency/Co.: AECOM
Date performed: 6/30/2016
Analysis time period: AM Peak
Freeway/Dir of Travel: I-26 EB
Junction: S-48 EB On-Ramp
Jurisdiction:
Analysis Year: 2014
Description: S-48 IMR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1248	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	733	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	101	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	1725	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1248	733	101	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	347	204	28	v
Trucks and buses	4	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          1470        839         116        pcph

_________________________Estimation of V12 Merge Areas_________________________

                  L  =            (Equation 13-6 or 13-7)
                   EQ
                  P  =    1.000   Using Equation  0
                   FM
                  v  = v  (P  ) =  1470   pc/h
                   12   F   FM

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v                     2309          4800            No
      FO
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 1470                   (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

________________________Flow Entering Merge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                2309          4600                  No
      R12
_________________Level of Service Determination (if not F)_____________________

Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   13.7    pc/mi/ln
          R                   R           12             A
Level of service for ramp-freeway junction areas of influence  B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,              M  = 0.225
                                           S
Space mean speed in ramp influence area,  S  = 67.6    mph
                                           R
Space mean speed in outer lanes,          S  =  N/A    mph
                                           0
Space mean speed for all vehicles,        S  = 67.6    mph
_______________________________________________________________________________
```

Phone: Fax:
E-mail:

Merge Analysis

Analyst: AECOM
Agency/Co.: AECOM
Date performed: 6/30/2016
Analysis time period: AM Peak
Freeway/Dir of Travel: I-26 EB
Junction: US176 EB On-Ramp
Jurisdiction:
Analysis Year: 2014
Description: S-48 IMR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1869	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25.0	mph
Volume on ramp	1446	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	112	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	900	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1869	1446	112	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	519	402	31	v
Trucks and buses	4	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	1.5	
Recreational vehicle PCE, ER	2.0	2.0	1.2	

Heavy vehicle adjustment, fHV	0.943	0.971	0.990	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2201	1655	126	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2201 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3856	4800	No

v_3 or v_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12}/2 No

If yes, v_{12A} = 2201 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	3856	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 25.4 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.430	
Space mean speed in ramp influence area,	S_R = 60.8	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 60.8	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	6/30/2016
Analysis time period:	AM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	US 176 WB On-Ramp
Jurisdiction:	
Analysis Year:	2014

Description: S-48 IMR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1028	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25.0	mph
Volume on ramp	167	vph
Length of first accel/decel lane	1425	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	448	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	775	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1028	167	448	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	286	46	124	v
Trucks and buses	4	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          1211        191         513       pcph

_________________________Estimation of V12 Merge Areas_________________________

                  L  =            (Equation 13-6 or 13-7)
                   EQ
                  P  =    1.000   Using Equation  0
                   FM
                  v  = v  (P  ) =  1211   pc/h
                   12   F   FM

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v                     1402          4800            No
      FO
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 1211                  (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

________________________Flow Entering Merge Influence Area_____________________
                      Actual        Max Desirable          Violation?
     v                1402          4600                   No
      R12
_________________Level of Service Determination (if not F)_____________________

Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   7.4     pc/mi/ln
          R                   R           12             A
Level of service for ramp-freeway junction areas of influence  A

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 M  = 0.266
                                              S
Space mean speed in ramp influence area,     S  = 66.2    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 66.2    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	6/30/2016
Analysis time period:	AM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	S-48 WB On-Ramp
Jurisdiction:	
Analysis Year:	2014

Description: S-48 IMR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	753	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	98	vph
Length of first accel/decel lane	1225	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	442	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	1475	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	753	98	442	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	209	27	123	v
Trucks and buses	4	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          887         112         506       pcph

_________________________Estimation of V12 Merge Areas_________________________

                  L  =            (Equation 13-6 or 13-7)
                   EQ
                  P  =    1.000   Using Equation  0
                   FM
                  v  = v  (P  ) =  887    pc/h
                   12   F   FM

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v                     999           4800            No
      FO
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 887                     (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

________________________Flow Entering Merge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                999           4600                  No
      R12
_________________Level of Service Determination (if not F)_____________________

Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   5.5     pc/mi/ln
          R                   R           12             A
Level of service for ramp-freeway junction areas of influence  A

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 M  = 0.221
                                              S
Space mean speed in ramp influence area,     S  = 67.7    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 67.7    mph
_______________________________________________________________________________
```

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	6/30/2016
Analysis time period:	AM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	SC-202 WB On-Ramp
Jurisdiction:	
Analysis Year:	2014

Description: S-48 IMR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	826	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	65	vph
Length of first accel/decel lane	525	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	25	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	1000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	826	65	25	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	229	18	7	v
Trucks and buses	4	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          973         74          29         pcph

_________________________Estimation of V12 Merge Areas_________________________

                  L  =            (Equation 13-6 or 13-7)
                   EQ
                  P  =    1.000   Using Equation  0
                   FM
                  v  = v  (P  ) =  973    pc/h
                   12   F   FM

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v                     1047          4800            No
      FO
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 973                    (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

________________________Flow Entering Merge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                1047          4600                  No
      R12
_________________Level of Service Determination (if not F)_____________________

Density, D = 5.475 + 0.00734 v  + 0.0078 v    - 0.00627 L   =   10.3    pc/mi/ln
          R                   R           12             A
Level of service for ramp-freeway junction areas of influence  B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 M  = 0.285
                                              S
Space mean speed in ramp influence area,     S  = 65.6    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 65.6    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	6/30/2016
Analysis time period:	PM Peak
Freeway/Dir of Travel:	I-26 EB
Junction:	SC-202 EB On-Ramp
Jurisdiction:	
Analysis Year:	2014

Description: S-48 IMR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1372	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25.0	mph
Volume on ramp	34	vph
Length of first accel/decel lane	400	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	68	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	1050	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1372	34	68	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	381	9	19	v
Trucks and buses	4	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

```
Heavy vehicle adjustment, fHV           0.943       0.971       0.971
Driver population factor, fP            1.00        1.00        1.00
Flow rate, vp                           1616        39          78        pcph

_________________________Estimation of V12 Merge Areas_________________________

                  L  =            (Equation 13-6 or 13-7)
                   EQ
                  P  =    1.000   Using Equation  0
                   FM
                  v  = v  (P  ) =  1616   pc/h
                   12   F   FM

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v                     1655          4800            No
      FO
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 1616                   (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

________________________Flow Entering Merge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                1655          4600                  No
      R12
_________________Level of Service Determination (if not F)_____________________

Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   15.9    pc/mi/ln
          R                   R           12             A
Level of service for ramp-freeway junction areas of influence  B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                M  = 0.321
                                             S
Space mean speed in ramp influence area,    S  = 64.4    mph
                                             R
Space mean speed in outer lanes,            S  =  N/A    mph
                                             0
Space mean speed for all vehicles,          S  = 64.4    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	6/30/2016
Analysis time period:	PM Peak
Freeway/Dir of Travel:	I-26 EB
Junction:	S-48 EB On-Ramp
Jurisdiction:	
Analysis Year:	2014

Description: S-48 IMR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1303	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	501	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	103	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	1725	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1303	501	103	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	362	139	29	v
Trucks and buses	4	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

```
Heavy vehicle adjustment, fHV           0.943       0.971       0.971
Driver population factor, fP            1.00        1.00        1.00
Flow rate, vp                           1535        573         118       pcph

_________________________Estimation of V12 Merge Areas_________________________

                  L   =            (Equation 13-6 or 13-7)
                   EQ
                  P   =    1.000   Using Equation  0
                   FM
                  v  = v  (P  ) =  1535   pc/h
                   12   F   FM

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v                     2108          4800            No
      FO
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 1535                   (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

________________________Flow Entering Merge Influence Area_____________________
                      Actual        Max Desirable        Violation?
     v                2108          4600                 No
      R12
_________________Level of Service Determination (if not F)_____________________

Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   12.2    pc/mi/ln
          R                   R           12             A
Level of service for ramp-freeway junction areas of influence  B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 M  = 0.218
                                              S
Space mean speed in ramp influence area,     S  = 67.8    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 67.8    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	6/30/2016
Analysis time period:	PM Peak
Freeway/Dir of Travel:	I-26 EB
Junction:	US176 EB On-Ramp
Jurisdiction:	
Analysis Year:	2014
Description: S-48 IMR	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1590	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25.0	mph
Volume on ramp	814	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	214	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	900	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1590	814	214	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	442	226	59	v
Trucks and buses	4	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	1.5	
Recreational vehicle PCE, ER	2.0	2.0	1.2	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.990
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          1873        932         240       pcph

_________________________Estimation of V12 Merge Areas_________________________

                  L  =            (Equation 13-6 or 13-7)
                   EQ
                  P  =    1.000   Using Equation  0
                   FM
                  v  = v  (P  ) =  1873   pc/h
                   12   F   FM

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v                     2805          4800            No
      FO
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34        12
If yes, v    = 1873                     (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

________________________Flow Entering Merge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                2805          4600                  No
      R12
_________________Level of Service Determination (if not F)_____________________

Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   17.5    pc/mi/ln
          R                   R           12             A
Level of service for ramp-freeway junction areas of influence  B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 M  = 0.310
                                              S
Space mean speed in ramp influence area,     S  = 64.8    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 64.8    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	6/30/2016
Analysis time period:	PM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	US 176 WB On-Ramp
Jurisdiction:	
Analysis Year:	2014

Description: S-48 IMR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1737	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25.0	mph
Volume on ramp	133	vph
Length of first accel/decel lane	1425	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	1312	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	775	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1737	133	1312	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	483	37	364	v
Trucks and buses	4	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          2046        152         1502      pcph

_________________________Estimation of V12 Merge Areas_________________________

                  L   =            (Equation 13-6 or 13-7)
                   EQ
                  P   =    1.000   Using Equation  0
                   FM
                  v  = v  (P  ) =  2046   pc/h
                   12   F   FM

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v                     2198          4800            No
      FO
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 2046                   (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

________________________Flow Entering Merge Influence Area_____________________
                      Actual        Max Desirable        Violation?
     v                2198          4600                 No
      R12
_________________Level of Service Determination (if not F)_____________________

Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   13.6    pc/mi/ln
          R                   R           12             A
Level of service for ramp-freeway junction areas of influence  B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 M  = 0.285
                                              S
Space mean speed in ramp influence area,     S  = 65.6    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 65.6    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	6/30/2016
Analysis time period:	PM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	S-48 WB On-Ramp
Jurisdiction:	
Analysis Year:	2014

Description: S-48 IMR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1153	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	118	vph
Length of first accel/decel lane	1225	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	717	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	1475	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1153	118	717	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	320	33	199	v
Trucks and buses	4	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

```
Heavy vehicle adjustment, fHV           0.943       0.971       0.971
Driver population factor, fP            1.00        1.00        1.00
Flow rate, vp                           1358        135         821       pcph

_________________________Estimation of V12 Merge Areas_________________________

                  L   =            (Equation 13-6 or 13-7)
                   EQ
                  P   =    1.000   Using Equation  0
                   FM
                  v  = v  (P  ) =  1358   pc/h
                   12   F   FM

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v                     1493          4800            No
      FO
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 1358                   (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

________________________Flow Entering Merge Influence Area_____________________
                      Actual        Max Desirable          Violation?
     v                1493          4600                   No
      R12
_________________Level of Service Determination (if not F)_____________________

Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   9.4     pc/mi/ln
          R                   R           12            A
Level of service for ramp-freeway junction areas of influence  A

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 M  = 0.228
                                              S
Space mean speed in ramp influence area,     S  = 67.5    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 67.5    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	6/30/2016
Analysis time period:	PM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	SC-202 WB On-Ramp
Jurisdiction:	
Analysis Year:	2014

Description: S-48 IMR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1165	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	50	vph
Length of first accel/decel lane	525	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	106	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	1000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1165	50	106	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	324	14	29	v
Trucks and buses	4	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          1372        57          121       pcph

_________________________Estimation of V12 Merge Areas_________________________

                  L  =            (Equation 13-6 or 13-7)
                   EQ
                  P  =    1.000   Using Equation  0
                   FM
                  v  = v  (P  ) =  1372   pc/h
                   12   F   FM

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v                     1429          4800            No
      FO
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 1372                     (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

________________________Flow Entering Merge Influence Area_____________________
                      Actual        Max Desirable        Violation?
     v                1429          4600                 No
      R12
_________________Level of Service Determination (if not F)_____________________

Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   13.3    pc/mi/ln
          R                   R           12             A
Level of service for ramp-freeway junction areas of influence  B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 M  = 0.290
                                              S
Space mean speed in ramp influence area,     S  = 65.4    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 65.4    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	AM Peak
Freeway/Dir of Travel:	I-26 EB
Junction:	SC 202 EB Off-Ramp
Jurisdiction:	
Analysis Year:	2014
Description:	S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1199	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	35	vph
Length of first accel/decel lane	400	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	185	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1050	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1199		35		185	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	333		10		51	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          1412        40          212       pcph

_________________________Estimation of V12 Diverge Areas_______________________

                  L  =            (Equation 13-12 or 13-13)
                   EQ
                  P  =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  1412   pc/h
                   12   R     F   R   FD

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v  = v                1412          4800            No
      Fi   F
     v  = v - v            1372          4800            No
      FO   F   R
     v                     40            2100            No
      R
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 1412                   (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

______________________Flow Entering Diverge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                1412          4400                  No
      12
_________________Level of Service Determination (if not F)_____________________

Density,               D = 4.252 + 0.0086 v  - 0.009  L   =   12.8    pc/mi/ln
                        R                  12          D
Level of service for ramp-freeway junction areas of influence B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                D  = 0.302
                                             S
Space mean speed in ramp influence area,    S  = 65.0    mph
                                             R
Space mean speed in outer lanes,            S  =  N/A    mph
                                             0
Space mean speed for all vehicles,          S  = 65.0    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	AM Peak
Freeway/Dir of Travel:	I-26 EB
Junction:	S-48 EB Off-Ramp
Jurisdiction:	
Analysis Year:	2014

Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1349	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	101	vph
Length of first accel/decel lane	975	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	733	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1725	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1349		101		733	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	375		28		204	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          1589        116         839       pcph

_________________________Estimation of V12 Diverge Areas_______________________

                  L  =            (Equation 13-12 or 13-13)
                   EQ
                  P  =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  1589   pc/h
                   12   R     F   R   FD

_______________________________Capacity Checks_________________________________

                              Actual        Maximum         LOS F?
     v  = v                   1589          4800            No
      Fi   F
     v  = v - v               1473          4800            No
      FO   F   R
     v                        116           2100            No
      R
     v  or v                  0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?              No
      3     av34
Is   v  or v      > 1.5 v  /2               No
      3     av34         12
If yes, v    = 1589                      (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

______________________Flow Entering Diverge Influence Area_____________________
                         Actual        Max Desirable        Violation?
     v                   1589          4400                 No
      12
_________________Level of Service Determination (if not F)_____________________

Density,                  D = 4.252 + 0.0086 v  - 0.009  L   =   9.1     pc/mi/ln
                           R                  12          D
Level of service for ramp-freeway junction areas of influence A

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 D  = 0.308
                                              S
Space mean speed in ramp influence area,     S  = 64.8    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 64.8    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: AECOM
Agency/Co.: AECOM
Date performed: 7/1/2016
Analysis time period: AM Peak
Freeway/Dir of Travel: I-26 EB
Junction: US 176 EB Off-Ramp
Jurisdiction:
Analysis Year: 2014
Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1981	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	112	vph
Length of first accel/decel lane	1000	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	1446	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	900	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1981		112		1446	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	550		31		402	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          2333        128         1655      pcph

_________________________Estimation of V12 Diverge Areas_______________________

                  L  =            (Equation 13-12 or 13-13)
                   EQ
                  P  =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  2333   pc/h
                   12   R     F   R   FD

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v  = v                2333          4800            No
      Fi   F
     v  = v - v            2205          4800            No
      FO   F   R
     v                     128           2100            No
      R
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 2333                   (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

______________________Flow Entering Diverge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                2333          4400                  No
      12
_________________Level of Service Determination (if not F)_____________________

Density,               D = 4.252 + 0.0086 v  - 0.009  L   =   15.3    pc/mi/ln
                        R                  12          D
Level of service for ramp-freeway junction areas of influence B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 D  = 0.310
                                              S
Space mean speed in ramp influence area,     S  = 64.8    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 64.8    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	AM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	US 176 WB Off-Ramp
Jurisdiction:	
Analysis Year:	2014

Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1476	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	448	vph
Length of first accel/decel lane	1225	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	167	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	775	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1476		448		167	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	410		124		46	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          1738        513         191       pcph

_________________________Estimation of V12 Diverge Areas_______________________

                  L  =            (Equation 13-12 or 13-13)
                   EQ
                  P  =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  1738   pc/h
                   12   R     F   R   FD

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v  = v                1738          4800            No
      Fi   F
     v  = v - v            1225          4800            No
      FO   F   R
     v                     513           2100            No
      R
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 1738                   (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

______________________Flow Entering Diverge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                1738          4400                  No
      12
_________________Level of Service Determination (if not F)_____________________

Density,               D = 4.252 + 0.0086 v  - 0.009  L   =   8.2     pc/mi/ln
                        R                  12          D
Level of service for ramp-freeway junction areas of influence A

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                D  = 0.344
                                             S
Space mean speed in ramp influence area,    S  = 63.6    mph
                                             R
Space mean speed in outer lanes,            S  =  N/A    mph
                                             0
Space mean speed for all vehicles,          S  = 63.6    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	AM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	S-48 WB Off-Ramp
Jurisdiction:	
Analysis Year:	2014

Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1195	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	442	vph
Length of first accel/decel lane	1225	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	98	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1475	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1195		442		98	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	332		123		27	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          1407        506         112       pcph

_________________________Estimation of V12 Diverge Areas_______________________

                  L  =            (Equation 13-12 or 13-13)
                   EQ
                  P  =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  1407   pc/h
                   12   R     F   R   FD

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v  = v                1407          4800            No
      Fi   F
     v  = v - v            901           4800            No
      FO   F   R
     v                     506           2100            No
      R
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 1407                   (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

______________________Flow Entering Diverge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                1407          4400                  No
      12
_________________Level of Service Determination (if not F)_____________________

Density,               D = 4.252 + 0.0086 v  - 0.009  L   =   5.3     pc/mi/ln
                        R                  12          D
Level of service for ramp-freeway junction areas of influence A

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 D  = 0.344
                                              S
Space mean speed in ramp influence area,     S  = 63.7    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 63.7    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	AM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	SC 202 WB Off-Ramp
Jurisdiction:	
Analysis Year:	2014
Description:	S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	851	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	25.0	mph
Volume on ramp	25	vph
Length of first accel/decel lane	400	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	65	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	851		25		65	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	236		7		18	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          1002        29          74         pcph

_________________________Estimation of V12 Diverge Areas_______________________

                  L  =            (Equation 13-12 or 13-13)
                   EQ
                  P  =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  1002   pc/h
                   12   R     F   R   FD

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v  = v                1002          4800            No
      Fi   F
     v  = v - v            973           4800            No
      FO   F   R
     v                     29            1900            No
      R
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 1002                   (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

______________________Flow Entering Diverge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                1002          4400                  No
      12
_________________Level of Service Determination (if not F)_____________________

Density,               D = 4.252 + 0.0086 v  - 0.009  L   =   9.3     pc/mi/ln
                        R                  12          D
Level of service for ramp-freeway junction areas of influence A

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                D  = 0.561
                                             S
Space mean speed in ramp influence area,    S  = 56.5    mph
                                             R
Space mean speed in outer lanes,            S  =  N/A    mph
                                             0
Space mean speed for all vehicles,          S  = 56.5    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	PM Peak
Freeway/Dir of Travel:	I-26 EB
Junction:	SC 202 EB Off-Ramp
Jurisdiction:	
Analysis Year:	2014

Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1440	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	68	vph
Length of first accel/decel lane	400	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	34	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1050	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1440		68		34	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	400		19		9	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          1696        78          39         pcph

_________________________Estimation of V12 Diverge Areas_______________________

                  L   =            (Equation 13-12 or 13-13)
                   EQ
                  P   =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  1696   pc/h
                   12   R     F   R   FD

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v  = v                1696          4800            No
      Fi   F
     v  = v - v            1618          4800            No
      FO   F   R
     v                     78            2100            No
      R
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 1696                   (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

______________________Flow Entering Diverge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                1696          4400                  No
      12
_________________Level of Service Determination (if not F)_____________________

Density,               D = 4.252 + 0.0086 v  - 0.009  L   =   15.2    pc/mi/ln
                        R                  12          D
Level of service for ramp-freeway junction areas of influence B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 D  = 0.305
                                              S
Space mean speed in ramp influence area,     S  = 64.9    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 64.9    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	PM Peak
Freeway/Dir of Travel:	I-26 EB
Junction:	S-48 EB Off-Ramp
Jurisdiction:	
Analysis Year:	2014

Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1406	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	103	vph
Length of first accel/decel lane	975	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	501	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1725	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1406		103		501	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	391		29		139	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

Heavy vehicle adjustment, fHV	0.943	0.971	0.971	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1656	118	573	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1656 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1656	4800	No
$v_{FO} = v_F - v_R$	1538	4800	No
v_R	118	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34} > 2700 pc/h?		No	
Is v_3 or v_{av34} > 1.5 v_{12}/2		No	

If yes, v_{12A} = 1656 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	1656	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 9.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.309	
Space mean speed in ramp influence area,	S_R = 64.8	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 64.8	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	PM Peak
Freeway/Dir of Travel:	I-26 EB
Junction:	US 176 EB Off-Ramp
Jurisdiction:	
Analysis Year:	2014

Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1804	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	214	vph
Length of first accel/decel lane	1000	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	814	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	900	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1804		214		814	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	501		59		226	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

Heavy vehicle adjustment, fHV	0.943	0.971	0.971	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2125	245	932	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2125 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2125	4800	No
$v_{FO} = v_F - v_R$	1880	4800	No
v_R	245	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12}/2 No

If yes, v_{12A} = 2125 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2125	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 13.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.320	
Space mean speed in ramp influence area,	S_R = 64.4	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 64.4	mph

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Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	PM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	US 176 WB Off-Ramp
Jurisdiction:	
Analysis Year:	2014

Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	3049	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	1312	vph
Length of first accel/decel lane	1225	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	133	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	775	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3049		1312		133	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	847		364		37	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

Heavy vehicle adjustment, fHV	0.943	0.971	0.971	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	3591	1502	152	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3591 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3591	4800	No
$v_{FO} = v_F - v_R$	2089	4800	No
v_R	1502	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34} > 2700 pc/h?		No	
Is v_3 or v_{av34} > 1.5 v_{12}/2		No	

If yes, v_{12A} = 3591 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3591	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 24.1 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	D_S = 0.433	
Space mean speed in ramp influence area,	S_R = 60.7	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 60.7	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	PM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	S-48 WB Off-Ramp
Jurisdiction:	
Analysis Year:	2014

Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1870	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	717	vph
Length of first accel/decel lane	1225	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	118	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1475	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1870		717		118	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	519		199		33	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

Heavy vehicle adjustment, fHV	0.943	0.971	0.971	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2202	821	135	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2202 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2202	4800	No
$v_{FO} = v_F - v_R$	1381	4800	No
v_R	821	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12}/2 No

If yes, v_{12A} = 2202 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2202	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 12.2 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable, D_S = 0.372

Space mean speed in ramp influence area, S_R = 62.7 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 62.7 mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	PM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	SC 202 WB Off-Ramp
Jurisdiction:	
Analysis Year:	2014

Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1271	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	25.0	mph
Volume on ramp	106	vph
Length of first accel/decel lane	400	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	50	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1271		106		50	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	353		29		14	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          1497        121         57         pcph

_________________________Estimation of V12 Diverge Areas_______________________

                  L  =            (Equation 13-12 or 13-13)
                   EQ
                  P  =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  1497   pc/h
                   12   R     F   R   FD

_______________________________Capacity Checks_________________________________

                             Actual        Maximum         LOS F?
     v  = v                  1497          4800            No
      Fi   F
     v  = v - v              1376          4800            No
      FO   F   R
     v                       121           1900            No
      R
     v  or v                 0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?             No
      3     av34
Is   v  or v      > 1.5 v  /2              No
      3     av34         12
If yes, v    = 1497                     (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

______________________Flow Entering Diverge Influence Area_____________________
                      Actual        Max Desirable        Violation?
     v                1497          4400                 No
      12
_________________Level of Service Determination (if not F)_____________________

Density,               D = 4.252 + 0.0086 v  - 0.009  L   =   13.5    pc/mi/ln
                        R                   12         D
Level of service for ramp-freeway junction areas of influence B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                D  = 0.569
                                             S
Space mean speed in ramp influence area,    S  = 56.2    mph
                                             R
Space mean speed in outer lanes,            S  =  N/A    mph
                                             0
Space mean speed for all vehicles,          S  = 56.2    mph
_______________________________________________________________________________
```

APPENDIX F

NO-BUILD 2020 SYNCHRO AND SIM TRAFFIC REPORTS

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	27	8	129	10	0	14	0	434	900	143	1077	0
Future Vol, veh/h	27	8	129	10	0	14	0	434	900	143	1077	0
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	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	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	30	9	143	11	0	16	0	482	1000	159	1197	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2504	2996	1197	2573	2496	982	-	0	0	1482	0	0
Stage 1	1514	1514	-	982	982	-	-	-	-	-	-	-
Stage 2	990	1482	-	1591	1514	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	-	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	-	-	-	2.218	-	-
Pot Cap-1 Maneuver	~ 19	14	226	17	29	302	0	-	-	454	-	0
Stage 1	149	182	-	300	327	-	0	-	-	-	-	0
Stage 2	297	189	-	135	182	-	0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	-	0	226	-	0	302	-	-	-	454	-	-
Mov Cap-2 Maneuver	-	0	-	-	0	-	-	-	-	-	-	-
Stage 1	149	0	-	300	327	-	-	-	-	-	-	-
Stage 2	282	189	-	-	0	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s			0	2
HCM LOS	-	-		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	-	454	-
HCM Lane V/C Ratio	-	-	-	-	0.35	-
HCM Control Delay (s)	-	-	-	-	17.1	0
HCM Lane LOS	-	-	-	-	C	A
HCM 95th %tile Q(veh)	-	-	-	-	1.6	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

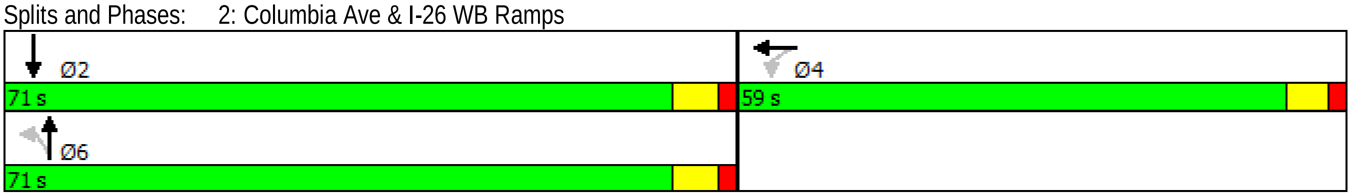
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	691	2	157	90	385	0	0	529	49
Future Volume (vph)	0	0	0	691	2	157	90	385	0	0	529	49
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	0	0	0	1745	0	0	1846	0	0	1842	0
Flt Permitted					0.961			0.458				
Satd. Flow (perm)	0	0	0	0	1745	0	0	853	0	0	1842	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					11						5	
Link Speed (mph)		45			45			35			35	
Link Distance (ft)		883			668			593			885	
Travel Time (s)		13.4			10.1			11.6			17.2	
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
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	944	0	0	528	0	0	642	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
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
Turn Type				Perm	NA		Perm	NA			NA	
Protected Phases					4			6			2	
Permitted Phases				4			6					
Detector Phase				4	4		6	6			2	
Switch Phase												
Minimum Initial (s)				10.0	10.0		10.0	10.0			10.0	
Minimum Split (s)				22.0	22.0		22.0	22.0			22.0	
Total Split (s)				59.0	59.0		71.0	71.0			71.0	
Total Split (%)				45.4%	45.4%		54.6%	54.6%			54.6%	
Maximum Green (s)				53.0	53.0		64.7	64.7			64.7	
Yellow Time (s)				4.0	4.0		4.3	4.3			4.3	
All-Red Time (s)				2.0	2.0		2.0	2.0			2.0	
Lost Time Adjust (s)					0.0			0.0			0.0	
Total Lost Time (s)					6.0			6.3			6.3	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				4.0	4.0		3.0	3.0			3.0	
Recall Mode				None	None		Min	Min			Min	
Act Effct Green (s)					53.0			64.7			64.7	
Actuated g/C Ratio					0.41			0.50			0.50	
v/c Ratio					1.32			1.25			0.70	
Control Delay					185.0			159.4			30.0	
Queue Delay					0.0			0.0			0.0	
Total Delay					185.0			159.4			30.0	
LOS					F			F			C	
Approach Delay					185.0			159.4			30.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS					F			F			C	
Queue Length 50th (ft)					~1025			~555			402	
Queue Length 95th (ft)					#1282			#780			548	
Internal Link Dist (ft)		803			588			513			805	
Turn Bay Length (ft)												
Base Capacity (vph)					717			424			919	
Starvation Cap Reductn					0			0			0	
Spillback Cap Reductn					0			0			0	
Storage Cap Reductn					0			0			0	
Reduced v/c Ratio					1.32			1.25			0.70	

Intersection Summary

Area Type: Other
Cycle Length: 130
Actuated Cycle Length: 130
Natural Cycle: 130
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.32
Intersection Signal Delay: 131.5 Intersection LOS: F
Intersection Capacity Utilization 119.5% ICU Level of Service H
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Columbia Ave & I-26 WB Ramps



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	691	2	157	90	385	0	0	529	49
Future Volume (veh/h)	0	0	0	691	2	157	90	385	0	0	529	49
Number				7	4	14	1	6	16	5	2	12
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln				1900	1863	1900	1900	1863	0	0	1863	1900
Adj Flow Rate, veh/h				768	2	174	100	428	0	0	588	54
Adj No. of Lanes				0	1	0	0	1	0	0	1	0
Peak Hour Factor				0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %				0	2	0	2	2	0	0	2	2
Cap, veh/h				576	1	130	97	379	0	0	837	77
Arrive On Green				0.41	0.41	0.41	0.50	0.50	0.00	0.00	0.50	0.50
Sat Flow, veh/h				1412	4	320	128	761	0	0	1681	154
Grp Volume(v), veh/h				944	0	0	528	0	0	0	0	642
Grp Sat Flow(s),veh/h/ln				1736	0	0	889	0	0	0	0	1836
Q Serve(g_s), s				53.0	0.0	0.0	29.6	0.0	0.0	0.0	0.0	35.1
Cycle Q Clear(g_c), s				53.0	0.0	0.0	64.7	0.0	0.0	0.0	0.0	35.1
Prop In Lane				0.81		0.18	0.19		0.00	0.00		0.08
Lane Grp Cap(c), veh/h				708	0	0	475	0	0	0	0	914
V/C Ratio(X)				1.33	0.00	0.00	1.11	0.00	0.00	0.00	0.00	0.70
Avail Cap(c_a), veh/h				708	0	0	475	0	0	0	0	914
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00
Uniform Delay (d), s/veh				38.5	0.0	0.0	40.9	0.0	0.0	0.0	0.0	25.2
Incr Delay (d2), s/veh				159.9	0.0	0.0	75.2	0.0	0.0	0.0	0.0	2.4
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				56.8	0.0	0.0	27.0	0.0	0.0	0.0	0.0	18.3
LnGrp Delay(d),s/veh				198.4	0.0	0.0	116.1	0.0	0.0	0.0	0.0	27.7
LnGrp LOS				F			F					C
Approach Vol, veh/h					944			528			642	
Approach Delay, s/veh					198.4			116.1			27.7	
Approach LOS					F			F			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		71.0		59.0		71.0		
Change Period (Y+Rc), s		6.3		6.0		6.3		
Max Green Setting (Gmax), s		64.7		53.0		64.7		
Max Q Clear Time (g_c+I1), s		37.1		55.0		66.7		
Green Ext Time (p_c), s		9.5		0.0		0.0		

Intersection Summary	
HCM 2010 Ctrl Delay	126.0
HCM 2010 LOS	F

Summary of All Intervals

Run Number	1	2	3	Avg
Start Time	7:20	7:20	7:20	7:20
End Time	8:30	8:30	8:30	8:30
Total Time (min)	70	70	70	70
Time Recorded (min)	60	60	60	60
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	2991	2611	2674	2759
Vehs Exited	2717	2371	2487	2526
Starting Vehs	249	303	325	292
Ending Vehs	523	543	512	525
Travel Distance (mi)	3020	2530	2666	2738
Travel Time (hr)	1418.0	1635.4	1594.7	1549.4
Total Delay (hr)	1363.2	1587.9	1545.1	1498.7
Total Stops	2362	2280	2178	2272
Fuel Used (gal)	432.8	466.4	461.1	453.4

Interval #0 Information Seeding

Start Time	7:20
End Time	7:30
Total Time (min)	10

Volumes adjusted by Growth Factors.

No data recorded this interval.

Interval #1 Information Recording

Start Time	7:30
End Time	8:30
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	1	2	3	Avg
Vehs Entered	2991	2611	2674	2759
Vehs Exited	2717	2371	2487	2526
Starting Vehs	249	303	325	292
Ending Vehs	523	543	512	525
Travel Distance (mi)	3020	2530	2666	2738
Travel Time (hr)	1418.0	1635.4	1594.7	1549.4
Total Delay (hr)	1363.2	1587.9	1545.1	1498.7
Total Stops	2362	2280	2178	2272
Fuel Used (gal)	432.8	466.4	461.1	453.4

Intersection: 1: Columbia Ave & I-26 EB Ramps

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	TR	LT
Maximum Queue (ft)	870	48	65	526
Average Queue (ft)	798	35	31	510
95th Queue (ft)	1055	51	59	517
Link Distance (ft)	743	38	20	508
Upstream Blk Time (%)	82	69	3	96
Queuing Penalty (veh)	134	16	36	1172
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: Columbia Ave & I-26 WB Ramps

Movement	WB	NB	SB
Directions Served	LTR	LT	TR
Maximum Queue (ft)	680	320	873
Average Queue (ft)	666	179	861
95th Queue (ft)	679	281	870
Link Distance (ft)	537	508	858
Upstream Blk Time (%)	100		100
Queuing Penalty (veh)	848		0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	45	8	121	1	0	10	0	621	791	246	1376	0
Future Vol, veh/h	45	8	121	1	0	10	0	621	791	246	1376	0
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	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	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	50	9	134	1	0	11	0	690	879	273	1529	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	3211	3645	1529	3276	3205	1129	-	0	0	1569	0	0
Stage 1	2076	2076	-	1129	1129	-	-	-	-	-	-	-
Stage 2	1135	1569	-	2147	2076	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	-	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	-	-	-	2.218	-	-
Pot Cap-1 Maneuver	~ 6	~ 5	144	5	10	248	0	-	-	420	-	0
Stage 1	70	95	-	248	279	-	0	-	-	-	-	0
Stage 2	246	171	-	64	95	-	0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	-	0	144	-	0	248	-	-	-	420	-	-
Mov Cap-2 Maneuver	-	0	-	-	0	-	-	-	-	-	-	-
Stage 1	70	0	-	248	279	-	-	-	-	-	-	-
Stage 2	235	171	-	-	0	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s			0	4.3
HCM LOS	-	-		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	-	420	-
HCM Lane V/C Ratio	-	-	-	-	0.651	-
HCM Control Delay (s)	-	-	-	-	28.2	0
HCM Lane LOS	-	-	-	-	D	A
HCM 95th %tile Q(veh)	-	-	-	-	4.5	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	953	2	245	159	517	0	0	669	35
Future Volume (vph)	0	0	0	953	2	245	159	517	0	0	669	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	0	0	0	1742	0	0	1840	0	0	1850	0
Flt Permitted					0.962			0.272				
Satd. Flow (perm)	0	0	0	0	1742	0	0	507	0	0	1850	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					10						3	
Link Speed (mph)		45			45			35			35	
Link Distance (ft)		883			668			593			885	
Travel Time (s)		13.4			10.1			11.6			17.2	
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
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	1333	0	0	751	0	0	782	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
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
Turn Type				Perm	NA		Perm	NA			NA	
Protected Phases					4			6			2	
Permitted Phases				4			6					
Detector Phase				4	4		6	6			2	
Switch Phase												
Minimum Initial (s)				10.0	10.0		10.0	10.0			10.0	
Minimum Split (s)				22.0	22.0		22.0	22.0			22.0	
Total Split (s)				64.0	64.0		86.0	86.0			86.0	
Total Split (%)				42.7%	42.7%		57.3%	57.3%			57.3%	
Maximum Green (s)				58.0	58.0		79.7	79.7			79.7	
Yellow Time (s)				4.0	4.0		4.3	4.3			4.3	
All-Red Time (s)				2.0	2.0		2.0	2.0			2.0	
Lost Time Adjust (s)					0.0			0.0			0.0	
Total Lost Time (s)					6.0			6.3			6.3	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				4.0	4.0		3.0	3.0			3.0	
Recall Mode				None	None		Min	Min			Min	
Act Effct Green (s)					58.0			79.7			79.7	
Actuated g/C Ratio					0.39			0.53			0.53	
v/c Ratio					1.96			2.79			0.79	
Control Delay					465.5			834.9			35.8	
Queue Delay					0.0			0.0			0.0	
Total Delay					465.5			834.9			35.8	
LOS					F			F			D	
Approach Delay					465.5			834.9			35.8	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS					F			F			D	
Queue Length 50th (ft)					~2026			~997			603	
Queue Length 95th (ft)					#2295			#1252			790	
Internal Link Dist (ft)		803			588			513			805	
Turn Bay Length (ft)												
Base Capacity (vph)					679			269			984	
Starvation Cap Reductn					0			0			0	
Spillback Cap Reductn					0			0			0	
Storage Cap Reductn					0			0			0	
Reduced v/c Ratio					1.96			2.79			0.79	

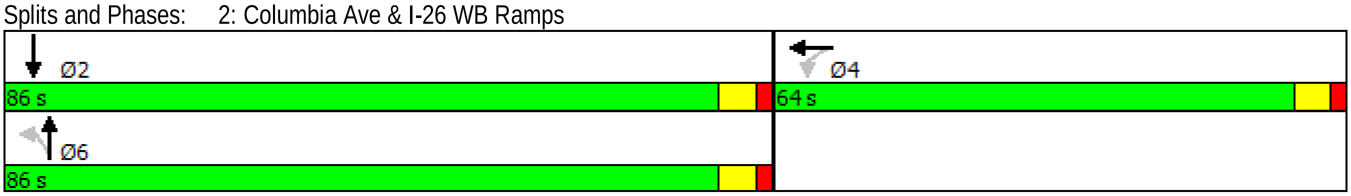
Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 2.79
Intersection Signal Delay: 445.1 — Intersection LOS: F
Intersection Capacity Utilization 156.7% — ICU Level of Service H
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Columbia Ave & I-26 WB Ramps



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	953	2	245	159	517	0	0	669	35
Future Volume (veh/h)	0	0	0	953	2	245	159	517	0	0	669	35
Number				7	4	14	1	6	16	5	2	12
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln				1900	1863	1900	1900	1863	0	0	1863	1900
Adj Flow Rate, veh/h				1059	2	272	177	574	0	0	743	39
Adj No. of Lanes				0	1	0	0	1	0	0	1	0
Peak Hour Factor				0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %				0	2	0	2	2	0	0	2	2
Cap, veh/h				532	1	137	88	213	0	0	932	49
Arrive On Green				0.39	0.39	0.39	0.53	0.53	0.00	0.00	0.53	0.53
Sat Flow, veh/h				1376	3	353	110	401	0	0	1754	92
Grp Volume(v), veh/h				1333	0	0	751	0	0	0	0	782
Grp Sat Flow(s),veh/h/ln				1732	0	0	512	0	0	0	0	1846
Q Serve(g_s), s				58.0	0.0	0.0	28.1	0.0	0.0	0.0	0.0	51.6
Cycle Q Clear(g_c), s				58.0	0.0	0.0	79.7	0.0	0.0	0.0	0.0	51.6
Prop In Lane				0.79		0.20	0.24		0.00	0.00		0.05
Lane Grp Cap(c), veh/h				670	0	0	302	0	0	0	0	981
V/C Ratio(X)				1.99	0.00	0.00	2.49	0.00	0.00	0.00	0.00	0.80
Avail Cap(c_a), veh/h				670	0	0	302	0	0	0	0	981
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00
Uniform Delay (d), s/veh				46.0	0.0	0.0	57.3	0.0	0.0	0.0	0.0	28.6
Incr Delay (d2), s/veh				451.2	0.0	0.0	680.7	0.0	0.0	0.0	0.0	4.7
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				111.6	0.0	0.0	69.5	0.0	0.0	0.0	0.0	27.6
LnGrp Delay(d),s/veh				497.2	0.0	0.0	738.0	0.0	0.0	0.0	0.0	33.2
LnGrp LOS				F			F					C
Approach Vol, veh/h					1333			751			782	
Approach Delay, s/veh					497.2			738.0			33.2	
Approach LOS					F			F			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		86.0		64.0		86.0		
Change Period (Y+Rc), s		6.3		6.0		6.3		
Max Green Setting (Gmax), s		79.7		58.0		79.7		
Max Q Clear Time (g_c+I1), s		53.6		60.0		81.7		
Green Ext Time (p_c), s		14.0		0.0		0.0		

Intersection Summary	
HCM 2010 Ctrl Delay	433.7
HCM 2010 LOS	F

Summary of All Intervals

Run Number	1	2	3	Avg
Start Time	4:35	4:35	4:35	4:35
End Time	5:45	5:45	5:45	5:45
Total Time (min)	70	70	70	70
Time Recorded (min)	60	60	60	60
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	2216	2731	2347	2431
Vehs Exited	2050	2642	2252	2314
Starting Vehs	393	402	412	403
Ending Vehs	559	491	507	519
Travel Distance (mi)	2049	2828	2315	2397
Travel Time (hr)	2471.4	2238.0	2322.1	2343.8
Total Delay (hr)	2430.7	2186.0	2277.5	2298.1
Total Stops	1925	2105	2187	2071
Fuel Used (gal)	637.5	614.3	615.2	622.3

Interval #0 Information Seeding

Start Time	4:35
End Time	4:45
Total Time (min)	10

Volumes adjusted by Growth Factors.

No data recorded this interval.

Interval #1 Information Recording

Start Time	4:45
End Time	5:45
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	1	2	3	Avg
Vehs Entered	2216	2731	2347	2431
Vehs Exited	2050	2642	2252	2314
Starting Vehs	393	402	412	403
Ending Vehs	559	491	507	519
Travel Distance (mi)	2049	2828	2315	2397
Travel Time (hr)	2471.4	2238.0	2322.1	2343.8
Total Delay (hr)	2430.7	2186.0	2277.5	2298.1
Total Stops	1925	2105	2187	2071
Fuel Used (gal)	637.5	614.3	615.2	622.3

Intersection: 1: Columbia Ave & I-26 EB Ramps

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	TR	LT
Maximum Queue (ft)	876	33	61	524
Average Queue (ft)	852	8	19	509
95th Queue (ft)	942	27	50	516
Link Distance (ft)	743	38	20	508
Upstream Blk Time (%)	94	0	1	96
Queuing Penalty (veh)	164	0	20	1565
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: Columbia Ave & I-26 WB Ramps

Movement	WB	NB	SB
Directions Served	LTR	LT	TR
Maximum Queue (ft)	680	488	874
Average Queue (ft)	666	281	860
95th Queue (ft)	681	440	872
Link Distance (ft)	537	508	858
Upstream Blk Time (%)	100	0	100
Queuing Penalty (veh)	1198	0	0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

APPENDIX G

NO-BUILD 2020 HCS REPORTS

HCS 2010: Basic Freeway Segments Release 6.80

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	AM Peak
Freeway/Direction:	I-26 EB
From/To:	West of SC 202
Jurisdiction:	
Analysis Year:	2020 No-Build
Description:	S-48 IMR

Flow Inputs and Adjustments

Volume, V	1385	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	385	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	816	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	816	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	75.0	mi/h
Number of lanes, N	2	
Density, D	10.9	pc/mi/ln
Level of service, LOS	A	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS 2010: Basic Freeway Segments Release 6.80

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	AM Peak
Freeway/Direction:	I-26 EB
From/To:	Between S-48 and SC 202
Jurisdiction:	
Analysis Year:	2020 No-Build
Description: S-48 IMR	

Flow Inputs and Adjustments

Volume, V	1546	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	429	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	910	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	910	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	75.0	mi/h
Number of lanes, N	2	
Density, D	12.1	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS 2010: Basic Freeway Segments Release 6.80

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	AM Peak
Freeway/Direction:	I-26 EB
From/To:	Between S-48 and US 176
Jurisdiction:	
Analysis Year:	2020 No-Build
Description: S-48 IMR	

Flow Inputs and Adjustments

Volume, V	2475	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	688	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	1458	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	1458	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	72.7	mi/h
Number of lanes, N	2	
Density, D	20.1	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS 2010: Basic Freeway Segments Release 6.80

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	AM Peak
Freeway/Direction:	I-26 EB
From/To:	East of US176
Jurisdiction:	
Analysis Year:	2020 No-Build

Description: S-48 IMR

Flow Inputs and Adjustments

Volume, V	3909	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1086	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	2302	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	2302	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	56.2	mi/h
Number of lanes, N	2	
Density, D	40.9	pc/mi/ln
Level of service, LOS	E	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS 2010: Basic Freeway Segments Release 6.80

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	AM Peak
Freeway/Direction:	I-26 WB
From/To:	East of US 176
Jurisdiction:	
Analysis Year:	2020 No-Build
Description: S-48 IMR	

Flow Inputs and Adjustments

Volume, V	2015	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	560	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	1187	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	1187	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	74.6	mi/h
Number of lanes, N	2	
Density, D	15.9	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS 2010: Basic Freeway Segments Release 6.80

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	AM Peak
Freeway/Direction:	I-26 WB
From/To:	Between S-48 and US 176
Jurisdiction:	
Analysis Year:	2020 No-Build

Description: S-48 IMR

Flow Inputs and Adjustments

Volume, V	1713	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	476	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	1009	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	1009	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	75.0	mi/h
Number of lanes, N	2	
Density, D	13.5	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS 2010: Basic Freeway Segments Release 6.80

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	AM Peak
Freeway/Direction:	I-26 WB
From/To:	Between S-48 and SC 202
Jurisdiction:	
Analysis Year:	2020 No-Build
Description: S-48 IMR	

Flow Inputs and Adjustments

Volume, V	1004	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	279	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	591	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	591	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	75.0	mi/h
Number of lanes, N	2	
Density, D	7.9	pc/mi/ln
Level of service, LOS	A	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS 2010: Basic Freeway Segments Release 6.80

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	AM Peak
Freeway/Direction:	I-26 WB
From/To:	West of SC 202
Jurisdiction:	
Analysis Year:	2020 No-Build
Description: S-48 IMR	

Flow Inputs and Adjustments

Volume, V	1047	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	291	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	617	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	617	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	75.0	mi/h
Number of lanes, N	2	
Density, D	8.2	pc/mi/ln
Level of service, LOS	A	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS 2010: Basic Freeway Segments Release 6.80

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	PM Peak
Freeway/Direction:	I-26 EB
From/To:	West of SC 202
Jurisdiction:	
Analysis Year:	2020 No-Build
Description:	S-48 IMR

Flow Inputs and Adjustments

Volume, V	1714	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	476	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	1009	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	1009	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	75.0	mi/h
Number of lanes, N	2	
Density, D	13.5	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS 2010: Basic Freeway Segments Release 6.80

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	PM Peak
Freeway/Direction:	I-26 EB
From/To:	Between S-48 and SC 202
Jurisdiction:	
Analysis Year:	2020 No-Build
Description: S-48 IMR	

Flow Inputs and Adjustments

Volume, V	1677	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	466	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	988	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	988	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	75.0	mi/h
Number of lanes, N	2	
Density, D	13.2	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS 2010: Basic Freeway Segments Release 6.80

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	PM Peak
Freeway/Direction:	I-26 EB
From/To:	Between S-48 and US 176
Jurisdiction:	
Analysis Year:	2020 No-Build
Description: S-48 IMR	

Flow Inputs and Adjustments

Volume, V	2499	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	694	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	1472	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	1472	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	72.5	mi/h
Number of lanes, N	2	
Density, D	20.3	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS 2010: Basic Freeway Segments Release 6.80

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	PM Peak
Freeway/Direction:	I-26 EB
From/To:	East of US176
Jurisdiction:	
Analysis Year:	2020 No-Build
Description: S-48 IMR	

Flow Inputs and Adjustments

Volume, V	3144	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	873	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	1851	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	1851	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	67.0	mi/h
Number of lanes, N	2	
Density, D	27.6	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS 2010: Basic Freeway Segments Release 6.80

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	PM Peak
Freeway/Direction:	I-26 WB
From/To:	East of US 176
Jurisdiction:	
Analysis Year:	2020 No-Build
Description: S-48 IMR	

Flow Inputs and Adjustments

Volume, V	3790	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1053	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	2232	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	2232	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	58.2	mi/h
Number of lanes, N	2	
Density, D	38.4	pc/mi/ln
Level of service, LOS	E	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS 2010: Basic Freeway Segments Release 6.80

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	PM Peak
Freeway/Direction:	I-26 WB
From/To:	Between S-48 and US 176
Jurisdiction:	
Analysis Year:	2020 No-Build
Description: S-48 IMR	

Flow Inputs and Adjustments

Volume, V	2523	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	701	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	1486	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	1486	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	72.4	mi/h
Number of lanes, N	2	
Density, D	20.5	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS 2010: Basic Freeway Segments Release 6.80

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	PM Peak
Freeway/Direction:	I-26 WB
From/To:	Between S-48 and SC 202
Jurisdiction:	
Analysis Year:	2020 No-Build
Description: S-48 IMR	

Flow Inputs and Adjustments

Volume, V	1519	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	422	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	895	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	895	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	75.0	mi/h
Number of lanes, N	2	
Density, D	11.9	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS 2010: Basic Freeway Segments Release 6.80

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	PM Peak
Freeway/Direction:	I-26 WB
From/To:	West of SC 202
Jurisdiction:	
Analysis Year:	2020 No-Build
Description:	S-48 IMR

Flow Inputs and Adjustments

Volume, V	1459	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	405	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	859	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	859	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	75.0	mi/h
Number of lanes, N	2	
Density, D	11.5	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	6/30/2016
Analysis time period:	AM Peak
Freeway/Dir of Travel:	I-26 EB
Junction:	SC-202 EB On-Ramp
Jurisdiction:	
Analysis Year:	2020 No-Build

Description: S-48 IMR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1347	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25.0	mph
Volume on ramp	199	vph
Length of first accel/decel lane	400	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	38	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	1050	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1347	199	38	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	374	55	11	v
Trucks and buses	4	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

```
Heavy vehicle adjustment, fHV           0.943       0.971       0.971
Driver population factor, fP            1.00        1.00        1.00
Flow rate, vp                           1586        228         43         pcph

_________________________Estimation of V12 Merge Areas_________________________

                  L  =            (Equation 13-6 or 13-7)
                   EQ
                  P  =    1.000   Using Equation  0
                   FM
                  v  = v  (P  ) =  1586   pc/h
                   12   F   FM

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v                     1814          4800            No
      FO
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 1586                   (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

________________________Flow Entering Merge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                1814          4600                  No
      R12
_________________Level of Service Determination (if not F)_____________________

Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   17.0    pc/mi/ln
          R                   R           12             A
Level of service for ramp-freeway junction areas of influence  B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 M  = 0.325
                                              S
Space mean speed in ramp influence area,     S  = 64.3    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 64.3    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

______________________________Merge Analysis______________________________

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	6/30/2016
Analysis time period:	AM Peak
Freeway/Dir of Travel:	I-26 EB
Junction:	S-48 EB On-Ramp
Jurisdiction:	
Analysis Year:	2020 No-Build

Description: S-48 IMR

______________________________Freeway Data______________________________

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1382	vph

______________________________On Ramp Data______________________________

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	1093	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

______________________Adjacent Ramp Data (if one exists)____________________

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	164	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	1725	ft

____________________Conversion to pc/h Under Base Conditions___________________

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1382	1093	164	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	384	304	46	v
Trucks and buses	4	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          1628        1251        188       pcph

_________________________Estimation of V12 Merge Areas_________________________

                  L  =            (Equation 13-6 or 13-7)
                   EQ
                  P  =    1.000   Using Equation  0
                   FM
                  v  = v  (P  ) =  1628   pc/h
                   12   F   FM

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v                     2879          4800            No
      FO
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 1628                   (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

________________________Flow Entering Merge Influence Area_____________________
                      Actual        Max Desirable        Violation?
     v                2879          4600                 No
      R12
_________________Level of Service Determination (if not F)_____________________

Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   18.0    pc/mi/ln
          R                   R          12             A
Level of service for ramp-freeway junction areas of influence  B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                M  = 0.255
                                             S
Space mean speed in ramp influence area,    S  = 66.6    mph
                                             R
Space mean speed in outer lanes,            S  =  N/A    mph
                                             0
Space mean speed for all vehicles,          S  = 66.6    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	6/30/2016
Analysis time period:	AM Peak
Freeway/Dir of Travel:	I-26 EB
Junction:	US176 EB On-Ramp
Jurisdiction:	
Analysis Year:	2020 No-Build

Description: S-48 IMR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	2354	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25.0	mph
Volume on ramp	1555	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	121	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	900	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2354	1555	121	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	654	432	34	v
Trucks and buses	4	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	1.5	
Recreational vehicle PCE, ER	2.0	2.0	1.2	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.990
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          2772        1780        136       pcph

_________________________Estimation of V12 Merge Areas_________________________

                  L  =            (Equation 13-6 or 13-7)
                   EQ
                  P  =    1.000   Using Equation  0
                   FM
                  v  = v  (P  ) =  2772   pc/h
                   12   F   FM

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v                     4552          4800            No
      FO
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 2772                    (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

________________________Flow Entering Merge Influence Area_____________________
                      Actual        Max Desirable        Violation?
     v                4552          4600                 No
      R12
_________________Level of Service Determination (if not F)_____________________

Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   30.8    pc/mi/ln
          R                   R           12             A
Level of service for ramp-freeway junction areas of influence  D

_____________________________Speed Estimation__________________________________

Intermediate speed variable,              M  = 0.616
                                           S
Space mean speed in ramp influence area,  S  = 54.7    mph
                                           R
Space mean speed in outer lanes,          S  =  N/A    mph
                                           0
Space mean speed for all vehicles,        S  = 54.7    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	6/30/2016
Analysis time period:	AM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	US 176 WB On-Ramp
Jurisdiction:	
Analysis Year:	2020 No-Build

Description: S-48 IMR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1533	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25.0	mph
Volume on ramp	180	vph
Length of first accel/decel lane	1425	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	482	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	775	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1533	180	482	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	426	50	134	v
Trucks and buses	4	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          1806        206         552        pcph

_________________________Estimation of V12 Merge Areas_________________________

                  L  =            (Equation 13-6 or 13-7)
                   EQ
                  P  =    1.000   Using Equation  0
                   FM
                  v  = v  (P  ) =  1806   pc/h
                   12   F   FM

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v                     2012          4800            No
      FO
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 1806                   (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

________________________Flow Entering Merge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                2012          4600                  No
      R12
_________________Level of Service Determination (if not F)_____________________

Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   12.1    pc/mi/ln
          R                   R           12             A
Level of service for ramp-freeway junction areas of influence  B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 M  = 0.279
                                              S
Space mean speed in ramp influence area,     S  = 65.8    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 65.8    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	6/30/2016
Analysis time period:	AM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	S-48 WB On-Ramp
Jurisdiction:	
Analysis Year:	2020 No-Build

Description: S-48 IMR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	863	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	141	vph
Length of first accel/decel lane	1225	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	850	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	1475	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	863	141	850	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	240	39	236	v
Trucks and buses	4	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          1016        161         973       pcph

_________________________Estimation of V12 Merge Areas_________________________

                  L  =            (Equation 13-6 or 13-7)
                   EQ
                  P  =    1.000   Using Equation  0
                   FM
                  v  = v  (P  ) =  1016   pc/h
                   12   F   FM

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v                     1177          4800            No
      FO
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 1016                   (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

________________________Flow Entering Merge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                1177          4600                  No
      R12
_________________Level of Service Determination (if not F)_____________________

Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   6.9     pc/mi/ln
          R                   R           12             A
Level of service for ramp-freeway junction areas of influence  A

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 M  = 0.223
                                              S
Space mean speed in ramp influence area,     S  = 67.6    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 67.6    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	6/30/2016
Analysis time period:	AM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	SC-202 WB On-Ramp
Jurisdiction:	
Analysis Year:	2020 No-Build

Description: S-48 IMR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	977	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	70	vph
Length of first accel/decel lane	525	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	27	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	1000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	977	70	27	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	271	19	8	v
Trucks and buses	4	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          1151        80          31         pcph

_________________________Estimation of V12 Merge Areas_________________________

                  L  =            (Equation 13-6 or 13-7)
                   EQ
                  P  =    1.000   Using Equation  0
                   FM
                  v  = v  (P  ) =  1151   pc/h
                   12   F   FM

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v                     1231          4800            No
      FO
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 1151                   (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

________________________Flow Entering Merge Influence Area_____________________
                      Actual        Max Desirable        Violation?
     v                1231          4600                 No
      R12
_________________Level of Service Determination (if not F)_____________________

Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   11.7    pc/mi/ln
          R                   R           12             A
Level of service for ramp-freeway junction areas of influence  B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,               M  = 0.287
                                            S
Space mean speed in ramp influence area,   S  = 65.5    mph
                                            R
Space mean speed in outer lanes,           S  =  N/A    mph
                                            0
Space mean speed for all vehicles,         S  = 65.5    mph
_______________________________________________________________________________
```

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	6/30/2016
Analysis time period:	PM Peak
Freeway/Dir of Travel:	I-26 EB
Junction:	SC-202 EB On-Ramp
Jurisdiction:	
Analysis Year:	2020 No-Build

Description: S-48 IMR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1640	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25.0	mph
Volume on ramp	37	vph
Length of first accel/decel lane	400	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	74	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	1050	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1640	37	74	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	456	10	21	v
Trucks and buses	4	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

```
Heavy vehicle adjustment, fHV            0.943       0.971       0.971
Driver population factor, fP             1.00        1.00        1.00
Flow rate, vp                            1932        42          85        pcph

_________________________Estimation of V12 Merge Areas_________________________

                  L  =            (Equation 13-6 or 13-7)
                   EQ
                  P  =    1.000   Using Equation  0
                   FM
                  v  = v  (P  ) =  1932   pc/h
                   12   F   FM

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v                     1974          4800            No
      FO
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 1932                     (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

________________________Flow Entering Merge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                1974          4600                  No
      R12
_________________Level of Service Determination (if not F)_____________________

Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   18.3    pc/mi/ln
          R                   R           12             A
Level of service for ramp-freeway junction areas of influence  B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 M  = 0.329
                                              S
Space mean speed in ramp influence area,     S  = 64.1    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 64.1    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	6/30/2016
Analysis time period:	PM Peak
Freeway/Dir of Travel:	I-26 EB
Junction:	S-48 EB On-Ramp
Jurisdiction:	
Analysis Year:	2020 No-Build

Description: S-48 IMR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1503	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	996	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	174	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	1725	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1503	996	174	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	418	277	48	v
Trucks and buses	4	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

```
Heavy vehicle adjustment, fHV           0.943       0.971       0.971
Driver population factor, fP            1.00        1.00        1.00
Flow rate, vp                           1770        1140        199       pcph

_________________________Estimation of V12 Merge Areas_________________________

                  L  =             (Equation 13-6 or 13-7)
                   EQ
                  P  =    1.000   Using Equation  0
                   FM
                  v  = v  (P  ) =  1770   pc/h
                   12   F   FM

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v                     2910          4800            No
      FO
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 1770                   (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

________________________Flow Entering Merge Influence Area_____________________
                      Actual        Max Desirable        Violation?
     v                2910          4600                 No
      R12
_________________Level of Service Determination (if not F)_____________________

Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   18.2    pc/mi/ln
          R                   R           12             A
Level of service for ramp-freeway junction areas of influence  B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 M  = 0.258
                                              S
Space mean speed in ramp influence area,     S  = 66.5    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 66.5    mph
_______________________________________________________________________________
```

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	6/30/2016
Analysis time period:	PM Peak
Freeway/Dir of Travel:	I-26 EB
Junction:	US176 EB On-Ramp
Jurisdiction:	
Analysis Year:	2020 No-Build

Description: S-48 IMR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	2269	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25.0	mph
Volume on ramp	875	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	230	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	900	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2269	875	230	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	630	243	64	v
Trucks and buses	4	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	1.5	
Recreational vehicle PCE, ER	2.0	2.0	1.2	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.990
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          2672        1001        258       pcph

_________________________Estimation of V12 Merge Areas_________________________

                  L  =            (Equation 13-6 or 13-7)
                   EQ
                  P  =    1.000   Using Equation  0
                   FM
                  v  = v  (P  ) =  2672   pc/h
                   12   F   FM

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v                     3673          4800            No
      FO
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 2672                   (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

________________________Flow Entering Merge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                3673          4600                  No
      R12
_________________Level of Service Determination (if not F)_____________________

Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   24.3    pc/mi/ln
          R                   R           12            A
Level of service for ramp-freeway junction areas of influence  C

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                M  = 0.400
                                             S
Space mean speed in ramp influence area,    S  = 61.8    mph
                                             R
Space mean speed in outer lanes,            S  =  N/A    mph
                                             0
Space mean speed for all vehicles,          S  = 61.8    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	6/30/2016
Analysis time period:	PM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	US 176 WB On-Ramp
Jurisdiction:	
Analysis Year:	2020 No-Build
Description:	S-48 IMR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	2380	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25.0	mph
Volume on ramp	143	vph
Length of first accel/decel lane	1425	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	1410	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	775	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2380	143	1410	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	661	40	392	v
Trucks and buses	4	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

```
Heavy vehicle adjustment, fHV           0.943       0.971       0.971
Driver population factor, fP            1.00        1.00        1.00
Flow rate, vp                           2803        164         1614      pcph

_________________________Estimation of V12 Merge Areas_________________________

                  L  =             (Equation 13-6 or 13-7)
                   EQ
                  P  =    1.000   Using Equation  0
                   FM
                  v  = v  (P  ) =  2803   pc/h
                   12   F   FM

_______________________________Capacity Checks_________________________________

                            Actual        Maximum         LOS F?
     v                      2967          4800            No
      FO
     v  or v                0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?            No
      3     av34
Is   v  or v      > 1.5 v  /2             No
      3     av34         12
If yes, v    = 2803                    (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

________________________Flow Entering Merge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                2967          4600                  No
      R12
_________________Level of Service Determination (if not F)_____________________

Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   19.6    pc/mi/ln
          R                   R           12             A
Level of service for ramp-freeway junction areas of influence  B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 M  = 0.326
                                              S
Space mean speed in ramp influence area,     S  = 64.3    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 64.3    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	6/30/2016
Analysis time period:	PM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	S-48 WB On-Ramp
Jurisdiction:	
Analysis Year:	2020 No-Build

Description: S-48 IMR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1323	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	196	vph
Length of first accel/decel lane	1225	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	1200	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	1475	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1323	196	1200	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	368	54	333	v
Trucks and buses	4	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          1558        224         1373      pcph

_________________________Estimation of V12 Merge Areas_________________________

                  L  =            (Equation 13-6 or 13-7)
                   EQ
                  P  =    1.000   Using Equation  0
                   FM
                  v  = v  (P  ) =  1558   pc/h
                   12   F   FM

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v                     1782          4800            No
      FO
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 1558                   (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

________________________Flow Entering Merge Influence Area_____________________
                      Actual        Max Desirable        Violation?
     v                1782          4600                 No
      R12
_________________Level of Service Determination (if not F)_____________________

Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   11.6    pc/mi/ln
          R                   R           12             A
Level of service for ramp-freeway junction areas of influence  B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,               M  = 0.234
                                            S
Space mean speed in ramp influence area,   S  = 67.3    mph
                                            R
Space mean speed in outer lanes,           S  =  N/A    mph
                                            0
Space mean speed for all vehicles,         S  = 67.3    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Merge Analysis

Analyst: AECOM
Agency/Co.: AECOM
Date performed: 6/30/2016
Analysis time period: PM Peak
Freeway/Dir of Travel: I-26 WB
Junction: SC-202 WB On-Ramp
Jurisdiction:
Analysis Year: 2020 No-Build
Description: S-48 IMR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1405	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	54	vph
Length of first accel/decel lane	525	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	114	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	1000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1405	54	114	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	390	15	32	v
Trucks and buses	4	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          1655        62          130       pcph

_________________________Estimation of V12 Merge Areas_________________________

                  L  =            (Equation 13-6 or 13-7)
                   EQ
                  P  =    1.000   Using Equation  0
                   FM
                  v  = v  (P  ) =  1655   pc/h
                   12   F   FM

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v                     1717          4800            No
      FO
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 1655                    (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

________________________Flow Entering Merge Influence Area_____________________
                      Actual        Max Desirable        Violation?
     v                1717          4600                 No
      R12
_________________Level of Service Determination (if not F)_____________________

Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   15.5    pc/mi/ln
          R                   R           12             A
Level of service for ramp-freeway junction areas of influence  B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 M  = 0.295
                                              S
Space mean speed in ramp influence area,     S  = 65.2    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 65.2    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	AM Peak
Freeway/Dir of Travel:	I-26 EB
Junction:	SC 202 EB Off-Ramp
Jurisdiction:	
Analysis Year:	2020 No-Build
Description:	S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1385	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	38	vph
Length of first accel/decel lane	400	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	199	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1050	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1385		38		199	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	385		11		55	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

Heavy vehicle adjustment, fHV	0.943	0.971	0.971	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1631	43	228	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1631 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1631	4800	No
$v_{FO} = v_F - v_R$	1588	4800	No
v_R	43	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12}/2 No

If yes, v_{12A} = 1631 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	1631	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 14.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable, D_S = 0.302

Space mean speed in ramp influence area, S_R = 65.0 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 65.0 mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	AM Peak
Freeway/Dir of Travel:	I-26 EB
Junction:	S-48 EB Off-Ramp
Jurisdiction:	
Analysis Year:	2020 No-Build

Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1546	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	164	vph
Length of first accel/decel lane	975	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	1093	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1725	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1546		164		1093	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	429		46		304	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

```
Heavy vehicle adjustment, fHV           0.943       0.971       0.971
Driver population factor, fP            1.00        1.00        1.00
Flow rate, vp                           1821        188         1251      pcph

_________________________Estimation of V12 Diverge Areas_______________________

                  L   =             (Equation 13-12 or 13-13)
                   EQ
                  P   =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  1821   pc/h
                   12   R     F   R   FD

_______________________________Capacity Checks_________________________________

                             Actual        Maximum         LOS F?
     v  = v                  1821          4800            No
      Fi   F
     v  = v - v              1633          4800            No
      FO   F   R
     v                       188           2100            No
      R
     v  or v                 0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?             No
      3     av34
Is   v  or v      > 1.5 v  /2              No
      3     av34         12
If yes, v    = 1821                     (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

______________________Flow Entering Diverge Influence Area_____________________
                      Actual        Max Desirable          Violation?
     v                1821          4400                   No
      12
_________________Level of Service Determination (if not F)_____________________

Density,               D = 4.252 + 0.0086 v  - 0.009  L   =   11.1    pc/mi/ln
                        R                  12          D
Level of service for ramp-freeway junction areas of influence B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                D  = 0.315
                                             S
Space mean speed in ramp influence area,    S  = 64.6    mph
                                             R
Space mean speed in outer lanes,            S  =  N/A    mph
                                             0
Space mean speed for all vehicles,          S  = 64.6    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	AM Peak
Freeway/Dir of Travel:	I-26 EB
Junction:	US 176 EB Off-Ramp
Jurisdiction:	
Analysis Year:	2020 No-Build

Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	2475	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	121	vph
Length of first accel/decel lane	1000	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	1555	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	900	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2475		121		1555	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	688		34		432	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          2915        138         1780      pcph

_________________________Estimation of V12 Diverge Areas_______________________

                  L  =            (Equation 13-12 or 13-13)
                   EQ
                  P  =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  2915   pc/h
                   12   R     F   R   FD

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v  = v                2915          4800            No
      Fi   F
     v  = v - v            2777          4800            No
      FO   F   R
     v                     138           2100            No
      R
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 2915                   (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

______________________Flow Entering Diverge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                2915          4400                  No
      12
_________________Level of Service Determination (if not F)_____________________

Density,                D = 4.252 + 0.0086 v  - 0.009  L   =   20.3    pc/mi/ln
                         R                  12          D
Level of service for ramp-freeway junction areas of influence C

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                D  = 0.310
                                             S
Space mean speed in ramp influence area,    S  = 64.8    mph
                                             R
Space mean speed in outer lanes,            S  =  N/A    mph
                                             0
Space mean speed for all vehicles,          S  = 64.8    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	AM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	US 176 WB Off-Ramp
Jurisdiction:	
Analysis Year:	2020 No-Build

Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	2015	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	482	vph
Length of first accel/decel lane	1225	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	180	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	775	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2015		482		180	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	560		134		50	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          2373        552         206        pcph

_________________________Estimation of V12 Diverge Areas_______________________

                  L  =            (Equation 13-12 or 13-13)
                   EQ
                  P  =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  2373   pc/h
                   12   R     F   R   FD

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v  = v                2373          4800            No
      Fi   F
     v  = v - v            1821          4800            No
      FO   F   R
     v                     552           2100            No
      R
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 2373                   (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

______________________Flow Entering Diverge Influence Area_____________________
                      Actual        Max Desirable          Violation?
     v                2373          4400                   No
      12
_________________Level of Service Determination (if not F)_____________________

Density,               D = 4.252 + 0.0086 v  - 0.009  L   =   13.6    pc/mi/ln
                        R                   12          D
Level of service for ramp-freeway junction areas of influence B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 D  = 0.348
                                              S
Space mean speed in ramp influence area,     S  = 63.5    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 63.5    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	AM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	S-48 WB Off-Ramp
Jurisdiction:	
Analysis Year:	2020 No-Build

Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1713	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	850	vph
Length of first accel/decel lane	1225	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	141	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1475	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1713		850		141	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	476		236		39	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

```
Heavy vehicle adjustment, fHV           0.943       0.971       0.971
Driver population factor, fP            1.00        1.00        1.00
Flow rate, vp                           2018        973         161       pcph

_________________________Estimation of V12 Diverge Areas_______________________

                  L  =            (Equation 13-12 or 13-13)
                   EQ
                  P  =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  2018   pc/h
                   12   R     F   R   FD

_______________________________Capacity Checks_________________________________

                             Actual        Maximum         LOS F?
     v  = v                  2018          4800            No
      Fi   F
     v  = v - v              1045          4800            No
      FO   F   R
     v                       973           2100            No
      R
     v  or v                 0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?             No
      3     av34
Is   v  or v      > 1.5 v  /2              No
      3     av34         12
If yes, v    = 2018                     (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

______________________Flow Entering Diverge Influence Area_____________________
                      Actual        Max Desirable          Violation?
     v                2018          4400                   No
      12
_________________Level of Service Determination (if not F)_____________________

Density,               D = 4.252 + 0.0086 v  - 0.009  L   =   10.6    pc/mi/ln
                        R                  12          D
Level of service for ramp-freeway junction areas of influence B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 D  = 0.386
                                              S
Space mean speed in ramp influence area,     S  = 62.3    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 62.3    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: AECOM
Agency/Co.: AECOM
Date performed: 7/1/2016
Analysis time period: AM Peak
Freeway/Dir of Travel: I-26 WB
Junction: SC 202 WB Off-Ramp
Jurisdiction:
Analysis Year: 2020 No-Build
Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1004	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	25.0	mph
Volume on ramp	27	vph
Length of first accel/decel lane	400	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	70	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1004		27		70	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	279		8		19	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

```
Heavy vehicle adjustment, fHV            0.943       0.971       0.971
Driver population factor, fP             1.00        1.00        1.00
Flow rate, vp                            1182        31          80         pcph

_________________________Estimation of V12 Diverge Areas_______________________

                  L  =            (Equation 13-12 or 13-13)
                   EQ
                  P  =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  1182   pc/h
                   12   R     F   R   FD

_______________________________Capacity Checks_________________________________

                             Actual        Maximum         LOS F?
     v  = v                  1182          4800            No
      Fi   F
     v  = v - v              1151          4800            No
      FO   F   R
     v                       31            1900            No
      R
     v  or v                 0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?             No
      3     av34
Is   v  or v      > 1.5 v  /2              No
      3     av34         12
If yes, v    = 1182                     (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

______________________Flow Entering Diverge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                1182          4400                  No
      12
_________________Level of Service Determination (if not F)_____________________

Density,               D = 4.252 + 0.0086 v  - 0.009  L   =   10.8    pc/mi/ln
                        R                  12          D
Level of service for ramp-freeway junction areas of influence B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 D  = 0.561
                                              S
Space mean speed in ramp influence area,     S  = 56.5    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 56.5    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	PM Peak
Freeway/Dir of Travel:	I-26 EB
Junction:	SC 202 EB Off-Ramp
Jurisdiction:	
Analysis Year:	2020 No-Build

Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1714	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	74	vph
Length of first accel/decel lane	400	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	37	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1050	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1714		74		37	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	476		21		10	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          2019        85          42         pcph

_________________________Estimation of V12 Diverge Areas_______________________

                  L  =            (Equation 13-12 or 13-13)
                   EQ
                  P  =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  2019   pc/h
                   12   R     F   R   FD

_______________________________Capacity Checks_________________________________

                             Actual        Maximum         LOS F?
     v  = v                  2019          4800            No
      Fi   F
     v  = v - v              1934          4800            No
      FO   F   R
     v                       85            2100            No
      R
     v  or v                 0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?             No
      3     av34
Is   v  or v      > 1.5 v  /2              No
      3     av34         12
If yes, v    = 2019                     (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

______________________Flow Entering Diverge Influence Area_____________________
                        Actual        Max Desirable          Violation?
     v                  2019          4400                   No
      12
_________________Level of Service Determination (if not F)____________________

Density,                 D = 4.252 + 0.0086 v  - 0.009  L   =   18.0    pc/mi/ln
                          R                   12          D
Level of service for ramp-freeway junction areas of influence B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                D  = 0.306
                                             S
Space mean speed in ramp influence area,    S  = 64.9    mph
                                             R
Space mean speed in outer lanes,            S  =  N/A    mph
                                             0
Space mean speed for all vehicles,          S  = 64.9    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: AECOM
Agency/Co.: AECOM
Date performed: 7/1/2016
Analysis time period: PM Peak
Freeway/Dir of Travel: I-26 EB
Junction: S-48 EB Off-Ramp
Jurisdiction:
Analysis Year: 2020 No-Build
Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1677	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	174	vph
Length of first accel/decel lane	975	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	996	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1725	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1677		174		996	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	466		48		277	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

```
Heavy vehicle adjustment, fHV             0.943       0.971       0.971
Driver population factor, fP              1.00        1.00        1.00
Flow rate, vp                             1975        199         1140      pcph

_________________________Estimation of V12 Diverge Areas_______________________

                  L   =            (Equation 13-12 or 13-13)
                   EQ
                  P   =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  1975   pc/h
                   12   R     F   R   FD

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v  = v                1975          4800            No
      Fi   F
     v  = v - v            1776          4800            No
      FO   F   R
     v                     199           2100            No
      R
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 1975                   (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

______________________Flow Entering Diverge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                1975          4400                  No
      12
_________________Level of Service Determination (if not F)_____________________

Density,               D = 4.252 + 0.0086 v  - 0.009  L   =   12.5    pc/mi/ln
                        R                  12          D
Level of service for ramp-freeway junction areas of influence B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 D  = 0.316
                                              S
Space mean speed in ramp influence area,     S  = 64.6    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 64.6    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	PM Peak
Freeway/Dir of Travel:	I-26 EB
Junction:	US 176 EB Off-Ramp
Jurisdiction:	
Analysis Year:	2020 No-Build

Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	2499	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	230	vph
Length of first accel/decel lane	1000	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	875	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	900	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp		
Volume, V (vph)	2499		230		875		vph
Peak-hour factor, PHF	0.90		0.90		0.90		
Peak 15-min volume, v15	694		64		243		v
Trucks and buses	4		2		2		%
Recreational vehicles	0		0		0		%
Terrain type:	Rolling		Rolling		Rolling		
Grade	0.00	%	0.00	%	0.00	%	
Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, ET	2.5		2.5		2.5		
Recreational vehicle PCE, ER	2.0		2.0		2.0		

```
Heavy vehicle adjustment, fHV           0.943       0.971       0.971
Driver population factor, fP            1.00        1.00        1.00
Flow rate, vp                           2943        263         1001      pcph

_________________________Estimation of V12 Diverge Areas_______________________

                  L  =            (Equation 13-12 or 13-13)
                   EQ
                  P  =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  2943   pc/h
                   12   R     F   R   FD

_______________________________Capacity Checks_________________________________

                             Actual        Maximum         LOS F?
     v  = v                  2943          4800            No
      Fi   F
     v  = v - v              2680          4800            No
      FO   F   R
     v                       263           2100            No
      R
     v  or v                 0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?             No
      3     av34
Is   v  or v      > 1.5 v  /2              No
      3     av34         12
If yes, v    = 2943                     (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

______________________Flow Entering Diverge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                2943          4400                  No
      12
_________________Level of Service Determination (if not F)____________________

Density,                D = 4.252 + 0.0086 v  - 0.009  L   =   20.6    pc/mi/ln
                         R                  12          D
Level of service for ramp-freeway junction areas of influence C

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                D  = 0.322
                                             S
Space mean speed in ramp influence area,    S  = 64.4    mph
                                             R
Space mean speed in outer lanes,            S  =  N/A    mph
                                             0
Space mean speed for all vehicles,          S  = 64.4    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	PM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	US 176 WB Off-Ramp
Jurisdiction:	
Analysis Year:	2020 No-Build

Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	3790	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	1410	vph
Length of first accel/decel lane	1225	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	143	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	775	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3790		1410		143	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	1053		392		40	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          4464        1614        164       pcph

_________________________Estimation of V12 Diverge Areas_______________________

                  L  =            (Equation 13-12 or 13-13)
                   EQ
                  P  =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  4464   pc/h
                   12   R     F   R   FD

_______________________________Capacity Checks_________________________________

                             Actual        Maximum         LOS F?
     v  = v                  4464          4800            No
      Fi   F
     v  = v - v              2850          4800            No
      FO   F   R
     v                       1614          2100            No
      R
     v  or v                 0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?             No
      3     av34
Is   v  or v      > 1.5 v  /2              No
      3     av34         12
If yes, v    = 4464                     (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

______________________Flow Entering Diverge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                4464          4400                  Yes
      12
_________________Level of Service Determination (if not F)_____________________

Density,               D = 4.252 + 0.0086 v  - 0.009  L   =   31.6    pc/mi/ln
                        R                   12          D
Level of service for ramp-freeway junction areas of influence D

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 D  = 0.443
                                              S
Space mean speed in ramp influence area,     S  = 60.4    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 60.4    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: AECOM
Agency/Co.: AECOM
Date performed: 7/1/2016
Analysis time period: PM Peak
Freeway/Dir of Travel: I-26 WB
Junction: S-48 WB Off-Ramp
Jurisdiction:
Analysis Year: 2020 No-Build
Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	2523	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	1200	vph
Length of first accel/decel lane	1225	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	196	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1475	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2523		1200		196	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	701		333		54	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

```
Heavy vehicle adjustment, fHV           0.943       0.971       0.971
Driver population factor, fP            1.00        1.00        1.00
Flow rate, vp                           2972        1373        224       pcph

_________________________Estimation of V12 Diverge Areas_______________________

                  L  =            (Equation 13-12 or 13-13)
                   EQ
                  P  =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  2972   pc/h
                   12   R     F   R   FD

_______________________________Capacity Checks_________________________________

                             Actual        Maximum         LOS F?
     v  = v                  2972          4800            No
      Fi   F
     v  = v - v              1599          4800            No
      FO   F   R
     v                       1373          2100            No
      R
     v  or v                 0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?             No
      3     av34
Is   v  or v      > 1.5 v  /2              No
      3     av34         12
If yes, v    = 2972                     (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

______________________Flow Entering Diverge Influence Area_____________________
                      Actual        Max Desirable        Violation?
     v                2972          4400                 No
      12
_________________Level of Service Determination (if not F)_____________________

Density,               D = 4.252 + 0.0086 v  - 0.009  L   =   18.8    pc/mi/ln
                        R                  12          D
Level of service for ramp-freeway junction areas of influence B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 D  = 0.422
                                              S
Space mean speed in ramp influence area,     S  = 61.1    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 61.1    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	PM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	SC 202 WB Off-Ramp
Jurisdiction:	
Analysis Year:	2020 No-Build

Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1519	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	25.0	mph
Volume on ramp	114	vph
Length of first accel/decel lane	400	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	54	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1519		114		54	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	422		32		15	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          1789        130         62         pcph

_________________________Estimation of V12 Diverge Areas_______________________

                  L  =            (Equation 13-12 or 13-13)
                   EQ
                  P  =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  1789   pc/h
                   12   R     F   R   FD

_______________________________Capacity Checks_________________________________

                              Actual        Maximum         LOS F?
     v  = v                   1789          4800            No
      Fi   F
     v  = v - v               1659          4800            No
      FO   F   R
     v                        130           1900            No
      R
     v  or v                  0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?              No
      3     av34
Is   v  or v      > 1.5 v  /2               No
      3     av34         12
If yes, v    = 1789                      (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

______________________Flow Entering Diverge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                1789          4400                  No
      12
_________________Level of Service Determination (if not F)____________________

Density,               D = 4.252 + 0.0086 v  - 0.009  L   =   16.0    pc/mi/ln
                        R                  12          D
Level of service for ramp-freeway junction areas of influence B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 D  = 0.570
                                              S
Space mean speed in ramp influence area,     S  = 56.2    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 56.2    mph
_______________________________________________________________________________
```

APPENDIX H

NO-BUILD 2040 SYNCHRO AND SIM TRAFFIC REPORTS

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	29	9	185	12	0	17	0	208	1209	147	1461	0
Future Vol, veh/h	29	9	185	12	0	17	0	208	1209	147	1461	0
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	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	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	32	10	206	13	0	19	0	231	1343	163	1623	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2862	3524	1623	2961	2853	903	-	0	0	1574	0	0
Stage 1	1950	1950	-	903	903	-	-	-	-	-	-	-
Stage 2	912	1574	-	2058	1950	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	-	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	-	-	-	2.218	-	-
Pot Cap-1 Maneuver	~ 11	~ 6	~ 127	~ 9	17	336	0	-	-	419	-	0
Stage 1	83	111	-	332	356	-	0	-	-	-	-	0
Stage 2	328	170	-	72	111	-	0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	-	0	~ 127	-	0	336	-	-	-	419	-	-
Mov Cap-2 Maneuver	-	0	-	-	0	-	-	-	-	-	-	-
Stage 1	83	0	-	332	356	-	-	-	-	-	-	-
Stage 2	310	170	-	-	0	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s			0	1.7
HCM LOS	-	-		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	-	419	-
HCM Lane V/C Ratio	-	-	-	-	0.39	-
HCM Control Delay (s)	-	-	-	-	19	0
HCM Lane LOS	-	-	-	-	C	A
HCM 95th %tile Q(veh)	-	-	-	-	1.8	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

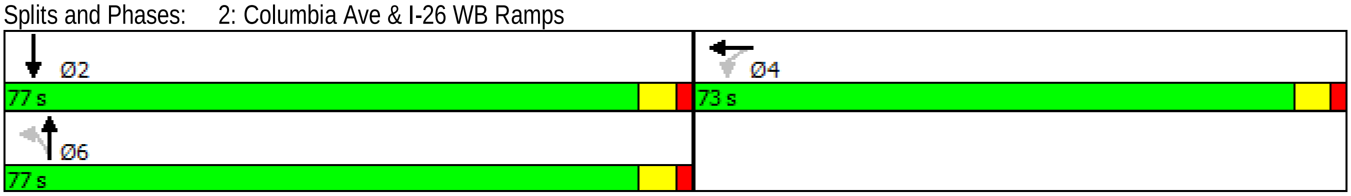
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1026	3	159	125	129	0	0	582	56
Future Volume (vph)	0	0	0	1026	3	159	125	129	0	0	582	56
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	0	0	0	1754	0	0	1818	0	0	1840	0
Flt Permitted					0.959			0.190				
Satd. Flow (perm)	0	0	0	0	1754	0	0	354	0	0	1840	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					7						4	
Link Speed (mph)		45			45			35			35	
Link Distance (ft)		883			668			593			885	
Travel Time (s)		13.4			10.1			11.6			17.2	
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
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	1320	0	0	282	0	0	709	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
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
Turn Type				Perm	NA		Perm	NA			NA	
Protected Phases					4			6			2	
Permitted Phases				4			6					
Detector Phase				4	4		6	6			2	
Switch Phase												
Minimum Initial (s)				10.0	10.0		10.0	10.0			10.0	
Minimum Split (s)				22.0	22.0		22.0	22.0			22.0	
Total Split (s)				73.0	73.0		77.0	77.0			77.0	
Total Split (%)				48.7%	48.7%		51.3%	51.3%			51.3%	
Maximum Green (s)				67.0	67.0		70.7	70.7			70.7	
Yellow Time (s)				4.0	4.0		4.3	4.3			4.3	
All-Red Time (s)				2.0	2.0		2.0	2.0			2.0	
Lost Time Adjust (s)					0.0			0.0			0.0	
Total Lost Time (s)					6.0			6.3			6.3	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				4.0	4.0		3.0	3.0			3.0	
Recall Mode				None	None		Min	Min			Min	
Act Effct Green (s)					67.0			70.7			70.7	
Actuated g/C Ratio					0.45			0.47			0.47	
v/c Ratio					1.68			1.70			0.82	
Control Delay					339.4			367.1			43.0	
Queue Delay					0.0			0.0			0.0	
Total Delay					339.4			367.1			43.0	
LOS					F			F			D	
Approach Delay					339.4			367.1			43.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS					F			F			D	
Queue Length 50th (ft)					~1890			~399			584	
Queue Length 95th (ft)					#2161			#421			769	
Internal Link Dist (ft)		803			588			513			805	
Turn Bay Length (ft)												
Base Capacity (vph)					787			166			869	
Starvation Cap Reductn					0			0			0	
Spillback Cap Reductn					0			0			0	
Storage Cap Reductn					0			0			0	
Reduced v/c Ratio					1.68			1.70			0.82	

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.70
Intersection Signal Delay: 251.8 Intersection LOS: F
Intersection Capacity Utilization 129.9% ICU Level of Service H
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Columbia Ave & I-26 WB Ramps



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	1026	3	159	125	129	0	0	582	56
Future Volume (veh/h)	0	0	0	1026	3	159	125	129	0	0	582	56
Number				7	4	14	1	6	16	5	2	12
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln				1900	1863	1900	1900	1863	0	0	1863	1900
Adj Flow Rate, veh/h				1140	3	177	139	143	0	0	647	62
Adj No. of Lanes				0	1	0	0	1	0	0	1	0
Peak Hour Factor				0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %				0	2	0	2	2	0	0	2	2
Cap, veh/h				674	2	105	108	100	0	0	789	76
Arrive On Green				0.45	0.45	0.45	0.47	0.47	0.00	0.00	0.47	0.47
Sat Flow, veh/h				1508	4	234	154	212	0	0	1674	160
Grp Volume(v), veh/h				1320	0	0	282	0	0	0	0	709
Grp Sat Flow(s),veh/h/ln				1746	0	0	366	0	0	0	0	1834
Q Serve(g_s), s				67.0	0.0	0.0	20.7	0.0	0.0	0.0	0.0	50.0
Cycle Q Clear(g_c), s				67.0	0.0	0.0	70.7	0.0	0.0	0.0	0.0	50.0
Prop In Lane				0.86		0.13	0.49		0.00	0.00		0.09
Lane Grp Cap(c), veh/h				780	0	0	208	0	0	0	0	865
V/C Ratio(X)				1.69	0.00	0.00	1.35	0.00	0.00	0.00	0.00	0.82
Avail Cap(c_a), veh/h				780	0	0	208	0	0	0	0	865
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00
Uniform Delay (d), s/veh				41.5	0.0	0.0	59.1	0.0	0.0	0.0	0.0	34.2
Incr Delay (d2), s/veh				317.2	0.0	0.0	187.3	0.0	0.0	0.0	0.0	6.3
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				101.0	0.0	0.0	19.5	0.0	0.0	0.0	0.0	26.7
LnGrp Delay(d),s/veh				358.7	0.0	0.0	246.4	0.0	0.0	0.0	0.0	40.5
LnGrp LOS				F			F					D
Approach Vol, veh/h					1320			282			709	
Approach Delay, s/veh					358.7			246.4			40.5	
Approach LOS					F			F			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		77.0		73.0		77.0		
Change Period (Y+Rc), s		6.3		6.0		6.3		
Max Green Setting (Gmax), s		70.7		67.0		70.7		
Max Q Clear Time (g_c+I1), s		52.0		69.0		72.7		
Green Ext Time (p_c), s		7.1		0.0		0.0		

Intersection Summary	
HCM 2010 Ctrl Delay	247.4
HCM 2010 LOS	F

SimTraffic Simulation Summary
No-Build 2040 AM

Summary of All Intervals

Run Number	1	2	3	Avg
Start Time	7:20	7:20	7:20	7:20
End Time	8:30	8:30	8:30	8:30
Total Time (min)	70	70	70	70
Time Recorded (min)	60	60	60	60
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	2588	2719	2674	2659
Vehs Exited	2569	2612	2593	2591
Starting Vehs	459	438	425	437
Ending Vehs	478	545	506	510
Travel Distance (mi)	2864	2890	2921	2891
Travel Time (hr)	2438.5	2434.2	2281.7	2384.8
Total Delay (hr)	2386.1	2381.0	2227.9	2331.7
Total Stops	2344	2247	2116	2236
Fuel Used (gal)	659.2	659.7	627.3	648.7

Interval #0 Information Seeding

Start Time	7:20
End Time	7:30
Total Time (min)	10

Volumes adjusted by Growth Factors.
No data recorded this interval.

Interval #1 Information Recording

Start Time	7:30
End Time	8:30
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	1	2	3	Avg
Vehs Entered	2588	2719	2674	2659
Vehs Exited	2569	2612	2593	2591
Starting Vehs	459	438	425	437
Ending Vehs	478	545	506	510
Travel Distance (mi)	2864	2890	2921	2891
Travel Time (hr)	2438.5	2434.2	2281.7	2384.8
Total Delay (hr)	2386.1	2381.0	2227.9	2331.7
Total Stops	2344	2247	2116	2236
Fuel Used (gal)	659.2	659.7	627.3	648.7

Intersection: 1: Columbia Ave & I-26 EB Ramps

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	TR	LT
Maximum Queue (ft)	870	48	70	524
Average Queue (ft)	837	34	40	511
95th Queue (ft)	985	50	64	522
Link Distance (ft)	743	38	20	508
Upstream Blk Time (%)	91	62	5	87
Queuing Penalty (veh)	204	18	76	1406
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: Columbia Ave & I-26 WB Ramps

Movement	WB	NB	SB
Directions Served	LTR	LT	TR
Maximum Queue (ft)	704	193	889
Average Queue (ft)	675	81	861
95th Queue (ft)	691	161	883
Link Distance (ft)	537	508	858
Upstream Blk Time (%)	98		87
Queuing Penalty (veh)	1166		0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection	
Int Delay, s/veh	6.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	48	9	173	1	0	12	0	711	1168	245	1793	0
Future Vol, veh/h	48	9	173	1	0	12	0	711	1168	245	1793	0
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	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	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	53	10	192	1	0	13	0	790	1298	272	1992	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	3983	4625	1992	4077	3976	1439	-	0	0	2088	0	0
Stage 1	2537	2537	-	1439	1439	-	-	-	-	-	-	-
Stage 2	1446	2088	-	2638	2537	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	-	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	-	-	-	2.218	-	-
Pot Cap-1 Maneuver	~ 2	~ 1	~ 76	~ 1	3	163	0	-	-	~ 264	-	0
Stage 1	~ 37	55	-	165	198	-	0	-	-	-	-	0
Stage 2	164	94	-	32	55	-	0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	-	0	~ 76	-	0	163	-	-	-	~ 264	-	-
Mov Cap-2 Maneuver	-	0	-	-	0	-	-	-	-	-	-	-
Stage 1	~ 37	0	-	165	198	-	-	-	-	-	-	-
Stage 2	151	94	-	-	0	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s			0	12.7
HCM LOS	-	-		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	-	~ 264	-
HCM Lane V/C Ratio	-	-	-	-	1.031	-
HCM Control Delay (s)	-	-	-	-	105.5	0
HCM Lane LOS	-	-	-	-	F	A
HCM 95th %tile Q(veh)	-	-	-	-	10.6	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1325	3	248	228	543	0	0	713	36
Future Volume (vph)	0	0	0	1325	3	248	228	543	0	0	713	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	0	0	0	1751	0	0	1835	0	0	1852	0
Flt Permitted					0.960			0.091				
Satd. Flow (perm)	0	0	0	0	1751	0	0	170	0	0	1852	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					8						2	
Link Speed (mph)		45			45			35			35	
Link Distance (ft)		883			668			593			885	
Travel Time (s)		13.4			10.1			11.6			17.2	
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
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	1751	0	0	856	0	0	832	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
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
Turn Type				Perm	NA		Perm	NA			NA	
Protected Phases					4			6			2	
Permitted Phases				4			6					
Detector Phase				4	4		6	6			2	
Switch Phase												
Minimum Initial (s)				10.0	10.0		10.0	10.0			10.0	
Minimum Split (s)				22.0	22.0		22.0	22.0			22.0	
Total Split (s)				72.0	72.0		78.0	78.0			78.0	
Total Split (%)				48.0%	48.0%		52.0%	52.0%			52.0%	
Maximum Green (s)				66.0	66.0		71.7	71.7			71.7	
Yellow Time (s)				4.0	4.0		4.3	4.3			4.3	
All-Red Time (s)				2.0	2.0		2.0	2.0			2.0	
Lost Time Adjust (s)					0.0			0.0			0.0	
Total Lost Time (s)					6.0			6.3			6.3	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				4.0	4.0		3.0	3.0			3.0	
Recall Mode				None	None		Min	Min			Min	
Act Effct Green (s)					66.0			71.7			71.7	
Actuated g/C Ratio					0.44			0.48			0.48	
v/c Ratio					2.26			10.57			0.94	
Control Delay					595.1			4335.5			56.0	
Queue Delay					0.0			0.0			0.0	
Total Delay					595.1			4335.5			56.0	
LOS					F			F			E	
Approach Delay					595.1			4335.5			56.0	

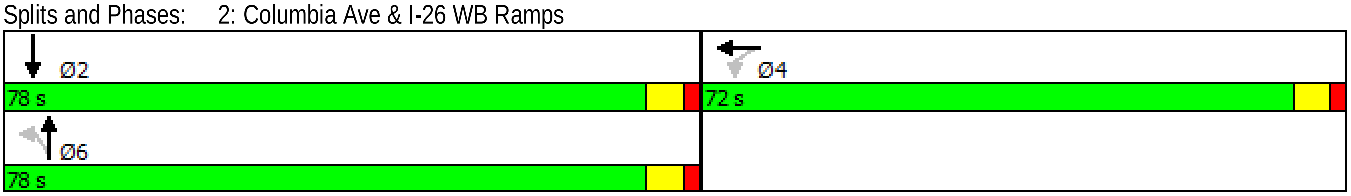
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS					F			F			E	
Queue Length 50th (ft)					~2788			~1597			757	
Queue Length 95th (ft)					#3051			#1865			#1045	
Internal Link Dist (ft)		803			588			513			805	
Turn Bay Length (ft)												
Base Capacity (vph)					774			81			886	
Starvation Cap Reductn					0			0			0	
Spillback Cap Reductn					0			0			0	
Storage Cap Reductn					0			0			0	
Reduced v/c Ratio					2.26			10.57			0.94	

Intersection Summary	
Area Type: Other	
Cycle Length: 150	
Actuated Cycle Length: 150	
Natural Cycle: 45	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 10.57	
Intersection Signal Delay: 1395.7	Intersection LOS: F
Intersection Capacity Utilization 185.1%	ICU Level of Service H
Analysis Period (min) 15	

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Columbia Ave & I-26 WB Ramps



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	1325	3	248	228	543	0	0	713	36
Future Volume (veh/h)	0	0	0	1325	3	248	228	543	0	0	713	36
Number				7	4	14	1	6	16	5	2	12
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln				1900	1863	1900	1900	1863	0	0	1863	1900
Adj Flow Rate, veh/h				1472	3	276	253	603	0	0	792	40
Adj No. of Lanes				0	1	0	0	1	0	0	1	0
Peak Hour Factor				0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %				0	2	0	2	2	0	0	2	2
Cap, veh/h				644	1	121	49	43	0	0	840	42
Arrive On Green				0.44	0.44	0.44	0.48	0.48	0.00	0.00	0.48	0.48
Sat Flow, veh/h				1464	3	274	37	89	0	0	1758	89
Grp Volume(v), veh/h				1751	0	0	856	0	0	0	0	832
Grp Sat Flow(s),veh/h/ln				1741	0	0	127	0	0	0	0	1847
Q Serve(g_s), s				66.0	0.0	0.0	7.5	0.0	0.0	0.0	0.0	64.2
Cycle Q Clear(g_c), s				66.0	0.0	0.0	71.7	0.0	0.0	0.0	0.0	64.2
Prop In Lane				0.84		0.16	0.30		0.00	0.00		0.05
Lane Grp Cap(c), veh/h				766	0	0	92	0	0	0	0	883
V/C Ratio(X)				2.29	0.00	0.00	9.34	0.00	0.00	0.00	0.00	0.94
Avail Cap(c_a), veh/h				766	0	0	92	0	0	0	0	883
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00
Uniform Delay (d), s/veh				42.0	0.0	0.0	72.5	0.0	0.0	0.0	0.0	37.2
Incr Delay (d2), s/veh				582.7	0.0	0.0	3774.8	0.0	0.0	0.0	0.0	17.9
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				155.7	0.0	0.0	99.9	0.0	0.0	0.0	0.0	37.0
LnGrp Delay(d),s/veh				624.7	0.0	0.0	3847.3	0.0	0.0	0.0	0.0	55.1
LnGrp LOS				F			F					E
Approach Vol, veh/h					1751			856			832	
Approach Delay, s/veh					624.7			3847.3			55.1	
Approach LOS					F			F			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		78.0		72.0		78.0		
Change Period (Y+Rc), s		6.3		6.0		6.3		
Max Green Setting (Gmax), s		71.7		66.0		71.7		
Max Q Clear Time (g_c+I1), s		66.2		68.0		73.7		
Green Ext Time (p_c), s		4.6		0.0		0.0		

Intersection Summary		
HCM 2010 Ctrl Delay		1289.0
HCM 2010 LOS		F

Summary of All Intervals

Run Number	1	2	3	Avg
Start Time	4:35	4:35	4:35	4:35
End Time	5:45	5:45	5:45	5:45
Total Time (min)	70	70	70	70
Time Recorded (min)	60	60	60	60
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	2911	2325	2458	2563
Vehs Exited	2864	2264	2432	2520
Starting Vehs	445	470	463	460
Ending Vehs	492	531	489	504
Travel Distance (mi)	3117	2359	2559	2678
Travel Time (hr)	3248.8	3755.9	3657.5	3554.1
Total Delay (hr)	3192.0	3710.8	3609.3	3504.0
Total Stops	2591	2078	2604	2426
Fuel Used (gal)	857.4	946.0	931.4	911.6

Interval #0 Information Seeding

Start Time	4:35
End Time	4:45
Total Time (min)	10

Volumes adjusted by Growth Factors.
No data recorded this interval.

Interval #1 Information Recording

Start Time	4:45
End Time	5:45
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	1	2	3	Avg
Vehs Entered	2911	2325	2458	2563
Vehs Exited	2864	2264	2432	2520
Starting Vehs	445	470	463	460
Ending Vehs	492	531	489	504
Travel Distance (mi)	3117	2359	2559	2678
Travel Time (hr)	3248.8	3755.9	3657.5	3554.1
Total Delay (hr)	3192.0	3710.8	3609.3	3504.0
Total Stops	2591	2078	2604	2426
Fuel Used (gal)	857.4	946.0	931.4	911.6

Intersection: 1: Columbia Ave & I-26 EB Ramps

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	TR	LT
Maximum Queue (ft)	882	47	55	525
Average Queue (ft)	863	10	28	510
95th Queue (ft)	942	32	56	516
Link Distance (ft)	743	38	20	508
Upstream Blk Time (%)	97	1	2	95
Queuing Penalty (veh)	224	0	41	1934
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: Columbia Ave & I-26 WB Ramps

Movement	WB	NB	SB
Directions Served	LTR	LT	TR
Maximum Queue (ft)	692	420	873
Average Queue (ft)	667	249	859
95th Queue (ft)	683	391	874
Link Distance (ft)	537	508	858
Upstream Blk Time (%)	100		100
Queuing Penalty (veh)	1573		0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

APPENDIX I

NO-BUILD 2040 HCS REPORTS

HCS 2010: Basic Freeway Segments Release 6.80

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	AM Peak
Freeway/Direction:	I-26 EB
From/To:	West of SC 202
Jurisdiction:	
Analysis Year:	2040 No-Build

Description: S-48 IMR

Flow Inputs and Adjustments

Volume, V	2003	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	556	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	1180	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	1180	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	74.6	mi/h
Number of lanes, N	2	
Density, D	15.8	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS 2010: Basic Freeway Segments Release 6.80

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	AM Peak
Freeway/Direction:	I-26 EB
From/To:	Between S-48 and SC 202
Jurisdiction:	
Analysis Year:	2040 No-Build

Description: S-48 IMR

Flow Inputs and Adjustments

Volume, V	2202	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	612	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	1297	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	1297	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	74.0	mi/h
Number of lanes, N	2	
Density, D	17.5	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

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Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	AM Peak
Freeway/Direction:	I-26 EB
From/To:	Between S-48 and US 176
Jurisdiction:	
Analysis Year:	2040 No-Build

Description: S-48 IMR

Flow Inputs and Adjustments

Volume, V	3396	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	943	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	2000	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	2000	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	63.9	mi/h
Number of lanes, N	2	
Density, D	31.3	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

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Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	AM Peak
Freeway/Direction:	I-26 EB
From/To:	East of US176
Jurisdiction:	
Analysis Year:	2040 No-Build
Description: S-48 IMR	

Flow Inputs and Adjustments

Volume, V	5164	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1434	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	3041	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	3041	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	28.9	mi/h
Number of lanes, N	2	
Density, D	105.3	pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

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Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	AM Peak
Freeway/Direction:	I-26 WB
From/To:	East of US 176
Jurisdiction:	
Analysis Year:	2040 No-Build

Description: S-48 IMR

Flow Inputs and Adjustments

Volume, V	2790	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	775	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	1643	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	1643	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	70.4	mi/h
Number of lanes, N	2	
Density, D	23.3	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

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Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	AM Peak
Freeway/Direction:	I-26 WB
From/To:	Between S-48 and US 176
Jurisdiction:	
Analysis Year:	2040 No-Build
Description: S-48 IMR	

Flow Inputs and Adjustments

Volume, V	2418	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	672	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	1424	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	1424	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	73.0	mi/h
Number of lanes, N	2	
Density, D	19.5	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

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Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	AM Peak
Freeway/Direction:	I-26 WB
From/To:	Between S-48 and SC 202
Jurisdiction:	
Analysis Year:	2040 No-Build
Description:	S-48 IMR

Flow Inputs and Adjustments

Volume, V	1414	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	393	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	833	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	833	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	75.0	mi/h
Number of lanes, N	2	
Density, D	11.1	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

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Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	AM Peak
Freeway/Direction:	I-26 WB
From/To:	West of SC 202
Jurisdiction:	
Analysis Year:	2040 No-Build

Description: S-48 IMR

Flow Inputs and Adjustments

Volume, V	1467	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	408	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	864	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	864	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	75.0	mi/h
Number of lanes, N	2	
Density, D	11.5	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

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Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	PM Peak
Freeway/Direction:	I-26 EB
From/To:	West of SC 202
Jurisdiction:	
Analysis Year:	2040 No-Build
Description:	S-48 IMR

Flow Inputs and Adjustments

Volume, V	2415	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	671	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	1422	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	1422	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	73.0	mi/h
Number of lanes, N	2	
Density, D	19.5	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

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Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	PM Peak
Freeway/Direction:	I-26 EB
From/To:	Between S-48 and SC 202
Jurisdiction:	
Analysis Year:	2040 No-Build

Description: S-48 IMR

Flow Inputs and Adjustments

Volume, V	2370	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	658	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	1396	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	1396	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	73.3	mi/h
Number of lanes, N	2	
Density, D	19.1	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

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Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	PM Peak
Freeway/Direction:	I-26 EB
From/To:	Between S-48 and US 176
Jurisdiction:	
Analysis Year:	2040 No-Build
Description: S-48 IMR	

Flow Inputs and Adjustments

Volume, V	3502	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	973	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	2062	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	2062	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	62.5	mi/h
Number of lanes, N	2	
Density, D	33.0	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

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Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	PM Peak
Freeway/Direction:	I-26 EB
From/To:	East of US176
Jurisdiction:	
Analysis Year:	2040 No-Build
Description: S-48 IMR	

Flow Inputs and Adjustments

Volume, V	4257	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1183	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	2507	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	2507	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	49.9	mi/h
Number of lanes, N	2	
Density, D	50.3	pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

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Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	PM Peak
Freeway/Direction:	I-26 WB
From/To:	East of US 176
Jurisdiction:	
Analysis Year:	2040 No-Build

Description: S-48 IMR

Flow Inputs and Adjustments

Volume, V	5028	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1397	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	2961	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	2961	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	32.4	mi/h
Number of lanes, N	2	
Density, D	91.3	pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

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Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	PM Peak
Freeway/Direction:	I-26 WB
From/To:	Between S-48 and US 176
Jurisdiction:	
Analysis Year:	2040 No-Build

Description: S-48 IMR

Flow Inputs and Adjustments

Volume, V	3467	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	963	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	2042	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	2042	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	63.0	mi/h
Number of lanes, N	2	
Density, D	32.4	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

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Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	PM Peak
Freeway/Direction:	I-26 WB
From/To:	Between S-48 and SC 202
Jurisdiction:	
Analysis Year:	2040 No-Build
Description: S-48 IMR	

Flow Inputs and Adjustments

Volume, V	2158	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	599	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	1271	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	1271	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	74.2	mi/h
Number of lanes, N	2	
Density, D	17.1	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

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Operational Analysis

Analyst:	AECOM
Agency or Company:	AECOM
Date Performed:	6/30/2016
Analysis Time Period:	PM Peak
Freeway/Direction:	I-26 WB
From/To:	West of SC 202
Jurisdiction:	
Analysis Year:	2040 No-Build

Description: S-48 IMR

Flow Inputs and Adjustments

Volume, V	2084	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	579	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Rolling	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	2.5	
Recreational vehicle PCE, ER	2.0	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	1227	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-side lateral clearance	6.0	ft
Total ramp density, TRD	0.33	ramps/mi
Number of lanes, N	2	
Free-flow speed:	Base	
FFS or BFFS	75.4	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
TRD adjustment	1.3	mi/h
Free-flow speed, FFS	74.1	mi/h

LOS and Performance Measures

Flow rate, vp	1227	pc/h/ln
Free-flow speed, FFS	74.1	mi/h
Average passenger-car speed, S	74.4	mi/h
Number of lanes, N	2	
Density, D	16.5	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	6/30/2016
Analysis time period:	AM Peak
Freeway/Dir of Travel:	I-26 EB
Junction:	SC-202 EB On-Ramp
Jurisdiction:	
Analysis Year:	2040 No-Build

Description: S-48 IMR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1957	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25.0	mph
Volume on ramp	245	vph
Length of first accel/decel lane	400	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	46	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	1050	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1957	245	46	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	544	68	13	v
Trucks and buses	4	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

```
Heavy vehicle adjustment, fHV         0.943       0.971       0.971
Driver population factor, fP          1.00        1.00        1.00
Flow rate, vp                         2305        280         53         pcph

_________________________Estimation of V12 Merge Areas_________________________

                  L  =            (Equation 13-6 or 13-7)
                   EQ
                  P  =    1.000   Using Equation  0
                   FM
                  v  = v  (P  ) =  2305   pc/h
                   12   F   FM

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v                     2585          4800            No
      FO
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 2305                   (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

________________________Flow Entering Merge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                2585          4600                  No
      R12
_________________Level of Service Determination (if not F)_____________________

Density, D = 5.475 + 0.00734 v  + 0.0078 v    - 0.00627 L   =   23.0    pc/mi/ln
          R                   R           12             A
Level of service for ramp-freeway junction areas of influence  C

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 M  = 0.353
                                              S
Space mean speed in ramp influence area,     S  = 63.4    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 63.4    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	6/30/2016
Analysis time period:	AM Peak
Freeway/Dir of Travel:	I-26 EB
Junction:	S-48 EB On-Ramp
Jurisdiction:	
Analysis Year:	2040 No-Build

Description: S-48 IMR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1979	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	1417	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	223	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	1725	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1979	1417	223	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	550	394	62	v
Trucks and buses	4	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

```
Heavy vehicle adjustment, fHV           0.943       0.971       0.971
Driver population factor, fP            1.00        1.00        1.00
Flow rate, vp                           2331        1622        255       pcph

_________________________Estimation of V12 Merge Areas_________________________

                  L  =            (Equation 13-6 or 13-7)
                   EQ
                  P  =    1.000   Using Equation  0
                   FM
                  v  = v  (P  ) =  2331   pc/h
                   12   F   FM

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v                     3953          4800            No
      FO
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 2331                     (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

________________________Flow Entering Merge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                3953          4600                  No
      R12
_________________Level of Service Determination (if not F)_____________________

Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   26.2    pc/mi/ln
          R                   R           12             A
Level of service for ramp-freeway junction areas of influence  C

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 M  = 0.389
                                              S
Space mean speed in ramp influence area,     S  = 62.2    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 62.2    mph
_______________________________________________________________________________
```

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	6/30/2016
Analysis time period:	AM Peak
Freeway/Dir of Travel:	I-26 EB
Junction:	US176 EB On-Ramp
Jurisdiction:	
Analysis Year:	2040 No-Build

Description: S-48 IMR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	3248	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25.0	mph
Volume on ramp	1916	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	148	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	900	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3248	1916	148	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	902	532	41	v
Trucks and buses	4	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	1.5	
Recreational vehicle PCE, ER	2.0	2.0	1.2	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.990
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          3825        2193        166       pcph

_________________________Estimation of V12 Merge Areas__________________________

                  L  =            (Equation 13-6 or 13-7)
                   EQ
                  P  =    1.000   Using Equation  0
                   FM
                  v  = v  (P  ) =  3825   pc/h
                   12   F    FM

_______________________________Capacity Checks__________________________________

                           Actual        Maximum         LOS F?
     v                     6018          4800            Yes
      FO
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 3825                   (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

________________________Flow Entering Merge Influence Area______________________
                      Actual        Max Desirable         Violation?
     v                6018          4600                  Yes
      R12
_________________Level of Service Determination (if not F)______________________

Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   42.0    pc/mi/ln
          R                   R           12            A
Level of service for ramp-freeway junction areas of influence  F

_____________________________Speed Estimation___________________________________

Intermediate speed variable,                 M  = 1.848
                                              S
Space mean speed in ramp influence area,     S  = 14.0    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 14.0    mph
________________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Merge Analysis

Analyst: AECOM
Agency/Co.: AECOM
Date performed: 6/30/2016
Analysis time period: AM Peak
Freeway/Dir of Travel: I-26 WB
Junction: US 176 WB On-Ramp
Jurisdiction:
Analysis Year: 2040 No-Build
Description: S-48 IMR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	2196	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25.0	mph
Volume on ramp	222	vph
Length of first accel/decel lane	1425	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	594	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	775	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2196	222	594	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	610	62	165	v
Trucks and buses	4	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          2586        254         680       pcph

_________________________Estimation of V12 Merge Areas_________________________

                  L   =            (Equation 13-6 or 13-7)
                   EQ
                  P   =    1.000   Using Equation  0
                   FM
                  v  = v  (P  ) =  2586   pc/h
                   12   F   FM

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v                     2840          4800            No
      FO
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 2586                   (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

________________________Flow Entering Merge Influence Area_____________________
                      Actual        Max Desirable        Violation?
     v                2840          4600                 No
      R12
_________________Level of Service Determination (if not F)_____________________

Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   18.6    pc/mi/ln
          R                   R           12             A
Level of service for ramp-freeway junction areas of influence  B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                M  = 0.317
                                             S
Space mean speed in ramp influence area,    S  = 64.6    mph
                                             R
Space mean speed in outer lanes,            S  =  N/A    mph
                                             0
Space mean speed for all vehicles,          S  = 64.6    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	6/30/2016
Analysis time period:	AM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	S-48 WB On-Ramp
Jurisdiction:	
Analysis Year:	2040 No-Build

Description: S-48 IMR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1230	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	184	vph
Length of first accel/decel lane	1225	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	1188	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	1475	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1230	184	1188	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	342	51	330	v
Trucks and buses	4	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          1449        211         1360      pcph

_________________________Estimation of V12 Merge Areas_________________________

                  L   =            (Equation 13-6 or 13-7)
                   EQ
                  P   =    1.000   Using Equation  0
                   FM
                  v  = v  (P  ) =  1449   pc/h
                   12   F   FM

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v                     1660          4800            No
      FO
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 1449                    (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

________________________Flow Entering Merge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                1660          4600                  No
      R12
_________________Level of Service Determination (if not F)_____________________

Density, D = 5.475 + 0.00734 v  + 0.0078 v    - 0.00627 L   =   10.6    pc/mi/ln
          R                   R           12             A
Level of service for ramp-freeway junction areas of influence  B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 M  = 0.231
                                              S
Space mean speed in ramp influence area,     S  = 67.4    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 67.4    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	6/30/2016
Analysis time period:	AM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	SC-202 WB On-Ramp
Jurisdiction:	
Analysis Year:	2040 No-Build

Description: S-48 IMR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1381	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	86	vph
Length of first accel/decel lane	525	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	33	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	1000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1381	86	33	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	384	24	9	v
Trucks and buses	4	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

```
Heavy vehicle adjustment, fHV           0.943       0.971       0.971
Driver population factor, fP            1.00        1.00        1.00
Flow rate, vp                           1627        98          38         pcph

_________________________Estimation of V12 Merge Areas_________________________

                  L  =            (Equation 13-6 or 13-7)
                   EQ
                  P  =    1.000   Using Equation  0
                   FM
                  v  = v  (P  ) =  1627   pc/h
                   12   F   FM

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v                     1725          4800            No
      FO
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 1627                  (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

________________________Flow Entering Merge Influence Area_____________________
                      Actual        Max Desirable          Violation?
     v                1725          4600                   No
      R12
_________________Level of Service Determination (if not F)_____________________

Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   15.6    pc/mi/ln
          R                   R           12             A
Level of service for ramp-freeway junction areas of influence  B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 M  = 0.296
                                              S
Space mean speed in ramp influence area,     S  = 65.2    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 65.2    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	6/30/2016
Analysis time period:	PM Peak
Freeway/Dir of Travel:	I-26 EB
Junction:	SC-202 EB On-Ramp
Jurisdiction:	
Analysis Year:	2040 No-Build

Description: S-48 IMR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	2325	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25.0	mph
Volume on ramp	45	vph
Length of first accel/decel lane	400	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	90	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	1050	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2325	45	90	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	646	13	25	v
Trucks and buses	4	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          2738        52          103       pcph

_________________________Estimation of V12 Merge Areas_________________________

                  L  =            (Equation 13-6 or 13-7)
                   EQ
                  P  =    1.000   Using Equation  0
                   FM
                  v  = v  (P  ) =  2738   pc/h
                   12   F   FM

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v                     2790          4800            No
      FO
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 2738                   (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

________________________Flow Entering Merge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                2790          4600                  No
      R12
_________________Level of Service Determination (if not F)_____________________

Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   24.7    pc/mi/ln
          R                   R           12             A
Level of service for ramp-freeway junction areas of influence  C

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 M  = 0.364
                                              S
Space mean speed in ramp influence area,     S  = 63.0    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 63.0    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Merge Analysis

Analyst: AECOM
Agency/Co.: AECOM
Date performed: 6/30/2016
Analysis time period: PM Peak
Freeway/Dir of Travel: I-26 EB
Junction: S-48 EB On-Ramp
Jurisdiction:
Analysis Year: 2040 No-Build
Description: S-48 IMR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	2140	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	1362	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	230	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	1725	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2140	1362	230	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	594	378	64	v
Trucks and buses	4	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.943	0.971	0.971	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2520	1559	263	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2520 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	4079	4800	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34} > 2700 pc/h?		No	
Is v_3 or v_{av34} > 1.5 v_{12}/2		No	

If yes, v_{12A} = 2520 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	4079	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 27.2 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.416	
Space mean speed in ramp influence area,	S_R = 61.3	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 61.3	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	6/30/2016
Analysis time period:	PM Peak
Freeway/Dir of Travel:	I-26 EB
Junction:	US176 EB On-Ramp
Jurisdiction:	
Analysis Year:	2040 No-Build

Description: S-48 IMR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	3218	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25.0	mph
Volume on ramp	1079	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	284	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	900	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3218	1079	284	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	894	300	79	v
Trucks and buses	4	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	1.5	
Recreational vehicle PCE, ER	2.0	2.0	1.2	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.990
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          3790        1235        319       pcph

_________________________Estimation of V12 Merge Areas_________________________

                  L  =             (Equation 13-6 or 13-7)
                   EQ
                  P  =    1.000   Using Equation  0
                   FM
                  v  = v  (P  ) =  3790   pc/h
                   12   F   FM

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v                     5025          4800            Yes
      FO
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 3790                   (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

________________________Flow Entering Merge Influence Area_____________________
                      Actual        Max Desirable          Violation?
     v                5025          4600                   Yes
      R12
_________________Level of Service Determination (if not F)_____________________

Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   34.7    pc/mi/ln
          R                   R           12             A
Level of service for ramp-freeway junction areas of influence  F

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 M  = 0.839
                                              S
Space mean speed in ramp influence area,     S  = 47.3    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 47.3    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	6/30/2016
Analysis time period:	PM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	US 176 WB On-Ramp
Jurisdiction:	
Analysis Year:	2040 No-Build

Description: S-48 IMR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	3290	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25.0	mph
Volume on ramp	177	vph
Length of first accel/decel lane	1425	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	1738	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	775	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3290	177	1738	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	914	49	483	v
Trucks and buses	4	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          3875        203         1989      pcph

_________________________Estimation of V12 Merge Areas_________________________

                  L  =            (Equation 13-6 or 13-7)
                   EQ
                  P  =    1.000   Using Equation  0
                   FM
                  v  = v  (P  ) =  3875   pc/h
                   12   F   FM

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v                     4078          4800            No
      FO
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 3875                   (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

________________________Flow Entering Merge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                4078          4600                  No
      R12
_________________Level of Service Determination (if not F)_____________________

Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   28.3    pc/mi/ln
          R                   R          12             A
Level of service for ramp-freeway junction areas of influence  D

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 M  = 0.480
                                              S
Space mean speed in ramp influence area,     S  = 59.2    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 59.2    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	6/30/2016
Analysis time period:	PM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	S-48 WB On-Ramp
Jurisdiction:	
Analysis Year:	2040 No-Build

Description: S-48 IMR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1891	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	267	vph
Length of first accel/decel lane	1225	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	1576	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	1475	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1891	267	1576	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	525	74	438	v
Trucks and buses	4	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.943	0.971	0.971	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2227	306	1804	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2227 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2533	4800	No

v_3 or v_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12}/2 No

If yes, v_{12A} = 2227 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	2533	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 17.4 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	M_S = 0.260		
Space mean speed in ramp influence area,	S_R = 66.4	mph	
Space mean speed in outer lanes,	S_0 = N/A	mph	
Space mean speed for all vehicles,	S = 66.4	mph	

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	6/30/2016
Analysis time period:	PM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	SC-202 WB On-Ramp
Jurisdiction:	
Analysis Year:	2040 No-Build

Description: S-48 IMR

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	2018	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	66	vph
Length of first accel/decel lane	525	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	140	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	1000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2018	66	140	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	561	18	39	v
Trucks and buses	4	2	2	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          2377        76          160       pcph

_________________________Estimation of V12 Merge Areas_________________________

                  L   =            (Equation 13-6 or 13-7)
                   EQ
                  P   =    1.000   Using Equation  0
                   FM
                  v  = v  (P  ) =  2377   pc/h
                   12   F   FM

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v                     2453          4800            No
      FO
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 2377                  (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

________________________Flow Entering Merge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                2453          4600                  No
      R12
_________________Level of Service Determination (if not F)_____________________

Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   21.3    pc/mi/ln
          R                   R           12             A
Level of service for ramp-freeway junction areas of influence  C

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 M  = 0.319
                                              S
Space mean speed in ramp influence area,     S  = 64.5    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 64.5    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	AM Peak
Freeway/Dir of Travel:	I-26 EB
Junction:	SC 202 EB Off-Ramp
Jurisdiction:	
Analysis Year:	2040 No-Build

Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	2003	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	46	vph
Length of first accel/decel lane	400	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	245	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1050	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2003		46		245	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	556		13		68	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          2359        53          280       pcph

_________________________Estimation of V12 Diverge Areas_______________________

                  L  =            (Equation 13-12 or 13-13)
                   EQ
                  P  =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  2359   pc/h
                   12   R     F   R   FD

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v  = v                2359          4800            No
      Fi   F
     v  = v - v            2306          4800            No
      FO   F   R
     v                     53            2100            No
      R
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 2359                   (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

______________________Flow Entering Diverge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                2359          4400                  No
      12
_________________Level of Service Determination (if not F)____________________

Density,               D = 4.252 + 0.0086 v  - 0.009  L   =   20.9    pc/mi/ln
                        R                  12          D
Level of service for ramp-freeway junction areas of influence C

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                D  = 0.303
                                             S
Space mean speed in ramp influence area,    S  = 65.0    mph
                                             R
Space mean speed in outer lanes,            S  =  N/A    mph
                                             0
Space mean speed for all vehicles,          S  = 65.0    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	AM Peak
Freeway/Dir of Travel:	I-26 EB
Junction:	S-48 EB Off-Ramp
Jurisdiction:	
Analysis Year:	2040 No-Build

Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	2202	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	223	vph
Length of first accel/decel lane	975	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	1417	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1725	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2202		223		1417	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	612		62		394	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          2593        255         1622      pcph

_________________________Estimation of V12 Diverge Areas_______________________

                  L  =            (Equation 13-12 or 13-13)
                   EQ
                  P  =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  2593   pc/h
                   12   R     F   R   FD

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v  = v                2593          4800            No
      Fi   F
     v  = v - v            2338          4800            No
      FO   F   R
     v                     255           2100            No
      R
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 2593                   (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

______________________Flow Entering Diverge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                2593          4400                  No
      12
_________________Level of Service Determination (if not F)_____________________

Density,               D = 4.252 + 0.0086 v  - 0.009  L   =   17.8    pc/mi/ln
                        R                  12          D
Level of service for ramp-freeway junction areas of influence B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 D  = 0.321
                                              S
Space mean speed in ramp influence area,     S  = 64.4    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 64.4    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	AM Peak
Freeway/Dir of Travel:	I-26 EB
Junction:	US 176 EB Off-Ramp
Jurisdiction:	
Analysis Year:	2040 No-Build
Description:	S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	3396	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	148	vph
Length of first accel/decel lane	1000	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	1916	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	900	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3396		148		1916	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	943		41		532	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

```
Heavy vehicle adjustment, fHV           0.943        0.971        0.971
Driver population factor, fP            1.00         1.00         1.00
Flow rate, vp                           4000         169          2193      pcph

_________________________Estimation of V12 Diverge Areas_______________________

                  L  =            (Equation 13-12 or 13-13)
                   EQ
                  P  =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  4000   pc/h
                   12   R     F   R   FD

_______________________________Capacity Checks_________________________________

                              Actual        Maximum         LOS F?
     v  = v                   4000          4800            No
      Fi   F
     v  = v - v               3831          4800            No
      FO   F   R
     v                        169           2100            No
      R
     v  or v                  0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?              No
      3     av34
Is   v  or v      > 1.5 v  /2               No
      3     av34         12
If yes, v    = 4000                      (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

______________________Flow Entering Diverge Influence Area_____________________
                         Actual        Max Desirable         Violation?
     v                   4000          4400                  No
      12
_________________Level of Service Determination (if not F)____________________

Density,                  D = 4.252 + 0.0086 v  - 0.009  L   =   29.7    pc/mi/ln
                           R                  12          D
Level of service for ramp-freeway junction areas of influence D

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 D  = 0.313
                                              S
Space mean speed in ramp influence area,     S  = 64.7    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 64.7    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	AM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	US 176 WB Off-Ramp
Jurisdiction:	
Analysis Year:	2040 No-Build

Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	2790	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	594	vph
Length of first accel/decel lane	1225	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	222	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	775	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2790		594		222	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	775		165		62	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          3286        680         254       pcph

_________________________Estimation of V12 Diverge Areas_______________________

                  L  =            (Equation 13-12 or 13-13)
                   EQ
                  P  =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  3286   pc/h
                   12   R     F   R   FD

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v  = v                3286          4800            No
      Fi   F
     v  = v - v            2606          4800            No
      FO   F   R
     v                     680           2100            No
      R
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 3286                   (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

______________________Flow Entering Diverge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                3286          4400                  No
      12
_________________Level of Service Determination (if not F)_____________________

Density,               D = 4.252 + 0.0086 v  - 0.009  L   =   21.5    pc/mi/ln
                        R                  12          D
Level of service for ramp-freeway junction areas of influence C

_____________________________Speed Estimation__________________________________

Intermediate speed variable,              D  = 0.359
                                           S
Space mean speed in ramp influence area,  S  = 63.1    mph
                                           R
Space mean speed in outer lanes,          S  =  N/A    mph
                                           0
Space mean speed for all vehicles,        S  = 63.1    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	AM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	S-48 WB Off-Ramp
Jurisdiction:	
Analysis Year:	2040 No-Build

Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	2418	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	1188	vph
Length of first accel/decel lane	1225	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	184	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1475	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2418		1188		184	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	672		330		51	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          2848        1360        211       pcph

_________________________Estimation of V12 Diverge Areas_______________________

                  L  =           (Equation 13-12 or 13-13)
                   EQ
                  P  =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  2848   pc/h
                   12   R     F   R   FD

_______________________________Capacity Checks_________________________________

                             Actual        Maximum         LOS F?
     v  = v                  2848          4800            No
      Fi   F
     v  = v - v              1488          4800            No
      FO   F   R
     v                       1360          2100            No
      R
     v  or v                 0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?             No
      3     av34
Is   v  or v      > 1.5 v  /2              No
      3     av34         12
If yes, v    = 2848                     (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

______________________Flow Entering Diverge Influence Area_____________________
                      Actual        Max Desirable          Violation?
     v                2848          4400                   No
      12
_________________Level of Service Determination (if not F)_____________________

Density,               D = 4.252 + 0.0086 v  - 0.009  L   =   17.7    pc/mi/ln
                        R                  12          D
Level of service for ramp-freeway junction areas of influence B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                D  = 0.420
                                             S
Space mean speed in ramp influence area,    S  = 61.1    mph
                                             R
Space mean speed in outer lanes,            S  =  N/A    mph
                                             0
Space mean speed for all vehicles,          S  = 61.1    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	AM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	SC 202 WB Off-Ramp
Jurisdiction:	
Analysis Year:	2040 No-Build

Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1414	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	25.0	mph
Volume on ramp	33	vph
Length of first accel/decel lane	400	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	86	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1414		33		86	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	393		9		24	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          1665        38          98         pcph

_________________________Estimation of V12 Diverge Areas_______________________

                  L  =            (Equation 13-12 or 13-13)
                   EQ
                  P  =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  1665   pc/h
                   12   R     F   R   FD

_______________________________Capacity Checks_________________________________

                             Actual        Maximum         LOS F?
     v  = v                  1665          4800            No
      Fi   F
     v  = v - v              1627          4800            No
      FO   F   R
     v                       38            1900            No
      R
     v  or v                 0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?             No
      3     av34
Is   v  or v      > 1.5 v  /2              No
      3     av34         12
If yes, v    = 1665                     (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

______________________Flow Entering Diverge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                1665          4400                  No
      12
_________________Level of Service Determination (if not F)_____________________

Density,               D = 4.252 + 0.0086 v  - 0.009  L   =   15.0    pc/mi/ln
                        R                  12          D
Level of service for ramp-freeway junction areas of influence B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                D  = 0.561
                                             S
Space mean speed in ramp influence area,    S  = 56.5    mph
                                             R
Space mean speed in outer lanes,            S  =  N/A    mph
                                             0
Space mean speed for all vehicles,          S  = 56.5    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	PM Peak
Freeway/Dir of Travel:	I-26 EB
Junction:	SC 202 EB Off-Ramp
Jurisdiction:	
Analysis Year:	2040 No-Build
Description:	S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	2415	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	90	vph
Length of first accel/decel lane	400	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	45	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1050	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2415		90		45	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	671		25		13	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          2844        103         52        pcph

_________________________Estimation of V12 Diverge Areas_______________________

                  L  =            (Equation 13-12 or 13-13)
                   EQ
                  P  =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  2844   pc/h
                   12   R     F   R   FD

_______________________________Capacity Checks_________________________________

                             Actual        Maximum         LOS F?
     v  = v                  2844          4800            No
      Fi   F
     v  = v - v              2741          4800            No
      FO   F   R
     v                       103           2100            No
      R
     v  or v                 0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?             No
      3     av34
Is   v  or v      > 1.5 v  /2              No
      3     av34         12
If yes, v    = 2844                     (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

______________________Flow Entering Diverge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                2844          4400                  No
      12
_________________Level of Service Determination (if not F)_____________________

Density,               D = 4.252 + 0.0086 v  - 0.009  L   =   25.1    pc/mi/ln
                        R                   12         D
Level of service for ramp-freeway junction areas of influence C

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 D  = 0.307
                                              S
Space mean speed in ramp influence area,     S  = 64.9    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 64.9    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: AECOM
Agency/Co.: AECOM
Date performed: 7/1/2016
Analysis time period: PM Peak
Freeway/Dir of Travel: I-26 EB
Junction: S-48 EB Off-Ramp
Jurisdiction:
Analysis Year: 2040 No-Build
Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	2370	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	230	vph
Length of first accel/decel lane	975	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	1362	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1725	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2370		230		1362	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	658		64		378	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

```
Heavy vehicle adjustment, fHV           0.943       0.971       0.971
Driver population factor, fP            1.00        1.00        1.00
Flow rate, vp                           2791        263         1559      pcph

_________________________Estimation of V12 Diverge Areas_______________________

                  L  =            (Equation 13-12 or 13-13)
                   EQ
                  P  =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  2791   pc/h
                   12   R     F   R   FD

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v  = v                2791          4800            No
      Fi   F
     v  = v - v            2528          4800            No
      FO   F   R
     v                     263           2100            No
      R
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 2791                   (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

______________________Flow Entering Diverge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                2791          4400                  No
      12
_________________Level of Service Determination (if not F)_____________________

Density,               D = 4.252 + 0.0086 v  - 0.009  L   =   19.5    pc/mi/ln
                        R                  12          D
Level of service for ramp-freeway junction areas of influence B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 D  = 0.322
                                              S
Space mean speed in ramp influence area,     S  = 64.4    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 64.4    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	PM Peak
Freeway/Dir of Travel:	I-26 EB
Junction:	US 176 EB Off-Ramp
Jurisdiction:	
Analysis Year:	2040 No-Build

Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	3502	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	284	vph
Length of first accel/decel lane	1000	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	1079	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	900	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3502		284		1079	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	973		79		300	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

```
Heavy vehicle adjustment, fHV            0.943       0.971       0.971
Driver population factor, fP             1.00        1.00        1.00
Flow rate, vp                            4125        325         1235      pcph

_________________________Estimation of V12 Diverge Areas_______________________

                  L  =            (Equation 13-12 or 13-13)
                   EQ
                  P  =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  4125   pc/h
                   12   R     F   R   FD

_______________________________Capacity Checks_________________________________

                              Actual        Maximum         LOS F?
     v  = v                   4125          4800            No
      Fi   F
     v  = v - v               3800          4800            No
      FO   F   R
     v                        325           2100            No
      R
     v  or v                  0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?              No
      3     av34
Is   v  or v      > 1.5 v  /2               No
      3     av34         12
If yes, v    = 4125                      (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

______________________Flow Entering Diverge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                4125          4400                  No
      12
_________________Level of Service Determination (if not F)_____________________

Density,                 D = 4.252 + 0.0086 v  - 0.009  L   =   30.7    pc/mi/ln
                          R                  12          D
Level of service for ramp-freeway junction areas of influence D

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                D  = 0.327
                                             S
Space mean speed in ramp influence area,    S  = 64.2    mph
                                             R
Space mean speed in outer lanes,            S  =  N/A    mph
                                             0
Space mean speed for all vehicles,          S  = 64.2    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	PM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	US 176 WB Off-Ramp
Jurisdiction:	
Analysis Year:	2040 No-Build

Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	5028	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	1738	vph
Length of first accel/decel lane	1225	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	177	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	775	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	5028		1738		177	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	1397		483		49	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

Heavy vehicle adjustment, fHV	0.943	0.971	0.971	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	5922	1989	203	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 5922 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5922	4800	Yes
$v_{FO} = v_F - v_R$	3933	4800	No
v_R	1989	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12}/2 No

If yes, v_{12A} = 5922 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	5922	4400	Yes

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 44.2 pc/mi/ln

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	D_S = 0.477	
Space mean speed in ramp influence area,	S_R = 59.3	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 59.3	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	PM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	S-48 WB Off-Ramp
Jurisdiction:	
Analysis Year:	2040 No-Build
Description:	S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	3467	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	1576	vph
Length of first accel/decel lane	1225	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	267	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1475	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3467		1576		267	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	963		438		74	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          4083        1804        306       pcph

_________________________Estimation of V12 Diverge Areas_______________________

                  L  =            (Equation 13-12 or 13-13)
                   EQ
                  P  =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  4083   pc/h
                   12   R     F   R   FD

_______________________________Capacity Checks_________________________________

                             Actual        Maximum         LOS F?
     v  = v                  4083          4800            No
      Fi   F
     v  = v - v              2279          4800            No
      FO   F   R
     v                       1804          2100            No
      R
     v  or v                 0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?             No
      3     av34
Is   v  or v      > 1.5 v  /2              No
      3     av34         12
If yes, v    = 4083                     (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

______________________Flow Entering Diverge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                4083          4400                  No
      12
_________________Level of Service Determination (if not F)_____________________

Density,               D = 4.252 + 0.0086 v  - 0.009  L   =   28.3    pc/mi/ln
                        R                  12          D
Level of service for ramp-freeway junction areas of influence D

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 D  = 0.460
                                              S
Space mean speed in ramp influence area,     S  = 59.8    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 59.8    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.80

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	PM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	SC 202 WB Off-Ramp
Jurisdiction:	
Analysis Year:	2040 No-Build

Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	2158	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	25.0	mph
Volume on ramp	140	vph
Length of first accel/decel lane	400	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	66	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2158		140		66	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	599		39		18	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          2542        160         76         pcph

_________________________Estimation of V12 Diverge Areas_______________________

                  L  =            (Equation 13-12 or 13-13)
                   EQ
                  P  =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  2542   pc/h
                   12   R     F   R   FD

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v  = v                2542          4800            No
      Fi   F
     v  = v - v            2382          4800            No
      FO   F   R
     v                     160           1900            No
      R
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 2542                   (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

______________________Flow Entering Diverge Influence Area_____________________
                      Actual        Max Desirable          Violation?
     v                2542          4400                   No
      12
_________________Level of Service Determination (if not F)_____________________

Density,               D = 4.252 + 0.0086 v  - 0.009  L   =   22.5    pc/mi/ln
                        R                  12          D
Level of service for ramp-freeway junction areas of influence C

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 D  = 0.572
                                              S
Space mean speed in ramp influence area,     S  = 56.1    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 56.1    mph
_______________________________________________________________________________
```

APPENDIX J

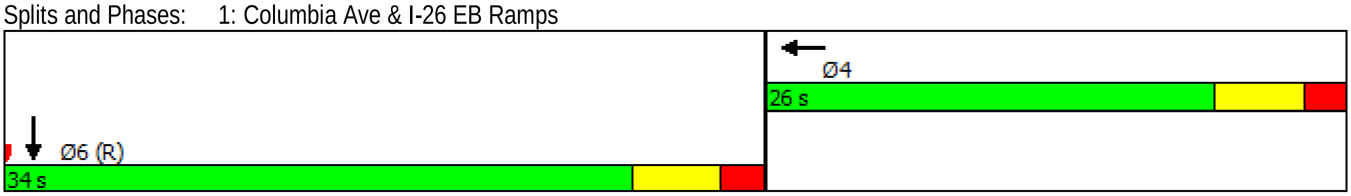
BUILD ALT 1 2020 SYNCHRO AND SIM TRAFFIC REPORTS

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑						↑↑↑	
Traffic Volume (vph)	0	0	0	0	433	0	0	0	0	0	1077	0
Future Volume (vph)	0	0	0	0	433	0	0	0	0	0	1077	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	0	0	0	3539	0	0	0	0	0	5085	0
Flt Permitted												
Satd. Flow (perm)	0	0	0	0	3539	0	0	0	0	0	5085	0
Right Turn on Red			Yes	Yes		Yes			Yes			Yes
Satd. Flow (RTOR)												
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		153			109			130			161	
Travel Time (s)		3.0			2.1			2.5			3.1	
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
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	481	0	0	0	0	0	1197	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
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
Turn Type					NA						NA	
Protected Phases					4						6	
Permitted Phases												
Detector Phase					4						6	
Switch Phase												
Minimum Initial (s)					10.0						10.0	
Minimum Split (s)					22.0						22.0	
Total Split (s)					26.0						34.0	
Total Split (%)					43.3%						56.7%	
Maximum Green (s)					20.0						28.0	
Yellow Time (s)					4.0						4.0	
All-Red Time (s)					2.0						2.0	
Lost Time Adjust (s)					0.0						0.0	
Total Lost Time (s)					6.0						6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)					3.0						3.0	
Recall Mode					Min						C-Max	
Act Effct Green (s)					13.9						34.1	
Actuated g/C Ratio					0.23						0.57	
v/c Ratio					0.59						0.41	
Control Delay					18.1						6.1	
Queue Delay					0.0						0.0	
Total Delay					18.1						6.1	
LOS					B						A	
Approach Delay					18.1						6.1	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS					B						A	
Queue Length 50th (ft)					60						42	
Queue Length 95th (ft)					59						114	
Internal Link Dist (ft)		73			29			50			81	
Turn Bay Length (ft)												
Base Capacity (vph)					1179						2893	
Starvation Cap Reductn					0						0	
Spillback Cap Reductn					0						0	
Storage Cap Reductn					0						0	
Reduced v/c Ratio					0.41						0.41	

Intersection Summary	
Area Type: Other	
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 48 (80%), Referenced to phase 6:SBT, Start of Green	
Natural Cycle: 45	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.59	
Intersection Signal Delay: 9.6	Intersection LOS: A
Intersection Capacity Utilization 46.0%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 1: Columbia Ave & I-26 EB Ramps



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	0	433	0	0	0	0	0	1077	0
Future Volume (veh/h)	0	0	0	0	433	0	0	0	0	0	1077	0
Number				7	4	14				1	6	16
Initial Q (Qb), veh				0	0	0				0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00				1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln				0	1863	0				0	1863	0
Adj Flow Rate, veh/h				0	481	0				0	1197	0
Adj No. of Lanes				0	2	0				0	3	0
Peak Hour Factor				0.90	0.90	0.90				0.90	0.90	0.90
Percent Heavy Veh, %				0	2	0				0	2	0
Cap, veh/h				0	696	0				0	2373	0
Arrive On Green				0.00	0.20	0.00				0.00	0.15	0.00
Sat Flow, veh/h				0	3725	0				0	5421	0
Grp Volume(v), veh/h				0	481	0				0	1197	0
Grp Sat Flow(s),veh/h/ln				0	1770	0				0	1695	0
Q Serve(g_s), s				0.0	7.6	0.0				0.0	13.0	0.0
Cycle Q Clear(g_c), s				0.0	7.6	0.0				0.0	13.0	0.0
Prop In Lane				0.00		0.00				0.00		0.00
Lane Grp Cap(c), veh/h				0	696	0				0	2373	0
V/C Ratio(X)				0.00	0.69	0.00				0.00	0.50	0.00
Avail Cap(c_a), veh/h				0	1180	0				0	2373	0
HCM Platoon Ratio				1.00	1.00	1.00				1.00	0.33	1.00
Upstream Filter(I)				0.00	1.00	0.00				0.00	1.00	0.00
Uniform Delay (d), s/veh				0.0	22.4	0.0				0.0	19.0	0.0
Incr Delay (d2), s/veh				0.0	1.2	0.0				0.0	0.8	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				0.0	3.8	0.0				0.0	6.2	0.0
LnGrp Delay(d),s/veh				0.0	23.7	0.0				0.0	19.8	0.0
LnGrp LOS					C						B	
Approach Vol, veh/h					481						1197	
Approach Delay, s/veh					23.7						19.8	
Approach LOS					C						B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs				4		6		
Phs Duration (G+Y+Rc), s				17.8		34.0		
Change Period (Y+Rc), s				6.0		6.0		
Max Green Setting (Gmax), s				20.0		28.0		
Max Q Clear Time (g_c+I1), s				9.6		15.0		
Green Ext Time (p_c), s				2.2		6.6		

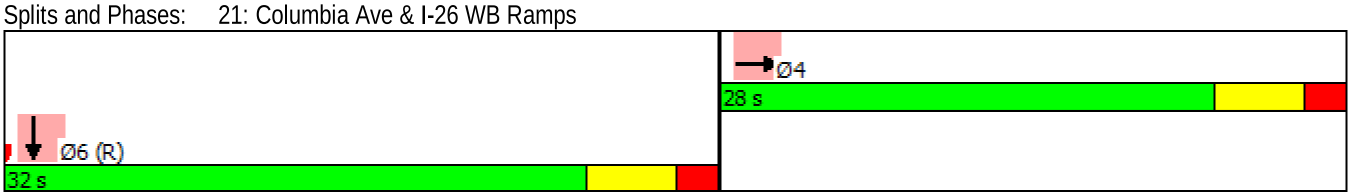
Intersection Summary	
HCM 2010 Ctrl Delay	20.9
HCM 2010 LOS	C

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑									↑↑	
Traffic Volume (vph)	0	370	0	0	0	0	0	0	0	0	529	0
Future Volume (vph)	0	370	0	0	0	0	0	0	0	0	529	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	3539	0	0	0	0	0	0	0	0	3539	0
Flt Permitted												
Satd. Flow (perm)	0	3539	0	0	0	0	0	0	0	0	3539	0
Right Turn on Red			Yes			Yes			Yes	Yes		Yes
Satd. Flow (RTOR)												
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		147			115			170			129	
Travel Time (s)		2.9			2.2			3.3			2.5	
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
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	411	0	0	0	0	0	0	0	0	588	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
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
Turn Type		NA									NA	
Protected Phases		4									6	
Permitted Phases												
Detector Phase		4									6	
Switch Phase												
Minimum Initial (s)		10.0									10.0	
Minimum Split (s)		22.0									22.0	
Total Split (s)		28.0									32.0	
Total Split (%)		46.7%									53.3%	
Maximum Green (s)		22.0									26.0	
Yellow Time (s)		4.0									4.0	
All-Red Time (s)		2.0									2.0	
Lost Time Adjust (s)		0.0									0.0	
Total Lost Time (s)		6.0									6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		3.0									3.0	
Recall Mode		None									C-Max	
Act Effct Green (s)		12.6									35.4	
Actuated g/C Ratio		0.21									0.59	
v/c Ratio		0.55									0.28	
Control Delay		5.2									6.9	
Queue Delay		0.0									0.0	
Total Delay		5.2									6.9	
LOS		A									A	
Approach Delay		5.2									6.9	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS		A									A	
Queue Length 50th (ft)		4									46	
Queue Length 95th (ft)		10									85	
Internal Link Dist (ft)		67			35			90			49	
Turn Bay Length (ft)												
Base Capacity (vph)		1297									2088	
Starvation Cap Reductn		0									0	
Spillback Cap Reductn		0									7	
Storage Cap Reductn		0									0	
Reduced v/c Ratio		0.32									0.28	

Intersection Summary	
Area Type: Other	
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 3 (5%), Referenced to phase 6:SBT, Start of Green	
Natural Cycle: 45	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.55	
Intersection Signal Delay: 6.2	Intersection LOS: A
Intersection Capacity Utilization 34.9%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 21: Columbia Ave & I-26 WB Ramps



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑									↑↑	
Traffic Volume (veh/h)	0	370	0	0	0	0	0	0	0	0	529	0
Future Volume (veh/h)	0	370	0	0	0	0	0	0	0	0	529	0
Number	7	4	14							1	6	16
Initial Q (Qb), veh	0	0	0							0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00							1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00							1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1863	0							0	1863	0
Adj Flow Rate, veh/h	0	411	0							0	588	0
Adj No. of Lanes	0	2	0							0	2	0
Peak Hour Factor	0.90	0.90	0.90							0.90	0.90	0.90
Percent Heavy Veh, %	0	2	0							0	2	0
Cap, veh/h	0	625	0							0	1534	0
Arrive On Green	0.00	0.18	0.00							0.00	0.43	0.00
Sat Flow, veh/h	0	3725	0							0	3725	0
Grp Volume(v), veh/h	0	411	0							0	588	0
Grp Sat Flow(s),veh/h/ln	0	1770	0							0	1770	0
Q Serve(g_s), s	0.0	6.5	0.0							0.0	6.8	0.0
Cycle Q Clear(g_c), s	0.0	6.5	0.0							0.0	6.8	0.0
Prop In Lane	0.00		0.00							0.00		0.00
Lane Grp Cap(c), veh/h	0	625	0							0	1534	0
V/C Ratio(X)	0.00	0.66	0.00							0.00	0.38	0.00
Avail Cap(c_a), veh/h	0	1298	0							0	1534	0
HCM Platoon Ratio	1.00	1.00	1.00							1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00							0.00	1.00	0.00
Uniform Delay (d), s/veh	0.0	23.0	0.0							0.0	11.6	0.0
Incr Delay (d2), s/veh	0.0	1.2	0.0							0.0	0.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0							0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	3.2	0.0							0.0	3.4	0.0
LnGrp Delay(d),s/veh	0.0	24.2	0.0							0.0	12.3	0.0
LnGrp LOS		C									B	
Approach Vol, veh/h		411									588	
Approach Delay, s/veh		24.2									12.3	
Approach LOS		C									B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs				4		6		
Phs Duration (G+Y+Rc), s				16.6		32.0		
Change Period (Y+Rc), s				6.0		6.0		
Max Green Setting (Gmax), s				22.0		26.0		
Max Q Clear Time (g_c+I1), s				8.5		8.8		
Green Ext Time (p_c), s				2.1		3.6		

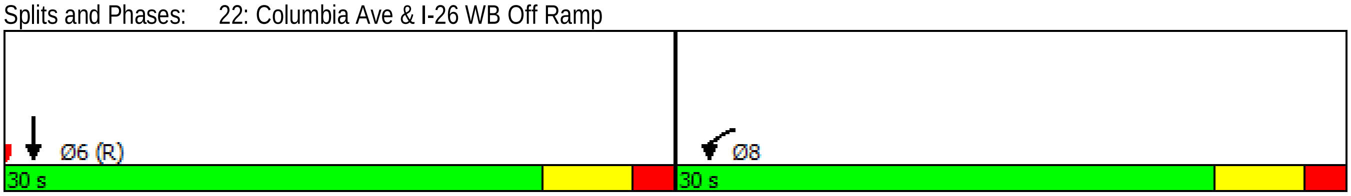
Intersection Summary		
HCM 2010 Ctrl Delay		17.2
HCM 2010 LOS		B

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	691	0	0	0	0	529
Future Volume (vph)	691	0	0	0	0	529
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	3433	0	0	0	0	3539
Flt Permitted	0.950					
Satd. Flow (perm)	3433	0	0	0	0	3539
Right Turn on Red	Yes	Yes		Yes		
Satd. Flow (RTOR)	306					
Link Speed (mph)	30		35			35
Link Distance (ft)	161		300			170
Travel Time (s)	3.7		5.8			3.3
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)						
Lane Group Flow (vph)	768	0	0	0	0	588
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	24		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		9	15	
Turn Type	Prot					NA
Protected Phases	8					6
Permitted Phases						
Detector Phase	8					6
Switch Phase						
Minimum Initial (s)	7.0					10.0
Minimum Split (s)	15.0					22.0
Total Split (s)	30.0					30.0
Total Split (%)	50.0%					50.0%
Maximum Green (s)	24.0					24.0
Yellow Time (s)	4.0					4.0
All-Red Time (s)	2.0					2.0
Lost Time Adjust (s)	0.0					0.0
Total Lost Time (s)	6.0					6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0					3.0
Recall Mode	Min					C-Max
Act Effct Green (s)	14.8					33.2
Actuated g/C Ratio	0.25					0.55
v/c Ratio	0.71					0.30
Control Delay	15.6					2.7
Queue Delay	0.0					0.2
Total Delay	15.6					2.9
LOS	B					A
Approach Delay	15.6					2.9

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Approach LOS	B					A
Queue Length 50th (ft)	74					11
Queue Length 95th (ft)	108					15
Internal Link Dist (ft)	81		220			90
Turn Bay Length (ft)						
Base Capacity (vph)	1556					1960
Starvation Cap Reductn	0					621
Spillback Cap Reductn	0					0
Storage Cap Reductn	0					0
Reduced v/c Ratio	0.49					0.44

Intersection Summary	
Area Type: Other	
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 3 (5%), Referenced to phase 6:SBT, Start of Green	
Natural Cycle: 40	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.71	
Intersection Signal Delay: 10.1	Intersection LOS: B
Intersection Capacity Utilization 44.3%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 22: Columbia Ave & I-26 WB Off Ramp



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	691	0	0	0	0	529
Future Volume (veh/h)	691	0	0	0	0	529
Number	3	18			1	6
Initial Q (Qb), veh	0	0			0	0
Ped-Bike Adj(A_pbT)	1.00	1.00			1.00	
Parking Bus, Adj	1.00	1.00			1.00	1.00
Adj Sat Flow, veh/h/ln	1863	0			0	1863
Adj Flow Rate, veh/h	768	0			0	588
Adj No. of Lanes	2	0			0	2
Peak Hour Factor	0.90	0.90			0.90	0.90
Percent Heavy Veh, %	2	0			0	2
Cap, veh/h	0	0			0	1416
Arrive On Green	0.00	0.00			0.00	0.13
Sat Flow, veh/h	0				0	3725
Grp Volume(v), veh/h	0.0				0	588
Grp Sat Flow(s),veh/h/ln					0	1770
Q Serve(g_s), s					0.0	9.2
Cycle Q Clear(g_c), s					0.0	9.2
Prop In Lane					0.00	
Lane Grp Cap(c), veh/h					0	1416
V/C Ratio(X)					0.00	0.42
Avail Cap(c_a), veh/h					0	1416
HCM Platoon Ratio					1.00	0.33
Upstream Filter(I)					0.00	0.97
Uniform Delay (d), s/veh					0.0	19.6
Incr Delay (d2), s/veh					0.0	0.9
Initial Q Delay(d3),s/veh					0.0	0.0
%ile BackOfQ(50%),veh/ln					0.0	4.7
LnGrp Delay(d),s/veh					0.0	20.5
LnGrp LOS						C
Approach Vol, veh/h						588
Approach Delay, s/veh						20.5
Approach LOS						C

Timer	1	2	3	4	5	6	7	8
Assigned Phs						6		
Phs Duration (G+Y+Rc), s						30.0		
Change Period (Y+Rc), s						6.0		
Max Green Setting (Gmax), s						24.0		
Max Q Clear Time (g_c+I1), s						11.2		
Green Ext Time (p_c), s						3.1		

Intersection Summary		
HCM 2010 Ctrl Delay		20.5
HCM 2010 LOS		C

Summary of All Intervals

Start Time	7:20
End Time	8:30
Total Time (min)	70
Time Recorded (min)	60
# of Intervals	2
# of Recorded Intervals	1
Vehs Entered	5184
Vehs Exited	5189
Starting Vehs	139
Ending Vehs	134
Travel Distance (mi)	5590
Travel Time (hr)	141.0
Total Delay (hr)	37.8
Total Stops	2324
Fuel Used (gal)	222.9

Interval #0 Information Seeding

Start Time	7:20
End Time	7:30
Total Time (min)	10

Volumes adjusted by Growth Factors.
No data recorded this interval.

Interval #1 Information Recording

Start Time	7:30
End Time	8:30
Total Time (min)	60

Volumes adjusted by Growth Factors.

Vehs Entered	5184
Vehs Exited	5189
Starting Vehs	139
Ending Vehs	134
Travel Distance (mi)	5590
Travel Time (hr)	141.0
Total Delay (hr)	37.8
Total Stops	2324
Fuel Used (gal)	222.9

Intersection: 1: Columbia Ave & I-26 EB Ramps

Movement	WB	WB	SB	SB	SB
Directions Served	T	T	T	T	T
Maximum Queue (ft)	144	113	98	120	55
Average Queue (ft)	102	54	54	95	16
95th Queue (ft)	144	99	100	110	46
Link Distance (ft)	57	57	13	13	13
Upstream Blk Time (%)	32	7	16	33	5
Queuing Penalty (veh)	69	14	56	120	19
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 21: Columbia Ave & I-26 WB Ramps

Movement	EB	EB	SB	SB
Directions Served	T	T	T	T
Maximum Queue (ft)	93	92	75	153
Average Queue (ft)	48	62	24	117
95th Queue (ft)	90	108	61	170
Link Distance (ft)	13	13	16	16
Upstream Blk Time (%)	39	43	6	31
Queuing Penalty (veh)	72	79	17	81
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 22: Columbia Ave & I-26 WB Off Ramp

Movement	WB	WB	SB	SB
Directions Served	L	L	T	T
Maximum Queue (ft)	165	160	51	73
Average Queue (ft)	113	111	12	37
95th Queue (ft)	156	153	40	60
Link Distance (ft)	103	103	30	30
Upstream Blk Time (%)	8	9	5	23
Queuing Penalty (veh)	26	30	14	60
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

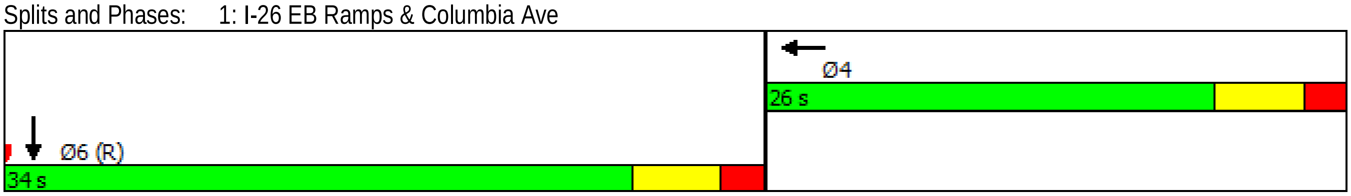
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	624	0	0	0	0	0	1376	0
Future Volume (vph)	0	0	0	0	624	0	0	0	0	0	1376	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	0	0	0	3539	0	0	0	0	0	5085	0
Flt Permitted												
Satd. Flow (perm)	0	0	0	0	3539	0	0	0	0	0	5085	0
Right Turn on Red			Yes	Yes		Yes			Yes			Yes
Satd. Flow (RTOR)												
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		135			109			140			150	
Travel Time (s)		2.6			2.1			2.7			2.9	
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
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	693	0	0	0	0	0	1529	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
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
Turn Type					NA						NA	
Protected Phases					4						6	
Permitted Phases												
Detector Phase					4						6	
Switch Phase												
Minimum Initial (s)					10.0						10.0	
Minimum Split (s)					22.0						22.0	
Total Split (s)					26.0						34.0	
Total Split (%)					43.3%						56.7%	
Maximum Green (s)					20.0						28.0	
Yellow Time (s)					4.0						4.0	
All-Red Time (s)					2.0						2.0	
Lost Time Adjust (s)					0.0						0.0	
Total Lost Time (s)					6.0						6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)					3.0						3.0	
Recall Mode					Min						C-Max	
Act Effct Green (s)					17.3						30.7	
Actuated g/C Ratio					0.29						0.51	
v/c Ratio					0.68						0.59	
Control Delay					19.2						10.2	
Queue Delay					0.0						0.0	
Total Delay					19.2						10.2	
LOS					B						B	
Approach Delay					19.2						10.2	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS					B						B	
Queue Length 50th (ft)					113						125	
Queue Length 95th (ft)					84						221	
Internal Link Dist (ft)		55			29			60			70	
Turn Bay Length (ft)												
Base Capacity (vph)					1179						2598	
Starvation Cap Reductn					0						0	
Spillback Cap Reductn					0						0	
Storage Cap Reductn					0						0	
Reduced v/c Ratio					0.59						0.59	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 60
Offset: 48 (80%), Referenced to phase 6:SBT, Start of Green
Natural Cycle: 45
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.68
Intersection Signal Delay: 13.0 Intersection LOS: B
Intersection Capacity Utilization 53.8% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 1: I-26 EB Ramps & Columbia Ave



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	0	624	0	0	0	0	0	1376	0
Future Volume (veh/h)	0	0	0	0	624	0	0	0	0	0	1376	0
Number				7	4	14				1	6	16
Initial Q (Qb), veh				0	0	0				0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00				1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln				0	1863	0				0	1863	0
Adj Flow Rate, veh/h				0	693	0				0	1529	0
Adj No. of Lanes				0	2	0				0	3	0
Peak Hour Factor				0.90	0.90	0.90				0.90	0.90	0.90
Percent Heavy Veh, %				0	2	0				0	2	0
Cap, veh/h				0	911	0				0	2373	0
Arrive On Green				0.00	0.26	0.00				0.00	0.15	0.00
Sat Flow, veh/h				0	3725	0				0	5421	0
Grp Volume(v), veh/h				0	693	0				0	1529	0
Grp Sat Flow(s),veh/h/ln				0	1770	0				0	1695	0
Q Serve(g_s), s				0.0	10.8	0.0				0.0	16.9	0.0
Cycle Q Clear(g_c), s				0.0	10.8	0.0				0.0	16.9	0.0
Prop In Lane				0.00		0.00				0.00		0.00
Lane Grp Cap(c), veh/h				0	911	0				0	2373	0
V/C Ratio(X)				0.00	0.76	0.00				0.00	0.64	0.00
Avail Cap(c_a), veh/h				0	1180	0				0	2373	0
HCM Platoon Ratio				1.00	1.00	1.00				1.00	0.33	1.00
Upstream Filter(I)				0.00	1.00	0.00				0.00	1.00	0.00
Uniform Delay (d), s/veh				0.0	20.6	0.0				0.0	20.7	0.0
Incr Delay (d2), s/veh				0.0	2.2	0.0				0.0	1.4	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				0.0	5.6	0.0				0.0	8.2	0.0
LnGrp Delay(d),s/veh				0.0	22.8	0.0				0.0	22.1	0.0
LnGrp LOS					C						C	
Approach Vol, veh/h					693						1529	
Approach Delay, s/veh					22.8						22.1	
Approach LOS					C						C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs				4		6		
Phs Duration (G+Y+Rc), s				21.4		34.0		
Change Period (Y+Rc), s				6.0		6.0		
Max Green Setting (Gmax), s				20.0		28.0		
Max Q Clear Time (g_c+I1), s				12.8		18.9		
Green Ext Time (p_c), s				2.6		6.3		

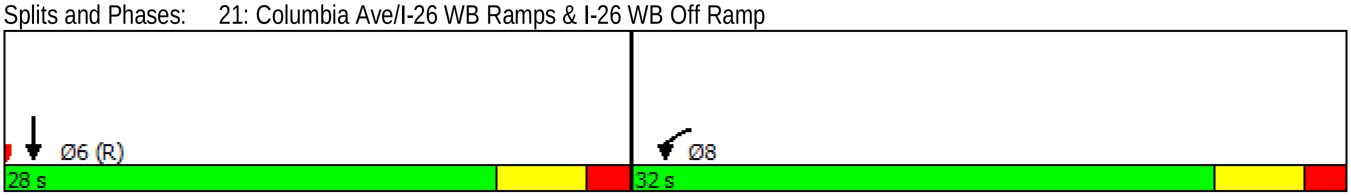
Intersection Summary			
HCM 2010 Ctrl Delay			22.3
HCM 2010 LOS			C

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	953	0	0	0	0	669
Future Volume (vph)	953	0	0	0	0	669
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	3433	0	0	0	0	3539
Flt Permitted	0.950					
Satd. Flow (perm)	3433	0	0	0	0	3539
Right Turn on Red	Yes	Yes		Yes		
Satd. Flow (RTOR)	142					
Link Speed (mph)	30		35			35
Link Distance (ft)	149		327			152
Travel Time (s)	3.4		6.4			3.0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1059	0	0	0	0	743
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	24		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		9	15	
Turn Type	Prot					NA
Protected Phases	8					6
Permitted Phases						
Detector Phase	8					6
Switch Phase						
Minimum Initial (s)	7.0					10.0
Minimum Split (s)	22.0					22.0
Total Split (s)	32.0					28.0
Total Split (%)	53.3%					46.7%
Maximum Green (s)	26.0					22.0
Yellow Time (s)	4.0					4.0
All-Red Time (s)	2.0					2.0
Lost Time Adjust (s)	0.0					0.0
Total Lost Time (s)	6.0					6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0					3.0
Recall Mode	Min					C-Max
Act Effct Green (s)	22.4					25.6
Actuated g/C Ratio	0.37					0.43
v/c Ratio	0.77					0.49
Control Delay	18.2					6.1
Queue Delay	0.0					0.2
Total Delay	18.2					6.3
LOS	B					A
Approach Delay	18.2					6.3

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Approach LOS	B					A
Queue Length 50th (ft)	141					24
Queue Length 95th (ft)	189					32
Internal Link Dist (ft)	69		247			72
Turn Bay Length (ft)						
Base Capacity (vph)	1568					1510
Starvation Cap Reductn	0					215
Spillback Cap Reductn	0					0
Storage Cap Reductn	0					0
Reduced v/c Ratio	0.68					0.57

Intersection Summary	
Area Type: Other	
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 0 (0%), Referenced to phase 6:SBT, Start of Green	
Natural Cycle: 45	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.77	
Intersection Signal Delay: 13.3	Intersection LOS: B
Intersection Capacity Utilization 55.7%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 21: Columbia Ave/I-26 WB Ramps & I-26 WB Off Ramp



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	953	0	0	0	0	669
Future Volume (veh/h)	953	0	0	0	0	669
Number	3	18			1	6
Initial Q (Qb), veh	0	0			0	0
Ped-Bike Adj(A_pbT)	1.00	1.00			1.00	
Parking Bus, Adj	1.00	1.00			1.00	1.00
Adj Sat Flow, veh/h/ln	1863	0			0	1863
Adj Flow Rate, veh/h	1059	0			0	743
Adj No. of Lanes	2	0			0	2
Peak Hour Factor	0.90	0.90			0.90	0.90
Percent Heavy Veh, %	2	0			0	2
Cap, veh/h	0	0			0	1298
Arrive On Green	0.00	0.00			0.00	0.12
Sat Flow, veh/h	0				0	3725
Grp Volume(v), veh/h	0.0				0	743
Grp Sat Flow(s),veh/h/ln					0	1770
Q Serve(g_s), s					0.0	11.9
Cycle Q Clear(g_c), s					0.0	11.9
Prop In Lane					0.00	
Lane Grp Cap(c), veh/h					0	1298
V/C Ratio(X)					0.00	0.57
Avail Cap(c_a), veh/h					0	1298
HCM Platoon Ratio					1.00	0.33
Upstream Filter(I)					0.00	0.93
Uniform Delay (d), s/veh					0.0	21.9
Incr Delay (d2), s/veh					0.0	1.7
Initial Q Delay(d3),s/veh					0.0	0.0
%ile BackOfQ(50%),veh/ln					0.0	6.1
LnGrp Delay(d),s/veh					0.0	23.6
LnGrp LOS						C
Approach Vol, veh/h						743
Approach Delay, s/veh						23.6
Approach LOS						C

Timer	1	2	3	4	5	6	7	8
Assigned Phs						6		
Phs Duration (G+Y+Rc), s						28.0		
Change Period (Y+Rc), s						6.0		
Max Green Setting (Gmax), s						22.0		
Max Q Clear Time (g_c+I1), s						13.9		
Green Ext Time (p_c), s						3.0		

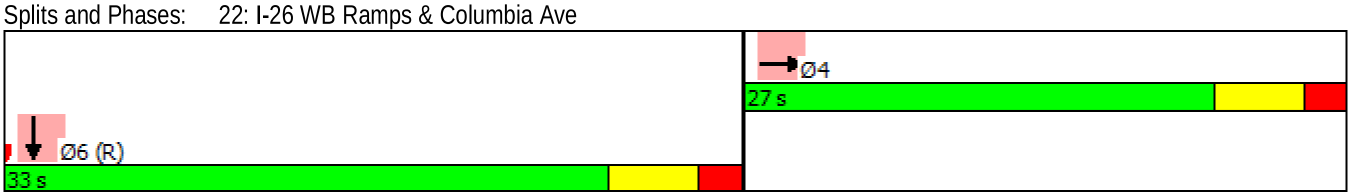
Intersection Summary	
HCM 2010 Ctrl Delay	23.6
HCM 2010 LOS	C

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	510	0	0	0	0	0	0	0	0	669	0
Future Volume (vph)	0	510	0	0	0	0	0	0	0	0	669	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	3539	0	0	0	0	0	0	0	0	3539	0
Flt Permitted												
Satd. Flow (perm)	0	3539	0	0	0	0	0	0	0	0	3539	0
Right Turn on Red			Yes			Yes			Yes	Yes		Yes
Satd. Flow (RTOR)												
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		159			115			152			129	
Travel Time (s)		3.1			2.2			3.0			2.5	
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
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	567	0	0	0	0	0	0	0	0	743	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
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
Turn Type		NA									NA	
Protected Phases		4									6	
Permitted Phases												
Detector Phase		4									6	
Switch Phase												
Minimum Initial (s)		10.0									10.0	
Minimum Split (s)		22.0									22.0	
Total Split (s)		27.0									33.0	
Total Split (%)		45.0%									55.0%	
Maximum Green (s)		21.0									27.0	
Yellow Time (s)		4.0									4.0	
All-Red Time (s)		2.0									2.0	
Lost Time Adjust (s)		0.0									0.0	
Total Lost Time (s)		6.0									6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		3.0									3.0	
Recall Mode		None									C-Max	
Act Effct Green (s)		15.4									32.6	
Actuated g/C Ratio		0.26									0.54	
v/c Ratio		0.63									0.39	
Control Delay		5.5									9.3	
Queue Delay		0.0									0.0	
Total Delay		5.5									9.3	
LOS		A									A	
Approach Delay		5.5									9.3	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS		A									A	
Queue Length 50th (ft)		11									74	
Queue Length 95th (ft)		9									128	
Internal Link Dist (ft)		79			35			72			49	
Turn Bay Length (ft)												
Base Capacity (vph)		1238									1924	
Starvation Cap Reductn		0									0	
Spillback Cap Reductn		0									19	
Storage Cap Reductn		0									0	
Reduced v/c Ratio		0.46									0.39	

Intersection Summary	
Area Type: Other	
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 1 (2%), Referenced to phase 6:SBT, Start of Green	
Natural Cycle: 45	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.63	
Intersection Signal Delay: 7.7	Intersection LOS: A
Intersection Capacity Utilization 42.6%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 22: I-26 WB Ramps & Columbia Ave



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	510	0	0	0	0	0	0	0	0	669	0
Future Volume (veh/h)	0	510	0	0	0	0	0	0	0	0	669	0
Number	7	4	14							1	6	16
Initial Q (Qb), veh	0	0	0							0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00							1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00							1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1863	0							0	1863	0
Adj Flow Rate, veh/h	0	567	0							0	743	0
Adj No. of Lanes	0	2	0							0	2	0
Peak Hour Factor	0.90	0.90	0.90							0.90	0.90	0.90
Percent Heavy Veh, %	0	2	0							0	2	0
Cap, veh/h	0	796	0							0	1593	0
Arrive On Green	0.00	0.22	0.00							0.00	0.45	0.00
Sat Flow, veh/h	0	3725	0							0	3725	0
Grp Volume(v), veh/h	0	567	0							0	743	0
Grp Sat Flow(s),veh/h/ln	0	1770	0							0	1770	0
Q Serve(g_s), s	0.0	8.9	0.0							0.0	8.8	0.0
Cycle Q Clear(g_c), s	0.0	8.9	0.0							0.0	8.8	0.0
Prop In Lane	0.00		0.00							0.00		0.00
Lane Grp Cap(c), veh/h	0	796	0							0	1593	0
V/C Ratio(X)	0.00	0.71	0.00							0.00	0.47	0.00
Avail Cap(c_a), veh/h	0	1239	0							0	1593	0
HCM Platoon Ratio	1.00	1.00	1.00							1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00							0.00	1.00	0.00
Uniform Delay (d), s/veh	0.0	21.5	0.0							0.0	11.5	0.0
Incr Delay (d2), s/veh	0.0	1.2	0.0							0.0	1.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0							0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	4.5	0.0							0.0	4.4	0.0
LnGrp Delay(d),s/veh	0.0	22.7	0.0							0.0	12.5	0.0
LnGrp LOS		C									B	
Approach Vol, veh/h		567									743	
Approach Delay, s/veh		22.7									12.5	
Approach LOS		C									B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs				4		6		
Phs Duration (G+Y+Rc), s				19.5		33.0		
Change Period (Y+Rc), s				6.0		6.0		
Max Green Setting (Gmax), s				21.0		27.0		
Max Q Clear Time (g_c+I1), s				10.9		10.8		
Green Ext Time (p_c), s				2.6		4.5		

Intersection Summary	
HCM 2010 Ctrl Delay	16.9
HCM 2010 LOS	B

Summary of All Intervals

Run Number	1	2	3	Avg
Start Time	4:35	4:35	4:35	4:35
End Time	5:45	5:45	5:45	5:45
Total Time (min)	70	70	70	70
Time Recorded (min)	60	60	60	60
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	6412	6287	6312	6337
Vehs Exited	6393	6283	6349	6341
Starting Vehs	206	195	226	208
Ending Vehs	225	199	189	202
Travel Distance (mi)	6935	6808	6870	6871
Travel Time (hr)	195.6	188.4	189.5	191.2
Total Delay (hr)	67.8	62.9	63.5	64.7
Total Stops	3682	3309	3448	3481
Fuel Used (gal)	286.7	279.3	281.2	282.4

Interval #0 Information Seeding

Start Time	4:35
End Time	4:45
Total Time (min)	10

Volumes adjusted by Growth Factors.

No data recorded this interval.

Interval #1 Information Recording

Start Time	4:45
End Time	5:45
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	1	2	3	Avg
Vehs Entered	6412	6287	6312	6337
Vehs Exited	6393	6283	6349	6341
Starting Vehs	206	195	226	208
Ending Vehs	225	199	189	202
Travel Distance (mi)	6935	6808	6870	6871
Travel Time (hr)	195.6	188.4	189.5	191.2
Total Delay (hr)	67.8	62.9	63.5	64.7
Total Stops	3682	3309	3448	3481
Fuel Used (gal)	286.7	279.3	281.2	282.4

Intersection: 1: I-26 EB Ramps & Columbia Ave

Movement	WB	WB	SB	SB	SB
Directions Served	T	T	T	T	T
Maximum Queue (ft)	150	120	113	114	83
Average Queue (ft)	119	68	81	91	31
95th Queue (ft)	156	113	112	102	71
Link Distance (ft)	57	57	5	5	5
Upstream Blk Time (%)	41	13	23	39	8
Queuing Penalty (veh)	128	40	107	178	37
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 21: Columbia Ave/I-26 WB Ramps & I-26 WB Off Ramp

Movement	WB	WB	SB	SB
Directions Served	L	L	T	T
Maximum Queue (ft)	153	152	50	74
Average Queue (ft)	126	130	22	39
95th Queue (ft)	154	160	46	61
Link Distance (ft)	91	91	10	10
Upstream Blk Time (%)	20	22	17	41
Queuing Penalty (veh)	96	106	55	137
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 22: I-26 WB Ramps & Columbia Ave

Movement	EB	EB	SB	SB
Directions Served	T	T	T	T
Maximum Queue (ft)	103	113	109	165
Average Queue (ft)	55	81	51	136
95th Queue (ft)	108	128	101	178
Link Distance (ft)	22	22	16	16
Upstream Blk Time (%)	30	46	17	44
Queuing Penalty (veh)	77	118	56	149
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

APPENDIX K

BUILD ALT 2 2020 SYNCHRO AND SIM TRAFFIC REPORTS

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	27	8	129	0	0	0	0	433	942	143	1077	0
Future Volume (vph)	27	8	129	0	0	0	0	433	942	143	1077	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	225		0	0		0	0		0	150		0
Storage Lanes	1		1	0		0	0		1	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	0.95	1.00
Frt			0.850						0.850			
Flt Protected		0.963								0.950		
Satd. Flow (prot)	0	1794	1583	0	0	0	0	1863	1583	1770	3539	0
Flt Permitted		0.963								0.480		
Satd. Flow (perm)	0	1794	1583	0	0	0	0	1863	1583	894	3539	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			95						1011			
Link Speed (mph)		45			45			35			35	
Link Distance (ft)		881			239			1099			740	
Travel Time (s)		13.3			3.6			21.4			14.4	
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)	30	9	143	0	0	0	0	481	1047	159	1197	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	39	143	0	0	0	0	481	1047	159	1197	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane								Yes				
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	1	2	
Detector Template	Left	Thru	Right					Thru	Right	Left	Thru	
Leading Detector (ft)	20	100	20					100	20	20	100	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	20	6	20					6	20	20	6	
Detector 1 Type	Cl+Ex	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	0.0	
Detector 1 Queue (s)	0.0	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	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	Perm	Perm	NA	
Protected Phases		4						2			6	
Permitted Phases	4		4						2	6		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4	4					2	2	6	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0					10.0	10.0	10.0	10.0	
Minimum Split (s)	15.0	15.0	15.0					22.0	22.0	22.0	22.0	
Total Split (s)	15.0	15.0	15.0					45.0	45.0	45.0	45.0	
Total Split (%)	25.0%	25.0%	25.0%					75.0%	75.0%	75.0%	75.0%	
Maximum Green (s)	9.0	9.0	9.0					39.0	39.0	39.0	39.0	
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0					2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0	0.0					0.0	0.0	0.0	0.0	
Total Lost Time (s)		6.0	6.0					6.0	6.0	6.0	6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0					3.0	3.0	3.0	3.0	
Recall Mode	None	None	None					C-Min	C-Min	C-Min	C-Min	
Act Effct Green (s)		7.9	7.9					43.9	43.9	43.9	43.9	
Actuated g/C Ratio		0.13	0.13					0.73	0.73	0.73	0.73	
v/c Ratio		0.17	0.49					0.35	0.73	0.24	0.46	
Control Delay		24.4	16.3					2.6	7.7	5.3	5.3	
Queue Delay		0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay		24.4	16.3					2.6	7.7	5.3	5.3	
LOS		C	B					A	A	A	A	
Approach Delay		18.0						6.1			5.3	
Approach LOS		B						A			A	

Intersection Summary	
Area Type: Other	
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 23 (38%), Referenced to phase 2:NBT and 6:SBTL, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.73	
Intersection Signal Delay: 6.5	Intersection LOS: A
Intersection Capacity Utilization 87.5%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 1: Columbia Ave & I-26 EB Ramps

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	27	8	129	0	0	0	0	433	942	143	1077	0
Future Volume (veh/h)	27	8	129	0	0	0	0	433	942	143	1077	0
Number	7	4	14				5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1863				0	1863	1863	1863	1863	0
Adj Flow Rate, veh/h	30	9	0				0	481	0	159	1197	0
Adj No. of Lanes	0	1	1				0	1	1	1	2	0
Peak Hour Factor	0.90	0.90	0.90				0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2				0	2	2	2	2	0
Cap, veh/h	77	23	88				0	1386	1178	716	2634	0
Arrive On Green	0.06	0.06	0.00				0.00	0.74	0.00	0.74	0.74	0.00
Sat Flow, veh/h	1380	414	1583				0	1863	1583	910	3632	0
Grp Volume(v), veh/h	39	0	0				0	481	0	159	1197	0
Grp Sat Flow(s),veh/h/ln	1794	0	1583				0	1863	1583	910	1770	0
Q Serve(g_s), s	1.3	0.0	0.0				0.0	5.3	0.0	4.4	7.8	0.0
Cycle Q Clear(g_c), s	1.3	0.0	0.0				0.0	5.3	0.0	9.7	7.8	0.0
Prop In Lane	0.77		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	100	0	88				0	1386	1178	716	2634	0
V/C Ratio(X)	0.39	0.00	0.00				0.00	0.35	0.00	0.22	0.45	0.00
Avail Cap(c_a), veh/h	269	0	237				0	1386	1178	716	2634	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	0.81	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	27.3	0.0	0.0				0.0	2.6	0.0	4.3	3.0	0.0
Incr Delay (d2), s/veh	2.5	0.0	0.0				0.0	0.6	0.0	0.7	0.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	0.0				0.0	2.9	0.0	1.2	3.9	0.0
LnGrp Delay(d),s/veh	29.8	0.0	0.0				0.0	3.2	0.0	5.0	3.5	0.0
LnGrp LOS	C							A		A	A	
Approach Vol, veh/h		39						481			1356	
Approach Delay, s/veh		29.8						3.2			3.7	
Approach LOS		C						A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		50.7		9.3		50.7		
Change Period (Y+Rc), s		6.0		6.0		6.0		
Max Green Setting (Gmax), s		39.0		9.0		39.0		
Max Q Clear Time (g_c+I1), s		7.3		3.3		11.7		
Green Ext Time (p_c), s		16.5		0.0		15.2		

Intersection Summary			
HCM 2010 Ctrl Delay			4.1
HCM 2010 LOS			A

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	691	0	2	157	90	370	0	0	529	49
Future Vol, veh/h	0	0	691	0	2	157	90	370	0	0	529	49
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Yield	Yield	Yield	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Free	-	-	None	-	-	None	-	-	None
Storage Length	-	-	0	-	-	-	175	-	-	-	-	150
Veh in Median Storage, #	-	-	-	-	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	768	0	2	174	100	411	0	0	588	54

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	-	1199	411	588	0	-	-	-	0
Stage 1	-	611	-	-	-	-	-	-	-
Stage 2	-	588	-	-	-	-	-	-	-
Critical Hdwy	-	6.52	6.22	4.12	-	-	-	-	-
Critical Hdwy Stg 1	-	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	-	4.018	3.318	2.218	-	-	-	-	-
Pot Cap-1 Maneuver	0	185	641	987	-	0	0	-	-
Stage 1	0	484	-	-	-	0	0	-	-
Stage 2	0	496	-	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	-	0	641	987	-	-	-	-	-
Mov Cap-2 Maneuver	-	0	-	-	-	-	-	-	-
Stage 1	-	0	-	-	-	-	-	-	-
Stage 2	-	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.7	1.8	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	SBT	SBR
Capacity (veh/h)	987	-	641	-	-
HCM Lane V/C Ratio	0.101	-	0.276	-	-
HCM Control Delay (s)	9.1	-	12.7	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0.3	-	1.1	-	-

SimTraffic Simulation Summary
2020 Build Loop AM

Summary of All Intervals

Run Number	1	2	3	Avg
Start Time	7:20	7:20	7:20	7:20
End Time	8:30	8:30	8:30	8:30
Total Time (min)	70	70	70	70
Time Recorded (min)	60	60	60	60
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	5225	5258	5272	5251
Vehs Exited	5221	5265	5275	5255
Starting Vehs	131	150	145	139
Ending Vehs	135	143	142	139
Travel Distance (mi)	5855	5873	5894	5874
Travel Time (hr)	137.9	140.5	140.4	139.6
Total Delay (hr)	25.5	26.8	26.3	26.2
Total Stops	796	995	936	909
Fuel Used (gal)	223.1	225.4	227.7	225.4

Interval #0 Information Seeding

Start Time	7:20
End Time	7:30
Total Time (min)	10
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	7:30
End Time	8:30
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	Avg
Vehs Entered	5225	5258	5272	5251
Vehs Exited	5221	5265	5275	5255
Starting Vehs	131	150	145	139
Ending Vehs	135	143	142	139
Travel Distance (mi)	5855	5873	5894	5874
Travel Time (hr)	137.9	140.5	140.4	139.6
Total Delay (hr)	25.5	26.8	26.3	26.2
Total Stops	796	995	936	909
Fuel Used (gal)	223.1	225.4	227.7	225.4

Intersection: 1: Columbia Ave & I-26 EB Ramps

Movement	EB	NB	SB	SB	SB
Directions Served	LT	T	L	T	T
Maximum Queue (ft)	68	99	89	113	115
Average Queue (ft)	23	21	34	35	33
95th Queue (ft)	55	69	67	94	87
Link Distance (ft)		1032		690	690
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	225		150		
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 2: Columbia Ave & I-26 WB Ramps

Movement	WB	NB
Directions Served	TR	L
Maximum Queue (ft)	71	59
Average Queue (ft)	32	24
95th Queue (ft)	53	52
Link Distance (ft)	543	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		175
Storage Blk Time (%)		
Queuing Penalty (veh)		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	8	121	0	0	0	0	624	742	246	1376	0
Future Volume (vph)	45	8	121	0	0	0	0	624	742	246	1376	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	225		0	0		0	0		0	150		0
Storage Lanes	1		1	0		0	0		1	1		0
Taper Length (ft)	100			100			100			100		
Satd. Flow (prot)	0	1786	1583	0	0	0	0	1863	1583	1770	3539	0
Flt Permitted		0.959								0.346		
Satd. Flow (perm)	0	1786	1583	0	0	0	0	1863	1583	645	3539	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			55						824			
Link Speed (mph)		45			45			35			35	
Link Distance (ft)		881			239			1090			740	
Travel Time (s)		13.3			3.6			21.2			14.4	
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
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	59	134	0	0	0	0	693	824	273	1529	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane								Yes				
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
Turn Type	Perm	NA	Perm					NA	Perm	Perm	NA	
Protected Phases		4						2			6	
Permitted Phases	4		4						2	6		
Detector Phase	4	4	4					2	2	6	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0					10.0	10.0	10.0	10.0	
Minimum Split (s)	15.0	15.0	15.0					22.0	22.0	22.0	22.0	
Total Split (s)	15.0	15.0	15.0					45.0	45.0	45.0	45.0	
Total Split (%)	25.0%	25.0%	25.0%					75.0%	75.0%	75.0%	75.0%	
Maximum Green (s)	9.0	9.0	9.0					39.0	39.0	39.0	39.0	
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0					2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0	0.0					0.0	0.0	0.0	0.0	
Total Lost Time (s)		6.0	6.0					6.0	6.0	6.0	6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0					3.0	3.0	3.0	3.0	
Recall Mode	None	None	None					C-Min	C-Min	C-Min	C-Min	
Act Effct Green (s)		8.1	8.1					43.7	43.7	43.7	43.7	
Actuated g/C Ratio		0.14	0.14					0.73	0.73	0.73	0.73	
v/c Ratio		0.25	0.52					0.51	0.60	0.58	0.59	
Control Delay		25.6	22.6					10.3	6.6	13.0	6.7	
Queue Delay		0.0	0.0					0.0	0.0	0.0	0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		25.6	22.6					10.3	6.6	13.0	6.7	
LOS		C	C					B	A	B	A	
Approach Delay		23.5						8.3			7.6	
Approach LOS		C						A			A	
Queue Length 50th (ft)		19	26					108	0	48	142	
Queue Length 95th (ft)		48	71					380	343	#176	206	
Internal Link Dist (ft)		801			159			1010			660	
Turn Bay Length (ft)										150		
Base Capacity (vph)		267	284					1357	1377	470	2578	
Starvation Cap Reductn		0	0					0	0	0	0	
Spillback Cap Reductn		0	0					0	0	0	0	
Storage Cap Reductn		0	0					0	0	0	0	
Reduced v/c Ratio		0.22	0.47					0.51	0.60	0.58	0.59	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 60
Offset: 32 (53%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.60
Intersection Signal Delay: 8.8 Intersection LOS: A
Intersection Capacity Utilization 80.4% ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Columbia Ave & I-26 EB Ramps

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	45	8	121	0	0	0	0	624	742	246	1376	0
Future Volume (veh/h)	45	8	121	0	0	0	0	624	742	246	1376	0
Number	7	4	14				5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1863				0	1863	1863	1863	1863	0
Adj Flow Rate, veh/h	50	9	0				0	693	0	273	1529	0
Adj No. of Lanes	0	1	1				0	1	1	1	2	0
Peak Hour Factor	0.90	0.90	0.90				0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2				0	2	2	2	2	0
Cap, veh/h	111	20	116				0	1354	1151	645	2573	0
Arrive On Green	0.07	0.07	0.00				0.00	0.97	0.00	0.73	0.73	0.00
Sat Flow, veh/h	1514	273	1583				0	1863	1583	748	3632	0
Grp Volume(v), veh/h	59	0	0				0	693	0	273	1529	0
Grp Sat Flow(s),veh/h/ln	1787	0	1583				0	1863	1583	748	1770	0
Q Serve(g_s), s	1.9	0.0	0.0				0.0	1.5	0.0	10.3	12.5	0.0
Cycle Q Clear(g_c), s	1.9	0.0	0.0				0.0	1.5	0.0	11.7	12.5	0.0
Prop In Lane	0.85		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	130	0	116				0	1354	1151	645	2573	0
V/C Ratio(X)	0.45	0.00	0.00				0.00	0.51	0.00	0.42	0.59	0.00
Avail Cap(c_a), veh/h	268	0	237				0	1354	1151	645	2573	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.33	1.33	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	0.85	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	26.7	0.0	0.0				0.0	0.3	0.0	4.2	3.9	0.0
Incr Delay (d2), s/veh	2.4	0.0	0.0				0.0	1.2	0.0	2.0	1.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.0	0.0	0.0				0.0	1.0	0.0	2.4	6.3	0.0
LnGrp Delay(d),s/veh	29.1	0.0	0.0				0.0	1.5	0.0	6.2	5.0	0.0
LnGrp LOS	C							A		A	A	
Approach Vol, veh/h		59						693			1802	
Approach Delay, s/veh		29.1						1.5			5.1	
Approach LOS		C						A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		49.6		10.4		49.6		
Change Period (Y+Rc), s		6.0		6.0		6.0		
Max Green Setting (Gmax), s		39.0		9.0		39.0		
Max Q Clear Time (g_c+I1), s		3.5		3.9		14.5		
Green Ext Time (p_c), s		26.1		0.1		19.5		

Intersection Summary	
HCM 2010 Ctrl Delay	4.7
HCM 2010 LOS	A

Intersection	
Int Delay, s/veh	4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	953	0	2	245	159	510	0	0	669	35
Future Vol, veh/h	0	0	953	0	2	245	159	510	0	0	669	35
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Yield	Yield	Yield	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Free	-	-	None	-	-	None	-	-	None
Storage Length	-	-	0	-	-	-	175	-	-	-	-	150
Veh in Median Storage, #	-	-	-	-	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	1059	0	2	272	177	567	0	0	743	39

Major/Minor				Minor1			Major1			Major2		
Conflicting Flow All				-	1663	567	743	0	-	-	-	0
Stage 1				-	920	-	-	-	-	-	-	-
Stage 2				-	743	-	-	-	-	-	-	-
Critical Hdwy				-	6.52	6.22	4.12	-	-	-	-	-
Critical Hdwy Stg 1				-	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2				-	5.52	-	-	-	-	-	-	-
Follow-up Hdwy				-	4.018	3.318	2.218	-	-	-	-	-
Pot Cap-1 Maneuver				0	97	523	864	-	0	0	-	-
Stage 1				0	350	-	-	-	0	0	-	-
Stage 2				0	422	-	-	-	0	0	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver				-	77	523	864	-	-	-	-	-
Mov Cap-2 Maneuver				-	154	-	-	-	-	-	-	-
Stage 1				-	278	-	-	-	-	-	-	-
Stage 2				-	422	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	19.8	2.4	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	SBT	SBR
Capacity (veh/h)	864	-	513	-	-
HCM Lane V/C Ratio	0.204	-	0.535	-	-
HCM Control Delay (s)	10.2	-	19.8	-	-
HCM Lane LOS	B	-	C	-	-
HCM 95th %tile Q(veh)	0.8	-	3.1	-	-

Summary of All Intervals

Run Number	1	2	3	Avg
Start Time	4:35	4:35	4:35	4:35
End Time	5:45	5:45	5:45	5:45
Total Time (min)	70	70	70	70
Time Recorded (min)	60	60	60	60
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	6331	6373	6113	6270
Vehs Exited	6335	6337	6152	6275
Starting Vehs	195	171	194	187
Ending Vehs	191	207	155	185
Travel Distance (mi)	7081	7118	6924	7041
Travel Time (hr)	181.2	184.6	173.4	179.7
Total Delay (hr)	44.3	46.7	40.8	43.9
Total Stops	1444	1351	1205	1333
Fuel Used (gal)	277.6	281.1	271.3	276.7

Interval #0 Information Seeding

Start Time	4:35
End Time	4:45
Total Time (min)	10

Volumes adjusted by Growth Factors.
No data recorded this interval.

Interval #1 Information Recording

Start Time	4:45
End Time	5:45
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	1	2	3	Avg
Vehs Entered	6331	6373	6113	6270
Vehs Exited	6335	6337	6152	6275
Starting Vehs	195	171	194	187
Ending Vehs	191	207	155	185
Travel Distance (mi)	7081	7118	6924	7041
Travel Time (hr)	181.2	184.6	173.4	179.7
Total Delay (hr)	44.3	46.7	40.8	43.9
Total Stops	1444	1351	1205	1333
Fuel Used (gal)	277.6	281.1	271.3	276.7

Intersection: 1: Columbia Ave & I-26 EB Ramps

Movement	EB	EB	NB	SB	SB	SB
Directions Served	LT	R	T	L	T	T
Maximum Queue (ft)	102	18	172	160	140	126
Average Queue (ft)	39	1	58	76	51	52
95th Queue (ft)	81	10	142	141	117	113
Link Distance (ft)		762	1024		690	690
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	225			150		
Storage Blk Time (%)				1	0	
Queuing Penalty (veh)				4	0	

Intersection: 2: Columbia Ave & I-26 WB Ramps

Movement	WB	NB	SB
Directions Served	TR	L	R
Maximum Queue (ft)	117	114	7
Average Queue (ft)	53	44	0
95th Queue (ft)	94	80	4
Link Distance (ft)	543		
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		175	150
Storage Blk Time (%)			
Queuing Penalty (veh)			

HCS 2010: Freeway Merge and Diverge Segments Release 6.65

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	AM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	S-48 WB Off-Ramp Alt 2
Jurisdiction:	
Analysis Year:	2020 Build Alt 2 Ramp

Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1713	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	159	vph
Length of first accel/decel lane	1225	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	691	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1713		159		691	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	476		44		192	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

```
Heavy vehicle adjustment, fHV           0.943       0.971       0.971
Driver population factor, fP            1.00        1.00        1.00
Flow rate, vp                           2018        182         791       pcph

_________________________Estimation of V12 Diverge Areas_______________________

                  L  =            (Equation 13-12 or 13-13)
                   EQ
                  P  =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  2018   pc/h
                   12   R     F   R   FD

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v  = v                2018          4800            No
      Fi   F
     v  = v - v            1836          4800            No
      FO   F   R
     v                     182           2100            No
      R
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 2018                   (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

______________________Flow Entering Diverge Influence Area_____________________
                      Actual        Max Desirable        Violation?
     v                2018          4400                 No
      12
_________________Level of Service Determination (if not F)_____________________

Density,               D = 4.252 + 0.0086 v  - 0.009  L   =   10.6    pc/mi/ln
                        R                   12         D
Level of service for ramp-freeway junction areas of influence B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 D  = 0.314
                                              S
Space mean speed in ramp influence area,     S  = 64.6    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 64.6    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.65

Phone: Fax:
E-mail:

_____Diverge Analysis_____

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	AM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	S-48 WB Off-Ramp Alt 2 Loop
Jurisdiction:	
Analysis Year:	2020 Build Alt 2 Loop

Description: S-48 IMR

_____Freeway Data_____

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1554	vph

_____Off Ramp Data_____

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	691	vph
Length of first accel/decel lane	1225	ft
Length of second accel/decel lane		ft

_____Adjacent Ramp Data (if one exists)_____

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	141	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	550	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1554		691		141	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	432		192		39	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

Heavy vehicle adjustment, fHV	0.943	0.971	0.971	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1830	791	161	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1830 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1830	4800	No
$v_{FO} = v_F - v_R$	1039	4800	No
v_R	791	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12}/2 No

If yes, v_{12A} = 1830 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	1830	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 9.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable, D_S = 0.369

Space mean speed in ramp influence area, S_R = 62.8 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 62.8 mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.65

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	PM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	S-48 WB Off-Ramp Alt 2
Jurisdiction:	
Analysis Year:	2020 Build Alt 2 Ramp

Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	2523	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	247	vph
Length of first accel/decel lane	1225	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	953	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2523		247		953	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	701		69		265	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          2972        283         1091      pcph

_________________________Estimation of V12 Diverge Areas_______________________

                  L  =            (Equation 13-12 or 13-13)
                   EQ
                  P  =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  2972   pc/h
                   12   R     F   R   FD

_______________________________Capacity Checks_________________________________

                           Actual        Maximum         LOS F?
     v  = v                2972          4800            No
      Fi   F
     v  = v - v            2689          4800            No
      FO   F   R
     v                     283           2100            No
      R
     v  or v               0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?           No
      3     av34
Is   v  or v      > 1.5 v  /2            No
      3     av34         12
If yes, v    = 2972                   (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

______________________Flow Entering Diverge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                2972          4400                  No
      12
_________________Level of Service Determination (if not F)_____________________

Density,               D = 4.252 + 0.0086 v  - 0.009  L   =   18.8    pc/mi/ln
                        R                  12          D
Level of service for ramp-freeway junction areas of influence B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 D  = 0.323
                                              S
Space mean speed in ramp influence area,     S  = 64.3    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 64.3    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.65

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	PM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	S-48 WB Off-Ramp Alt 2 Loop
Jurisdiction:	
Analysis Year:	2020 Build Alt 2 Loop

Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	2276	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	953	vph
Length of first accel/decel lane	1225	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	196	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	550	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2276		953		196	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	632		265		54	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          2681        1091        224       pcph

_________________________Estimation of V12 Diverge Areas_______________________

                  L  =            (Equation 13-12 or 13-13)
                   EQ
                  P  =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  2681   pc/h
                   12   R     F   R   FD

_______________________________Capacity Checks_________________________________

                             Actual        Maximum         LOS F?
     v  = v                  2681          4800            No
      Fi   F
     v  = v - v              1590          4800            No
      FO   F   R
     v                       1091          2100            No
      R
     v  or v                 0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?             No
      3     av34
Is   v  or v      > 1.5 v  /2              No
      3     av34         12
If yes, v    = 2681                     (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

______________________Flow Entering Diverge Influence Area______________________
                      Actual        Max Desirable         Violation?
     v                2681          4400                  No
      12
_________________Level of Service Determination (if not F)______________________

Density,               D = 4.252 + 0.0086 v  - 0.009  L   =   16.3    pc/mi/ln
                        R                   12          D
Level of service for ramp-freeway junction areas of influence B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 D  = 0.396
                                              S
Space mean speed in ramp influence area,     S  = 61.9    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 61.9    mph
_______________________________________________________________________________
```

APPENDIX L

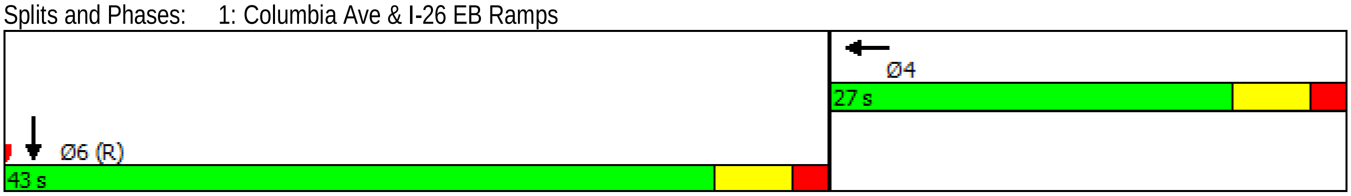
BUILD ALT 1 2040 SYNCHRO AND SIM TRAFFIC REPORTS

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑						↑↑↑	
Traffic Volume (vph)	0	0	0	0	498	0	0	0	0	0	1461	0
Future Volume (vph)	0	0	0	0	498	0	0	0	0	0	1461	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	0	0	0	3539	0	0	0	0	0	5085	0
Flt Permitted												
Satd. Flow (perm)	0	0	0	0	3539	0	0	0	0	0	5085	0
Right Turn on Red			Yes	Yes		Yes			Yes			Yes
Satd. Flow (RTOR)												
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		153			109			130			161	
Travel Time (s)		3.0			2.1			2.5			3.1	
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
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	553	0	0	0	0	0	1623	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
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
Turn Type					NA						NA	
Protected Phases					4						6	
Permitted Phases												
Detector Phase					4						6	
Switch Phase												
Minimum Initial (s)					10.0						10.0	
Minimum Split (s)					22.0						22.0	
Total Split (s)					27.0						43.0	
Total Split (%)					38.6%						61.4%	
Maximum Green (s)					21.0						37.0	
Yellow Time (s)					4.0						4.0	
All-Red Time (s)					2.0						2.0	
Lost Time Adjust (s)					0.0						0.0	
Total Lost Time (s)					6.0						6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)					3.0						3.0	
Recall Mode					Min						C-Max	
Act Effct Green (s)					16.5						41.5	
Actuated g/C Ratio					0.24						0.59	
v/c Ratio					0.66						0.54	
Control Delay					21.8						7.6	
Queue Delay					0.0						0.0	
Total Delay					21.8						7.6	
LOS					C						A	
Approach Delay					21.8						7.6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS					C						A	
Queue Length 50th (ft)					102						43	
Queue Length 95th (ft)					119						238	
Internal Link Dist (ft)		73			29			50			81	
Turn Bay Length (ft)												
Base Capacity (vph)					1061						3011	
Starvation Cap Reductn					0						0	
Spillback Cap Reductn					0						0	
Storage Cap Reductn					0						0	
Reduced v/c Ratio					0.52						0.54	

Intersection Summary	
Area Type: Other	
Cycle Length: 70	
Actuated Cycle Length: 70	
Offset: 55 (79%), Referenced to phase 6:SBT, Start of Green	
Natural Cycle: 45	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.66	
Intersection Signal Delay: 11.2	Intersection LOS: B
Intersection Capacity Utilization 58.1%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 1: Columbia Ave & I-26 EB Ramps



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	0	498	0	0	0	0	0	1461	0
Future Volume (veh/h)	0	0	0	0	498	0	0	0	0	0	1461	0
Number				7	4	14				1	6	16
Initial Q (Qb), veh				0	0	0				0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00				1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln				0	1863	0				0	1863	0
Adj Flow Rate, veh/h				0	553	0				0	1623	0
Adj No. of Lanes				0	2	0				0	3	0
Peak Hour Factor				0.90	0.90	0.90				0.90	0.90	0.90
Percent Heavy Veh, %				0	2	0				0	2	0
Cap, veh/h				0	738	0				0	2688	0
Arrive On Green				0.00	0.21	0.00				0.00	0.17	0.00
Sat Flow, veh/h				0	3725	0				0	5421	0
Grp Volume(v), veh/h				0	553	0				0	1623	0
Grp Sat Flow(s),veh/h/ln				0	1770	0				0	1695	0
Q Serve(g_s), s				0.0	10.3	0.0				0.0	20.6	0.0
Cycle Q Clear(g_c), s				0.0	10.3	0.0				0.0	20.6	0.0
Prop In Lane				0.00		0.00				0.00		0.00
Lane Grp Cap(c), veh/h				0	738	0				0	2688	0
V/C Ratio(X)				0.00	0.75	0.00				0.00	0.60	0.00
Avail Cap(c_a), veh/h				0	1062	0				0	2688	0
HCM Platoon Ratio				1.00	1.00	1.00				1.00	0.33	1.00
Upstream Filter(I)				0.00	1.00	0.00				0.00	1.00	0.00
Uniform Delay (d), s/veh				0.0	26.0	0.0				0.0	22.1	0.0
Incr Delay (d2), s/veh				0.0	1.8	0.0				0.0	1.0	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				0.0	5.2	0.0				0.0	9.9	0.0
LnGrp Delay(d),s/veh				0.0	27.8	0.0				0.0	23.1	0.0
LnGrp LOS					C						C	
Approach Vol, veh/h					553						1623	
Approach Delay, s/veh					27.8						23.1	
Approach LOS					C						C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs				4		6		
Phs Duration (G+Y+Rc), s				20.6		43.0		
Change Period (Y+Rc), s				6.0		6.0		
Max Green Setting (Gmax), s				21.0		37.0		
Max Q Clear Time (g_c+I1), s				12.3		22.6		
Green Ext Time (p_c), s				2.3		9.4		

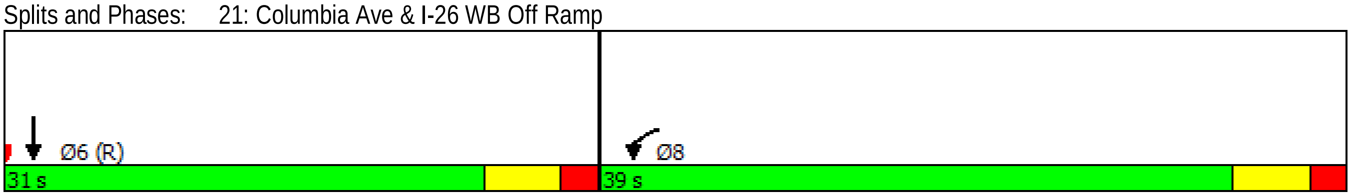
Intersection Summary	
HCM 2010 Ctrl Delay	24.3
HCM 2010 LOS	C

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	1026	0	0	0	0	582
Future Volume (vph)	1026	0	0	0	0	582
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	3433	0	0	0	0	3539
Flt Permitted	0.950					
Satd. Flow (perm)	3433	0	0	0	0	3539
Right Turn on Red	Yes	Yes		Yes		
Satd. Flow (RTOR)	191					
Link Speed (mph)	30		35			35
Link Distance (ft)	161		300			170
Travel Time (s)	3.7		5.8			3.3
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1140	0	0	0	0	647
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	24		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		9	15	
Turn Type	Prot					NA
Protected Phases	8					6
Permitted Phases						
Detector Phase	8					6
Switch Phase						
Minimum Initial (s)	7.0					10.0
Minimum Split (s)	22.0					22.0
Total Split (s)	39.0					31.0
Total Split (%)	55.7%					44.3%
Maximum Green (s)	33.0					25.0
Yellow Time (s)	4.0					4.0
All-Red Time (s)	2.0					2.0
Lost Time Adjust (s)	0.0					0.0
Total Lost Time (s)	6.0					6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0					3.0
Recall Mode	Min					C-Max
Act Effct Green (s)	27.3					30.7
Actuated g/C Ratio	0.39					0.44
v/c Ratio	0.78					0.42
Control Delay	19.3					8.9
Queue Delay	0.0					0.4
Total Delay	19.3					9.3
LOS	B					A
Approach Delay	19.3					9.3

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Approach LOS	B					A
Queue Length 50th (ft)	178					97
Queue Length 95th (ft)	215					160
Internal Link Dist (ft)	81		220			90
Turn Bay Length (ft)						
Base Capacity (vph)	1719					1553
Starvation Cap Reductn	0					451
Spillback Cap Reductn	0					0
Storage Cap Reductn	0					0
Reduced v/c Ratio	0.66					0.59

Intersection Summary	
Area Type: Other	
Cycle Length: 70	
Actuated Cycle Length: 70	
Offset: 9 (13%), Referenced to phase 6:SBT, Start of Green	
Natural Cycle: 45	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.78	
Intersection Signal Delay: 15.6	Intersection LOS: B
Intersection Capacity Utilization 55.4%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 21: Columbia Ave & I-26 WB Off Ramp



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↰					↑↑
Traffic Volume (veh/h)	1026	0	0	0	0	582
Future Volume (veh/h)	1026	0	0	0	0	582
Number	3	18			1	6
Initial Q (Qb), veh	0	0			0	0
Ped-Bike Adj(A_pbT)	1.00	1.00			1.00	
Parking Bus, Adj	1.00	1.00			1.00	1.00
Adj Sat Flow, veh/h/ln	1863	0			0	1863
Adj Flow Rate, veh/h	1140	0			0	647
Adj No. of Lanes	2	0			0	2
Peak Hour Factor	0.90	0.90			0.90	0.90
Percent Heavy Veh, %	2	0			0	2
Cap, veh/h	0	0			0	1264
Arrive On Green	0.00	0.00			0.00	0.12
Sat Flow, veh/h	0				0	3725
Grp Volume(v), veh/h	0.0				0	647
Grp Sat Flow(s),veh/h/ln					0	1770
Q Serve(g_s), s					0.0	12.0
Cycle Q Clear(g_c), s					0.0	12.0
Prop In Lane					0.00	
Lane Grp Cap(c), veh/h					0	1264
V/C Ratio(X)					0.00	0.51
Avail Cap(c_a), veh/h					0	1264
HCM Platoon Ratio					1.00	0.33
Upstream Filter(I)					0.00	0.97
Uniform Delay (d), s/veh					0.0	25.1
Incr Delay (d2), s/veh					0.0	1.4
Initial Q Delay(d3),s/veh					0.0	0.0
%ile BackOfQ(50%),veh/ln					0.0	6.1
LnGrp Delay(d),s/veh					0.0	26.6
LnGrp LOS						C
Approach Vol, veh/h						647
Approach Delay, s/veh						26.6
Approach LOS						C

Timer	1	2	3	4	5	6	7	8
Assigned Phs						6		
Phs Duration (G+Y+Rc), s						31.0		
Change Period (Y+Rc), s						6.0		
Max Green Setting (Gmax), s						25.0		
Max Q Clear Time (g_c+I1), s						14.0		
Green Ext Time (p_c), s						3.2		

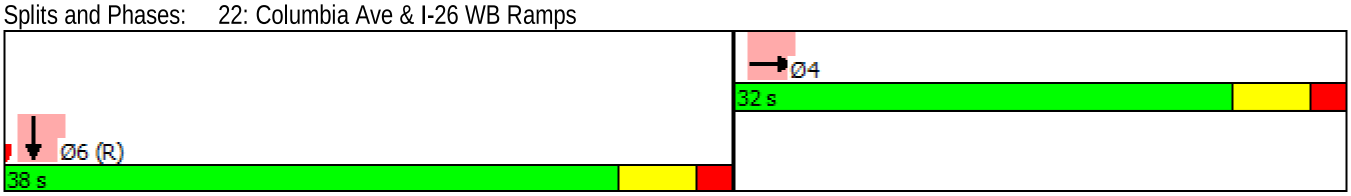
Intersection Summary	
HCM 2010 Ctrl Delay	26.6
HCM 2010 LOS	C

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	402	0	0	0	0	0	0	0	0	582	0
Future Volume (vph)	0	402	0	0	0	0	0	0	0	0	582	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	3539	0	0	0	0	0	0	0	0	3539	0
Flt Permitted												
Satd. Flow (perm)	0	3539	0	0	0	0	0	0	0	0	3539	0
Right Turn on Red			Yes			Yes			Yes	Yes		Yes
Satd. Flow (RTOR)												
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		147			115			170			129	
Travel Time (s)		2.9			2.2			3.3			2.5	
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
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	447	0	0	0	0	0	0	0	0	647	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
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
Turn Type		NA									NA	
Protected Phases		4									6	
Permitted Phases												
Detector Phase		4									6	
Switch Phase												
Minimum Initial (s)		10.0									10.0	
Minimum Split (s)		22.0									22.0	
Total Split (s)		32.0									38.0	
Total Split (%)		45.7%									54.3%	
Maximum Green (s)		26.0									32.0	
Yellow Time (s)		4.0									4.0	
All-Red Time (s)		2.0									2.0	
Lost Time Adjust (s)		0.0									0.0	
Total Lost Time (s)		6.0									6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		3.0									3.0	
Recall Mode		None									C-Max	
Act Effct Green (s)		14.5									43.5	
Actuated g/C Ratio		0.21									0.62	
v/c Ratio		0.61									0.29	
Control Delay		6.1									7.1	
Queue Delay		0.0									0.1	
Total Delay		6.1									7.2	
LOS		A									A	
Approach Delay		6.1									7.2	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS		A									A	
Queue Length 50th (ft)		4									58	
Queue Length 95th (ft)		5									101	
Internal Link Dist (ft)		67			35			90			49	
Turn Bay Length (ft)												
Base Capacity (vph)		1314									2199	
Starvation Cap Reductn		0									0	
Spillback Cap Reductn		0									439	
Storage Cap Reductn		0									0	
Reduced v/c Ratio		0.34									0.37	

Intersection Summary	
Area Type: Other	
Cycle Length: 70	
Actuated Cycle Length: 70	
Offset: 5 (7%), Referenced to phase 6:SBT, Start of Green	
Natural Cycle: 45	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.61	
Intersection Signal Delay: 6.7	Intersection LOS: A
Intersection Capacity Utilization 37.2%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 22: Columbia Ave & I-26 WB Ramps



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	402	0	0	0	0	0	0	0	0	582	0
Future Volume (veh/h)	0	402	0	0	0	0	0	0	0	0	582	0
Number	7	4	14							1	6	16
Initial Q (Qb), veh	0	0	0							0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00							1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00							1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1863	0							0	1863	0
Adj Flow Rate, veh/h	0	447	0							0	647	0
Adj No. of Lanes	0	2	0							0	2	0
Peak Hour Factor	0.90	0.90	0.90							0.90	0.90	0.90
Percent Heavy Veh, %	0	2	0							0	2	0
Cap, veh/h	0	646	0							0	1618	0
Arrive On Green	0.00	0.18	0.00							0.00	0.46	0.00
Sat Flow, veh/h	0	3725	0							0	3725	0
Grp Volume(v), veh/h	0	447	0							0	647	0
Grp Sat Flow(s),veh/h/ln	0	1770	0							0	1770	0
Q Serve(g_s), s	0.0	8.3	0.0							0.0	8.5	0.0
Cycle Q Clear(g_c), s	0.0	8.3	0.0							0.0	8.5	0.0
Prop In Lane	0.00		0.00							0.00		0.00
Lane Grp Cap(c), veh/h	0	646	0							0	1618	0
V/C Ratio(X)	0.00	0.69	0.00							0.00	0.40	0.00
Avail Cap(c_a), veh/h	0	1315	0							0	1618	0
HCM Platoon Ratio	1.00	1.00	1.00							1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00							0.00	1.00	0.00
Uniform Delay (d), s/veh	0.0	26.8	0.0							0.0	12.6	0.0
Incr Delay (d2), s/veh	0.0	1.3	0.0							0.0	0.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0							0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	4.2	0.0							0.0	4.3	0.0
LnGrp Delay(d),s/veh	0.0	28.1	0.0							0.0	13.4	0.0
LnGrp LOS		C									B	
Approach Vol, veh/h		447									647	
Approach Delay, s/veh		28.1									13.4	
Approach LOS		C									B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs				4		6		
Phs Duration (G+Y+Rc), s				18.8		38.0		
Change Period (Y+Rc), s				6.0		6.0		
Max Green Setting (Gmax), s				26.0		32.0		
Max Q Clear Time (g_c+I1), s				10.3		10.5		
Green Ext Time (p_c), s				2.5		4.3		

Intersection Summary	
HCM 2010 Ctrl Delay	19.4
HCM 2010 LOS	B

Summary of All Intervals

Run Number	1	2	3	Avg
Start Time	7:20	7:20	7:20	7:20
End Time	8:30	8:30	8:30	8:30
Total Time (min)	70	70	70	70
Time Recorded (min)	60	60	60	60
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	7063	7226	7216	7169
Vehs Exited	7023	7148	7084	7085
Starting Vehs	248	289	256	261
Ending Vehs	288	367	388	343
Travel Distance (mi)	7643	7805	7774	7741
Travel Time (hr)	266.1	346.3	275.9	296.1
Total Delay (hr)	125.2	203.6	133.2	154.0
Total Stops	7425	9634	6909	7988
Fuel Used (gal)	307.1	328.7	314.1	316.6

Interval #0 Information Seeding

Start Time	7:20
End Time	7:30
Total Time (min)	10

Volumes adjusted by Growth Factors.

No data recorded this interval.

Interval #1 Information Recording

Start Time	7:30
End Time	8:30
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	1	2	3	Avg
Vehs Entered	7063	7226	7216	7169
Vehs Exited	7023	7148	7084	7085
Starting Vehs	248	289	256	261
Ending Vehs	288	367	388	343
Travel Distance (mi)	7643	7805	7774	7741
Travel Time (hr)	266.1	346.3	275.9	296.1
Total Delay (hr)	125.2	203.6	133.2	154.0
Total Stops	7425	9634	6909	7988
Fuel Used (gal)	307.1	328.7	314.1	316.6

Intersection: 1: Columbia Ave & I-26 EB Ramps

Movement	WB	WB	SB	SB	SB
Directions Served	T	T	T	T	T
Maximum Queue (ft)	138	125	98	108	88
Average Queue (ft)	123	51	66	92	37
95th Queue (ft)	159	103	112	110	77
Link Distance (ft)	57	57	13	13	13
Upstream Blk Time (%)	44	9	18	33	14
Queuing Penalty (veh)	111	23	86	159	70
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 21: Columbia Ave & I-26 WB Off Ramp

Movement	WB	WB	SB	SB
Directions Served	L	L	T	T
Maximum Queue (ft)	168	186	62	96
Average Queue (ft)	136	151	26	43
95th Queue (ft)	175	183	62	72
Link Distance (ft)	103	103	30	30
Upstream Blk Time (%)	18	25	11	39
Queuing Penalty (veh)	94	127	32	112
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 22: Columbia Ave & I-26 WB Ramps

Movement	EB	EB	SB	SB
Directions Served	T	T	T	T
Maximum Queue (ft)	94	90	83	171
Average Queue (ft)	59	73	23	127
95th Queue (ft)	100	111	60	177
Link Distance (ft)	13	13	16	16
Upstream Blk Time (%)	46	45	8	43
Queuing Penalty (veh)	92	90	23	124
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

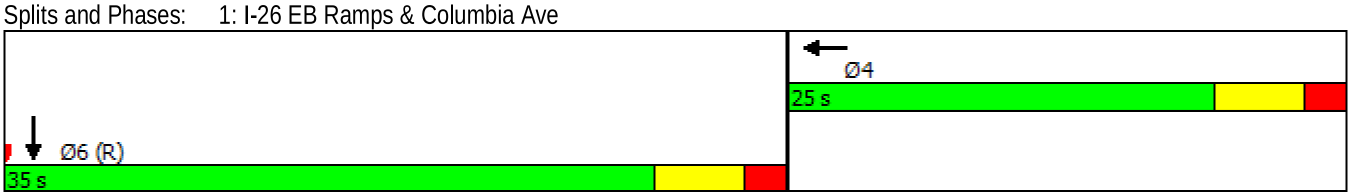
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	723	0	0	0	0	0	1781	0
Future Volume (vph)	0	0	0	0	723	0	0	0	0	0	1781	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	0	0	0	3539	0	0	0	0	0	5085	0
Flt Permitted												
Satd. Flow (perm)	0	0	0	0	3539	0	0	0	0	0	5085	0
Right Turn on Red			Yes	Yes		Yes			Yes			Yes
Satd. Flow (RTOR)												
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		135			109			140			150	
Travel Time (s)		2.6			2.1			2.7			2.9	
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
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	803	0	0	0	0	0	1979	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
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
Turn Type					NA						NA	
Protected Phases					4						6	
Permitted Phases												
Detector Phase					4						6	
Switch Phase												
Minimum Initial (s)					10.0						10.0	
Minimum Split (s)					22.0						22.0	
Total Split (s)					25.0						35.0	
Total Split (%)					41.7%						58.3%	
Maximum Green (s)					19.0						29.0	
Yellow Time (s)					4.0						4.0	
All-Red Time (s)					2.0						2.0	
Lost Time Adjust (s)					0.0						0.0	
Total Lost Time (s)					6.0						6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)					3.0						3.0	
Recall Mode					Min						C-Max	
Act Effct Green (s)					18.0						30.0	
Actuated g/C Ratio					0.30						0.50	
v/c Ratio					0.76						0.78	
Control Delay					19.5						11.1	
Queue Delay					0.0						0.0	
Total Delay					19.5						11.1	
LOS					B						B	
Approach Delay					19.5						11.1	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS					B						B	
Queue Length 50th (ft)					83						127	
Queue Length 95th (ft)					m146						209	
Internal Link Dist (ft)		55			29			60			70	
Turn Bay Length (ft)												
Base Capacity (vph)					1120						2542	
Starvation Cap Reductn					0						0	
Spillback Cap Reductn					0						0	
Storage Cap Reductn					0						0	
Reduced v/c Ratio					0.72						0.78	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 60
Offset: 45 (75%), Referenced to phase 6:SBT, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.78
Intersection Signal Delay: 13.5 Intersection LOS: B
Intersection Capacity Utilization 64.4% ICU Level of Service C
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: I-26 EB Ramps & Columbia Ave



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	0	723	0	0	0	0	0	1781	0
Future Volume (veh/h)	0	0	0	0	723	0	0	0	0	0	1781	0
Number				7	4	14				1	6	16
Initial Q (Qb), veh				0	0	0				0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00				1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln				0	1863	0				0	1863	0
Adj Flow Rate, veh/h				0	803	0				0	1979	0
Adj No. of Lanes				0	2	0				0	3	0
Peak Hour Factor				0.90	0.90	0.90				0.90	0.90	0.90
Percent Heavy Veh, %				0	2	0				0	2	0
Cap, veh/h				0	987	0				0	2458	0
Arrive On Green				0.00	0.28	0.00				0.00	0.16	0.00
Sat Flow, veh/h				0	3725	0				0	5421	0
Grp Volume(v), veh/h				0	803	0				0	1979	0
Grp Sat Flow(s),veh/h/ln				0	1770	0				0	1695	0
Q Serve(g_s), s				0.0	12.7	0.0				0.0	22.5	0.0
Cycle Q Clear(g_c), s				0.0	12.7	0.0				0.0	22.5	0.0
Prop In Lane				0.00		0.00				0.00		0.00
Lane Grp Cap(c), veh/h				0	987	0				0	2458	0
V/C Ratio(X)				0.00	0.81	0.00				0.00	0.81	0.00
Avail Cap(c_a), veh/h				0	1121	0				0	2458	0
HCM Platoon Ratio				1.00	1.00	1.00				1.00	0.33	1.00
Upstream Filter(I)				0.00	1.00	0.00				0.00	1.00	0.00
Uniform Delay (d), s/veh				0.0	20.2	0.0				0.0	22.5	0.0
Incr Delay (d2), s/veh				0.0	4.2	0.0				0.0	2.9	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				0.0	6.7	0.0				0.0	11.2	0.0
LnGrp Delay(d),s/veh				0.0	24.4	0.0				0.0	25.4	0.0
LnGrp LOS					C						C	
Approach Vol, veh/h					803						1979	
Approach Delay, s/veh					24.4						25.4	
Approach LOS					C						C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs				4		6		
Phs Duration (G+Y+Rc), s				22.7		35.0		
Change Period (Y+Rc), s				6.0		6.0		
Max Green Setting (Gmax), s				19.0		29.0		
Max Q Clear Time (g_c+I1), s				14.7		24.5		
Green Ext Time (p_c), s				2.0		3.9		

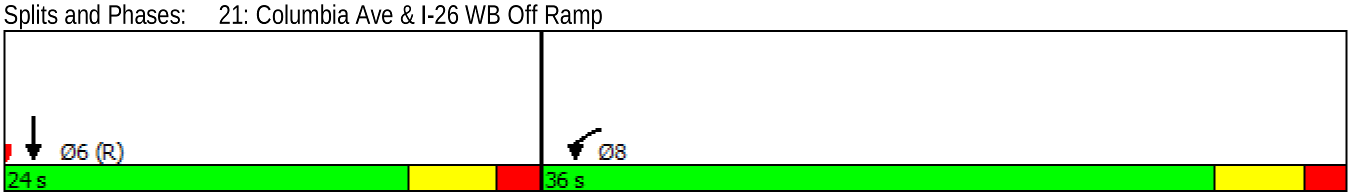
Intersection Summary	
HCM 2010 Ctrl Delay	25.1
HCM 2010 LOS	C

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	1325	0	0	0	0	713
Future Volume (vph)	1325	0	0	0	0	713
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	3433	0	0	0	0	3539
Flt Permitted	0.950					
Satd. Flow (perm)	3433	0	0	0	0	3539
Right Turn on Red	Yes	Yes		Yes		
Satd. Flow (RTOR)	59					
Link Speed (mph)	30		35			35
Link Distance (ft)	149		327			152
Travel Time (s)	3.4		6.4			3.0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1472	0	0	0	0	792
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	24		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		9	15	
Turn Type	Prot					NA
Protected Phases	8					6
Permitted Phases						
Detector Phase	8					6
Switch Phase						
Minimum Initial (s)	7.0					10.0
Minimum Split (s)	15.0					22.0
Total Split (s)	36.0					24.0
Total Split (%)	60.0%					40.0%
Maximum Green (s)	30.0					18.0
Yellow Time (s)	4.0					4.0
All-Red Time (s)	2.0					2.0
Lost Time Adjust (s)	0.0					0.0
Total Lost Time (s)	6.0					6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0					3.0
Recall Mode	Min					C-Max
Act Effct Green (s)	29.0					19.0
Actuated g/C Ratio	0.48					0.32
v/c Ratio	0.87					0.71
Control Delay	20.3					13.0
Queue Delay	0.0					0.5
Total Delay	20.3					13.5
LOS	C					B
Approach Delay	20.3					13.5

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Approach LOS	C					B
Queue Length 50th (ft)	210					134
Queue Length 95th (ft)	#308					193
Internal Link Dist (ft)	69		247			72
Turn Bay Length (ft)						
Base Capacity (vph)	1746					1118
Starvation Cap Reductn	0					86
Spillback Cap Reductn	0					0
Storage Cap Reductn	0					0
Reduced v/c Ratio	0.84					0.77

Intersection Summary	
Area Type: Other	
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 16 (27%), Referenced to phase 6:SBT, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.87	
Intersection Signal Delay: 17.9	Intersection LOS: B
Intersection Capacity Utilization 67.5%	ICU Level of Service C
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 21: Columbia Ave & I-26 WB Off Ramp



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	1325	0	0	0	0	713
Future Volume (veh/h)	1325	0	0	0	0	713
Number	3	18			1	6
Initial Q (Qb), veh	0	0			0	0
Ped-Bike Adj(A_pbT)	1.00	1.00			1.00	
Parking Bus, Adj	1.00	1.00			1.00	1.00
Adj Sat Flow, veh/h/ln	1863	0			0	1863
Adj Flow Rate, veh/h	1472	0			0	792
Adj No. of Lanes	2	0			0	2
Peak Hour Factor	0.90	0.90			0.90	0.90
Percent Heavy Veh, %	2	0			0	2
Cap, veh/h	0	0			0	1062
Arrive On Green	0.00	0.00			0.00	0.10
Sat Flow, veh/h	0				0	3725
Grp Volume(v), veh/h	0.0				0	792
Grp Sat Flow(s),veh/h/ln					0	1770
Q Serve(g_s), s					0.0	13.1
Cycle Q Clear(g_c), s					0.0	13.1
Prop In Lane					0.00	
Lane Grp Cap(c), veh/h					0	1062
V/C Ratio(X)					0.00	0.75
Avail Cap(c_a), veh/h					0	1062
HCM Platoon Ratio					1.00	0.33
Upstream Filter(I)					0.00	0.91
Uniform Delay (d), s/veh					0.0	24.8
Incr Delay (d2), s/veh					0.0	4.4
Initial Q Delay(d3),s/veh					0.0	0.0
%ile BackOfQ(50%),veh/ln					0.0	7.0
LnGrp Delay(d),s/veh					0.0	29.2
LnGrp LOS						C
Approach Vol, veh/h						792
Approach Delay, s/veh						29.2
Approach LOS						C

Timer	1	2	3	4	5	6	7	8
Assigned Phs						6		
Phs Duration (G+Y+Rc), s						24.0		
Change Period (Y+Rc), s						6.0		
Max Green Setting (Gmax), s						18.0		
Max Q Clear Time (g_c+I1), s						15.1		
Green Ext Time (p_c), s						1.4		

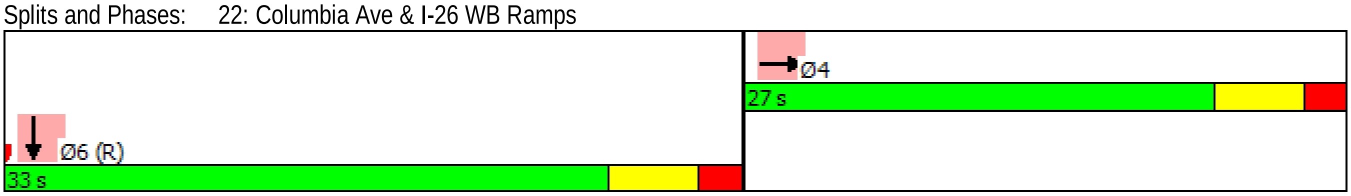
Intersection Summary		
HCM 2010 Ctrl Delay		29.2
HCM 2010 LOS		C

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	543	0	0	0	0	0	0	0	0	713	0
Future Volume (vph)	0	543	0	0	0	0	0	0	0	0	713	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	3539	0	0	0	0	0	0	0	0	3539	0
Flt Permitted												
Satd. Flow (perm)	0	3539	0	0	0	0	0	0	0	0	3539	0
Right Turn on Red			Yes			Yes			Yes	Yes		Yes
Satd. Flow (RTOR)												
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		159			115			152			129	
Travel Time (s)		3.1			2.2			3.0			2.5	
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
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	603	0	0	0	0	0	0	0	0	792	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
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
Turn Type		NA									NA	
Protected Phases		4									6	
Permitted Phases												
Detector Phase		4									6	
Switch Phase												
Minimum Initial (s)		10.0									10.0	
Minimum Split (s)		22.0									22.0	
Total Split (s)		27.0									33.0	
Total Split (%)		45.0%									55.0%	
Maximum Green (s)		21.0									27.0	
Yellow Time (s)		4.0									4.0	
All-Red Time (s)		2.0									2.0	
Lost Time Adjust (s)		0.0									0.0	
Total Lost Time (s)		6.0									6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		3.0									3.0	
Recall Mode		None									C-Max	
Act Effct Green (s)		16.2									31.8	
Actuated g/C Ratio		0.27									0.53	
v/c Ratio		0.63									0.42	
Control Delay		5.8									10.2	
Queue Delay		0.0									0.8	
Total Delay		5.8									11.0	
LOS		A									B	
Approach Delay		5.8									11.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS		A									B	
Queue Length 50th (ft)		5									83	
Queue Length 95th (ft)		6									144	
Internal Link Dist (ft)		79			35			72			49	
Turn Bay Length (ft)												
Base Capacity (vph)		1238									1875	
Starvation Cap Reductn		0									0	
Spillback Cap Reductn		0									718	
Storage Cap Reductn		0									0	
Reduced v/c Ratio		0.49									0.68	

Intersection Summary	
Area Type: Other	
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 4 (7%), Referenced to phase 6:SBT, Start of Green	
Natural Cycle: 45	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.63	
Intersection Signal Delay: 8.8	Intersection LOS: A
Intersection Capacity Utilization 44.7%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 22: Columbia Ave & I-26 WB Ramps



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	543	0	0	0	0	0	0	0	0	713	0
Future Volume (veh/h)	0	543	0	0	0	0	0	0	0	0	713	0
Number	7	4	14							1	6	16
Initial Q (Qb), veh	0	0	0							0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00							1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00							1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1863	0							0	1863	0
Adj Flow Rate, veh/h	0	603	0							0	792	0
Adj No. of Lanes	0	2	0							0	2	0
Peak Hour Factor	0.90	0.90	0.90							0.90	0.90	0.90
Percent Heavy Veh, %	0	2	0							0	2	0
Cap, veh/h	0	834	0							0	1593	0
Arrive On Green	0.00	0.24	0.00							0.00	0.45	0.00
Sat Flow, veh/h	0	3725	0							0	3725	0
Grp Volume(v), veh/h	0	603	0							0	792	0
Grp Sat Flow(s),veh/h/ln	0	1770	0							0	1770	0
Q Serve(g_s), s	0.0	9.4	0.0							0.0	9.5	0.0
Cycle Q Clear(g_c), s	0.0	9.4	0.0							0.0	9.5	0.0
Prop In Lane	0.00		0.00							0.00		0.00
Lane Grp Cap(c), veh/h	0	834	0							0	1593	0
V/C Ratio(X)	0.00	0.72	0.00							0.00	0.50	0.00
Avail Cap(c_a), veh/h	0	1239	0							0	1593	0
HCM Platoon Ratio	1.00	1.00	1.00							1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00							0.00	1.00	0.00
Uniform Delay (d), s/veh	0.0	21.1	0.0							0.0	11.7	0.0
Incr Delay (d2), s/veh	0.0	1.2	0.0							0.0	1.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0							0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	4.7	0.0							0.0	4.9	0.0
LnGrp Delay(d),s/veh	0.0	22.3	0.0							0.0	12.8	0.0
LnGrp LOS		C									B	
Approach Vol, veh/h		603									792	
Approach Delay, s/veh		22.3									12.8	
Approach LOS		C									B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs				4		6		
Phs Duration (G+Y+Rc), s				20.1		33.0		
Change Period (Y+Rc), s				6.0		6.0		
Max Green Setting (Gmax), s				21.0		27.0		
Max Q Clear Time (g_c+I1), s				11.4		11.5		
Green Ext Time (p_c), s				2.7		4.8		

Intersection Summary	
HCM 2010 Ctrl Delay	16.9
HCM 2010 LOS	B

APPENDIX M

BUILD ALT 2 2040 SYNCHRO AND SIM TRAFFIC REPORTS

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	29	9	185	0	0	0	0	498	1261	147	1461	0
Future Volume (vph)	29	9	185	0	0	0	0	498	1261	147	1461	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	225		0	0		0	0		0	150		0
Storage Lanes	1		1	0		0	0		1	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	0.95	1.00
Frt			0.850						0.850			
Flt Protected		0.963								0.950		
Satd. Flow (prot)	0	1794	1583	0	0	0	0	1863	1583	1770	3539	0
Flt Permitted		0.963								0.432		
Satd. Flow (perm)	0	1794	1583	0	0	0	0	1863	1583	805	3539	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			62						973			
Link Speed (mph)		45			45			35			35	
Link Distance (ft)		881			239			1099			740	
Travel Time (s)		13.3			3.6			21.4			14.4	
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)	32	10	206	0	0	0	0	553	1401	163	1623	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	42	206	0	0	0	0	553	1401	163	1623	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane								Yes				
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	1	2	
Detector Template	Left	Thru	Right					Thru	Right	Left	Thru	
Leading Detector (ft)	20	100	20					100	20	20	100	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	20	6	20					6	20	20	6	
Detector 1 Type	Cl+Ex	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	0.0	
Detector 1 Queue (s)	0.0	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	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	Perm	Perm	NA	
Protected Phases		4						2			6	
Permitted Phases	4		4						2	6		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4	4					2	2	6	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0					10.0	10.0	10.0	10.0	
Minimum Split (s)	15.0	15.0	15.0					22.0	22.0	22.0	22.0	
Total Split (s)	16.0	16.0	16.0					74.0	74.0	74.0	74.0	
Total Split (%)	17.8%	17.8%	17.8%					82.2%	82.2%	82.2%	82.2%	
Maximum Green (s)	10.0	10.0	10.0					68.0	68.0	68.0	68.0	
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0					2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0	0.0					0.0	0.0	0.0	0.0	
Total Lost Time (s)		6.0	6.0					6.0	6.0	6.0	6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0					3.0	3.0	3.0	3.0	
Recall Mode	None	None	None					C-Min	C-Min	C-Min	C-Min	
Act Effct Green (s)		9.9	9.9					68.1	68.1	68.1	68.1	
Actuated g/C Ratio		0.11	0.11					0.76	0.76	0.76	0.76	
v/c Ratio		0.21	0.90					0.39	0.98	0.27	0.61	
Control Delay		39.4	67.3					2.0	25.5	4.6	6.1	
Queue Delay		0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay		39.4	67.3					2.0	25.5	4.6	6.1	
LOS		D	E					A	C	A	A	
Approach Delay		62.6						18.8			6.0	
Approach LOS		E						B			A	

Intersection Summary	
Area Type: Other	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 21 (23%), Referenced to phase 2:NBT and 6:SBTL, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.98	
Intersection Signal Delay: 15.8	Intersection LOS: B
Intersection Capacity Utilization 107.2%	ICU Level of Service G
Analysis Period (min) 15	

Splits and Phases: 1: Columbia Ave & I-26 EB Ramps

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	29	9	185	0	0	0	0	498	1261	147	1461	0
Future Volume (veh/h)	29	9	185	0	0	0	0	498	1261	147	1461	0
Number	7	4	14				5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1863				0	1863	1863	1863	1863	0
Adj Flow Rate, veh/h	32	10	0				0	553	0	163	1623	0
Adj No. of Lanes	0	1	1				0	1	1	1	2	0
Peak Hour Factor	0.90	0.90	0.90				0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2				0	2	2	2	2	0
Cap, veh/h	69	22	80				0	1520	1292	709	2888	0
Arrive On Green	0.05	0.05	0.00				0.00	0.82	0.00	0.82	0.82	0.00
Sat Flow, veh/h	1367	427	1583				0	1863	1583	852	3632	0
Grp Volume(v), veh/h	42	0	0				0	553	0	163	1623	0
Grp Sat Flow(s),veh/h/ln	1794	0	1583				0	1863	1583	852	1770	0
Q Serve(g_s), s	2.0	0.0	0.0				0.0	7.0	0.0	5.6	14.0	0.0
Cycle Q Clear(g_c), s	2.0	0.0	0.0				0.0	7.0	0.0	12.6	14.0	0.0
Prop In Lane	0.76		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	91	0	80				0	1520	1292	709	2888	0
V/C Ratio(X)	0.46	0.00	0.00				0.00	0.36	0.00	0.23	0.56	0.00
Avail Cap(c_a), veh/h	199	0	176				0	1520	1292	709	2888	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	0.69	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	41.5	0.0	0.0				0.0	2.2	0.0	3.8	2.8	0.0
Incr Delay (d2), s/veh	3.6	0.0	0.0				0.0	0.5	0.0	0.8	0.8	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	0.0	0.0				0.0	3.7	0.0	1.4	6.9	0.0
LnGrp Delay(d),s/veh	45.2	0.0	0.0				0.0	2.6	0.0	4.6	3.6	0.0
LnGrp LOS	D							A		A	A	
Approach Vol, veh/h		42						553			1786	
Approach Delay, s/veh		45.2						2.6			3.7	
Approach LOS		D						A			A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		79.4		10.6		79.4						
Change Period (Y+Rc), s		6.0		6.0		6.0						
Max Green Setting (Gmax), s		68.0		10.0		68.0						
Max Q Clear Time (g_c+I1), s		9.0		4.0		16.0						
Green Ext Time (p_c), s		33.2		0.0		30.9						
Intersection Summary												
HCM 2010 Ctrl Delay			4.2									
HCM 2010 LOS			A									

Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	1026	0	3	159	125	402	0	0	582	56
Future Vol, veh/h	0	0	1026	0	3	159	125	402	0	0	582	56
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Yield	Yield	Yield	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Free	-	-	None	-	-	None	-	-	None
Storage Length	-	-	0	-	-	-	175	-	-	-	-	150
Veh in Median Storage, #	-	-	-	-	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	1140	0	3	177	139	447	0	0	647	62

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	-	1371	447	647	0	-	-	-	0
Stage 1	-	724	-	-	-	-	-	-	-
Stage 2	-	647	-	-	-	-	-	-	-
Critical Hdwy	-	6.52	6.22	4.12	-	-	-	-	-
Critical Hdwy Stg 1	-	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	-	4.018	3.318	2.218	-	-	-	-	-
Pot Cap-1 Maneuver	0	146	612	939	-	0	0	-	-
Stage 1	0	430	-	-	-	0	0	-	-
Stage 2	0	467	-	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	-	0	612	939	-	-	-	-	-
Mov Cap-2 Maneuver	-	0	-	-	-	-	-	-	-
Stage 1	-	0	-	-	-	-	-	-	-
Stage 2	-	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.3	2.3	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	SBT	SBR
Capacity (veh/h)	939	-	612	-	-
HCM Lane V/C Ratio	0.148	-	0.294	-	-
HCM Control Delay (s)	9.5	-	13.3	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0.5	-	1.2	-	-

Summary of All Intervals

Run Number	1	2	3	Avg
Start Time	7:20	7:20	7:20	7:20
End Time	8:30	8:30	8:30	8:30
Total Time (min)	70	70	70	70
Time Recorded (min)	60	60	60	60
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	7126	7166	7170	7153
Vehs Exited	7053	7137	7105	7097
Starting Vehs	206	249	253	232
Ending Vehs	279	278	318	289
Travel Distance (mi)	7952	8033	8009	7998
Travel Time (hr)	264.0	268.1	284.3	272.1
Total Delay (hr)	110.8	114.2	130.7	118.5
Total Stops	5500	5470	6120	5699
Fuel Used (gal)	308.2	311.4	313.6	311.1

Interval #0 Information Seeding

Start Time	7:20
End Time	7:30
Total Time (min)	10

Volumes adjusted by Growth Factors.

No data recorded this interval.

Interval #1 Information Recording

Start Time	7:30
End Time	8:30
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	1	2	3	Avg
Vehs Entered	7126	7166	7170	7153
Vehs Exited	7053	7137	7105	7097
Starting Vehs	206	249	253	232
Ending Vehs	279	278	318	289
Travel Distance (mi)	7952	8033	8009	7998
Travel Time (hr)	264.0	268.1	284.3	272.1
Total Delay (hr)	110.8	114.2	130.7	118.5
Total Stops	5500	5470	6120	5699
Fuel Used (gal)	308.2	311.4	313.6	311.1

Intersection: 1: Columbia Ave & I-26 EB Ramps

Movement	EB	EB	NB	NB	SB	SB	SB
Directions Served	LT	R	T	R	L	T	T
Maximum Queue (ft)	105	94	404	738	93	126	158
Average Queue (ft)	30	4	44	82	36	49	54
95th Queue (ft)	74	43	180	456	69	117	127
Link Distance (ft)		761	1032	1032		690	690
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	225				150		
Storage Blk Time (%)						0	
Queuing Penalty (veh)						0	

Intersection: 2: Columbia Ave & I-26 WB Ramps

Movement	WB	NB
Directions Served	TR	L
Maximum Queue (ft)	74	72
Average Queue (ft)	35	30
95th Queue (ft)	56	59
Link Distance (ft)	543	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		175
Storage Blk Time (%)		
Queuing Penalty (veh)		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	48	9	173	0	0	0	0	723	1096	257	1781	0
Future Volume (vph)	48	9	173	0	0	0	0	723	1096	257	1781	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	225		0	0		0	0		0	150		0
Storage Lanes	1		1	0		0	0		1	1		0
Taper Length (ft)	100			100			100			100		
Satd. Flow (prot)	0	1788	1583	0	0	0	0	1863	1583	1770	3539	0
Flt Permitted		0.960								0.291		
Satd. Flow (perm)	0	1788	1583	0	0	0	0	1863	1583	542	3539	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			36						992			
Link Speed (mph)		45			45			35			35	
Link Distance (ft)		881			239			1090			740	
Travel Time (s)		13.3			3.6			21.2			14.4	
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
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	63	192	0	0	0	0	803	1218	286	1979	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane								Yes				
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
Turn Type	Perm	NA	Perm					NA	Perm	Perm	NA	
Protected Phases		4						2			6	
Permitted Phases	4		4						2	6		
Detector Phase	4	4	4					2	2	6	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0					10.0	10.0	10.0	10.0	
Minimum Split (s)	15.0	15.0	15.0					22.0	22.0	22.0	22.0	
Total Split (s)	18.0	18.0	18.0					72.0	72.0	72.0	72.0	
Total Split (%)	20.0%	20.0%	20.0%					80.0%	80.0%	80.0%	80.0%	
Maximum Green (s)	12.0	12.0	12.0					66.0	66.0	66.0	66.0	
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0					2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0	0.0					0.0	0.0	0.0	0.0	
Total Lost Time (s)		6.0	6.0					6.0	6.0	6.0	6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0					3.0	3.0	3.0	3.0	
Recall Mode	None	None	None					C-Min	C-Min	C-Min	C-Min	
Act Effct Green (s)		11.6	11.6					66.4	66.4	66.4	66.4	
Actuated g/C Ratio		0.13	0.13					0.74	0.74	0.74	0.74	
v/c Ratio		0.27	0.82					0.58	0.85	0.72	0.76	
Control Delay		38.5	58.4					5.9	12.5	19.6	9.6	
Queue Delay		0.0	0.0					0.0	0.0	0.0	0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		38.5	58.4					5.9	12.5	19.6	9.6	
LOS		D	E					A	B	B	A	
Approach Delay		53.5						9.9			10.8	
Approach LOS		D						A			B	
Queue Length 50th (ft)		33	87					117	215	76	295	
Queue Length 95th (ft)		71	#198					200	387	#260	381	
Internal Link Dist (ft)		801			159			1010			660	
Turn Bay Length (ft)										150		
Base Capacity (vph)		241	245					1378	1429	400	2618	
Starvation Cap Reductn		0	0					0	0	0	0	
Spillback Cap Reductn		0	0					0	0	0	0	
Storage Cap Reductn		0	0					0	0	0	0	
Reduced v/c Ratio		0.26	0.78					0.58	0.85	0.71	0.76	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 83 (92%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.85
Intersection Signal Delay: 12.8   Intersection LOS: B
Intersection Capacity Utilization 102.9%   ICU Level of Service G
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Columbia Ave & I-26 EB Ramps

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	48	9	173	0	0	0	0	723	1096	257	1781	0
Future Volume (veh/h)	48	9	173	0	0	0	0	723	1096	257	1781	0
Number	7	4	14				5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1863				0	1863	1863	1863	1863	0
Adj Flow Rate, veh/h	53	10	0				0	803	0	286	1979	0
Adj No. of Lanes	0	1	1				0	1	1	1	2	0
Peak Hour Factor	0.90	0.90	0.90				0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2				0	2	2	2	2	0
Cap, veh/h	93	18	98				0	1499	1275	623	2849	0
Arrive On Green	0.06	0.06	0.00				0.00	1.00	0.00	0.80	0.80	0.00
Sat Flow, veh/h	1504	284	1583				0	1863	1583	675	3632	0
Grp Volume(v), veh/h	63	0	0				0	803	0	286	1979	0
Grp Sat Flow(s),veh/h/ln	1788	0	1583				0	1863	1583	675	1770	0
Q Serve(g_s), s	3.1	0.0	0.0				0.0	0.0	0.0	12.9	22.3	0.0
Cycle Q Clear(g_c), s	3.1	0.0	0.0				0.0	0.0	0.0	12.9	22.3	0.0
Prop In Lane	0.84		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	110	0	98				0	1499	1275	623	2849	0
V/C Ratio(X)	0.57	0.00	0.00				0.00	0.54	0.00	0.46	0.69	0.00
Avail Cap(c_a), veh/h	238	0	211				0	1499	1275	623	2849	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.33	1.33	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	0.56	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	41.1	0.0	0.0				0.0	0.0	0.0	3.0	3.9	0.0
Incr Delay (d2), s/veh	4.6	0.0	0.0				0.0	0.8	0.0	2.4	1.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	0.0	0.0				0.0	0.3	0.0	2.7	11.0	0.0
LnGrp Delay(d),s/veh	45.7	0.0	0.0				0.0	0.8	0.0	5.4	5.3	0.0
LnGrp LOS	D							A		A	A	
Approach Vol, veh/h		63						803			2265	
Approach Delay, s/veh		45.7						0.8			5.3	
Approach LOS		D						A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		78.4		11.6		78.4		
Change Period (Y+Rc), s		6.0		6.0		6.0		
Max Green Setting (Gmax), s		66.0		12.0		66.0		
Max Q Clear Time (g_c+I1), s		2.0		5.1		24.3		
Green Ext Time (p_c), s		51.7		0.1		36.1		

Intersection Summary		
HCM 2010 Ctrl Delay		5.0
HCM 2010 LOS		A

Intersection	
Int Delay, s/veh	4.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	1325	0	3	248	228	543	0	0	713	36
Future Vol, veh/h	0	0	1325	0	3	248	228	543	0	0	713	36
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Yield	Yield	Yield	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Free	-	-	None	-	-	None	-	-	None
Storage Length	-	-	0	-	-	-	175	-	-	-	-	150
Veh in Median Storage, #	-	-	-	-	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	1472	0	3	276	253	603	0	0	792	40

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	-	1902	603	792	0	-	-	-	0
Stage 1	-	1110	-	-	-	-	-	-	-
Stage 2	-	792	-	-	-	-	-	-	-
Critical Hdwy	-	6.52	6.22	4.12	-	-	-	-	-
Critical Hdwy Stg 1	-	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	-	4.018	3.318	2.218	-	-	-	-	-
Pot Cap-1 Maneuver	0	69	499	829	-	0	0	-	-
Stage 1	0	285	-	-	-	0	0	-	-
Stage 2	0	401	-	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	-	0	499	829	-	-	-	-	-
Mov Cap-2 Maneuver	-	0	-	-	-	-	-	-	-
Stage 1	-	0	-	-	-	-	-	-	-
Stage 2	-	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	21	3.3	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	SBT	SBR
Capacity (veh/h)	829	-	499	-	-
HCM Lane V/C Ratio	0.306	-	0.559	-	-
HCM Control Delay (s)	11.2	-	21	-	-
HCM Lane LOS	B	-	C	-	-
HCM 95th %tile Q(veh)	1.3	-	3.4	-	-

Summary of All Intervals

Run Number	1	2	3	Avg
Start Time	4:35	4:35	4:35	4:35
End Time	5:45	5:45	5:45	5:45
Total Time (min)	70	70	70	70
Time Recorded (min)	60	60	60	60
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	7947	7934	7944	7939
Vehs Exited	7774	7802	7793	7790
Starting Vehs	293	297	322	301
Ending Vehs	466	429	473	455
Travel Distance (mi)	8876	8865	8887	8876
Travel Time (hr)	714.6	740.6	789.1	748.1
Total Delay (hr)	545.6	571.2	620.8	579.2
Total Stops	7925	7708	9099	8242
Fuel Used (gal)	444.8	453.7	461.6	453.4

Interval #0 Information Seeding

Start Time	4:35
End Time	4:45
Total Time (min)	10

Volumes adjusted by Growth Factors.

No data recorded this interval.

Interval #1 Information Recording

Start Time	4:45
End Time	5:45
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	1	2	3	Avg
Vehs Entered	7947	7934	7944	7939
Vehs Exited	7774	7802	7793	7790
Starting Vehs	293	297	322	301
Ending Vehs	466	429	473	455
Travel Distance (mi)	8876	8865	8887	8876
Travel Time (hr)	714.6	740.6	789.1	748.1
Total Delay (hr)	545.6	571.2	620.8	579.2
Total Stops	7925	7708	9099	8242
Fuel Used (gal)	444.8	453.7	461.6	453.4

Intersection: 1: Columbia Ave & I-26 EB Ramps

Movement	EB	EB	NB	NB	SB	SB	SB
Directions Served	LT	R	T	R	L	T	T
Maximum Queue (ft)	103	80	629	606	160	171	160
Average Queue (ft)	45	7	189	173	70	70	71
95th Queue (ft)	94	43	669	758	124	155	151
Link Distance (ft)		762	1024	1024		690	690
Upstream Blk Time (%)			0	2			
Queuing Penalty (veh)			4	16			
Storage Bay Dist (ft)	225				150		
Storage Blk Time (%)					0	0	
Queuing Penalty (veh)					3	1	

Intersection: 3: Columbia Ave & I-26 WB Ramps

Movement	WB	NB	SB
Directions Served	TR	L	R
Maximum Queue (ft)	96	137	7
Average Queue (ft)	46	56	0
95th Queue (ft)	76	102	4
Link Distance (ft)	543		
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		175	150
Storage Blk Time (%)		0	
Queuing Penalty (veh)		1	

HCS 2010: Freeway Merge and Diverge Segments Release 6.65

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: AECOM
Agency/Co.: AECOM
Date performed: 7/1/2016
Analysis time period: AM Peak
Freeway/Dir of Travel: I-26 WB
Junction: S-48 WB Off-Ramp Alt 2
Jurisdiction:
Analysis Year: 2040 Build Alt 2 Ramp
Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1713	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	162	vph
Length of first accel/decel lane	1225	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	1026	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1713		162		1026	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	476		45		285	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

Heavy vehicle adjustment, fHV	0.943	0.971	0.971	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2018	185	1174	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2018 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2018	4800	No
$v_{FO} = v_F - v_R$	1833	4800	No
v_R	185	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12}/2 No

If yes, v_{12A} = 2018 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2018	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 10.6 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable, D_S = 0.315

Space mean speed in ramp influence area, S_R = 64.6 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 64.6 mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.65

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	AM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	S-48 WB Off-Ramp Alt 2 Loop
Jurisdiction:	
Analysis Year:	2040 Build Alt 2 Loop

Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	2256	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	1026	vph
Length of first accel/decel lane	1225	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	184	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	550	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2256		1026		184	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	627		285		51	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          2657        1174        211       pcph

_________________________Estimation of V12 Diverge Areas_______________________

                  L  =            (Equation 13-12 or 13-13)
                   EQ
                  P  =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  2657   pc/h
                   12   R     F   R   FD

_______________________________Capacity Checks_________________________________

                             Actual        Maximum          LOS F?
     v  = v                  2657          4800             No
      Fi   F
     v  = v - v              1483          4800             No
      FO   F   R
     v                       1174          2100             No
      R
     v  or v                 0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?             No
      3     av34
Is   v  or v      > 1.5 v  /2              No
      3     av34         12
If yes, v    = 2657                     (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

______________________Flow Entering Diverge Influence Area_____________________
                      Actual        Max Desirable        Violation?
     v                2657          4400                 No
      12
_________________Level of Service Determination (if not F)_____________________

Density,               D = 4.252 + 0.0086 v  - 0.009  L   =   16.1    pc/mi/ln
                        R                   12          D
Level of service for ramp-freeway junction areas of influence B

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 D  = 0.404
                                              S
Space mean speed in ramp influence area,     S  = 61.7    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 61.7    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.65

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	PM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	S-48 WB Off-Ramp Alt 2
Jurisdiction:	
Analysis Year:	2040 Build Alt 2 Ramp

Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	1325	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	247	vph
Length of first accel/decel lane	1225	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	1026	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1000	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1325		247		1026	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	368		69		285	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

```
Heavy vehicle adjustment, fHV          0.943       0.971       0.971
Driver population factor, fP           1.00        1.00        1.00
Flow rate, vp                          1561        283         1174      pcph

_________________________Estimation of V12 Diverge Areas_______________________

                  L  =            (Equation 13-12 or 13-13)
                   EQ
                  P  =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  1561   pc/h
                   12   R     F   R   FD

_______________________________Capacity Checks_________________________________

                             Actual        Maximum         LOS F?
     v  = v                  1561          4800            No
      Fi   F
     v  = v - v              1278          4800            No
      FO   F   R
     v                       283           2100            No
      R
     v  or v                 0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?             No
      3     av34
Is   v  or v      > 1.5 v  /2              No
      3     av34         12
If yes, v    = 1561                     (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

______________________Flow Entering Diverge Influence Area______________________
                      Actual        Max Desirable          Violation?
     v                1561          4400                   No
      12
_________________Level of Service Determination (if not F)_____________________

Density,               D = 4.252 + 0.0086 v  - 0.009  L   =   6.7     pc/mi/ln
                        R                  12          D
Level of service for ramp-freeway junction areas of influence A

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 D  = 0.323
                                              S
Space mean speed in ramp influence area,     S  = 64.3    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 64.3    mph
_______________________________________________________________________________
```

HCS 2010: Freeway Merge and Diverge Segments Release 6.65

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	AECOM
Agency/Co.:	AECOM
Date performed:	7/1/2016
Analysis time period:	PM Peak
Freeway/Dir of Travel:	I-26 WB
Junction:	S-48 WB Off-Ramp Alt 2 Loop
Jurisdiction:	
Analysis Year:	2040 Build Alt 2 Loop

Description: S-48 IMR

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	75.0	mph
Volume on freeway	3216	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	1325	vph
Length of first accel/decel lane	1225	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	267	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	550	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3216		1325		267	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	893		368		74	v
Trucks and buses	4		2		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

```
Heavy vehicle adjustment, fHV           0.943       0.971       0.971
Driver population factor, fP            1.00        1.00        1.00
Flow rate, vp                           3788        1516        306       pcph

_________________________Estimation of V12 Diverge Areas_______________________

                  L  =            (Equation 13-12 or 13-13)
                   EQ
                  P  =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  3788   pc/h
                   12   R     F   R   FD

_______________________________Capacity Checks_________________________________

                             Actual        Maximum         LOS F?
     v  = v                  3788          4800            No
      Fi   F
     v  = v - v              2272          4800            No
      FO   F   R
     v                       1516          2100            No
      R
     v  or v                 0    pc/h     (Equation 13-14 or 13-17)
      3     av34
Is   v  or v      > 2700 pc/h?             No
      3     av34
Is   v  or v      > 1.5 v  /2              No
      3     av34         12
If yes, v    = 3788                     (Equation 13-15, 13-16, 13-18, or 13-19)
         12A

______________________Flow Entering Diverge Influence Area_____________________
                      Actual        Max Desirable         Violation?
     v                3788          4400                  No
      12
_________________Level of Service Determination (if not F)____________________

Density,               D = 4.252 + 0.0086 v  - 0.009  L   =   25.8    pc/mi/ln
                        R                  12          D
Level of service for ramp-freeway junction areas of influence C

_____________________________Speed Estimation__________________________________

Intermediate speed variable,                 D  = 0.434
                                              S
Space mean speed in ramp influence area,     S  = 60.7    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 60.7    mph
_______________________________________________________________________________
```

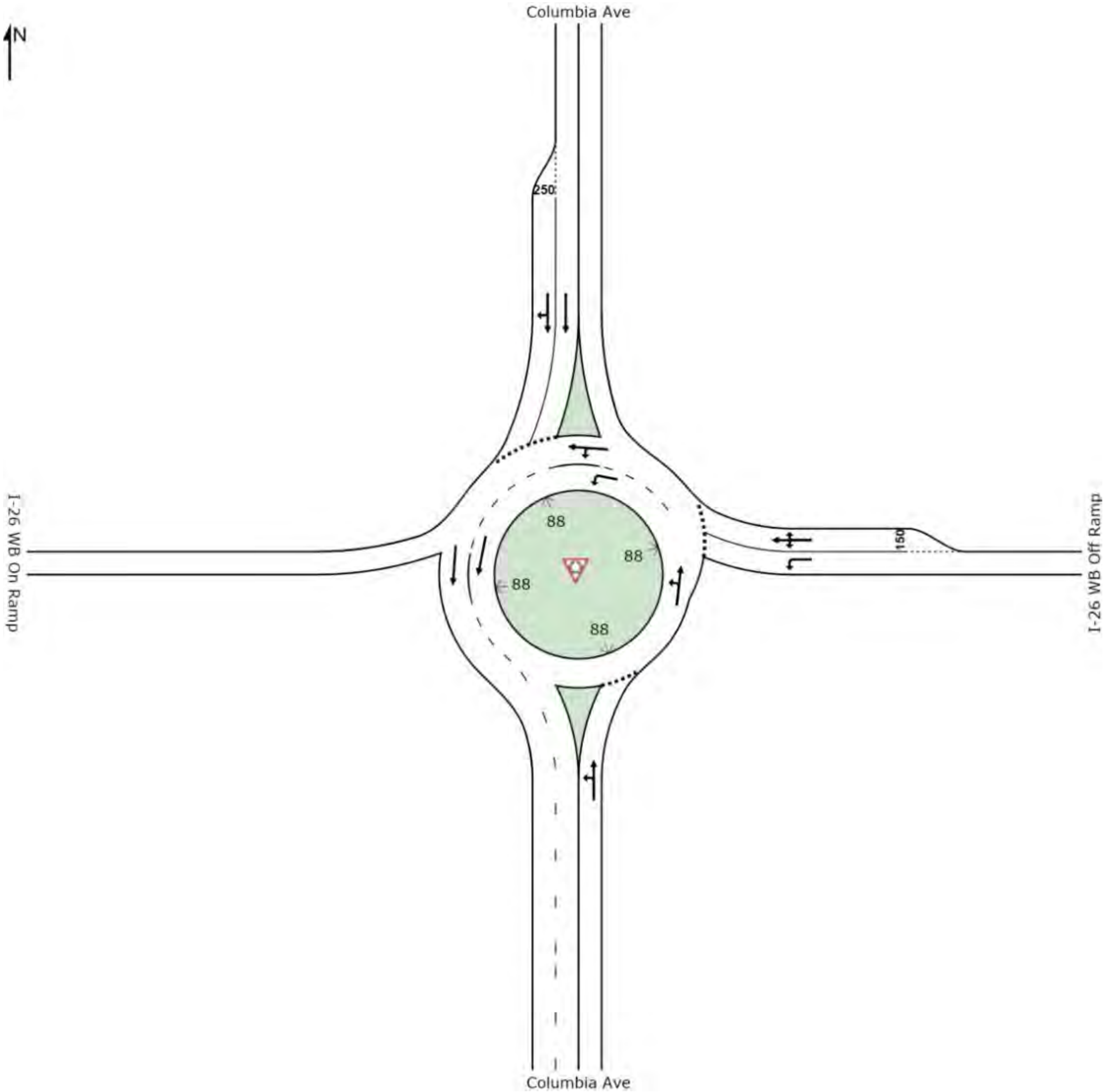
APPENDIX N

BUILD ALT 3 2020 AND 2040 SIDRA REPORTS

SITE LAYOUT

Site: I-26 WB Ramps 2020 AM - Alt 3

I-26 WB Ramps 2020 AM
Roundabout



INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

Site: I-26 WB Ramps 2020 AM - Alt 3

I-26 WB Ramps 2020 AM
Roundabout

Volume Display Method: Total and %

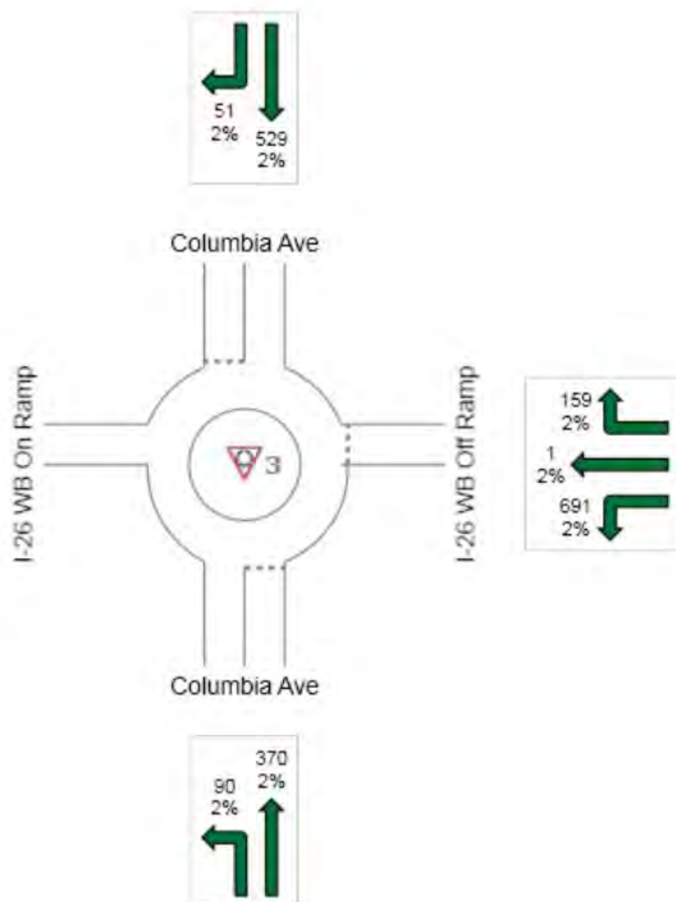
Volumes are shown for Movement Class(es): All Classes and Heavy Vehicles

Total Intersection Volumes (veh)

All Movement Classes: 1891

Light Vehicles (LV): 1853

Heavy Vehicles (HV): 38



SIDRA INTERSECTION 6

MOVEMENT SUMMARY

Site: I-26 WB Ramps 2020 AM - Alt 3

I-26 WB Ramps 2020 AM
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Columbia Ave											
3	L2	98	2.0	0.451	8.2	LOS A	0.0	0.0	0.00	0.00	26.0
8	T1	402	2.0	0.451	8.2	LOS A	0.0	0.0	0.00	0.00	25.5
Approach		500	2.0	0.451	8.2	LOS A	0.0	0.0	0.00	0.00	25.6
East: I-26 WB Off Ramp											
1	L2	751	2.0	0.695	20.3	LOS C	5.1	128.5	0.79	0.95	20.6
6	T1	1	2.0	0.695	20.3	LOS C	5.1	128.5	0.79	0.95	20.4
16	R2	173	2.0	0.695	20.3	LOS C	5.1	128.5	0.79	0.95	19.9
Approach		925	2.0	0.695	20.3	LOS C	5.1	128.5	0.79	0.95	20.4
North: Columbia Ave											
4	T1	575	2.0	0.533	15.5	LOS C	2.2	55.3	0.65	0.73	22.0
14	R2	55	2.0	0.533	15.2	LOS C	2.1	53.3	0.64	0.72	21.5
Approach		630	2.0	0.533	15.5	LOS C	2.2	55.3	0.65	0.73	22.0
All Vehicles		2055	2.0	0.695	15.9	LOS C	5.1	128.5	0.55	0.65	22.0

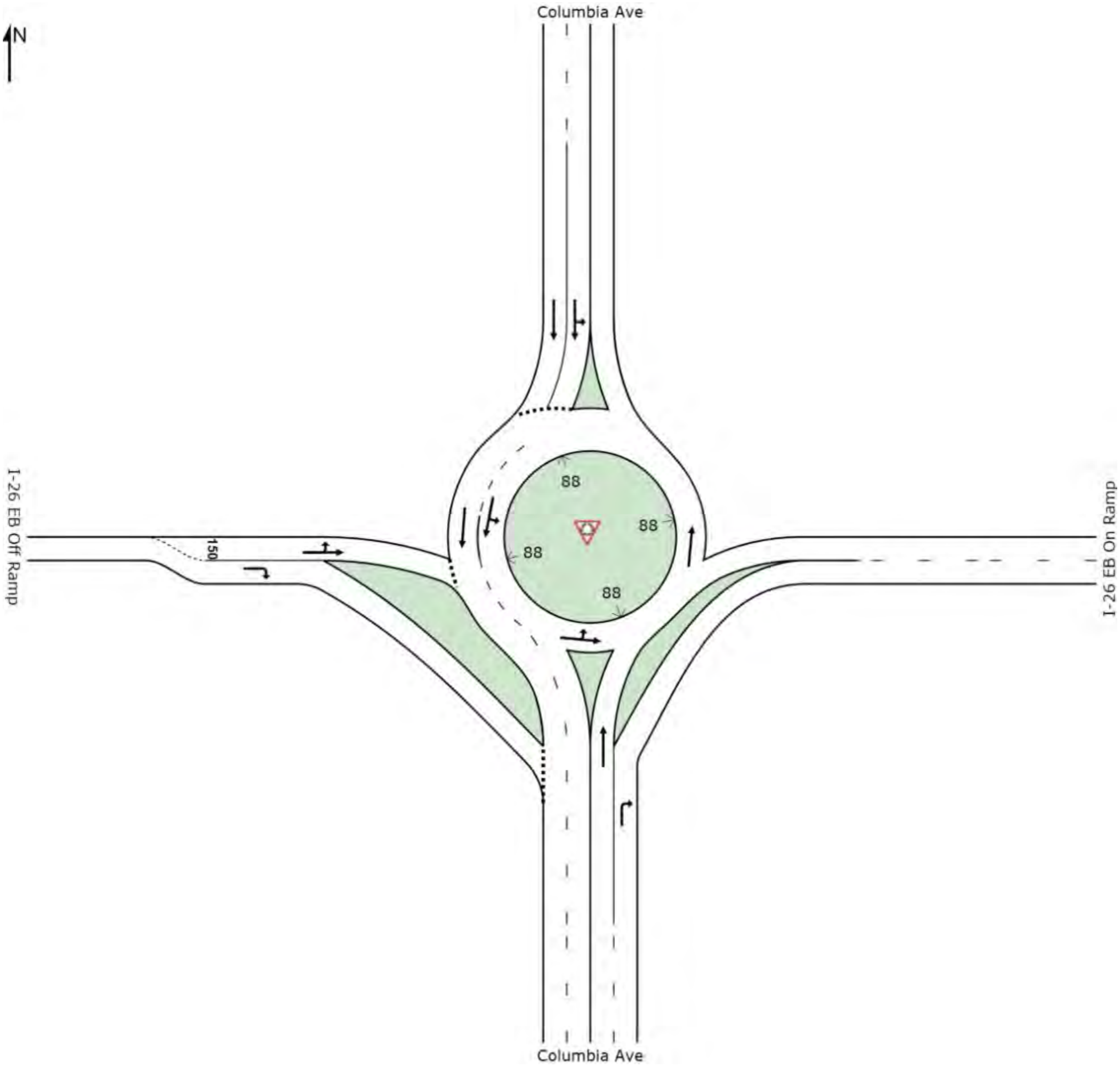
Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SIDRA INTERSECTION 6

SITE LAYOUT

Site: I-26 EB Ramps 2020 AM - Alt 3

I-26 EB Ramps 2020 AM
Roundabout



SIDRA INTERSECTION 6

INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

Site: I-26 EB Ramps 2020 AM - Alt 3

I-26 EB Ramps 2020 AM
Roundabout

Volume Display Method: Total and %

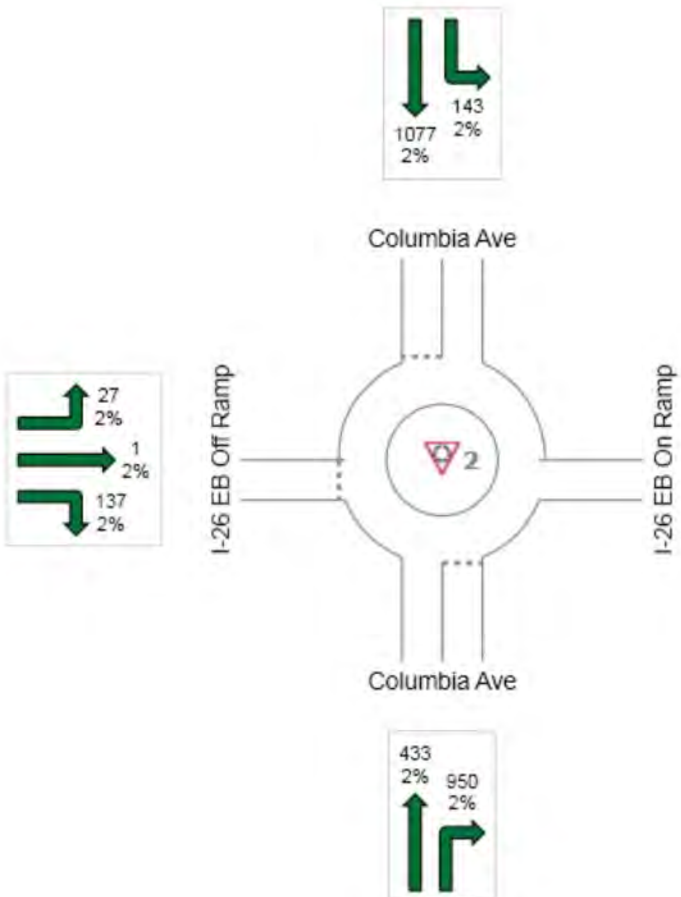
Volumes are shown for Movement Class(es): All Classes and Heavy Vehicles

Total Intersection Volumes (veh)

All Movement Classes: 2768

Light Vehicles (LV): 2713

Heavy Vehicles (HV): 55



MOVEMENT SUMMARY

Site: I-26 EB Ramps 2020 AM - Alt 3

I-26 EB Ramps 2020 AM
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Columbia Ave											
8	T1	471	2.0	0.243	0.0	LOS A	0.0	0.0	0.00	0.00	25.8
18	R2	1033	2.0	0.629	0.2	LOS A	0.0	0.0	0.00	0.00	25.0
Approach		1503	2.0	0.629	0.1	NA	0.0	0.0	0.00	0.00	25.2
North: Columbia Ave											
7	L2	155	2.0	0.598	11.0	LOS B	0.0	0.0	0.00	0.00	25.9
4	T1	1171	2.0	0.598	11.0	LOS B	0.0	0.0	0.00	0.00	25.7
Approach		1326	2.0	0.598	11.0	LOS B	0.0	0.0	0.00	0.00	25.7
West: I-26 EB Off Ramp											
5	L2	29	2.0	0.071	9.4	LOS A	0.2	4.4	0.63	0.63	22.6
2	T1	1	2.0	0.071	9.4	LOS A	0.2	4.4	0.63	0.63	22.3
12	R2	149	2.0	0.310	12.4	LOS B	0.9	22.8	0.65	0.68	22.0
Approach		179	2.0	0.310	11.9	LOS B	0.9	22.8	0.65	0.67	22.1
All Vehicles		3009	2.0	0.629	5.6	LOS A	0.9	22.8	0.04	0.04	25.2

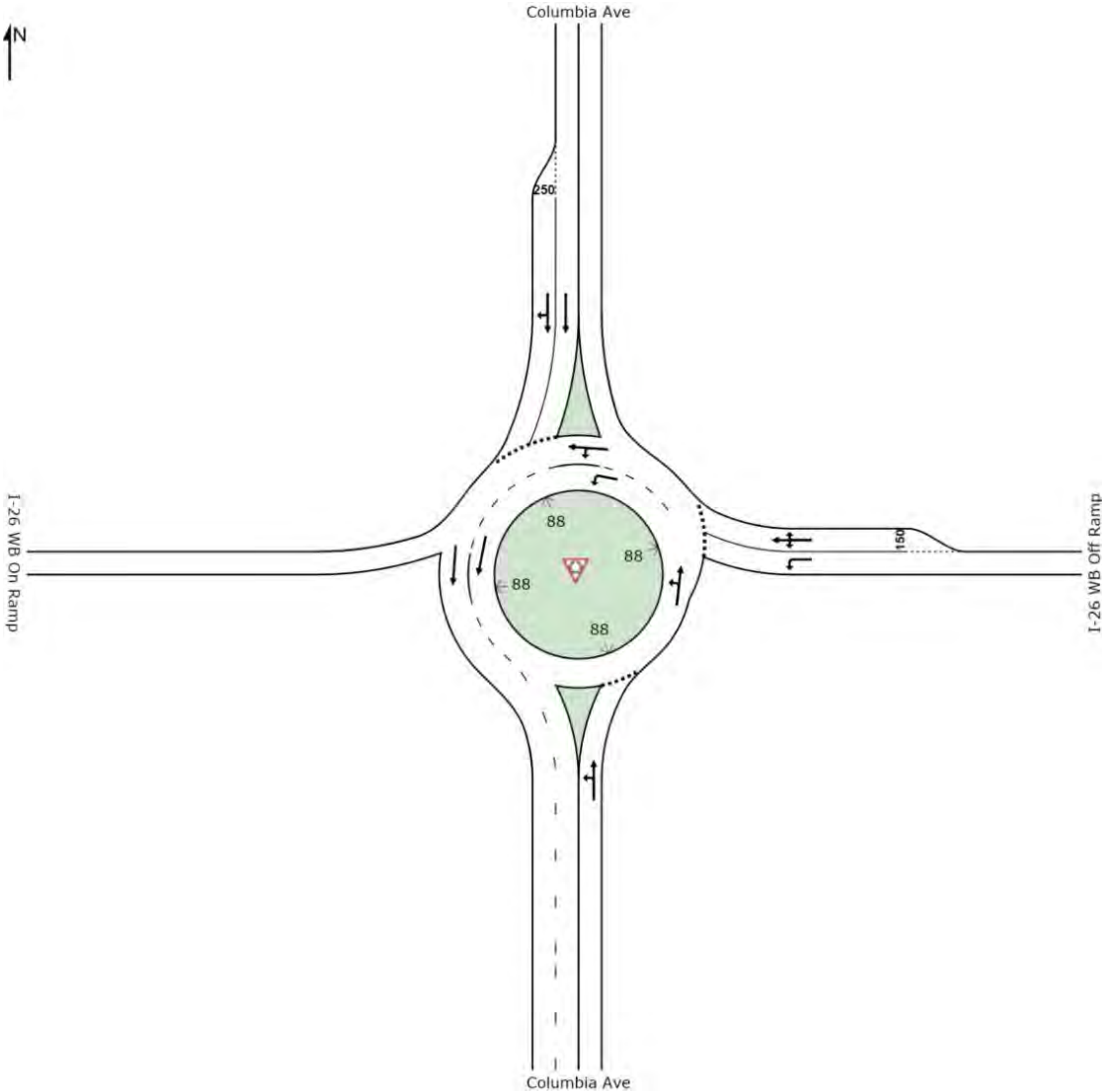
Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SIDRA INTERSECTION 6

SITE LAYOUT

Site: I-26 WB Ramps 2020 PM - Alt 3

I-26 WB Ramps 2042 PM
Roundabout



SIDRA INTERSECTION 6

INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

Site: I-26 WB Ramps 2020 PM - Alt 3

I-26 WB Ramps 2042 PM
Roundabout

Volume Display Method: Total and %

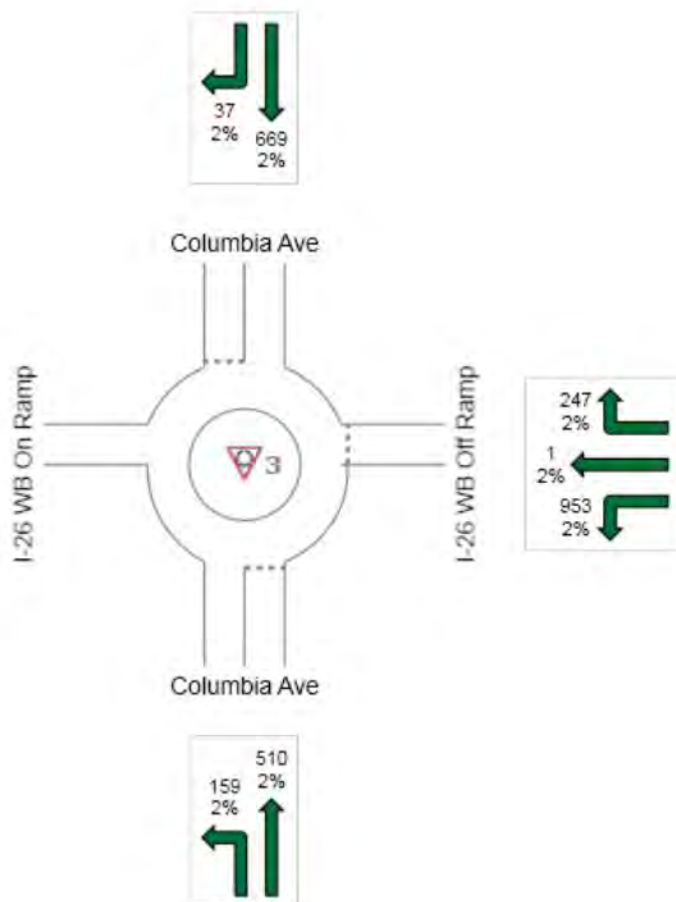
Volumes are shown for Movement Class(es): All Classes and Heavy Vehicles

Total Intersection Volumes (veh)

All Movement Classes: 2576

Light Vehicles (LV): 2524

Heavy Vehicles (HV): 52



MOVEMENT SUMMARY

Site: I-26 WB Ramps 2020 PM - Alt 3

I-26 WB Ramps 2042 PM
Roundabout

Movement Performance - Vehicles

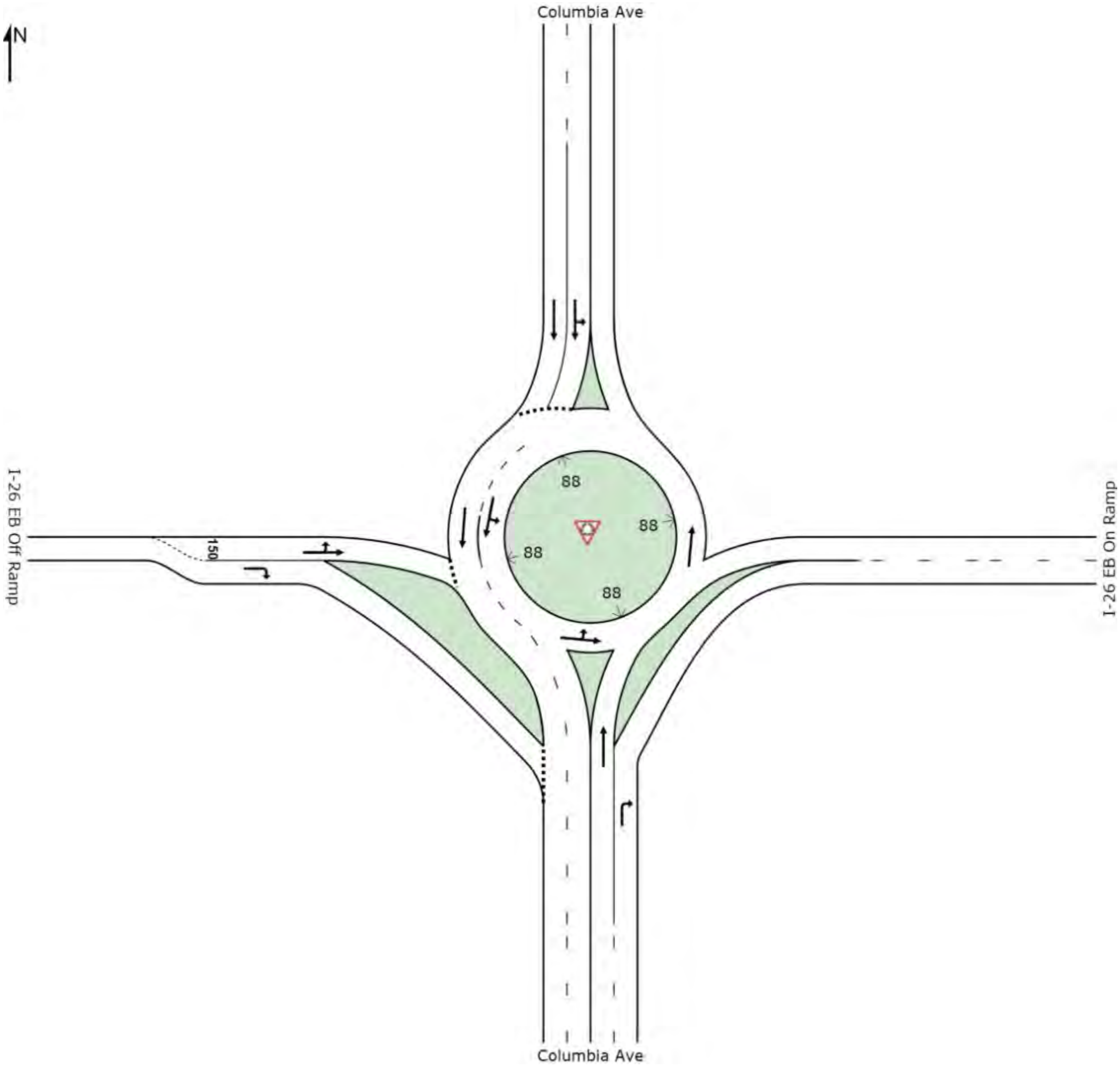
Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Columbia Ave											
3	L2	173	2.0	0.656	12.5	LOS B	0.0	0.0	0.00	0.00	25.9
8	T1	554	2.0	0.656	12.5	LOS B	0.0	0.0	0.00	0.00	25.4
Approach		727	2.0	0.656	12.5	LOS B	0.0	0.0	0.00	0.00	25.5
East: I-26 WB Off Ramp											
1	L2	1036	2.0	1.237	146.6	LOS F	50.2	1275.0	1.00	4.14	9.7
6	T1	1	2.0	1.237	146.6	LOS F	50.2	1275.0	1.00	4.14	9.6
16	R2	268	2.0	1.237	146.6	LOS F	50.2	1275.0	1.00	4.14	9.5
Approach		1305	2.0	1.237	146.6	LOS F	50.2	1275.0	1.00	4.14	9.6
North: Columbia Ave											
4	T1	727	2.0	0.731	27.0	LOS D	3.8	95.4	0.80	0.99	19.8
14	R2	40	2.0	0.731	26.4	LOS D	3.7	92.8	0.79	0.97	19.5
Approach		767	2.0	0.731	27.0	LOS D	3.8	95.4	0.80	0.99	19.8
All Vehicles		2800	2.0	1.237	79.0	LOS F	50.2	1275.0	0.68	2.20	13.8

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: I-26 EB Ramps 2020 PM - Alt 3

I-26 EB Ramps 2020 PM
Roundabout



SIDRA INTERSECTION 6

INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

Site: I-26 EB Ramps 2020 PM - Alt 3

I-26 EB Ramps 2020 PM
Roundabout

Volume Display Method: Total and %

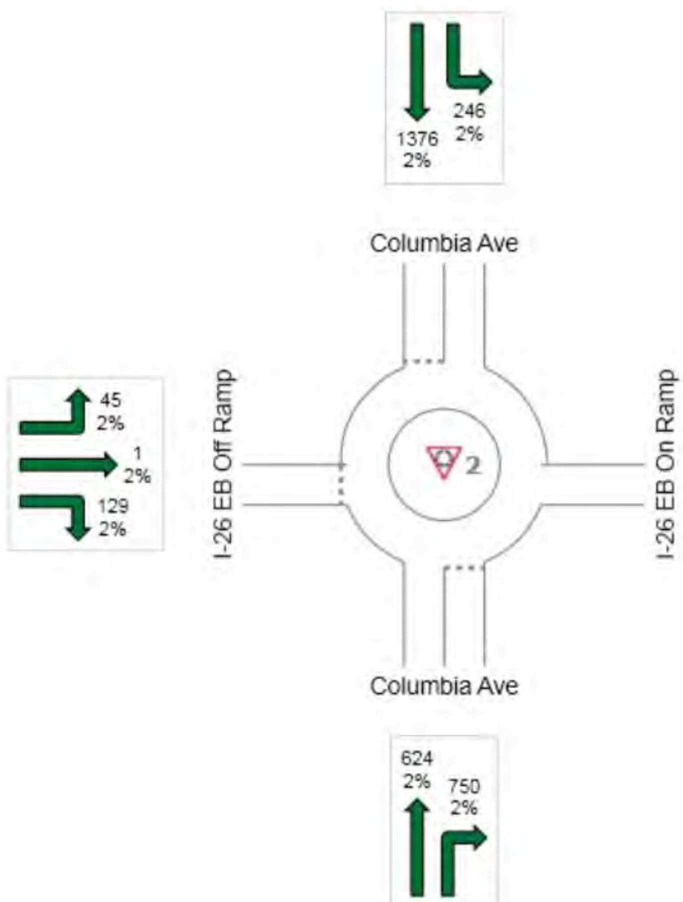
Volumes are shown for Movement Class(es): All Classes and Heavy Vehicles

Total Intersection Volumes (veh)

All Movement Classes: 3171

Light Vehicles (LV): 3108

Heavy Vehicles (HV): 63



MOVEMENT SUMMARY

Site: I-26 EB Ramps 2020 PM - Alt 3

I-26 EB Ramps 2020 PM
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Columbia Ave											
8	T1	678	2.0	0.350	0.0	LOS A	0.0	0.0	0.00	0.00	25.8
18	R2	815	2.0	0.497	0.1	LOS A	0.0	0.0	0.00	0.00	25.0
Approach		1493	2.0	0.497	0.1	NA	0.0	0.0	0.00	0.00	25.3
North: Columbia Ave											
7	L2	267	2.0	0.796	18.5	LOS C	0.0	0.0	0.00	0.00	25.8
4	T1	1496	2.0	0.796	18.5	LOS C	0.0	0.0	0.00	0.00	25.7
Approach		1763	2.0	0.796	18.5	LOS C	0.0	0.0	0.00	0.00	25.7
West: I-26 EB Off Ramp											
5	L2	49	2.0	0.159	14.4	LOS B	0.4	10.0	0.75	0.75	21.6
2	T1	1	2.0	0.159	14.4	LOS B	0.4	10.0	0.75	0.75	21.3
12	R2	140	2.0	0.368	16.7	LOS C	1.1	27.5	0.75	0.81	21.1
Approach		190	2.0	0.368	16.1	LOS C	1.1	27.5	0.75	0.79	21.2
All Vehicles		3447	2.0	0.796	10.4	LOS B	1.1	27.5	0.04	0.04	25.2

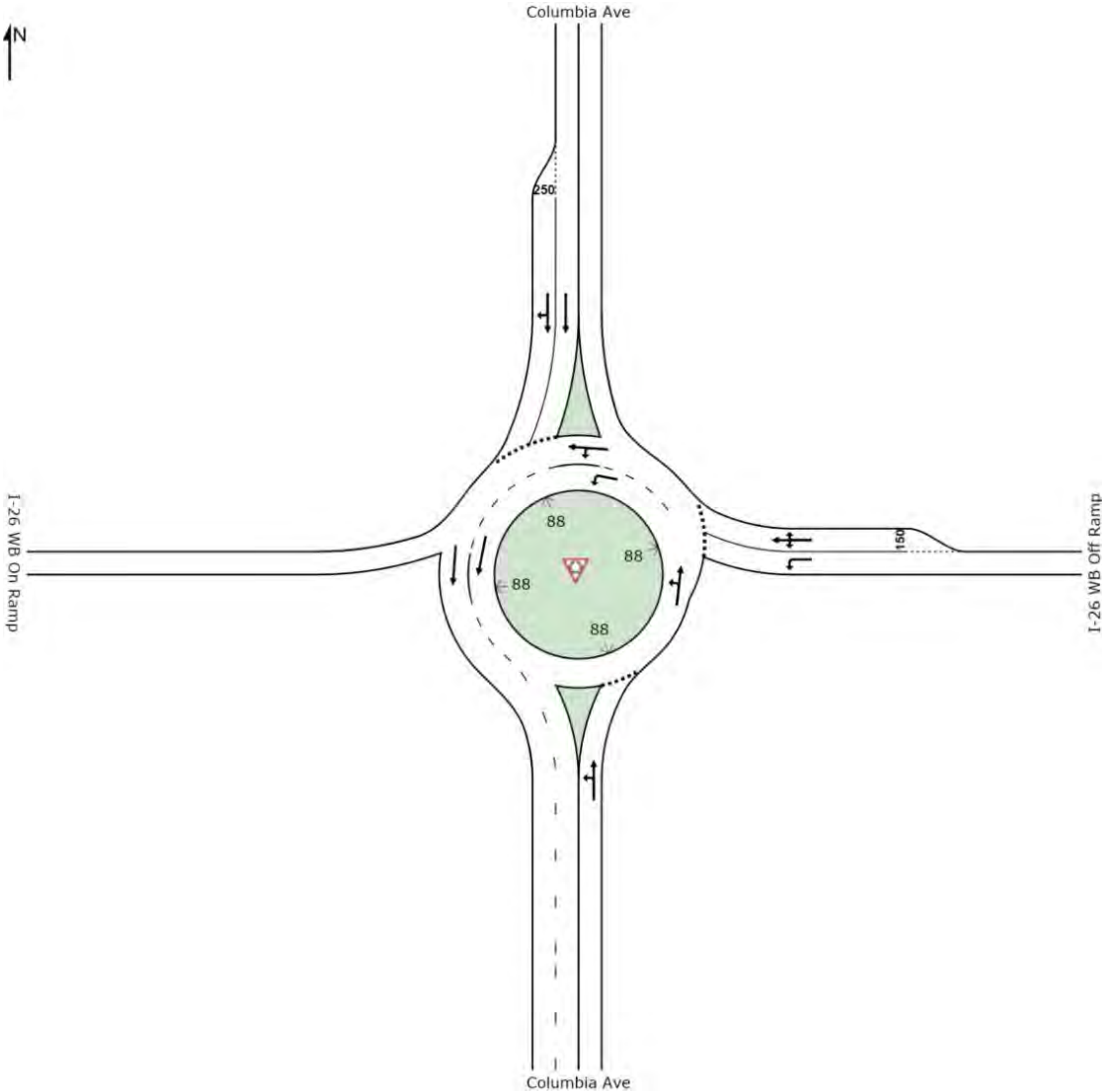
Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SIDRA INTERSECTION 6

SITE LAYOUT

Site: I-26 WB Ramps 2040 AM - Alt 3

I-26 WB Ramps 2040 AM
Roundabout



Created: Monday, November 28, 2016 3:22:02 PM
SIDRA INTERSECTION 6.0.24.4877

Project: Z:\IMR\Sidra\I-26 at Columbia Avenue IMR Final.sip6
8003941, 6023379, AECOM, PLUS / 1PC

INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

Site: I-26 WB Ramps 2040 AM - Alt 3

I-26 WB Ramps 2040 AM
Roundabout

Volume Display Method: Total and %

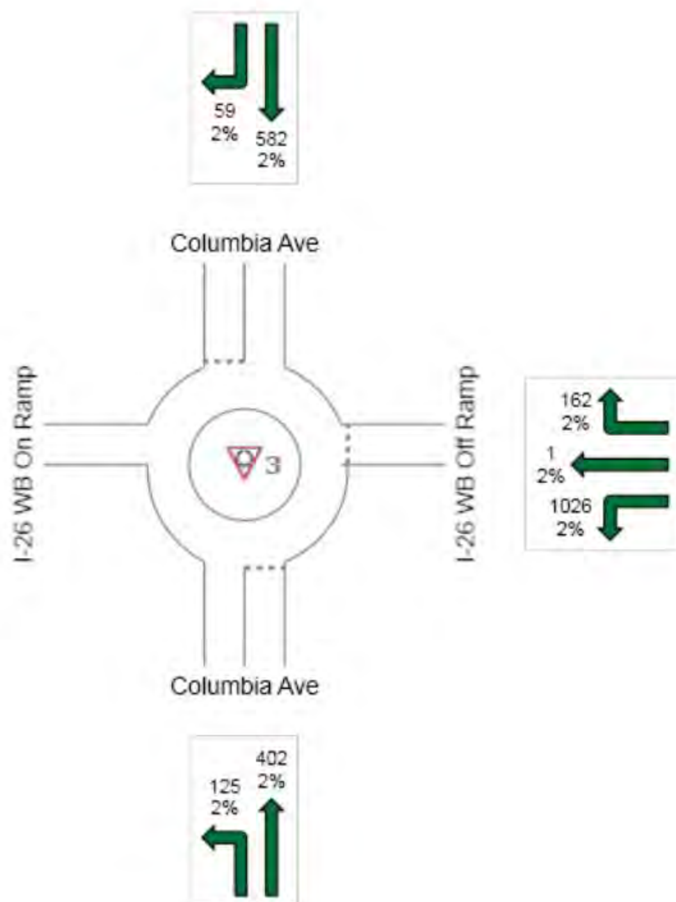
Volumes are shown for Movement Class(es): All Classes and Heavy Vehicles

Total Intersection Volumes (veh)

All Movement Classes: 2357

Light Vehicles (LV): 2310

Heavy Vehicles (HV): 47



SIDRA INTERSECTION 6

MOVEMENT SUMMARY

Site: I-26 WB Ramps 2040 AM - Alt 3

I-26 WB Ramps 2040 AM
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Columbia Ave											
3	L2	136	2.0	0.517	9.3	LOS A	0.0	0.0	0.00	0.00	25.9
8	T1	437	2.0	0.517	9.3	LOS A	0.0	0.0	0.00	0.00	25.4
Approach		573	2.0	0.517	9.3	LOS A	0.0	0.0	0.00	0.00	25.5
East: I-26 WB Off Ramp											
1	L2	1115	2.0	1.046	74.6	LOS F	25.7	653.2	1.00	2.42	13.9
6	T1	1	2.0	1.046	74.6	LOS F	25.7	653.2	1.00	2.42	13.7
16	R2	176	2.0	1.046	74.6	LOS F	25.7	653.2	1.00	2.42	13.5
Approach		1292	2.0	1.046	74.6	LOS F	25.7	653.2	1.00	2.42	13.8
North: Columbia Ave											
4	T1	633	2.0	0.765	33.2	LOS D	3.9	98.1	0.85	1.08	18.8
14	R2	64	2.0	0.765	32.4	LOS D	3.8	95.9	0.84	1.07	18.5
Approach		697	2.0	0.765	33.1	LOS D	3.9	98.1	0.85	1.08	18.8
All Vehicles		2562	2.0	1.046	48.7	LOS E	25.7	653.2	0.74	1.52	16.7

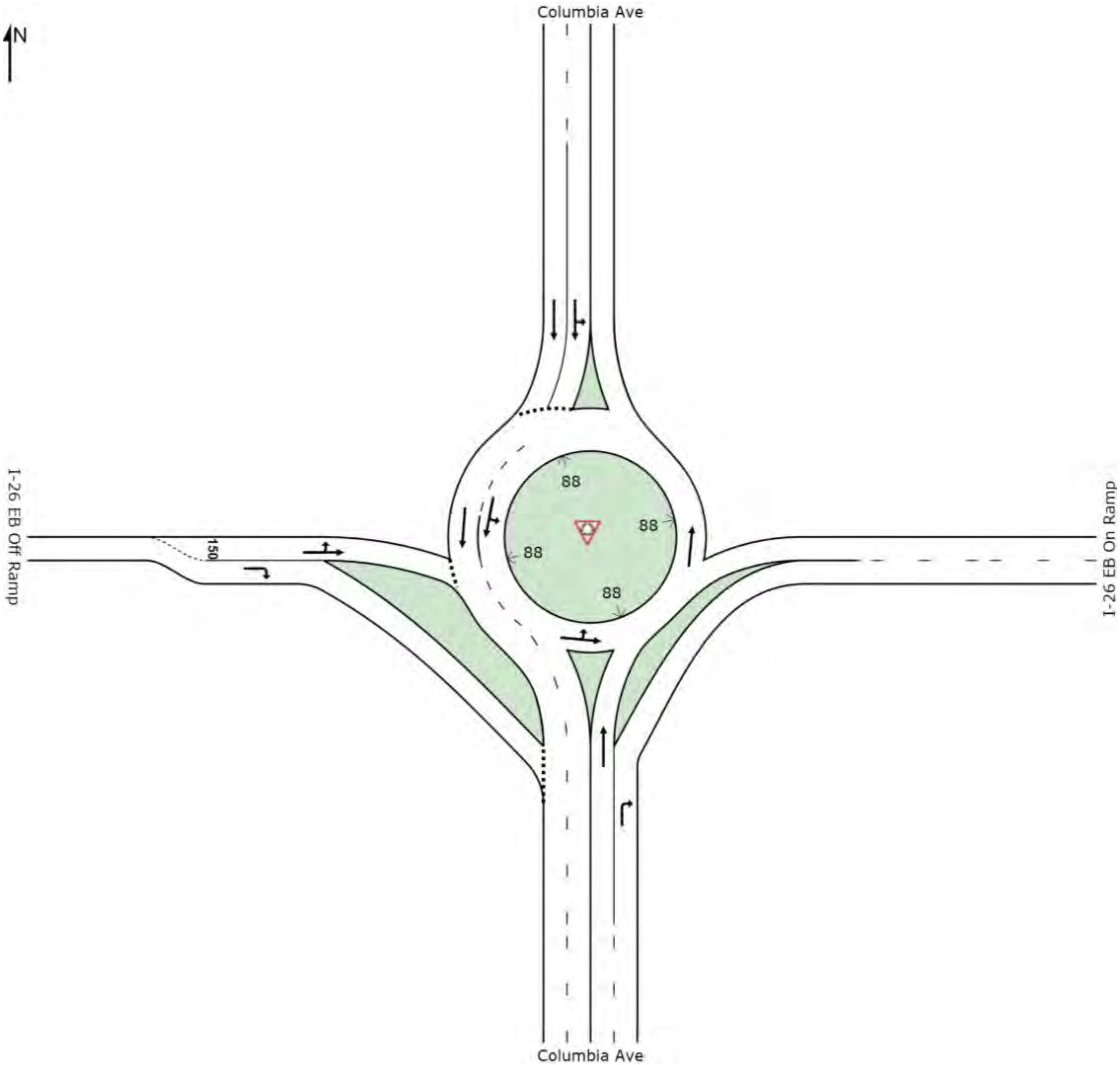
Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SIDRA INTERSECTION 6

SITE LAYOUT

Site: I-26 EB Ramps 2040 AM - Alt 3

I-26 EB Ramps 2040 AM
Roundabout



INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

Site: I-26 EB Ramps 2040 AM - Alt 3

I-26 EB Ramps 2040 AM
Roundabout

Volume Display Method: Total and %

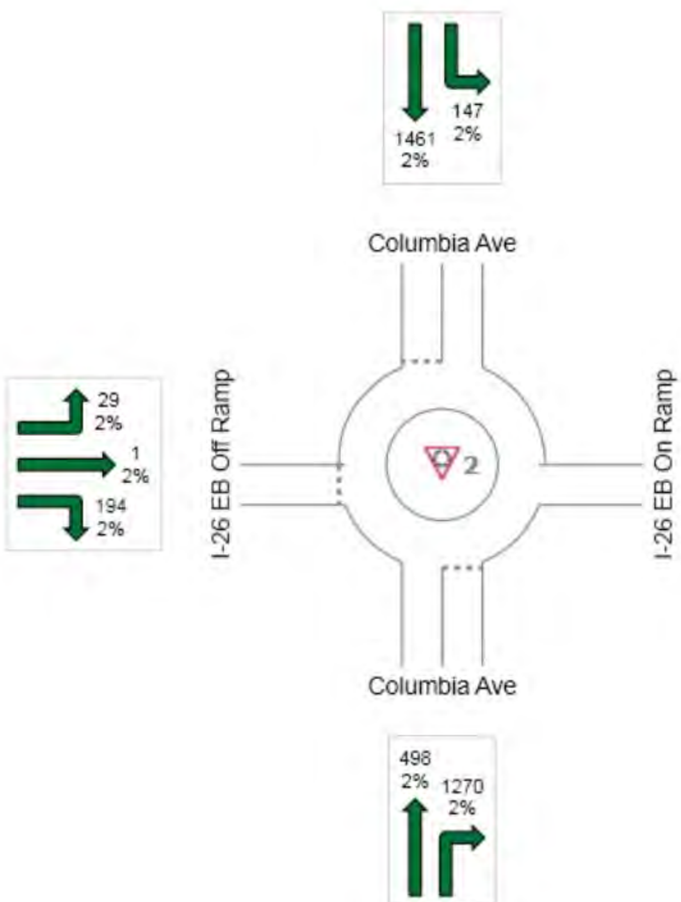
Volumes are shown for Movement Class(es): All Classes and Heavy Vehicles

Total Intersection Volumes (veh)

All Movement Classes: 3600

Light Vehicles (LV): 3528

Heavy Vehicles (HV): 72



MOVEMENT SUMMARY

Site: I-26 EB Ramps 2040 AM - Alt 3

I-26 EB Ramps 2040 AM
Roundabout

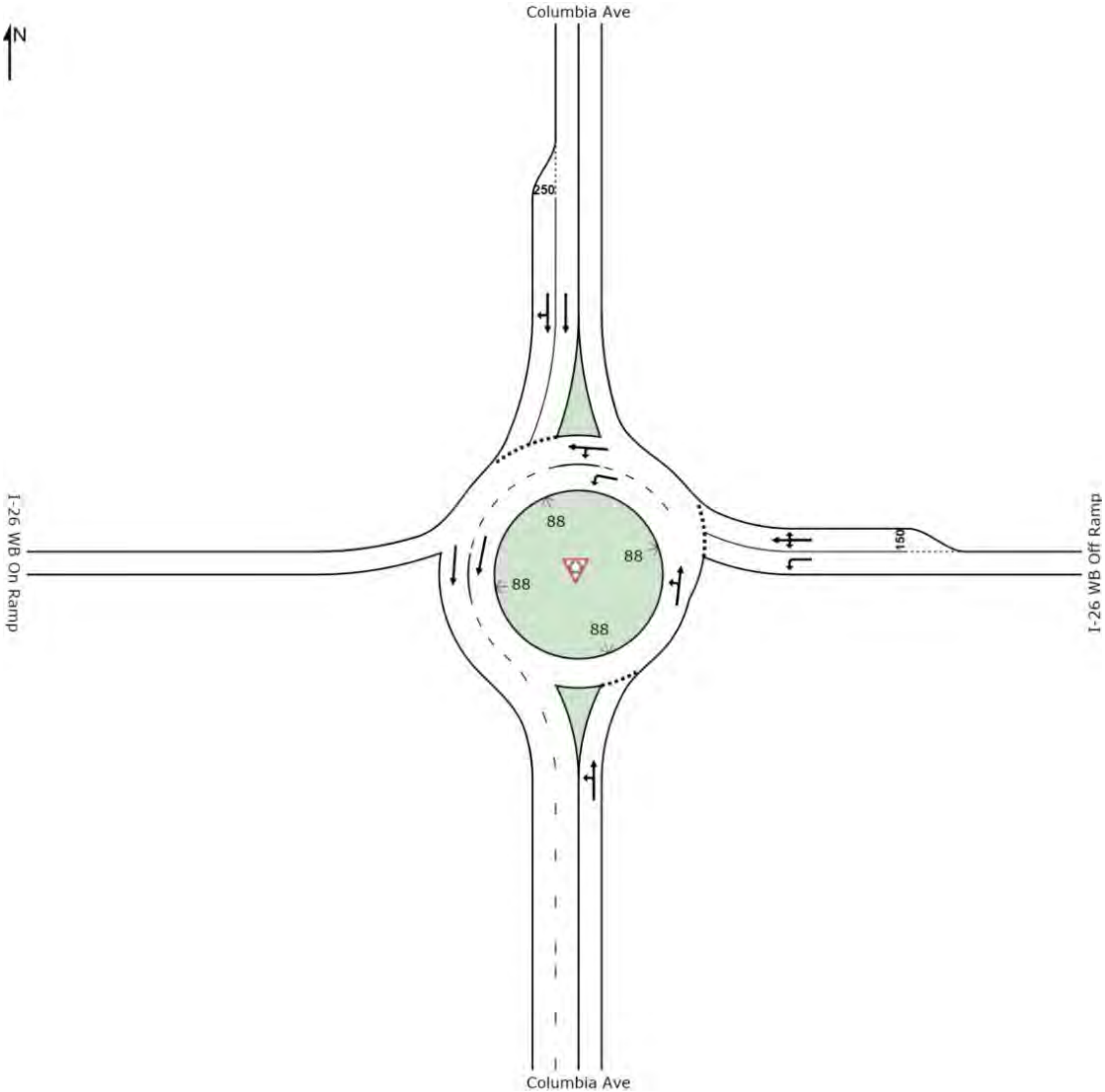
Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Columbia Ave											
8	T1	541	2.0	0.279	0.0	LOS A	0.0	0.0	0.00	0.00	25.8
18	R2	1380	2.0	0.841	0.5	LOS A	0.0	0.0	0.00	0.00	24.8
Approach		1922	2.0	0.841	0.4	NA	0.0	0.0	0.00	0.00	25.1
North: Columbia Ave											
7	L2	160	2.0	0.789	18.1	LOS C	0.0	0.0	0.00	0.00	26.0
4	T1	1588	2.0	0.789	18.1	LOS C	0.0	0.0	0.00	0.00	25.7
Approach		1748	2.0	0.789	18.1	LOS C	0.0	0.0	0.00	0.00	25.8
West: I-26 EB Off Ramp											
5	L2	32	2.0	0.103	13.1	LOS B	0.2	6.3	0.73	0.73	21.8
2	T1	1	2.0	0.103	13.1	LOS B	0.2	6.3	0.73	0.73	21.6
12	R2	211	2.0	0.592	26.7	LOS D	2.1	52.5	0.83	0.96	19.3
Approach		243	2.0	0.592	24.9	LOS C	2.1	52.5	0.82	0.93	19.6
All Vehicles		3913	2.0	0.841	9.8	LOS A	2.1	52.5	0.05	0.06	24.9

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: I-26 WB Ramps 2040 PM - Alt 3

I-26 WB Ramps 2040 PM
Roundabout



SIDRA INTERSECTION 6

INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

Site: I-26 WB Ramps 2040 PM - Alt 3

I-26 WB Ramps 2040 PM
Roundabout

Volume Display Method: Total and %

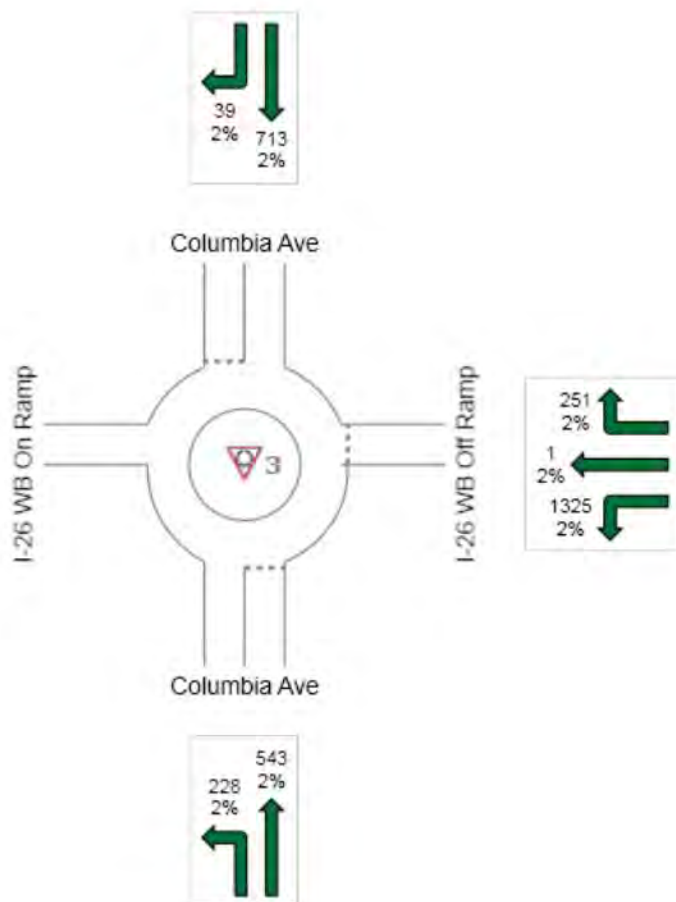
Volumes are shown for Movement Class(es): All Classes and Heavy Vehicles

Total Intersection Volumes (veh)

All Movement Classes: 3100

Light Vehicles (LV): 3038

Heavy Vehicles (HV): 62



MOVEMENT SUMMARY

Site: I-26 WB Ramps 2040 PM - Alt 3

I-26 WB Ramps 2040 PM
Roundabout

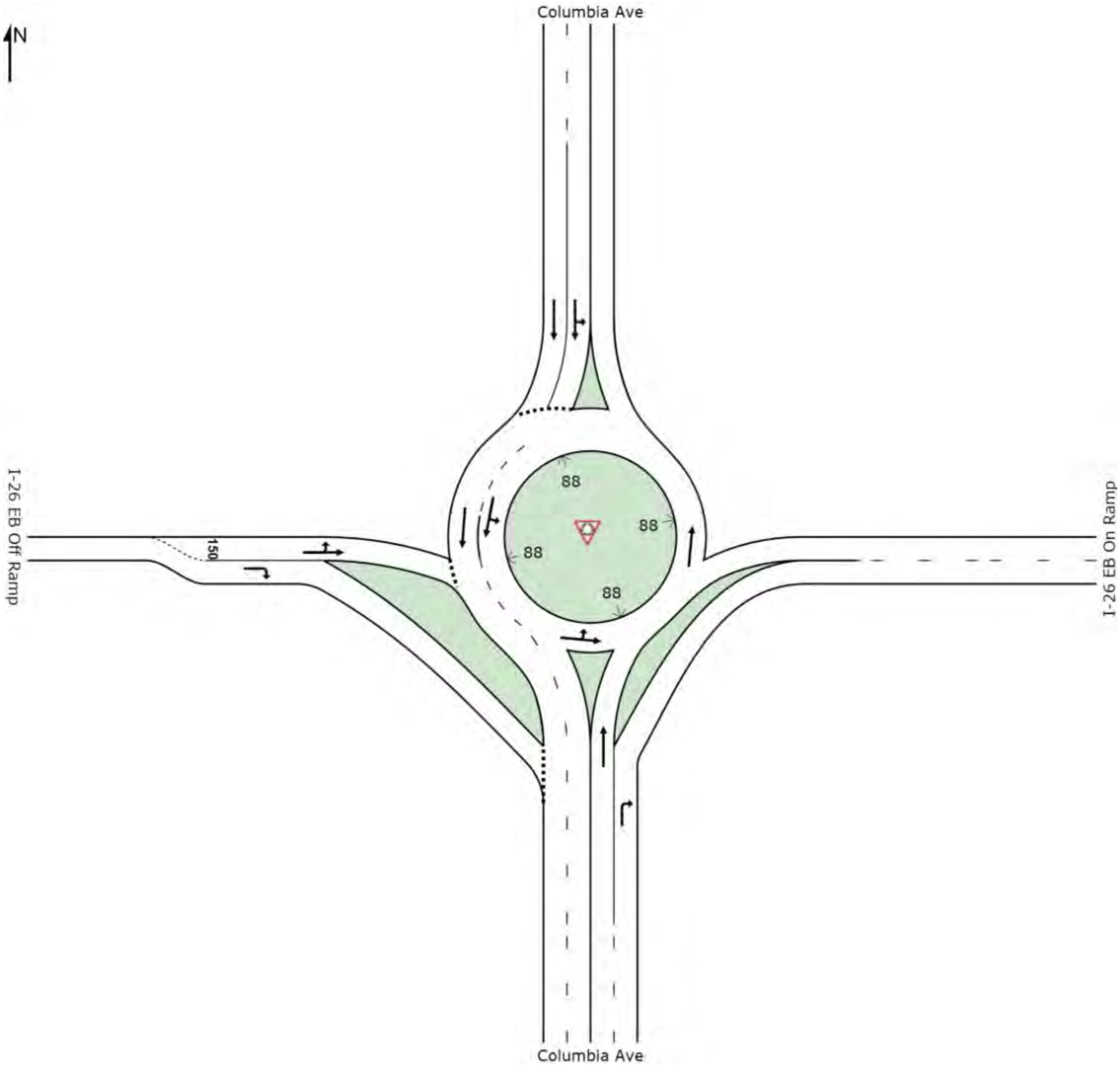
Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Columbia Ave											
3	L2	248	2.0	0.756	16.3	LOS C	0.0	0.0	0.00	0.00	25.9
8	T1	590	2.0	0.756	16.3	LOS C	0.0	0.0	0.00	0.00	25.3
Approach		838	2.0	0.756	16.3	LOS C	0.0	0.0	0.00	0.00	25.5
East: I-26 WB Off Ramp											
1	L2	1440	2.0	1.819	397.3	LOS F	131.7	3345.1	1.00	7.42	4.7
6	T1	1	2.0	1.819	397.3	LOS F	131.7	3345.1	1.00	7.42	4.7
16	R2	273	2.0	1.819	397.3	LOS F	131.7	3345.1	1.00	7.42	4.7
Approach		1714	2.0	1.819	397.3	LOS F	131.7	3345.1	1.00	7.42	4.7
North: Columbia Ave											
4	T1	775	2.0	0.796	33.1	LOS D	4.6	116.5	0.84	1.10	18.8
14	R2	42	2.0	0.796	32.4	LOS D	4.5	113.6	0.83	1.08	18.5
Approach		817	2.0	0.796	33.0	LOS D	4.6	116.5	0.84	1.10	18.8
All Vehicles		3370	2.0	1.819	214.2	LOS F	131.7	3345.1	0.71	4.04	7.6

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: I-26 EB Ramps 2040 PM - Alt 3

I-26 EB Ramps 2040 PM
Roundabout



Created: Monday, November 28, 2016 3:28:39 PM
SIDRA INTERSECTION 6.0.24.4877
Project: Z:\IMR\Sidra\I-26 at Columbia Avenue IMR Final.sip6
8003941, 6023379, AECOM, PLUS / 1PC

SIDRA INTERSECTION 6

INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

Site: I-26 EB Ramps 2040 PM - Alt 3

I-26 EB Ramps 2040 PM
Roundabout

Volume Display Method: Total and %

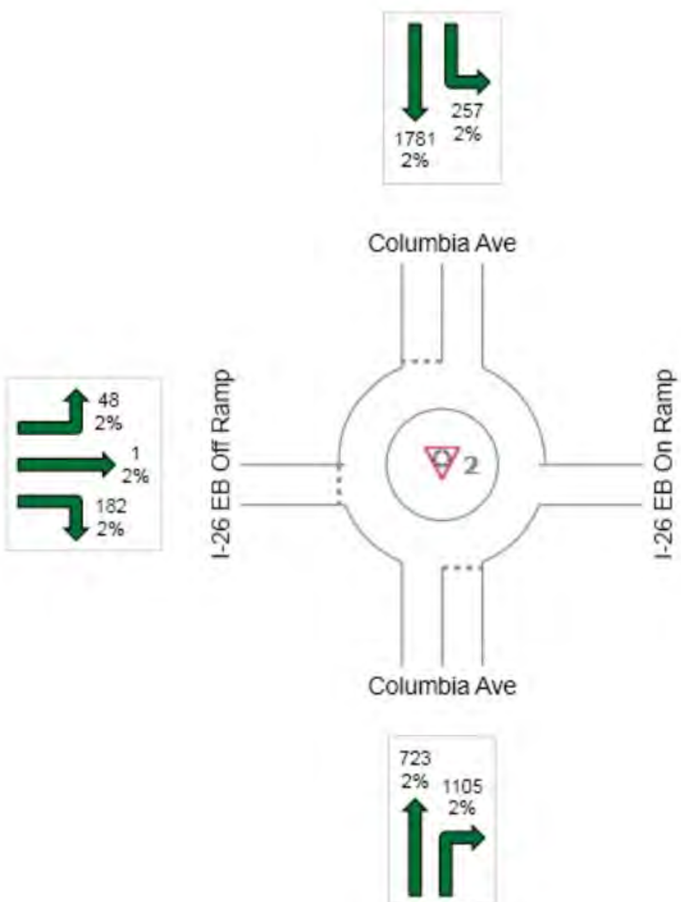
Volumes are shown for Movement Class(es): All Classes and Heavy Vehicles

Total Intersection Volumes (veh)

All Movement Classes: 4097

Light Vehicles (LV): 4015

Heavy Vehicles (HV): 82



MOVEMENT SUMMARY

Site: I-26 EB Ramps 2040 PM - Alt 3

I-26 EB Ramps 2040 PM
Roundabout

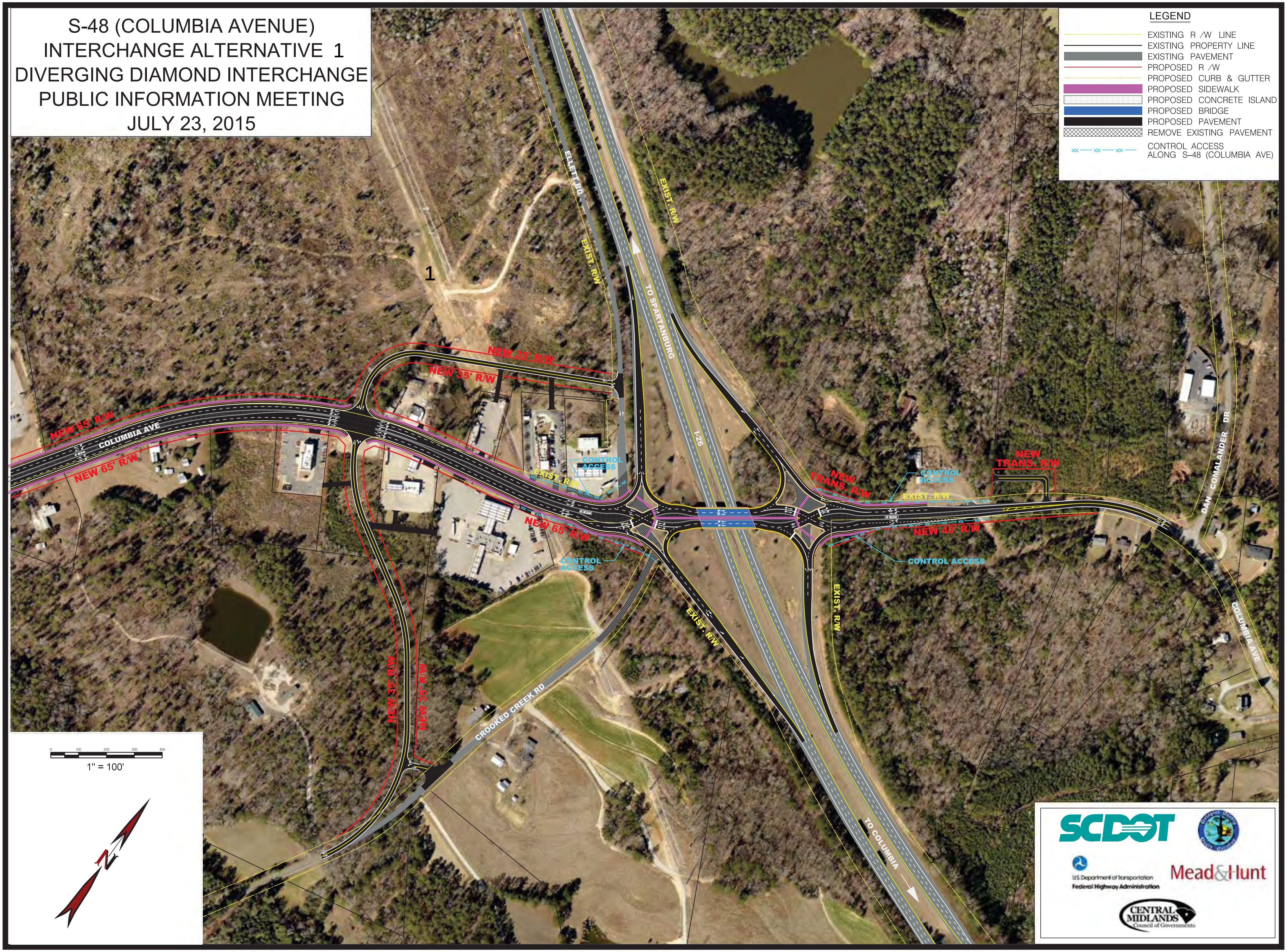
Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Columbia Ave											
8	T1	786	2.0	0.406	0.1	LOS A	0.0	0.0	0.00	0.00	25.7
18	R2	1201	2.0	0.732	0.3	LOS A	0.0	0.0	0.00	0.00	24.9
Approach		1987	2.0	0.732	0.2	NA	0.0	0.0	0.00	0.00	25.2
North: Columbia Ave											
7	L2	279	2.0	1.000	46.4	LOS E	0.0	0.0	1.00	0.04	17.0
4	T1	1936	2.0	1.000	46.4	LOS E	0.0	0.0	1.00	0.04	16.9
Approach		2215	2.0	1.000	46.4	LOS E	0.0	0.0	1.00	0.04	16.9
West: I-26 EB Off Ramp											
5	L2	52	2.0	0.234	21.7	LOS C	0.6	14.8	0.83	0.86	20.2
2	T1	1	2.0	0.234	21.7	LOS C	0.6	14.8	0.83	0.86	19.9
12	R2	198	2.0	0.711	43.0	LOS E	2.6	66.0	0.91	1.11	16.9
Approach		251	2.0	0.711	38.5	LOS E	2.6	66.0	0.89	1.06	17.5
All Vehicles		4453	2.0	1.000	25.4	LOS D	2.6	66.0	0.55	0.08	19.8

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

APPENDIX O

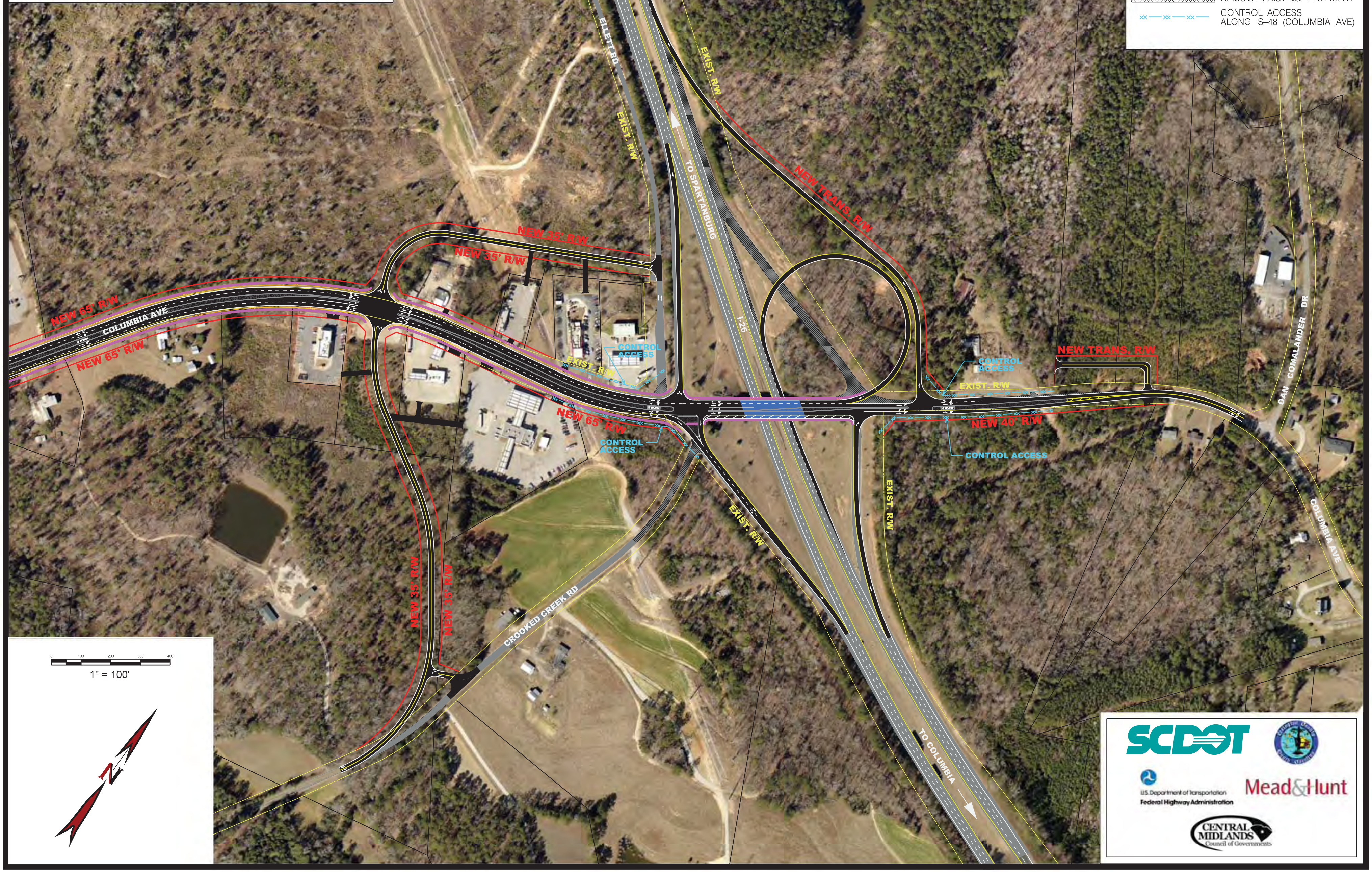
ALTERNATIVE 1, 2, & 3 CONCEPTUAL DESIGNS

S-48 (COLUMBIA AVENUE) INTERCHANGE ALTERNATIVE 1 DIVERGING DIAMOND INTERCHANGE PUBLIC INFORMATION MEETING JULY 23, 2015



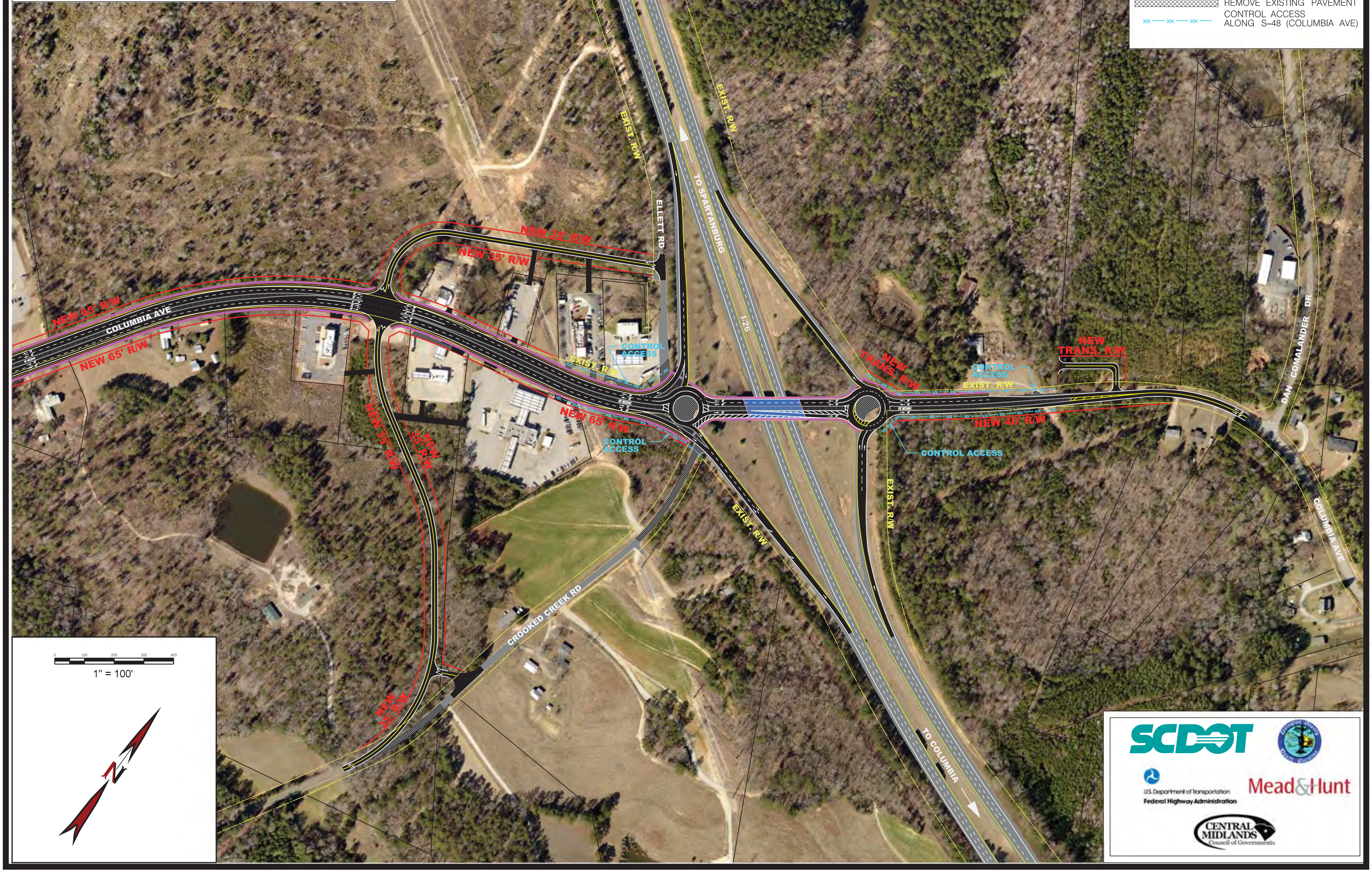
ALL RIGHT-OF-WAY (R/W) SHOWN IS PROPOSED AND SUBJECT TO CHANGE

S-48 (COLUMBIA AVENUE) INTERCHANGE ALTERNATIVE 2 PARTIAL CLOVERLEAF PUBLIC INFORMATION MEETING JULY 23, 2015



ALL RIGHT-OF-WAY (R/W) SHOWN IS PROPOSED AND SUBJECT TO CHANGE

S-48 (COLUMBIA AVENUE) INTERCHANGE ALTERNATIVE 3 DUAL ROUNDABOUT PUBLIC INFORMATION MEETING JULY 23, 2015



ALL RIGHT-OF-WAY (R/W) SHOWN IS PROPOSED AND SUBJECT TO CHANGE

Appendix C

Farmland Impact Conversion Rating Form

U.S. DEPARTMENT OF AGRICULTURE
Natural Resources Conservation Service

NRCS-CPA-106
(Rev. 1-91)

FARMLAND CONVERSION IMPACT RATING FOR CORRIDOR TYPE PROJECTS

PART I *(To be completed by Federal Agency)*	3. Date of Land Evaluation Request **8/22/16** — 4. Sheet 1 of **1**
1. Name of Project **S-48 (Columbia Avenue) Improvement**	5. Federal Agency Involved **US Federal Highway Administration / SCDOT**
2. Type of Project **New Loc, Widening, & Interchange Improve.**	6. County and State **Lexington County, SC**
PART II *(To be completed by NRCS)*	1. Date Request Received by NRCS — 2. Person Completing Form
3. Does the corridor contain prime, unique statewide or local important farmland? (If no, the FPPA does not apply - Do not complete additional parts of this form). YES ☐ NO ☐	4. Acres Irrigated — Average Farm Size
5. Major Crop(s) — 6. Farmable Land in Government Jurisdiction Acres: %	7. Amount of Farmland As Defined in FPPA Acres: %
8. Name Of Land Evaluation System Used — 9. Name of Local Site Assessment System	10. Date Land Evaluation Returned by NRCS

PART III *(To be completed by Federal Agency)*		Alternative Corridor For Segment ________			
		Corridor A	Corridor B	Corridor C	Corridor D
A. Total Acres To Be Converted Directly		48			
B. Total Acres To Be Converted Indirectly, Or To Receive Services		0			
C. Total Acres In Corridor		48	0	0	0
PART IV *(To be completed by NRCS)* **Land Evaluation Information**					
A. Total Acres Prime And Unique Farmland					
B. Total Acres Statewide And Local Important Farmland					
C. Percentage Of Farmland in County Or Local Govt. Unit To Be Converted					
D. Percentage Of Farmland in Govt. Jurisdiction With Same Or Higher Relative Value					
PART V ***(To be completed by NRCS) Land Evaluation Information Criterion Relative value of Farmland to Be Serviced or Converted (Scale of 0 - 100 Points)***		100			
PART VI ***(To be completed by Federal Agency) Corridor Assessment Criteria (These criteria are explained in 7 CFR 658.5(c))***	**Maximum Points**				
1. Area in Nonurban Use	15	11			
2. Perimeter in Nonurban Use	10	5			
3. Percent Of Corridor Being Farmed	20	0			
4. Protection Provided By State And Local Government	20	0			
5. Size of Present Farm Unit Compared To Average	10	0			
6. Creation Of Nonfarmable Farmland	25	0			
7. Availablility Of Farm Support Services	5	5			
8. On-Farm Investments	20	0			
9. Effects Of Conversion On Farm Support Services	25	0			
10. Compatibility With Existing Agricultural Use	10	5			
TOTAL CORRIDOR ASSESSMENT POINTS	160	26	0	0	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland (From Part V)	100	100			
Total Corridor Assessment (From Part VI above or a local site assessment)	160	26	0	0	0
TOTAL POINTS *(Total of above 2 lines)*	260	126	0	0	0

1. Corridor Selected:	2. Total Acres of Farmlands to be Converted by Project:	3. Date Of Selection:	4. Was A Local Site Assessment Used?
Corridor A	48.1	8/22/16	YES ☐ NO ☐

5. Reason For Selection:

Signature of Person Completing this Part: Matt DeWitt

DATE 08/22/2016

NOTE: Complete a form for each segment with more than one Alternate Corridor

CORRIDOR - TYPE SITE ASSESSMENT CRITERIA

The following criteria are to be used for projects that have a linear or corridor - type site configuration connecting two distant points, and crossing several different tracts of land. These include utility lines, highways, railroads, stream improvements, and flood control systems. Federal agencies are to assess the suitability of each corridor - type site or design alternative for protection as farmland along with the land evaluation information.

(1) How much land is in nonurban use within a radius of 1.0 mile from where the project is intended?
More than 90 percent - 15 points
90 to 20 percent - 14 to 1 point(s)
Less than 20 percent - 0 points

(2) How much of the perimeter of the site borders on land in nonurban use?
More than 90 percent - 10 points
90 to 20 percent - 9 to 1 point(s)
Less than 20 percent - 0 points

(3) How much of the site has been farmed (managed for a scheduled harvest or timber activity) more than five of the last 10 years?
More than 90 percent - 20 points
90 to 20 percent - 19 to 1 point(s)
Less than 20 percent - 0 points

(4) Is the site subject to state or unit of local government policies or programs to protect farmland or covered by private programs to protect farmland?
Site is protected - 20 points
Site is not protected - 0 points

(5) Is the farm unit(s) containing the site (before the project) as large as the average - size farming unit in the County ? (Average farm sizes in each county are available from the NRCS field offices in each state. Data are from the latest available Census of Agriculture, Acreage or Farm Units in Operation with $1,000 or more in sales.)
As large or larger - 10 points
Below average - deduct 1 point for each 5 percent below the average, down to 0 points if 50 percent or more below average - 9 to 0 points

(6) If the site is chosen for the project, how much of the remaining land on the farm will become non-farmable because of interference with land patterns?
Acreage equal to more than 25 percent of acres directly converted by the project - 25 points
Acreage equal to between 25 and 5 percent of the acres directly converted by the project - 1 to 24 point(s)
Acreage equal to less than 5 percent of the acres directly converted by the project - 0 points

(7) Does the site have available adequate supply of farm support services and markets, i.e., farm suppliers, equipment dealers, processing and storage facilities and farmer's markets?
All required services are available - 5 points
Some required services are available - 4 to 1 point(s)
No required services are available - 0 points

(8) Does the site have substantial and well-maintained on-farm investments such as barns, other storage building, fruit trees and vines, field terraces, drainage, irrigation, waterways, or other soil and water conservation measures?
High amount of on-farm investment - 20 points
Moderate amount of on-farm investment - 19 to 1 point(s)
No on-farm investment - 0 points

(9) Would the project at this site, by converting farmland to nonagricultural use, reduce the demand for farm support services so as to jeopardize the continued existence of these support services and thus, the viability of the farms remaining in the area?
Substantial reduction in demand for support services if the site is converted - 25 points
Some reduction in demand for support services if the site is converted - 1 to 24 point(s)
No significant reduction in demand for support services if the site is converted - 0 points

(10) Is the kind and intensity of the proposed use of the site sufficiently incompatible with agriculture that it is likely to contribute to the eventual conversion of surrounding farmland to nonagricultural use?
Proposed project is incompatible to existing agricultural use of surrounding farmland - 10 points
Proposed project is tolerable to existing agricultural use of surrounding farmland - 9 to 1 point(s)
Proposed project is fully compatible with existing agricultural use of surrounding farmland - 0 points

Appendix D

Natural Resources Technical Memorandum (NRTM)

NATURAL RESOURCES TECHNICAL MEMORANDUM

PROPOSED S-48 (COLUMBIA AVENUE)
CORRIDOR IMPROVEMENT PROJECT

LEXINGTON COUNTY, SOUTH CAROLINA

SCDOT PROJECT P042383
LEXINGTON COUNTY PROJECT PQ13003-04/29/13S

PREPARED FOR

SCDOT

South Carolina Department of Transportation

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
COLUMBIA, SOUTH CAROLINA

OCTOBER 2016

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Project Description

The South Carolina Department of Transportation (SCDOT), in partnership with Lexington County and the Columbia Area Transportation Study (COATS), proposes to improve approximately 2.2 miles of the S-48 (Columbia Avenue) corridor in Lexington County, South Carolina. Specifically, the Project Corridor proposed for improvement extends along Columbia Avenue from Interstate 26 (I-26) to U.S. 76 (Chapin Road) within the Town of Chapin.

At the request of SCDOT, an environmental assessment (EA) is being performed, which outlines potential alignment alternatives to satisfy the purpose and need of the project, including improvements to existing roadways, new location roadways, and combinations of existing and new location roadways. These alternatives are being assessed to determine the least damaging practicable alternative with respect to construction impacts on the human and natural environment, while maintaining appropriate design criteria.

In association with the EA, Mead & Hunt, Inc. (Mead & Hunt) has been contracted to provide an environmental review of the proposed project study area (PSA), including documentation of existing natural resources within the PSA. This Natural Resources Technical Memorandum (NRTM) summarizes the findings of the environmental review.

Mead & Hunt reviewed a PSA approximately 140 acres in total area within the vicinity of the Project Corridor, including the following:

- A portion of primarily undeveloped land, originating near the intersection of S-51 (Amick's Ferry Road) and Zion Church Road and extending east to the intersection of S-82 (East Boundary Street) and Stonewall Court;
- A portion of primarily undeveloped land, originating near the intersection of S-82 (East Boundary Street) and Stonewall Court and extending northwest to S-48 (Columbia Avenue), approximately 400 feet east of its intersection with S-82 (East Boundary Street);
- Approximately 2.3 miles of S-48 (Columbia Avenue), from Pinewoods Drive to a point approximately 350 east of S-689 (Comalander Drive);
- Approximately one mile of I-26, generally centered on the interchange with S-48 (Columbia Avenue), and approximately 50 acres of the surrounding area associated with the interchange;
- Approximately 1,100 feet of S-232 (Crooked Creek Road), located approximately 1,500 feet southwest of the I-26 interchange with S-48 (Columbia Avenue); and a portion of primarily undeveloped land, originating at S-232 (Crooked Creek Road) and extending northwest to S-48 (Columbia Avenue), approximately 1,200 feet west of I-26.

Please see Appendix A, Figure 1 for a Site Location Map of the PSA.

This report provides an overall description of the project vicinity, and specifically describes natural resources within the PSA, including wetlands, water resources, plant communities, and protected species. The qualifications of the Mead & Hunt personnel involved in the preparation of this report are located in Appendix D.

1.2 Purpose

The purpose of the project is to improve traffic congestion along the Columbia Avenue corridor between I-26 and Chapin Road.

1.3 Methodology

Prior to conducting fieldwork, Mead & Hunt reviewed the following reference material:

- U.S. Geological Survey (USGS) 7.5 minute topographic quadrangle. Chapin, South Carolina (1971).
- USGS National Hydrography Database (NHD). Subregion 0305. (Last Updated January 2016).
- U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS). Soil Survey Geographic (SSURGO) Database; South Carolina, Statewide (2015).
- USDA-NRCS National List of Hydric Soils Database; National List, All States. (Last updated December 2015).
- USDA Soil Conservation Service (SCS) Soil Survey of Lexington County, South Carolina (1976).
- U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) Seamless Wetlands Data for South Carolina (Last updated October 2015).
- USFWS South Carolina Field Office. Endangered, Candidate, and At-Risk Species. County Listings. Lexington County (Last Updated: February 2015).
- S.C. Department of Natural Resources (SCDNR). Rare, Threatened, and Endangered Species and Communities Known to Occur in Lexington County (Last Updated June 2014).
- SCDNR South Carolina Heritage Trust (SCHT). Geographic Database of Rare, Threatened, and Endangered Species Inventory Species Found in Lexington County (Last Updated January 2006).
- South Carolina Department of Health and Environmental Control (SCDHEC). Integrated Report for 2014. Part I: *Section 303(d) List of Impaired Waters.*
- National Agriculture Imagery Program (NAIP) Aerial Photography. Lexington County (2013).
- Independent Mapping Consultants. High Resolution Aerial Photography; S-48 (Columbia Avenue) Corridor Improvement Project (2015).

Field reviews of the PSA were conducted August 31st and November 18th, 2015. Mead & Hunt Environmental Scientist and Professional Wetland Scientist (P.W.S.), Matt DeWitt led field reviews of the PSA for the presence of wetlands and other "waters of the U.S.", community types, and protected species habitat. The boundaries of waters of the U.S., including wetlands, were also flagged (delineated) in the field at that time. Wetlands were determined using the Routine On-Site Determination Method as defined in the Corps of Engineers Wetland Delineation Manual (Environmental Laboratory, 1987) and the Eastern Mountains and Piedmont Regional Supplement to the Manual (USACE. 2012). Delineated waters were subsequently located using a handheld Trimble GeoXH Global Positioning System (GPS) unit capable of sub-meter accuracy. The GeoXH™ was used to collect point features, using a one second logging interval. The GeoXH™ settings used generally included a PDOP of 4.0, an elevation mask of 15-degrees and a minimum SNR of 33.0. GPS coordinates were validated using GPS Analyst and ArcGIS 9.3 software.

2.0 PHYSICAL RESOURCES

2.1 Land Use

The proposed project is located in and around the Town of Chapin, South Carolina. Chapin is a rural suburb of Columbia, South Carolina's capital and largest city. Chapin is located approximately 25 miles northwest of Columbia, and has experienced increasing development in the past decade, due to its proximity to Columbia and the high demand areas along Lake Murray.

Land use within the project vicinity, an area defined as extending one mile on all sides of the proposed project, is comprised primarily of undeveloped woodland, low-density residential development, and sparse commercial and industrial development. The central portion of the project vicinity encompasses the Town of Chapin, which provides higher density residential communities and greater commercial development.

Land use directly within the project limits is primarily comprised of undeveloped forestland, roadway and utility rights-of-way (R/Ws), agricultural lands, and sparse residential and commercial development. Higher density development is found along the eastern portion of Columbia Avenue and in the vicinity of the I-26 interchange with Columbia Avenue. Undeveloped forestland within the project limits primarily consist of planted pine, mixed pine-hardwoods, oak-hickory, bottomland hardwoods, and successional scrub-shrub.

2.2 Physiography and Topography

The PSA is located in the Piedmont physiographic province of South Carolina, and is specifically situated within the Piedmont (45) Level III Ecoregion (Griffith, et al., 2002). The Piedmont is a transitional area between the mostly mountainous ecoregions of the Appalachian Mountains to the northwest and the relatively flat coastal plain to the southeast. The landform of the ecoregion is comprised of moderately dissected irregular plains and some hills. Once largely cultivated, much of this ecoregion is in planted pine or has reverted to successional pine and hardwood woodlands.

The PSA is further characterized as being situated within the Carolina Slate Belt (45c) Level IV Ecoregion (Griffith, et al., 2002). The Carolina Slate Belt region is characterized by dissected irregular plains, some low hills, and rounded hills and ridges. Streams in the region are typically low to moderate gradient and comprised of mostly cobble, gravel, and sandy substrates.

Based on USGS topographic mapping (Appendix A, Figure 2), elevations in the study area range from approximately 350 feet above National Geodetic Vertical Datum (NGVD) to 490 feet NGVD. The highest elevations in the PSA are located along Columbia Avenue, immediately east of the intersection with Peak Street, in the northwestern portion of the PSA. The lowest elevations in the PSA are located approximately 1,000 feet northwest of the I-26 interchange with Columbia Avenue, in the eastern portion of the PSA. The PSA drains to multiple receiving waterbodies, including Lake Murray, Wateree Creek, and Rister's Creek. The southernmost portion of the PSA, between Amicks Ferry Road and East Boundary Street, drains south to Lake Murray. Portions of the PSA located east of East Boundary Street and south of Columbia Avenue drain in a general southeasterly direction towards Wateree Creek. The remaining portion of the PSA, located north of Columbia Avenue drains in a general northerly direction towards tributaries of Risters Creek; please see Section 2.4.2 for more details regarding drainage of surface water within the PSA.

2.3 Geology and Soils

The origins of soil parent materials within Lexington County are residual; that is, the parent materials have formed in saprolite through the weathering of the underlying hard rock. The rocks underlying these soils are comprised of gneissic granite and rocks known as "Carolina slates." Carolina slates are metamorphosed shale, dominantly argillite, fine-grained sandstone, and muscovite mica. Weathered products of these rocks are high in silt and very fine sands (USDA, 1976).

The Farmland Protection Policy (FPPA) Act of 1981 requires evaluation of farmland conversions to nonagricultural uses. Farmland can be prime farmland, unique farmland, or farmland of statewide importance. The proposed project would likely require the acquisition of farmland soils; therefore, the project will be assessed under the provisions of the FPPA during the development of the Environmental Assessment.

According to the USDA NRCS Soil Survey of Lexington County (USDA, 1796), eleven (11) soil map units (SMUs) are mapped within the PSA. The SMUs mapped within the PSA are depicted in Appendix A, Figure 3. Farmland Classification and Hydric Rating for each SMU is located in Table 1 on the following page.

TABLE 1
SOIL MAP UNITS WITHIN THE PROJECT STUDY AREA

Symbol	Soil Unit Name	Farmland Classification*	Hydric Rating*
CeB	Cecil fine sandy loam, 2 to 6 percent slopes	All areas are prime farmland	Nonhydric
CeC	Cecil fine sandy loam, 6 to 10 percent slopes	Farmland of statewide importance	Nonhydric
Ch	Chenneby silty clay loam	Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season	Predominantly Nonhydric
EnB	Enon silt loam, 2 to 6 percent slopes	Farmland of statewide importance	Nonhydric
GeB	Georgeville very fine sandy loam, 2 to 6 percent slopes	All areas are prime farmland	Nonhydric
GeC	Georgeville very fine sandy loam, 6 to 10 percent slopes	Farmland of statewide importance	Nonhydric
GeD	Georgeville very fine sandy loam, 10 to 15 percent slopes	Not prime farmland	Nonhydric
HrB	Herndon silt loam, 2 to 6 percent slopes	All areas are prime farmland	Nonhydric
NaB	Nason silt loam, 2 to 6 percent slopes	Farmland of statewide importance	Nonhydric
NaD	Nason silt loam, 6 to 15 percent slopes	Not prime farmland	Nonhydric
TaE	Tatum silt loam, 15 to 25 percent slopes	Not prime farmland	Nonhydric

** Reference: USDA-NRCS Web Soil Survey. (http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx).*

A description of each SMU mapped within the PSA can be found below:

Cecil fine sandy loam, two (2) to six (6) percent slopes, (CeB) is a deep, well-drained soil found on uplands of the Piedmont Plateau. CeB soils formed in material weathered from granite rocks. The soil has moderate permeability, and the available water capacity is medium (NRCS, 1976). Within the PSA, CeB soil is mapped in two (2) areas along Columbia Avenue, north and east of Chapin High School. The SMU comprises approximately eight (8) percent of the PSA. CeB soil is classified as a prime farmland, and is not included on the hydric soils list for Lexington County, South Carolina (USDA, 2015).

Cecil fine sandy loam, six (6) to ten (10) percent slopes, (CeC) is similar to CeB soil in composition, and usually mapped along drainageways where the gradient is greater than CeB (NRCS, 1976). Within the PSA, CeC soil is mapped in one (1) area along Columbia Avenue, north of Chapin High School. The SMU comprises approximately one (1) percent of the PSA.

CeC soil is classified as farmland of statewide importance, and is not included on the hydric soils list for Lexington County, South Carolina (USDA, 2015).

Chenneby silty clay loam (Ch) is a deep, somewhat poorly drained soil found in nearly level areas of Lexington County. Ch soils formed in silty fluvial sediment of stream floodplains. The soil has moderate permeable, and the available water capacity is high (NRCS, 1976). Within the PSA, Ch soil is mapped along Tributary 2, in an undeveloped area between Amick's Ferry Road and Lexington Avenue. The SMU comprises less than one (1) percent of the PSA. Ch soil is classified as a prime farmland if drained and either protected from flooding or not frequently flooded during the growing season, and is included on the hydric soils list for Lexington County, South Carolina (USDA, 2015).

Enon silt loam, two (2) to six (6) percent slopes, (EnB) is a moderately deep, well-drained soil found on uplands of the Piedmont Plateau. EnB soils formed in material weathered from mixed acidic and basic rocks. The soil has slow permeability, and the available water capacity is medium (NRCS, 1976). Within the PSA, EnB soil is mapped in one (1) area along Columbia Avenue, approximately 1,500 feet west of its interchange with I-26. The SMU comprises approximately two (2) percent of the PSA. EnB soil is classified as farmland of statewide importance, and is not included on the hydric soils list for Lexington County, South Carolina (USDA, 2015).

Georgeville very fine sandy loam, two (2) to six (6) percent slopes, (GeB) is a deep, well-drained soil found on uplands of the Piedmont Plateau. GeB soils formed in material weathered from slate rocks. The soil has moderate permeability, and the available water capacity is medium to high (NRCS, 1976). Within the PSA, GeB soil is mapped in three (3) areas adjacent to the I-26 interchange with Columbia Avenue. The SMU comprises approximately 74-percent of the PSA. GeB soil is classified as a prime farmland, and is not included on the hydric soils list for Lexington County, South Carolina (USDA, 2015).

Georgeville very fine sandy loam, six (6) to ten (10) percent slopes, (GeC) is similar to GeB soil in composition, and usually mapped along smooth side slopes where the gradient is greater than GeB (NRCS, 1976). Within the PSA, GeC soil is mapped in two (2) areas within the PSA, including an area north of the I-26 interchange with Columbia Avenue, and an undeveloped area between Amick's Ferry Road and Lexington Avenue. The SMU comprises approximately four (4) percent of the PSA. GeC soil is classified as farmland of statewide importance, and is not included on the hydric soils list for Lexington County, South Carolina (USDA, 2015).

Georgeville very fine sandy loam, ten (10) to 15 percent slopes, (GeD) is similar to GeB soil in composition, and usually mapped along narrow, irregular side slopes where the gradient is greater than GeB or GeC (NRCS, 1976). Within the PSA, GeD soil is mapped in two (2) areas within the PSA, including an area along Columbia Avenue east of I-26, and a small area along Crooked Creek Road. The SMU comprises approximately two (2) percent of the PSA. GeC is not classified as a farmland soil, and is not included on the hydric soils list for Lexington County, South Carolina (USDA, 2015).

Herndon silt loam, two (2) to six (6) percent slopes, (HrB) is a deep, well-drained soil found on uplands of the Piedmont Plateau. HrB soils formed in material weathered from slate rocks. The soil has moderate permeability, and the available water capacity is medium to high (NRCS, 1976). Within the PSA, HrB soil is mapped along Crooked Creek Road and the undeveloped area north towards Columbia Avenue. The SMU comprises approximately five (5) percent of the PSA. HrB soil is classified as a prime farmland, and is not included on the hydric soils list for Lexington County, South Carolina (USDA, 2015).

Nason silt loam, two (2) to six (6) percent slopes, (NaB) is a moderately deep, well-drained soil found on uplands of the Piedmont Plateau. NaB soils formed in material weathered from slate rocks. The soil has moderate permeability, and the available water capacity is high (NRCS, 1976). Within the PSA, NaB soil is mapped along Tributary 3, in an undeveloped area between Amick's Ferry Road and Lexington Avenue. The SMU comprises approximately three (3) percent of the PSA. NaB soil is classified as farmland of statewide importance, and is not included on the hydric soils list for Lexington County, South Carolina (USDA, 2015).

Nason silt loam, six (6) to fifteen (15) percent slopes, (NaD) is similar to NaB soil in composition, and usually mapped on side slopes where the gradient is greater than NaB (NRCS, 1976). Within the PSA, NaD soil is mapped in one area (1) along I-26, east of Columbia Avenue. The SMU comprises less than one (1) percent of the PSA. NaD is not classified as a farmland soil, and is not included on the hydric soils list for Lexington County, South Carolina (USDA, 2015).

Tatum silt loam, fifteen (15) to 25 percent slopes, (TaE) is a moderately deep, well-drained soil found on uplands of the Piedmont Plateau. TaE soils formed in material weathered from slate rocks. The soil has moderate permeability, and the available water capacity is high (NRCS, 1976). Within the PSA, TaE soil is mapped in one (1) small area in the eastern extent of the PSA. The SMU comprises less than one (1) percent of the PSA. TaE is not classified as a farmland soil, and is not included on the hydric soils list for Lexington County, South Carolina (USDA, 2015).

The project will also have both short-term construction related impacts as well as long-term operational impacts on soils in the PSA; however, these impacts are not considered significant.

2.4.1 Water Resources and Water Quality

2.4.2 Water Resources

River Basins

The PSA spans two River Basins, as defined by the SC Department of Health and Environmental Control (SCDHEC). Portions of the PSA situated west of East Boundary Street are located within the Saluda River Basin. The remainder of the PSA is located within the Broad River Basin.

The Saluda River Basin extends from the Blue Ridge, through the Piedmont, and into the Sand Hills of South Carolina. The Broad River Basin, located immediately east of the Saluda River Basin, extends across the Piedmont of North Carolina and South Carolina. Mead & Hunt reviewed the Basinwide Watershed Water Quality Assessment Reports for the Saluda River Basin (SCDHEC, 2011) and the Broad River Basin (SCDHEC, 2007) as well as the S.C. List of 303(d) Impaired Waters (SCDHEC, 2014) for information pertaining to water resources and water quality.

Sub-Basins

The Saluda River Basin is subdivided into two (2) major sub-basins, including the Saluda and Congaree Sub-basin. Of these, the western portion of the PSA is situated within the Saluda Sub-Basin (USGS Hydrologic Unit Code [HUC] 03050109).

Within South Carolina, the Broad River Basin is subdivided into three (3) sub-basins, including the Enoree River, the Tyger River, and the Broad River Sub-Basins. The eastern portion of the PSA is located within the Broad River Sub-Basin (HUCs 03050105 and 03050106).

Saluda River Sub-Basin

The Saluda River Basin is located in Greenville, Pickens, Anderson, Abbeville, Laurens, Greenwood, Newberry, Saluda, Lexington, and Richland Counties, and encompasses 2,523 square miles. Of the approximately 1.6 million acres, 53.7% is forested land, 26.1% is agricultural land, 12.9% is urban land, 4.2% is water, 2.1% is forested wetland, and 1.0% is barren land. The urban land is comprised of the Cities of Greenville and Columbia, and to a lesser extent the Cities of Laurens and Newberry (SCDHEC, 2011).

The Saluda River Sub-Basin encompasses 5,609 stream miles and 69,198 acres of lake waters. The headwaters of the Sub-Basin are formed by the South Saluda River and North Saluda River. The confluence forms the Saluda River, which flows past the City of Greenville and forms the headwaters of Lake Greenwood. Hydrology from the Reedy River is also received in the headwaters of Lake Greenwood. Downstream of Lake Greenwood, the Saluda River receives flow from Little River forms the headwaters of Lake Murray. The Saluda River emerges from the Lake Murray dam and joins the Broad River Basin in the City of Columbia to form the Congaree River (SCDHEC, 2011). Hydrology from the PSA drains into the Sub-Basin upstream of Lake Murray.

Broad River Sub-Basin

The Broad River Sub-Basin is located in Cherokee, Spartanburg, York, Union, Chester, Fairfield, Newberry, and Richland Counties, and encompasses approximately 2,500 square miles within South Carolina. Of the approximately 1.5 million acres, 60.6% is forested land, 23.8% is agricultural land, 1.2% is scrub/shrub land, 2.1% is forested wetland, 9.8% is urban land, 1.6% is water, and 0.9% is barren land. The urban land percentage is comprised chiefly of the Cities of Spartanburg, Gaffney, and Chester, and portions of the Cities of York, Union, and Columbia (SCDHEC, 2007).

Within the Broad River Basin, there are approximately 2,798.6 stream miles and 14,603.0 acres of lake waters. The Broad River flows across the North Carolina/South Carolina state line and accepts drainage from Buffalo Creek, Cherokee Creek, Kings Creek, Thicketty Creek, Bullock Creek, and the Pacolet River. The Broad River then accepts drainage from Turkey Creek and the Sandy River before forming the headwaters of the Parr Shoals Reservoir. Downstream of the reservoir, the Broad River accepts the Little River and Cedar Creek before converging with the Saluda River in Columbia to form the Congaree River (SCDHEC, 2007). Hydrology from the PSA drains into the Sub-Basin through Wateree Creek, upstream of Little River.

Watersheds

The Saluda River Sub-Basin is further subdivided into fourteen (14) watersheds. Of these, the western portion of the PSA is located in the Saluda River/Lake Murray Watershed (HUC 03050109-13). Watershed 03050109-13 is located in Newberry, Saluda, Lexington, and Richland Counties and consists primarily of the Saluda River and its tributaries from the Lake Murray headwaters to the dam. The watershed occupies 165,195 acres of the Piedmont region of South Carolina. Land use/land cover in the watershed includes 45.8% forested land, 25.8% water, 17.6% agricultural land, 9.1% urban land, 0.9% forested wetland (swamp), and 0.8% barren land (SCDHEC, 2011). Within the PSA, the Saluda River/Lake Murray Watershed encompasses Tributaries 1 through 3, and Ponds 1 and 2.

The Broad River Sub-Basin is further subdivided into seventeen (17) watersheds. Of these, the eastern portion of the PSA is located in the Broad River/Crane Creek Watershed (HUC 03050106-07). Watershed 03050106-07 is located Newberry, Fairfield, and Richland Counties and consists primarily of the Broad River and its tributaries from the Parr Shoals dam to its confluence with the Saluda River. The watershed occupies 148,599 acres of the Piedmont region of South Carolina. Land use/land cover in the watershed includes: 59.4% forested land, 21.4% urban land, 13.0% agricultural land, 3.0% forested wetland, 2.0% water, 0.8% barren land, and 0.4% scrub/shrub land (SCDHEC, 2007). Within the PSA, the Borad River/Crane Creek Watershed encompasses Tributaries 4 through 7, and Ponds 3 and 4, and Freshwater Wetlands 1 through 3.

Please see Section 4.1 for complete details of Delineated Waters of the U.S. identified within the PSA.

Due to the location and size of the proposed project, hydrology from the PSA drains to multiple SCDHEC water-quality monitoring stations. Please see Appendix A, Figure 4 for the extent of drainage areas within the PSA, and their associated water-quality monitoring stations.

The western portion of the PSA, located within the Saluda River Basin, drains to Station RL-09087. Station RL-09087 is located in the downlake section of Lake Murray, approximately seven (7) aerial miles south of the PSA. The Basinwide Watershed Water Quality Assessment Report for the Saluda River Basin does not provide detailed information regarding water quality at Station RL-09087, but does provide information related to stations in close proximity. Station S-273 is located approximately one (1) mile east, or downstream, of Station RL-09087 on Lake Murray. Aquatic life and recreational uses are fully supported at Station S-273; however, the site exhibits a significant increasing trend in five-day biochemical oxygen demand, as well as an increasing trend in pH. Station S-273 also has significant decreasing trends in turbidity, total phosphorus concentration, total nitrogen concentration, and fecal coliform bacteria concentration, which suggest improving conditions for these parameters at the site (SCDEHC, 2011).

The eastern portion of the PSA, located within the Broad River Basin, drains to Station B-801. Station B-801 is located on Wateree Creek at S-698 (Wash Lever Road), approximately four (4) aerial miles east of the PSA. At Station B-801, aquatic life uses are fully supported based on macroinvertebrate community data (SCDHEC, 2007).

Mead & Hunt did not conduct any quantitative water quality sampling within the PSA.

2.4.3 303 (d) List of Impaired Waters

In accordance with Section 303(d) of the 1972 Federal Clean Water Act (CWA), SCDHEC evaluates water bodies identified as impaired for appropriate inclusion on the Section 303(d) list. The 303(d) list is a State list of waters that are not meeting water quality standards or have impaired uses. The 303(d) list targets water bodies that do not meet water quality standards set for the state for water quality management, as well as identifying the cause(s) of the impairment and the designated classifications.

According to SCDHEC's 2014 Section 303(d) List of Impaired Waters, Station B-801 is impaired for all uses based on macroinvertebrate community data (BIO). Station RL-09087 is not currently listed as impaired for any parameters.

2.4.4 Total Maximum Daily Loads

A TMDL, or Total Maximum Daily Load, is the amount of a single pollutant (e.g., bacteria, nutrients, metals) that can enter a waterbody on a daily basis and still meet water quality standards set forth by the State. "TMDL" refers to both a calculation of a pollutant entering a waterbody as well as a document which includes this calculation along with source assessments, watershed and land use information, reductions and allocations information, implementation and other relevant information, maps, figures and pictures (SCDHEC, 2007).

TMDLs are a requirement found in Section 303(d) of the 1972 Federal Clean Water Act (CWA). Once a site is included on the 303(d) list of impaired waters, a TMDL must be developed within two to thirteen years of initial listing. In South Carolina, TMDLs are developed and proposed by SCDHEC and then forwarded to EPA Region 4 for final approval.

TMDLs are calculated by adding all the point and nonpoint sources for the pollutant causing the impairment. After a TMDL is calculated, the amount of load entering from point and nonpoint sources is compared to the water quality standards for that waterbody. Then this total loading is reduced to the levels where the water quality standards can be met. This reduced loading is then divided among all the point and nonpoint sources.

The goal of a TMDL is to identify potential pollution sources, calculate and quantify the reduction of those sources, and provide general implementation information needed in order to meet water quality standards and improve water quality. After the approval of the TMDL, an implementation plan can be developed to realize the goals of the written TMDL document. Implementation of a TMDL has a potential to reduce sources of pollution within a watershed and a potential to restore the full use of the waterbody.

According to the SCDHEC *Total Maximum Daily Load Development for the Upper Broad River Basin,* a TMDL has been developed by SCDHEC in 2005 and approved by the EPA for the Broad River Basin (HUC 03050106) to determine the maximum amount of fecal coliform it can receive from nonpoint sources and still meet water quality standards. There are eight facilities that have fecal coliform limits in their NPDES permits that discharge into this long section of the Broad River. Part of the City of Columbia Municipal Separate Storm Sewer System (MS4) is in this section of the Broad River watershed. Possible sources of fecal coliform bacteria in the Broad River, identified in the TMDL, include MS4 stormwater runoff, leaking sewers, SSOs, failing onsite wastewater disposal systems, land application of manure, cattle watering in the creek, pets, and wildlife. The TMDL specifies a reduction in the load of fecal coliform bacteria into this section of the Broad River of 62% in order for the river to meet the recreational use standard (SCHEC, 2007).

2.4.5 National Pollutant Discharge Elimination System

Point source discharge means a discharge which is released to the waters of the State by a discernible, confined and discrete conveyance, including but not limited to a pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, vessel, or other floating craft from which waste is or may be discharged. The National Pollutant Discharge Elimination System (NPDES) Permit Program was created by Section 402 of the CWA. In 1975, the Bureau of Water received authority from the EPA to administer the NPDES Permit Program in South Carolina. The SCDHEC Bureau of Water is responsible for the permitting, compliance, monitoring and enforcement activities of the program.

Persons with point source discharges to surface waters are required to have NPDES permits. Typical regulated point source discharges are:

- discharges from wastewater treatment systems owned by municipalities, industries, private utilities, State and Federal government, etc.;
- discharges such as cooling water, boiler blow down, etc.;
- stormwater discharges from municipal separate storm sewer systems (MS4s);
- stormwater discharges associated with industrial activity; and,
- stormwater dischargers from construction sites.

According to the Water Quality Assessment Reports for the Saluda River Basin (SCDHEC, 2011) and the Broad River Basin (SCDHEC, 2007), no NPDES permitted facilities are authorized within the PSA. Additionally, no NPDES permitted facilities are operating upstream of the proposed project.

2.4.6 Water Quality Summary

Mead & Hunt reviewed SCDHEC's Watershed and Water Quality Information, provided by an online query in March 2016. According to these reports, Station RL-09087 is not impaired for any parameters assessed at the site. Station B-801 is impaired based on macroinvertebrate community data (BIO). In addition, a TMDL for fecal coliform has been established within HUC 03050106, as stated in the Basinwide Watershed Water Quality Assessment Report for the Broad River Basin (SCDHEC, 2007). Please see Appendix C for a copy of the SCDHEC Watershed and Water Quality Information Reports and SCDOT Permit Determination Form.

The proposed project is not anticipated to contribute to these impairments or have long term impacts on water quality within the watershed. However, due to the existing water quality impairments and approved TMDL within watershed 03050106, SCDHEC may require additional water quality protection and stormwater treatment measures during and after construction. This watershed includes Tributaries 4 through 7, and Ponds 3 and 4, and Freshwater Wetlands 1 through 3.

During construction activities, temporary siltation may occur in adjacent waters and erosion will be of a greater degree than presently occurring. It is recommended that the contractor minimize this impact through implementation of construction best management practices, reflecting policies contained in 23 CFR 650 B and S.C. Code of Regulations 72-400. The SCDOT has also issued an Engineering Directive Memorandum (Number 23), dated March 10, 2009, regarding Department procedures to be followed in order to ensure compliance with S.C. Code of 72-400, Standards for Stormwater Management and Sediment Reduction. Exposed areas may be stabilized by following the Department's Supplemental Technical Specification for Seeding (SCDOT Designation SC-M-810 (11-08).

3.0 BIOTIC RESOURCES

3.1 Terrestrial Plant Communities

Vegetative terrestrial communities in the PSA were distinguished by plant species, location in the landscape, past disturbances, and hydrologic characteristics. For the purpose of this report, only habitats located directly within the PSA are summarized. Based on the field review, five (5) terrestrial habitat community/land use types, are present within the PSA, including Maintained Lands (roadsides, utility rights-of-way, lawns, and fields), Mixed Pine/Hardwood Forest, Pine Forest, Bottomland Hardwood Forest, and Successional Forest. A brief summary of the terrestrial habitat communities found within the PSA follows:

<u>Maintained and Disturbed Roadside</u>

Maintained and disturbed roadside is the dominant community type throughout the PSA, and occurs immediately alongside Columbia Avenue, I-26, and other existing roadways within the PSA. This community type comprises approximately 59-percent of the PSA. Most of the disturbed roadway edges are comprised of herbaceous species and a few shrubs, including various grasses such as common fescue (*Festuca* sp.), ryegrass (*Lolium perenne*) and bluegrass (*Poa* sp.).

Mixed Pine/Hardwood Forest

Mixed Pine/Hardwood Forest is the dominant forested community type located throughout much of the PSA, and comprises approximately 31-percent of the PSA. Dominant vegetation consists of pine and hardwood tree species, including sweetgum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), loblolly pine (*Pinus taeda*), water oak (*Quercus nigra)*, eastern redcedar (*Juniperus virginiana*), and American holly (*Ilex opaca*).

Pine Forest

Pine Forests consist of areas planted for the production of pine trees, and comprise approximately five (5) percent of the PSA. The dominant vegetation in pine forests is loblolly pine. Opportunistic tree species, such as red maple and sweetgum, are also present in low densities in the understory. A sparse shrub layer consisting of Chinsee privet (*Ligustrum sinense*) and ryegrass is also present. Groundcover vegetation is sparse but may also include a more diverse array of herbaceous and shrub species.

Successional Forest

Successional Forests are located throughout portions of the PSA and include areas that have been logged or cleared within the past five years and are in the primary stages of forest succession. This community type makes up a small portion of the PSA, approximately four (4) percent. Vegetation in successional forests primarily consists of saplings and shrubs, and include the same species found in a mixed pine/hardwood forest. Successional forests also include a more diverse array of herbaceous species.

Bottomland Hardwood Forest

Bottomland Hardwood Forest are located in small areas throughout portions of the PSA, primarily within the floodplain of creeks and tributaries. Bottomland hardwood forest make up approximately one (1) percent of the PSA. Dominant vegetation consists of hardwood tree species, including red maple, water oak, tulip poplar (*Liriodendron tulipifera*), and sweetgum. A sparse shrub layer consisting of Chinese privet and giant cane (*Arundinaria gigantea*) is also present. Groundcover vegetation is sparse but include a diverse array of herbaceous species and grasses.

3.2 Wetland Plant Communities

Wetland communities located within the PSA include three (3) freshwater forested areas designated Wetlands 1 through 3. The Cowardin classification of these communities is PFO1H, PFO1C, and PFO1/4A, respectively. More information on the aforementioned wetland areas, including approximate size, dominant vegetation, soils, indicators of hydrology and hydric soils, and jurisdictional status is included in Section 4.0 Delineated Waters of the U.S.

3.3 Aquatic Plant Communities

No aquatic plant communities, including submerged aquatic vegetation (SAV), were observed in the PSA during the field reviews.

4.0. WATERS OF THE U.S.

Waters of the U.S. are defined by 33 CFR 328.3(b) and protected by Section 404 of the Clean Water Act (33 U.S.C. 1344), which is administered and enforced in South Carolina by the U.S. Army Corps of Engineers (USACE), Charleston District. The term "waters of the U.S." is defined in 33 CFR Part 328 as:

1. All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
2. All interstate waters including interstate wetlands;
3. All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters:
    - Which are or could be used by interstate or foreign travelers for recreational or other purposes; or
    - From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or
    - Which are used or could be used for industrial purpose by industries in interstate commerce;
4. All impoundments of waters otherwise defined as waters of the United States under the definition;
5. Tributaries of waters identified in paragraphs 1 – 4 above;
6. The territorial seas; and
7. Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in 1 – 6 above.

Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of the Clean Water Act (other than cooling ponds as defined in 40 CFR 123.11(m) which also meet the criteria of this definition) are not waters of the United States. Waters of the U.S. do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other federal agency, for the purposes of the Clean Water Act, the final authority regarding Clean Water Act jurisdiction remains with the Environmental Protection Agency.

Wetlands are defined as those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands are defined in the field as areas that display positive evidence of three environmental parameters including dominance of hydrophytic vegetation, wetland hydrology, and hydric soils (Environmental Laboratory, 1987).

The boundaries of waters of the U.S. were delineated on August 31st and November 18th, 2015. Wetlands were determined using the Routine On-Site Determination Method as defined in the Corps of Engineers Wetland Delineation Manual (Environmental Laboratory, 1987) and the

Eastern Mountains and Piedmont Regional Supplement to the Manual (US Army Corps of Engineers, 2012). Wetlands were delineated with pink flagging tape, pre-printed with the words "Wetland Delineation" in black letters. Tributaries were delineated with a combination of the pink pre-printed "Wetland Delineation" flagging tape and solid blue flagging to differentiate the area as a tributary. Furthermore, delineated waters were subsequently located using a handheld Trimble GeoXH Global Positioning System (GPS) unit capable of sub-meter accuracy. Jurisdictional determination and verification of delineated wetland/waters of the U.S. boundaries by the U.S. Army Corps of Engineers (USACE) is pending.

4.1 Wetlands

Prior to conducting fieldwork, Mead & Hunt reviewed National Wetlands Inventory (NWI) Seamless Wetlands Data provided by the U.S. Fish and Wildlife Service (USFWS, 2015). NWI elements mapped within the PSA are defined as two (2) palustrine, or freshwater, unconsolidated bottom, permanently flooded dike/impoundment (PUBHh) wetlands. Please see Appendix A, Figure 5 for the location and extent of NWI elements within the PSA.

A total of three (3) wetland communities were identified within the PSA during site reviews, as listed in Table 2 and depicted on Delineated Waters of the U.S. Maps (Appendix A, Figures 6-1 through 6-6).

TABLE 2
WETLANDS WITHIN THE PROJECT STUDY AREA

Wetland ID	Wetland Type	Figure	Area
Freshwater Wetland 1	Forested	6-5	0.472 acre
Freshwater Wetland 2	Forested	6-6	0.023 acre
Freshwater Wetland 3	Forested	6-6	0.043 acre
Totals		**0.538 acre**	

<u>Wetland 1</u>

Wetland 1 is a palustrine, forested wetland located northwest of Crooked Creek Road, approximately 1,500 feet south of I-26 interchange with Columbia Avenue. The wetland is contained within the PSA and encompasses approximately 0.472 acre. The overstory of Wetland 1 is dominated by red maple, post oak (*Quercus stellata*), tulip poplar, and sweetgum. Understory vegetation is sparse and includes sweetgum, red maple, eastern redcedar, Chinese privet, and species of rushes (*Juncus* spp.). Round leaf greenbriar (*Smilax rotundifolia*) is a common vine found in the wetland. Primary and secondary wetland hydrology indicators within Wetland 1 include: surface water, saturated soils, water marks, water-stained leaves, and drainage patterns. Hydric soil indicators, including low chroma soils and a depleted matrix were also observed in the wetland. Wetland 1 is not depicted on the USFWS NWI Wetland Mapper. A representative photograph of Wetland 1 is included in Appendix B, Photograph 11.

Wetland 2

Wetland 2 is a palustrine, forested wetland located approximately 850 feet northwest of I-26 interchange with Columbia Avenue. The wetland is contained within the PSA and encompasses approximately 0.023 acre. The overstory of Wetland 2 is dominated by tulip poplar, sweetgum and American holly. Understory vegetation is sparse and includes sweetgum, loblolly pine, and eastern redcedar, Chinese privet, and species of rushes (*Juncus* spp.). Round leaf greenbriar is a common vine found in the wetland. Primary and secondary wetland hydrology indicators within Wetland 2 include: surface water, a high water table, saturated soils, water marks, water-stained leaves, and drainage patterns. Hydric soil indicators, including low chroma soils and a depleted matrix were also observed in the wetland. Wetland 2 is not depicted on the USFWS NWI Wetland Mapper. Representative photographs of Wetland 2 are included in Appendix B, Photographs 16 and 17.

Wetland 3

Wetland 3 is a palustrine, forested wetland located west of Ellett Road, approximately 700 feet west of I-26 interchange with Columbia Avenue. Approximately 0.043 acre of the wetland is located within the PSA. The overstory of Wetland 3 is dominated by willow oak (*Quercus phellos*), loblolly pine, sweetgum, and eastern redcedar. Understory vegetation is dense and includes red maple, loblolly pine, American holly, blackberry (*Rubus* spp.), and species of rushes (*Juncus* spp.). Round leaf greenbriar is a common vine found in the wetland. Primary and secondary wetland hydrology indicators within Wetland 3 include: surface water, a high water table, saturated soils, water marks, water-stained leaves, and drainage patterns. Hydric soil indicators, including low chroma soils and a depleted matrix were also observed in the wetland. Wetland 3 is not depicted on the USFWS NWI Wetland Mapper. A representative photograph of Wetland 3 is included in Appendix B, Photograph 22.

4.2 Streams or Tributaries

A total of seven (7) streams, or tributaries, were identified within the PSA during site reviews, as listed in Table 3 and depicted on Delineated Waters of the U.S. Maps (Appendix A, Figures 6-1 through 6-6).

TABLE 3
STREAMS, OR TRIBUTARIES, WITHIN THE PROJECT STUDY AREA

Stream ID	Figure	Intermittent [lf (acre)]	Perennial [lf (acre)]	Total [lf (acre)]
Tributary 1	6-1	94-lf (0.007 ac)	-	**94-lf (0.007 ac.)**
Tributary 2	6-1	-	220-lf (0.032 ac)	**220-lf (0.032 ac)**
Tributary 3	6-1	-	209-lf (0.027 ac)	**209-lf (0.027 ac)**
Tributary 4	6-2	191-lf (0.013 ac)	133-lf (0.009 ac)	**324-lf (0.022 ac)**
Tributary 5	6-3	-	133-lf (0.010 ac)	**133-lf (0.010 ac)**
Tributary 6	6-3	124-lf (0.015 ac)	79-lf (0.011 ac)	**203-lf (0.026 ac)**
Tributary 7	6-3	80-lf (0.007 ac)	-	**80-lf (0.007 ac)**
Totals		**489-lf (0.042 ac)**	**774-lf (0.089 ac)**	**1,263-lf (0.131 ac)**

Tributary 1

Tributary 1 is an unnamed, seasonal tributary to Lake Murray (Bear Creek). Within the PSA, Tributary 1 crosses Amick's Ferry Road, approximately 450 feet southeast of Zion Church Road. Tributary 1 originates at a smooth wall (S.W.) pipe outfall, within the PSA, and drains in a southeasterly direction approximately 6 linear feet (lf). The stream then traverses a S.W. pipe for approximately 40 feet under Amick's Ferry Road. From the pipe outfall southeast of Amick's Ferry Road, Tributary 1 continues to drain in a southeasterly direction beyond the limits of the PSA. Beyond the PSA, Tributary 1 appears to continue in a southeasterly direction for approximately 1,000 feet and discharges to Tributary 2. Within the PSA, Tributary 1 is approximately 3 to 4 feet in width, with bank heights ranging from 1 to 2 feet. Approximately 94-lf (0.007 acre) of the stream is found within the PSA. During field investigations, the stream channel exhibited moderate flow, weak sinuosity, and a substrate consisting of silt and sand. Aquatic life was not directly observed within Tributary 1. Within the PSA, Tributary 1 accepts drainage from Pond 1, the surrounding upland forest, roadside drainage, and residential yards and other maintained lands. Tributary 1 is depicted on USGS topographic mapping as an intermittent blue-line stream, and included in the National Hydrography Dataset. Representative photographs of Tributary 1 are included in Appendix B, Photographs 2 and 3.

Tributary 2

Tributary 2 is an unnamed, perennial tributary to Lake Murray (Bear Creek). Within the PSA, Tributary 2 is located approximately 600 feet west of Lexington Avenue. Tributary 2 originates north of the PSA and drains in a southerly direction through the PSA and beyond the limits of the PSA. Beyond the PSA, Tributary 2 appears to accept drainage from Tributaries 1 and 3 before discharging to Lake Murray, approximately 1.25 miles south of the PSA. Within the PSA, Tributary 2 is approximately 4 to 12 feet in width, with bank heights ranging from 0 to 3 feet. Approximately 220-lf (0.032 acre) of the stream is found within the PSA. During field investigations, the stream channel exhibited moderate flow, moderate sinuosity, and a substrate consisting of silt, sand, gravel, cobble, and leaf-litter. Aquatic life was not directly observed within Tributary 2. Within the PSA, Tributary 2 accepts drainage from the surrounding upland forest, roadside drainage, and residential yards. Tributary 2 is depicted on USGS topographic mapping as an intermittent blue-line stream, and included in the National Hydrography Dataset. Representative photographs of Tributary 2 are included in Appendix B, Photographs 4 and 5.

Tributary 3

Tributary 3 is an unnamed, perennial tributary to Lake Murray (Bear Creek). Within the PSA, Tributary 3 is located approximately 425 fee southeast of Clark Street. Tributary 3 originates north of the PSA and drains in a southerly direction through the PSA and beyond the limits of the PSA. Beyond the PSA, Tributary 3 appears to continue in a southeasterly direction for approximately one-half mile and discharges to Tributary 2. Within the PSA, Tributary 3 is approximately 3 to 10 feet in width, with bank heights ranging from 0 to 2 feet. Approximately 209-lf (0.027 acre) of the stream is found within the PSA. During field investigations, the stream channel exhibited heavy flow, weak sinuosity, and a substrate consisting of silt, sand, and cobble. Aquatic life was not directly observed within Tributary 3. Within the PSA, Tributary 3 accepts drainage from Pond 2, the surrounding upland forest, commercial stormwater runoff, and residential yards. Tributary 3 is depicted on USGS topographic mapping as an intermittent blue-line stream, and included in the National Hydrography Dataset. Representative photographs of Tributary 3 are included in Appendix B, Photographs 6 and 7.

Tributary 4

Tributary 4 is an unnamed, partially seasonal and partially perennial tributary to Wateree Creek. Within the PSA, Tributary 4 crosses Crooked Creek Road, approximately 1,500 feet south of I-26 interchange with Columbia Avenue. Tributary 4 originates north of the PSA and drains in a southerly direction as an intermittent stream approximately 191-lf before discharging into Freshwater Wetland 1. The stream channel reforms south of Freshwater Wetland 1 and flows in a southeasterly direction as a perennial tributary approximately 57-lf. The stream then traverses a S.W. pipe for approximately 36 feet under Crooked Creek Road. From the pipe outfall southeast of Crooked Creek Road, Tributary 4 continues to drain in a southeasterly direction beyond the limits of the PSA. Beyond the PSA, Tributary 4 appears to continue in a southeasterly direction for approximately 100 feet and discharges to Tributary 5. Within the PSA, Tributary 4 is approximately 2 to 4 feet in width, with bank heights ranging from 0 to 2 feet. Approximately 324-lf (0.022 acre) of the stream is found within the PSA. During field investigations, the stream channel exhibited moderate flow, weak sinuosity, and a substrate consisting of silt and sand. Aquatic life was not directly observed within Tributary 4. Within the PSA, Tributary 4 accepts drainage from Freshwater Wetland 1, the surrounding upland forest, roadside drainage, and residential yards and other maintained lands. Tributary 4 is not depicted on USGS topographic mapping or included in the National Hydrography Dataset. Representative photographs of Tributary 4 are included in Appendix B, Photographs 10 and 12.

Tributary 5

Tributary 5 is an unnamed, perennial tributary to Wateree Creek. Within the PSA, Tributary 5 crosses Crooked Creek Road, approximately 1,500 feet south of I-26 interchange with Columbia Avenue. Tributary 5 originates west of the PSA and drains in an easterly direction approximately 67 linear feet (lf). The stream then traverses a S.W. pipe for approximately 36 feet under Crooked Creek Road. From the pipe outfall southeast of Crooked Creek Road, Tributary 5 continues to drain in an easterly direction beyond the limits of the PSA. Beyond the PSA, Tributary 5 appears to accept drainage from Tributary 4 before discharging to Wateree Creek, approximately 1.25 miles east of the PSA. Within the PSA, Tributary 5 is approximately 3 to 4 feet in width, with bank heights ranging from 1 to 3 feet. Approximately 133-lf (0.010 acre) of the stream is found within the PSA. During field investigations, the stream channel exhibited moderate flow, weak sinuosity, and a substrate consisting of silt and sand. Aquatic life was not directly observed within Tributary 5. Within the PSA, Tributary 5 accepts drainage from the surrounding upland forest, roadside drainage, and residential yards and other maintained lands. Tributary 5 is depicted on USGS topographic mapping as an intermittent blue-line stream, and included in the National Hydrography Dataset. A representative photograph of Tributary 5 is included in Appendix B, Photograph 13.

Tributary 6

Tributary 6 is an unnamed, partially seasonal and partially perennial tributary to Risters Creek. Within the PSA, Tributary 6 is located approximately 850 feet northwest of I-26 interchange with Columbia Avenue. Tributary 6 originates at a smooth wall (S.W.) pipe outfall, within the

PSA, and drains in a northerly direction as an intermittent stream approximately 124-lf before receiving hydrology from Freshwater Wetland 2. Tributary 6 continues to flow in a northerly direction as a perennial stream beyond the limits of the PSA. Beyond the PSA, Tributary 6 appears to accept drainage from Tributary 7 before discharging to Risters Creek, approximately 650 feet north of the PSA. Within the PSA, Tributary 6 is approximately 3 to 9 feet in width, with bank heights ranging from 0 to 4 feet. Approximately 203-lf (0.026 acre) of the stream is found within the PSA. During field investigations, the stream channel exhibited moderate flow, moderate to high sinuosity, and a substrate consisting of silt and sand. Aquatic life was not directly observed within Tributary 6. Within the PSA, Tributary 6 accepts drainage from Freshwater Wetland 2, the surrounding upland forest, roadside drainage, and the maintained interstate median. Tributary 6 is not depicted on USGS topographic mapping or included in the National Hydrography Dataset. Representative photographs of Tributary 6 are included in Appendix B, Photographs 14 and 15.

Tributary 7

Tributary 7 is an unnamed, seasonal tributary to Risters Creek. Within the PSA, Tributary 7 is located approximately 750 feet northwest of I-26 interchange with Columbia Avenue. Tributary 7 originates at a headcut, within the PSA, and drains in a northerly direction beyond the limits of the PSA. Beyond the PSA, Tributary 7 appears to continue in a northerly direction for approximately 150 feet and discharges to Tributary 6. Within the PSA, Tributary 7 is approximately 2 to 5 feet in width, with bank heights ranging from 0 to 2 feet. Approximately 80-lf (0.007 acre) of the stream is found within the PSA. During field investigations, the stream channel exhibited weak flow, moderate sinuosity, and a substrate consisting of silt and sand. Aquatic life was not directly observed within Tributary 7. Within the PSA, Tributary 7 accepts drainage from Pond 4, the surrounding upland forest, and roadside drainage. Tributary 7 is not depicted on USGS topographic mapping or included in the National Hydrography Dataset. Representative photographs of Tributary 7 are included in Appendix B, Photographs 18, 19, and 20.

4.3 Ponds / Open Waters

A total of four (4) ponds, and other open waters were identified within the PSA during site reviews, as listed in Table 4 and depicted on Delineated Waters of the U.S. Maps (Appendix A, Figures 6-1 through 6-6).

TABLE 4
OPEN WATER PONDS WITHIN THE PROJECT STUDY AREA

Pond ID	Figure	Photograph	Area (ac.)
Pond 1	6-1	1	0.014
Pond 2	6-1	8	0.153
Pond 3	6-2	9	0.173
Pond 4	6-6	21	0.051
Totals			**0.391 acre**

4.4 Permitting

A Clean Water Act Section 404 permit is required for impacts to waters of the U.S., including wetlands. Section 404 is administered by the U.S. Army Corps of Engineers (USACE). Depending on the type and extent of waters of the U.S., including wetlands, to be impacted, Section 404 permitting requirements can range from activities that are considered exempt or preauthorized to those requiring pre-construction notification (PCN) for a Nationwide Permit (NWP) or Individual Permit (IP) from the USACE. For South Carolina Department of Transportation (SCDOT) projects, a USACE General Permit (GP) may be applicable. SCDOT GP's are currently authorized for seven (7) purposes, including Road Widening (SAC 2015-1280), Intersection Improvements (SAC 2015-1281), Bridge Replacements (SAC 2015-1282), Roadway Improvements (SAC 2015-1283), Roadway Maintenance (SAC 2015-1284), Pipes and Culverts (SAC 2015-1285), and Cleaning and Repairing Outfalls and Ditches (SAC 2015-1286).

In addition to the Section 404 permit, SCDHEC must grant, deny, or waive a Water Quality Certification (WQC), in accordance with Section 401 of the Clean Water Act. Waters considered by SCDHEC to be sensitive may also require additional consideration during the 401 WQC process. These include, but are not limited to, Outstanding Resource Waters (ORW), Shellfish Harvesting Waters (SFH), trout waters, areas draining to waters included on the 303(d) list of impaired waters, and areas draining to waters with an approved TMDL. As discussed in Section 2.4, the PSA drains to water listed as a water with an EPA approved TMDL. Depending on the type of impairments, extent of the project, and other factors, SCDHEC may require additional water quality protection and stormwater treatment measures during and after construction.

The SCDOT GP has been approved by SCDHEC, therefore separate approval for Section 401 WQC is not required. If impacts exceed the GP threshold limits, an IP from the USACE would be required which involves a more rigorous, time-consuming review process. It is not uncommon for the regulatory processing of an IP application to take close to a year.

Specific permitting requirements and strategies for the project will be determined once impacts to wetlands, and other waters of the U.S., are quantified following establishment of proposed project construction limits. Pursuant to Section 404, regulated discharges would include, but are not necessarily limited to, the placement of fill material, riprap, pipes, culverts, etc., into waters of the U.S. The permit application must include a delineation of affected waters of the U.S., including wetlands, as well as a description of impact avoidance and minimization strategies, and an alternatives analysis. Based on preliminary design, it is anticipated that an IP would be necessary for the project. During final design, further measures to avoid and minimize impacts; this may reduce impacts to Waters of the U.S. below the threshold of a NWP.

<u>Compensatory Mitigation</u>
Compensatory mitigation is normally required to offset unavoidable losses of waters of the U.S. The Council on Environmental Quality (CEQ) has defined mitigation in 40 CFR Part 1508.20 to include: avoiding impacts, minimizing impacts, rectifying impacts, reducing impacts over time, and compensating for impacts. Three general types of mitigation include avoidance,

minimization and compensatory mitigation. Compensatory mitigation consists usually of the restoration of existing degraded wetlands or waters, or the creation of wetlands/waters of equal or greater value than those to be impacted. This type of mitigation is only undertaken after avoidance and minimization actions are exhausted and should be undertaken, when practicable, in areas near the impact site (i.e., on-site compensatory mitigation). The USACE typically requires compensatory mitigation for any wetland impacts for which a Section 404 permit application is submitted.

It is anticipated that compensatory mitigation for permanent project impacts will be attained through purchase of mitigation credits from a USACE approved mitigation bank. Specific mitigation requirements will be established during the Section 404 permitting process.

5.0 FLOODPLAINS

Floodplains are low-lying areas adjacent to rivers, streams, and other waterbodies that are susceptible to inundation during rain events. These areas provide important functions in the natural environment such as providing storage for flood waters, protecting the surrounding environment from erosion, and providing habitat for wildlife. As such, agencies are required to take actions that reduce the risk of impacts to floodplains and their associated floodway, or main channel of flow.

Floodplain and floodway protection is required under several federal, state, and local laws, including Executive Order 11988, entitled “Floodplain Management,” which requires federal agencies to avoid making modifications to and supporting development in floodplains wherever practical. Floodplains subject to inundation by the one-percent-annual-chance (100-year) flood event are regulated by the Federal Emergency Management Agency (FEMA).

FEMA publishes maps which depict areas of regulated floodplains and floodways. The Flood Insurance Rate Map (FIRM) is the most common of these flood maps. FIRMs depict the boundaries of flood hazard areas and differentiates them by Zone.

Zone A floodplains are areas subject to inundation by the 1-percent-annual-chance flood event and are generally determined using approximate methodologies. Because detailed hydraulic analyses have not been performed, Base Flood Elevations (BFEs) or flood depths are not available for Zone A floodplains.

Zone AE floodplains are areas subject to inundation by the 1-percent-annual-chance flood event and are determined by detailed methods. BFEs are available for Zone AE floodplains and are provided on FIRMs.

In accordance with Executive Order 11988, a hydraulic analysis must be conducted for an encroachment of a FEMA-regulated floodplain. The hydraulic analysis is used to determine if the project is likely to increase the risk of flooding within the floodplain. In order to meet the requirements of a “No-Rise” condition, FEMA requires projects which would encroach on Regulated Floodways and Zone AE floodplains to result in a change no greater than 0.1 feet from the established 100-year flood elevations. Furthermore, SCDOT requires all Zone A crossings to be analyzed for the 100-year flood to insure that the floodplain encroachment does not cause one (1) foot or more of backwater when compared to unrestricted or natural conditions.

Based upon a review of the floodplain mapping and a GIS analysis of the project study area, the proposed project will not cross or encroach on FEMA-regulated floodplains. The extent of floodplains in the vicinity of the project are illustrated in Appendix A, Figure 7.

If project modifications are necessary that would require impacts to FEMA-regulated floodplains, a preliminary hydraulic analysis will be performed for each floodplain encroachment and a detailed hydraulic analysis will be performed during final design.

6.0 THREATENED AND ENDANGERED SPECIES

The Federal Endangered Species Act (ESA) of 1973, as amended, is the federal regulatory tool that serves to administer permits, implement recovery plans, and monitor federally protected (endangered and threatened) species. The ESA is administered and regulated by the USFWS and/or National Oceanic and Atmospheric Administration-National Marine Fisheries Service (NOAA-NMFS).

Because of the federal nexus of the proposed project, consultation with the USFWS is required under Section 7 of the ESA, as amended (16 USC 1531-1534), for proposed projects that “may affect” federally endangered and threatened species. This assessment analyzes potential impacts to federally endangered and threatened species associated with the proposed project, and is intended to initiate informal consultation, as needed.

Federal Protected Species - Species with the federal classification of Endangered (E) or Threatened (T), or Threatened due to Similarity of Appearance (T [S/A]) are protected under the ESA of 1973, as amended (16 U.S.C. 1531 et seq.). The term “endangered species” is defined as “any species which is in danger of extinction throughout all or a significant portion of its range”, and the term “threatened species” is defined as “any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range” (16 U.S.C. 1532).

The term “Proposed” (P) is defined as “any species proposed for official listing as endangered or threatened.” “Candidate” (C) species are taxons under consideration for which there is sufficient information to support listing but development of a proposed listing regulation is precluded by other higher priority listing activities. “At-Risk Species” (ARS) is an informal term that refers to those species which may be in need of concentrated conservation actions, and have been petitioned for listing as threatened or endangered. The USFWS designations P, C, and ARS do not provide federal protection and require no Section 7 consultation under the ESA.

State Protected Species – Animal species that are on the South Carolina state protected species list receive protection under the South Carolina Nongame and Endangered Species Conservation

Act (South Carolina Code, Title 50). State endangered species are defined as any species or subspecies of wildlife whose prospects of survival or recruitment within the state are in jeopardy or are likely within the foreseeable future to become so. It is unlawful for any person to take, possess, transport, export, process, sell or offer for sale or ship, and for any common or contract carrier knowingly to transport or receive for shipment any species or subspecies of wildlife appearing on the state list of protected species without appropriate authorization.

TABLE 5
ENDANGERED/THREATENED SPECIES IN LEXINGTON COUNTY

Protected Species		Protection	
Common Name	**Scientific Name**	**Federal**	**State**
Bird Species			
American wood stork	*Mycteria americana*	T	-
Bald eagle	*Haliaeetus leucocephalus*	BGEPA	T
Red-cockaded woodpecker	*Picoides borealis*	E	E
Fish Species			
Americal eel	Anguilla rostrata	ARS	-
Blueback herring	Alosa aestivalis	ARS	-
Robust redhorse	Moxostoma robustum	ARS	-
Mammal Species			
Tri-colored bat	*Perimyotis subflavus*	ARS	-
Mollusk Species			
Savannah Lilliput	*Toxolasma pullus*	ARS	-
Plant Species			
Bog spicebush	*Perimyotis subflavus*	ARS	-
Carolina-birds-in-a-nest	*Macbridea caroliniana*	ARS	-
Ciliate-leaf tickseed	*Coreopsis integrifolia*	ARS	-
Long Beach seedbox	*Ludwigia brevipes*	ARS	-
Smooth coneflower	*Echinacea laevigata*	E	-
Spathulate seedbox	*Ludwigia spathulata*	ARS	-
Wire-leaved dropseed	*Sporobolus teretifolius*	ARS	-
Reptile Species			
Southern hognose snake	Heterdon simus	ARS	-
Spotted turtle	Clemmys guttata	ARS	-

BGEPA = Bald and Golden Eagle Protection Act, E = Endangered, T = Threatened, ARS = At Risk Species

A search of the USFWS database provided existing information concerning the potential occurrence of threatened or endangered species within Lexington County. This database identifies three (3) federally threatened or endangered species known to occur or to have formerly occurred in Lexington County, as listed in Table 5 (USFWS, 2015). Please note: Table 5 also includes thirteen (13) At-Risk Species and the bald eagle (*Haliaeetus leucocephalus*). The bald eagle is no longer protected under the ESA, but is afforded protection through the Bald and Golden Eagle Protection Act (BGEPA) of 1940.

The South Carolina Department of Natural Resources (SCDNR) Rare, Threatened and Endangered Species Inventory database, updated June 11, 2014, was also reviewed for information regarding species with state endangered or threatened status. No additional species are currently listed as state threatened or endangered in Lexington County.

State and/or federally-listed endangered and threatened species and their respective habitats are briefly described below:

American wood stork (*Mycteria americana*) – Federal Threatened
The American wood stork is a large, long-legged wading bird, approximately 45 inches in height with a wingspan of 60 to 65 inches. The species has mostly white plumage excluding the black trailing edges of the wings and tail. The neck and head is primarily un-feathered with grayish black skin. The bill is black, thick at the base, and curves downward. The American wood stork prefer freshwater and estuarine wetlands for breeding, feeding, and roosting. These birds are colonial nesters with colonies that range from less than 12 to more than 500 nests. Nests can be located in small or large trees, but these nests typically occur in trees found in standing water or on small islands. Feeding often occurs in water six (6) to ten (10) inches deep.

Bald eagle (*Haliaeetus leucocephalus*) – Bald and Golden Eagle Protection Act
The bald eagle is a large raptor, with a wingspan of about seven feet, and mainly dark brown in color. Adults have a pure white head and tail. It nests in large, mature live pine or cypress trees. Nests are typically large, up to six feet in width, and constructed of sticks and soft materials, such as dead vegetation, grass, and pine needles. Nesting trees are usually found within two miles of coasts, rivers, and lakes, near the bodies of water in which it feeds. The bald eagle primarily feeds on fish but also takes a variety of bird, mammals and turtles when fish are not readily available. In South Carolina, bald eagles will nest from October 1 through May 15.

Red-cockaded woodpecker (*Picoides borealis*) - Federal/State Endangered
Adult red-cockaded woodpeckers are approximately 18 to 20 centimeters (cm) long with a wingspan of 35 to 38 cm. Adults have a black cap, throat, and stripe on the side of the neck and white cheeks and underparts. The back is barred with black and white horizontal stripes. Adult males have a small red spot on each side of the black cap. The bird is native to southern pine forests and typically nests within open pine stands with trees 80 years or older. Roosting cavities are excavated within live pines, which are often infected with a fungus which causes what is known as red-heart disease. Foraging may occur in pine and/or mixed pine/hardwood stands 30 years or older with trees 10 inches or larger in diameter at breast height (dbh).

Smooth coneflower (*Echinacea laevigata*) – *Federal Endangered*
Smooth coneflower is a perennial herb that grows up to one (1) meter tall from a vertical root stock. The large elliptical to broadly lanceolate basal leaves may reach eight (8) inches in length and three (3) inches in width. The leaves are smooth to slightly rough in texture. The stems are smooth, with few leaves. Flower heads of the plant are usually solitary, with light pink to purplish rays, usually drooping, and two (2) to three (3) inches long. Flowering occurs from late May through mid-July and fruits develop from late June to September. The fruiting structures often persist through the fall. Smooth coneflower was formerly a plant of prairie-like habitats or oak-savannas maintained by natural or Native American-set fires. Now it occurs primarily in openings in woods, such as cedar barrens and clear cuts, along roadsides and utility line rights-of-way, and on dry limestone bluffs. Smooth coneflower is usually found in areas with magnesium- and calcium-rich soils and requires full or partial sun. Associated species include: *Juniperus virginiana* and *Eryngium yuccifolium*.

6.1 Methodology

Environmental scientists performed literature and field reviews to determine the likelihood of protected species within the PSA and the potential for project-related impacts. The list of protected species known to occur in Lexington County was reviewed, and field reviews were conducted within the PSA on July 29th through July 31st, 2015. Areas that matched the descriptions of preferred habitat for protected species were classified as protected species habitat and were surveyed for the presence of protected species.

The PSA totals approximately 140 acres in size, and is generally centered on the proposed project alignment. A one-half mile buffer around the PSA was also reviewed for potential red-cockaded woodpecker nesting habitat; please see Appendix A, Figure 8 for the location and extent of the PSA and buffer area. The natural communities observed consisted of mixed pine/hardwood forest, planted pine forest, bottomland hardwood forest, and successional forest. In addition, the PSA consists of some maintained and disturbed roadside areas and residential lawns and other maintained lands.

The SCDNR South Carolina Heritage Trust (SCHT) Geographic Database of Rare and Endangered Species was also reviewed to determine the presence of known populations of protected species within the vicinity of the project.

At-Risk Species (ARS) do not receive legal protection from the ESA; therefore, surveys for these species were not conducted during field reviews. In the event additional species are listed as federally threatened or endangered prior to the construction of the project, surveys for added species will be performed in accordance with USFWS survey protocols.

6.2 Results

Information obtained from the SCDNR-SCHT database indicates that there are no state-listed threatened or endangered species known to be present within the PSA as of January 17, 2006.

Furthermore, according to the database, no state-listed threatened or endangered species are located within a one mile radius of the project.

No potential nesting or foraging habitat for bald eagle is present within the PSA due to a lack of any large river or body of water within two miles of the PSA.

No suitable habitat for American wood stork is present within the PSA due to the lack of persistent, shallow waterbodies for wading/feeding, or the presence of trees within standing water for nesting.

Potential foraging habitat for red-cockaded woodpecker is found within pine plantations and other pine forests along Columbia Avenue and an undeveloped portion of the PSA between Amick's Ferry Road and Lexington Avenue. Based on this finding, a one-half mile buffer area was mapped and reviewed for potential roosting habitat for the species. No preferred roosting habitat was identified within the PSA or within the one-half mile buffer area. Habitat is unsuitable due to the age of pine trees in the area, highway traffic, and the relatively dense subcanopy of pine forests. Additionally, no tree cavities or evidence of the species was identified in these areas.

No suitable habitat for smooth coneflower exists within the PSA based on the lack of suitable soils for the species.

6.3 Biological Conclusions

Based on the literature and field reviews, it is determined that the project will have a biological conclusion of 'no effect' on American wood stork, bald eagle, red-cockaded woodpecker, or smooth coneflower.

At-Risk Species (ARS) do not currently receive legal protection from the ESA; therefore, a biological conclusion for these species is not provided. In the event additional species are listed as federally threatened or endangered prior to the construction of the project, SCDOT will consult with USFWS on the results of the surveys performed, if necessary, and will follow any USFWS regulations/requirements resulting from that consultation.

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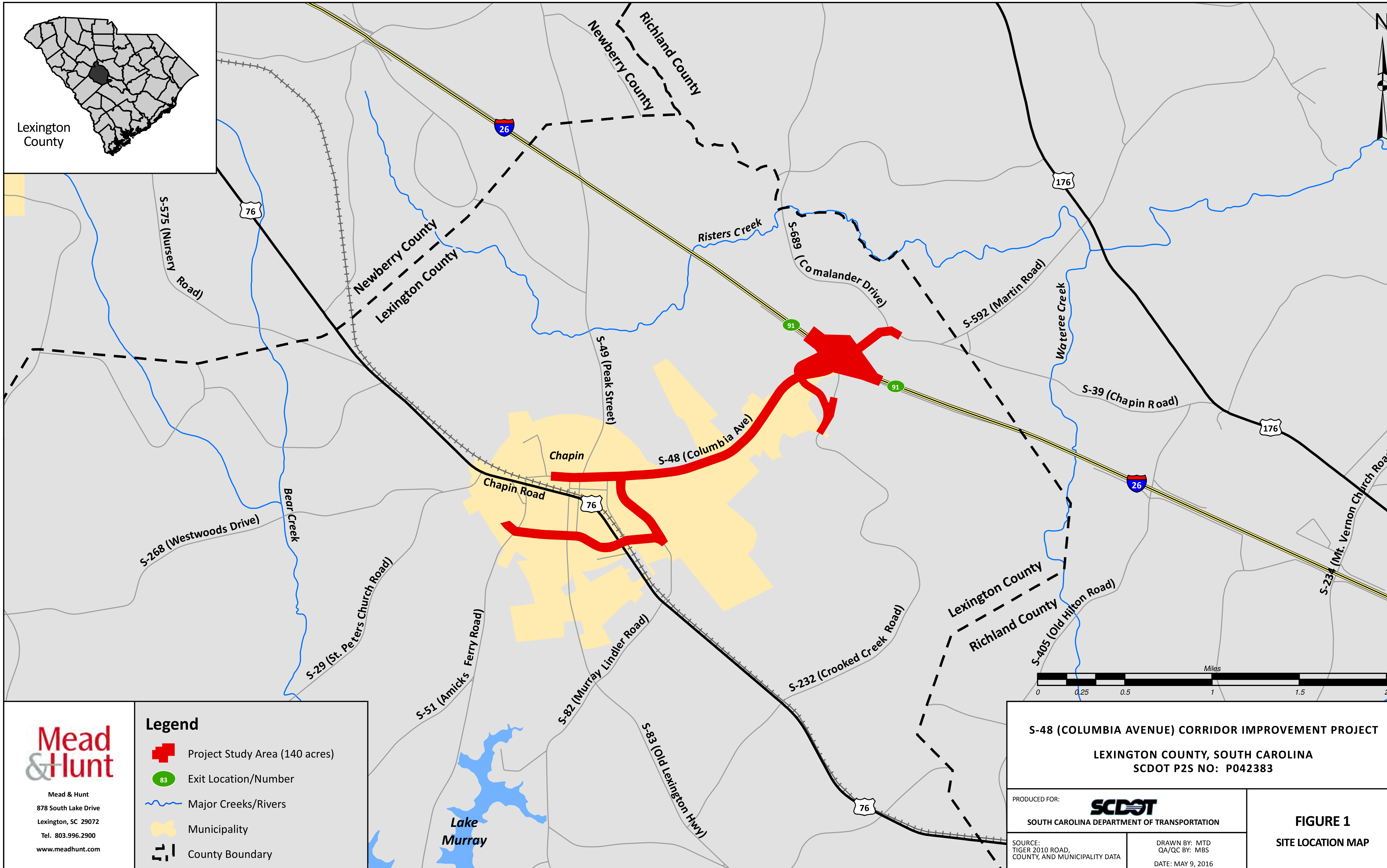
APPENDIX A

FIGURES



Mead & Hunt
878 South Lake Drive
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Legend

- Project Study Area (140 acres)
- 83 Exit Location/Number
- Major Creeks/Rivers
- Municipality
- County Boundary

S-48 (COLUMBIA AVENUE) CORRIDOR IMPROVEMENT PROJECT

LEXINGTON COUNTY, SOUTH CAROLINA
SCDOT P2S NO: P042383

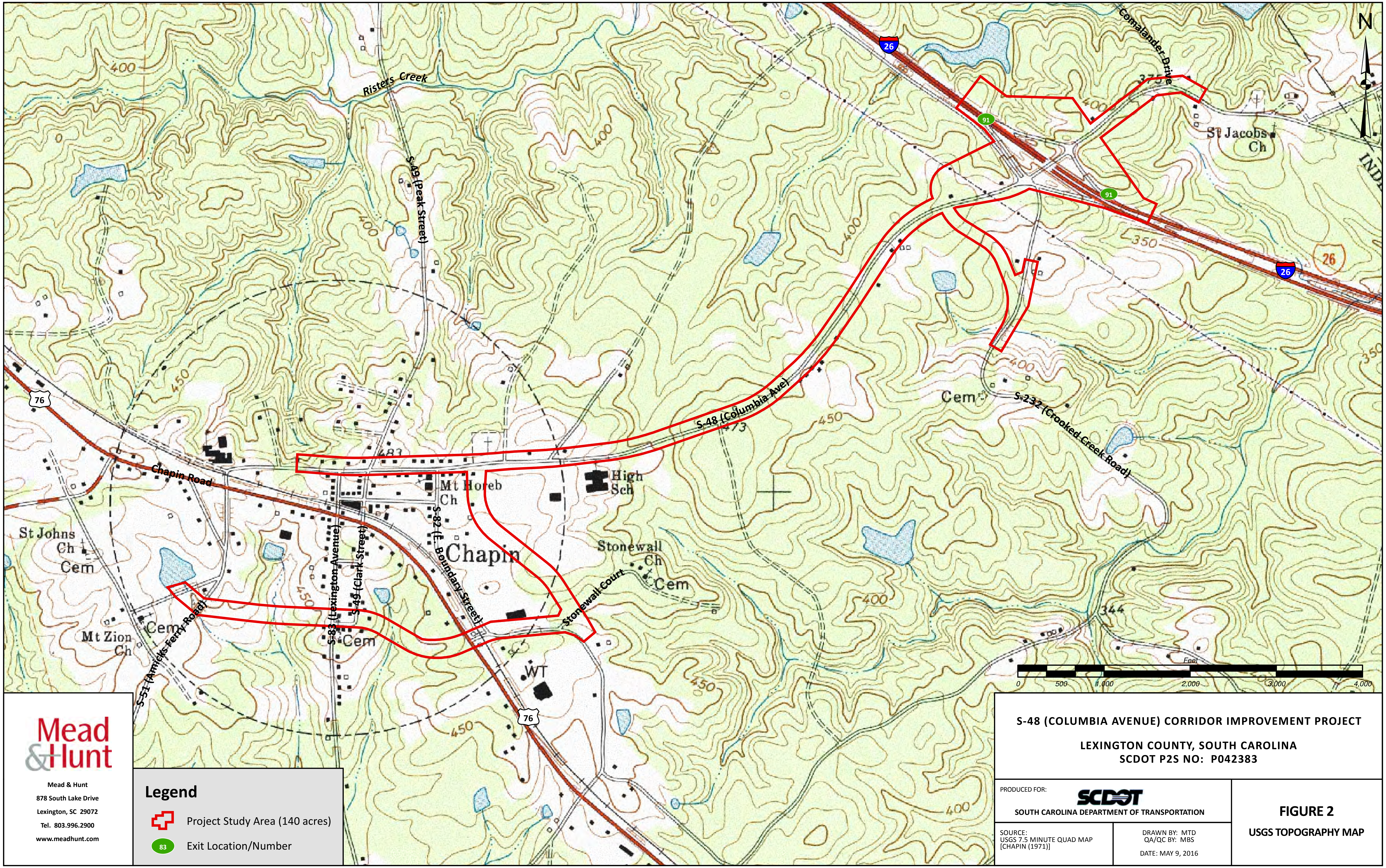
PRODUCED FOR:
SCDOT
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SOURCE:
TIGER 2010 ROAD,
COUNTY, AND MUNICIPALITY DATA

DRAWN BY: MTD
QA/QC BY: MBS

DATE: MAY 9, 2016

FIGURE 1
SITE LOCATION MAP



Mead & Hunt

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878 South Lake Drive
Lexington, SC 29072
Tel. 803.996.2900
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Legend

Project Study Area (140 acres)

83 Exit Location/Number

S-48 (COLUMBIA AVENUE) CORRIDOR IMPROVEMENT PROJECT

LEXINGTON COUNTY, SOUTH CAROLINA
SCDOT P2S NO: P042383

PRODUCED FOR:
SCDOT
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SOURCE:
USGS 7.5 MINUTE QUAD MAP
[CHAPIN (1971)]

DRAWN BY: MTD
QA/QC BY: MBS

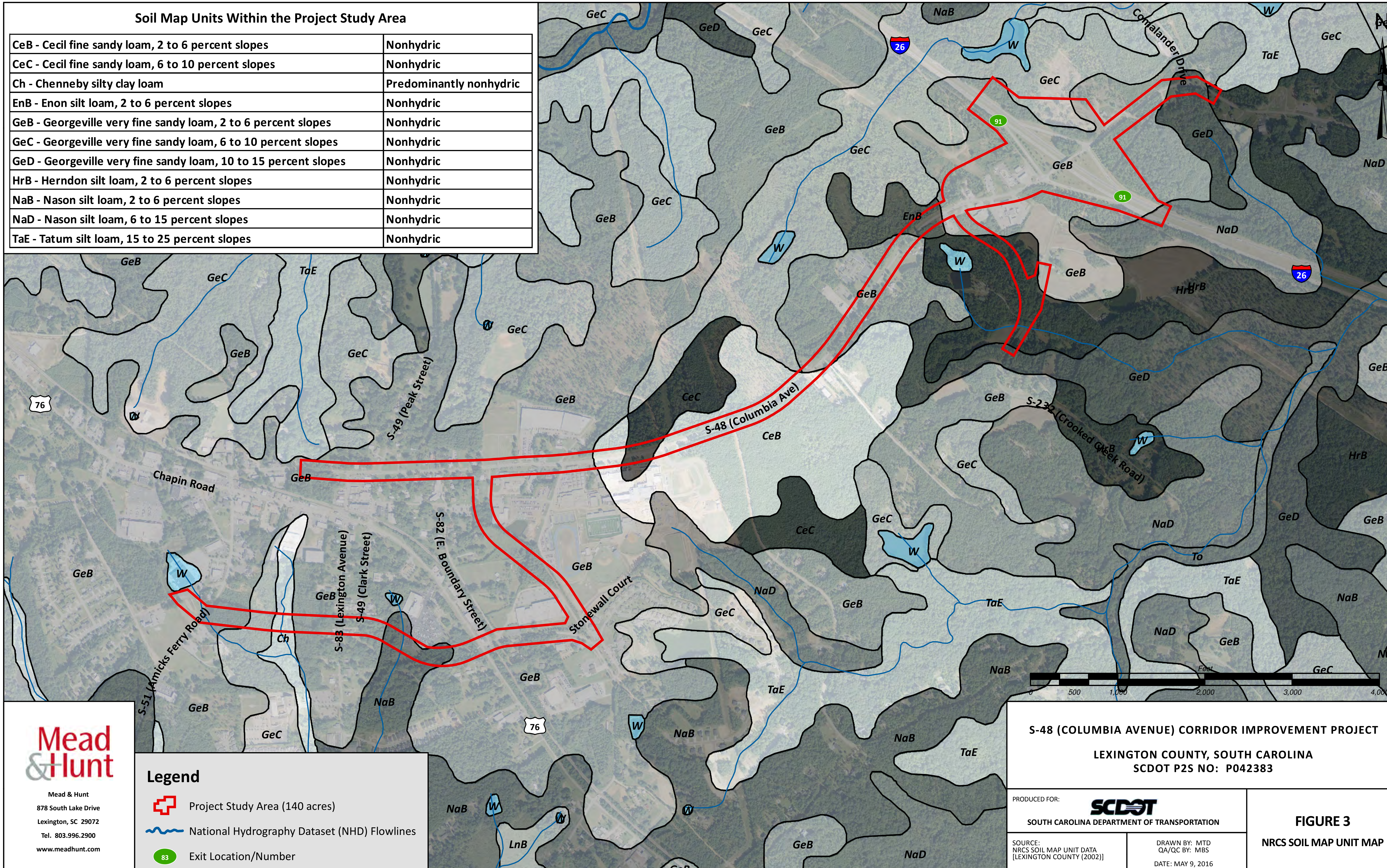
DATE: MAY 9, 2016

FIGURE 2

USGS TOPOGRAPHY MAP

Soil Map Units Within the Project Study Area

CeB - Cecil fine sandy loam, 2 to 6 percent slopes	Nonhydric
CeC - Cecil fine sandy loam, 6 to 10 percent slopes	Nonhydric
Ch - Chenneby silty clay loam	Predominantly nonhydric
EnB - Enon silt loam, 2 to 6 percent slopes	Nonhydric
GeB - Georgeville very fine sandy loam, 2 to 6 percent slopes	Nonhydric
GeC - Georgeville very fine sandy loam, 6 to 10 percent slopes	Nonhydric
GeD - Georgeville very fine sandy loam, 10 to 15 percent slopes	Nonhydric
HrB - Herndon silt loam, 2 to 6 percent slopes	Nonhydric
NaB - Nason silt loam, 2 to 6 percent slopes	Nonhydric
NaD - Nason silt loam, 6 to 15 percent slopes	Nonhydric
TaE - Tatum silt loam, 15 to 25 percent slopes	Nonhydric



Legend

Project Study Area (140 acres)

National Hydrography Dataset (NHD) Flowlines

83 Exit Location/Number

Mead & Hunt

Mead & Hunt
878 South Lake Drive
Lexington, SC 29072
Tel. 803.996.2900
www.meadhunt.com

S-48 (COLUMBIA AVENUE) CORRIDOR IMPROVEMENT PROJECT

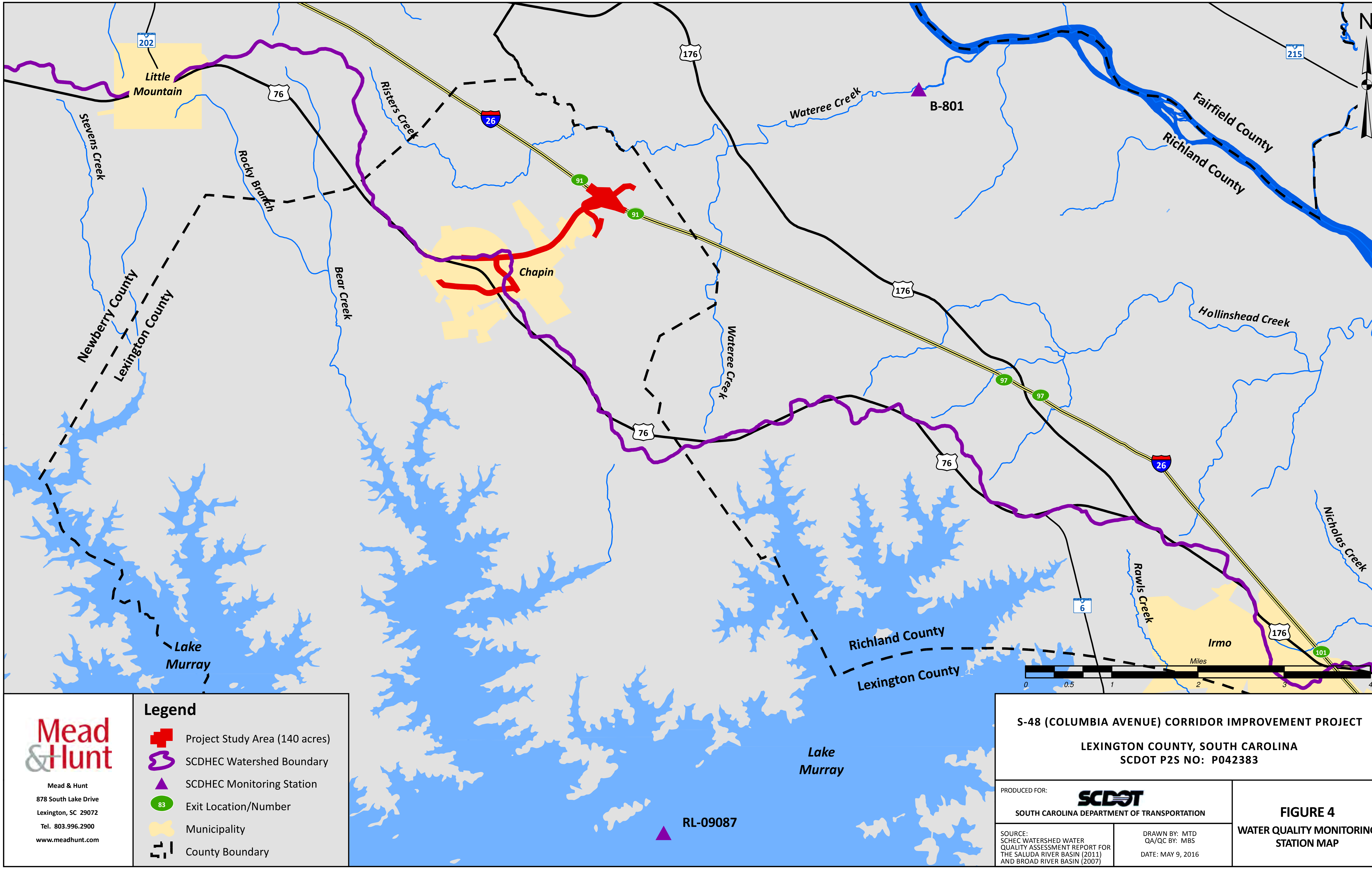
LEXINGTON COUNTY, SOUTH CAROLINA
SCDOT P2S NO: P042383

PRODUCED FOR:
SCDOT
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

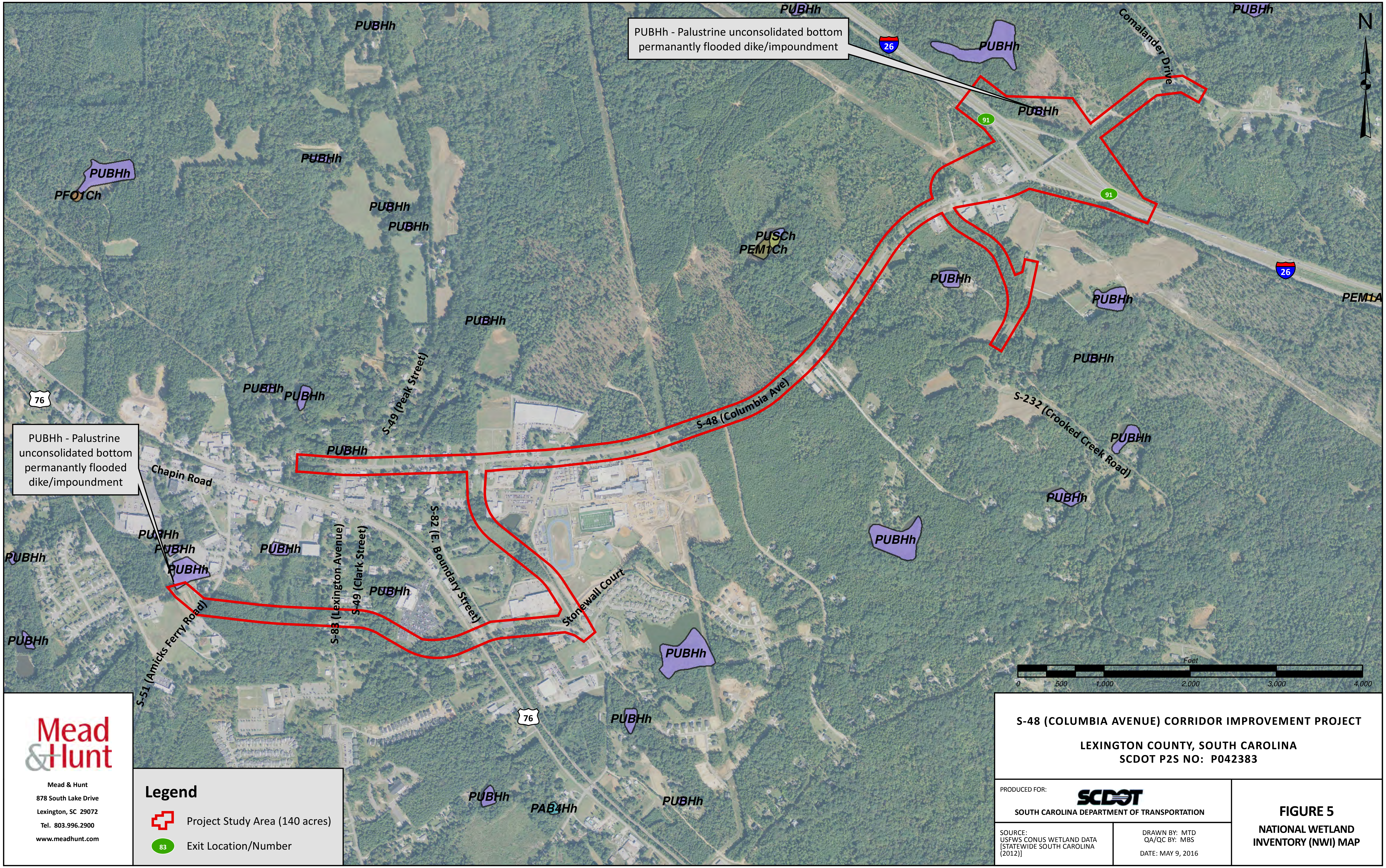
SOURCE:
NRCS SOIL MAP UNIT DATA
[LEXINGTON COUNTY (2002)]

DRAWN BY: MTD
QA/QC BY: MBS
DATE: MAY 9, 2016

FIGURE 3
NRCS SOIL MAP UNIT MAP



Little Mountain
Chapin
Irmo
Lake Murray
Lake Murray
Stevens Creek
Rocky Branch
Risters Creek
Bear Creek
Wateree Creek
Wateree Creek
Hollinshead Creek
Rawls Creek
Nicholas Creek
Fairfield County
Richland County
Newberry County
Lexington County
Richland County
Lexington County
B-801
RL-09087
202
76
26
91
91
176
176
176
97
97
76
76
26
6
101
215
N
Miles
0 0.5 1 2 3 4
Legend
Project Study Area (140 acres)
SCDHEC Watershed Boundary
SCDHEC Monitoring Station
83
Exit Location/Number
Municipality
County Boundary
Mead & Hunt
Mead & Hunt
878 South Lake Drive
Lexington, SC 29072
Tel. 803.996.2900
www.meadhunt.com
S-48 (COLUMBIA AVENUE) CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY, SOUTH CAROLINA
SCDOT P2S NO: P042383
PRODUCED FOR:
SCDOT
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
FIGURE 4
WATER QUALITY MONITORING STATION MAP
SOURCE:
SCHEC WATERSHED WATER QUALITY ASSESSMENT REPORT FOR THE SALUDA RIVER BASIN (2011) AND BROAD RIVER BASIN (2007)
DRAWN BY: MTD
QA/QC BY: MBS
DATE: MAY 9, 2016



Mead & Hunt

Mead & Hunt
878 South Lake Drive
Lexington, SC 29072
Tel. 803.996.2900
www.meadhunt.com

Legend

Project Study Area (140 acres)

83 Exit Location/Number

S-48 (COLUMBIA AVENUE) CORRIDOR IMPROVEMENT PROJECT

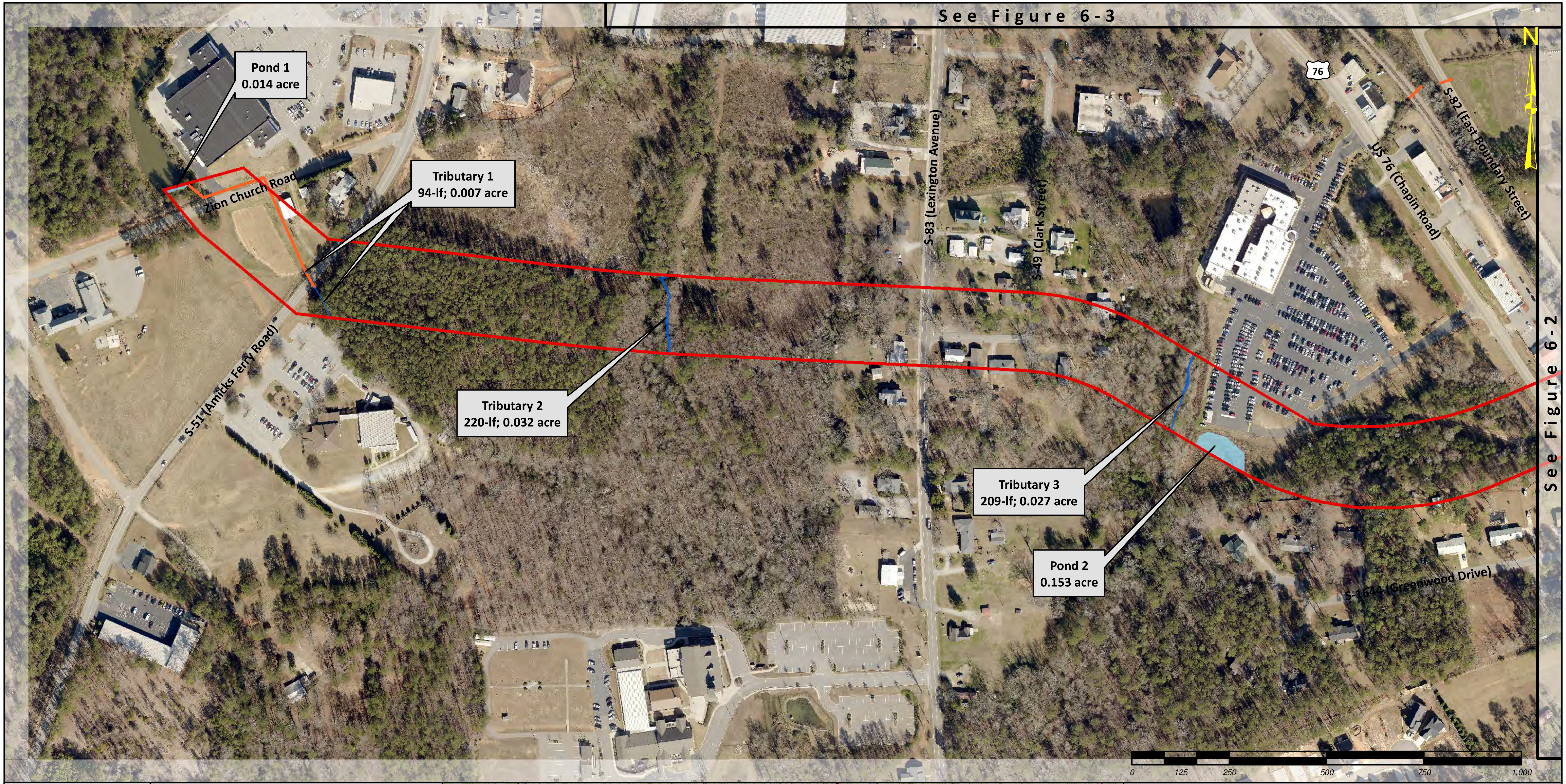
LEXINGTON COUNTY, SOUTH CAROLINA
SCDOT P2S NO: P042383

PRODUCED FOR:
SCDOT
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SOURCE:
USFWS CONUS WETLAND DATA
[STATEWIDE SOUTH CAROLINA (2012)]

DRAWN BY: MTD
QA/QC BY: MBS
DATE: MAY 9, 2016

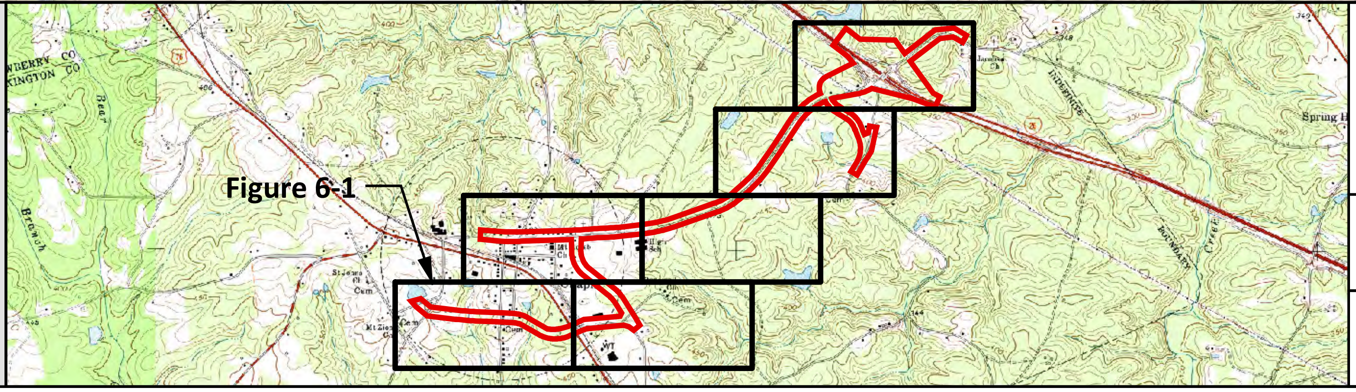
FIGURE 5
NATIONAL WETLAND INVENTORY (NWI) MAP



Mead & Hunt
878 South Lake Drive
Lexington, SC 29072
Tel. 803.996.2900
www.meadhunt.com

Legend

- Project Study Area (140 acres)
- Freshwater Wetland
- Pond / Water (0.167 acre)
- Tributary (523-lf / 0.066 acre)
- Culvert / Pipe / Flume



S-48 (COLUMBIA AVENUE) CORRIDOR IMPROVEMENT PROJECT

LEXINGTON COUNTY, SOUTH CAROLINA
SCDOT P2S NO: P042383

PRODUCED FOR:
SCDOT
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SOURCE:
HIGH RESOLUTION AERIAL PHOTOGRAPHY [INDEPENDENT MAPPING CONSULTANTS (2015)]

DRAWN BY: MTD
QA/QC BY: MBS
DATE: MAY 9, 2016

FIGURE 6-1

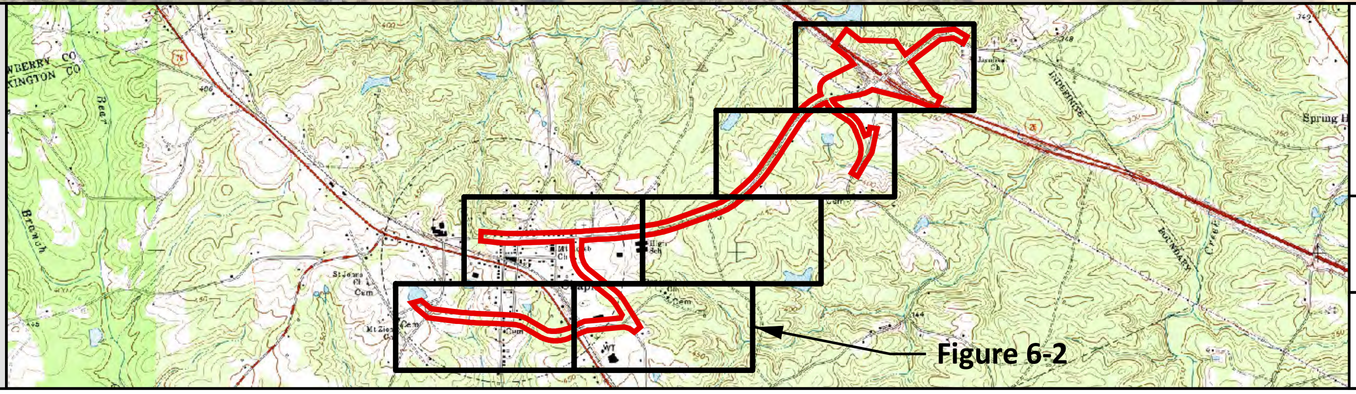
DELINEATED WATERS OF THE U.S.

Mead & Hunt

Mead & Hunt
878 South Lake Drive
Lexington, SC 29072
Tel. 803.996.2900
www.meadhunt.com

Legend

- Project Study Area (140 acres)
- Freshwater Wetland
- Pond / Water (0.173 acre)
- Tributary
- Culvert / Pipe / Flume



S-48 (COLUMBIA AVENUE) CORRIDOR IMPROVEMENT PROJECT

LEXINGTON COUNTY, SOUTH CAROLINA
SCDOT P2S NO: P042383

PRODUCED FOR:
SCDOT
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SOURCE:
HIGH RESOLUTION AERIAL PHOTOGRAPHY [INDEPENDENT MAPPING CONSULTANTS (2015)]

DRAWN BY: MTD
QA/QC BY: MBS

DATE: MAY 9, 2016

FIGURE 6-2

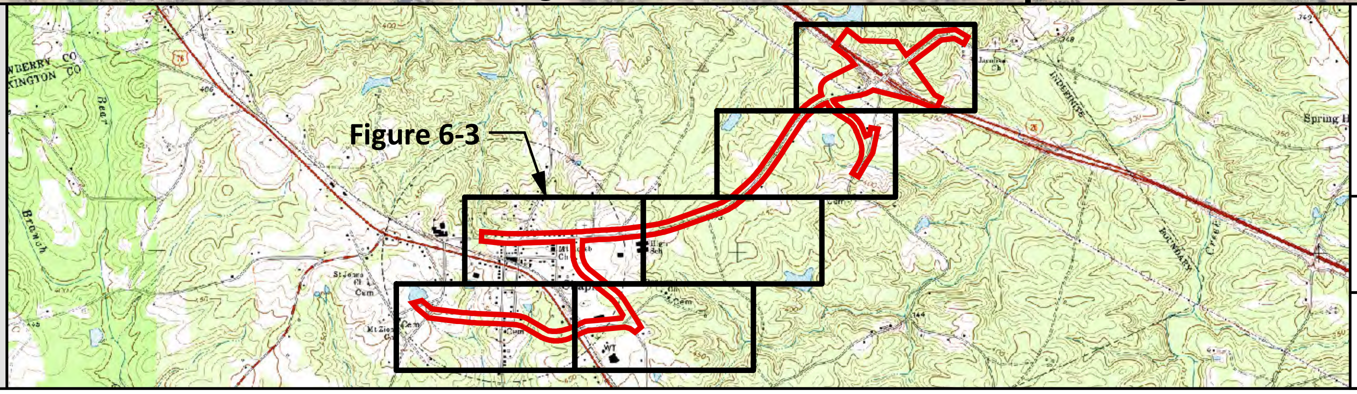
DELINEATED WATERS OF THE U.S.

Mead & Hunt

Mead & Hunt
878 South Lake Drive
Lexington, SC 29072
Tel. 803.996.2900
www.meadhunt.com

Legend

- Project Study Area (140 acres)
- Freshwater Wetland
- Pond / Water
- Tributary
- Culvert / Pipe / Flume



S-48 (COLUMBIA AVENUE) CORRIDOR IMPROVEMENT PROJECT

LEXINGTON COUNTY, SOUTH CAROLINA
SCDOT P2S NO: P042383

PRODUCED FOR:
SCDOT
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SOURCE:
HIGH RESOLUTION AERIAL PHOTOGRAPHY
[INDEPENDENT MAPPING CONSULTANTS (2015)]

DRAWN BY: MTD
QA/QC BY: MBS

DATE: MAY 9, 2016

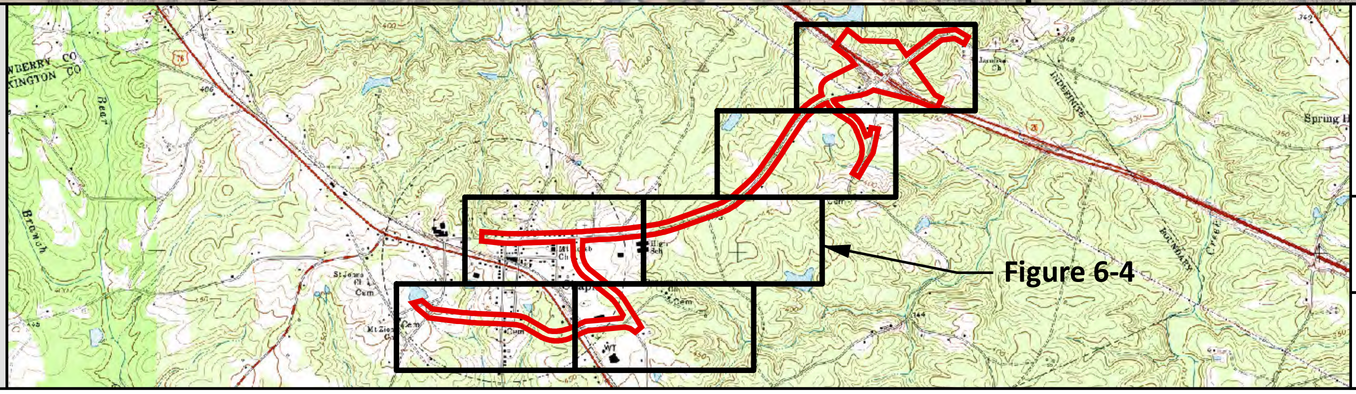
FIGURE 6-3

DELINEATED WATERS OF THE U.S.

Mead & Hunt
878 South Lake Drive
Lexington, SC 29072
Tel. 803.996.2900
www.meadhunt.com

Legend

- Project Study Area (140 acres)
- Freshwater Wetland
- Pond / Water
- Tributary
- Culvert / Pipe / Flume



S-48 (COLUMBIA AVENUE) CORRIDOR IMPROVEMENT PROJECT

LEXINGTON COUNTY, SOUTH CAROLINA
SCDOT P2S NO: P042383

PRODUCED FOR:
SCDOT
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SOURCE:
HIGH RESOLUTION AERIAL PHOTOGRAPHY
[INDEPENDENT MAPPING CONSULTANTS (2015)]

DRAWN BY: MTD
QA/QC BY: MBS

DATE: MAY 9, 2016

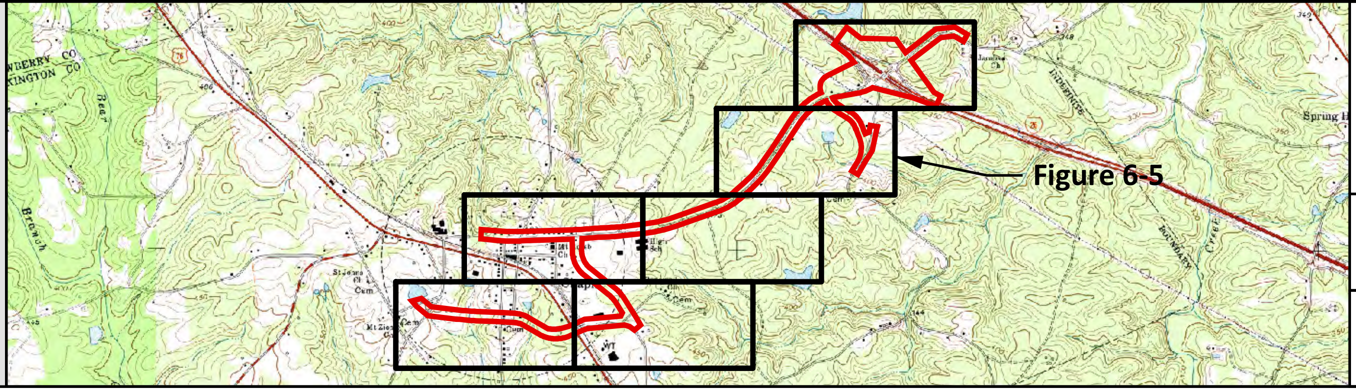
FIGURE 6-4
DELINEATED WATERS OF THE U.S.

Mead & Hunt

Mead & Hunt
878 South Lake Drive
Lexington, SC 29072
Tel. 803.996.2900
www.meadhunt.com

Legend

- Project Study Area (140 acres)
- Freshwater Wetland (0.472 acre)
- Pond / Water
- Tributary (457-lf / 0.032 acre)
- Culvert / Pipe / Flume



S-48 (COLUMBIA AVENUE) CORRIDOR IMPROVEMENT PROJECT

LEXINGTON COUNTY, SOUTH CAROLINA
SCDOT P2S NO: P042383

PRODUCED FOR:
SCDOT
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

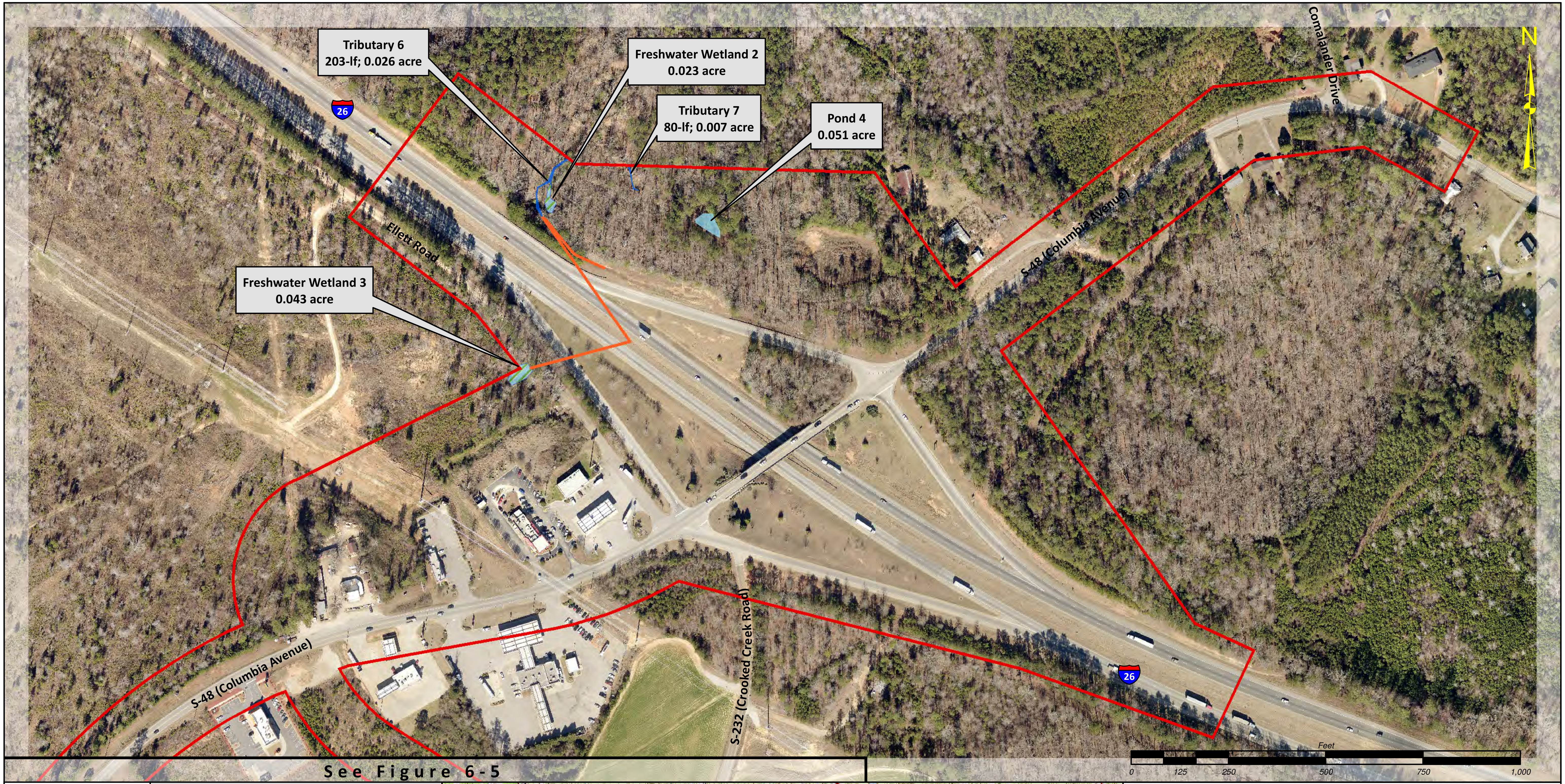
SOURCE:
HIGH RESOLUTION AERIAL PHOTOGRAPHY
[INDEPENDENT MAPPING CONSULTANTS (2015)]

DRAWN BY: MTD
QA/QC BY: MBS

DATE: MAY 9, 2016

FIGURE 6-5

DELINEATED WATERS OF THE U.S.

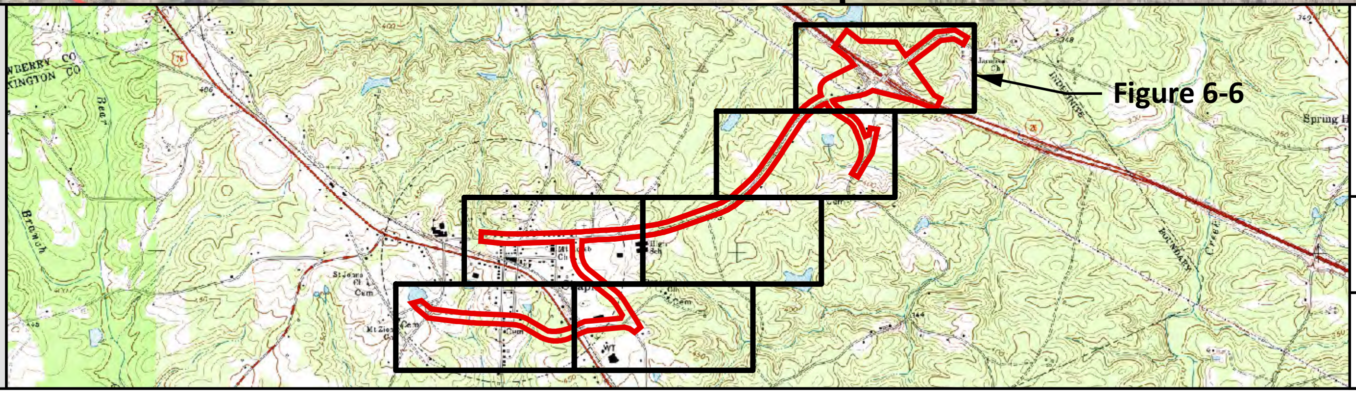


Mead & Hunt

Mead & Hunt
878 South Lake Drive
Lexington, SC 29072
Tel. 803.996.2900
www.meadhunt.com

Legend

- Project Study Area (140 acres)
- Freshwater Wetland (0.066 acre)
- Pond / Water (0.051 acre)
- Tributary (283-lf / 0.033 acre)
- Culvert / Pipe / Flume



S-48 (COLUMBIA AVENUE) CORRIDOR IMPROVEMENT PROJECT

LEXINGTON COUNTY, SOUTH CAROLINA
SCDOT P2S NO: P042383

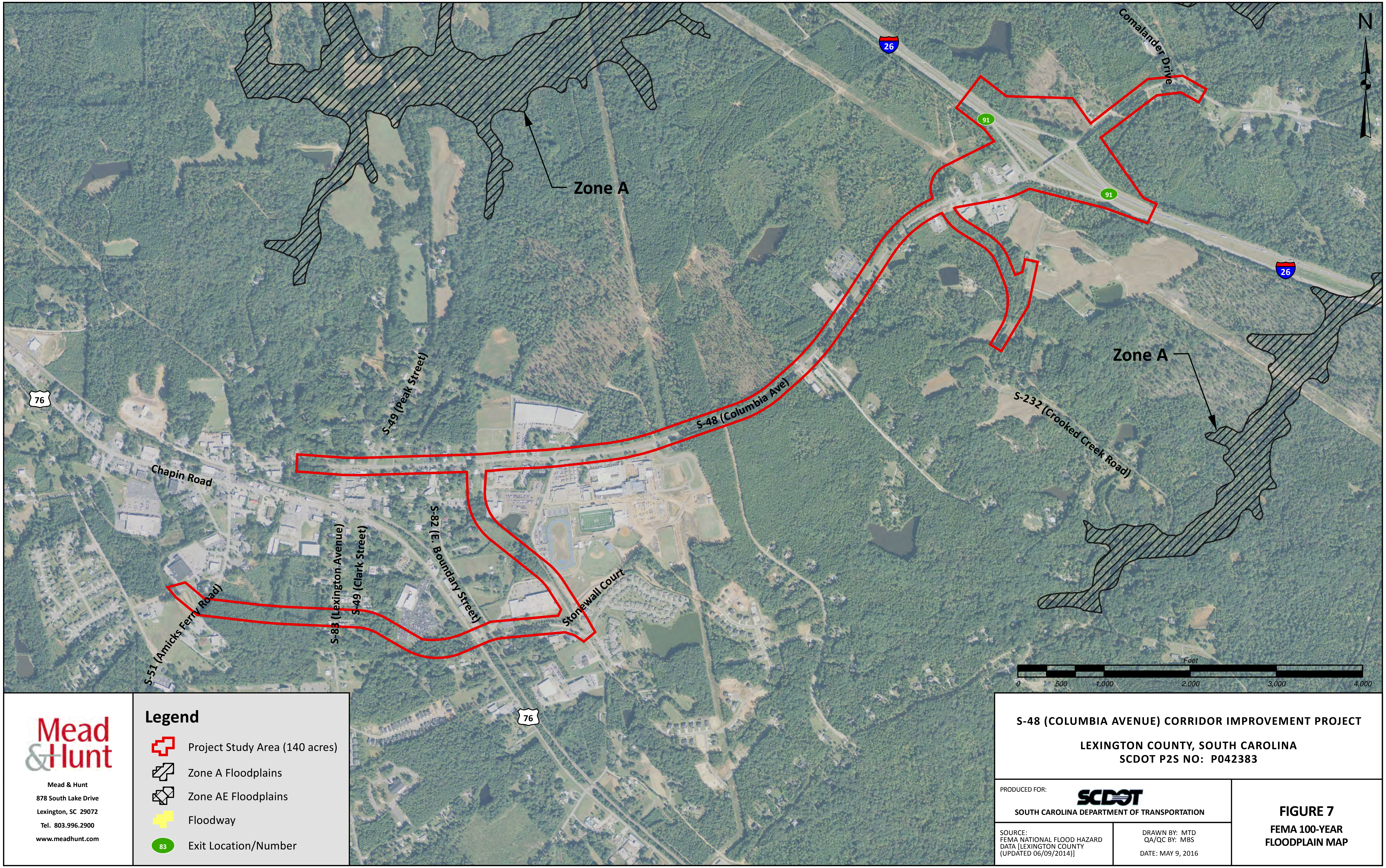
PRODUCED FOR:
SCDOT
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SOURCE:
HIGH RESOLUTION AERIAL PHOTOGRAPHY
[INDEPENDENT MAPPING CONSULTANTS (2015)]

DRAWN BY: MTD
QA/QC BY: MBS

DATE: MAY 9, 2016

FIGURE 6-6
DELINEATED WATERS OF THE U.S.



S-48 (COLUMBIA AVENUE) CORRIDOR IMPROVEMENT PROJECT

LEXINGTON COUNTY, SOUTH CAROLINA
SCDOT P2S NO: P042383

PRODUCED FOR:
SCDOT
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SOURCE:
FEMA NATIONAL FLOOD HAZARD DATA [LEXINGTON COUNTY (UPDATED 06/09/2014)]

DRAWN BY: MTD
QA/QC BY: MBS
DATE: MAY 9, 2016

FIGURE 7
FEMA 100-YEAR FLOODPLAIN MAP

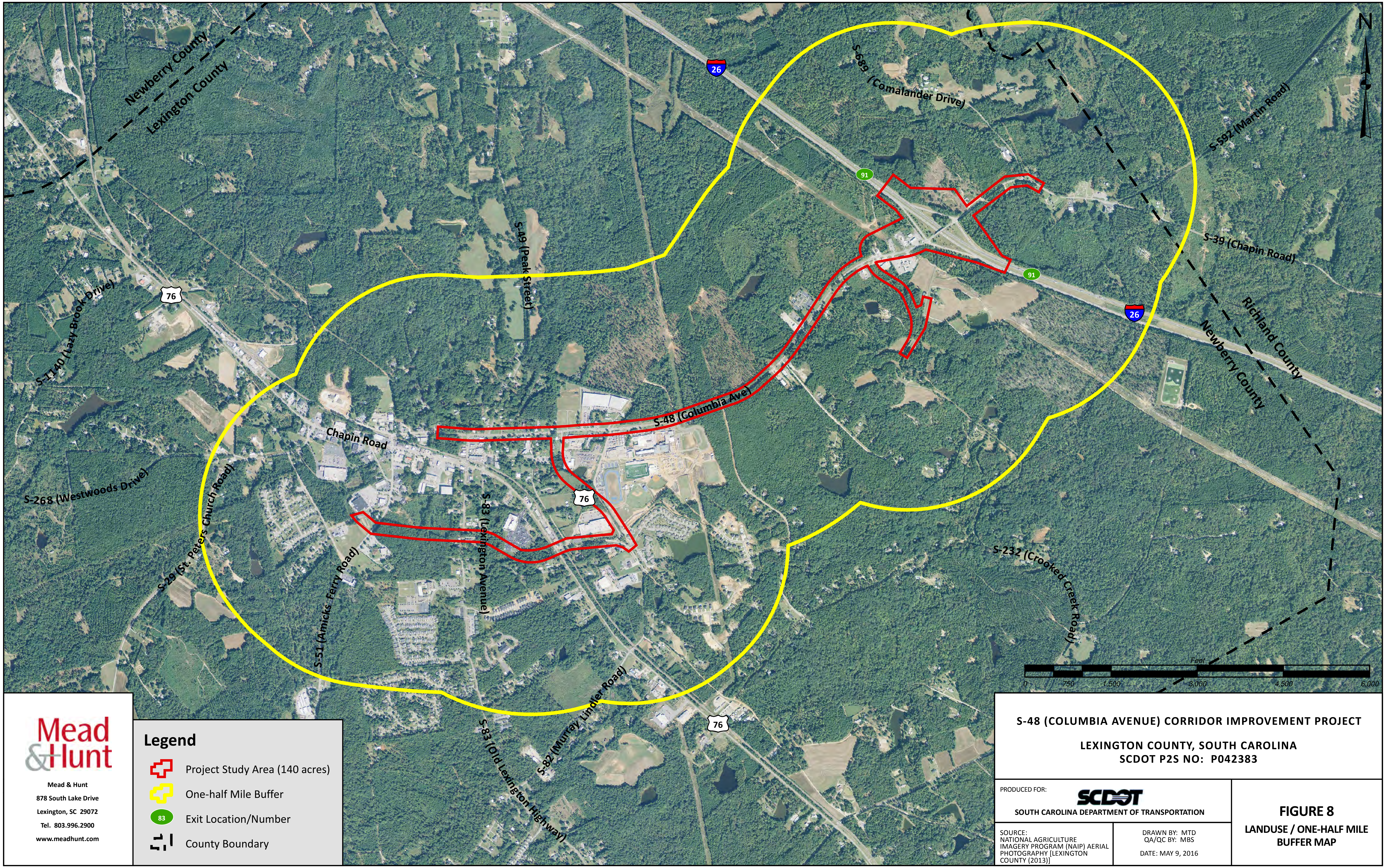


FIGURE 8
LANDUSE / ONE-HALF MILE BUFFER MAP

APPENDIX B

REPRESENTATIVE PHOTOGRAPHS

Date: 11/18/2015

Taken By: Matt DeWitt

Photograph 1

Description: View of Pond 1 looking across-gradient. Photograph is taken from the eastern edge of the pond, facing west.

Date: 08/31/2015

Taken By: Matt DeWitt

Photograph 2

Description: View of the origination point (pipe) and a short segment of Tributary 1. Photograph is taken immediately west of Amick's Ferry Road, facing southwest.

Date:
08/31/2015

Taken By:
Matt DeWitt

Photograph 3

Description:
View of Tributary 1, facing downstream. Photograph is taken east of Amick's Ferry Road, facing southeast.

Date:
08/31/2015

Taken By:
Matt DeWitt

Photograph 4

Description:
View of Tributary 2, facing downstream. Photograph is taken near the northern boundary of the PSA, facing south.

Date: 08/31/2015

Taken By: Matt DeWitt

Photograph 5

Description: View of Tributary 2, facing upstream. Photograph is taken near the southern boundary of the PSA, facing north.

Date: 08/31/2015

Taken By: Matt DeWitt

Photograph 6

Description: View of Tributary 3, facing downstream. Photograph is taken near the southern boundary of the PSA, facing south.

Date: 08/31/2015

Taken By: Matt DeWitt

Photograph 7

Description: View of Tributary 3, facing upstream. Photograph is taken near the center of the PSA, facing north.

Date: 11/18/2015

Taken By: Matt DeWitt

Photograph 8

Description: View of Pond 2, facing up-gradient. Photograph is taken from the western edge of the pond, facing east.

	Date: 11/18/2015 Taken By: Matt DeWitt Photograph 9 Description: View of Pond 3 looking across-gradient. Photograph is taken from the northeastern side of the pond, facing south.
	Date: 11/18/2015 Taken By: Matt DeWitt Photograph 10 Description: View of Tributary 4, facing downstream. Photograph is taken upstream of Freshwater Wetland 1, facing south.

	Date: 11/18/2015 Taken By: Matt DeWitt Photograph 11 Description: View of Freshwater Wetland 1, facing up-gradient. Photograph is taken from the center of the wetland, facing north.
	Date: 11/18/2015 Taken By: Matt DeWitt Photograph 12 Description: View of Tributary 4, facing upstream. Photograph is taken downstream of Freshwater Wetland 1, facing north.

Date: 11/18/2015

Taken By: Matt DeWitt

Photograph 13

Description: View of Tributary 5, facing downstream. Photograph is taken west of Crooked Creek Road, facing east.

Date: 11/18/2015

Taken By: Matt DeWitt

Photograph 14

Description: View of the origination point (pipe) of Tributary 6. Photograph is taken immediately east of I-26, facing southeast.

	Date: 11/18/2015 Taken By: Matt DeWitt Photograph 15 Description: View of Tributary 6, facing downstream. Photograph is taken near the Stream Origination Point, facing northwest.
	Date: 11/18/2015 Taken By: Matt DeWitt Photograph 16 Description: View of Freshwater Wetland 2, facing down-gradient. Photograph is taken from the southern edge of the wetland, facing north.

Date: 11/18/2015

Taken By: Matt DeWitt

Photograph 17

Description: View of the linear portion of Freshwater Wetland 2, facing up-gradient. Photograph is taken from the northern portion of the wetland, facing south.

Date: 11/18/2015

Taken By: Matt DeWitt

Photograph 18

Description: View of the origination point (headcut) of Tributary 7. Photograph is taken facing east.

<table>
<tr><td rowspan="4"></td><td>Date:
11/18/2015</td></tr>
<tr><td>Taken By:
Matt DeWitt</td></tr>
<tr><td>Photograph 19</td></tr>
<tr><td>Description:
View of the origination point (headcut) of Tributary 7 and the upstream ephemeral channel. Photograph is taken facing east.</td></tr>
<tr><td rowspan="4"></td><td>Date:
11/18/2015</td></tr>
<tr><td>Taken By:
Matt DeWitt</td></tr>
<tr><td>Photograph 20</td></tr>
<tr><td>Description:
View of Tributary 7, facing downstream. Photograph is taken near the Stream Origination Point, facing north.</td></tr>
</table>

<table>
<tr><td rowspan="4"></td><td>Date:
08/31/2015</td></tr>
<tr><td>Taken By:
Matt DeWitt</td></tr>
<tr><td>Photograph 21</td></tr>
<tr><td>Description:
View of Pond 4, facing across-gradient. Photograph is taken from the southern edge of the pond, facing north.</td></tr>
<tr><td rowspan="4"></td><td>Date:
11/18/2015</td></tr>
<tr><td>Taken By:
Matt DeWitt</td></tr>
<tr><td>Photograph 22</td></tr>
<tr><td>Description:
View of Freshwater Wetland 3, facing up-gradient. Photograph is taken immediately southwest of Ellett Road, facing southwest.</td></tr>
</table>

APPENDIX C

WATERSHED AND WATER QUALITY INFORMATION and PERMIT DETERMINATION FORM

Date: rev 06/08/2016

PERMIT DETERMINATION

FROM Matt DeWitt, PWS COMPANY Mead & Hunt

CONTACT INFO (phone and/or email) (803) 520-2837 / matt.dewitt@meadhunt.com

SCDOT PROJECT ENGINEER Jennifer Necker, P.E.

TO Siobhan Gordon - RPG 3 Permits Coordinator

Project Description S-48 (Columbia Avenue) Corridor Improvement Project

Route or Road No. S-48 County Lexington

CONST. PIN 42383 OTHER PINS or STRUCTURE # ____

RESPONSE:

○ It has been determined that no permits are required because:

____

◉ The following permit(s) is/are necessary:
(Please check which type(s) of permit the project will need)

USACE Permit	☐ GP	☑ IP	☑ 401	☑ JD
OCRM Permit	☐ CAP	☐ CZC		

Navigable ☐ SCDHEC NAVGP – if checked a USCG and/or USACE navigable permit may also be required, but will be determined during the NEPA and Permitting stages.

Other ____

Water Classification: FW *Print and attach the SCDHEC water quality report*

303(d) listed ○ no ◉ yes, for * BIO

TMDL developed ○ no ◉ yes, for * FC

*List all that apply using the SCDHEC abbreviations

Comments: The portion of the project located west of East Boundary Street drains southerly towards Station RL-09087, in Lake Murray. Station RL-09087 is not impaired for any parameters assessed at the site. The eastern portion of the project drains easterly towards Station B-801. Station B-801 is impaired based on macroinvertebrate community data (BIO). A TMDL for fecal coliform (FC) has also been established for the eastern portion of the project area.

The determination above was based on the most recently available information at the time. This is a preliminary determination and is subject to change if the design of the project is modified.

matt.dewitt@meadhunt.com Digitally signed by matt.dewitt@meadhunt.com DN: cn=matt.dewitt@meadhunt.com Date: 2016.06.07 15:16:13 -04'00'

Biologist, SCDOT/Consultant

06/08/2016

Date

Revised 04/2013

DHEC

PROMOTE PROTECT PROSPER

South Carolina Department of Health and Environmental Control

3/9/2016

Watershed and Water Quality Information

Genaral Information

Applicant Name: SCDOT

Permit Type: MS4

Latitude: 34.1746

Longitude: -81.3286

MS4 Designation: Not in designated area

Monitoring Station: B-801

Within Coastal Critical Area: NO

Water Classification (Provisional): FW

Waterbody Name: Unnamed Trib to Wateree Creek

Entered Waterbody Name: Wateree Creek

Parameter Descriptions

NH3N	Ammonia
CR	Chromium
CU	Copper
HG	Mercury
NI	Nickel
PB	Lead
ZN	Zinc
DO	Dissolved Oxygen
PH	pH

FC	Fecal Coliform
FCB	Fecal Coliform (Shellfish)
BIO	Macroinvertebrates (Bio)
TP	(Lakes) Phosphorus
TN	(Lakes) Nitrogen
CHLA	(Lakes) Chlorophyll a
ENTERO	(Beach) Enterococcus
HGF	Mercury (Fish)
PCB	PCB (Fish)

Impaired Status (downstream sites)

Station	NH3N	CR	CU	HG	NI	PB	ZN	DO	PH	TURBIDITY	ECOLI	FCB	BIO	TP	TN	CHLA	ENTERO	HGF	PCB
B-801	X	X	X	X	X	X	X	X	X	F	X	X	N	X	X	X	X	X	X
B-836	X	X	X	X	X	X	X	X	X	A	X	X	A	X	X	X	X	X	X
B-311	X	X	X	X	X	X	X	X	X	A	X	X	A	X	X	X	X	F	X
B-337	F	F	F	F	F	X	F	F	F	A	T	A	A	X	X	X	X	A	X

F = Standards Fully Supported
N = Standards Not Supported
A = Assessed at Upstream Station
X = Parameter Not Assessed at Station
T = Within TMDL Approved Watershed

Parameters to be addressed (those not supporting standards)

ECOLI

BIO

Fish Consumption Advisory

TMDL Information - TMDL Parameters to be addressed

In TMDL Watershed: Yes

TMDL Site: B-337

TMDL Report No: 028-05

TMDL Parameter: Fecal

TMDL Document Link: http://www.scdhec.gov/HomeAndEnvironment/Docs/tmdl_lwrbrd_fc.pdf

D H E C

PROMOTE PROTECT PROSPER

South Carolina Department of Health and Environmental Control

3/9/2016

Watershed and Water Quality Information

Genaral Information

Applicant Name: SCDOT

Permit Type: Construction

Latitude: 34.1602

Longitude: -81.3501

MS4 Designation: Not in designated area

Monitoring Station: RL-09087

Within Coastal Critical Area: NO

Water Classification (Provisional): FW

Waterbody Name: Unnamed Trib to Lake Murray

Entered Waterbody Name: Lake Murray

Parameter Descriptions

NH3N	Ammonia	FC	Fecal Coliform
CR	Chromium	FCB	Fecal Coliform (Shellfish)
CU	Copper	BIO	Macroinvertebrates (Bio)
HG	Mercury	TP	(Lakes) Phosphorus
NI	Nickel	TN	(Lakes) Nitrogen
PB	Lead	CHLA	(Lakes) Chlorophyll a
ZN	Zinc	ENTERO	(Beach) Enterococcus
DO	Dissolved Oxygen	HGF	Mercury (Fish)
PH	pH	PCB	PCB (Fish)

Impaired Status (downstream sites)

Station	NH3N	CR	CU	HG	NI	PB	ZN	DO	PH	TURBIDITY	ECOLI	FCB	BIO	TP	TN	CHLA	ENTERO	HGF	PCB
RL-09087	X	X	X	X	X	X	X	F	F	F	F	A	X	F	F	F	X	X	X
S-273	X	X	X	X	X	X	X	A	A	A	A	A	X	A	A	A	X	F	X
RL-11041	F	F	F	F	F	X	F	A	A	A	A	A	X	A	A	A	X	A	X
RL-07023	A	A	A	A	A	X	A	A	A	A	A	A	X	A	A	A	X	A	X

F = Standards Fully Supported

N = Standards Not Supported

A = Assessed at Upstream Station

X = Parameter Not Assessed at Station

T = Within TMDL Approved Watershed

Parameters to be addressed (those not supporting standards)

Fish Consumption Advisory

TMDL Information - TMDL Parameters to be addressed

In TMDL Watershed: No

TMDL Site:

TMDL Report No:

TMDL Parameter:

TMDL Document Link:

Appendix E

SCDHEC Watershed and Water Quality Information Reports

DHEC

PROMOTE PROTECT PROSPER

South Carolina Department of Health and Environmental Control

3/9/2016

Watershed and Water Quality Information

Genaral Information

Applicant Name:	SCDOT	**Permit Type:**	MS4
Latitude:	34.1746	**Longitude:**	-81.3286
MS4 Designation:	Not in designated area	**Monitoring Station:**	B-801
Within Coastal Critical Area:	NO	**Water Classification (Provisional):**	FW
Waterbody Name:	Unnamed Trib to Wateree Creek	**Entered Waterbody Name:**	Wateree Creek

Parameter Descriptions

NH3N	Ammonia	FC	Fecal Coliform
CR	Chromium	FCB	Fecal Coliform (Shellfish)
CU	Copper	BIO	Macroinvertebrates (Bio)
HG	Mercury	TP	(Lakes) Phosphorus
NI	Nickel	TN	(Lakes) Nitrogen
PB	Lead	CHLA	(Lakes) Chlorophyll a
ZN	Zinc	ENTERO	(Beach) Enterococcus
DO	Dissolved Oxygen	HGF	Mercury (Fish)
PH	pH	PCB	PCB (Fish)

Impaired Status (downstream sites)

Station	NH3N	CR	CU	HG	NI	PB	ZN	DO	PH	TURBIDITY	ECOLI	FCB	BIO	TP	TN	CHLA	ENTERO	HGF	PCB
B-801	X	X	X	X	X	X	X	X	X	F	X	X	N	X	X	X	X	X	X
B-836	X	X	X	X	X	X	X	X	X	A	X	X	A	X	X	X	X	X	X
B-311	X	X	X	X	X	X	X	X	X	A	X	X	A	X	X	X	X	F	X
B-337	F	F	F	F	F	X	F	F	F	A	T	A	A	X	X	X	X	A	X

F = Standards Fully Supported
N = Standards Not Supported
A = Assessed at Upstream Station
X = Parameter Not Assessed at Station
T = Within TMDL Approved Watershed

Parameters to be addressed (those not supporting standards)

ECOLI

BIO

Fish Consumption Advisory

TMDL Information - TMDL Parameters to be addressed

In TMDL Watershed:	Yes	**TMDL Site:**	B-337
TMDL Report No:	028-05	**TMDL Parameter:**	Fecal
TMDL Document Link:	http://www.scdhec.gov/HomeAndEnvironment/Docs/tmdl_lwrbrd_fc.pdf		

D H E C

PROMOTE PROTECT PROSPER

South Carolina Department of Health and Environmental Control

3/9/2016

Watershed and Water Quality Information

Genaral Information

Applicant Name: SCDOT

Permit Type: Construction

Latitude: 34.1602

Longitude: -81.3501

MS4 Designation: Not in designated area

Monitoring Station: RL-09087

Within Coastal Critical Area: NO

Water Classification (Provisional): FW

Waterbody Name: Unnamed Trib to Lake Murray

Entered Waterbody Name: Lake Murray

Parameter Descriptions

NH3N	Ammonia
CR	Chromium
CU	Copper
HG	Mercury
NI	Nickel
PB	Lead
ZN	Zinc
DO	Dissolved Oxygen
PH	pH

FC	Fecal Coliform
FCB	Fecal Coliform (Shellfish)
BIO	Macroinvertebrates (Bio)
TP	(Lakes) Phosphorus
TN	(Lakes) Nitrogen
CHLA	(Lakes) Chlorophyll a
ENTERO	(Beach) Enterococcus
HGF	Mercury (Fish)
PCB	PCB (Fish)

Impaired Status (downstream sites)

Station	NH3N	CR	CU	HG	NI	PB	ZN	DO	PH	TURBIDITY	ECOLI	FCB	BIO	TP	TN	CHLA	ENTERO	HGF	PCB
RL-09087	X	X	X	X	X	X	X	F	F	F	F	A	X	F	F	F	X	X	X
S-273	X	X	X	X	X	X	X	A	A	A	A	A	X	A	A	A	X	F	X
RL-11041	F	F	F	F	F	X	F	A	A	A	A	A	X	A	A	A	X	A	X
RL-07023	A	A	A	A	A	X	A	A	A	A	A	A	X	A	A	A	X	A	X

F = Standards Fully Supported
N = Standards Not Supported

A = Assessed at Upstream Station
X = Parameter Not Assessed at Station

T = Within TMDL Approved Watershed

Parameters to be addressed (those not supporting standards)

Fish Consumption Advisory

TMDL Information - TMDL Parameters to be addressed

In TMDL Watershed: No

TMDL Site:

TMDL Report No:

TMDL Parameter:

TMDL Document Link:

Appendix F

Biological Assessment

Biological Assessment
Federally Threatened and Endangered Species
S-48/Columbia Avenue Corridor Improvements
Lexington County, South Carolina

S-48/Columbia Ave Corridor Improvements is a South Carolina Department of Transportation (SCDOT) project being managed by Lexington County as a Local Public Agency (LPA). The Columbia Area Transportation Study Metropolitan Planning Organization (COATS MPO) has identified this project in their 2035 Long Range Plan. The corridor study area begins near the the US 76/Amicks Ferry Road/Columbia Avenue intersection and continues approximately 2.5 miles, over Interstate 26 (I-26) where it reconnects with Columbia Ave west of the interstate. The purpose of this project is to alleviate congestion along the S-48/Columbia Avenue corridor by providing additional capacity and enhancing operational efficiency.

The Federal Endangered Species Act (ESA) of 1973, as amended, is the federal regulatory tool that serves to administer permits, implement recovery plans, and monitor federally protected (endangered and threatened) species. The ESA is administered and regulated by the United State Fish and Wildlife Service (USFWS) and/or the National Oceanic and Atmospheric Administration-National Marine Fisheries Service (NOAA-NMFS).

Species with the federal classification of Endangered (E) or Threatened (T), or Threatened due to Similarity of Appearance (T [S/A]) are protected under the ESA of 1973, as amended (16 U.S.C. 1531 et seq.). The term “endangered species” is defined as “any species which is in danger of extinction throughout all or a significant portion of its range”, and the term “threatened species” is defined as “any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range” (16 U.S.C. 1532).

The term “Proposed” (P) is defined as “any species proposed for official listing as endangered or threatened.” “Federal species of concern” (FSC) are defined as “species that may or may not be listed in the future; or a species under consideration for listing for which there is insufficient information to support listing.” “Candidate” (C) species are taxons under consideration for which there is insufficient information to support a listing. The P, FSC and C designations provide no federal protection and require no Section 7 consultation under the ESA.

Because of the federal nexus of the project, consultation with the USFWS is required under Section 7 of the ESA, as amended (16 USC 1531-1534), for proposed projects that “may affect” federally endangered and threatened species. This Biological Assessment (BA) analyzes potential impacts to federally endangered and threatened species associated with the proposed project, and is intended to initiate informal consultation, as needed.

The following list (Table 1) of federally protected [endangered (E) and threatened (T)] species for Lexington County was obtained from the USFWS protected species database (accessed July 27, 2015; see Appendix A). Additional information regarding state protection status was obtained from the South Carolina Department of Natural Resources (SCDNR) Rare, Threatened, and Endangered Species Inventory (accessed July 27, 2015).

TABLE 1
FEDERALLY PROTECTED SPECIES IN LEXINGTON COUNTY, SOUTH CAROLINA

Protected Species		County Listed	Protection Status	
Common Name	**Scientific Name**		**Federal**	**State**
Bird Species				
American wood stork	*Mycteria americana*	Lexington	T	T
Bald eagle	*Haliaeetus leucocephalus*	Lexington	BGEPA	BGEPA
Red-cockaded woodpecker	*Picoides borealis*	Lexington	E	E
Smooth coneflower	*Echinacea laevigata*	Lexington	E	E

T = Threatened, E = Endangered, CH = Critical Habitat, BGEPA = Bald and Golden Eagle Protection Act

Federally-listed endangered, threatened, and protected species and their respective habitats are briefly described below:

American wood stork (*Mycteria americana*)
The American wood stork is federally and state listed as threatened. This species is approximately 85 - 113 centimeters in height with a wingspan of approximately 150 - 165 centimeters. The American wood stork has mostly white plumage excluding the black trailing edges of the wings and tail. The neck and head is not feathered, and the skin is grayish black. The bill is large and curves downward. The wood stork's breeding range in the United States includes Florida, Georgia, South Carolina, and North Carolina. American wood storks prefer freshwater and estuarine wetlands for breeding, feeding, and roosting. These birds are colonial nesters with colonies that range from less than 12 to more than 500 nests. Nests can be located in small or large trees, but these nests typically occur in trees found in standing water or on small islands. Surveys can be conducted year round in likely habitats.

Bald eagle (*Haliaeetus leucocephalus*)
The bald eagle is federally protected by the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA). This species has a wing span of up to 2 meters. Bald eagles are distinguished by their white head and tail compared to their brown body. This distinctive white coloration does not appear until four or five years of age. The bald eagle's range includes all of the contiguous, continental United States along with Alaska, Canada, and northern Mexico. They prefer estuaries, large lakes, reservoirs, rivers, and some seacoasts. Bald eagles nest in the tops of large trees and tend to use the same nest year after year. Nests can

be up to 10 feet across and weigh a half ton. Surveys for individuals and nests can be conducted year round.

Red-cockaded woodpecker (*Picoides borealis*)
The red-cockaded woodpecker is federally and state listed as endangered. This species is approximately 22 centimeters long and has a black back with broken white horizontal stripes. The head is black with a large white cheek patch on each side. Historically, this bird was likely common throughout the southeastern United States from eastern Texas and Oklahoma, east to Florida and north to Missouri, Kentucky, and Maryland. The birds excavate and inhabit cavities in living pine trees that are usually 60 – 80 years old. Most concentrations of red-cockaded woodpeckers can be found in areas of open pine with a sparse hardwood midstory and a diverse herbaceous stratum. Surveys for active cavity trees can be conducted year round.

Smooth coneflower (*Echinacea laevigata*)
The smooth coneflower is a federally listed endangered, perennial herb that grows up to 1 m tall. Leaves are elliptical/ lanceolate, reach 20 centimeters in length, and reach 7.5 centimeters in width. Leaves are smooth to slightly rough, and the stems are smooth with few to no leaves. The typically solitary flowers have light pink to purplish petals that are 5 to 8 centimeters long. Flowering occurs from mid-May through July and fruiting occurs from July through October. Smooth coneflower inhabits grassy openings and rocky glades with shallow soil over mafic bedrock and sunny roadsides and rights-of-way through such habitats. Historically, smooth coneflower probably occurred in prairies and savannahs maintained by frequent fire and large animal grazing. Smooth coneflower can currently be found in Georgia, South Carolina, North Carolina, and Virgina. Populations have been documented on Sumter National Forest and Department of Energy’s Savannah River Site.

Terrestrial Plant Communities

The Project Study Area (PSA) encompasses approximately 139 acres. Based on field reviews of the PSA, six terrestrial habitat community/land use types are present within the PSA: Commercial and Residential Development, Maintained and Disturbed Right-of-way, Mixed Pine/Hardwood Forest, Pine Forest, Hardwood Forest, and Successional Forest (see Figure 1).

Commercial and Residential Development
Commercial and residential development occupies approximately 45 acres (32%) of the PSA. This habitat type includes constructed environments and impermeable surfaces and is subject to a high degree of disturbance. Dominant vegetation within the commercial and residential development includes a variety of ornamental and native shrub and tree species, and maintained grasses.

Maintained and Disturbed Right-of-way
Maintained and disturbed right-of-way occurs immediately alongside the S-48/Columbia Avenue corridor and other existing roadways. This community type occupies approximately 37

acres (27%) of the PSA. Most of the disturbed roadway edges are comprised of herbaceous species and a few shrubs, including various grasses such as common fescue (*Festuca* sp.) and ryegrass (*Lolium perenne*). One area of dense mimosa (*Albizia julibrissin*) was observed within this community type in the western portion of the PSA.

Mixed Pine/Hardwood Forest

Mixed Pine/Hardwood Forest is the dominant forested community type and occupies approximately 43 acres (31%) of the PSA. Dominant vegetation consists of pine and hardwood tree species, including sweetgum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), loblolly pine (*Pinus taeda*), water oak (*Quercus nigra)*, and American holly (*Ilex opaca*). This community is generally composed of trees of approximately 10 - 20 years in age. Many areas in this community had recently been disturbed in the form of minor clearing and thinning.

Pine Forest

Pine Forests occupies approximately 7 acres (5%) of the PSA. This habitat type consists of areas planted for the production of pine trees. The dominant vegetation in the pine forests is loblolly pine. Opportunistic tree species such as red maple and sweetgum were also present in low densities in the understory. Groundcover vegetation was sparse. The age of the trees in this forest type vary by stand, and generally range from approximately 10 - 20 years of age. One stand, located just east of Aimlicks Ferry Road, was observed to contain loblolly pine with a dominant age class of approximately 30 years old.

Hardwood Forest

Hardwood Forests are located throughout bottomland and upland potions of the PSA. This habitat type occupies approximately 2 acres (1%) of the PSA. Along the streams in the PSA, dominant vegetation consists of red maple, water oak, sweetgum, and tulip polar (*Liriodendron tulipifera*). A sparse shrub layer consisting of Chinese privet (*Ligustrum sinense*) was also present. In the upland portions of the PSA, dominant vegetation consists of water oak, sweetgum, American holly, and white oak (*Quercus alba*).

Successional Forest

One area of Successional Forest is located in the PSA and occupies approximately 5 acres (4%) of the PSA. This habitat is made up of an area that has been logged within the past five years and is in the early stages of forest succession. Dominant vegetation consists of many of the same species as mentioned above in the mixed pine/hardwood forest description, but also include a more diverse array of herbaceous and shrub species.

Methodology

Environmental scientists performed literature and field reviews to determine the likelihood of federally protected species within the PSA and the potential for project-related impacts. The list of state and/or federally protected species known to occur in Lexington County was reviewed, and a field review was conducted within the PSA on July 29 - 31, 2015. Areas that matched the descriptions of preferred habitat for protected species were classified as protected species habitat and were surveyed for the presence of protected species.

The SCDNR South Carolina Heritage Trust (SCHT) Geographic Database of Rare and Endangered Species was also reviewed to determine the presence of known populations of protected species within the vicinity of the project.

Results

Information obtained from the SCDNR-SCHT database indicates that there are no state-listed threatened or endangered species known to be present within the PSA as of July 27, 2015. Furthermore, according to the database, no state-listed threatened or endangered species are located within a one mile radius of the project.

The PSA does not contain suitable habitat for the American wood, bald eagle, or the smooth coneflower. The PSA contains suitable foraging habitat for the red-cockaded woodpecker. One small forest stand, located just east of Aimlick's Ferry Road, is composed of approximately 30 year old loblolly pines. However, this stand is considered poor quality foraging habitat due to the small size of the stand, the high density of the stand, the presence of a dense hardwood midstory, and surrounding development. The surrounding 0.5 mile was reviewed for the presence of suitable nesting habitat. Suitable nesting habitat for the red-cockaded woodpecker is not present within 0.5 miles of the documented suitable foraging habitat.

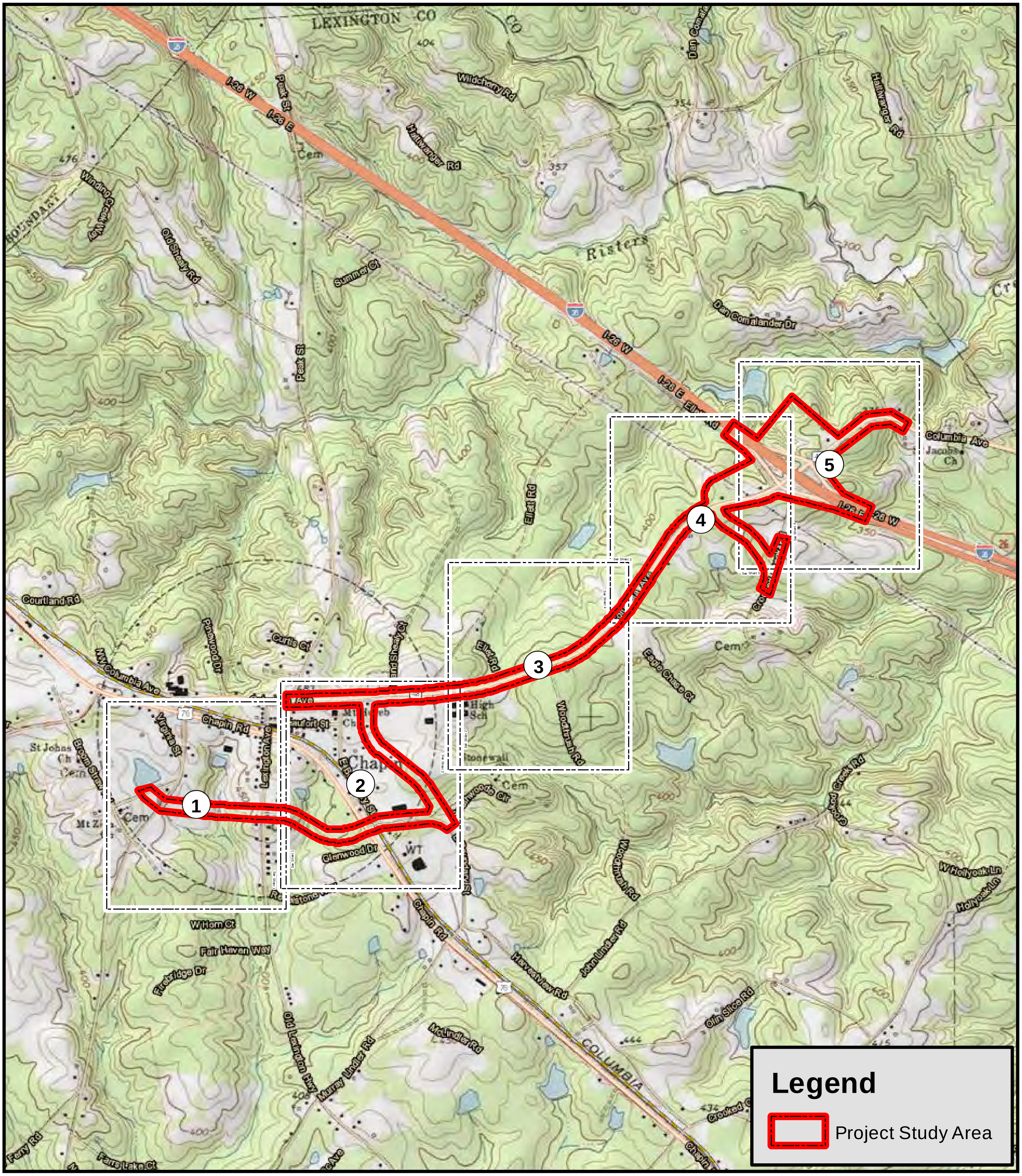
Biological Conclusions

Based on the literature and field reviews, it is determined that the project will have a biological conclusion of 'no effect' on the American wood stork, the bald eagle, and the red-cockaded woodpecker.

September 30, 2015

SCDOT Authorized Agent's Signature **Date**

FIGURES

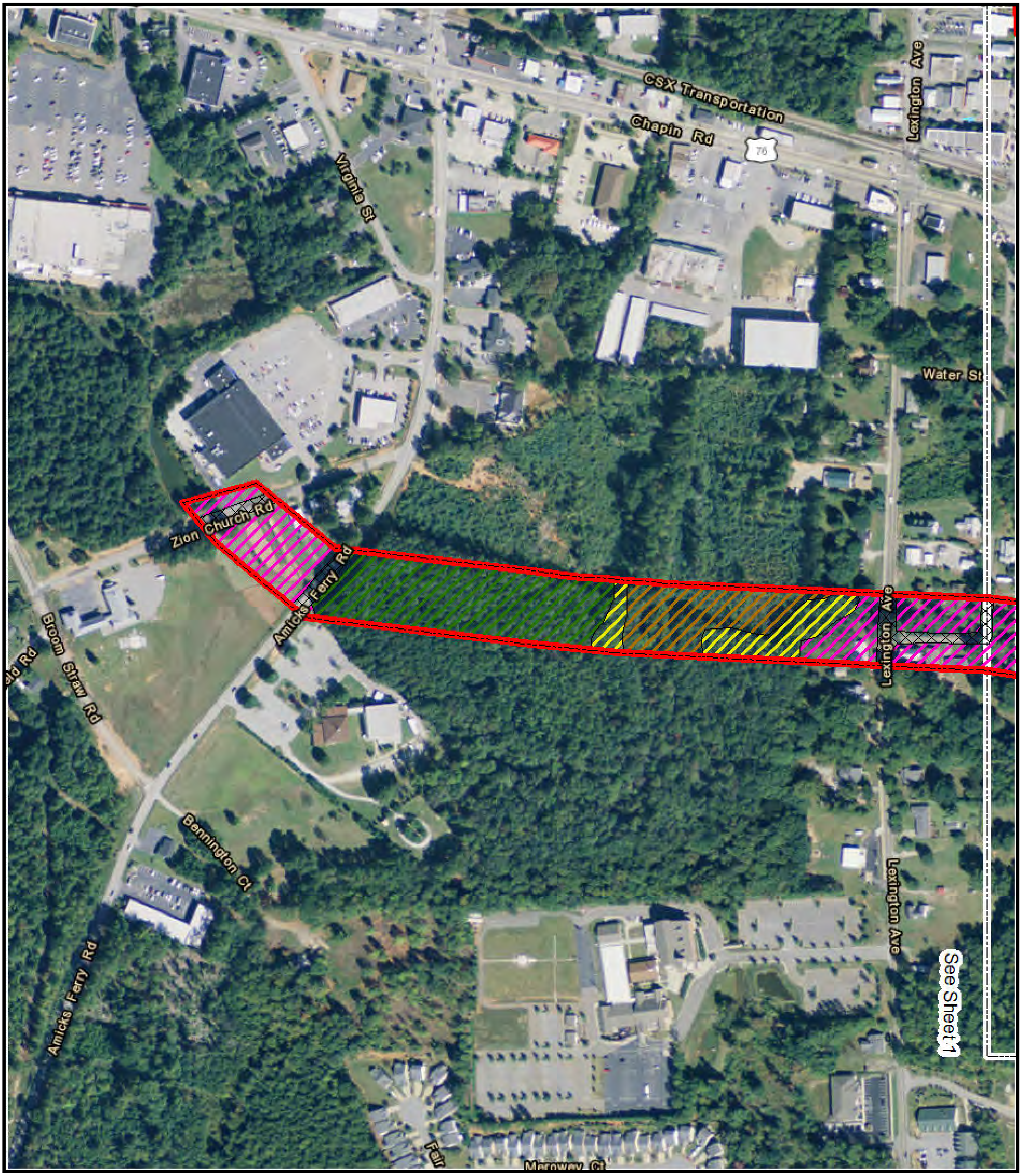


Source: ESRI Base Map, USA Topo Maps and Transportation

Figure 1 - Index
Habitat Map

0 1,550 3,100 Feet
0 500 1,000 Meters

S-48/Columbia Avenue Corridor Improvements
Lexington County
September 2015



Source: ESRI Base Map, Imagery and Transportation

Legend

Project Study Area

Type

- Developed
- Hardwood Forest
- Mixed Forest
- Pine Forest
- Right of way
- Succesional Forest

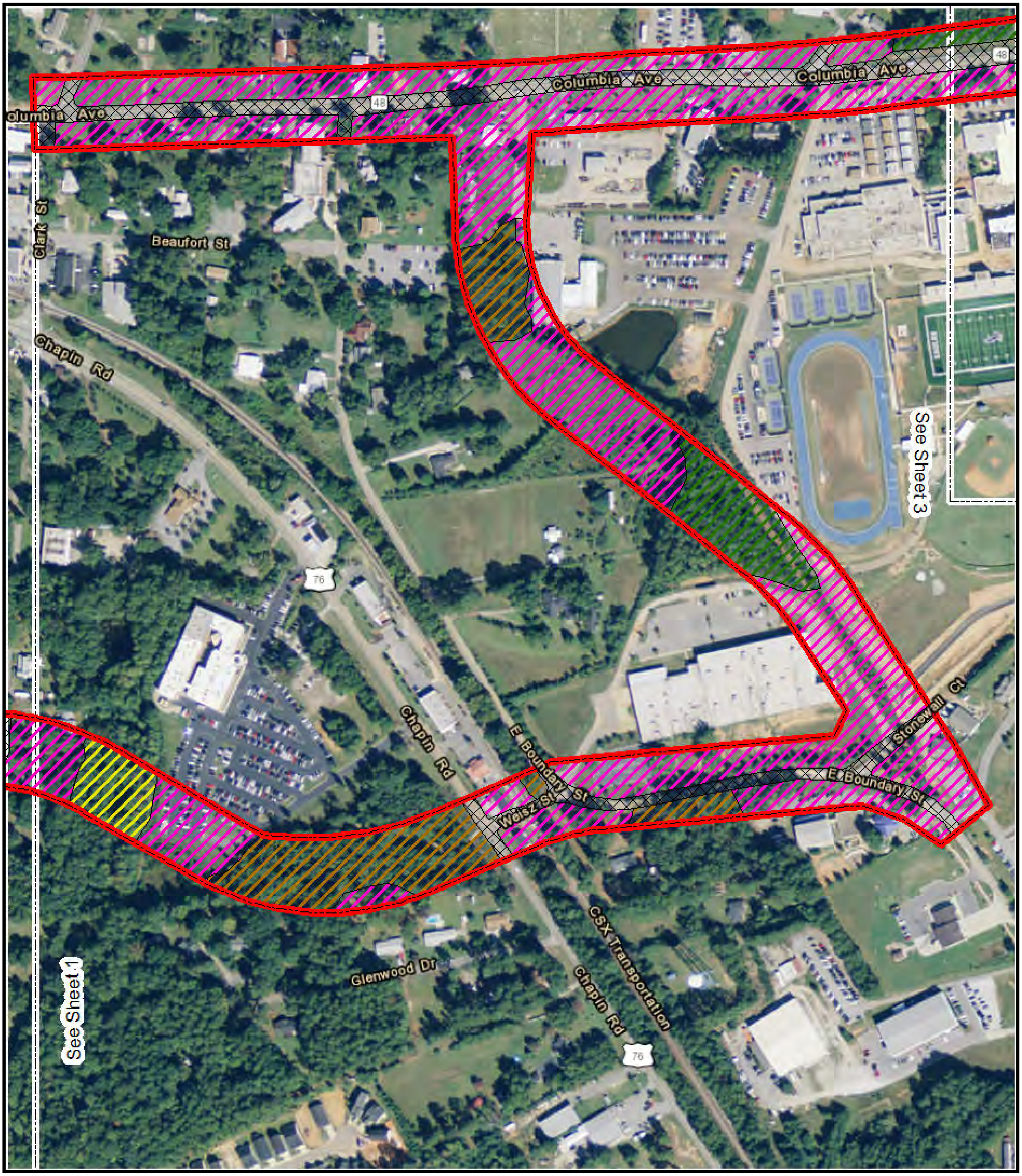
0 290 580 Feet

0 90 180 Meters

Figure 1 - 1

Habitat Map

S-48/Columbia Avenue Corridor Improvements
Lexington County
September 2015



Source: ESRI Base Map, Imagery and Transportation

Legend

Project Study Area

Type

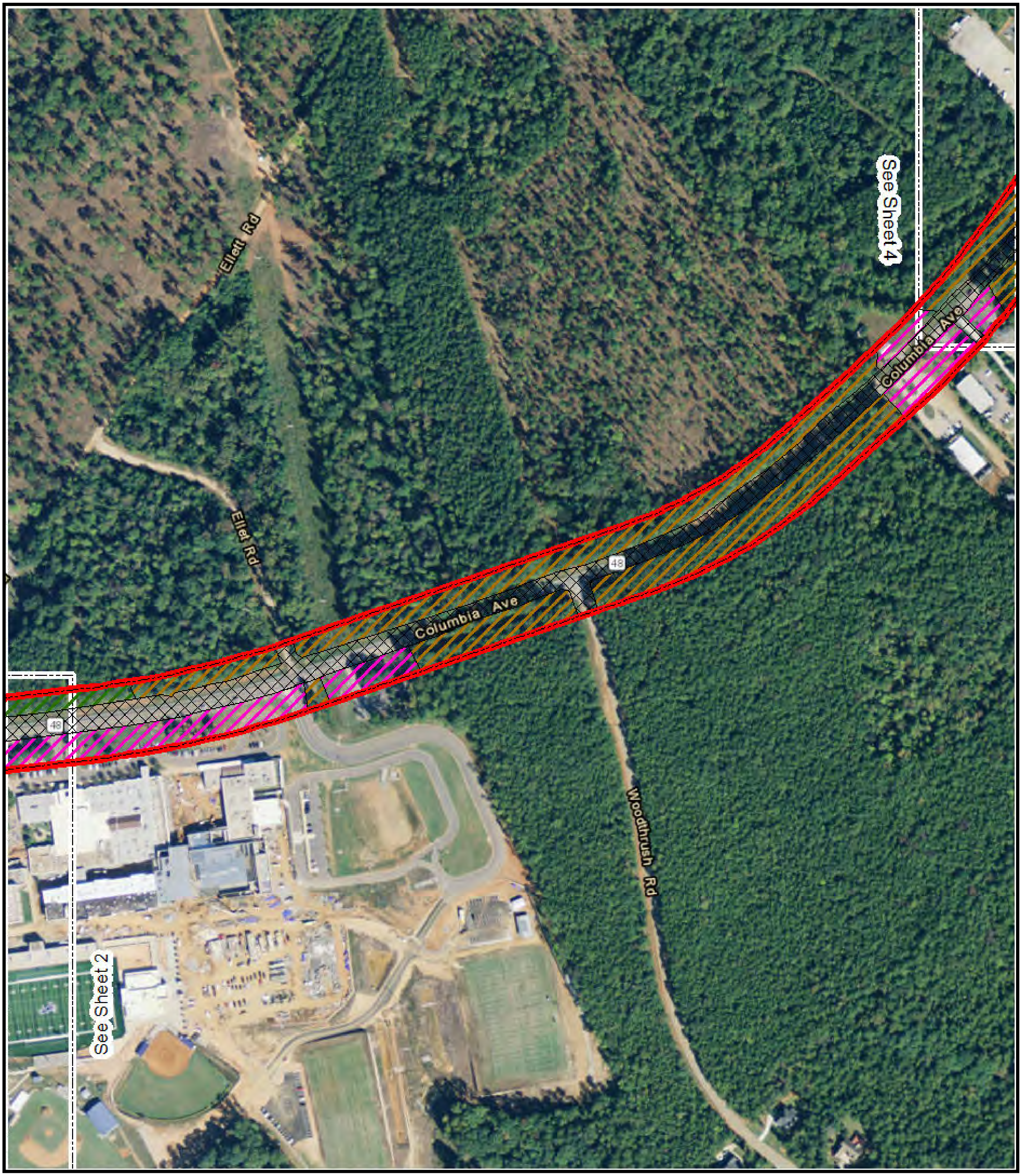
- Developed
- Hardwood Forest
- Mixed Forest
- Pine Forest
- Right of way
- Succesional Forest

Figure 1 - 2
Habitat Map

0 290 580 Feet

0 90 180 Meters

S-48/Columbia Avenue Corridor Improvements
Lexington County
September 2015



Source: ESRI Base Map, Imagery and Transportation

Legend

Project Study Area

Type

- Developed
- Hardwood Forest
- Mixed Forest
- Pine Forest
- Right of way
- Succesional Forest

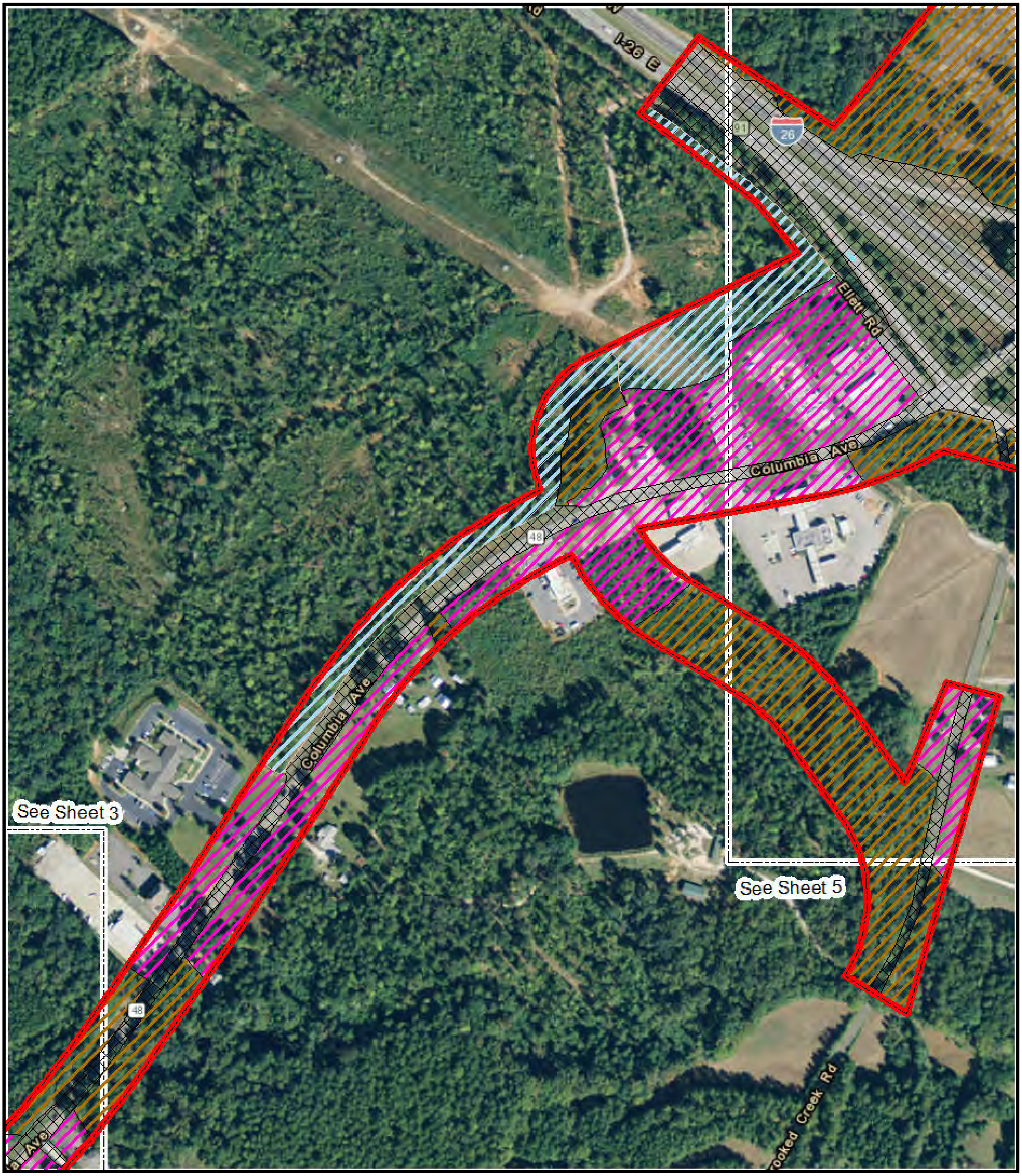
Figure 1 - 3

Habitat Map

0 | 290 | 580 Feet

0 | 90 | 180 Meters

S-48/Columbia Avenue Corridor Improvements
Lexington County
September 2015



Source: ESRI Base Map, Imagery and Transportation

Legend

Project Study Area

Type

- Developed
- Hardwood Forest
- Mixed Forest
- Pine Forest
- Right of way
- Succesional Forest

0 290 580 Feet

0 90 180 Meters

Figure 1 - 4

Habitat Map

S-48/Columbia Avenue Corridor Improvements

Lexington County

September 2015

Source: ESRI Base Map, Imagery and Transportation

Legend

Project Study Area

Type

- Developed
- Hardwood Forest
- Mixed Forest
- Pine Forest
- Right of way
- Succesional Forest

0 290 580 Feet

0 90 180 Meters

Figure 1 - 5

Habitat Map

S-48/Columbia Avenue Corridor Improvements
Lexington County
September 2015

APPENDIX A - PROTECTED SPECIES LIST

South Carolina List of At-Risk, Candidate, Endangered, and Threatened Species - Lexington County

CATEGORY	COMMON NAME/STATUS	SCIENTIFIC NAME	SURVEY WINDOW/ TIME PERIOD	COMMENTS
Amphibian	None Found			
Bird	American wood stork (T)	*Mycteria americana*	February 15-September 1	Nesting season
	Bald eagle (BGEPA)	*Haliaeetus leucocephalus*	October 1-May 15	Nesting season
	Red-cockaded woodpecker (E)	*Picoides borealis*	April 1-July 31	Nesting season
Crustacean	None Found			
Fish	American eel (ARS)	*Anguilla rostrata*	March 1-May 30; October 1-December 15	Temperature dependent: normally (17-20°C); can be found between 13-25°C
	Blueback herring (ARS)	*Alosa aestivalis*	Mid-January-mid May	Peak: March-April
	Robust redhorse (ARS)	*Moxostoma robustum*	Late April-early May	Temperature dependent: 16-24°C
Insect	None Found			
Mammal	Tri-colored bat (ARS*)	*Perimyotis subflavus*	Year round	Found in mines and caves in the winter
Mollusk	Savannah lilliput (ARS)	*Toxolasma pullus*	March 1-September 30	
Plant	Bog spicebush (ARS)	*Lindera subcoriacea*	March-August	
	Ciliate-leaf tickseed (ARS)	*Coreopsis integrifolia*	August-November	
	Long Beach seedbox (ARS)	*Ludwigia brevipes*	July-October	
	Smooth coneflower (E)	*Echinacea laevigata*	Late May-October	
	Spathulate seedbox (ARS)	*Ludwigia spathulata*	June-October	
	Wire-leaved dropseed (ARS)	*Sporobolus teretifolius*	August-September	Following fire
Reptile	Southern hognose snake (ARS)	*Heterdon simus*	Most of the year	
	Spotted turtle (ARS)	*Clemmys guttata*	February-mid April	

*	Contact National Marine Fisheries Service (NMFS) for more information on this species
**	The U.S. Fish and Wildlife Service (FWS) and NMFS share jurisdiction of this species
ARS	Species that the FWS has been petitioned to list and for which a positive 90-day finding has been issued (listing may be warranted); information is provided only for conservation actions as no Federal protections currently exist.
ARS*	Species that are either former Candidate Species or are emerging conservation priority species
BGEPA	Federally protected under the Bald and Golden Eagle Protection Act
C	FWS or NMFS has on file sufficient information on biological vulnerability and threat(s) to support proposals to list these species
CH	Critical Habitat
E	Federally Endangered
P or P - CH	Proposed for listing or critical habitat in the Federal Register
S/A	Federally protected due to similarity of appearance to a listed species
T	Federally Threatened

These lists should be used only as a guideline, not as the final authority. The lists include known occurrences and areas where the species has a high possibility of occurring. Records are updated as deemed necessary and may differ from earlier lists.

For a list of State endangered, threatened, and species of concern, please visit https://www.dnr.sc.gov/species/index.html.

2/24/2015

Appendix G

Greenhouse Gases Analysis Assumptions

GHG Running Exhaust and Fuel Cycle Emissions (CO_2e)

Columbia Avenue (S-48) Environmental Assessment

Year	Emission Factor (g/mi)*	ADT** (vehicles per day)	Length (mi)	grams/day	MT CO2E/day	MT CO2E/year
2015 Existing Condition	620.8800	15,400	2.14	20,461,721.28	20.46	7,468.53
2040 No Build Alt	440.8625	19,700	2.14	18,585,881.28	18.59	6,783.85
2040 Reasonable Alt 9	440.8625	19,700	2.84	24,665,375.15	24.67	9,002.86
2040 Reasonable Alt 9A	440.8625	19,700	2.82	24,491,675.33	24.49	8,939.46
2040 Reasonable Alt 18	440.8625	19,700	2.82	24,491,675.33	24.49	8,939.46
2040 Reasonable Alt 18A	440.8625	19700	2.77	24057425.76	24.06	8780.96
2040 Preferred Alt 25	440.8625	19700	2.14	18585881.28	18.59	6783.85

*Posted speed of 35mph used for emission factors, provided by FHWA RC Center from MOVES2014a

** Used Highest ADT in corridor

12/2/2016

S-48 (Columbia Avenue) – ICE Tool Assumptions for GHG Analysis of Construction Maintenance

- Analysis timeframe – 25 years (to include through design year of 2040)
- Preferred Alternative – 9A
- Rural Minor Arterial, posted speed limit 35mph
- 2040 ADT – 19,700 (highest among segments in corridor, using as most conservative estimate). Lane miles 19,700/3 =
- Total improvements: Centerline 2.84 miles
- Timeframe:
  - Year 1 – Construct 1.81 miles of new roadway from Amick's Ferry Rd to Columbia Ave– 3 lanes; reconstruct Columbia Avenue and widen from two to 5 lanes for a length of 1.01 miles; construct new interchange and overpass bridge (~200 ft) at I-26. Five-foot sidewalks and 4-foot bike lanes on all roadway. Bridge – assuming 6 lanes.
  - Year 15 – Resurface entire roadway
- Total Project-days of lane closure: Construction – assume two years for widening and new interchange. Lane closures 50 percent of time. Assume 90 day timeframe for resurfacing. Total days: 820.
- Mitigation Inputs – 50% planned deployment of preventative maintenance

General Information

Infrastructure location (state)	SC
Analysis timeframe (years)	25

Average daily traffic per lane mile - for facilities that will be reconstructed or resurfaced	6,567

Roadway System	
Total existing centerline miles	1.83
Total existing lane miles	3.66
Total newly-constructed centerline miles	2.715
Total newly-constructed lane miles	10.92

Rail, Bus, and Bicycle Infrastructure	
Total existing track miles of light rail	0
Total existing track miles of heavy rail	0
Total newly-constructed track miles of rail	0
Total existing lane miles of bus rapid transit	0
Total newly-constructed lane miles of bus rapid transit	0
Total existing lane miles of bicycle lanes	0
Total newly-constructed lane miles of bicycle lanes	0

Roadways

Roadway Projects							
	Roadway Construction					Roadway Rehabilitation	
Facility type	New Roadway (lane miles)	Construct Additional Lane (lane miles)	Re-Alignment (lane miles)	Lane Widening (lane miles)	Shoulder Improvement (centerline miles)	Re-construct Pavement (lane miles)	Resurface Pavement (lane miles)
Rural Interstates	5.43	5.49	0	0	0	0	10.92
Rural Principal Arterials	0	0	0	0	0	0	0
Rural Minor Arterials	0	0	0	0	0	0	0
Rural Collectors	0	0	0	0	0	0	0
Urban Interstates / Expressways	0	0	0	0	0	0	0
Urban Principal Arterials	0	0	0	0	0	0	0
Urban Minor Arterials / Collectors	0	0	0	0	0	0	0

Parking	
Surface Parking (spaces)	0
Structured Parking (spaces)	0

Options	
% roadway construction on rocky / mountainous terrain	0%

Bridge Structures

Bridge Structure	Construct New Bridge				Reconstruct Bridge				Add Lane to Bridge			
	Number of bridges	Average number of spans per bridge	Average number of lanes per bridge	Total number of lane-spans	Number of bridges	Average number of spans per bridge	Average number of lanes per bridge	Total number of lane-spans	Number of bridges	Average number of spans per bridge	Average number of new lanes per bridge	Total number of lane-spans
Single-Span	1	1	6	6	0	1	0	0	0	1	0	0
Two-Span	0	2	0	0	0	2	0	0	0	2	0	0
Multi-Span (over land)	0	0	0	0	0	0	0	0	0	0	0	0
Multi-Span (over water)	0	0	0	0	0	0	0	0	0	0	0	0

Rail, bus, bicycle, and pedestrian facilities

Rail construction

Project Type	Light rail	Heavy rail
New construction (underground - hard rock) - track miles	0	0
New construction (underground - soft soil) - track miles	0	0
New construction (elevated) - track miles	0	0
New construction (at grade) - track miles	0	0
Converted or upgraded existing facility - track miles	0	N/A
New rail station (underground) - stations	0	0
New rail station (elevated) - stations	0	0
New rail station (at grade) - stations	0	0

Bus rapid transit construction

New lane or right-of-way - lane miles	0
Converted or upgraded lane/facility - lane miles	0
New BRT Stations	0

Bicycle and Pedestrian Facilities

Project Type	New Construction	Resurfacing	Restriping
Off-Street Bicycle or Pedestrian Path - miles	0	0	N/A
On-Street Bicycle Lane - lane miles	2.84	2.84	0
On-Street Sidewalk - miles	2.84	N/A	N/A

Construction - Delay

Total project-days of lane closure	820
Average daily traffic per directional segment for facilities requiring lane closure	9,850
Percentage of facility lanes closed during construction	50%

Impacts on Vehicle Operation

Estimating Project-Days of Lane Closure

Estimates of project-days of lane closure may be available from project documents. The tool assumes that lane closures occur in one-mile increments. Average values for construction schedules (e.g., daytime versus overnight) are incorporated in the calculations. Estimates of emissions from construction delay are meant to provide a rough sense of the scale of emissions relative to the construction processes themselves, and are not meant to replace estimates derived from traffic modeling software. Planned construction projects that will result in significant lane closures on high volume roads should be evaluated using traffic modeling software.

Energy / GHG reduction strategies

Strategy	Baseline deployment	Planned deployment	Maximum potential deployment	Applied to
Alternative fuels and vehicle hybridization				
Hybrid maintenance vehicles and equipment	0%	0%	44%	Fuel use by maintenance equipment
Switch from diesel to B20 in maintenance vehicles and equipment	0%	0%	100%	Fuel use by maintenance equipment
Switch from diesel to B100 in maintenance vehicles and equipment	0%	0%	100%	Fuel use by maintenance equipment
Combined hybridization/B20 in maintenance vehicles and equipment	0%	0%	44%	Fuel use by maintenance equipment
Hybrid construction vehicles and equipment	0%	0%	44%	Fuel use by construction equipment
Switch from diesel to B20 in construction vehicles and equipment	0%	0%	100%	Fuel use by construction equipment
Switch from diesel to B100 in construction vehicles and equipment	0%	0%	100%	Fuel use by construction equipment
Combined hybridization/B20 in construction vehicles and equipment	0%	0%	44%	Fuel use by construction equipment
Vegetation management				
Alternative vegetation management strategies (hardscaping, alternative mowing, integrated roadway/vegetation management)	No	No	N/A	Fuel use by vegetation management equipment
Snow fencing and removal strategies				
Alternative snow removal strategies (snow fencing, wing plows)	No	No	N/A	Fuel use by snow removal equipment
In-place roadway recycling				
Cold In-place recycling	0%	0%	99%	Asphalt and fuel use by construction equipment in roadway resurfacing and BRT conversions
Full depth reclamation	0%	0%	99%	Base stone and fuel use by construction equipment in roadway reconstruction and BRT conversions
Warm-mix asphalt				
Warm-mix asphalt	0%	0%	100%	Asphalt use in all projects
Recycled and reclaimed materials				
Use recycled asphalt pavement as a substitute for virgin asphalt aggregate	0%	0%	25%	Asphalt use in all projects
Use recycled asphalt pavement as a substitute for virgin asphalt bitumen	0%	0%	40%	Asphalt use in all projects
Use industrial byproducts as substitutes for Portland cement	0%	0%	33%	Concrete use in all projects
Use recycled concrete aggregate as a substitute for base stone	0%	0%	100%	Base stone use in all projects
Preventive maintenance				
Preventive maintenance	0%	50%	100%	Materials and construction fuel use in roadway resurfacing and reconstruction projects

	Annualized energy use (mmBTUs), per year over 25 years											
	Unmitigated						Mitigated					
	Roadway - new construction	Roadway- rehabilitation	Roadway - total	Bridges	Rail, bus, bicycle, ped.	Total	Roadway - new construction	Roadway- rehabilitation	Roadway - total	Bridges	Rail, bus, bicycle, ped.	Total
Upstream Energy												
Materials	2,396	719	3,115	65	163	3,343	2,396	600	2,996	65	163	3,224
Direct Energy												
Construction Equipment	892	84	976	170	31	1,177	892	70	962	-	31	993
Routine Maintenance						126						126
Total	3,288	803	4,091	235	194	4,646	3,288	670	3,958	65	194	4,343

Note: To convert mmBTU to the equivalent gallons of US conventional diesel, use the conversion factor of 7.785 gallons of diesel / mmBTU. Please keep in mind that this conversion represents the equivalent amount of energy required, which can be useful for informational purposes, but it does not necessarily represent actual gallons of diesel required.

	Annual GHG emissions (MT CO2e), per year over 25 years											
	Unmitigated						Mitigated					
	Roadway - new construction	Roadway- rehabilitation	Roadway - total	Bridges	Rail, bus, bicycle, ped.	Total	Roadway - new construction	Roadway- rehabilitation	Roadway - total	Bridges	Rail, bus, bicycle, ped.	Total
Upstream Emissions												
Materials	152	41	193	6	9	208	152	35	187	6	9	202
Direct Emissions												
Construction Equipment	65	6	71	1	2	74	65	5	70	1	2	73
Routine Maintenance						9						9
Total	217	47	264	7	11	291	217	40	257	7	11	284

Construction delay	Result	Energy use (mmBTUs)	GHG emissions (MT CO2e)
Total project-days of construction/lane closure	820		
Project lifetime (years)	25		
Additional energy use / emissions due to delay (per project-day)		11.0	1.0
Total energy use / GHG emissions due to construction delay		9,036	805
Annual energy use / GHG emissions due to construction delay, per year		361.4	32.2

Pavement smoothness	Result	Energy use (mmBTUs)	GHG emissions (MT CO2e)
Total lane miles of roadway reconstruction / resurfacing	11		
Project lifetime (years)	25		
Reduced Energy use / GHG emissions due to smooth pavement		199	15
Annual energy / emissions savings due to pavement smoothness		8.0	0.6

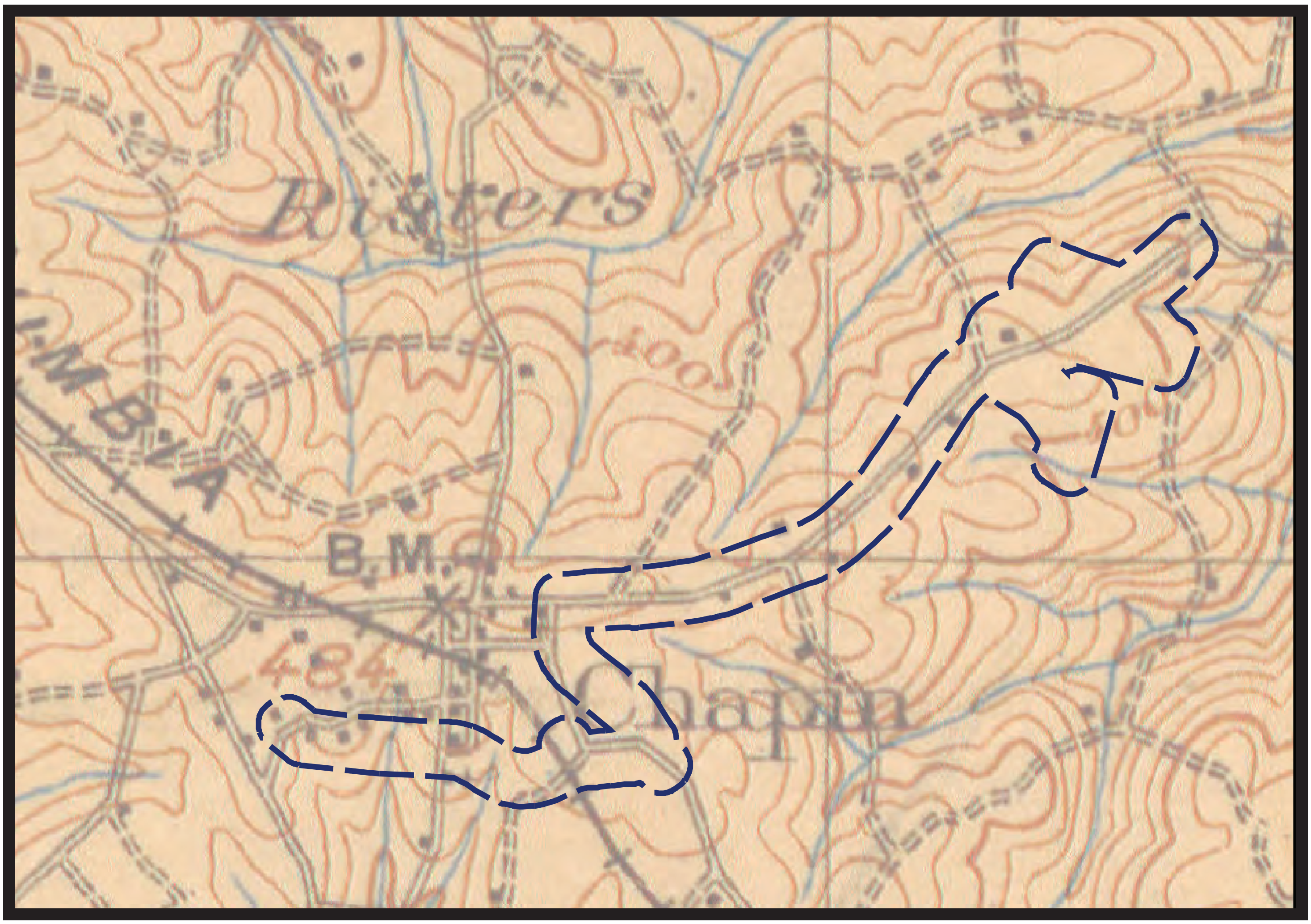
Total	Energy use (mmBTUs)	GHG emissions (MT CO2e)
Total Annualized Delay and Pavement Smoothness Impacts	353.5	31.6

Appendix H

Cultural Resources Surveys and Concurrence Documents

Cultural Resources Survey of S-48
(Columbia Avenue) Improvements

Lexington County, South Carolina



New South Associates, Inc.

Cultural Resources Survey of S-48 (Columbia Avenue) Improvements

Lexington County, South Carolina

Lexington County Project PQ13003-04/29/13S

Report submitted to:

Mead & Hunt, Inc. • 307 W. Main Street • Lexington, South Carolina 29072

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September 28, 2016 • Final Report
New South Associates Technical Report 2535

ABSTRACT

South Carolina Department of Transportation proposes improvements to S-48 (Columbia Avenue) between I-26 and East Boundary Street in the Town of Chapin, Lexington County (Lexington County Project PQ13003-04/29/13S). SCDOT plans to widen a section of this road between Chapin and I-26 and add roads on new location south of Chapin and near the I-26 intersection to ease traffic congestion. The length of the project, including sections to be widened and new roads, measures 3.8 miles (6.1 km). Construction would take place in a varying width right-of-way (ROW). New South Associates, Inc. completed a cultural resources survey of the project corridor to identify significant archaeological and historic architectural resources in its Area of Potential Effect (APE), and assist SCDOT in meeting obligations under Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR 800). This report describes the goals, methods, and results of the survey and recommends further historic preservation needs.

Background research indicated no archaeological resources were previously recorded inside the project APE. One recorded historic architectural resource, U/63/0089, representing a twentieth-century church, was in the project's APE. This resource was previously determined not eligible for the National Register of Historic Places (NRHP).

The archaeological survey identified two sites. Site 38LX661 comprises the archaeological component of a 1930s house with outbuildings. The site produced few historic artifacts and is judged to lack significant archaeological research potential. The associated buildings (recorded as Resource U/63/0904) also have no historical significance. Site 38LX662 contains a twentieth-century barnyard with agricultural structures. The site has an extremely low artifact density and appears to have no significant archaeological research potential. Both sites, therefore, are recommended not eligible for the NRHP and do not warrant further preservation.

The historic architectural survey recorded and evaluated 19 resources that mostly reflected twentieth-century domestic/agricultural functions. Only one resource, the Mt. Horeb Lutheran Cemetery (U/63/0891) on Columbia Avenue, was recommended eligible for the NRHP. This twentieth-century burial ground has associations with the Mount Horeb Lutheran Church, giving it local significance under Criterion A, and a stone wall along its street-side suggests significance under Criterion C. Measures should be taken to avoid this resource during the proposed project. The other 18 resources lack qualities of significance that would qualify them for NRHP listing

under Criteria A, B, or C. Additionally, most have been altered in ways that detract from their historical appearance and use, and they generally lack aspects of integrity. These 18 resources therefore do not require further preservation.

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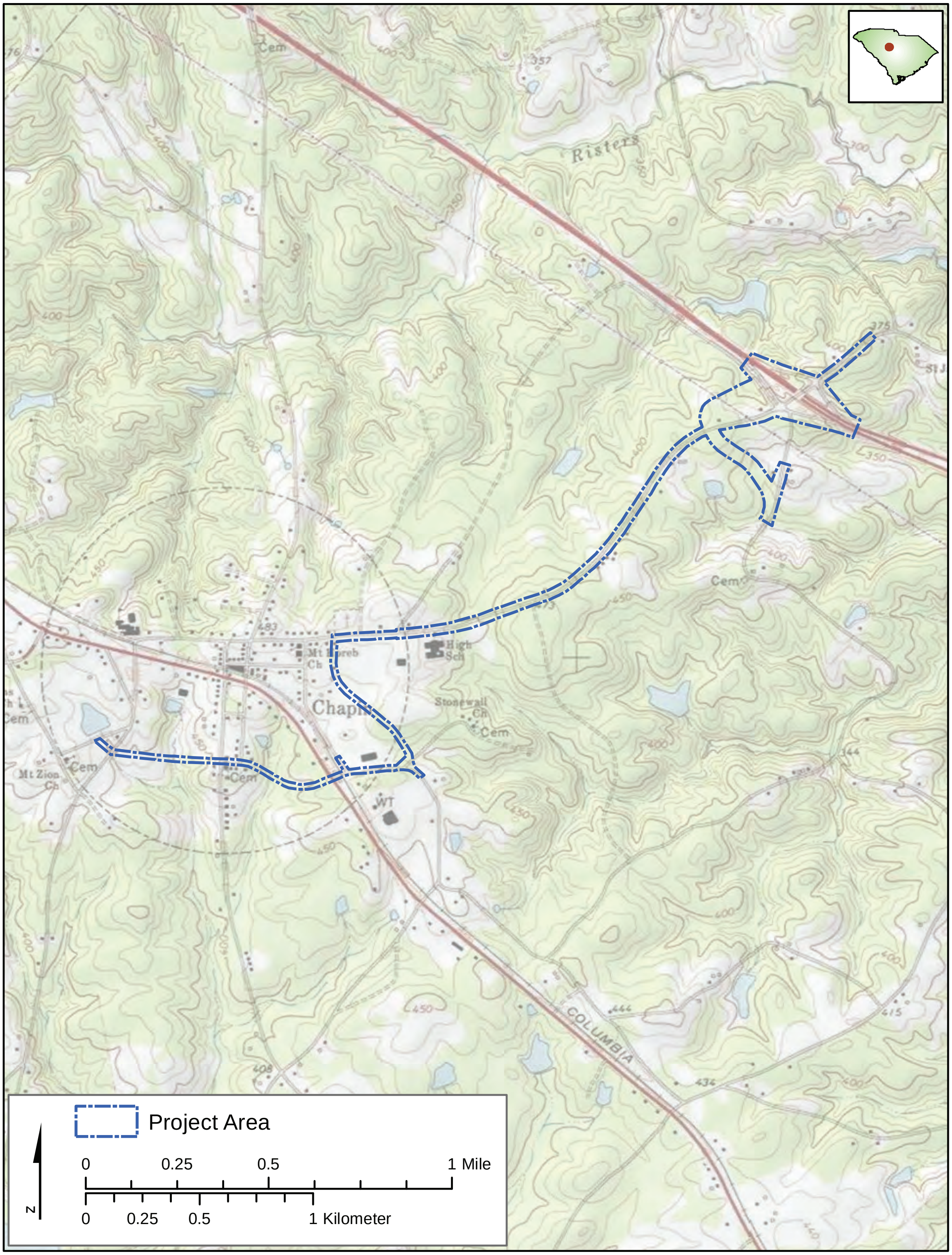
I. INTRODUCTION

South Carolina Department of Transportation (SCDOT) proposes improvements to S-48 (Columbia Avenue) between I-26 and East Boundary Street in the Town of Chapin, Lexington County, South Carolina (Lexington County Project PQ13003-04/29/13S). New South Associates, Inc. has completed a Phase I cultural resources survey of the proposed project corridor to identify significant archaeological and historical resources in its Area of Potential Effect (APE). The cultural resources survey was completed for Mead & Hunt to assist SCDOT in meeting obligations under Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR 800). This report describes the goals, methods, and results of the survey and provides recommendations regarding further historic preservation needs.

The project area is located in the Town of Chapin in northern Lexington County (Figure 1). The undertaking is intended to alleviate traffic congestion within the corridor and would involve widening existing roads, as well as adding access roads on new location. Proposed work involves widening the existing section of S-48 between East Boundary Street and the I-26 interchange. In addition, a connector between Zion Church Road in the west and East Boundary Street will be constructed on new location; this connector will incorporate the existing portion of East Boundary Street between Weisz Street and Southwoode Circle. A new road will also be built between Southwoode Circle and S-48 on the west side of Chapin High School (Figure 2). Additional roads will be at the I-26 intersection to connect S-48 with Ellet and Crooked Creek roads (Figure 3). The project corridor along S-48 would be expanded to three- and five-lane urban and rural roadways with landscaped medians. Work at the I-26 interchange will include replacing the existing S-48 bridge and reconfiguring the ramps.

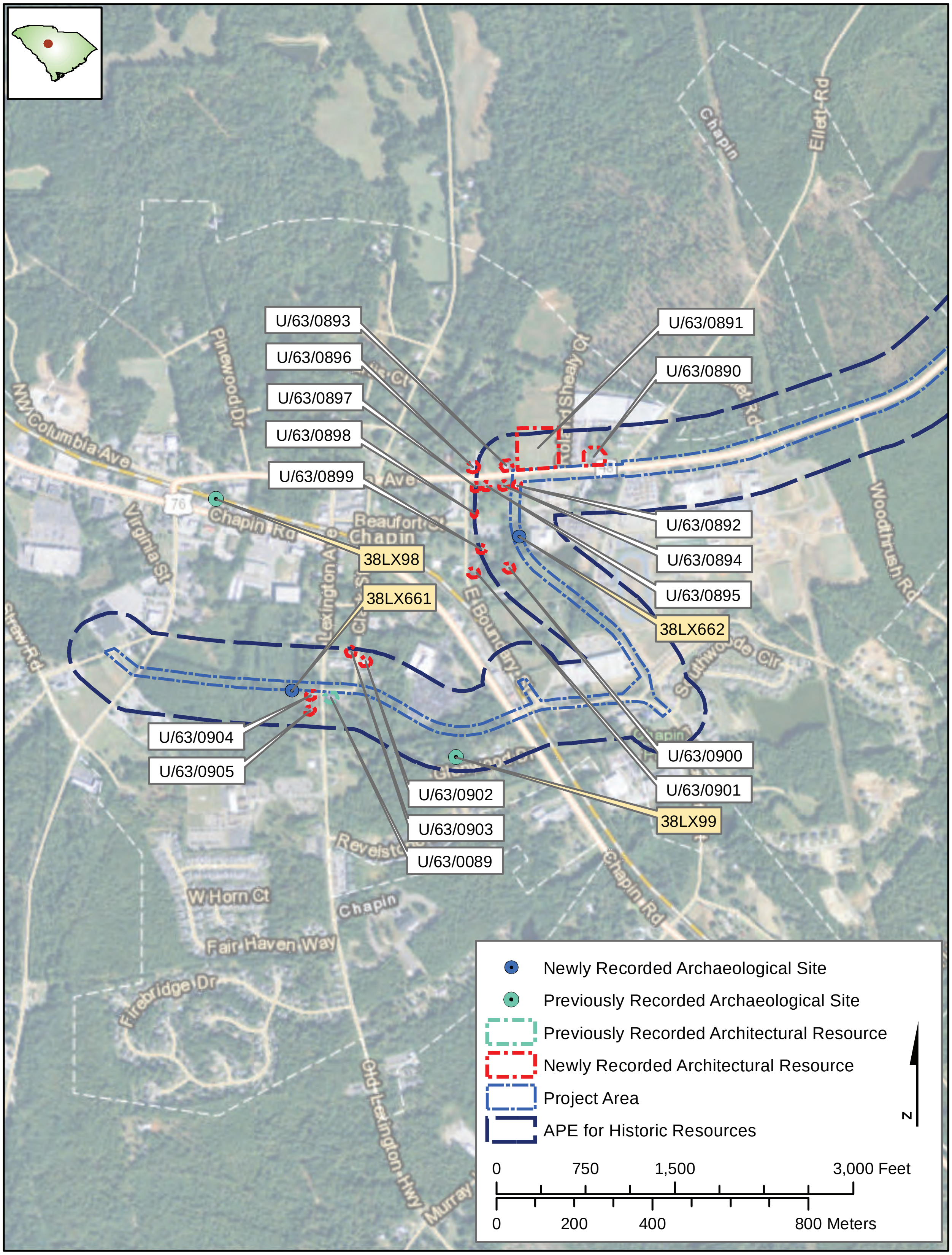
The S-48 corridor measures roughly 1.9 miles (3.1 km.) long from its beginning near East Boundary Street to its end about 0.3 mile (0.5 km.) east of I-26. Work on this corridor will take place in new (ROW) measuring 45-65 feet (13-20 m.) from the centerline of the existing road. The new location segments will take place in 35-foot (10.7-m.) wide ROW. The segment from Zion Church Road to Southwoode Circle measures 0.9 mile (1.4 km.) long; the road from Southwoode Circle to S-48 is 0.47 miles (0.75 km.) long; the segment from S-48 to Ellett Road measures 0.2 mile (0.3 km.); and the segment from S-48 to Crooked Creek Road measures roughly 0.3 mile (0.5 mi.). The total linear length of the project thus measures 3.8 miles (6.1 km.) (Figures 2 and 3).

Figure 1.
Map Showing the Project Area



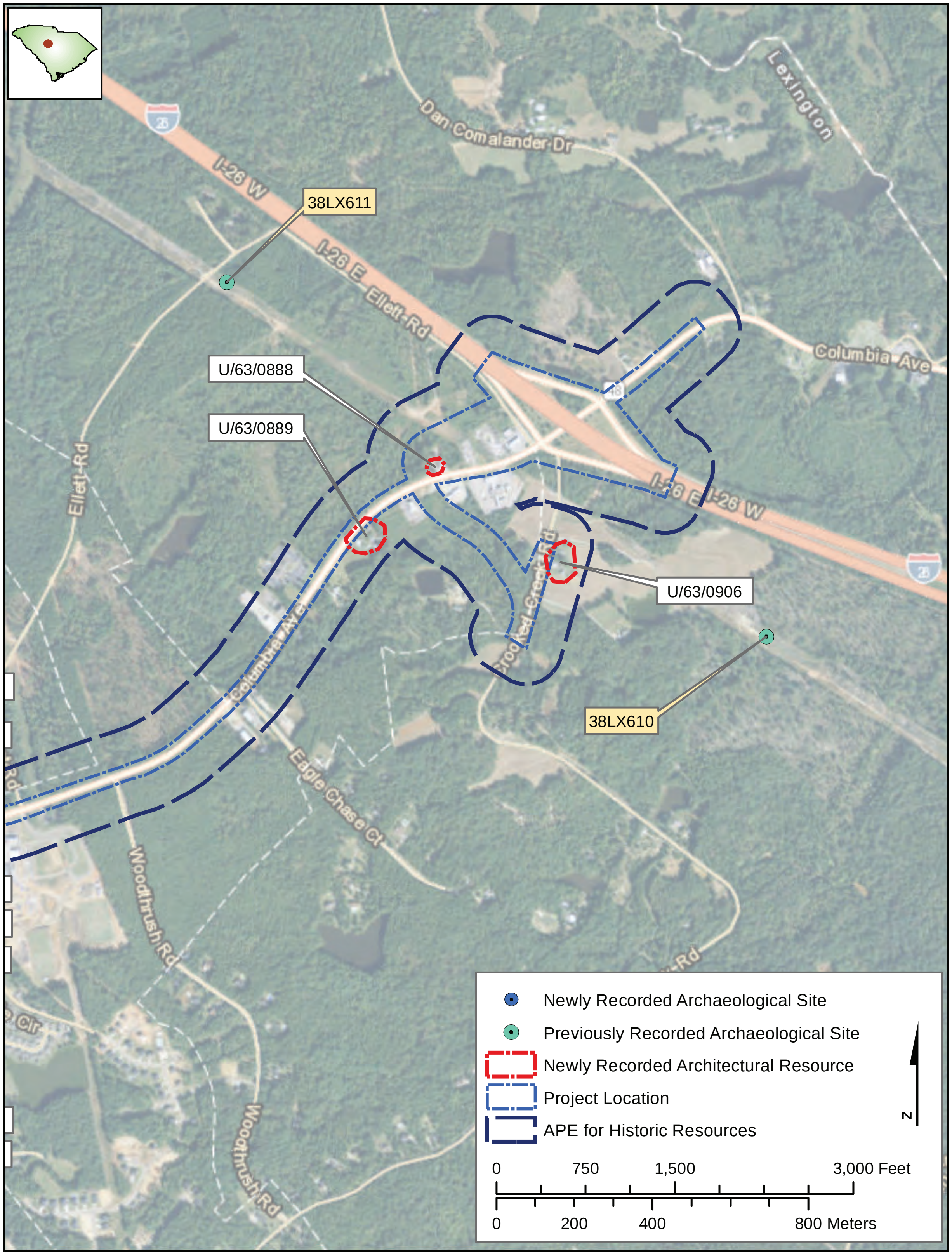
Source: USGS Chapin, South Carolina Quadrangle

Figure 2.
Project APE Showing Previously Recorded and Newly Recorded Cultural Resources to the West



Source: ESRI Resource Data

Figure 3.
Project APE Showing Previously Recorded and Newly Recorded Cultural Resources to the East



Source: ESRI Resource Data

The APE includes areas of new ROW, which could be directly impacted, as well as areas within visual or auditory effect, typically 300 feet (91 m.) beyond the ROW. For the archaeological survey, all areas of direct effect were examined, including new and existing ROW along the project corridor. For the historic architectural resources survey, the entire APE was examined.

The goal of this Phase I survey was to identify significant cultural resources in the project's APE and to assess project effects. Specific tasks included background research, fieldwork, and laboratory analysis. Background research entailed reviews of previously recorded archaeological sites and historic resources, along with development of prehistoric and historic contexts for the project area. These provided information necessary for survey planning as well as interpreting and evaluating cultural resources identified during the fieldwork. The fieldwork comprised archaeological and historic architectural resources surveys of the APE. Laboratory analysis applied to archaeological materials recovered during the survey and focused on characterizing the chronology and functions of newly recorded sites.

The remainder of this report is organized as follows: Chapters II and III discuss the project's environmental and historic contexts. Chapter IV reviews previously recorded cultural resources and provides expectations for the survey. Chapter V describes the methods applied to the study and Chapters VI and VII discuss the survey results. Chapter VIII provides evaluations and recommendations for further preservation work. Appendices contain Archaeological Site and Historic Resource forms and SHPO Concurrence.

II. ENVIRONMENTAL CONTEXT

The project area is in the Piedmont physiographic province, which consists of a dissected peneplain containing remnants of an ancient mountain range. Topography is gently rolling with few sharp breaks in terrain except along major river valleys, which often possess steep flanks (Barry 1980:57). Broad upland areas exhibiting moderate relief divide the valleys. The project corridor crosses moderately to extensively dissected uplands between the Saluda and Broad rivers. The dominant landforms in the area are wide ridge crests whose flanks are cut by valleys of varying width and depth. Ridge flanks vary from moderate to excessively sloped. The project corridor follows a series of ridge crests, and elevations generally lie 120-143 meters (400-470 ft.) above sea level.

Bedrock in the Piedmont is primarily metamorphic, comprised of schists, gneisses, slates, and some granite igneous rock where intrusive activity occurred (Kovacik and Winberry 1987:16). The project corridor lies within the Carolina terrane, "a late Precambrian through Middle Cambrian composite volcanic island arc that formed in a position exotic to North America" (Dennis and Shervais 1996). The geology of the project vicinity is also classified as part of the Carolina Slate Belt. Metavolcanic and meta-sedimentary rocks that have been metamorphosed to the lower greenschist facies and intruded by plutons are the characteristic bedrock, along with deformed and undeformed granitic and deformed gabbroic rocks (Agerton and Baker 2006:7). Regional geology can influence prehistoric and historic settlement and land use. For instance, rocks commonly found in the piedmont include argillite, quartzite, and jasper (Maybin and Nystrom 1997; Murphy 1995:40–41), which can be utilized for prehistoric chipped stone tools. No primary sources of these materials have been identified within or near the project corridor, although quartz and metaquartzite are found throughout the region and are the most accessible lithic materials for prehistoric implement manufacture (Drucker et al. 1979:7). For the historic period, granite is mined commercially in the Inner Piedmont, along with sand, vermiculite, and other rocks and minerals (Maybin and Nystrom 1997; Murphy 1995:67).

The USDA has mapped seven soil series in the project corridor (Table 1). Except for a small area mapped as poorly-drained Chenneby soil, survey corridor soils are well drained and occur on ridges and side slopes. The soils mostly formed in residuum and therefore would not contain deeply buried cultural materials unless overlain by historic colluvial or flood deposits. Moreover, given past clearing and agricultural land use, it is probable that the soils in the project corridor have been substantially eroded (Natural Resources Conservation Service 2014).

Table 1. Summary of Soils Mapped in the Survey Corridor

Map Symbol	Name	Landform	Drainage	Parent Material
CeB	Cecil fine sandy loam, 2-6% slopes	Ridges and side slopes	Well drained	Residuum
CeC	Cecil fine sandy loam, 6-10% slopes	Ridges and side slopes	Well drained	Residuum
Ch	Chenneby silty clay loam	Floodplains and depressions	Somewhat poor	Loamy and silty sediments
EnB	Enon silt loam, 2-6% slopes	Ridges and side slopes	Well drained	Residuum
GeB	Georgeville very fine sandy loam, 2-6% slopes	Gently sloping to moderately steep Piedmont uplands	Well drained	Residuum
GeC	Georgeville very fine sandy loam, 6-10% slopes	Gently sloping to moderately steep Piedmont uplands	Well drained	Residuum
GeD	Georgeville very fine sandy loam, 10-15% slopes	Gently sloping to moderately steep Piedmont uplands	Well drained	Residuum
HrB	Hemdon silt loam, 2-6% slopes	Gently sloping to moderately steep Piedmont uplands	Well drained	Residuum
NaB	Nason silt loam, 2-6% slopes	Nearly level to very steep uplands	Well drained	Residuum
NaD	Nason silt loam, 6-15% slopes	Nearly level to very steep uplands	Well drained	Residuum
TaE	Tatum silt loam, 15-25% slopes	Ridges	Well drained	Residuum

The project area lies at the divide between the Broad and Saluda river watersheds. Both are subdivisions of the Santee River basin. The corridor lies at the heads of several unnamed low-order and ephemeral drainages. The only stream crossings in the corridor are along the new road segment between Amicks Ferry Road and Lexington Avenue and the segment between Crooked Creek Road and S-48. Both are intermittent first-order tributaries.

Lexington County’s climate is characterized as humid-subtropical. Although the Appalachian Mountains to the west and Atlantic Ocean to the east moderate winter conditions, summer heat is unaffected and the county area is often extremely hot. Summers are long and temperatures average 90 degrees Fahrenheit or higher, with thunderstorms being common between June and August. In spring, cold and mild days alternate. Fall is the driest season and is typically warm with high temperatures in the 70s. Winters are mild, temperatures only reaching as low as 32 degrees on half of the days, while temperatures of 70 degrees occur. Snowfall and ice storms are rare (Agerton and Baker 2006:2–4).

Plant and animal species in the region evolved and adapted to changing climates since the end of the last glacial period. As the Glacial period ended between 12,000 to 10,000 years ago (the time of initial human occupation) seasonal differences became more pronounced in the region as temperatures grew warmer in summer and colder in winter, and precipitation increased (Watts 1980). Vegetation changed from patchy spruce/pine boreal forest and parkland to more homogeneous, mesic oak-hickory forest composed of oak, hickory, beech, birch, and elm. This transition was complete by 9,000 years ago (Anderson and O'Steen 1992:3; Delcourt and Delcourt 1985, 1987; Drucker et al. 1979:9). In the mid-Holocene, the oak-dominated Piedmont forests received an appreciable influx of pine, although pine never replaced oak forests as it did in the sand hills and coastal plain. Overall, a pattern of relative stability characterized the mid-Holocene Piedmont (Anderson and Sassaman 1995).

Present-day vegetation is generally classified as oak-hickory-pine forest and southern mixed forest. Evergreen forest dominates the region with about equal amounts of cold-deciduous broad-leaved and evergreen needle-leaved trees. Oak-hickory forest is composed of nut-producing trees. Dominant species include white, post, and southern red oaks, and hickories of pignut and mockernut. Loblolly-shortleaf pine commonly covers disturbed areas and has an understory of dogwood and sourwood (Kricher 1988:57–58; McNab and Avers 1994).

These habitats provided prehistoric and historic human populations with plant resources and supported a range of animals that were also important to prehistoric and historic economies. Species that are now or formerly present, and which would have been exploited by past human populations, include white-tailed deer, bear, squirrel, raccoon, opossum, turkey, quail, grouse, various amphibians and reptiles, and fish (Kricher 1988:57; McNab and Avers 1994).

III. CULTURAL CONTEXT

The following overviews of the region's prehistory and history provide a means for interpreting and evaluating archaeological sites or historic resources identified in the project corridor. The prehistoric period in South Carolina is divided into the Paleoindian, Archaic, Woodland, and Mississippian periods. The Protohistoric period refers to the time when Native American and European societies first encountered one another. The historic period deals primarily with the time after Europeans began permanent settlement of the region. The overview below focuses on Lexington County history.

PREHISTORIC CONTEXT

PALEOINDIAN PERIOD

The Paleoindian period (13,000 and 10,000 B.P.) encompasses the earliest known human presence in eastern North America and has been subdivided into early, middle, and late subperiods. Distinctive Clovis bifaces comprise the chief diagnostic artifacts of the Early Paleoindian, while indicators of the Middle and Late Paleoindian periods reflect regional variations. The appearance of Cumberland, Simpson, Suwannee, and Quad biface types signal the Middle Paleoindian period, while diagnostics of the Late Paleoindian include Hardaway-Dalton and Dalton types.

Archaeologists tend to agree that Paleoindians lived in nomadic band level societies with economies based on hunter and foraging. Although the population density was low, it is believed that toward the end of the Paleoindian period the population density increased significantly (Walthall 1980:30). Many southeastern researchers argue that eastern Paleoindian groups may have based their subsistence economies on the exploitation of extinct big game, given that many sites are located in prime megafaunal habitats such as major river systems (Gardner 1974; Goodyear et al. 1979; Michie 1977; Williams and Stoltman 1965).

Archaeological evidence has begun to suggest a possibility of a pre-Clovis horizon in the New World. Data from at Monte Verde (Meltzer et al. 1997), Meadowcroft Rockshelter (Adovasio et al. 1977; 1985), Cactus Hill (McAvoy and McAvoy 1999) are prominent examples of possible early human occupations. In South Carolina, excavations at the Topper site in the middle Savannah River Valley near Aiken yielded radiocarbon dates of more than 50,000 B.P. obtained from a possible hearth area. Additionally, excavations below a Clovis layer to the Pleistocene terrace produced flakes that were believed to be pre-Clovis chert processing debris (Goodyear 2005).

ARCHAIC PERIOD

Early Archaic

The Early Archaic period (9,900-8,000 B.P.) is indicated by Taylor side-notched, Palmer/Kirk corner-notched, and bifurcated projectile point forms (Chapman 1985; Coe 1964; Goodyear et al. 1979; Michie 1977). The period coincided with warming conditions, rising sea levels, and greater precipitation. Oaks became the dominant forest vegetation and data indicated episodes of heavy rainfall (Delcourt and Delcourt 1987; Segovia 1985). This environment caused cultural adjustments that are visible in the archaeological record. Anderson and Hanson (1988) argued that Early Archaic settlement involved seasonal movement within river valleys between the coast and Piedmont. People mostly lived in a series of transient foraging camps and congregated annually at the Fall Line in autumn.

Middle Archaic

Diagnostic artifacts of the Middle Archaic period (8,000-5,000 B.P.) include Kirk Stemmed, Stanly, Morrow Mountain, and Guilford projectile points. Notably, the Morrow Mountain and Guildford phases show a nearly complete reliance on local quartz. Middle Archaic sites are common in the region, compared to other periods, and sites typically occur on ridges separated by watersheds (Goodyear et al. 1979). Sassaman (1983) suggested that Middle Archaic settlement was extremely mobile, a characteristic resembling Binford's (1980) definition of a foraging society. Based on research in the Haw River Valley of North Carolina, Cable (1982) argued that postglacial warming led to increased vegetational homogeneity, which encouraged foraging. Sassaman's (1983) noted that sites tend to be ephemeral and toolkits show evidence of expediency and limited specialization, which are consistent with frequent residential movement within zones offering essentially the same subsistence resources.

Late Archaic

The Late Archaic period (5,000-3,000 B.P.) has been described as a time of increased settlement permanence, population growth, subsistence intensification, and technological innovation (Smith 1986). Savannah River Stemmed, small Savannah River Stemmed, and Otarre projectile points characterize the period, along with the development of ceramic technology (Griffin 1943; Stoltman 1974). The use of pottery in the Piedmont first occurred about 800 years after its introduction in the Coastal Plain, probably because inhabitants of the Piedmont and Fall Line relied on carved soapstone cooking tools (heating stones and bowls) (Sassaman et al. 1990; Sassaman 1993). Late Archaic sites are relatively common, with components found in upland and valley settings. Goodyear et al. (1979) noted considerable differences between riverine sites, which contained upland sites and high artifact density and variability. This pattern suggested Late Archaic populations lived primarily in established settlements along larger drainages and used upland zones for specific resource procurement activities.

WOODLAND PERIOD

Early Woodland

The Early Woodland period (3,000-2,450 B.P.) is indicated by Dunlap and Swannanoa ceramics in the project vicinity (Adams 1999). Dunlap pottery is characterized by medium to coarse sand paste, fabric impressions, and simple jar or cup-shaped vessels. Swannanoa ceramics contain heavy crushed quartz temper and exhibit cord marked or fabric impressions on conoidal jars and simple bowls. They are also occasionally simple stamped, check stamped, and smoothed plain (Keel 1976:230). Projectile points consist of Savannah River Stemmed and Swannanoa Stemmed. The more Piedmont-oriented Badin pottery has also been found in Newberry, Union, and Chester County areas. Associated projectile points consist of medium to large triangular points known as Badin and Yadkin (Coe 1964).

Goodyear et al. (1979) found extensive Early Woodland use of the inter-riverine zone in the Piedmont. Two sites contained dense remains and were located on the south face of slopes adjacent to springs. They believed that the sites reflected fall-winter occupations with subsistence activities oriented toward gathering nuts and hunting deer. If the sites represent seasonal base camps, then they would represent a strong break with previous Archaic systems and their settlement strategies for exploiting inter-riverine biotic resources (Goodyear et al. 1979:230).

Middle Woodland

Middle Woodland (2,450-1,450 B.P.) diagnostic artifacts the region include Pigeon and Cartersville ceramics. Pigeon is quartz tempered with check stamped, simple stamped, and brushed surfaces. The Cartersville type has sand or grit paste with a cord marked surfaces, and occasionally simple stamping and check stamping. The Cartersville series may relate to the Deptford series found closer to the coast, and some Deptford wares have been found in the Piedmont. Anderson and Schuldenrein (1985:720) suggested that Cartersville continued well into the Late Woodland period. Associated projectile points include Pigeon side-notched and corner-notched types. Connestee pottery emerged during the second half of the Middle Woodland period. Keel (1976) put its temporal range between about 1,900 and 1,400 B.P. Connestee is a thin-walled sand-tempered ware (Trinkley 1990). The Connestee ceramic type is primarily brushed, simple stamped, and cord marked (Keel 1976:222).

Little is known about the Middle Woodland in the project region. In the Savannah River Valley, seasonal or permanent base camps in prime resource locations are characteristics of Middle Woodland settlement patterns. Sassaman et al. (1990:13) believed that settlement and subsistence organization was probably locally consolidated and at times consisted of relatively large aggregations of people, large-scale storage, and maybe some limited economic specialization.

Late Woodland

Napier pottery indicates the Late Woodland Period (1,450-800 B.P.). The Napier series is a fine sand tempered ware with fine, complicated stamped designs (Trinkley 1980; 1990). The Late Woodland period is also defined by the decline in the more coastal-oriented stamped Deptford wares (Trinkley 1990). Although Cartersville ceramics may extend into the Late Woodland period, archaeological surveys in the Piedmont have not found appreciable quantities. Projectile points are typically small and triangular. Analysis of settlement suggests similar patterns to the Middle Woodland with respect to site locations, but they are more widely dispersed. Little inter-riverine occupation has been noted (Goodyear et al. 1979; Sassaman et al. 1990:14; Taylor and Smith 1978). Sassaman et al. (1990:14–15) note that the Late Woodland is difficult to distinguish from the Middle Woodland and subsequent Mississippian, and in some respects it represents a transition between these periods. During the Late Woodland, village life apparently intensified, while corn and squash remains hint at incipient agricultural economies.

MISSISSIPPIAN PERIOD

The Mississippian period (A.D. 1100-1640) is characterized by sedentary village life, agricultural food production, and regionally integrated and hierarchically organized social, political, and ceremonial systems (Anderson 1989; 1994). Pottery comprises the principal diagnostic artifact type. DePratter and Judge (1986) defined four Mississippian ceramic phases in the Wateree Valley, and these appear applicable to the present project area. The first phase is Belmont Neck (ca. A.D. 1100-1175), typified by complicated stamping with predominantly notched rims. Rows of punctuates or punctuated rosettes applied just below the rim characterize the second phase, Pee Dee (ca. A.D. 1175-1450). The third is Mulberry (ca. A.D. 1450-1600), consisting of segmented or punctuated appliqué strips and, in some vessels, a series of vertical ticks on the shoulders. The fourth phase is Wateree (ca. A.D. 1600-1680), characterized by thick vessel walls, poorly executed stamping, and wide appliqué rim strips (DePratter and Judge 1986). Both Stuart (1975) and South (1973) have also noted changes in rim forms in central South Carolina. These Mississippian ceramic types appear to be the most applicable series to the Newberry County area.

Mississippian populations developed adaptations to environmentally restricted river floodplains. Settlements were supported by well-drained easily tilled soils suitable for horticulture and access to rich sources of fish and waterfowl (Smith 1978:486, 488). Cultivated plants were a hallmark of the Mississippian period, although it is not clear what percentage of the diet they constituted. Principal crops were maize, squash, sunflower, marsh elder, and gourd. After about A.D. 1200, beans became important (Bense 1994:186). Settlement patterns were hierarchical. Most people lived in small dispersed farms that were tied to larger sites where political, ceremonial, and other activities were centralized and at which social elite lived (Bense 1994).

PROTOHISTORIC AND CONTACT PERIOD

The Protohistoric period refers to the end of the Mississippian era and the initial interactions between Native American and European societies beginning in the sixteenth century. The end of the period is marked by the relocation of most of the Native American population out of the region by the early nineteenth century.

The project vicinity may have been within the sphere of Cofitachequi, a Mississippian chiefdom centered on the Wateree River near present-day Camden that emerged around A.D. 1300. Hernando DeSoto visited the chiefdom in 1540, and he might have been preceded by members of the 1526 Ayllon expedition (Swanton 1922:31). Juan Pardo and his forces visited the town in 1566. In 1568, Pardo established a small fort there but local Indians soon destroyed it. A small Spanish expedition traveled through the area in 1627-1628, and the only Indian place name mentioned is Cofitachequi (DePratter 1989).

In 1670, Henry Woodward trekked from newly established Charleston to Cofitachequi to seek treaties with the chiefs he encountered on the way. Woodward referred to the Cofitachequi chief as “emperor” and reported 1,000 bowmen at his disposal. Woodward convinced the emperor to visit Charles Town, which he did in September of that year. He again visited the English settlement two years later (Cheves 1897:194, 201, 388). The last known reference to Cofitachequi dated to 1681, and it only mentions the town in passing. John Lawton passed through the Cofitachequi area in the early 1700s and the local occupants consisted of a new group known as the Congarees (DePratter 1989; Lawson 1709:34)

The Congarees participated in the Yamassee War of 1715, which had a disastrous outcome for them. Over half of them were captured and sent to the West Indies as slaves (Swanton 1946:93). The others retreated westward and were subsumed under the Catawba Nation, then situated along the Catawba River and its tributaries near present day Rock Hill. Ferguson (1989) and Garrow and Wheaton (1989) have described pottery associated with the historic Catawba as thin, well made, and highly burnished.

HISTORIC CONTEXT

COLONIAL PERIOD

Comprised of only 31,113 square miles, modern South Carolina is a fraction of its original size. In 1665, eight Lords Proprietors received a charter for the Carolina Province that described its boundaries as a band between the current southern boundary of Virginia to just below present-day Daytona Beach, Florida that extended from the Atlantic coast to the Pacific Ocean. Over the next 300 years, the boundaries of South Carolina gradually dwindled until, in 1990, the state reached its current size (Edgar 1998:1, 3).

European colonists to the region required defense from the native populations. In 1718, the colonists built a fortified post called Fort Congaree on the site of a former Congaree Native American village. A second garrison was later constructed two and half miles north after attacks in the late 1740s (Central Midlands Regional Planning Council 1974:132). By 1733, a large trading post was established near Fort Congaree to serve as an exchange center between the western districts and Charles Town (Michie 1989). During this time the region became a political entity known as Congaree District.

The total population of Carolina, especially the backcountry, increased two and a half times between 1730 and 1760, from 30,000 to over 80,000. The potential for attack from hostile Native Americans led Governor Robert Johnson to introduce a plan calling for eight frontier settlements at a distance of 80-100 miles from Charles Town as buffers against the surrounding Indian populations. Placed on major rivers, the townships contained at least 20,000 acres and were subdivided into square plots. The townships were intended for European immigrants, and as enticement all settlers received paid passage, land without obligation to pay quitrents for ten years, and access to a fund that provided them provisions and other assistance (Kovacik and Winberry 1987:78).

The township of Saxe-Gotha, known as the former Congaree District, was located in present-day Lexington County. Settlers in the region between the Broad and Saluda Rivers were mainly German immigrants, leading to the district being labeled “Dutch Fork” (Kovacik and Winberry 1987:79). The actual settlement of Saxe-Gotha, known as Granby, was located just south of the present-day city of Cayce. Through the nineteenth century many of the inhabitants of Dutch Fork continued to speak German.

CHEROKEE OPPOSITION

European settlers of the South Carolina backcountry remained relatively isolated from the coastal settlements, causing excessive delays in communication and dealings with colonial administrators. Concerns for the safety of the interior settlements in the face of hostile Indians prompted the creation of militia units in these areas. The units, however, proved unprepared for Cherokee uprisings that began in the late 1750s (Edgar 1998:205).

In 1759, forts were constructed along the Broad, Enoree, and Bush rivers as sanctuaries for European settlers against then-regular Cherokee attacks. Clashes became so frequent that the colonial authorities attempted to stop further settlement of the upcountry. Refugees seeking protection in the forts found disease and widespread corruption as those in charge embezzled money meant for relief and supplies, while charging outrageous prices for food. Additionally, militiamen posted outside the forts plundered the abandoned homes of refugees (Edgar 1998:206; Pope 1973:21).

Campaigns against the Cherokee in the early 1760s led to the Treaty of Charleston, which ended what had become the Cherokee War (Pope 1973:21–29). In the aftermath, the South Carolina backcountry saw settlement by Euro-Americans increase. Despite the end of hostilities, the upcountry remained a lawless and dangerous region. Cattle and horse thefts were common, while pillaging of abandoned homes continued. The nearest courts were more than 100 miles away in Charleston, making law enforcement largely ineffective (Pope 1973:24).

AMERICAN REVOLUTION

In the years preceding the American Revolution, the upcountry was in regular conflict with colonial legislators. Upcountry residents became increasingly preoccupied by a lack of representation, by limited support for local schools and churches, and by the potential for uprisings by the neighboring Cherokee. Additionally, the friction with England was largely a concern of coastal districts; in the upcountry, many residents remained loyal to the country that granted them large tracts of land. These factors led to the American Revolution resembling a civil war in South Carolina as many Piedmont settlers sided with England against low country planters. After failure to convince some of the most prominent upcountry Loyalists to change sides, Colonel Richard Richardson and his men raided a Loyalist camp at the Great Cane Break on Reedy River after the skirmish at Fort Ninety Six. As a result, the Patriots captured 136 Loyalists (Mabrey 1981).

After the British captured Charleston in 1780, the scene of conflict shifted from the coast to the upcountry. The first major victory for the Patriots was the Battle of Musgrove's' Mill on the Enoree River in August of 1780. The Patriots were further encouraged in October by the victory at Kings Mountain. That month General Lord Cornwallis moved his headquarters to the town of Winnsboro. The Battle of Fish Dam Ford (November 9, 1780) on the Broad River in Chester County was a victory for General Thomas Sumter and was quickly followed by the Battle of Blackstock on the Tyger River (November 25). Other skirmishes in the surrounding area culminated in the Battle of Cowpens (January 1781), where the Patriots under General Morgan decisively defeated the British cavalry commander, Banastre Tarleton. After the British disaster at Cowpens, Cornwallis spent the remainder of the year trying to find and defeat Generals Greene and Morgan. He moved into North Carolina, then into Virginia. From then until the British withdrew from Charleston at the end of 1782, guerrilla warfare raged across northwestern South Carolina (Mabrey 1981:320).

FORMATION OF LEXINGTON COUNTY

In 1783, the state legislature decided to divide the seven districts into smaller, more manageable and better-represented counties of no more than 40 square miles. Lexington County, along with Orange, Winton, and Lewisburg counties, was part of Orangeburg District. Lexington County was created out of Saxe Gotha township, with a courthouse at Granby (now Cayce) on the south bank of the Congaree River in 1785. In 1791, the county was reincorporated into Orange District and finally became a separate county in 1804. Smaller parts of the county were carved off to form Aiken and Calhoun counties in 1871 and 1908, respectively.

In 1786, the state capital was moved from Charleston to the falls of the Congaree River. With Columbia growing in importance on the river's north side, Granby declined in importance. The area was also flood-prone, prompting the county seat to be moved to the newly established Town of Lexington (first known as Lexington Courthouse) in 1820 (Central Midlands Regional Planning Council 1974).

CIVIL WAR

No Civil War battles were fought in Lexington County. However, many Lexington County men served and died during the bloody conflict. There were 60,000 men of military age (18-45) in South Carolina at the beginning of the Civil War. The total number of recorded deaths was 18,666 with some estimates as high as 21,146 (Edgar 1998:375).

Although no formal battles were fought in the county, there was a skirmish at Two Leagues Crossroads near the town of Lexington on February 16, 1865 (National Park Service 2014). On February 1, 1865, the Union Army began crossing the Savannah River into South Carolina and making their way to Aiken and Columbia. On February 16 and 17, Union forces arrived in Lexington County and began shelling the city of Columbia from the west bank of the Congaree. The action at Two Leagues Crossroads was among several skirmishes around Columbia in mid-February.

In South Carolina, the Civil War ended with the burning of Columbia and Sherman's subsequent march north. The state was left under military rule with an occupation force of Union soldiers. A garrison remained there after civilians took over the government until 1876.

RECONSTRUCTION AND THE TWENTIETH CENTURY

While the Civil War overturned long-standing economic, social, and political structures in the South, most Lexington County residents continued farming. Cotton production was widespread, but was not dependable owing to fluctuating markets. After the war, landowners divided plantations into smaller farms to be cultivated by tenant farmers or sharecroppers. Tenant farmers were both black and white, and relocated often to seek out the best prices and land. Sharecroppers used the tools and animals of landowners, while cash renters brought their own goods and animals and only rented the land (Kovacik and Winberry 1987:107–108).

Cotton and corn production declined drastically during the Civil War. However, both crops steadily increased during the final decades of the nineteenth century. By the mid-twentieth century, soybean and tobacco were also grown. Due to soil erosion, however, most of the agricultural production in the region shifted from the lower to upper Piedmont. By 1940, cotton accounted for only 3-6 percent of harvested acreage in Lexington (Kovacik and Winberry 1987:109–110).

An important shift in the post-Civil War economic situation was a rise in manufacturing. Counties along the Fall Line such as Richland, Lexington, and Aiken accounted for 15 percent of the state's manufacturing, while about half of the factories were located in the upper Piedmont. Important industries contributing to the growth of the state were textile mills, cotton gins, and forestry (Kovacik and Winberry 1987:112, 116–117).

Along with the increase in manufacturing came the increase in hydroelectric power. The Columbia Canal in Richland County and Portman Shoals in Anderson County, were early examples in the state. Several more followed, and, by 1926, South Carolina ranked sixth in the United States for hydroelectric power. In Lexington County, the Lexington Water Power Company completed their plant at Dreher Shoals on the Saluda River in 1930. The plant consisted of an earthen dam one and half miles long, which created Lake Murray (Kovacik and Winberry 1987:118–1198). This act had a tremendous effect on the people of the surrounding area. When the land was acquired for the undertaking it affected approximately 5,000 people. Three churches, six school, and 193 cemeteries had to be removed or relocated (Chapin, South Carolina 2014).

CHAPIN

In the mid-1800s Martin Chapin and his wife moved to the Dutch Fork area from Cortland, New York. Suffering from a lung ailment, he had been advised by doctors that he should move south to piney woods in hopes that the fresh pine-infused air would heal him. After settling, Chapin's health soon recovered and he established a successful lumber mill and started purchasing land. According to county records, Chapin purchased a total of 4,218 acres in the Chapin area. In order to get his lumber to market, Chapin granted a ROW to the Columbia, Newberry, and Laurens Railroad. The line brought prosperity as well as a new town. The town of Chapin was created on Christmas Eve 1889 when Martin Chapin gave the land for its streets with limits to extend three quarters of a mile, east, and west from his own house (Chapin, South Carolina 2014).

Chapin died in 1894, but the town of Chapin continued in relative prosperity. Many of Chapin's farmers lost everything when the Bank of Chapin collapsed during the Great Depression. However, the town persisted and with the introduction of the automobile, electricity, telephone, and radio, the limits of the small town were expanded. As of 2010, the town had a population of 1,445. Nearby Lake Murray is perhaps the main attraction to Chapin (Chapin, South Carolina 2014).

IV. BACKGROUND RESEARCH RESULTS

To identify any previously recorded cultural resources in the project's APE and to obtain information necessary to develop survey expectations, New South searched archaeological site files at the SCIAA. Additionally, Archsite, the digital site files and GIS database maintained by SCIAA and the South Carolina Department of Archives and History (SCDAH), was searched to identify previously documented properties within 0.8 kilometer (0.5 mi.) of the APE. Historic maps were examined to determine potential locations of historic sites. Prior survey data for the region were also consulted to further assess cultural resources potential.

ARCHAEOLOGY

Archaeological site data at SCIAA indicated no sites have been previously recorded in the project's APE. Four sites were identified within 0.8 kilometer (0.5 mi.) of the project corridor (see Figures 2 and 3).

Site 38LX98 comprises an undiagnostic prehistoric artifact scatter occupying a wide ridge crest. The site is associated with well-drained Georgeville soils, and no permanent surface water is nearby. The site files report Site 38LX99 with Middle and Late Archaic components. It lies on a ridge spur overlooking a wide stream valley to the west. Soils mapped at the site are well drained Georgeville and Nason types. The site forms indicate both of these sites were judged not eligible for the NRHP, but do not provide information on who recorded and evaluated them.

Sites 38LX610 and 38LX611 were identified during surveys of the St. George 230 kV Line corridor, which crosses S-48 on the west side of I-26. Site 38LX610 was a low-density prehistoric lithic scatter with Late Archaic and Early Woodland components. It contained quartz debitage along with two bifaces and one Otarre hafted biface. The site occupied a ridge spur overlooking a stream valley with well-drained Georgeville soil. Site 38LX611 also reflected a low-density scatter of quartz artifacts. A Yadkin projectile point indicated an Early to Middle Woodland component. The site was in a broad upland with Georgeville soils that overlooked a low-order drainage (Risters Creek). Both of these sites were recommended not eligible for the NRHP (Pappas and Bailey 2011).

Three prior surveys took place within 0.8 kilometer (0.5 mi.) of the survey corridor. The earliest of these examined the St. George 230 kV Line corridor noted above. This survey, completed in 2011, intersected the present survey corridor near its eastern end and recorded Sites 38LX610 and 38LX611. A second survey by SM&E Engineers (2012) covered approximately 215 acres for the proposed Chapin Technology Park. This tract lay northeast of the present survey area, although a spur extended to S-48 at roughly the midpoint of the survey corridor. Conducted in 2012, this survey identified two sites, both of which lay more than 0.8 kilometer (0.5 mi.) from the S-48 project corridor. Finally, SCDOT surveyed areas of potential impact for improvements to I-26 in 2014. This survey followed the existing alignment of the highway but did not encompass the interchange included in the present survey. The study identified four archaeological sites, none in or near the S-48 survey corridor (Jurgelski 2014).

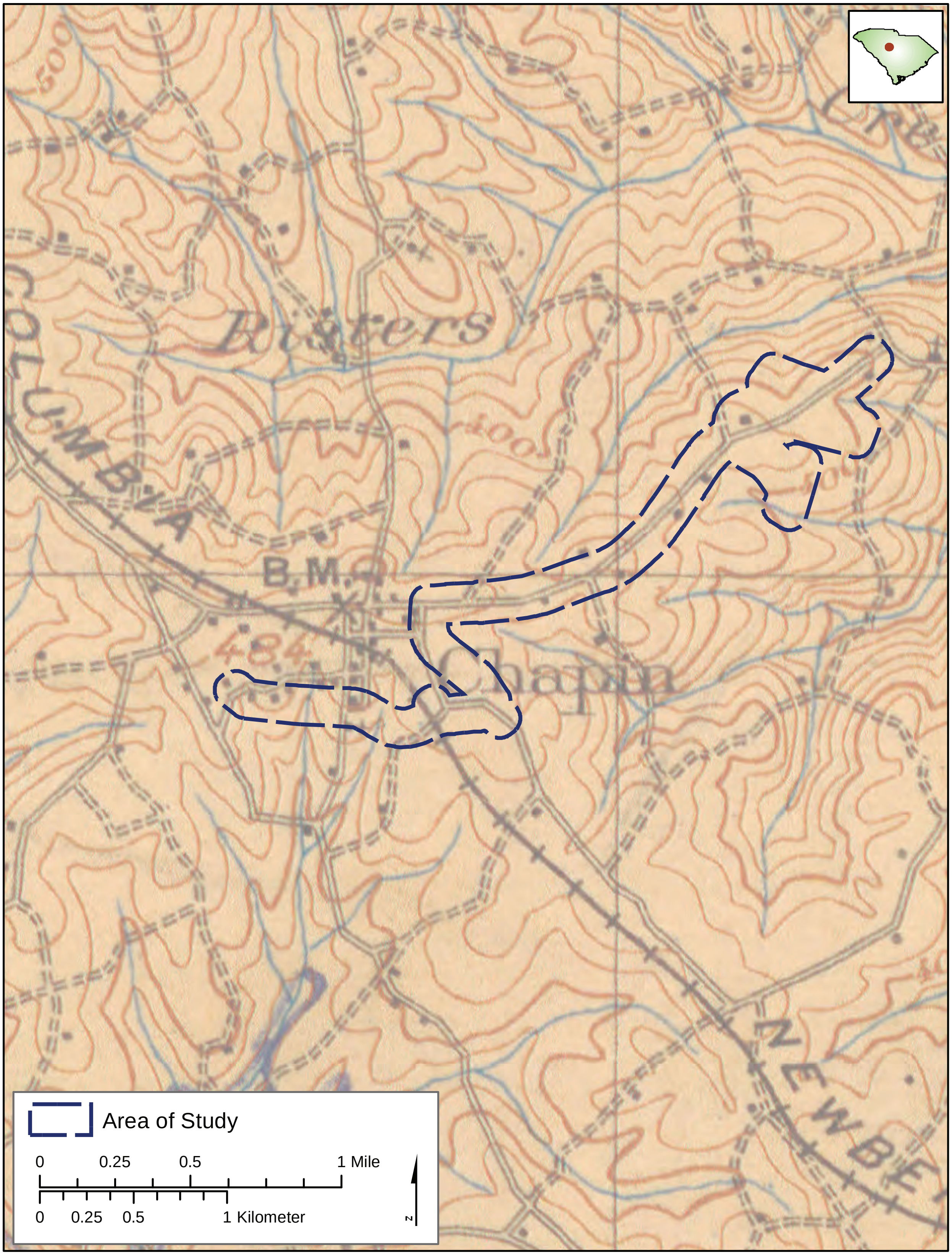
Notably, these surveys produced very few sites, which suggests a low site density in the region. The information regarding site locations from the prior surveys and site file data suggests that well-drained upland settings in the project vicinity, particularly those having Georgeville soils, would be the most sensitive for prehistoric archaeological sites. Direct association to water sources does not appear important, although positions overlooking valleys or drainages have a greater sensitivity for sites. These suggestions are extremely tentative given the very small sample size. Also, the review provided no information on historic archaeological sites.

Data from the general region further suggests models for site potential. For prehistoric sites, studies by the U.S. Forest Service in the South Carolina piedmont suggest the following expectations (Bates 1994, 1997): high potential areas include elevated spots within floodplains such as levees. In uplands, ridge tops, noses, saddles, and crests lying within 150 meters (500 ft.) of a stream or floodplain are considered to have a high potential. Medium potential areas include level positions within floodplains or bottoms and slopes under 10 percent that lie more than 150 meters (500 ft.) from water sources. Active floodplains, swamps, and slopes over 150 meters (500 ft.) from water are considered to have a low potential for prehistoric archaeological sites.

Prehistoric sites expected in the project corridor vicinity consist of low-density artifact scatters that probably reflect brief or short-term camps. The small sample of site file data does not suggest a probability for specific prehistoric components, although Middle Archaic through Middle Woodland components have been recorded in the vicinity.

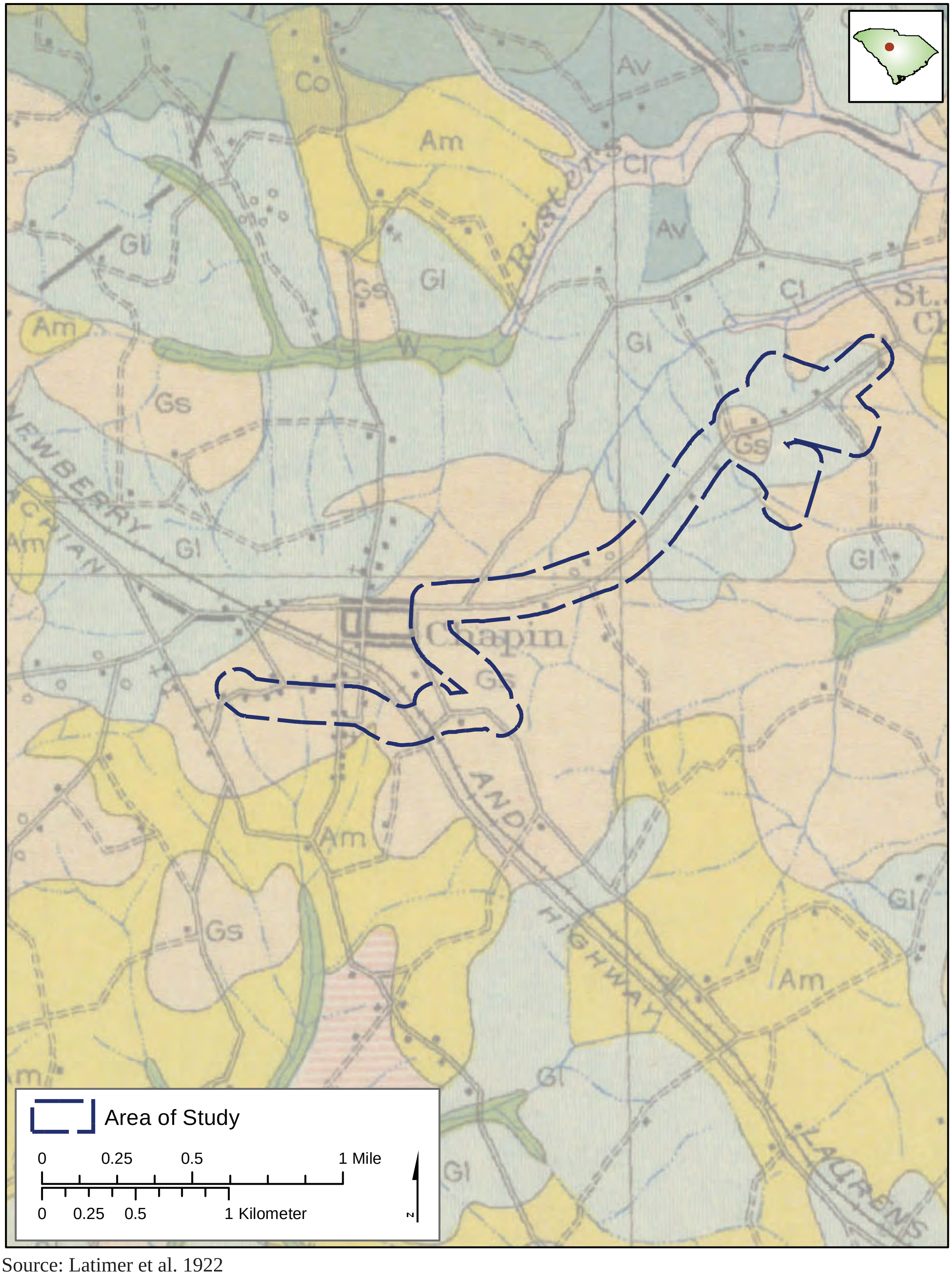
Historic maps consulted for this survey range in date from 1904-1971 (Latimer et al. 1922; South Carolina State Highway Department 1940, 1958; U.S. Geological Survey 1904, 1937, 1971). The maps indicate that S-48 was in place by the first decade of the twentieth century, along with other roads included in, or crossed by, the survey corridor. These include the roads within Chapin as well as Crooked Creek Road at the corridor's eastern portion (Figures 4 and 5).

Figure 4.
Study Area Shown on the 1918 Chapin Topographic Quadrangle



Source: U.S. Geological Survey 1918

Figure 5.
Study Area Shown on the 1922 Soil Survey of Lexington County Map



Source: Latimer et al. 1922

Models of historic settlement indicate that transportation routes exerted more influence on site locations than environmental variables, and historic maps illustrate this interpretation. Early twentieth-century topographic maps show very sparse settlement in the project vicinity outside of a concentration at Chapin. Mapped structures showed a clear association to roads, and this pattern persisted through the late twentieth century. The maps show few structures clearly associated with the Columbia Newberry and Laurens Railroad line, which passes through. South Carolina Highway Department county road maps show the functions of structures, and indicate that the majority of the buildings in the project vicinity were residential.

Some aspects of physical setting, however, might influence historic settlement. Upland settings, such as ridges, knolls, noses, and saddles within 150 meters (500 ft.) of water, have a high potential for historic archaeological sites (Bates 1994, 1997). Poorly-drained valley bottoms that are not suitable for most types of occupation have a potential for specialized types of sites, such as mills. With respect to chronology, studies of historic farmsteads in the Aiken Plateau indicated a general trend for early settlement in lower elevations, with uplands becoming settled more densely after the Civil War (Cabak and Inkrot 1997:76–79). Early settlement associated with riverine settings, however, focused on larger and medium sized drainages, which do not occur in the S-48 study corridor.

The map review showed structures scattered along nearly the entire survey corridor. The only locations having few to no structures are those located at a distance from roads, such as along segments of the proposed connector south of Chapin. Concentrations of structures occur only within the town of Chapin and at the point where the new road connector crosses Lexington Avenue. Based on the review, locations characterized as having a high potential for historic archaeological resources are those where maps show structures. Areas where no structures were mapped, but that are within proximity to roads, have a moderate potential for historic archaeological resources.

ARCHITECTURE

The purpose of the background research by the architectural historian was to identify historic properties in the survey area that may be adversely affected by the proposed undertaking and to develop a general cultural and historical background to properly evaluate resources identified during field survey.

One listed resource and one resource previously determined not eligible are located within 0.5 mile of the APE, one of which is inside the APE.

Chapin Methodist Church (U/063/0089) was constructed circa 1936 and is located at 415 Lexington Avenue in Chapin within the project's APE (see Figure 2). It has been determined to be not eligible for the NRHP. The second resource, the Robinson-Hiller House, built in 1902, is significant as an excellent example of Queen Anne residential architecture and for its association with Charles Plumber Robinson (1867-1944), who was a prominent merchant of Chapin and Lexington County in the early twentieth century, and his wife Sarah "Eddie" Smithson Robinson, who was a social activist and officer of the Women's Christian Temperance Union. Charles Robinson founded C.P. Robinson Lumber Company, a sawmill and building products company, which included a lumberyard and brickworks. He also later owned and operated a mercantile store, cotton gin, corn mill, and roller mill. His various business interests made Robinson the major employer in the Chapin community during the first decade of the twentieth century. After the Robinson's left Chapin in 1919, James Haltiwanger Hiller acquired the house. This house was listed in the National Register on May 18, 1998.

V. SURVEY METHODS

ARCHAEOLOGY

FIELDWORK

The objective of the archaeological fieldwork was to identify significant archaeological resources in the project's APE, and entailed pedestrian survey combined with systematic shovel testing. Shovel tests intervals measured 30 meters (100 ft.). Shovel tests were on transects placed inside the APE. Shovel tests measured roughly 30 centimeters (1.0 ft.) in diameter and were excavated by hand until reaching culturally sterile subsoil. All soils from shovel tests were screened through 0.25-inch mesh hardware cloth for systematic artifact recovery. Notes were kept on the location of each shovel test, the conditions in the immediate area, and the results of excavation, including recording soils identified and cultural materials recovered, if any. Conditions in the APE were documented with photographs, and notes were maintained by the field director.

A site was defined if artifacts from the same, broad cultural period were recovered in: a) a 30-meter (100 ft.) diameter area yielding three or more artifacts; and/or b) visible or historically recorded surface features (e.g., wells, chimney falls, house piers, brick scatters). The presence of only one or two artifacts within a 30-meter radius was considered an isolated find.

Once a site was identified, it was further examined with shovel tests placed on a 15-meter (50-ft.) grid (using a Cartesian coordinate system). The goal of the supplemental testing was to determine the site boundaries and collect information necessary for ascertaining site chronology and function. Where possible, all site boundaries were delineated until two sterile shovel tests were encountered or if a natural boundary (e.g., excessive slope, disturbance) was reached. A sketch map was prepared of each site, and photographs were taken of site conditions and features. South Carolina Archaeological Site Forms were prepared and submitted to SCIAA to obtain site numbers (Appendix A).

LABORATORY ANALYSIS

Laboratory analysis followed immediately after the fieldwork at New South's Stone Mountain, Georgia laboratory. Analysis included cleaning, identifying, and cataloging artifacts, along with preparation them for curation.

Only historic artifacts were identified during this survey. These materials were analyzed primarily with respect to chronology and function. Each artifact was described as to type, material, manufacturing method (if appropriate for diagnostic purposes), beginning and end dates (if known), and decorative motifs. The artifact were also classified into a functional typology based on South's (1977) scheme. Information on the recovered artifacts was entered into a relational database that generated a catalog of the items retrieved from the field (Appendix B). All artifacts, field notes, and other relevant materials were prepared for permanent curation at the SCIAA, in Columbia.

HISTORIC RESOURCES SURVEY

The architectural historian conducted a survey of the APE for previously unrecorded historic architectural resources 50 years of age or older. The APE for the architectural study is 300 feet from the edge of the existing ROW. Buildings, structures, and sites greater than 50 years in age were assessed for their National Register eligibility. The previously unrecorded resources were surveyed using the Statewide Survey Intensive Form, produced by the South Carolina State Historic Preservation Office (SHPO). These newly recorded architectural properties were surveyed in accordance with the SHPO-produced *Survey Manual: South Carolina Statewide Survey of Historic Places*. They were photographed using a digital camera. Properties were evaluated following the NRHP criteria and a preliminary assessment of effect for the proposed project was conducted for any property in the APE that was NRHP listed or that met the NRHP criteria for eligibility.

NATIONAL REGISTER OF HISTORIC PLACES EVALUATION

Cultural resources are evaluated based on criteria for National Register of Historic Places (NRHP) eligibility specified in the Department of Interior Regulations 36 CFR Part 60: National Register of Historic Places. Cultural resources can be defined as significant if they "possess integrity of location, design, setting, materials, workmanship, feeling, and association," and if they:

Criterion A) are associated with events that have made a significant contribution to the broad pattern of history;

Criterion B) are associated with the lives of persons significant in the past;

Criterion C) embody the distinctive characteristics of a type, period, or method of construction, or represent the work of a master, possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction; or, Criterion D) have yielded, or may be likely to yield, information important in prehistory or history.

Criteria A, B, and C are usually applied to architectural resources. Archaeological sites are generally evaluated relative to Criterion D, although other criteria can apply. In order to evaluate a resource under Criterion D, the National Register Bulletin 36 lists five primary steps to follow:

1. Provide a context for the site in question. What is the state of knowledge for this site type, for this period? What excavations have been conducted at similar sites, and what was learned? What holes are there in our knowledge? How many such sites are known in the area?

2. Define the attributes of a prime example of this site type. In the ideal situation, what would an example of this site type offer? How do the desired attributes link to research issues defined in the context for such sites?

VI. ARCHAEOLOGICAL SURVEY RESULTS

The Phase I survey entailed systematic shovel testing in the area of direct effects to determine the presence of significant archaeological resources. Fieldwork took place September 29-October 2, 2015 and resulted in the identification of two historic archaeological sites. This chapter presents the survey results and describes the newly identified resources, sites 38LX661 and 38LX662 (see Figures 2 and 3).

GENERAL RESULTS

The section of S-48 in the APE crosses a moderately wide and undulating ridge with gentle to moderate slopes along most of its length. The survey area north of the I-26 interchange encompasses an ephemeral drainage head. The relocated Crooked Creek Road ROW lies on a ridge flank and crosses a narrow drainage in its southeastern portion. The new road extending south-southeast from S-48 to the proposed roundabout at East Boundary Street and Southwoode Circle crosses generally level terrain, except at its southern portion, where slopes become more pronounced. Finally, the new road ROW between Zion's Church Road and the roundabout crosses two low-order streams, both of which lie in narrow bottoms and exhibit moderately steep valley walls. Slopes throughout the survey area were less than 15 percent and no areas were excluded from shovel testing owing to gradient. Rain over several days prior to the survey had left some areas saturated, but except for the margins of streams, no extensive poorly drained soils were noted in the survey area that precluded shovel testing.

Current land use in and adjacent to the APE includes a mixture of built-up land (residential, educational, and business/commercial), rural (low-density) residential, and forest (Figure 6). Much of the corridor was graded, filled, paved, and/or contained buried utilities. In addition, the APE portion north of the I-26 interchange had been logged and the surface exhibited deep vehicle tire ruts as well as evidence of substantial erosion. Areas showing clear evidence of substantial disturbance were visually inspected and shovel tests were mostly used to confirm conditions.

Where surface disturbance was not obvious, such as in forested tracts or fields, shovel tests typically encountered red (2.5YR 5/8) to dark reddish brown (5YR 3/4) clayey or silty clay soils at the ground surface or below leaf litter and humus. The results indicated significant erosion, presumably owing to past clearing and cultivation and/or logging. This disturbance impacted the potential for identifying significant archaeological resources.

Figure 6.
Survey Area Conditions

A. Commercial Development and Disturbance, South of S-48/Columbia Avenue, Facing East

B. Landscaped Lawn and Parking Area North of East Boundary Street, Facing West

C. Woodland South of S-48/Columbia Avenue, Facing East

The survey resulted in the identification of two historic archaeological sites, both identified on the basis of structures rather than shovel testing. Both sites appear to reflect twentieth-century residential and agricultural use of the Chapin vicinity. Descriptions of these resources are provided below.

SITE 38LX661

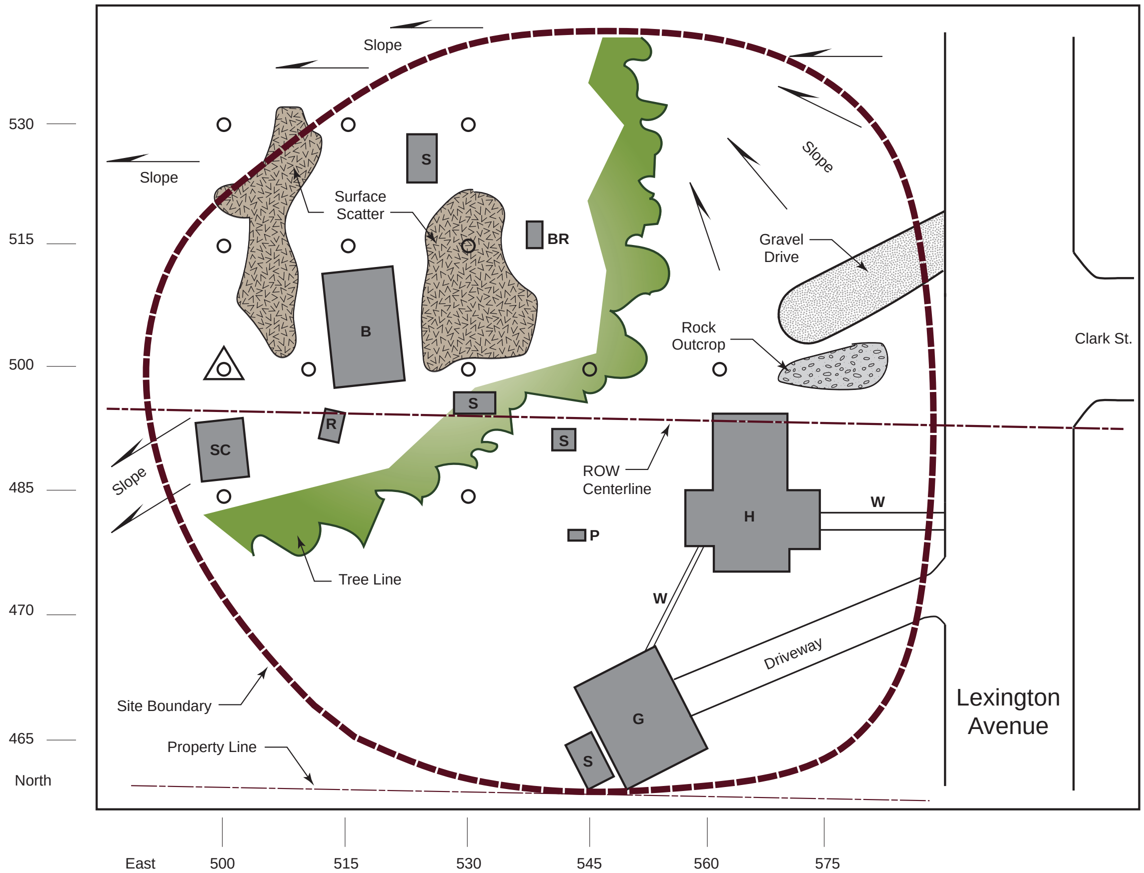
Site 38LX661 represents the archaeological component of a twentieth-century house with outbuildings located on Lexington Avenue south of Chapin (Figures 7-9). Structures at the site were also recorded as Resource U/63/0904 (see Chapter VII). The site lies partly inside the area of direct effects for the new road between Zion's Church Road and East Boundary Street-Southwoode Circle, and was identified on the basis of structures inside and adjacent to the new ROW along with surface deposits of artifacts and refuse. Lexington Avenue extends along a wide ridge and the site is on the west side of the road and overlooks the ridge's west flank.

The Lexington County government web page indicates the site occupies a roughly 1.0-acre parcel. The frame house on a brick foundation was built in 1938. The outbuildings include a cement-block garage south of the house, one barn, three wooden sheds, one cement-block shed, one structure tentatively identified as a screen house, one pump house, and one rabbit hutch. A small indeterminate brick structure was also present in the barnyard area.

The barn is the most prominent of the agricultural outbuildings and consists of a single crib barn with flanking sheds. The siding is horizontal plank and the roof is standing seam metal. No clear foundation was noted. One of the sheds, presently situated behind the garage, is also clad with horizontal planks and has a metal roof. These two buildings appeared older than the other sheds and outbuildings, although precise dates for them were not determined. The other structures include a frame shed with asphalt shingle roof, an open-sided structure with in-ground posts and a metal roof, and a cinderblock shed with an asphalt shingle roof. The screen house is framed with 2x4-inch lumber on a cement block foundation and has a standing seam metal roof. The pump house is clad in particleboards with metal roof sheets laid on top. The wooden structures are built of milled lumber and wire nails, and it is probable that the oldest outbuildings are contemporary to the house.

The house appeared to be in use, at least until recently, and the grounds immediately around it were in lawn and ornamental plantings. The outbuildings were arrayed mostly northwest and west of the house in a position overlooking a mid-order tributary, and were in forest with dense understory. The outbuildings reflected a mix of functions. The garage and one or more sheds, as well as the pump house supported residential activities. The barn and other sheds probably had agricultural purposes originally (a disc harrow fragment in the area of the barn further suggested past agricultural activities), although they were converted for storage. Finally, the screen house, which had collapsed below a tree fall, could be classified as having a recreational function.

Figure 7.
Plan Map of Site 38LX661



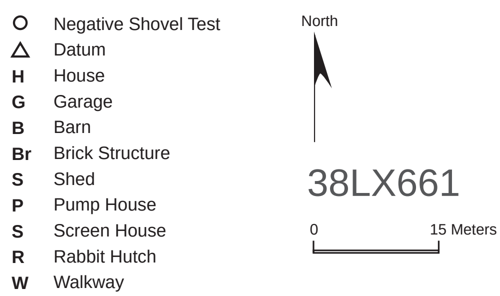


Figure 8.
House and Barn at 38LX661

A. House and Garage, Facing West

B. Barn and Shed, Facing Southwest

Figure 9.
Outbuildings at 38LX661

A. Screen House Ruin, Facing Northwest

B. Well House and Cement and Block Shed, Facing North

The area associated with the barn contained surface refuse that appeared modern (post-1960s). To systematically sample artifact deposits within the APE, shovel tests were placed on a 15-meter grid around the barn and associated outbuildings. These revealed red (2.5YR 5/8) clay subsoil within 15 centimeters (0.5 ft.) of the surface, which was sometimes capped by reddish brown (5YR 4/3) loam. Six artifacts were found from three shovel tests. These consisted of two whiteware fragments (manufacturing date 1815-present) and four fragments of undiagnostic glass. The shovel testing thus suggested a very diffuse sheet midden associated with the site's twentieth century occupation, with the majority of surface deposits most likely being more recent. For example, metal cans (probably beverage containers) were sanitary types with relatively small church key piercing, denoting later dates (possibly mid-twentieth century) (Waechter 2010). Additionally, machine-made glass half-gallon "Thatcher grip" bottles were present, which have a beginning date of 1962 (Dairy Antique Web Site 2005). The low density of historic artifacts might be due to disposal taking place on the ridge slope west of the house and yard, as was common at Piedmont farmsteads (Drucker et al. 1983; Joseph et al. 2004). Alternatively, given the proximity of the site to Chapin, the residents likely had access to municipal trash removal, at least during the second half of the twentieth century.

The shovel testing did not provide substantial information regarding the site's boundaries, but the combination of surface deposits, structures, and known property lines suggests the site measures 90x90 meters. The south edge of the ROW for the new road roughly bisects the site, with the barn and some sheds being inside the APE.

DISCUSSION

Site 38LX661 reflects a twentieth-century domestic occupation/farmstead. The site encompasses a 1930s house and outbuildings that suggest the site's residents were engaged in farming, at least earlier in the century. At the time of the fieldwork, agriculture-related buildings were in an overgrown portion of the site and were not maintained, indicating that farming had been abandoned. It is probable that the mid- to later twentieth-century surface refuse noted in the area of the barn and nearby outbuildings began to accumulate after this time, while the screen house suggested the farm yard was converted to a recreational space.

Cabak and Inkrot (1997)'s study of farmsteads on the Aiken Plateau provides a framework for interpreting and evaluating 38LX661. The site might be best described as what Cabak and Inkrot (1997:179–180) term a modern farmstead. "Modern" in this context is defined on the basis of dwelling style, outbuilding types, and construction materials rather than time period. The screen house at 38LX661 is a unique architectural feature compared to Cabak and Inkrot's sample of farmsteads, in which outbuildings were almost entirely utilitarian, and it indicates that 38LX661 reflects a transition from an agricultural function to suburban residence.

Analysis of sheet middens at the Aiken Plateau farmsteads indicated that modern farmsteads tend to have sparser deposits in house yards than traditional farmsteads, as well as lower variability. This phenomenon appears related to duration of use as well as differences in how occupants at modern farmsteads used outdoor space (Cabak and Inkrot 1997). The low artifact recovery rate in shovel tests at 38LX661 thus further supports the interpretation of the site as a modern farmstead. Moreover, the results and comparable data suggest that 38LX661 would not contain substantial deposits of artifacts that could be applied to detailed archaeological study.

This situation is important in evaluating 38LX661's archaeological significance. Cabak and Inkrot (1997)'s research focused on processes of modernization among farming households and communities. The research program examined architecture and artifact deposits to assess the degree to which farms incorporated components of modernization, particularly industrialization and new technology. Architecture expresses modernization of rural lifeways in the use of national and popular building styles and materials. Artifacts should show this process in the adoption of mass produced consumer goods while traditional processes of home production were discarded.

In the case of 38LX661, the architectural elements of the site have been documented (also see Chapter VII) and further research would not provide significant additional information. The archaeological component is very limited in density, and artifacts have either very broad or late date ranges. The site is judged to have a low research potential and so is recommended not eligible for the NRHP under Criterion D. In addition, the site is not known to be associated with a specific event or person and therefore is not eligible Criteria A or B. It was examined under Criterion C for architecture (see discussion of U/63/0904) and was not found to embody the distinctive characteristics of a type, period, or method of construction, nor does it represent the work of a master or possess high artistic value, therefore it is not eligible for listing on the NRHP under any four of the criteria.

SITE 38LX662

Site 38LX662 encompasses agricultural structures in the new ROW from S-48 to East Boundary Street-Southwoode Circle. The site lies approximately 135 meters east of East Boundary Street, and its immediate vicinity has been disturbed by modern development. To the west is a parking lot and picnic area associated with Mount Horeb Church, and a building with a graded lot is to the east. Also, a large spoil pile lies at the north side of the site. The site occupies a narrow parcel between these disturbances that is densely overgrown with trees, shrubs, and vines (Figures 10 and 11).

Figure 10.
Plan Map of Site 38LX662

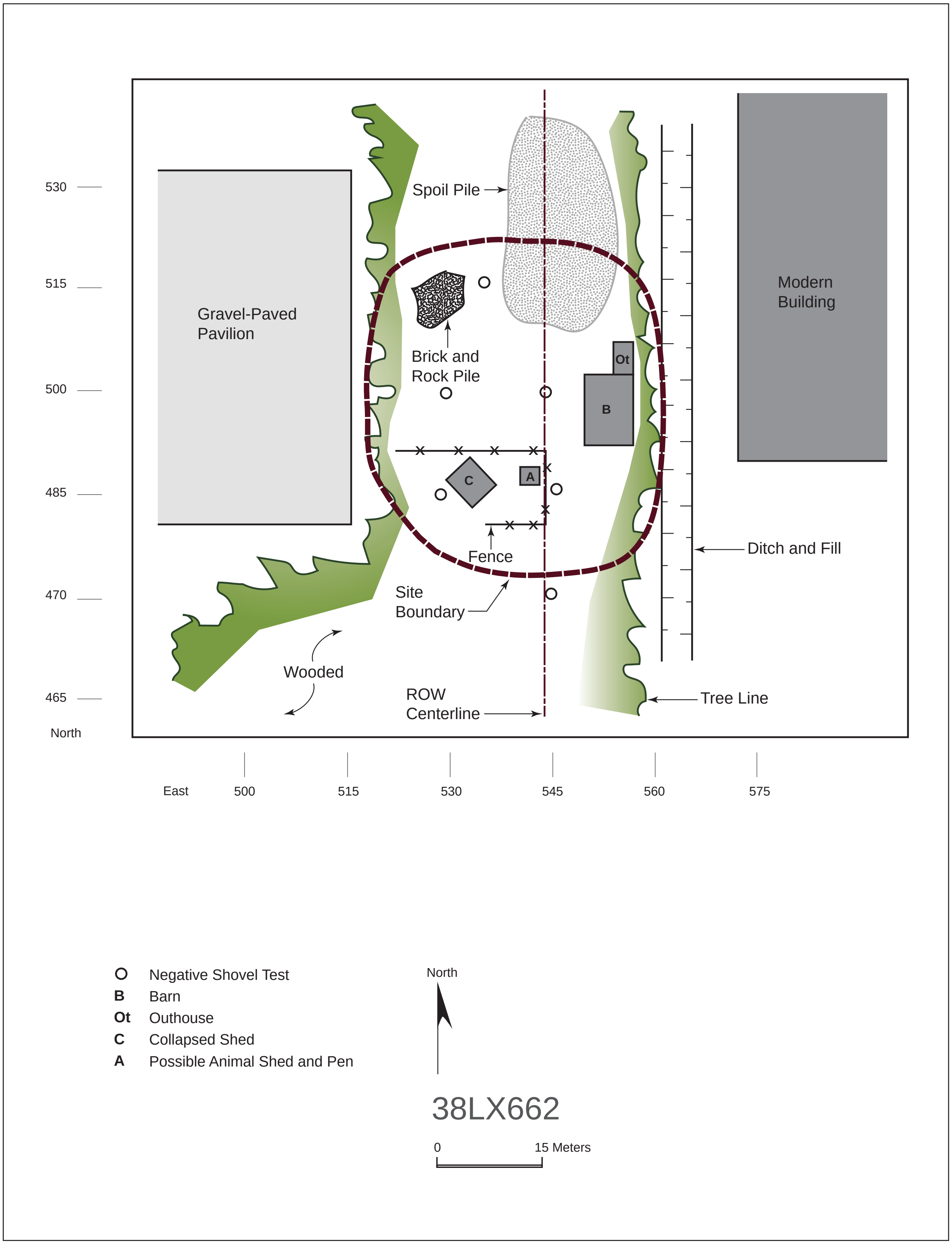


Figure 11.
Photos of Site 38LX662

A. Barn Facing East

B. Animal Stall, Facing West

The site contains one barn with attached outhouse, a collapsed shed, and an animal stall within an area measuring roughly 45 meters (148 ft.) in diameter. The barn lies at the east margin of the site, while the other structures are to its southwest. Additional features include a pile of bricks and stone northwest of the barn. The pile was examined for intact courses, but this feature appeared to reflect dumping rather than structural remains. A scatter of lumber debris was noted at the site's southwest margin but no evidence of a foundation or other structural remains were found.

The barn was a frame structure built of milled lumber with wire nails on a stone foundation. The roof was standing seam metal, and a two-seat outhouse was built on to its north side. The collapsed shed appeared to have been a post-in-ground structure sided with wood planks and sheet metal, and the animal stall was a low (<1.0 meter [3.3 ft.] tall) structure on wooden posts with wood planks on two sides and a metal roof. Remnants of a fence were present on three sides of this shed, indicating a pen, and the fence extended west toward the picnic area. Given the use of milled lumber and wire nails, these buildings appeared to date to the twentieth century.

Shovel tests at the site indicated soil profiles were eroded to yellowish red (10YR 5/8) clay subsoil, which was typically encountered immediately below the leaf litter. No shovel tests produced any artifacts. Modern materials, such as an abandoned lawnmower and figures from a Christmas crèche set, were in and around the door of the barn, suggesting its most recent use was for storage. Only two items were recovered for analysis, consisting of clear glass bottles found below the floor of the barn at its eastern side. Both specimens are machine-made, indicating twentieth-century manufacture.

One of the bottles can be classified as an oval "prescription/druggist" type with a prescription finish (Lindsey 2013). This specimen has the mark "KELLOGS" on the base, but no definite identification for it could be found. The second specimen is a "dandy flask" type with a brandy/wine finish (Lindsey 2013). This bottle has the mark "AGWWXI" on its base, suggesting a product of the American Glass Works, although the mark could not be identified for certain. The bottles probably reflect refuse disposal in the vicinity of the barn. Although they cannot be definitively associated with its use, their dates are consistent with the likely time period the barn was used for agricultural purposes and they could reflect discard related to the site's occupation.

No clear historic association for 38LX662 was found. The site vicinity contains older houses, but tax records indicate that the structures at the site are not on the same property as any standing dwellings, and it is probable that the associated house has been removed. Additionally, the only archival source to suggest a date for the site is the 1971 USGS Chapin quadrangle, which shows a building at the site's location. Earlier maps do not provide enough detail to indicate when these structures were built.

DISCUSSION

Site 38LX662 represents remnants of a barnyard. Extant elements include a barn, shed, and animal stall/pen. Archaeological survey indicated very low artifact densities. Based on construction materials, the site probably dates to the twentieth century, although its date could not be determined with certainty. With reference to the discussion of Cabak and Inkrot (1997)'s research into farm modernization, 38LX662 is judged to have a poor research potential. The context of the outbuildings has been lost with the removal of the original house and disturbance to the immediate vicinity, so that an overall assessment of the site's layout and character cannot be made. Moreover, the lack of artifact deposits constrains further study. Because of these reasons, 38LX662 is recommended not eligible for the NRHP under Criterion D. In addition, the site is not known to be associated with a specific event or person and therefore is not eligible Criteria A or B. Under Criterion C for architecture the buildings were not found to embody the distinctive characteristics of a type, period, or method of construction, nor do they represent the work of a master or possess high artistic value, therefore the site is not eligible for listing on the NRHP under any four of the criteria.

VII. HISTORIC ARCHITECTURAL RESOURCES SURVEY RESULTS

On October 14, 2015 the architectural historian surveyed the APE to identify previously unrecorded historic architectural resources. The project area contains of a mix of building types, both historic and non-historic. Development at the intersection of I-26 and S-48 primarily consists of modern development, including gas stations and fast food restaurants, with only a couple of historic architectural resources extant. Further west on S-48, as the road enters Chapin, most of the buildings are residences, many of which have been converted for commercial use. South of town, where the proposed new alignment would cross Clark Street and Lexington Avenue, the area is primarily residential.

Table 2. Architectural Resources Surveyed within the APE

	Resource Number	Name/Address	Resource Use	Date of Construction	NRHP Eligibility Recommendation
1	U/63/0888	645 Columbia Avenue	Commercial	Circa 1915	Not Eligible
2	U/63/0889	1201 Crooked Creek Road	Residential	Circa 1900	Not Eligible
3	U/63/0890	271 Columbia Avenue	Commercial	Circa 1900	Not Eligible
4	U/63/0891	Mt. Horeb Lutheran Cemetery	Funerary	Circa 1900	Eligible
5	U/63/0892	246 Columbia Avenue	Residential	Circa 1915	Not Eligible
6	U/63/0893	241 Columbia Avenue	Residential	Circa 1900	Not Eligible
7	U/63/0894	242 Columbia Avenue	Residential	Circa 1950	Not Eligible
8	U/63/0895	236 Columbia Avenue	Residential	Circa 1917	Not Eligible
9	U/63/0896	231 Columbia Avenue	Commercial	Circa 1900	Not Eligible
10	U/63/0897	230 Columbia Avenue	Commercial	Circa 1950	Not Eligible
11	U/63/0898	104 East Boundary Street	Commercial	Circa 1915	Not Eligible
12	U/63/0899	108 East Boundary Street	Residential	Circa 1925	Not Eligible
13	U/63/0900	206 East Boundary Street	Residential	Circa 1915	Not Eligible
14	U/63/0901	208 East Boundary Street	Residential	Circa 1940	Not Eligible
15	U/63/0902	318 Clark Street	Residential	Circa 1902	Not Eligible
16	U/63/0903	319 Clark Street	Residential	Circa 1920	Not Eligible
17	U/63/0904	401 Lexington Avenue	Residential	Circa 1938	Not Eligible
18	U/63/0905	403 Lexington Avenue	Residential	Circa 1916	Not Eligible
19	U/63/0906	1232 Crooked Creek	Agricultural	Circa 1900	Not Eligible

The current survey revisited one previously identified resource and identified 19 previously unrecorded historic architectural resources (see Figures 2 and 3). These resources are listed in Table 2 and then described individually. Table 2 also provides a recommendation for the eligibility of each property for the NRHP.

PREVIOUSLY RECORDED RESOURCE

U/63/0089

Christ's Church and House of Prayer and its cemetery were revisited during the current survey. It is located at 400-415 Lexington Avenue at its intersection with Clark Street. The main church building is a small, corner tower, brick church. The crenulated tower is located in the northwest corner of the church over a recessed entryway. The church has a metal front gable roof with exposed rafter tails. There is an exterior chimney on the south elevation. There are arched stained glass windows on the façade, as well as the side elevations. A second circa 1960 brick building is located behind the church and is likely a classroom building; it is connected to the church by a breezeway. The cemetery is located in the yard just south of the church. It was recorded in 2011 on findagrave.com as the "Chapin Community Church Cemetery" with 16 interments dating 1896-1966. Seven of the interments share the same surname of "Bouknight." According to the Chapin United Methodist Church website, this church replaced their original 1892 wooden structure after it was destroyed by a tornado in 1936. The congregation has since moved to a much larger building just south on Lexington Avenue. The South Carolina Department of Archives and History previously determined the church not eligible for listing in the NRHP.

NEWLY RECORDED RESOURCES

U/63/0888

Resource U/63/0888 is a one-story house located at 645 Columbia Avenue, approximately 0.2 mile west of the intersection of S-48 and I-26 (Figure 12). The construction date of the house is estimated to be circa 1915. The building is currently being used as an office/store for a building supply company and has been altered and added on to for that purpose. The historic core of the house appears to have been a central hall. It has a side gable roof with an exterior chimney on the west side of the house. The front porch has been enclosed and there have been multiple additions to the rear and side elevations.

Figure 12.
Photos of U/63/0888

A. U/63/0888, Main Building, Northwest Corner Oblique, Looking Northeast

B. U/63/0888, Main Building, North Elevation, Looking Southeast

C. U/63/0888, Log Barn, West Elevation, Looking East

Resource U/63/0888 is not known to be associated with a specific event or person and was not evaluated under Criteria A or B. It was examined under Criterion C for architecture and was not found to embody the distinctive characteristics of a type, period, or method of construction, nor does it represent the work of a master or possess high artistic value, therefore it is not eligible for listing on the NRHP.

U/63/0889

Resource U/63/0889 is a rural complex of buildings located on Columbia Avenue approximately 0.4 mile west of I-26 (Figures 13-15). The property extends east to Crooked Creek Road and its official address is 1201 Crooked Creek Road. The main structure is a one-story, side-gable house that has two front doors on an engaged, full-width front porch, part of which has been enclosed (Figure 13A). The porch supports are four-by-four posts. The roof is metal and there is one interior chimney. The exterior walls are asbestos shingle. Directly behind the house is another asbestos-shingled building that appears to have been freestanding originally, but is now attached to the main house at its north corner (Figure 13B and 13C). It also has a metal roof and interior chimney. There is a field stone retaining wall in front of the house adjacent to Columbia Avenue (Figure 14A). The property has a number of outbuildings. To the north of the main house, is a small, one-room, concrete block building with a gable roof and exposed rafter tails. The property owner indicated that it had been built as a beauty shop for his mother (Figure 14B). Behind the house there are five agricultural buildings of varying sizes and shapes, along with a well house (Figures 14C-15C). The property is currently vacant. A chain link fence surrounds the majority of the buildings and the agricultural fields that once surrounded the buildings have been allowed to naturally reforest.

Resource U/63/0889 is not known to be associated with a specific event or person and was not evaluated under Criteria A or B. It was examined under Criterion C for architecture and was not found to embody the distinctive characteristics of a type, period, or method of construction, nor does it represent the work of a master or possess high artistic value, therefore it is not eligible for listing on the NRHP.

U/63/0890

Resource U/63/0890 is a circa 1900 two-story house located at 271 Columbia Avenue that is currently used commercially by a law firm and a bakery (Figure 16A). It is a Queen Anne house with a hipped roof and projecting gables on each elevation. The house is not representative of any recognized architectural style. A shed roof porch on the south facing façade wraps around to the east elevation. The porch supports are square brick piers on the bottom with pairs of wood columns above. The roof is covered with composition shingles and there are two interior

Figure 13.
Photos of U/63/0889, House

A. U/63/0889, House, Northwest Elevation, Looking South

B. U/63/0889, Rear Addition, Southwest Elevation, Looking Northeast

C. U/63/0889, House and Rear Addition, East Elevation, Looking West

Figure 14.
Resource U/63/0889, Retaining Wall, Shop, and Barn

A. U/63/0889, Stone Retaining Wall, Looking Southeast

B. U/63/0889, Beauty Shop, West Corner Oblique, Looking East

C. U/63/0889, Barn #1, North Corner Oblique, Looking Southeast

Figure 15.
Resource U/63/0889, Barns

A. U/63/0889, Barn #2, Northwest Elevation, Looking Southeast

B. U/63/0889, Barn #3, Northwest Elevation, Looking Southeast

C. U/63/0889, Barn #4 and #5, West Elevation, Looking East

Figure 16.
Resources U/63/0890 and U/63/0891

A. U/63/0890, Southeast Corner, Looking Northwest

B. U/63/0891, Stone Wall and S-48, Looking East

C. U/63/0891, Stone Arch, Looking North

chimneys. The exterior walls are vinyl siding. The windows in the historic core of the house appear to be the original two-over-two wood sash windows. There is a one-story addition on the west elevation and several additions on the rear of the house. A handicapped accessible ramp has been added to the façade and east elevation and the area surrounding the house has been paved to accommodate parking.

Resource U/63/0890 is not known to be associated with a specific event or person and was not evaluated under Criteria A or B. It was examined under Criterion C for architecture and although it is a Queen Anne house, it is not a good example of the type due to a lack of integrity in setting, materials, design, workmanship, feeling, and association. The house and its setting have been altered and it no longer conveys a sense of early-twentieth century residence; therefore, it is not eligible for listing on the NRHP.

U/63/0891

Mount Horeb Lutheran Cemetery (U/63/0891) is located on a small rise overlooking on Columbia Avenue from the north side of the road (Figures 16B-18C). Most of the approximately 700 graves are located on a 3.73-acre parcel at the front of the property, but there is an additional 2-acre parcel located behind it, which is also owned by the Mount Horeb Lutheran Church. The church, which is located one block to the west at the corner of Columbia Avenue and East Boundary Street, purchased the west portion of the cemetery in the 1960s. It is still an active cemetery, but the oldest graves date back to the first decade of the twentieth century. The most striking feature of the cemetery is a monumental rock wall that has fronted the cemetery along Columbia Avenue for close to 80 years. The solid wall is constructed out of fieldstone and cement with no regular course pattern and very little mortar showing. It is approximately 225-feet long and between two and three feet thick, with an arched opening at its center point, for pedestrian access, and an opening that serves as an automobile entrance at the center of the cemetery. The wall features a crenelated column approximately every 14 feet. The columns flanking the arch and the automobile entrance, as well as at the corner of Columbia Avenue and Roland Shealy Court on the east side of the cemetery, are approximately eight feet tall and the remaining columns are between four and five feet tall. The arch itself is approximately 12 feet tall at its peak and is set back in a curved recess of the wall that also features benches to each side of the arch. "Mt. Horeb" spelled out in what appears to be white tile is inset in the arch. The top of the wall is finished with cement and smaller cracked rocks.

According to 85-year-old William Rauch, a lifelong church member and caretaker of the cemetery for 25 years, the rock wall was built by local men with Works Progress Administration (WPA) funds circa 1937. Mr. Rauch was a young boy at the time and remembered when the

Figure 17.
Resource U/63/0891

A. U/63/0891, Arch, Looking Northwest

B. U/63/0891, Wall, Looking Northeast

C. U/63/0891, Detail, Looking Northwest

Figure 18.
Resource U/63/0891

A. U/63/0891, Main Entrance, Looking Northeast

B. U/63/0891, Headstones and Arch, Looking Southeast

C.U/63/0891, View Toward S-48 Proposed New Alignment and U/63/0892, Looking Southwest wall was under construction. Among the local masons that worked on the project was Jesse Bundrick, who was also a church member. Mr. Rauch said that the rock used in construction was field rock that was gathered from the Lake Murray area before it was flooded. He also said that when the wall was first completed that the top of the wall featuring the smaller cracked rocks gleamed bright white from all of the lime in the cement (William Rauch, Personal Communication 2015).

Resource U/63/0891 is not known to be associated with a specific person and was not evaluated under Criterion B. It was evaluated under Criterion A and found to be significant on the local level for its association with the WPA and Mount Horeb Lutheran Church, one of the first congregations to be established in the town of Chapin, which was formed in 1889. The congregation began the same year, meeting in Lindler's Funeral Parlor (no longer extant) about a block from the site of the present church, which is located at the corner of Columbia Avenue and East Boundary Street. Burials date from the early 1900s to the present day (Buie 1991). Resource U/63/0891 was also evaluated under Criterion C and found to be significant in the area of architecture for its prominent rock wall and arch that borders Columbia Avenue and represents the work of a skilled mason.

Resource U/63/0891 retains integrity in the majority of the seven aspects evaluated. The wall remains in its as-built location at the front of the cemetery bordering Columbia Avenue. It does not appear that the wall has been altered in any way and retains its original design and featuring crenelated columns and a recessed arched opening with benches. It also retains its original materials, which consist of uncut rock, cement, mortar, and tile. The workmanship of the wall is evidence of the skill of the mason or masons that constructed it. The joinery of the rocks is very tight and there is virtually no mortar in evidence on the face of the wall. Evidence of skilled workmanship is also evident in the construction of the arch. Setting is one aspect in which the cemetery has lost some of its integrity. To the north and west, the setting remains the same as it was historically with residential structures lining Columbia Avenue and Mt. Horeb Lutheran Church at the corner of East Boundary Street, but to the south and east, industrial structures have been built on the adjacent lands that were formerly agricultural fields. Despite that, the cemetery retains integrity of feeling and association. It still conveys the historic character of a twentieth-century cemetery, while continuing to function as one, and is still associated with Mt. Horeb Lutheran Church. Therefore, Mount Horeb Lutheran Cemetery is considered eligible for listing in the NRHP.

U/63/0892

Resource U/63/0892 is located at 246 Columbia Avenue and appears to be a Side Gable Cottage (Figures 19A and 19B). The circa 1915 house sits on a brick pier foundation that has been infilled with concrete block. It has a metal roof with a large, centered, shed roof dormer. There

Figure 19.
Resources U/63/0892 and U/63/0893

A. U/63/0892, Northeast Corner Oblique, Looking Southwest

B. U/63/0892, Southeast Corner Oblique, Looking West

C. U/63/0893, South Elevation, Looking North is also one exterior chimney. There is an engaged full-width porch on the façade, which is supported by columns consisting of heavy square brick bases with battered wood columns on top. The exterior walls are covered in vinyl siding. The windows, which appear to be original, are four-over-one double hung sashes. There is a hipped-roof addition at the rear of the house. The house is currently vacant, but had been used commercially in the recent past. A portion of the property is a gravel parking lot.

Resource U/63/0892 is not known to be associated with a specific event or person and was not evaluated under Criteria A or B. It was examined under Criterion C for architecture. Although it is a Side Gable Cottage house type, it is not considered to be a good and representative example of the type because the walls, fascia, and soffits have been covered in vinyl siding. Therefore, the house is considered not eligible for listing on the NRHP.

U/63/0893

Resource U/63/0893 is located at 241 Columbia Avenue. It is a circa 1915 New South Cottage with a hipped roof and projecting front and rear gables (see Figure 19C). The house sits on a brick pier foundation, which is hidden by vinyl lattice sheets. The roof is metal and there are two interior chimneys. The exterior walls have been covered with vinyl siding. The projecting front bay has three faces, each with a window that has a metal awning. A partial width shed roof porch wraps around to the west elevation. The house displays some elements of the Folk Victorian architectural style in its jigsawed porch detailing and patterned shingles in the gable ends. There is a shed roof addition on the rear (north) elevation.

Resource U/63/0893 is not known to be associated with a specific event or person and was not evaluated under Criteria A or B. It was examined under Criterion C for architecture. Although it is a New South Cottage house type, it is not considered to be a good and representative example of the type because of its condition. The walls, fascia, and soffits have been covered in vinyl siding, several of the sawn porch balusters are missing, and the windows on the porch do not appear to be original. Therefore, the house is considered not eligible for listing on the NRHP.

U/63/0894

Resource U/63/0894 is a circa 1950 house located at 242 Columbia Avenue (Figures 20A and 21B). It has a concrete block foundation and exterior walls, with a side gable roof. The roof is covered with composition shingles and there is one interior and one exterior chimney. A concrete floored porch/patio extends most of the width of the façade, then wraps around to the east side of the house and is sheltered by a shed roof metal awning supported by wrought iron posts. There is a small addition on the west side of the house that features jalousie windows. There is also a shed roof addition to the rear of the house. The house is surrounded by foundation plantings with a casually landscaped yard and lawn.

Figure 20.
Photos of U/63/0894 and U/63/0895

A. U/63/0894, Northeast Corner Oblique, Looking Southwest

B. U/63/0894, Northwest Corner Oblique, Looking Southeast

C. U/63/0895, Northeast Corner Oblique, Looking Southwest

Figure 21.
Photos of U/63/0895 and U/63/0896

A. U/63/0895, West Elevation, Looking Southeast

B. U/63/0896, South Elevation, Looking Northwest

C. U/63/0896, North Elevation, Looking South

Resource U/63/0894 is not known to be associated with a specific event or person and was not evaluated under Criteria A or B. It was examined under Criterion C for architecture and was not found to embody the distinctive characteristics of a type, period, or method of construction, nor does it represent the work of a master or possess high artistic value; therefore, it is not eligible for listing on the NRHP.

U/63/0895

Resource U/63/0895, a house located at 242 Columbia Avenue, was built in 1917 according to the Lexington County Tax Assessor’s website (see Figures 20C and 21A). It is a one-story house with a rectangular plan. It sits on a continuous brick foundation and vinyl siding covers the exterior walls. The roof, which is standing seam metal, is cross gabled and there are decorative knee braces under the eaves. The north elevation features two bay windows that are topped with the same metal roofing. The west elevation also has a bay window. The entrance to the house is located in a hipped roof addition on the east elevation. The house has been heavily altered and its original form is not known.

Resource U/63/0895 is not known to be associated with a specific event or person and was not evaluated under Criteria A or B. It was examined under Criterion C for architecture and was not found to embody the distinctive characteristics of a type, period, or method of construction, nor does it represent the work of a master or possess high artistic value, therefore it is not eligible for listing on the NRHP.

U/63/0896

Resource U/63/0896 is a circa 1900 one-story house located at 231 Columbia Avenue (see Figures 21B and 21C). The core of the house is an L-shaped Gable Wing Cottage and there are two large additions to the rear, one that appears to be non-historic. The gable roof is covered with stamped metal and there are two interior chimneys. There is a full-width shed roof porch that wraps around the projecting wing and is supported by squared posts. The exterior walls, soffit, and fascia are covered with vinyl siding. The windows on the façade appear to be historic two-over-two sash windows over which storm windows have been installed. The remaining windows are mainly one-over-one sash. The house is currently used as an office building.

Resource U/63/0896 is not known to be associated with a specific event or person and was not evaluated under Criteria A or B. It was evaluated under Criterion C for architecture. Although it is a Gable Wing Cottage house type, it is not considered to be a good and representative example of the type because of the non-historic addition at the rear, the application of vinyl siding, and the change from residential to commercial use, which resulted in a loss of integrity of design, materials, workmanship, association, and feeling. Therefore, resource U/63/0896 is not eligible for listing on the NRHP.

U/63/0897

Resource U/63/0897 is a circa 1950 one-story ranch house located at 230 Columbia Avenue that is currently being used commercially (Figures 22A and 22B). The house is T-shaped with a hipped roof covered in composition shingles and one interior chimney. The exterior walls are brick. The partial width porch has been altered with the addition of heavy Classical columns and balustrade. Two large picture windows on the façade have been replaced with fixed lights. A significant portion of the property has been paved to accommodate parking.

Resource U/63/0897 is not known to be associated with a specific event or person and was not evaluated under Criteria A or B. It was examined under Criterion C for architecture and was not found to embody the distinctive characteristics of a type, period, or method of construction, nor does it represent the work of a master or possess high artistic value; therefore, it is not eligible for listing on the NRHP.

U/63/0898

Resource U/63/0898 is a circa 1915 Queen Anne Cottage, located at 104 East Boundary Street (see Figures 22C, 23A and 23B). It is one-story and generally square in plan with projecting gables. It has a crimped metal roof with one interior chimney and patterned shingles in the gable ends. The house has a wrap-around shed roof porch with decorative spindle work and turned posts and balusters. The windows appear to be the original two-over-two sash. The exterior walls, soffit, fascia, and patterned shingles in the gable ends are all vinyl. The house is currently vacant, but has recently been used commercially.

Resource U/63/0898 is not known to be associated with a specific event or person and was not evaluated under Criteria A or B. It was examined under Criterion C for architecture. Although it is a Queen Anne Cottage house type, it is not considered to be a good and representative example of the type due to the application of vinyl siding and the change in use from residential to commercial resulting in a loss of integrity of materials, workmanship, and association. Therefore, resource U/63/0898 is not eligible for listing on the NRHP.

U/63/0899

Resource U/63/0899 is a circa 1925 Georgian House located at 108 East Boundary Street (see Figures 23C and 24A). The two-story house has a gable end roof covered in composition shingles and one exterior chimney. Under the eaves are decorative knee braces. On the façade, there is a full-width hipped roof porch supported by tapered columns. The windows in the main core of the house appear to be historic eight-over-one sash windows. There is a shed roof

Figure 22.
Photos of U/63/0897 and U/63/0898

A. U/63/0897, Northwest Corner Oblique, Looking Southeast

B. U/63/0897, South Elevation, Looking North

C. U/63/0898, West Elevation, Looking East

Figure 23.
Photos of U/63/0898 and U/63/0899

A. U/63/0898, North Elevation, Looking South

B. U/63/0899, West Elevation, Looking East

C. U/63/0899, Southeast Corner Oblique, Looking Northwest addition on the rear of the house and a carport addition on the south elevation. The exteriors walls, fascia, and soffit have been covered with vinyl siding. Behind the house is a historic clapboard garage and concrete block well house.

Resource U/63/0899 is not known to be associated with a specific event or person and was not evaluated under Criteria A or B. It was examined under Criterion C for architecture. Although it is a Georgian House type, it is not considered to be a good and representative example of the type due to the application of vinyl siding and non-historic additions, resulting in a loss of integrity of design, materials, and workmanship. Therefore, resource U/63/0899 is not eligible for listing on the NRHP.

U/63/0900

Resource U/63/0900 is a circa 1915 Gable Wing Cottage located at 206 East Boundary Street (Figure 24B, 24C, and 25A). The historic core of the house is L-shaped. The roof is cross-gabled and covered with composition shingles; there is one interior chimney. The projecting front gable has three sides with a window in each bay. There is a partial width shed roof porch across the recessed wing, supported by square posts with decorative brackets at the roof junction. There is a rear wing addition on the east elevation, which has porch additions on both its north and south elevations. There is also a screened porch addition on the south elevation of the house. The exterior walls, soffit, and fascia have been covered with vinyl siding and the windows appear to be replacements. A concrete block outbuilding, with a gable roof and attached lean-to, is located behind the house.

Resource U/63/0900 is not known to be associated with a specific event or person and was not evaluated under Criteria A or B. It was examined under Criterion C for architecture. Although it is a Gable Wing Cottage house type, it is not considered to be a good and representative example of the type due to the application of vinyl siding and non-historic additions, resulting in a loss of integrity of design, materials, and workmanship. Therefore, resource U/63/0900 is not eligible for listing on the NRHP.

U/63/0901

Resource U/63/0901 is a small one-story cottage located down a long drive at 208 East Boundary Street (Figure 25B and 25C). The house has a gable end roof covered with composition shingles and exposed rafter tails under the eaves. There is a shed roof porch on the north elevation and a gable roof addition on each side elevation. The house features two exterior chimneys on the

Figure 24.
Photos of U/63/0900


A. U/63/0900, West Elevation, Looking East

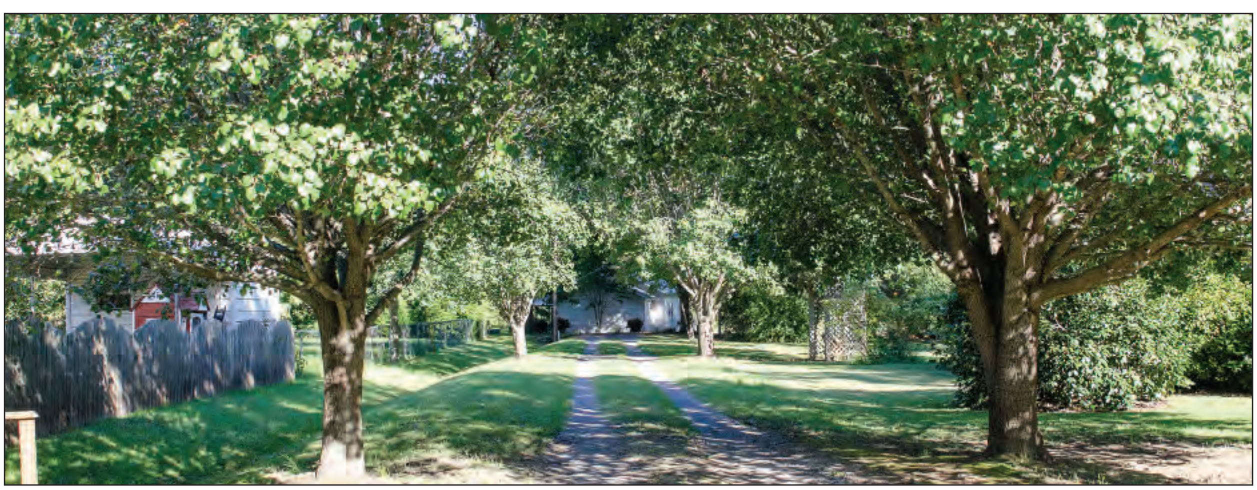

B. U/63/0900, North Elevation, Looking South


C. U/63/0900, Outbuilding, Looking Southeast

Figure 25.
Photos of U/63/0901

A. U/63/0901, North Elevation, Looking Southeast

B. U/63/0901, Southwest Corner Oblique, Looking East



C. U/63/0901, View Down Driveway Toward House, Looking East façade and one interior chimney in the rear of the house. Some of the windows are historic, but many are vinyl replacements. Vinyl siding has been applied to the exterior walls. The house is set back on a large parcel of land with groves of mature trees and a fallow field.

Resource U/63/0901 is not known to be associated with a specific event or person and was not evaluated under Criteria A or B. It was examined under Criterion C for architecture and was not found to embody the distinctive characteristics of a type, period, or method of construction, nor does it represent the work of a master or possess high artistic value; therefore, it is not eligible for listing on the NRHP.

U/63/0902

Resource U/63/0902 is a Gable Wing Cottage located at 318 Clark Street (Figures 26B and 26C). Its core is T-shaped with a cross-gable roof and there is also another wing off of the rear (east) elevation. There are two interior chimneys in the core and an exterior chimney on the rear wing. A hipped-roof porch extends across the width of a recessed wing and features a metal awning. There is a small, hipped-roof addition on the north elevation with jalousie windows. The windows are vinyl replacements and the exterior walls are covered with vinyl siding.

Resource U/63/0902 is not known to be associated with a specific event or person and was not evaluated under Criteria A or B. It was examined under Criterion C for architecture. Although it is a Gable Wing Cottage house type, it is not considered to be a good and representative example of the type due to the application of vinyl siding and non-historic additions, resulting in a loss of integrity of design, materials, and workmanship. Therefore, resource U/63/0903 is not eligible for listing on the NRHP.

U/63/0903

Resource U/63/0903 is a circa 1920 Side-Gabled Cottage located at 319 Clark Street (see Figures 27A and 27B). The façade of the historic core of the one-story house has two front doors with flanking window openings, which are sheltered by a partial width, shed roof porch. The porch appears to be a reconstruction with a metal balustrade. The exterior walls are clapboard and the roof is crimped metal. The windows appear to be vinyl replacements. There is an addition to the south elevation, which appears to be historic, and several non-historic additions to the rear (west) elevation.

Resource U/63/0903 is not known to be associated with a specific event or person and was not evaluated under Criteria A or B. It was examined under Criterion C for architecture. Although it is a Side-Gabled Cottage house type, it is not considered to be a good and representative example

Figure 26.
Photos of U/63/0902 and U/63/9043

A. U/63/0902, Northwest Corner Oblique, Looking Southeast

B. U/63/0902, South Elevation, Looking North

C. U/63/0903, Southeast Corner Oblique, Looking Northwest

Figure 27.
Photos of U/63/0903 and U/63/904

A. U/63/0903, North Elevation, Looking Southwest

B. U/63/0904, East Elevation, Looking Southwest

C. U/63/0904, Southeast Corner Oblique, Looking West of the type due to the non-historic alterations/additions and window replacement, resulting in a loss of integrity of design, materials, and workmanship. Therefore, resource U/63/0904 is not eligible for listing on the NRHP.

U/63/0904

Resource U/63/0904 is a circa 1938 one-story house located at 401 Lexington Avenue (see Figures 27C and 28A). It has an L-shaped plan with a cross-gable roof and partial-width, gable-roof porch. The exterior walls are asbestos plank and the roof is covered with composition shingle. There are two interior chimneys. Metal awnings are installed over the windows, which appear to be the historic four-over-one sash windows.

Resource U/63/0904 is not known to be associated with a specific event or person and was not evaluated under Criteria A or B. It was examined under Criterion C for architecture and was not found to embody the distinctive characteristics of a type, period, or method of construction, nor does it represent the work of a master or possess high artistic value, therefore it is not eligible for listing on the NRHP.

U/63/0905

Resource U/63/0905 is a circa 1916 Gable Wing Cottage located at 403 Lexington Avenue (Figures 28Band 28C). There is a projecting front gable that has three sides with a window in each bay, as well as a projecting wing on the rear (west) elevation. An L-shaped, shed roof front porch is tucked into the corner of the house and is supported by turned columns. There are two doors on the porch, one into each wing. The porch also features spindle work under the eave and a turned balustrade. The windows appear to be historic and are two-over-two double hung wood sash. The house has a continuous brick foundation and stamped metal shingles on the roof. The exterior walls are vinyl siding and there is a non-historic addition on the rear of the house.

Resource U/63/0905 is not known to be associated with a specific event or person and was not evaluated under Criteria A or B. It was examined under Criterion C for architecture. Although it is a Gable Wing Cottage house type, it is not considered to be a good and representative example of the type due to the application of vinyl siding and non-historic additions, resulting in a loss of integrity of design, materials, and workmanship. Therefore, resource U/63/0905 is not eligible for listing on the NRHP.

U/63/0906

Resource U/63/0906 is located at 1232 Crooked Creek Road and consists of a 1966 brick house, barn, and an equipment/wood shed (Figures 29). The house has a brick foundation and exterior walls with a cross-gable roof covered in composition shingle. The barn is wood framed,

Figure 28.
Photos of U/63/0905 and U/63/906

A. U/63/0905, Northeast Corner Oblique, Looking Southwest

B. U/63/0905, Southeast Corner Oblique, Looking Northwest

C. U/63/0906, Tobacco Barn, West Elevation, Looking East

Figure 29.
Resource U/63/0906, House and Shed

A.U/63/0906, Setting, Looking Southeast

B. U/63/0906, House, West Elevation, Looking East

C. U/63/0906, Shed, Southeast Corner Oblique, Looking Northeast with a metal roof and bracing under the eaves. It has clapboard in the gable ends and a combination of vertical and horizontal flush board on the exterior walls. There is an enclosed shed roof addition on the north elevation and an open shed roof addition on the west elevation. The equipment/wood shed has a side gable roof and tarpaper on the exterior walls. It is open on the south elevation.

Resource U/63/0906 is not known to be associated with a specific event or person and was not evaluated under Criteria A or B. It was examined under Criterion C for architecture. The house was not found to embody the distinctive characteristics of a type, period, or method of construction, nor does it represent the work of a master or possess high artistic value; therefore, it is not eligible for listing on the NRHP. The barn, although it is an interesting example, has additions to two sides and has lost integrity of setting, feeling, and association, as it is the only building left of a larger agricultural complex that included a historic farmhouse and another barn. Therefore, U/63/0906 is not eligible for listing on the NRHP.

POTENTIAL DISTRICT DISCUSSION

The resources surveyed and evaluated for this project do not possess the associations necessary to consider them as an eligible district. They are located in two discontiguous areas, the first located along Columbia Avenue, from East Boundary to Ellet Street, and the second around the intersection of Lexington Avenue and Clark Street. All of the resources evaluated in this document, with the exception of the Mount Horeb Lutheran Cemetery (U/63/0891), were built as residential structures; however, many of them located along Columbia Avenue are now being used commercially and have been heavily altered to serve in that capacity. There are also more modern commercial buildings in the setting and the area no longer conveys the visual sense of the historic residential district. Additionally, there is no continuity of house style, type, or age of the resources that would justify consideration under Criterion A or C. Therefore, the resources recorded in this survey are not reccomended eligible as a district.

VIII. SUMMARY AND RECOMMENDATIONS

This Phase I cultural resources survey covered proposed improvements to S-48 (Columbia Avenue) in the Town of Chapin, Lexington County, South Carolina. SCDOT plans to widen a section of this road between Chapin and I-26 and build new roadways to improve traffic flow. The cultural resources survey examined the project's APE to determine the presence of significant archaeological and historic architectural resources that might be affected by the planned undertaking. The project involved background research, archaeological and historic architecture surveys, and analysis. This chapter summarizes the project's results and provides recommendations regarding further preservation work.

Background research indicated no previously recorded archaeological resources were inside the project APE. One recorded historic architectural resource, U/63/0089, representing a twentieth-century church, was in the project's APE. This resource was previously determined not eligible for the NRHP.

As a result of the archaeological survey, two sites were identified. Site 38LX661 represents the archaeological component of a 1930s house with outbuildings. The site produced few historic artifacts and appears to have a low potential for cultural deposits that could provide significant research data. The associated buildings (recorded as Resource U/63/0904) were judged to lack historic significance as well. Site 38LX662 encompasses a twentieth-century barn and related agricultural structures. The site has a very low artifact density and is judged to lack significant archaeological research potential. Both sites, therefore, are recommended not eligible for the NRHP and do not warrant further preservation.

The historic architectural survey identified and evaluated 19 resources that reflected primarily twentieth-century domestic/agricultural functions. Only one resource, the Mt. Horeb Lutheran Cemetery (U/63/0891), located on Columbia Avenue, was recommended eligible for listing on the NRHP. Measures should be taken to avoid this resource during the implementation of the proposed project. The other 18 resources lack historical associations that would qualify for NRHP listing under Criteria A and B, and none have qualities of significance under Criterion C. Moreover, these resources have mostly been altered in ways that detract from their historical appearance and use, causing them to lose integrity.

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APPENDIX A: SITE FORMS

SOUTH CAROLINA INSTITUTE OF ARCHAEOLOGY AND ANTHROPOLOGY
UNIVERSITY OF SOUTH CAROLINA
SITE INVENTORY RECORD
(68-1 Rev. 85)

STATE: SC COUNTY: Lexington SITE NUMBER: 38LX661
Recorded By: Brad Botwick Affiliation: New South Associates, Inc. Date: 10/1/15

A. GENERAL INFORMATION
1. Site name: S-48 Find 1 Project: S-48/Columbia Ave Improvement Survey
2. USGS Quadrangle: Chapin, SC Date: 1971 Scale: 7.5 or 15 minute (circle one)
3. UTM: Zone 17 Easting 467630 Northing 3780020
4. Other map reference:
5. Descriptive site type (see handbook):
Prehistoric Historic Homesite
6. Archaeological investigation (circle): Survey Testing Excavation
7. Property owner: Phone number:
8. Address:
9. Other site designations:
10. National Register of Historic Places status (circle one):
Potentially eligible Probably not eligible Additional work

---**Office Use Only**---
Determined eligible Determined not eligible Date
On NRHP Date

----

11. Level of significance (circle): National State Local
12. Justification: The site consists of a twentieth-century house with outbuildings that appear to date between the early to late twentieth century. Modern and twentieth-century refuse was scattered on the surface but shovel testing produced few artifacts. The site appears to have a limited archaeological research potential.

B. ENVIRONMENT AND LOCATION
1. General physiographic province (circle):
Lower Coastal Plain Middle Coastal Plain Upper Coastal Plain
Piedmont Blue Ridge Mountains
2. Landform location: Ridge top/Ridge nose Site elevation (above MSL): 450 (in feet)
3. On site soil type: silty clay Soil classification: Georgeville fine sandy loam
4. Major river system (circle): Pee Dee Santee Ashley-Combahee-Edisto Savannah
5. Nearest river/stream: Unnamed second-order tributary of Saluda River
6. Current vegetation (circle): Pine/coniferous Hardwood Mixed pine/hardwood
Old field Grass/pasture Agricultural/crops Wetlands/freshwater
Wetlands/saltwater Other Comments: Residential lawn
7. Description of groundcover (circle): Absent Light Moderate Heavy

C. SITE CHARACTERISTICS
1. Estimated site dimensions: 90 meters by 90 meters
2. Site depth: <30 cm.
3. Cultural features (type and number): 1 house; 4 sheds; 1 garage; 1 barn; 1 pump house; 1 screen house; 1 rabbit hutch; 1 driveway; 2 walkways

4. Presence of (circle): midden floral remains faunal remains shell charcoal
5. Human skeletal remains (circle): present preservation (circle): good

absent poor
6. General site description: The site consists of a 20th century house with several outbuildings and support structures. Archaeological content appears limited, although there are deposits of 20th century refuse in the area of the outbuildings. Diagnostic materials date to the later 20th century.

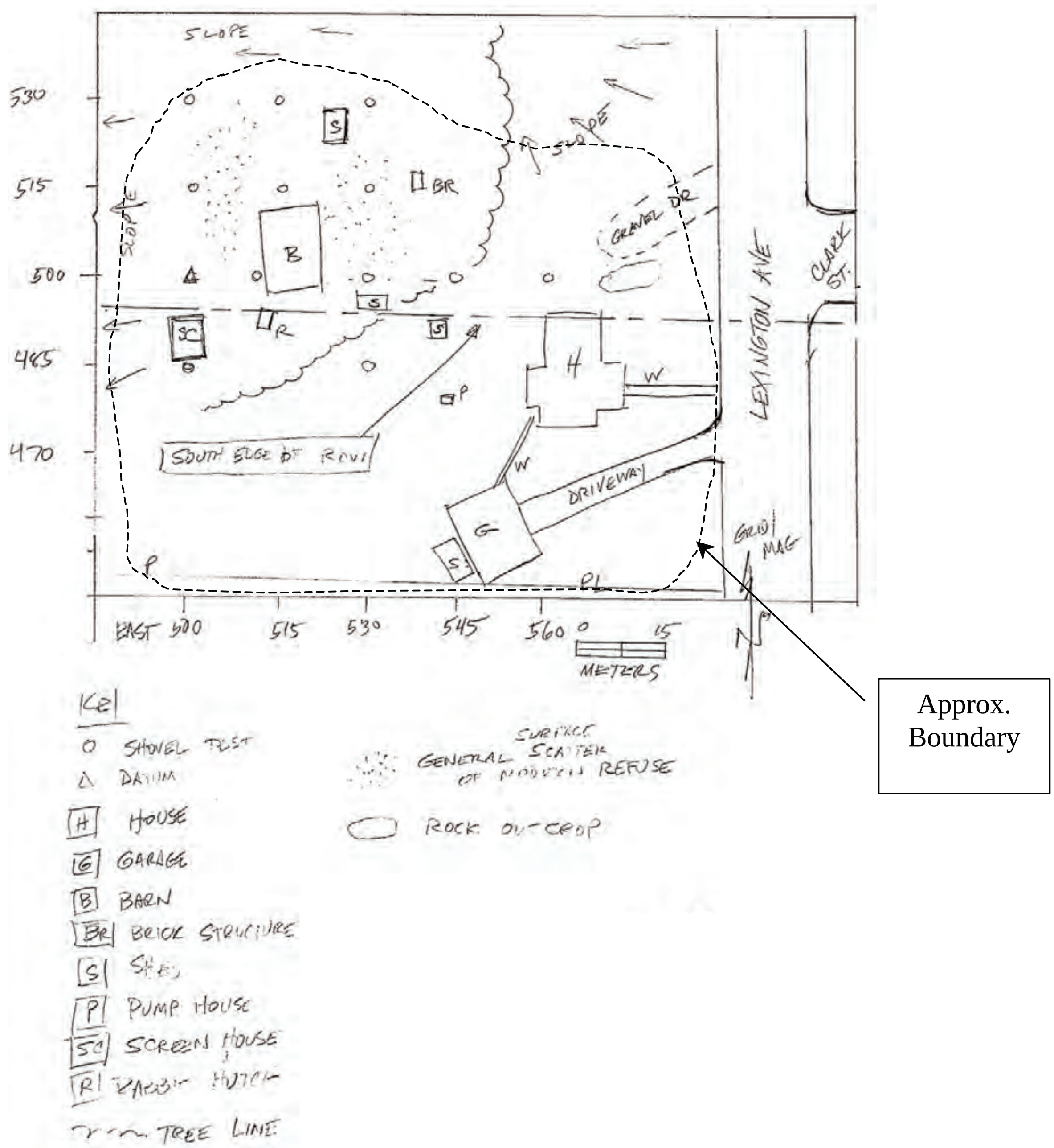
(Use in conjunction with handbook)

Site Map

The following information should be provided on the site map: site boundaries, nearby topographic features, associated streams, modern cultural features, different land use types in site area, collection loci, test excavation loci, archaeological features and means of access (include north arrow and scale).

MAP KEY:

Verbal description of location: The site is located on Lexington Avenue in Chapin directly across from the Intersection with Clark Street



D. ARCHAEOLOGICAL COMPONENTS

_____	Paleo Indian	_____	Middle Woodland	_____	17th Century
_____	Early Archaic	_____	Late Woodland	_____	18th Century
_____	Middle Archaic	_____	Mississippian	_____	19th Century
_____	Late Archaic	_____	Unknown prehistoric	__X__	20th Century
_____	Early Woodland	_____	16th Century	_____	Unknown historic

E. DATA RECOVERED

List materials recovered: Total number of artifacts: 0

(Attach additional artifact inventory sheets if needed)

F. DATA RECOVERY METHODS

1. Ground surface visibility (circle one): 0% 1-25% 26-50% 51-75% 76-100%
2. Number of person hours spent collecting (total hours X total people): 4
3. Description of surface collection methods (circle):
   Type: grid collection; grab collection; controlled sampling; other (specify): ______
   Extent: complete; selective; no collection made
4. Description of testing methods (circle):
   Systematic; Nonsystematic
   Type Shovel Testing
   Test units:

Number	Size/max. depth	
12	30 cm/30	cm.
______	______	cm.
______	______	cm.

5. Description of excavation units:

Number	Size/max. depth		Comments:
______	______	cm.	______
______	______	cm.	______
______	______	cm.	______
______	______	cm.	______

G. MANAGEMENT INFORMATION

1. Present land use (circle):
   Agricultural
   Forest
   Fallow
   Residential, low density
   Residential, high density
   Commercial
   Industrial
   Other (specify) ______

MANAGEMENT INFORMATION (Cont.)

2. Present condition/integrity of site (circle):

Intact Damaged

Extent of damage: light / moderate / heavy

Nature of damage: erosion / cultivation / logging / construction/developmen / vandalism / inundation / other (specify)

3. Potential impacts and threats to site (circle):

Potential threat: none / low / moderate / high

Nature of threat: erosion / cultivation / logging / construction/development / vandalism / inundation / other (specify) Road construction

Impact: direct impact zone / indirect impact zone / outside impact zone / indeterminate

4. Recommendations for further work (circle):

survey testing excavation archival none other: ____

Comments: ____

5. References (circle): Historic/archival documentation Yes No Not Known

Archaeological documentation Yes No Not Known

Cultural Resources Survey of S-48/Columbia Avenue Improvements, Lexington County, SC (2015), New South Associates, Inc.

6. Additional management information/comments:

7. Location of existing collections: N/A

8. Location of photographs: Temporarily with New South Associates, Stone Mountain, GA

9. Location of special samples: N/A

Type of special samples: ____

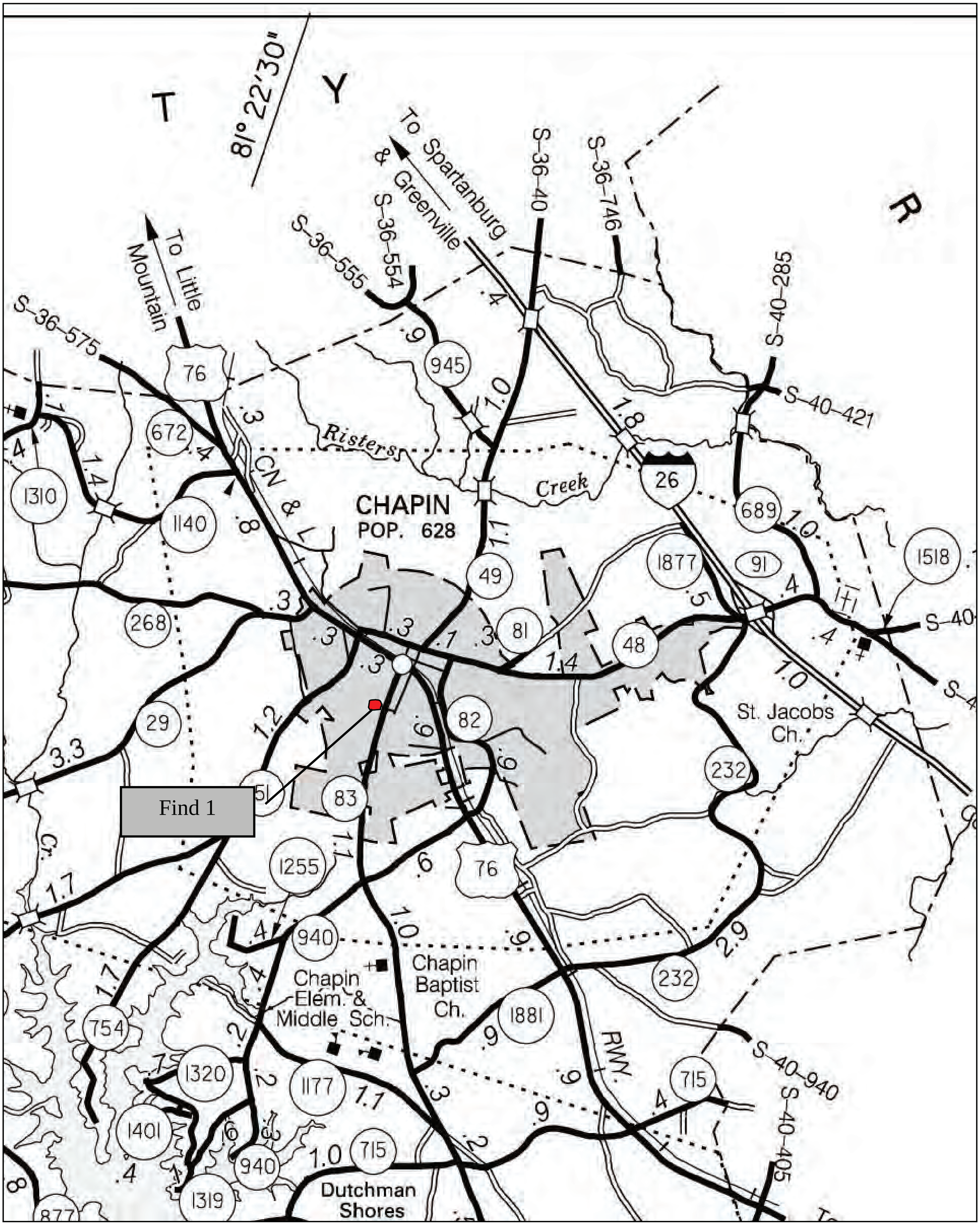
Signature of observer: ____ Date: ____

Subsequent visits:

Observer ____ Date: ____

Observer ____ Date: ____

Observer ____ Date: ____


81° 22′30″
To Spartanburg & Greenville
To Little Mountain
S-36-40
S-36-746
S-36-554
S-36-555
S-36-575
S-40-285
S-40-421
Risters Creek
CHAPIN
POP. 628
CN & L
St. Jacobs Ch.
Find 1
Chapin Elem. & Middle Sch.
Chapin Baptist Ch.
RWY.
S-40-940
S-40-405
Dutchman Shores
76
26
672
1310
1140
268
29
945
49
81
48
82
83
1877
91
689
1518
232
51
1255
940
754
1320
1401
1319
1177
715
1881


Find 1
Chapin
Mt Horeb
Ch
High
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St Johns
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400
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200 m

SOUTH CAROLINA INSTITUTE OF ARCHAEOLOGY AND ANTHROPOLOGY
UNIVERSITY OF SOUTH CAROLINA
SITE INVENTORY RECORD
(68-1 Rev. 85)

STATE: SC COUNTY: Lexington SITE NUMBER: 38LX662
Recorded By: Brad Botwick Affiliation: New South Associates, Inc. Date: 10/2/15

A. GENERAL INFORMATION
1. Site name: S-48 Find 2 Project: S-48/Columbia Ave Survey
2. USGS Quadrangle: Chapin, SC Date: 1971 Scale: 7.5 or 15 minute (circle one)
3. UTM: Zone 17 Easting 468215 Northing 3780420
4. Other map reference: ____
5. Descriptive site type (see handbook):
Prehistoric ____ Historic Farmstead/Outbuildings
6. Archaeological investigation (circle): Survey Testing Excavation
7. Property owner: ____ Phone number: ____
8. Address: ____
9. Other site designations: ____
10. National Register of Historic Places status (circle one):
Potentially eligible Probably not eligible Additional work

---**Office Use Only**---

Determined eligible Determined not eligible Date ____
On NRHP Date ____

----

11. Level of significance (circle): National State Local
12. Justification: The site consists of a barn with attached privy, collapsed shed, and possible animal pen. Adjacent areas are disturbed by modern land use and the site's original context is poorly demonstrated. Archaeological survey produced few artifacts, suggesting a poor research potential.

B. ENVIRONMENT AND LOCATION
1. General physiographic province (circle):
Lower Coastal Plain Middle Coastal Plain Upper Coastal Plain
Piedmont Blue Ridge Mountains
2. Landform location: Ridge top Site elevation (above MSL): 470 (in feet)
3. On site soil type: silty clay Soil classification: Georgeville fine sandy loam
4. Major river system (circle): Pee Dee Santee Ashley-Combahee-Edisto Savannah
5. Nearest river/stream: Saluda River tributary
6. Current vegetation (circle): Pine/coniferous Hardwood Mixed pine/hardwood
Old field Grass/pasture Agricultural/crops Wetlands/freshwater
Wetlands/saltwater Other Comments: ____
7. Description of groundcover (circle): Absent Light Moderate Heavy

C. SITE CHARACTERISTICS
1. Estimated site dimensions: 45 meters by 45 meters
2. Site depth: <30 cm.
3. Cultural features (type and number): 1 barn with attached outhouse; 1 possible animal pen/shelter; 1 collapsed shed; 1 brick and rock pile

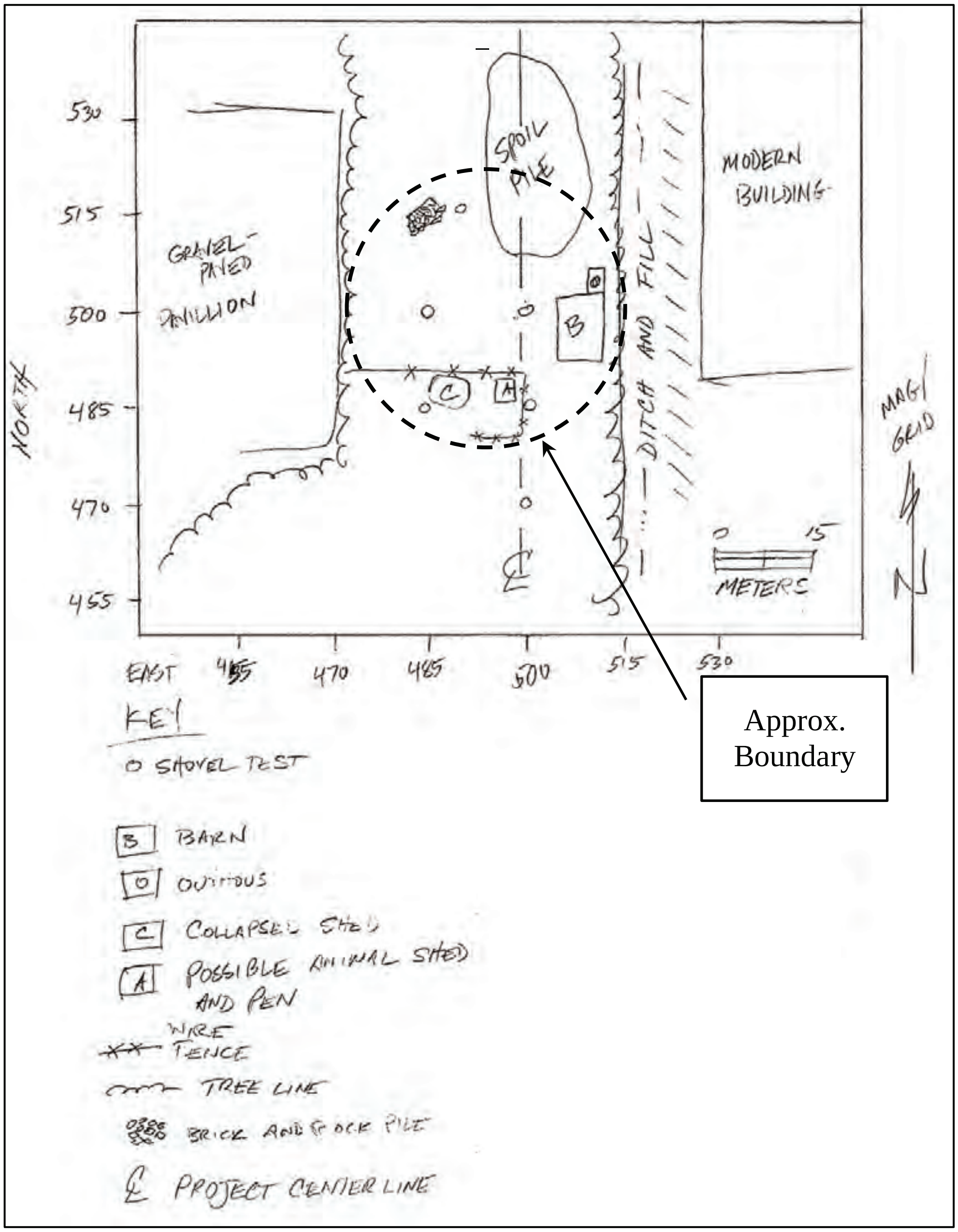
4. Presence of (circle): midden floral remains faunal remains shell charcoal
5. Human skeletal remains (circle): present preservation (circle): good

absent poor

6. General site description: The site consists of a groups of structures that were apparently associated with a former house/farmstead. The site is disturbed by modern land use and has a low artifact content. Structures appear to date to the 20th century based on construction details, such as milled lumber and wire nails.

(Use in conjunction with handbook)

Site Map



MAP KEY:

Verbal description of location: The site is located135 meters east of the intersection of E Boundary and Beaufort streets in Chapin. Proceed east through parking lot and picnic pavilion into woods.

D. ARCHAEOLOGICAL COMPONENTS

_____	Paleo Indian	_____	Middle Woodland	_____	17th Century
_____	Early Archaic	_____	Late Woodland	_____	18th Century
_____	Middle Archaic	_____	Mississippian	_____	19th Century
_____	Late Archaic	_____	Unknown prehistoric	___X_	20th Century
_____	Early Woodland	_____	16th Century	_____	Unknown historic

E. DATA RECOVERED

List materials recovered: Total number of artifacts: __2__________

Glass Bottles (2)

(Attach additional artifact inventory sheets if needed)

F. DATA RECOVERY METHODS

1. Ground surface visibility (circle one): $\boxed{0\%}$ 1-25% 26-50% 51-75% 76-100%
2. Number of person hours spent collecting (total hours X total people): ____4________________
3. Description of surface collection methods (circle):
   - Type: grid collection / grab collection / controlled sampling / other (specify): ______
   - Extent: complete / selective / no collection made
4. Description of testing methods (circle):
   - $\boxed{\text{Systematic}}$ / Nonsystematic
   - Type __Shovel testing_____________________
   - Test units:

Number	Size/max. depth	
__6___	_30 cm/30_____	cm.
______	______________	cm.
______	______________	cm.

5. Description of excavation units:

Number	Size/max. depth		Comments:
________	______________	cm.	
________	______________	cm.	
________	______________	cm.	
________	______________	cm.	

G. MANAGEMENT INFORMATION

1. Present land use (circle):
   - Agricultural
   - Forest
   - Fallow
   - Residential, low density
   - Residential, high density
   - Commercial
   - Industrial
   - Other (specify) _abandoned; dense woods

MANAGEMENT INFORMATION (Cont.)

2. Present condition/integrity of site (circle):

Intact **Damaged**

Extent of damage ---> | light | **moderate** | heavy

Nature of damage ---> | erosion | cultivation | logging | construction/developmen | vandalism | inundation | other (specify) ________

3. Potential impacts and threats to site (circle):

Potential threat: none / low / moderate / **high**

Nature of threat: erosion / cultivation / logging / construction/ development---> | **direct impact zone** | indirect impact zone | outside impact zone | indeterminate / vandalism / inundation / other (specify) Road Construction

4. Recommendations for further work (circle):

survey testing excavation archival **none** other: ________

Comments: ________

5. References (circle): Historic/archival documentation Yes No **Not Known**

Archaeological documentation Yes No Not Known

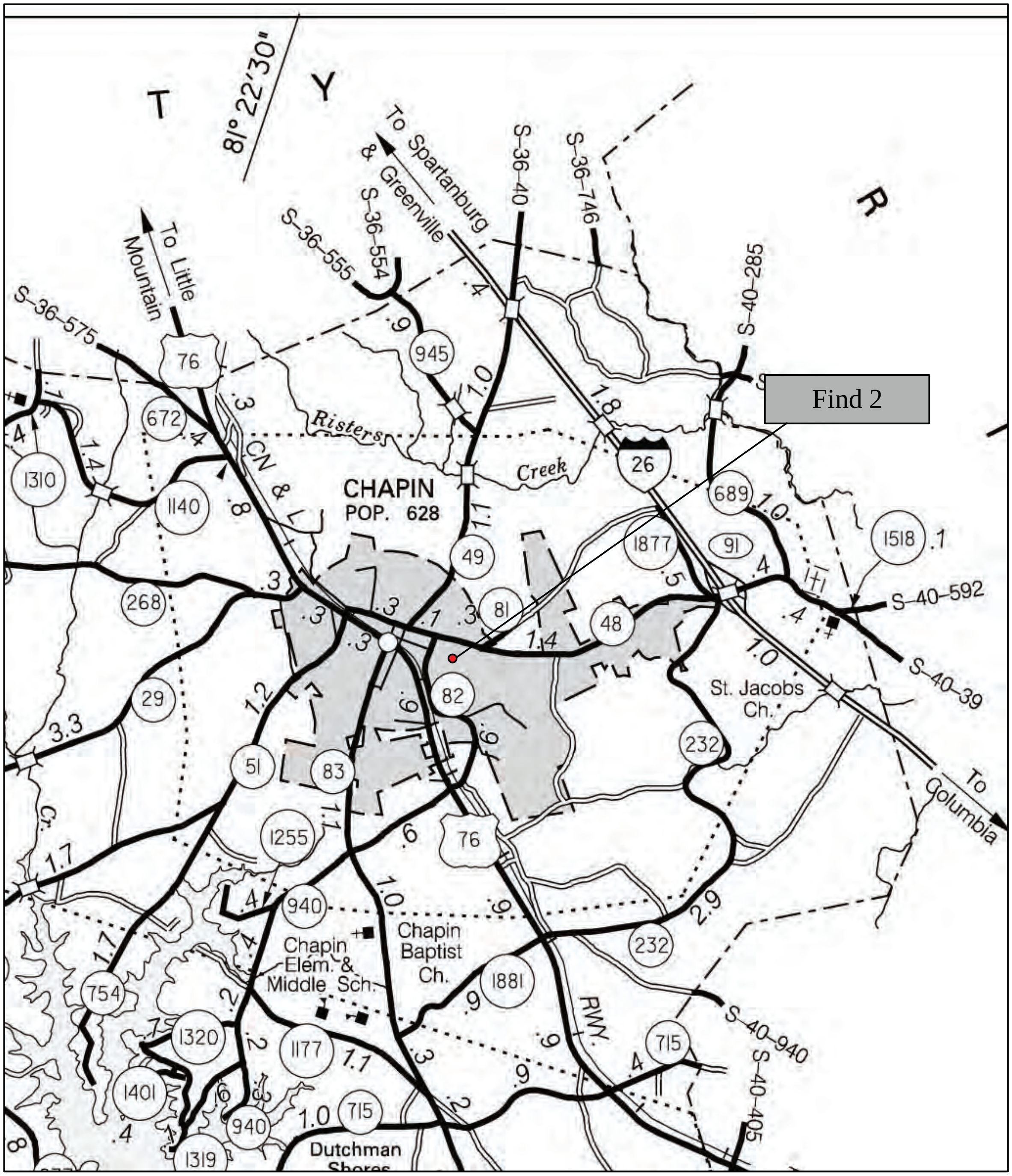
Cultural Resources Survey of S-48/Columbia Avenue Improvements, Lexington County, SC (2015), New South Associates, Inc.

6. Additional management information/comments: ________

7. Location of existing collections: ________
8. Location of photographs: ________
9. Location of special samples: ________
Type of special samples: ________

Signature of observer: ________ Date: ________

Subsequent visits:
Observer ________ Date: ________
Observer ________ Date: ________
Observer ________ Date: ________


Find 2
CHAPIN
POP. 628
To Spartanburg & Greenville
To Little Mountain
To Columbia
Risters Creek
St. Jacobs Ch.
Chapin Baptist Ch.
Chapin Elem. & Middle Sch.
Dutchman Shores
81° 22'30"
S-36-575
S-36-555
S-36-554
S-36-40
S-36-746
S-40-285
S-40-592
S-40-39
S-40-940
S-40-405
CN & L
RWY.


Find 2
Chapin
Mt Horeb Ch
High Sch
St Johns Ch
Cem
Mt Zion Ch
Cem
Cem
Stonewall Ch
Cem
WT
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473
450
400
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Google
200 m

APPENDIX B: SHPO CONCURRENCE

SCDOT

South Carolina
Department of Transportation

RECEIVED

APR 2 1 2016

SC Department of
Archives & History

April 20, 2016

Dr. Adrianne Daggett
South Carolina Department of Archives & History
8301 Parklane Road
Columbia, South Carolina 29223-4905

Re: *New South Associates' Cultural Resource Survey of S-48 (Columbia Avenue) Improvements, Lexington County, South Carolina. FINAL REPORT & Archaeological Monitoring at Mount Horeb Cemetery.* **SCDOT Project Number P042383**

Dear Dr. Daggett:

Thank you for your letter of April 12, 2016 regarding the project referenced above. Your letter recommends that SCDOT archaeological staff monitor construction activities adjacent to the National Register eligible Mount Horeb Cemetery to ensure that no unmarked burials or other archaeological resources are impacted. The South Carolina Department of Transportation (SCDOT) will add an environmental commitment to the project contract ensuring that archaeological monitoring occurs at the Mount Horeb Cemetery during initial ground disturbing activities at that location.

Project investigations resulted in the identification of two (2) archaeological sites, both recommended as not eligible for the National Register of Historic Places (NRHP). Project investigations also identified nineteen (19) aboveground sites (site #s 0888 through 0906) within the project's area of potential effect. Only one of these aboveground resources (site # 0891, the Mt. Horeb Cemetery) is recommended as eligible for the NRHP. As shown on the project plan sheet provided with SCDOT's 3/4/16 letter, the proposed project will not affect site # 0891. However, archaeological monitoring adjacent to this site will be an environmental commitment for the construction phase of the project. It is therefore recommended that the proposed project will not affect historic resources. No further investigations are recommended.

In accordance with the memorandum of agreement approved by the Federal Highway Administration (FHWA), November 29, 2011, SCDOT is providing this information as agency official designee, as defined under 36 CFR 800.2, to ensure compliance with Section 106 of the National Historic Preservation Act.

It is requested that you review the enclosed material and, if appropriate, indicate your concurrence with SCDOT findings, thus completing the Section 106 consultation process. Please respond within 30 days if you have any objections or if you have need of additional information.

Sincerely,

David P. Kelly
NEPA Coordinator, RPG 4

DPK:dk
Enclosures: 4/12/16 SHPO letter

I ~~(do not)~~ concur in the above determination.

Signed: ______________________ Date: 4/21/2016

RECEIVED
APR 26 2016
Environmental Management
SCDOT

cc: Shane Belcher, FHWA
Keith Derting, SCIAA

File: ENV/DPK

South Carolina
Department of Transportation

February 2, 2016

FEB - 4

2016-66-8

Ms. Elizabeth Johnson
Deputy State Historic Preservation Officer
South Carolina Department of Archives & History
8301 Parklane Road
Columbia, South Carolina 29223-4905

Re: ***New South Associates' Cultural Resource Survey of S-48 (Columbia Avenue) Improvements, Lexington County, South Carolina.***
SCDOT Project Number P042383

Dear Ms. Johnson:

The South Carolina Department of Transportation (SCDOT) proposes improvements to S-48 (Columbia Avenue) between I-26 and East Boundary Street in the Town of Chapin, Lexington County. SCDOT plans to widen a section of this road between Chapin and I-26 and add roads on new location south of Chapin and near the I-26 intersection to ease traffic congestion. The length of the project, including sections to be widened and new roads, measures 3.8 miles.

Project investigations resulted in the identification of two (2) archaeological sites, both of which are recommended as not eligible for the National Register of Historic Places (NRHP). Project investigations also identified nineteen (19) aboveground sites (site #s 0888 through 0906) within the project's area of potential effect. Only one of these aboveground resources (site # 0891, the Mt. Horeb Cemetery) is recommended as eligible for the NRHP. As shown on the attached project plan sheet, the proposed project will not affect site # 0891. It is therefore recommended that the proposed project will not affect historic resources. No further investigations are recommended.

In accordance with the memorandum of agreement approved by the Federal Highway Administration (FHWA), November 29, 2011, SCDOT is providing this information as agency official designee, as defined under 36 CFR 800.2, to ensure compliance with Section 106 of the National Historic Preservation Act.

It is requested that you review the enclosed material and, if appropriate, indicate your concurrence with SCDOT findings, thus completing the Section 106 consultation process. Please respond within 30 days if you have any objections or if you have need of additional information.

Sincerely,

David P. Kelly
NEPA Coordinator, RPG 4

RECEIVED

MAR - 1 2016

Environmental Management
SCDOT

DPK:dk
Enclosures: cultural resources report, survey site forms, plan sheet

I ~~(do not)~~ concur in the above determination.

Signed: W. Haire, P Date: 2/6/16

ec: Shane Belcher, FHWA
Lisa LaRue Baker, United Keetoowah Band of Cherokee
Russell Townsend, Eastern Band Cherokee

cc: Wenonah G. Haire, Catawba Nation THPO
Keith Derting, SCIAA

File: ENV/DPK

Addendum: Cultural Resources Survey of S-48 (Columbia Avenue) Improvements

Lexington County, South Carolina

Lexington County Project PQ13003-4/29/13S

New South Associates, Inc.

Addendum: Cultural Resources Survey of S-48 (Columbia Avenue) Improvements

Lexington County, South Carolina

Lexington County Project PQ13003-4/29/13S

Report submitted to:

Mead & Hunt, Inc. • 307 W. Main Street • Lexington, South Carolina 29072

Report prepared by:

New South Associates • 722-A Blanding Street • Columbia, South Carolina 29201

Natalie Adams Pope – Principal Investigator

Katie Dykens – Historian and Co-Author
Ryan Sipe – Archaeologist and Co-Author

October 17, 2016 • Final Report
New South Associates Technical Report 2617

ABSTRACT

This addendum report addresses additional area not surveyed and discussed in New South Technical Report #2535 entitled *Cultural Resources Survey of S-48 (Columbia Avenue) Improvements, Lexington County, South Carolina* (Dykens and Sipe 2016). The section addressed in this addendum report is located on the west end of the original project area, and extends along Columbia Avenue west from E. Boundary Street for approximately 0.4 mile. The use of a 300-foot APE extended the area under study in the addendum report to include approximately 0.1 mile of Lexington Street, Clark Street, and E. Boundary Street, as well as approximately 0.4 mile of Beaufort Street, which runs parallel to Columbia Avenue.

New South Associates, Inc. completed a cultural resources survey of the additional section of the project corridor to identify significant archaeological and historic architectural resources in its APE. This report describes the goals, methods, results, and recommendations for the additional surveyed area.

Background research indicated no archaeological resources were previously recorded inside the project APE. A historic district, the Chapin Commercial Historic District, had been determined by the South Carolina Historic Preservation Office (SHPO) to be eligible for inclusion on the National Register of Historic Places (NRHP). The parameters of the district were suggested but had not been finalized (see Appendix A).

The archaeological survey identified no sites. The historic architectural survey recorded and evaluated 25 additional resources, including nine that may contribute to the NRHP-eligible Chapin Commercial Historic District. One additional resource (U/63/0953) is recommended as eligible for inclusion on the NRHP. Since improvements in the area under study will be limited to the existing right-of-way and only includes repaving and restriping, there will be no effect to this resource. The other 15 resources lack qualities of significance that would qualify them for NRHP listing under Criterion A, B, or C. Additionally, most have been altered in ways that detract from their historical appearance and use, and they generally lack aspects of integrity. Therefore, these 15 resources do not require further consideration.

TABLE OF CONTENTS

LIST OF FIGURES AND TABLE

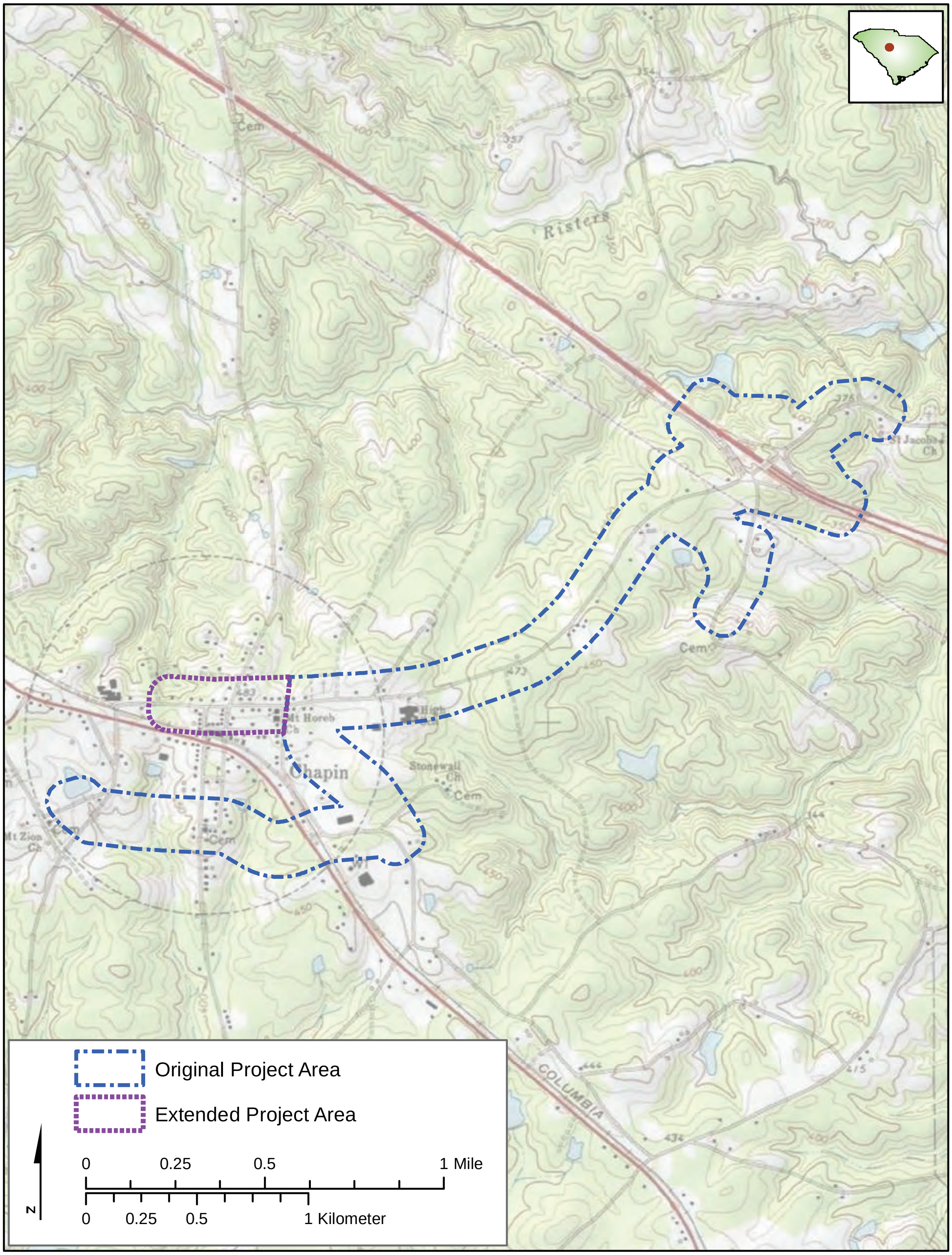
I. INTRODUCTION

This addendum report addresses additional area not reported on in New South Technical Report #2535 entitled *Cultural Resources Survey of S-48 (Columbia Avenue) Improvements, Lexington County, South Carolina* (Dykens and Sipe 2016). The section addressed in this addendum report is located on the west end of the original project area, and extends along Columbia Avenue west from E. Boundary Street for approximately 0.4 mile. The use of a 300-foot APE extended the area under study in the addendum report to include approximately 0.1 mile of Lexington Street, Clark Street, and E. Boundary Street, as well as approximately 0.4 mile of Beaufort Street, which runs parallel to Columbia Avenue (Figure 1). For the archaeological survey, all areas of direct effect were examined, including any new and existing ROW along the added project corridor. For the historic architectural resources survey, the entire APE was examined.

The goal of this Phase I survey was to identify significant cultural resources in the project's APE and to assess project effects. Specific tasks included background research, fieldwork, and reporting. Background research entailed reviews of previously recorded archaeological sites and historic resources, along with development of prehistoric and historic contexts for the project area. These contexts, which are available in the original report, provided information necessary for survey planning as well as interpreting and evaluating cultural resources identified during the fieldwork. The fieldwork comprised archaeological and historic architectural resources surveys of the APE.

Natalie Adams Pope served as Principal Investigator, while Ryan Sipe served as the project archaeologist and Katie Dykens served as the Architectural Historian. This addendum describes the objectives and results of this survey, and is organized into three chapters, including this introduction. Results of the survey are provided in Chapter II. A summary and recommendations are presented in Chapter III. Appendix A consists of a letter from the State Historic Preservation Office (SHPO) concerning the proposed Chapin Commercial Historic District.

Figure 1.
Map of Extended Project Area



Source: USGS Chapin, South Carolina Quadrangle

II. SURVEY RESULTS

ARCHAEOLOGICAL SURVEY RESULTS

A total of 42 shovel test locations were placed in the project area, which consisted of a transect on each side of Columbia Avenue. Shovel tests were either excavated or documented (in cases of development or disturbance) at 30-meter intervals. As a result of the archaeological survey, no sites or isolated finds were identified.

HISTORIC ARCHITECTURAL SURVEY RESULTS

On June 1, 2016, the architectural historians surveyed the additional APE to identify previously unrecorded historic architectural resources (Figure 2, Table 1). The added project area contains of a mix of building types, both historic and non-historic. Development on S-48 to the west of the intersection of E. Boundary Street consists mostly of residences, many of which have been converted for commercial use. Development in the affected area directly to the south of this western portion of S-48 was relatively high density commercial retail, with many historic buildings forming a commercial NRHP historic district.

Table 1. Architectural Resources Surveyed within the APE

Survey Number	Resource Number	Name/Address	Resource Use	Date of Construction	NRHP Eligibility Recommendation
1	U/63/0907	Columbia, Newberry & Laurens Railroad	Railroad	Circa 1890	Not Eligible
2	U/63/0938	155 Columbia Avenue	Residential	Circa 1904	Not Eligible
3	U/63/0939	161 Columbia Avenue	Residential	Circa 1940	Not Eligible
4	U/63/0939.01	161 Columbia Avenue	Residential	Circa 1950	Not Eligible
5	U/63/0940	105 Lexington Avenue	Commercial	Circa 1940	Eligible as Part of District
6	U/63/0941	106 Lexington Avenue	Commercial	Circa 1948	Eligible as Part of District
7	U/63/0942	111 Lexington Avenue	Commercial	Façade ca. 1910	Eligible as Part of District
8	U/63/0943	100 Beaufort Street	Commercial	Circa 1940	Eligible as Part of District
9	U/63/0944	102-104 Beaufort Street	Commercial	Circa 1940	Eligible as Part of District
10	U/63//0945	106 Beaufort Street	Commercial	Circa 1910	Eligible as Part of District
11	U/63/0946	108 Beaufort Street	Commercial	Circa 1908	Eligible as Part of District
12	U/63/0947	110 Beaufort St/119 Clark St	Commercial	Circa 1940	Eligible as Part of District
13	U/63/0948	103 Clark Street	Commercial	Circa 1901	Eligible as Part of District
14	U/63/0949	115 Clark Street	Commercial	Circa 1955	Not Eligible

Table 1. Architectural Resources Surveyed within the APE

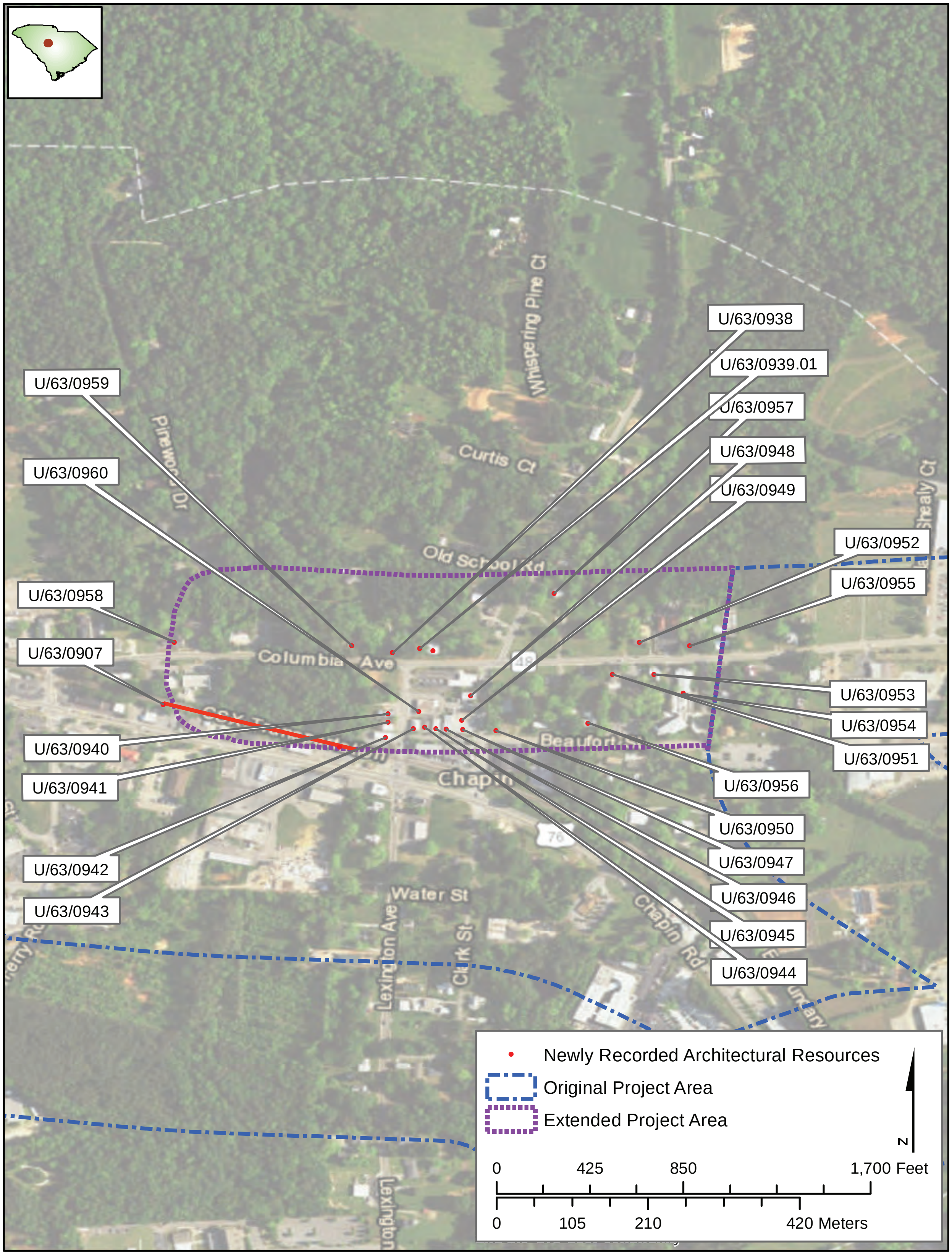
Survey Number	Resource Number	Name/Address	Resource Use	Date of Construction	NRHP Eligibility Recommendation
15	U/63/0950	114 Clark Street	Commercial	Circa 1948	Not Eligible
16	U/63/0951	218 Columbia Avenue	Commercial	Circa 1940	Not Eligible
17	U/63/0952	219 Columbia Avenue	Commercial	Circa 1941	Not Eligible
18	U/63/0953	222 Columbia Avenue	Residential	Circa 1892	Eligible
19	U/63/0954	101 East Boundary Street	Religious	Circa 1963	Not Eligible
20	U/63/0955	225 Columbia Avenue	Commercial	Circa 1920	Not Eligible
21	U/63/0956	210 Beaufort Street	Residential	Circa 1960	Not Eligible
22	U/63/0957	110 Peak Street	Residential	Circa 1910	Not Eligible
23	U/63/0958	123 Columbia Avenue	Funerary	Circa 1930	Not Eligible
24	U/63/0959	149 Columbia Avenue	Residential	Circa 1952	Not Eligible
25	U/63/0960	102 Lexington Avenue	Civic	Circa 1955	Not Eligible

CHAPIN COMMERCIAL HISTORIC DISTRICT

The proposed Chapin Commercial Historic District consists of approximately 11 buildings fronting onto Clark, Beaufort, Lexington, and Chapin Streets (Figure 3). All but one of these buildings were located within the APE and were surveyed as part of this addendum report. The historic district was visited by representatives of the South Carolina SHPO in January 2016 and was determined to be eligible for inclusion on the National Register of Historic Places (NRHP) at this time under Criterion A, in the area of Commerce on the local level of significance (see letter from SHPO, attached as Appendix A; (Foley 2016). The SHPO officer felt that the buildings, when considered in the collective, "appear to retain the character-defining features that identify their past and present use as commercial buildings," and that "it appeared that the composition of the district has changed relatively little since at least 1934" (Foley 2016). The district is comparatively small in size; however, this reflects the historic size of Chapin's commercial district rather than a loss of significant historic fabric. While none of the buildings surveyed individually rise to the level of importance necessary for inclusion on the NRHP, collectively they tell the story of Chapin's early twentieth-century commercial past.

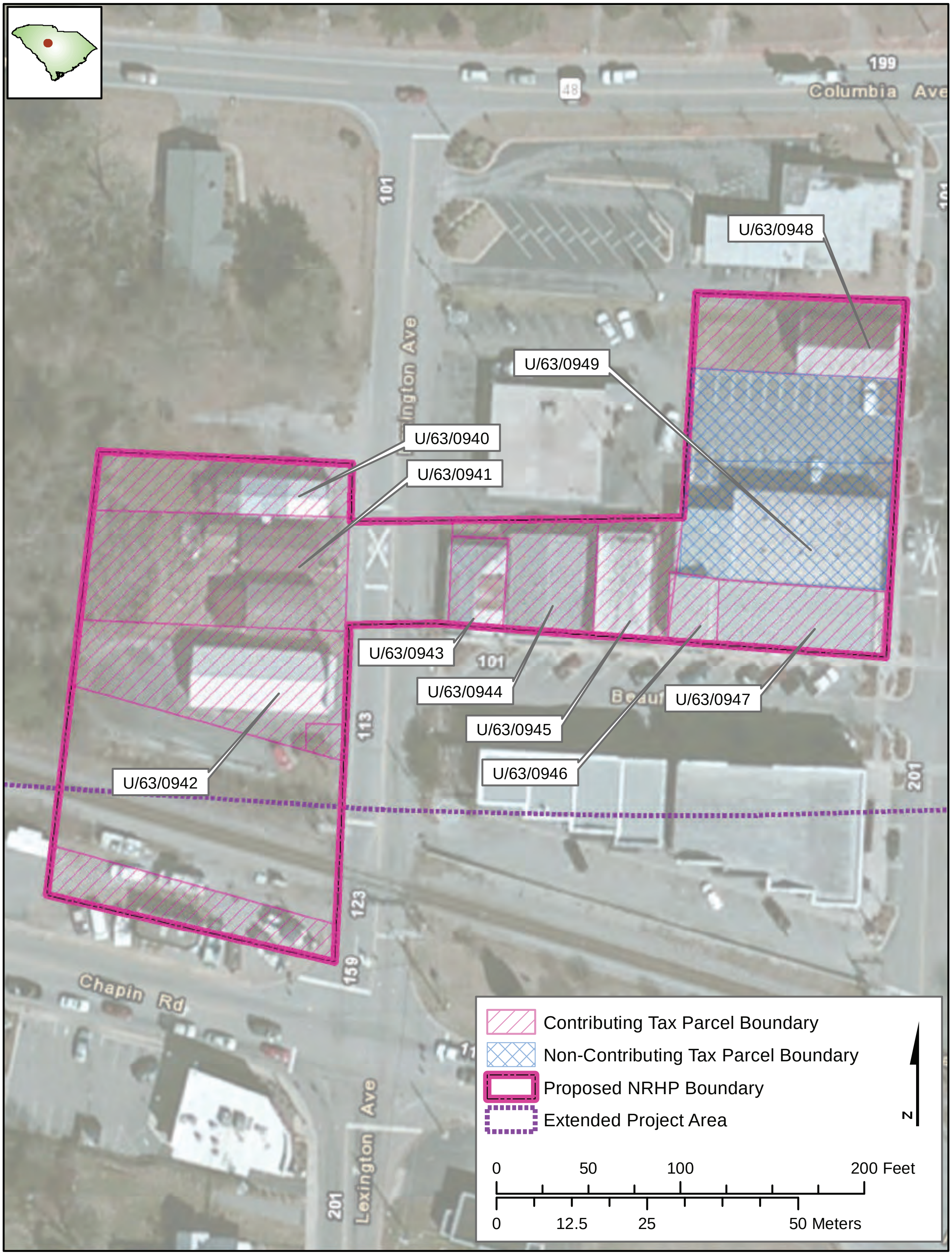
Lexington Avenue and Clark Street are both fairly busy commercial thoroughfares, connecting the main arteries S-48 (Columbia Avenue) with Chapin Road. This block of Lexington Avenue has primarily commercial buildings, although the former fire station (Resource U/63/0960), a civic building, takes up a double lot. Trees and other decorative landscaping are found throughout. Clark Street has commercial buildings on both sides of the street, although development is much denser on the west side (which is included in the historic district) and there is also residential development on the east side along with significant foliage and deciduous trees.

Figure 2.
Newly Surveyed Architectural Resources



Source: ESRI Resource Data

Figure 3.
Map of Proposed Chapin Commercial Historic District



Source: ESRI Resource Data

The block of Beaufort Street between Lexington Avenue and Clark Street is a high-density commercial area designed for use by pedestrian shoppers (Figure 4). The block is characterized by one- to two-story commercial buildings that form an almost continuous line, diagonal parking on either side of the road, and deciduous trees planted at regular intervals. The north side of the road is contained within the proposed historic district and is populated exclusively by historic buildings ranging from the 1910s to the 1960s. They are all single-story shops with little or no space between them, and are either concrete block or brick construction. The south side of the road is modern construction, with two long brick veneer buildings forming a continuous storefront. The new construction on the south side of the street is sensitive to the historic section on the north side in terms of materials—the buildings are clad in brick veneer—scale, and walkability. The use of arches and multi-pane windows may also be an attempt to blend with the historic architecture on the north side of the street.

U/63/0940

Resource U/63/0940 is a circa 1940 concrete block single retail store located at 105 Lexington Avenue. It is known as Chapin Dry Cleaners (Figure 5). The front (east) elevation has a stepped parapet at the roofline and is symmetrical with an inset doorway and two large fixed picture windows flanking the entrance. The side panels in the entrance have fixed windows as well. The building has a front-gabled standing seam metal roof. It is located in a commercial area and is surrounded by concrete parking areas and walkways.

Resource U/63/0940 was evaluated under Criterion C for architecture. The building was not found to embody the distinctive characteristics of a type, period, or method of construction nor does it represent the work of a master or possess high artistic value; therefore, it is recommended not eligible for individual listing on the NRHP. It is not known to be associated with a specific event or person and was not evaluated under Criterion B. It was evaluated for inclusion on the NRHP under Criterion A for Commerce on the local level as a part of a historic district and was found to be eligible by the South Carolina SHPO.

U/63/0941

Resource U/63/0941 is a circa 1948 concrete block single retail store located at 106 Lexington Avenue (Figure 6). It has a front-gabled composition shingle roof and its front (east) elevation is symmetrical. The central 15-light door is covered by a flat hood that is supported from above by two metal ties. The door is flanked to the left and right by six-over-six wood-frame double-hung sash windows. While this block of Lexington Avenue is exclusively commercial and civic buildings, Resource U/63/0941 is landscaped with a small front yard and garden area, containing a deciduous tree, ornamental bushes, some flowering plants, and window boxes with artificial flowers.

Figure 4.
Beaufort Street Context

A. Looking Northeast, South Side

B. Looking Northeast, North Side

Figure 5.
Resource U/63/0940

A. 105 Lexington Avenue, Northeast oblique

B. 105 Lexington Avenue, East Elevation

C. 105 Lexington Avenue, Southeast Oblique

Figure 6.
Resource U/63/0941

A. 106 Lexington Avenue, Southeast Oblique

B. 106 Lexington Avenue, South Elevation

C. 106 Lexington Avenue, Detail

Resource U/63/0941 was evaluated under Criterion C for architecture. The building was not found to embody the distinctive characteristics of a type, period, or method of construction nor does it represent the work of a master or possess high artistic value; therefore, it is recommended not eligible for individual listing on the NRHP. It is not known to be associated with a specific event or person and was not evaluated under Criterion B. It was evaluated for inclusion on the NRHP under Criterion A for Commerce on the local level as a part of a historic district and was found to be eligible by the South Carolina SHPO.

U/63/0942

Resource U/63/0942 is a modern standing seam metal single retail store that retains a circa 1940 pressed metal façade located at 111 Lexington Avenue (Figure 7). It is known as the Lake Murray Flower Shop. The south-facing façade is symmetrical, with a band of fixed windows beneath a vinyl awning and an inset doorway with double windowed doors. The tall parapet and side pilasters are covered with pressed metal sheets in a faux brick design. The cornice is fairly ornate with heavy molding, dentils, and brackets with finials and paterae.

This section of Lexington Avenue is a busy commercial corridor, adjacent to Beaufort Street and the Columbia, Newberry & Laurens Railroad. Resource U/63/0942 is surrounded by concrete parking and walking areas, although there are many potted plants placed outside. Resource U/63/0942 was evaluated under Criterion C for architecture. The building was not found to embody the distinctive characteristics of a type, period, or method of construction nor does it represent the work of a master or possess high artistic value; therefore, it is recommended not eligible for individual listing on the NRHP. It is not known to be associated with a specific event or person and was not evaluated under Criterion B. It was evaluated for inclusion on the NRHP under Criterion A for Commerce on the local level as a part of a historic district and was found to be eligible by the South Carolina SHPO.

U/63/0943

Resource U/63/0943 is a circa 1940 concrete block multiple retail building located at 100 Beaufort Street (Figure 8). It houses the Soarrin Eagle Hair Salon. The roof is front-gabled with a rear hip. The front (south) elevation is symmetrical with double wood panel half-light doors flanked by a three-pane wood-frame picture window to each side.

There is brick veneer to either side of the door as well as a line of bricks that run along the top of the windows and door. There is a stepped parapet capped with bricks at the roofline. A vinyl awning runs above the doors and windows.

Figure 7.
Resource U/63/0942

A. 111 Lexington Avenue, Southeast Oblique

B. 111 Lexington Avenue, South Elevation

C. 111 Lexington Avenue, Southwest Oblique

Figure 8.
Resource U/63/0943

A. 100 Beaufort Street, Southwest Oblique

B. 100 Beaufort Street, South Elevation

C. 100 Beaufort Street, West Elevation

Resource U/63/0943 is located on Beaufort Street, on a block characterized by one- to two-story commercial buildings that form an almost continuous line, diagonal parking on either side of the road, and deciduous trees planted at regular intervals. Resource U/63/0943 was evaluated under Criterion C for architecture. The building was not found to embody the distinctive characteristics of a type, period, or method of construction nor does it represent the work of a master or possess high artistic value; therefore, it is recommended not eligible for individual listing on the NRHP. It is not known to be associated with a specific event or person and was not evaluated under Criterion B. It was evaluated for inclusion on the NRHP under Criterion A for Commerce on the local level as a part of a historic district and was found to be eligible by the South Carolina SHPO.

U/63/0944

Resource U/63/0944 is a circa 1940 concrete block multiple retail building located at 104 Beaufort Street (Figure 9). It is a commercial duplex housing Julia Neal Fashions and the Whooo Needs New? antique store. The front (south) elevation is symmetrical with two separate half-light wood panel doors flanked by a picture window to the left and right. The west picture window is a wood-frame three-pane fixed window. The window to the east is a single fixed pane in an aluminum frame. There is a simple single stepped parapet at the roofline with glazed tiles capping the top. A vinyl awning runs above the windows and doors.

Resource U/63/0944 is located on Beaufort Street, on a block characterized by one- to two-story commercial buildings that form an almost continuous line, diagonal parking on either side of the road, and deciduous trees planted at regular intervals. Resource U/63/0944 was evaluated under Criterion C for architecture. The building was not found to embody the distinctive characteristics of a type, period, or method of construction nor does it represent the work of a master or possess high artistic value; therefore, it is recommended not eligible for individual listing on the NRHP. It is not known to be associated with a specific event or person and was not evaluated under Criterion B. It was evaluated for inclusion on the NRHP under Criterion A for Commerce on the local level as a part of a historic district and was found to be eligible by the South Carolina SHPO.

U/63/0945

Resource U/63/0945 is a circa 1910 Italianate commercial block retail building located at 106 Beaufort Street with 106A Beaufort Street housing Second Hand Time and 106B Beaufort Street houses the Chapin Yoga Center (Figure 10). The building is constructed of load-bearing brick in a six-to-one common bond with decorative iron earthquake bolts. The front (south) elevation contains two storefronts that are unequal in size though identical in design. They feature an inset

Figure 9.
Resource U/63/0944

A. 104 Beaufort Street, South Elevation

B. 104 Beaufort Street, Southeast Oblique

C. 104 Beaufort Street, Southeast Oblique Detail

Figure 10.
Resource U/63/0945

A. 106 Beaufort Street, South Elevation

B. 106 Beaufort Street, Southeast Oblique

C. 106 Beaufort Street, West Elevation Detail full-light wooden door between tall fixed pane wood frame shop windows with raised paneling beneath them and fascia above. The brick above the windows and doors is supported by a thick square wooden beam with carved inset panels. This beam is in turn supported by two round cast iron columns in each entrance. The roof parapet features a decorative cornice composed of brick including a tooth pattern and a geometric inset pattern running beneath the top of the cornice. The roof itself is not visible. The store's step up at the entrance is brownstone.

Resource U/63/0945 is located on Beaufort Street, on a block characterized by one- to two-story commercial buildings that form an almost continuous line, diagonal parking on either side of the road, and deciduous trees planted at regular intervals. Resource U/63/0945 was evaluated under Criterion C for architecture. The building was not found to embody the distinctive characteristics of a type, period, or method of construction nor does it represent the work of a master or possess high artistic value; therefore, it is recommended not eligible for individual listing on the NRHP. It is not known to be associated with a specific event or person and was not evaluated under Criterion B. It was evaluated for inclusion on the NRHP under Criterion A for Commerce on the local level as a part of a historic district and was found to be eligible by the South Carolina SHPO.

U/63/0946

Resource U/63/0946 is a circa 1908 Italianate commercial block retail building located at 108 Beaufort Street (Figure 11). It is known historically as the Bank of Chapin Building (Foley 2016) and houses the Jannett Art Can Studio. The building is constructed of load-bearing brick in a six-to-one common bond with decorative iron earthquake bolts. The front (south) elevation contains two one-over-one wood-frame fixed pane picture windows to the west and a set of double doors to the east. The doors are three-quarter-light with two panes, a recessed panel at the bottom, and a clear glass transom over the top. All three bays are topped with brick arches and a line of brick stands proud running across the façade above them, mirroring the arched shape of the bays. The roof parapet features a decorative cornice composed of brick including a tooth pattern and a geometric inset pattern running beneath the top of the cornice. The roof itself is not visible. This original brick roofline has been topped with weatherboard to create a diagonal roof, rising from the level of the brick roofline on the west to approximately three feet above this level on the east. The ground in front of the building is covered in tile.

Resource U/63/0946 is located on Beaufort Street, on a block characterized by one- to two-story commercial buildings that form an almost continuous line, diagonal parking on either side of the road, and deciduous trees planted at regular intervals. Resource U/63/0946 was evaluated under Criterion C for architecture. The building was not found to embody the distinctive

Figure 11.
Resource U/63/0946

A. 108 Beaufort Street, Southwest Oblique

B. 108 Beaufort Street, South Elevation

characteristics of a type, period, or method of construction nor does it represent the work of a master or possess high artistic value; therefore, it is recommended not eligible for individual listing on the NRHP. It is not known to be associated with a specific event or person and was not evaluated under Criterion B. It was evaluated for inclusion on the NRHP under Criterion A for Commerce on the local level as a part of a historic district and was found to be eligible by the South Carolina SHPO.

U/63/0947

Resource U/63/0947 is a circa 1940 concrete block commercial retail building located on the corner of Beaufort Street and Clark Street (Figures 12 and 13). It is a large building that has two distinct front elevations, one facing onto Beaufort Street, housing Classic Auto Replicas at 110 Beaufort Street, and one facing onto Clark Street, housing the Fashion Exchange at 119 Clark Street. The majority of the Beaufort Street (south) elevation is simple in design, with concrete block walls with a flat parapet capped with an aluminum gutter. The full-light door and two fixed picture windows are surrounded by brick. A vertical line of concrete blocks stands proud, demarcating the internal party wall between the two businesses.

The Clark Street (west) elevation and a portion of the south elevation at the corner of Beaufort and Clark Streets is quite different in design. It is clad in brick veneer and features tall windows with rounded arches that extend upwards. There are two bays of these fixed windows along the west portion of the south elevation. Along the west elevation are four bays with the center bay containing an inset glass door and a high rounded transom light, rather than another fixed window. A corrugated aluminum box cornice runs along the roofline of this section, providing a sheltering overhang. The cladding, cornice, and windows in this section of the building date from circa 1965. The building has a flat, built-up roof.

Resource U/63/0947 is located on the corner of Beaufort Street and Clark Street. This block of Beaufort Street is characterized by one- to two-story commercial buildings that form an almost continuous line, diagonal parking on either side of the road, and deciduous trees planted at regular intervals. This block of Clark Street is primarily commercial, with heavier density development on the west side of the road, where Resource U/63/0947 is located. Resource U/63/0947 was evaluated under Criterion C for architecture. The building was not found to embody the distinctive characteristics of a type, period, or method of construction nor does it represent the work of a master or possess high artistic value; therefore, it is recommended not eligible for individual listing on the NRHP. It is not known to be associated with a specific event or person and was not evaluated under Criterion B. It was evaluated for inclusion on the NRHP under Criterion A for Commerce on the local level as a part of a historic district and was found to be eligible by the South Carolina SHPO.

Figure 12.
Resource U/63/0947, 1 of 2

A. 110 Beaufort Street, South Elevation

B. 110 Beaufort Street, Southwest Oblique

Figure 13.
Resource U/63/0947, 2 of 2

A. 119 Clark Street, South Elevation

B. 119 Clark Street, Southeast Oblique


C. 119 Clark Street, East Elevation

U/63/0948

Resource U/63/0948 is a circa 1901 vernacular style community store located at 103 Clark Street (Figure 14). It is known historically as the Old Dispensary (Foley 2016). It is a rectangular wood frame building with weatherboard cladding and a front-gabled standing seam metal roof. It rests on brick piers. Its east-facing front façade is symmetrical, with rustic wooden double doors flanked by a large four-pane wood-frame fixed window to either side with vertical wood shutters. A standing-seam metal shed-roofed porch runs across the front elevation and is supported by four unfinished wood logs with knotholes. Limited fenestration on the sides of the building indicate that it was constructed to be used commercially or as a house of worship rather than as a residence.

Resource U/63/0948 was evaluated under Criterion C for architecture. The building was not found to embody the distinctive characteristics of a type, period, or method of construction nor does it represent the work of a master or possess high artistic value; therefore, it is recommended not eligible for individual listing on the NRHP. It is not known to be associated with a specific event or person and was not evaluated under Criterion B. It was evaluated for inclusion on the NRHP under Criterion A for Commerce on the local level as a part of a historic district and was found to be eligible by the South Carolina SHPO.

OTHER NEWLY SURVEYED RESOURCES

U/63/0907

Resource U/63/0907 is a section of the Columbia, Newberry & Laurens Railroad (Figure 15). The Columbia, Newberry& Laurens Railroad was chartered in 1885 and completed in 1891, although the route did not extend all the way to Laurens until 1896. It was purchased by the Atlantic Coast Line in 1924, and it retained its name until a merger with CSX in 1984 (Lewis 2016). The section that lies within the APE is a single-track linear line. It runs roughly parallel with Chapin Road (Route 76) and intersects Lexington Avenue directly outside of the APE. It is a standard gauge ribbon rail and is in active use.

Resource U/63/0907 was not found to embody the distinctive characteristics of a type, period, or method of construction, and does not possess significance for its engineering or materials. It is not recommended as eligible for inclusion on the NRHP under Criterion C. It is not known to be associated with any significant person or event, and therefore was not evaluated under Criterion A or B.

Figure 14.
Resource U/63/0948

A. 103 Clark Street, East Elevation

B. 103 Clark Street, North Elevation

C. 103 Clark Street, Southeast Oblique

Figure 15.
Resource U/63/0907

A. Columbia, Newberry & Laurens Railroad, Facing East

B. Columbia, Newberry & Laurens Railroad, Facing West

U/63/0938

Resource U/63/0938 is a circa 1904 Craftsman style side-gabled cottage located at 155 Columbia Avenue (Figure 16). It is rectangular in plan with a laterally-gabled composition shingle roof that extends to create a deep shed-roofed porch over the full front (south) façade of the main mass of the house. The porch has four heavy square wood and brick supports, a wooden railing with turned balusters, and two flights of concrete stairs leading to the landing. There are two wood panel half-light doors with a nine-over-six wood-frame double-hung sash window between them. Two additional nine-over-six double-hung sash windows lie on the outside of the doors.

There is also a central brick chimney. A smaller addition is located on the west end of the house, with two six-over-six wood-frame double-hung sash windows and a lower, laterally-gabled roof. The house is clad in asbestos shingles and has exposed rafter tails and overhanging eaves.

It is located on Columbia Avenue (SC-823), a busy thoroughfare with a mixture of residential buildings, purpose-built commercial buildings, and historically residential buildings that are currently used commercially. It is set back from the road on a slight rise with a grass front lawn and a band of ornamental hedge near the front of the building. There are deciduous trees in the yard, which is well-kept. Resource U/63/0938 is not known to be associated with a specific event or person and was not evaluated under Criteria A or B. It was evaluated under Criterion C for architecture. The house was not found to embody the distinctive characteristics of a type, period, or method of construction nor does it represent the work of a master or possess high artistic value; therefore, it is recommended not eligible for listing on the NRHP.

U/63/0939 and U/63/0939.01

Resource U/63/0939 is a 1930 Craftsman-style bungalow located at 161 Columbia Avenue (Figure 17). It is rectangular in massing with a composition-shingle hipped roof and a large front-gabled porch on the front (south) elevation. There are two square wood and brick porch supports, a heavy wood railing with square balusters, and square brick newel posts. The front façade is symmetrical with a six-pane half-light door directly flanked by a six-over-one wood-frame double-hung sash window to either side. Two more six-over-one double-hung sash windows are located to either side of this central group, with one window located under the porch, and one on the outside. A brick chimney is located on the east side of the building. The building has been clad in vinyl siding, but retains its overhanging eaves with two decorative brackets in the porch soffit. An octagonal louvered window is located in the center of the porch pediment.

Figure 16.
Resource U/63/0938

A. 155 Columbia Avenue, Southwest Oblique

B. 155 Columbia Avenue, South Elevation

C. 155 Columbia Avenue, Southeast Oblique

Figure 17.
Resource U/63/0939

A. 161 Columbia Avenue, Southeast Oblique

B. 161 Columbia Avenue, South Elevation

C. 161 Columbia Avenue, Southwest Oblique

Resource U/63/0939.01 is a circa 1950 one-car detached garage located approximately 20 feet to the west of U/63/0939 (Figure 18). It has a front-gabled roof, vertical wood siding, and a large open doorway. It has overhanging eaves and exposed rafter tails.

Resource U/63/0939 is located on Columbia Avenue (SC-823), a busy thoroughfare with a mixture of residential buildings, purpose-built commercial buildings, and historically residential buildings that are currently used commercially. It is set back from the road on a slight rise with a grass front lawn and concrete steps leading to the porch. There are ornamental shrubs near the house, but the yard is not manicured. Resource U/63/0939 is not known to be associated with a specific event or person and was not evaluated under Criteria A or B. It was evaluated under Criterion C for architecture.

The house and garage were not found to embody the distinctive characteristics of a type, period, or method of construction nor do they represent the work of a master or possess high artistic value; therefore, Resources U/63/0939 and U/63/0939.01 are recommended not eligible for listing on the NRHP.

U/63/0949

Resource U/63/0949 is a circa 1960 concrete block commercial office building located at 115 Clark Street (Figure 19). The large building has brick veneer on its front (east) elevation, along with a flat parapet that is capped by a simple aluminum box cornice.

The front elevation is asymmetrical, with a bank of five fixed picture windows in heavy aluminum frames running along the south side of the elevation and a full-light metal door in roughly the center of the elevation. A vinyl awning sits over the windows and door. The long north and south elevations have three vertical concrete block ribs spaced evenly along them and are capped with aluminum gutters.

Resource U/63/0949 is not known to be associated with a specific event or person and was not evaluated under Criteria A or B. It was evaluated under Criterion C for architecture. The building was not found to embody the distinctive characteristics of a type, period, or method of construction nor does it represent the work of a master or possess high artistic value; therefore, it is recommended not eligible for listing on the NRHP.

U/63/0950

Resource U/63/0950 is a circa 1948 concrete block single-story commercial building located at 114 Clark Street (Figure 20). It is similar in massing to a bungalow, but fenestration indicates that it was purpose-built as a commercial building. It has a composition shingle front-gabled roof with a rear hip. The front (west) elevation is symmetrical with a modern wood panel door

Figure 18.
Resource U/63/0939.01

A. 161 Columbia Avenue, Southeast Oblique

B. 161 Columbia Avenue, South Elevation

Figure 19.
Resource U/63/0949

A. 115 Clark Street, Northeast Oblique

B. 115 Clark Street, East Elevation

Figure 20.
Resource U/63/0950

A. 114 Clark Street, Northwest Oblique

B. 114 Clark Street, West Elevation

C. 114 Clark Street, South Elevation

flanked by two fixed picture windows with wood panel shutters. A composition shingle shed roofed porch extends over the whole façade and there are louvers in the roof pediment above the porch. The north and south elevations also feature large picture windows that light the front room, while fenestration towards the rear of the building tends to be much smaller in scale.

Resource U/63/0950 is situated on the corner of Clark Street, which is primarily commercial, and Beaufort Street, which is primarily residential on this block. The yard surrounding it is landscaped, with a grass lawn, deciduous trees, and ornamental bushes and plants. Resource U/63/0950 is not known to be associated with a specific event or person and was not evaluated under Criteria A or B. It was evaluated under Criterion C for architecture. The building was not found to embody the distinctive characteristics of a type, period, or method of construction nor does it represent the work of a master or possess high artistic value; therefore, it is recommended not eligible for listing on the NRHP.

U/63/0951

Resource U/63/0951 is a circa 1930 Craftsman-style bungalow with gingerbread detailing located at 218 Columbia Avenue (Figure 21). It is currently in use commercially, as the Side Tracks Salon. It is roughly square in massing with a composition shingle pyramidal roof and a very large front-gabled porch extending on the front (north) elevation. The porch is supported by two sets of tripled heavy square wooden supports on the outside and single supports in the center.

There are decorative brackets at the roofline, turned wood molding, arched trim, and heavy wood molding along the base of the porch pediment. A wood railing with square balusters runs around the porch and an arched louvered window sits in the porch pediment. The front elevation is symmetrical with a wood paneled half-light door flanked by matching half-light side lights. A two-over-two wood-frame double hung sash window sits to either side of the door. All doors and windows have decorative molded wood casings. There are overhanging eaves with exposed rafter tails carved in a scalloped pattern. A brick chimney extends from an internal fireplace on the west half of the building.

This section of Columbia Avenue is very heavily trafficked. It is primarily lined with civic and commercial buildings, some of which are repurposed residential buildings like U/63/0951. Resource U/63/0951 is set back from the street in a yard that is composed primarily of hardscape, with a palmetto tree in front and decorative bushed and ornamental vines planted alongside the building. Resource U/63/0951 is not known to be associated with a specific event or person and was not evaluated under Criteria A or B. It was evaluated under Criterion C for architecture. The building was not found to embody the distinctive characteristics of a type, period, or method of construction nor does it represent the work of a master or possess high artistic value; therefore, it is recommended not eligible for listing on the NRHP.

Figure 21.
Resource U/63/0951

A. 218 Columbia Avenue, Northwest Oblique

B. 218 Columbia Avenue, North Elevation

C. 218 Columbia Avenue, Northeast Oblique

U/63/0952

Resource U/63/0952 is a circa 1941 American Small House located at 219 Columbia Avenue (Figure 22). It is currently used as a commercial building, and houses the Law Office of Laura Huggins. It has a lateral-gable, composition shingle roof and is clad in clapboards. The historic core is rectangular in massing although either an addition or an altered carport on the right side of the front (south) elevation makes the building's footprint L-shaped. The nine-pane half-light wooden door is sheltered by a front-gabled porch with two sets of three square wooden supports. The pediment is partially closed forming a rounded arched porch roof and the eaves return. Concrete steps lead up to the small porch and there are wooden handrails. To the left and right of the entry are eight-over-eight wood-frame double hung sash windows with decorative wood shutters. The windows are modern replacements. There are two small internal chimneys, one in the center of the house, and one to the west. The east side features a porch that is entered via a doorway that faces east in the front of a room. Another eight-over-eight window is located on the south elevation of this portion of the house, and a handicapped entrance has been added on the far east side of the building.

While Columbia Avenue is a bustling commercial thoroughfare, U/63/0952 was originally a residential building and retains landscaping that is consistent with its original use. It is set back from the road with a grassy lawn and ornamental shrubs and other plants in beds surrounding the building. Resource U/63/0952 is not known to be associated with a specific event or person and was not evaluated under Criteria A or B. It was evaluated under Criterion C for architecture. The building was not found to embody the distinctive characteristics of a type, period, or method of construction nor does it represent the work of a master or possess high artistic value; therefore, it is recommended not eligible for listing on the NRHP.

U/63/0953

Resource U/63/0953 is a circa 1892 Folk Victorian style one and a half-story gable-wing cottage located at 222 Columbia Avenue (Figure 23). It is currently vacant. The cross-gabled roof is composed of both pressed metal shingles and standing-seam metal roofing, and the house is clad in wooden clapboards. The lateral-gable front section features a shed-roofed rounded porch which wraps around the front (north) elevation and east elevation. The porch has turned wood supports with scalloped brackets attaching them to the ball-and-stick fretwork that runs along the roofline. The porch railing is wood with turned balusters. Two brick steps led onto the porch directly in front of the entrance, which is framed by two three-pane sidelights and a four-pane transom. The door itself is wood paneled, with a central clear glass panel bracketed on the top and bottom by bands of small rectangular panes of stained glass. The front door is flanked to the

Figure 22.
Resource U/63/0952

A. 213-215 Columbia Avenue, South Elevation

B. 213-215 Columbia Avenue, Southwest Oblique

C. 213-215 Columbia Avenue, Southeast Oblique

Figure 23.
Resource U/63/0953

A. 222 Columbia Avenue, North Elevation

B. 222 Columbia Avenue, Northeast Oblique

C. 222 Columbia Avenue, East Elevation

left and right by six-over-six wood-frame double hung sash windows with louvered shutters. Two internal brick and concrete chimneys are placed symmetrically and extend through the top of the gable to either side of the entrance. Six-over-six wood-frame double hung windows in the gable ends indicate a usable half story above the ground floor. There are decorative brackets in the soffits and the eaves return.

The front-gabled rear portion of the building features six-over-six double-hung wood-frame sash windows with louvered shutters and one concrete parged chimney. Inconsistent detailing between this and the front section indicates that it is a historic addition rather than an original component of the house. Resource U/63/0953 is situated on Columbia Avenue, directly between Mount Horeb Lutheran Church, which spans almost half the block, and various commercial buildings. It is vacant and the yard is contains a combination of ornamental plants and weeds.

Resource U/63/0953 is not known to be associated with a specific event or person and was not evaluated under Criteria A or B. It was evaluated under Criterion C for architecture. It is a Folk Victorian gable-wing cottage. It has excellent integrity, having retained most original trim as well as elements such as windows and siding. No additions or alterations have been made to the building that post-date the era of significance. Its original use and site have not been altered although the building is currently vacant. The building was found to embody the distinctive characteristics of a type and period of construction and is recommended as eligible for inclusion on the NRHP under Criterion C for architecture on the local level of significance.

U/63/0954

Resource U/63/0954, the Mt. Horeb Lutheran Church, is located at 101 East Boundary Street (Figure 24). It is a large brick veneer building with multiple additions that extend along the entire west side of the block of East Boundary Street from Columbia Avenue to Beaufort Street. The original building was constructed in 1963, and it is the north portion of the complex, located at the corner of Columbia Avenue and East Boundary Street. It can be entered from either the east or west, but the main entrance is on the east elevation, facing East Boundary Street. While the church is Modern in style, the layout is traditional with a cross-gabled apse and transept on the north end of the building and a nave that runs to the south. The cross-gabled portion features a ribbed decoration on each side consisting of five vertical brick veneer bars that run from cornice to ground and which stand proud of the wall. The space between these ribs contains gold geometric metal grates on all three sides. The north side has stained glass windows that run behind these grates from the roofline to roughly six feet above the ground. The west elevation has one-over-one double-hung sash windows in these spaces, while the space are blind on the east elevation. Along the laterally-gabled nave run seven bays of tall, narrow fixed windows with the same abstract design stained glass that is on the north elevation. There is a handicapped entrance directly behind the transept on the rear (west) elevation.

Figure 24.
Resource U/63/0954

A. 101 East Boundary Street, Northeast Oblique

B. 101 East Boundary Street, North Elevation

C. 101 East Boundary Street, Northwest Oblique

The main entrance is located on the east elevation, to the rear of the historic nave. An extensive addition was completed in 1999, which more than doubled the size of the church. The main entrance is part of this addition, with a giant order brick portico and a large, contemporary bell tower sculpture. The addition extends to the south along East Boundary Street, and a hyphen connects the main building to another added hipped roof component at the corner of East Boundary Street and Beaufort Street.

The Mt. Horeb Lutheran Church is a significant component of Chapin history, having been established roughly concurrently with the town itself. Therefore, this building was evaluated under Criterion A, as it is associated with a locally significant church. It was also evaluated under Criterion C for architecture. While it is associated with the Mt. Horeb Lutheran Church, the current building was not constructed until 1963, and is not in the location of the original meeting place of the congregation. Unless the period of significance for the Mt. Horeb Lutheran Church can be established as post-dating 1963, it would be difficult to argue for the inclusion of the current building on the NRHP. Furthermore, extensive additions and renovations have significantly impacted the historic integrity of the building. It is recommended as being not eligible for inclusion on the NRHP.

U/63/0955

Resource U/63/0955 is a circa 1910 Craftsman-style gable-wing cottage located at 225 Columbia Avenue (Figure 25). It is currently in use commercially as the office of S. Duane Carter, CPA. It is one and a half stories tall with a composition-shingle roof and weatherboard siding. The front (south) elevation has a front-gabled three-sided L on the far west side, with a narrow nine-over-nine wood-frame double-hung sash window on each of the three sides. This portion intersects the hipped roof porch, which is supported by two heavy square wood and brick posts. A wood railing with turned balusters runs around the porch and wood steps lead to the wood panel half-light front door. Another nine-over-nine wood-frame double-hung sash window lies to the east of the door. The roofline of the laterally gabled front portion of the house rises slightly in the center, creating a slight hip. The rear portion of the house is front-gabled and terminates in a hip. There are overhanging eaves. There are three brick chimneys, two in the front portion of the house, and one at the rear.

Resource U/63/0955 faces onto Columbia Avenue, which is a busy commercial corridor on this block. The building is set back from the road allowing for a generous front yard. A low historic brick and concrete wall surrounds the house. Grass, decorative shrubs and plants, and a mature hemlock tree compose the yard. Resource U/63/0955 is not known to be associated with a specific event or person and was not evaluated under Criteria A or B. It was evaluated under

Figure 25.
Resource U/63/0955

A. 225 Columbia Avenue, South Elevation

B. 225 Columbia Avenue, Southeast Oblique

C. 225 Columbia Avenue, East Elevation

Criterion C for architecture. The building was not found to embody the distinctive characteristics of a type, period, or method of construction nor does it represent the work of a master or possess high artistic value; therefore, it is recommended not eligible for listing on the NRHP.

U/63/0956

Resource U/63/0956 is a circa 1960 compact Ranch house located at 210 Beaufort Street (Figure 26). It is one story tall with a composition shingle hipped roof and brick veneer cladding. Its front (south) elevation features two bays of aluminum frame one-over-one double hung sash windows, one single and one paired. There is no porch although concrete steps and a simple aluminum railing lead to a concrete stoop in front of the wood panel door and a tripartite picture window. There is a small window in the door. A carport with square brick supports is located on the east elevation. There are overhanging eaves.

Resource U/63/0956 is located next to the Mt. Horeb Lutheran Church, on a block that is primarily residential buildings, some in use commercially now. U/63/0956 remains residential and has a large yard with grass, ornamental bushes that have been shaped, and deciduous trees.

Resource U/63/0956 is not known to be associated with a specific event or person and was not evaluated under Criteria A or B. It was evaluated under Criterion C for architecture. The building was not found to embody the distinctive characteristics of a type, period, or method of construction nor does it represent the work of a master or possess high artistic value; therefore, it is recommended not eligible for listing on the NRHP.

U/63/0957

Resource U/63/0957 is a circa 1920 central hallway cottage located at 110 Peak Street (Figure 27). Its front (west) elevation is symmetrical with a laterally gabled standing-seam metal roof that extends to create a fairly deep porch across the full elevation. The eight-pane half-light door is flanked to the left and right by paired six-over-six wood-frame double-hung sash windows. The porch has four decorative aluminum supports and there is an external brick chimney on the south elevation. There are extensive additions to the rear of the building, including a large laterally gabled addition and a shed-roofed porch on the south side of the laterally gabled portion. The building has overhanging eaves and exposed rafter tails.

Resource U/63/0957 is in a residential area with a large lot surrounding it. It has a grass lawn, ornamental shrubs, and a number of deciduous trees. Resource U/63/0957 is not known to be associated with a specific event or person and was not evaluated under Criteria A or B. It was evaluated under Criterion C for architecture. The building was not found to embody the

Figure 26.
Resource U/63/0956

A. 210 Beaufort Street, Southeast Oblique

B. 210 Beaufort Street, South Elevation

Figure 27.
Resource U/63/0957

A. 110 Peak Street, Northwest Oblique

B. 110 Peak Street, West Elevation

C. 110 Peak Street, South Elevation

distinctive characteristics of a type, period, or method of construction nor does it represent the work of a master or possess high artistic value; therefore, it is recommended not eligible for listing on the NRHP.

U/63/0958

Resource U/63/0958 is a circa 1920 one and a half-story Georgian cottage located at 123 Columbia Avenue (Figure 28). It is currently in use as the Caughman-Harman Funeral Home. It has a composition shingle laterally gabled roof and vinyl siding. The front (south) elevation is symmetrical, with a hipped roof porch with square wood supports over all fenestration. The wood panel door has an oval window and is flanked by two three-pane sidelights and a two-pane transom overhead. To either side are six-over-six wood frame double-hung sash windows. Operable six-over-six double-hung sash windows in the gable ends on the side elevations indicate a usable half-story above the ground floor. A hyphen connects the historic core to a laterally-gabled addition, which features plain double doors and three six-over-six wood frame double-hung sash windows. All windows have louvered shutters. There is a small laterally-gabled addition on the rear.

Resource U/63/0958 is located on a busy commercial section of Columbia Avenue. Its carefully manicured yard has a grass lawn, hardscape, and ornamental shrubs. Resource U/63/0958 is not known to be associated with a specific event or person and was not evaluated under Criteria A or B. It was evaluated under Criterion C for architecture. The building was not found to embody the distinctive characteristics of a type, period, or method of construction nor does it represent the work of a master or possess high artistic value; therefore, it is recommended not eligible for listing on the NRHP.

U/63/0959

Resource U/63/0959 is a circa 1952 Tudor-inspired Linear Ranch House located at 149 Columbia Avenue (Figure 29). It has a laterally-gabled composition shingle roof and is clad in brick veneer. Its front (south) elevation features a central steeply pitched front gabled portion that stands slightly proud of the rest of the façade, though not enough to alter the overall rectangular massing of the house. This section features a set of paired two-over-two, wood frame, double hung sash windows and a fanlight in the top of the gable end. To the east of this section lies the wood panel front door, which has an oval window set at the top of two shallow concrete steps. A tripartite picture window and a large chimney are on the far east of the front façade. To the west of the front-gable portion are two single two-over-two wood frame double-hung sash windows, and a two-car carport with a square brick support. Another brick chimney is situated between the house and attached carport, rising through the laterally-gabled roof.

Figure 28.
Resource U/63/0958

A. 123 Columbia Avenue, South Elevation

B. 123 Columbia Avenue, Southeast Oblique

C. 123 Columbia Avenue, East Elevation

Figure 29.
Resource U/63/0959

A. 149 Columbia Ave, South Elevation

B. 149 Columbia Ave, Southwest Oblique

C. 149 Columbia Ave, Southeast Oblique

Resource U/63/0959 is located in a bust section of Columbia Avenue. Most of the buildings in this area were constructed to be residences, although some have been converted for commercial use. U/63/0959 has a generous setback and large yard, which contains grass, deciduous trees, and a variety of ornamental plants. Resource U/63/0959 is not known to be associated with a specific event or person and was not evaluated under Criteria A or B. It was evaluated under Criterion C for architecture. The building was not found to embody the distinctive characteristics of a type, period, or method of construction nor does it represent the work of a master or possess high artistic value; therefore, it is recommended not eligible for listing on the NRHP.

U/63/0960

Resource U/63/0960 is a circa 1955 industrial commercial building located at 102 Lexington Avenue (Figure 30). It is a former fire station and currently houses Chapin Post 193 of the American Legion. It is a large rectangular block building clad in brick veneer.

The roof is not visible and there is an aluminum box cornice at the roofline. The front (west) elevation has a metal safety door to the left and three irregularly sized large aluminum garage doors to the right.

Resource U/63/0960 is located on the corner of Lexington Avenue and Columbia Avenue, a busy commercial intersection. Its lot is composed entirely of concrete, with a large flagpole sited near the northwest corner of the building. Resource U/63/0960 is not known to be associated with a specific event or person and was not evaluated under Criteria A or B. It was evaluated under Criterion C for architecture. The building was not found to embody the distinctive characteristics of a type, period, or method of construction nor does it represent the work of a master or possess high artistic value; therefore, it is recommended not eligible for listing on the NRHP.

Figure 30.
Resource U/63/0960

A. 102 Lexington Avenue, Northwest Oblique

B. 102 Lexington Avenue, West Elevation

III. RESULTS AND RECOMMENDATIONS

As a result of the archaeological survey, no new archaeological sites were identified within the additional project area. The additional historic architectural survey identified and evaluated 25 resources that reflected primarily twentieth-century domestic and commercial functions. Nine resources were recommended eligible for listing on the NRHP under Criterion A as components of The Chapin Commercial Historic District. One additional resource is recommended as eligible for inclusion on the NRHP under Criterion C. Proposed improvements along S-48 (Chapin Road) within the historic district include repaving and restriping the road. Therefore, there will be no effects to the district. The other 15 resources lack historical associations that would qualify for NRHP listing under Criteria A and B, and none have qualities of significance under Criterion C. Moreover, these resources have mostly been altered in ways that detract from their historical appearance and use, causing them to lose integrity. Therefore, there will be no effect to historic properties within this additional study area.

REFERENCES CITED

Dykens, Katie and Ryan Sipe

2016 *Cultural Resources Survey of S-48 (Columbia Avenue) Improvements, Lexington County, South Carolina*. Report prepared for Mead & Hunt, Inc., Lexington, South Carolina. Report available from New South Associates, Inc., Stone Mountain, Georgia.

Foley, Ehren

2016 Re: Chapin Commercial Historic District, Lexington Co. January. Electronic mail communication.

Lewis, J.D.

2016 South Carolina - Railroads. *South Carolina - Railroads*. Electronic document, http://www.carolana.com/sc/transportation/railroads/, accessed January 26, 2016.

APPENDIX A: SHPO LETTER – CHAPIN COMMERCIAL HISTORIC DISTRICT

January 28, 2016

J.J. Casey
711 Hawk View Court
Chapin, S.C. 29036

Re: Chapin Commercial Historic District, Lexington Co.

THE South Carolina Archives & History Center

HISTORY & HERITAGE FOR ALL GENERATIONS

Dear Ms. Casey,

After our site visit to Chapin and review of additional documents, it is the opinion of our office that the town does possess an eligible National Register district. This eligible district comprises buildings fronting onto Clark, Beaufort, Lexington, and Chapin streets. Further research will be required to determine the precise number of contributing and non-contributing buildings/structures. We have provided a rough map of the likely district boundaries with a preliminary indication of contributing and non-contributing buildings. It is possible that further research into the history and development of the town will require a revision of the contributing/non-contributing buildings as well as a slight revision of the proposed boundaries. That is all to say that this preliminary determination is merely a starting point and will require further refinement as you proceed with preparing a nomination.

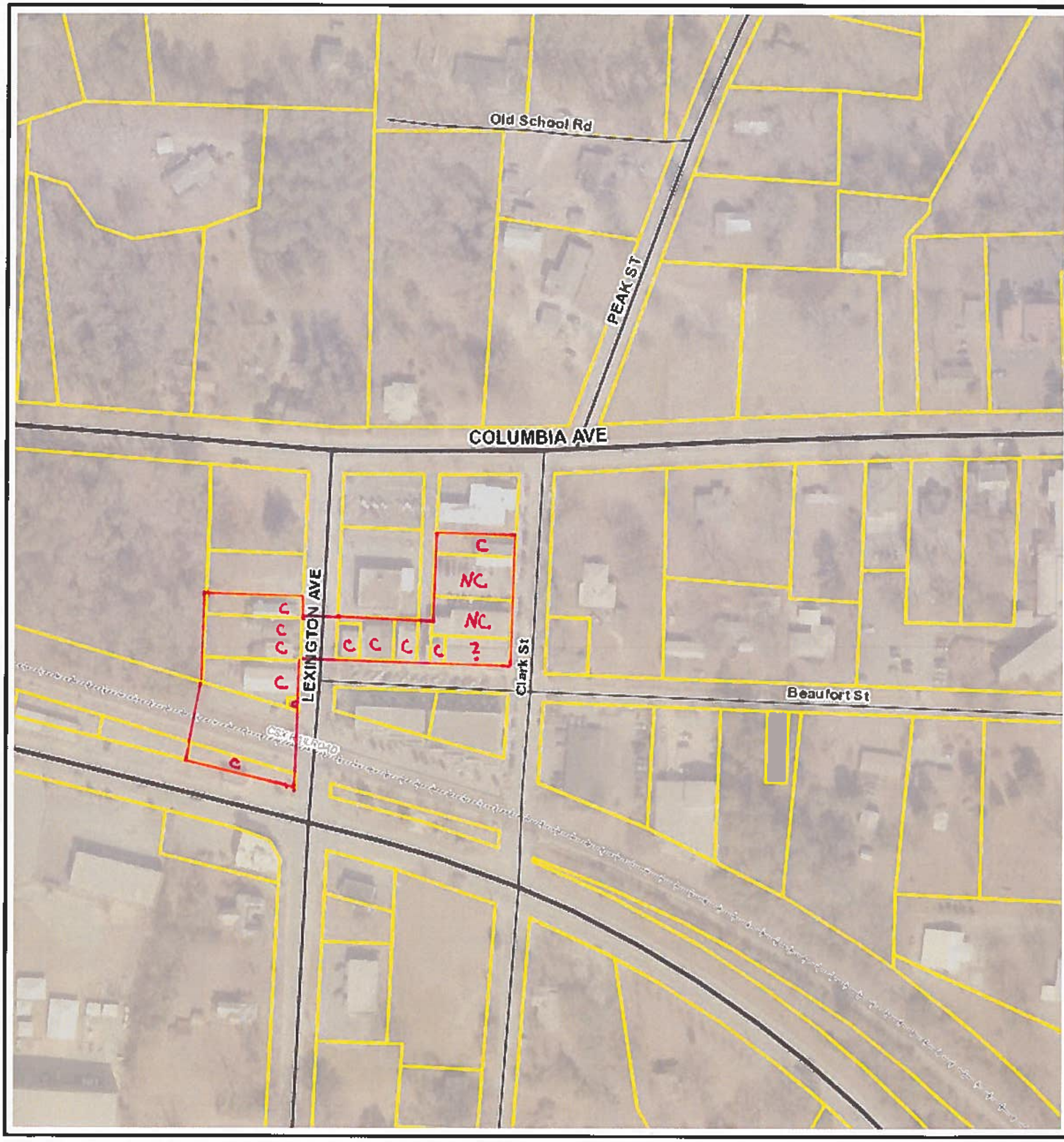
It is our opinion that the district is eligible for listing at the local level of significance under Criterion A in the area of Commerce. The collection of buildings includes the Old Dispensary (c. 1901; 103 Clark St.) and the Bank of Chapin building (c. 1908; 108 Beaufort St.), among others. It will be important to provide a comprehensive inventory of all buildings, contributing and non-contributing, which includes brief historical sketches and dates of construction. It will also be important to define a period of significance and to discuss how the district represented by these buildings, though small, played a significant role in the in the commercial life and development of the town of Chapin. I have included a sample nomination for the recently listed Columbia Commercial Historic District. While that district is more substantial in size, the format, documentation, and level of information that you will want to include is similar.

Several factors played a role in our determination of eligibility. One was the relatively high degree of physical integrity possessed by the buildings within the district boundaries. While none of the buildings are, either individually or as a whole, especially significant architecturally, they do appear to retain the character defining features that identify their past and present use as commercial buildings. These include original wood/steel storefronts and fenestration patterns. The Old Dispensary stands out as a particularly intact example, both on the interior and exterior, with few apparent changes other than the addition of a small office/restroom space in the rear corner. Anyone preparing a nomination would want to further assess and highlight the integrity of the buildings within the district. Also important was the fact that, when examining historic maps of the area, it appeared that the composition of the district has changed relatively little since at least 1934. There are a few instances of non-historic infill but, for the most part, the buildings that remain represent the core of Chapin's historic commercial center. That the district retains its historic composition was particularly important given its relatively small size. When considering whether these few buildings represented an eligible district, it was important for us to understand that Chapin's commercial district was always small in size and so what remains is largely what existed historically.

I have attached [by email attachment only] National Register forms, instructions, and a link to our consultants list for your use in preparing, or having prepared, a draft nomination for review by this office. If you have any questions about the nomination process or would like to discuss your approach to a draft nomination for the district, please contact me at 803-896-6182 or by email at efoley@scdah.sc.gov.

Sincerely,

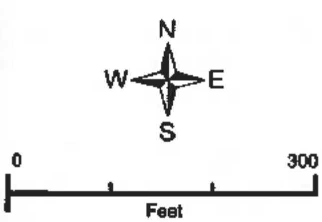
Ehren Foley, Ph.D.
National Register of Historic Places Historian
South Carolina State Historic Preservation Office
Columbia, South Carolina
803.896.6182



Lexington County

Chapin

Printed: Jan 27, 2016



South Carolina
Department of Transportation

October 24, 2016

OCT 27

2017-66-5

Dr. Adrianne Daggett
South Carolina Department of Archives & History
8301 Parklane Road
Columbia, South Carolina 29223-4905

Re: *New South Associates' Addendum: Cultural Resource Survey of S-48 (Columbia Avenue) Improvements, Lexington County, South Carolina.* **SCDOT Project Number P042383**

Dear Dr. Daggett:

The South Carolina Department of Transportation (SCDOT) proposes to improve S-48 and the approaches of several intersecting streets in the Town of Chapin (see attached project plans). The State Historic Preservation Office (SHPO) reviewed the majority of the project area in the first half of 2016 (see attached SHPO concurrence letter). The current addendum report covers an area that was subsequently added to the project scope. This area is roughly 0.4 miles long and is immediately west of the area covered in the former cultural resource coordination.

The current cultural resource investigations identified no archaeological sites. Twenty-five (25) aboveground resources were identified in the addendum project area. Of these resources only one (site # 0953) was identified as individually eligible for the National Register of Historic Places (NRHP). Nine of the identified resources are considered contributing elements to the Chapin Commercial Historic District. The proposed project does not acquire any new right-of-way from either site # 0953 or the Chapin Commercial District and will not affect either resource's character, setting, or feel. It is therefore recommended that the proposed project will not affect historic resources. No further investigations are recommended.

In accordance with the memorandum of agreement approved by the Federal Highway Administration (FHWA), November 29, 2011, SCDOT is providing this information as agency official designee, as defined under 36 CFR 800.2, to ensure compliance with Section 106 of the National Historic Preservation Act.

It is requested that you review the enclosed material and, if appropriate, indicate your concurrence with SCDOT findings, thus completing the Section 106 consultation process. Please respond within 30 days if you have any objections or if you have need of additional information.

Sincerely,

David P. Kelly
NEPA Coordinator, RPG 4

DPK:dk
Enclosures: Addendum cultural resources report, survey cards, plan sheets, 4/20/2016 SHPO correspondence

I (do ~~not~~) concur in the above determination.

Signed: Wenonah G. Haire DMD Date: 11/10/16

ec: Shane Belcher, FHWA
Russell Townsend, Eastern Band Cherokee
Eric Oosahwee, United Keetowah Band of Cherokee

cc: Wenonah G. Haire, Catwaba Nation THPO
Keith Derting, SCIAA

File: ENV/DPK

RECEIVED

NOV 28 2016

Environmental Management
SCDOT

Appendix I

Phase I Environmental Site Assessment

Mead & Hunt
878 South Lake Drive
Lexington, South Carolina 29072
803-996-2900
meadhunt.com

May 26, 2016

Mr. Jeff McNesby, PE
Lexington County
440 Ball Park Road
Lexington, SC 29072

Subject: Phase I Environmental Site Assessment
Columbia Avenue (S-48) Corridor Improvement Project from the intersection of Zion Church Road and Amick's Ferry Road (S-51) to approximately 1,500 feet east of the I-26/Columbia Avenue interchange (Exit 91).
Mead & Hunt Project Number: R4035500-121734.01

Dear Mr. McNesby:

Mead & Hunt, Inc. (Mead & Hunt) has performed a Phase I Environmental Site Assessment for the above referenced Lexington County project. The report was prepared pursuant to the contract between Mead & Hunt and Lexington County executed on April 28, 2014. Two (2) copies of the draft report are attached for your use.

Mead & Hunt appreciates the opportunity to provide our services to you on this important project. If you have any questions or if we can be of additional service, please feel free to contact us at (803) 996-2900.

Sincerely,

MEAD & HUNT, Inc.

Lou Raymond, PE, AICP
Environmental Planner

Attachment

cc: SCDOT

Phase I Environmental Site Assessment

Columbia Avenue (S-48) Corridor Improvement Project from the intersection of Zion Church Road and Amick's Ferry Road (S-51) to approximately 1,500 feet east of the I-26/Columbia Avenue interchange (Exit 91)

Lexington County, South Carolina

Prepared for:

County of Lexington
440 Ball Park Road
Lexington, South Carolina 29072

Mead & Hunt Project # R4035500-121734.01

Mead & Hunt

878 South Lake Drive
Lexington, South Carolina 29072
803-996-2900
meadhunt.com

May 26, 2016

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Appendices

Summary

Mead & Hunt, Inc. has completed a Phase I Environmental Site Assessment (ESA), according to American Society for Testing and Materials (ASTM) E 1527-13 and in accordance with purchase order 1502096 between Mead & Hunt and County of Lexington, SC, dated April 28, 2014, for the subject project described herein as the *Columbia Avenue (S-48) Corridor Improvement Project*. Our services were authorized by Angela Seymour with the County of Lexington Procurement Services through acceptance of a contract between Mead & Hunt and the County of Lexington. This summary is intended as an overview of the Phase I ESA, for the convenience of the reader. The complete report must be reviewed in its entirety prior to making decisions regarding properties along this project's study area.

The *Columbia Avenue (S-48) Corridor Improvement Project* is located in the Town of Chapin, County of Lexington, South Carolina. The project termini are from the intersection of Zion Church Road and Amick's Ferry Road (S-51) extending to approximately 1,500 feet beyond the I-26/Columbia Avenue interchange (Exit 91) to the east. Columbia Avenue is currently a two-lane roadway that runs from US 76 at its intersection with Amick's Ferry Road (S-51) to the Richland County line, approximately 0.8 mile east of the I-26 interchange. Proposed alternatives will be investigated to improve congestion within the corridor. Many alternatives will be investigated and include such improvements as roadway widening, new alignment, and interchange/intersection reconfiguration.

Five findings within the project study area and two findings outside the project study area of environmental concern were revealed. Mead & Hunt offers the following opinion regarding these findings identified during the Phase I ESA:

Four confirmed releases of hazardous materials or petroleum products were identified in the EDR Report inside the project study area.

According to the EDR Report, LUSTs were the source of two of the releases. One of the two is recommended for an investigation/risk assessment (Corner Pantry 132 at 661 Columbia Avenue). The other is awaiting funding for cleanup (Pitt Stop 7 at 648 Columbia Avenue). These two sites where LUSTs were the source of releases of hazardous materials or petroleum products are considered *recognized environmental conditions* (*RECs*).

The remaining two releases were SPILLS sites, one was approximately 20 gallons of diesel fuel in 2002 (Diesel Fuel Pump at 650 Columbia Avenue) and the other was 15 gallons of gasoline in 2006 (Fuel Tank at 659 Columbia Avenue). It is not anticipated that the volumes of these two SPILLS contaminated either property or extended up gradient to existing Columbia Avenue; and therefore are not considered *REC*s.

The fifth finding inside the project study area is the Signode Packaging site (also listed as FB Johnston Graphics and Central Label Production site) at 300 East Boundary Street (S-82) which is identified on at least six environmental databases, including RCRA, SHWS (equivalent of a state Superfund facility), and BROWNFIELDS. This site is considered a *REC*.

Two confirmed releases of hazardous materials or petroleum products were identified in the EDR Report outside the project study area. According to the EDR Report, LUSTs were the source of the releases, and both were recommended to conduct an investigation/risk assessment. One of the two confirmed releases outside the project study area is related to the Former Union Concrete Plant at 912 Chapin Road. This facility is now developed as a Mexican restaurant. The second of the two confirmed releases outside the project study area is related to the existing S&S Garage at 930 Chapin Road. It is not anticipated the contamination from these two confirmed releases would advance or extend up gradient to Chapin Road; and therefore neither is considered a *REC*.

Based on this Phase I ESA, Mead & Hunt found evidence of three *recognized environmental conditions* (*RECs*) in connection with the project study area for the *Columbia Avenue (S-48) Corridor Improvement Project*.

1.0 Introduction

Mead & Hunt, Inc. (Mead & Hunt) conducted a Phase I Environmental Site Assessment (ESA) of the subject project located in Lexington County, in Chapin, South Carolina. The ESA was conducted using the American Society for Testing and Materials (ASTM) E 1527-13, Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process and in accordance with purchase order 1502096 between Mead & Hunt and County of Lexington, dated April 28, 2014.

1.1 Purpose

The purpose of the Phase I ESA is to identify, pursuant to ASTM E 1527-13, *recognized environmental conditions* (*RECs*) in connection with the project study area for the *Columbia Avenue (S-48) Corridor Improvement Project*.

ASTM defines the term *recognized environmental condition* as the presence or likely presence of hazardous substances or petroleum products on the property under conditions that are indicative of an existing release, a past release, or a material threat of a release of hazardous substances or petroleum products into the structures on the property or into the ground, groundwater, or surface water of the site (project study area as described in Section 2). The term does not include *de minimis* conditions that generally do not present a material risk of harm to public health or the environment and that generally would not be the subject of enforcement action if brought to the attention of appropriate governmental agencies.

1.2 Detailed Scope of Services

Mead & Hunt's approach to performing this Environmental Site Assessment consisted of three major tasks in general accordance with ASTM Standard Practice E-1527-13.

<u>Task 1</u> - A review of reasonably ascertainable public records for the project study area (PSA) and the immediate vicinity was conducted. This review was performed to characterize environmental features of the PSA and to identify past and present land use activities, on or in the vicinity of the PSA, which may indicate a potential for *recognized environmental conditions*. The review of the reasonable ascertainable public records included:

1. Examination of federal, state, tribal and reasonably ascertainable local public records for the PSA and immediate vicinity.
2. Examination of one or more of the following standard sources: aerial photographs, fire insurance maps, tax files, building department records, zoning/land use records, street directories and topographic maps of the PSA and vicinity for evidence suggesting past uses that might have involved hazardous substances or petroleum products. These records for the PSA and maps of the PSA are included in Appendix C.

<u>Task 2</u> - A PSA reconnaissance was performed to identify visible signs of past or existing contamination on or adjacent to the PSA. This reconnaissance was also performed to evaluate evidence found in our public record

review that might indicate activities resulting in hazardous substances or petroleum products being used or deposited on properties within the PSA. The PSA reconnaissance included the following activities:

1. A reconnaissance of the PSA and adjacent properties was performed to look for evidence of current and past property uses, signs of spills, monitoring wells, stressed vegetation, buried waste, underground or above ground storage tanks, subsidence, transformers, or unusual soil discoloration which may indicate the possible presence of contaminants on the properties. Photographs are provided to document these conditions.

2. The exterior reconnaissance involved a viewing of the periphery of the properties in the PSA.

<u>Task 3</u> - Report preparation and review.
Unless specifically authorized as an addition to the Phase I ESA work scope, the assessment did not include any assessment of environmental conditions not specifically included in the ASTM E 1527-13 standard such as the assessment of business risk issues such as; lead in drinking water; mold, fungi or bacteria in on-site buildings; regulatory compliance; cultural/historic risks; industrial hygiene; health/safety; ecological resources; endangered species; indoor air quality including possible vapor intrusion; radon or high voltage power lines.

1.3 Significant Assumptions

A significant assumption used in evaluating potential impacts to the properties in the PSA from off-site facilities or incidents was that the slope of the water table under static conditions (no pumping interference) often approximates the land surface topography. Thus, the movement of groundwater is assumed to be in approximately the same direction as topographic slope of the surrounding property. Perennial surface waters (creeks, streams, rivers, etc.) are assumed to act as a discharge point for groundwater flow.

Another significant assumption is that information acquired from the public record is accurate and reliable.

1.4 Limitations and Exceptions

This Phase I Environmental Site Assessment was conducted using ASTM E 1527-13. The findings of this report are applicable and representative of conditions encountered at the properties within the PSA on the date of this assessment, and may not represent conditions at a later date.

The review of public records was limited to that information which was available to Mead & Hunt at the time this report was prepared. No interviews with local and state government authorities were conducted by Mead & Hunt. Information was derived from *reasonably ascertainable* and *practically reviewable* sources in compliance with our understanding of the standards set forth by ASTM E 1527-13.

Specific limitations to this assessment are; chain-of title and environmental lien or activity and use limitations information was not provided to date by the User (County of Lexington). The County of Lexington was responsible for reviewing and providing any land title and judicial records for environmental liens or activity and use limitations. Any information that would be provided by the County of Lexington is assumed to be correct.

1.5 Special Terms, Conditions and Reliance

This Phase I ESA was prepared pursuant to the contract (Agreement) between Mead & Hunt and Lexington County executed on April 28, 2014 and the County of Lexington, Purchase Order 1502096. A copy of the contract and purchase order is included in Appendix E.

1.6 User Reliance

The resulting report is provided for the sole use of Lexington County and their assignees. Use of this report by any third parties will be at such party's sole risk except when granted under written permission by Mead & Hunt. Any such authorized use or reliance by third parties will be subject to the same contract agreement under which the work was conducted for Lexington County.

Additional party's use and reliance on the report will be subject to the same rights, obligations, and limitations imposed on the client by our Agreement. However, the total liability of Mead & Hunt to all parties of the Phase I ESA shall be limited to the remedies and amounts as provided in the Agreement as a single contract. The additional party's use and reliance on the report shall signify the additional party's agreement to be bound by the proposal and contract that make up the Agreement between Mead & Hunt and Lexington County.

According to standards set forth by ASTM 1527-13, components of the Phase I ESA will expire 180 days from the date of completion of that component and may therefore require updating if the date of property acquisition exceeds this time period. The following lists the dates of completion for pertinent components:

Component	Date of Completion
Environmental Database Search	November 20, 2015
PSA Reconnaissance	December 3, 2015 and February 4, 2016

2.0 Project Study Area Description

2.1 Project Location

The *Columbia Avenue (S-48) Corridor Improvement Project* is located in the Town of Chapin, County of Lexington, South Carolina. The project termini are from the intersection of Zion Church Road and Amick's Ferry Road (S-51) to approximately 1,500 feet east of the I-26/Columbia Avenue interchange (Exit 91). Please see Appendix A, Figure 1 for the Site Location Map.

2.2 Project Description

Columbia Avenue (S-48) is currently a two-lane roadway that runs from US 76 at its' intersection with Amick's Ferry Road (S-51) to the Richland County line, approximately 0.8 mile east of the I-26 interchange. Proposed alternatives will be investigated to improve congestion within the corridor. Many alternatives will be investigated and include such improvements as roadway widening, new alignment, and interchange/intersection reconfiguration.

2.3 Descriptions of Roads, Structures, and Other Roadway Improvements

Columbia Avenue (S-48) and US 76 are the main two roadways that lead into the Town of Chapin. These roadways intersect near the center of the Town. Additionally, Columbia Avenue terminates at US 76 and an existing rail line parallels US 76 on the north side throughout the Town of Chapin and beyond. The only bridge structure within the PSA is the Columbia Avenue overpass of I-26. A new roadway is currently under construction on the north side of Columbia Avenue to the east of Chapin High School. This roadway is identified as Brighton Boulevard and intersects Columbia Avenue at the existing intersection of Columbia Avenue and Woodthrush Road.

2.4 Current Land Uses

Current land uses along the existing Columbia Avenue roadway, from the Chapin Road (S-39) northern project terminus to Peak Street (S-49) in Chapin, are generally developed closer to the center of the Town of Chapin (intersection of Columbia Avenue and US 76). However, there are more undeveloped lands east of Chapin High School and approximately 1,500 feet east of the I-26/Columbia Avenue interchange area. From Columbia Avenue in the Town of Chapin, the PSA parallels the Chapin High School property on its' west side (developed school property) heading south and then turning west through some commercial development along East Boundary Street (S-82) and crossing the commercially developed US 76 corridor, and then continuing through undeveloped land at the terminus of Amick's Ferry Road (S-51). Several of the commercial properties identified as listed sites in the EDR DataMap (see Appendix C) have changed names and/or have gone out of business throughout the PSA.

3.0 User Provided Information

This section summarizes information provided by the County of Lexington that may help in the identification of *RECs*. Pursuant to ASTM Practice E-1527-13, the environmental professional does not typically generate this information.

3.1 Title Records

Title records were not provided to date by the County of Lexington.

3.2 Environmental Liens or Activity and Use Limitations

The County of Lexington has not provided to date any knowledge of Environmental Liens or Activity and Use Limitations on the properties within the PSA.

3.3 Specialized Knowledge

No specialized knowledge of the properties within the PSA has been provided to date by the County of Lexington.

3.4 Valuation Reduction for Environmental Issues

The County of Lexington has not provided to date any valuation reduction for environmental issues.

3.5 Commonly Known Information about the Property

The County of Lexington has not provided to date any commonly known or reasonably ascertainable information about the properties within the PSA.

3.6 Obvious Indicators of Contamination

The County of Lexington has not provided to date any obvious indicators of contamination or the ability to detect contamination for properties within the PSA.

3.7 Reason for Performing Phase I ESA

Mead & Hunt understands the overall purpose of this Phase I ESA is to assist the County of Lexington in identifying *RECs* associated with the PSA and to satisfy one of the requirements to qualify for the innocent landowner, contiguous property owner, or bona fide prospective purchaser limitations on CERCLA liability. No other environmental aspects were assessed beyond the scope of ASTM 1527-13 in connection with this Phase I ESA.

4.0 Records Review

4.1 Standard Environmental Record Sources

Mead & Hunt contracted Environmental Data Resources, Inc. (EDR) to conduct an environmental search and prepare a Radius Map Report which compiles federal and state environmental database information from the regulatory records of the United States Environmental Protection Agency (USEPA) and the State of South Carolina. The purpose of the EDR Report was to identify environmental sites and activities within a radius of potential concern from the project corridor area, as outlined by ASTM E 1527-13. The following table lists databases included in the search. The EDR report, including detailed descriptions of the databases and acronyms used below, is included in Appendix D.

Database	Search Distance	Number of Sites
Federal Environmental Records Sources		
NPL	1 mile	0
Proposed NPL	1 mile	0
Delisted NPL	1 mile	0
NPL Liens	1 mile	0
CERCLIS	0.5 mile	0
CERCLIS – NFRAP	0.5 mile	0
LIENS 2	1 mile	0

Database	Search Distance	Number of Sites
CORRACTS	1 mile	0
RCRA-TSDF	0.5 mile	0
RCRA-LQG	0.25 mile	0
RCRA-SQG	0.25 mile	0
RCRA-CESQG	0.25 mile	**2**
RCRA – NonGen/NLR	0.25 mile	**3**
US ENG CONTROLS	0.5 mile	0
US INST CONTROL	0.5 mile	0
ERNS	1 mile	0
HMIRS	1 mile	0
DOT OPS	1 mile	0
US CDL	1 mile	0
US BROWNFIELDS	0.5 mile	0
DOD	1 mile	0
FUDS	1 mile	0
LUCIS	0.5 mile	0
CONSENT	1 mile	0
ROD	1 mile	0
UMTRA	0.5 mile	0
ODI	0.5 mile	0
DEBRIS REGION 9	0.5 mile	0
US MINES	0.25 mile	0
TRIS	0.25 mile	0
TSCA	0.25 mile	0
FTTS	1.0 mile	0
HIST FTTS	0.5 mile	0

Database	Search Distance	Number of Sites
SSTS	0.25 mile	0
ICIS	1.0 mile	0
PADS	1.0 mile	0
MLTS	1.0 mile	0
RADINFO	0.5 mile	0
FINDS	0.25 mile	**12**
RAATS	1.0 mile	0
RMP	1.0 mile	0
EPA WATCH LIST	0.5 mile	0
PRP	1.0 mile	0
2020 COR ACTION	0.25 mile	0
COAL ASH DOE	0.5 mile	0
FEMA UST	0.25 mile	0
FEDERAL FACILITY	0.5 mile	0
LEAD SMELTERS	0.5 mile	0
US AIRS	0.5 mile	0
COAL ASH EPA	0.5 mile	0
US FIN ASSUR	0.5 mile	0
US HIST CDL	0.5 mile	0
SCRD DRY CLEANERS	0.25 mile	0
PCB TRANSFORMER	0.5 mile	0
State/Tribal Environmental Record Sources		
SHWS	1 mile	**2**
ALLSITES	0.5 mile	**2**
GWCI	0.5 mile	**3**
RCR	0.5 mile	0

Database	Search Distance	Number of Sites
SWF/LF	0.5 mile	0
UIC	0.5 mile	0
SWRCY	0.5 mile	0
LUST	0.5 mile	**6**
UST	0.25 mile	**9**
AST	0.25 mile	**1**
SPILLS	0.5 mile	**2**
AUL	0.5 mile	0
VCP	0.5 mile	**1**
DRYCLEANERS	0.5 mile	0
BROWNFIELDS	0.5 mile	**2**
CDL	0.5 mile	0
NPDES	0.5 mile	0
AIRS	0.5 mile	0
COAL ASH	0.5 mile	0
Tribal Records		
INDIAN RESERVATION	1 mile	0
INDIAN LUST	0.5 mile	0
INDIAN UST	0.25 mile	0
INDIAN VCP	0.5 mile	0
INDIAN ODI	0.5 mile	0
EDR Proprietary Records		
EDR MGP	1.0 mile	0
EDR US Hist Auto Stat	0.125 mile	**5**
EDR US Hist Cleaners	0.125 mile	**4**
RGA HWS	0.5 mile	**1**

Database	Search Distance	Number of Sites
RGA LF	0.5 mile	0
RGA LUST	0.5 mile	**1**

Mead & Hunt evaluated the EDR Report for regulated sites located within the ASTM-designated search radii. EDR identified two RCRA-CESQG facilities within one-fourth of a mile of the PSA. RCRA-CESQG facilities are Conditionally Exempt Small Quantity Generators. These facilities are listed below:

- Rite Aid 11571: 1401 Chapin Road, approximately 1200 feet west of the PSA
- Central Label Production: 300 East Boundary Street, within the PSA

EDR also identified three RCRA-NonGen/NLR facilities within one-fourth of a mile of the PSA. RCRA-NonGen/NLR facilities are sites which have generated, transported, store, treated and/or disposed of hazardous waste as defined by RCRA but do not presently generate hazardous waste. These facilities are listed below:

- PWD Fine Cabinetry I[1]: 256B Columbia Ave., within the PSA but the existing building is setback approximately 1000 feet from Columbia Avenue
- Champion: 1404 Chapin Rd., approximately 1200 feet west of the PSA
- United Chemicals Suf.: East Boundary St., approximately 500 west of the PSA

EDR also identified twelve Facility Index System (FINDS) sites within a one-fourth of a mile of the PSA. FINDS facilities contain both facility information and "pointers" to other sources of information that contain more detail. These facilities are listed below:

- Pitt Stop 7: 648 Columbia Ave., within the PSA
- Rainbow Gas Garden 1: 650 Columbia Ave., within the PSA
- Corner Pantry 132[2]: 661 Columbia Ave., within the PSA
- LMC-Chapin: 557 Columbia Ave., within the PSA
- O'Cain Advertising: 500 Columbia Ave., within the PSA
- Wee R Kids Day Care: 520 Columbia Ave., within the PSA
- Palmetto Wood Design: 256B Columbia Ave., within the PSA but setback approximately 1000 feet from Columbia Ave.
- PWD Fine Cabinetry I[3]: 256B Columbia Ave., within the PSA but setback approximately 1000 feet from Columbia Avenue.
- Applied Building Sci: 205 Columbia Ave., within the PSA

[1] EDR erroneously refers to this property as Columbia Dr. instead of Columbia Ave.
[2] EDR erroneously refers to this property as Columbia Rd. instead of Columbia Ave.
[3] EDR erroneously refers to this property as Columbia Dr. instead of Columbia Ave.

- Champion: 1404 Chapin Rd., approximately 1200 feet west of the PSA
- Signode Packaging Sy: 300 East Boundary St., within the PSA
- Central Label Production: 300 East Boundary St., within the PSA

EDR also identified two State hazardous waste site (SHWS) facilities within one mile of the PSA. SHWS facilities are the states' equivalent to CERCLIS where these sites may or may not already be listed on the federal CERCLIS list. These facilities are listed below:

- FB Johnston Graphics: 300 East Boundary St., within the PSA
- Suffolk Chemical Co.: 0.5 miles N of US 76, approximately 1200 feet south of the PSA

EDR also identified two ALLSITES facilities within one-half of a mile of the PSA. ALLSITES facilities are sites listed on the states' (South Carolina) Department of Health and Environmental Control list which provides communities another form of notice on cleanup activities and assist those seeking to redevelop brownfield properties in South Carolina. These facilities are listed below:

- FB Johnston Graphics: 300 E. Boundary St., within the PSA
- Suffolk Chemical Co.: 0.5 miles N of US 76, approximately 1200 feet south of the PSA

EDR also identified three Groundwater Contamination Inventory (GWCI) cases within one-half of a mile of the PSA. GWCI cases are any sites that have groundwater contamination over a federal MCL. These cases are listed below:

- Corner Pantry 132[4]: 661 Columbia Ave., within the PSA
- WB Derrick 66: 1209 Chapin Rd., approximately 600 feet west of the PSA
- S&S Garage: 930 Chapin Rd., approximately 300 north of the PSA

EDR also identified six leaking underground storage tanks (LUST) within one-half mile of the PSA, two are the Corner Pantry 132 and S&S Garage, both noted above. The remaining four LUST cases are listed below:

- Pitt Stop 7: 648 Columbia Ave., within the PSA
- Chapin Fire Department: 106 Columbia Ave., within the PSA
- WB Derrick 66: 1209 Chapin Rd., approximately 600 feet west of the PSA
- Union Concrete Plant: 912 Chapin Rd., approximately 300 feet north of the PSA

Nine underground storage tanks (UST) were also identified within one-fourth of a mile of the PSA. Three UST facilities with identified LUSTs include Pitt Stop 7, Corner Pantry 132, and S&S Garage, all noted above. The remaining six are listed below:

- Rainbow Gas Garden 1: 650 Columbia Ave., within the PSA
- Chapin Fire Department: 106 Columbia Ave., within the PSA
- Pantry 476: 1259 Chapin Road, approximately 800 feet west of the PSA
- WB Derrick 66: 1209 Chapin Rd., approximately 600 feet west of the PSA

[4] EDR erroneously refers to this property as Columbia Rd. instead of Columbia Ave.

- Colonial Station: Hwy 76 & Clark St., approximately 300 feet south of the PSA
- Union Concrete Plant: 912 Chapin Rd., approximately 300 feet north of the PSA

EDR also identified one Aboveground Storage Tank (AST) site within one-fourth of a mile of the PSA. AST sites come from the SC Department of Health & Environmental Control's list. This site is listed below:

- SCE&G – Chapin Crew: 256 Columbia Ave., within the PSA

EDR also identified two SPILLS sites within one-half of a mile of the PSA. SPILLS sites are facilities that have reported spills and releases of petroleum and hazardous chemicals to the SC Department of Health & Environmental Control. These sites are listed below:

- Diesel Fuel Pump: 650 Columbia Ave., within the PSA
- Fuel Tank: 659 Columbia Ave., within the PSA

EDR also identified one Voluntary Cleanup (VCP) site within one-half of a mile of the PSA. VCP sites are facilities with an approved site investigation and/or remediation contract, and enter into a voluntary cleanup program with the SC Department of Health and Environmental Control. This site is listed below:

- Suffolk Chemical Co.: 0.5 miles N of US 76, approximately 1200 feet south of the PSA

EDR also identified two BROWNFIELDS sites within one-half of a mile of the PSA. The Brownfields is a component of the VCP that allows a non-responsible party to acquire a contaminated property with State Superfund liability protection for existing contamination by agreeing to perform an environmental assessment and/or remediation. These sites are listed below:

- FB Johnston Graphics: 300 E. Boundary St., within the PSA
- Suffolk Chemical Co.: 0.5 miles N of US 76, approximately 1200 feet south of the PSA

EDR also identified five EDR US Hist Auto Stat sites within one-eighth of a mile of the PSA. EDR US Hist Auto Stat sites come from listings of potential gas station/filling station/service station sites that were available to EDR researchers. These sites are listed below:

- 'Not reported': 650 Columbia Ave., within the PSA
- 'Not reported': 661 Columbia Ave., within the PSA
- 'Not reported': 258 Columbia Ave., within the PSA
- 'Not reported': 110 Beaufort St., approximately 200 west of the PSA
- 'Not reported': 930 Chapin Rd., approximately 300 north of the PSA

EDR also identified four EDR US Hist Cleaners sites within one-eighth of a mile of the PSA. EDR US Hist Cleaners sites come from listings of potential dry cleaner sites that were available to EDR researchers. These sites are listed below:

- 'Not reported': 105 Lexington Ave., approximately 200 west of the PSA
- 'Not reported': 140 Amick's Ferry Rd., approximately 1200 west of the PSA
- 'Not reported': 138 Amick's Ferry Rd., approximately 1200 west of the PSA
- 'Not reported': 138 Amick's Ferry Rd., approximately 1200 west of the PSA

EDR also identified one EDR Recovered Government Archive State Hazardous Waste (RGA HWS) database provides a list of SHWS incidents within one-half of a mile of the PSA. EDR RGA HWS sites come from historic databases and includes many records that no longer appear in current government lists. These sites are listed below:

- FB Johnston Graphics: 300 E. Boundary St., within the PSA

EDR also identified one EDR Recovered Government Archive Leaking Underground Storage Tank (RGA LUST) sites within one-half of a mile of the PSA. EDR RGA LUST sites come from historic databases and includes many records that no longer appear in current government lists. These sites are listed below:

- Pitt Stop 7: 648 Columbia Ave., within the PSA

Numerous facilities (19) were listed in the Orphan Summary of the preliminary EDR report. Orphan sites are those sites that cannot be geo-located by EDR due to incomplete address information (i.e. route numbers). Sites known to be out of the ASTM search distance were removed from the final report.

The PSA does not appear to be located on or near any tribal lands. According to the U.S. Census, the Catawba Indian Nation in York County is the only federally recognized tribe in South Carolina.

4.2 Additional Environmental Record Sources

Several additional databases which are not required by ASTM E 1527-13 were searched by EDR and are referenced in the EDR Report.

A search of the Environmental Protection Agency (EPA) Envirofacts database was also conducted. Review of the Envirofacts database revealed one additional facility of potential concern near the PSA. This site is listed below and has been permanently closed:

- Durastone: 250 E. Boundary St., near the PSA

4.3 Physical Setting Sources

4.3.1 Review of Topographic Map

The site is identified on a USGS 7.5-minute series Topographic Quadrangle Map, titled Chapin, South Carolina, dated 1971. A USGS Topographic Map, prepared using a portion of this map, is included in Appendix A, Figure 2.

USGS mapping depicts the PSA as being sparsely developed along the main roads and more urbanized within the Town of Chapin. Topography of the PSA is generally flat, and drains in three general directions. The southern portion of the PSA, located between Amick's Ferry Road (S-51) and East Boundary Street (S-82), drains in a general southerly direction towards Lake Murray. The remainder of the PSA, including Columbia Avenue, is primarily located along a ridge. Areas north of Columbia Avenue flow generally north to Rister's Creek and its tributaries. Areas south of Columbia Avenue drain in a general southeasterly direction to tributaries of Wateree Creek. Rister's Creek drains to Wateree Creek approximately 1.5 miles east of the Columbia Avenue interchange with I-26. Surface elevations within the PSA range from approximately 350 to 490 feet above National Geodetic Vertical Datum (NGVD).

4.3.2 Regional Hydrogeology and Geology

The property lies within the Carolina Slate Belt Geologic Province of South Carolina. The Carolina Slate Belt is characterized as an interior coastal plain and consists mostly of rocks originally deposited on or near the earth's surface by volcanic eruption and sedimentation. Surface soils are primarily comprised of sands, silts, and clays. A total of eleven soil map units are found within the PSA, primarily comprised of fine sandy loams, and silt loams. These soils types are formed from residuum weathered from slate and granite, and are classified as very deep, primarily well drained, with slow to moderate infiltration rates.

The property is located within the Broad River Basin. Groundwater within the basin occurs in the Tertiary sand aquifer, which crops out in a small area in the upper Coastal Plain and stretches to the fall line to the east.

4.4 Historical Use Information within the PSA

The historical use of the PSA was determined by reviewing various historical sources listed below. A copy of historic data sources is included in Appendix C.

In summary, historic aerial photography revealed that all three *RECs* remained undeveloped since at least 1970. An initial building structure is shown at the *REC* at 300 East Boundary Street by 1970. Also for this *REC*, an adjacent and larger building structure is built by 2006. By 1989, the two *RECs* near the I-20 interchange with Columbia Avenue are built - Corner Pantry 132 at 661 Columbia Avenue and Pitt Stop 7 at 648 Columbia Avenue.

4.4.1 Aerial Photographs

Aerial photography taken between 1943 and 2015 was reviewed to observe previous conditions and development of the PSA, as well as immediately adjacent properties. A copy of the 2015 aerial photograph is included in Appendix A, Figure 3. The following table presents the findings of the aerial photograph review.

Source	Date	Scale	Comments
Google Earth	2015	Reviewed at 1"=100'	Similar to 2013 photography.
EDR	2013	1"=500'	Similar to 2011 photography.
EDR	2011	1"=500'	Similar to 2010 photography.
Google Earth	2010	Reviewed at 1"=500'	Similar to 2009 photography.
EDR	2009	1"=500'	Similar to 2006 photography.

Source	Date	Scale	Comments
EDR	2006	1”=500’	An adjacent and larger building structure is built at the *REC* at 300 East Boundary Street.
Google Earth	2004	Reviewed at 1”=500’	Similar to 1999 photography.
EDR	1999	1”=500’	Similar to 1994 photography.
EDR	1994	1”=500’	Similar to 1989 photography.
EDR	1989	1”=500’	The two *RECs* near the I-20 interchange with Columbia Avenue are built - Corner Pantry 132 at 661 Columbia Avenue and Pitt Stop 7 at 648 Columbia Avenue.
EDR	1974	1”=500’	Chapin High School is built.
EDR	1970	1”=500’	An initial building structure is shown at the *REC* at 300 East Boundary Street.
EDR	1964	1”=500’	I-20 is built and interchange open at Columbia Avenue.
EDR	1951	1”=500’	Similar to 1943 photography.
EDR	1943	1”=500’	Three RECs are undeveloped. No I-20 and no Chapin High School

There was no direct evidence on the reviewed aerial photography suggesting a past site use indicative of the use, storage, and disposal of hazardous waste or hazardous material. The scales and clarity of some of the reviewed aerial photography prohibited the identification of small areas of possible open dumping, drum storage, hazardous material storage, and the three *RECs* in the PSA.

4.4.2 Topographic Maps

Mead & Hunt reviewed historic topographic maps for the PSA acquired from EDR. EDR provided maps of the PSA and surrounding vicinity from 1904, 1971, and 2014. The 1904 map was labeled as the Columbia, South Carolina Quadrangle map of the 30-minute series USGS topographic map. The remaining years were labeled as Chapin, South Carolina Quadrangle of the 7.5 minute series USGS topographic mapping. The 1904 map shows the developed land for the Town of Chapin and sparse development along Columbia Avenue but I-20 was not built. The 1971 map shows the developed lands in Chapin, along US 76, and sparse development along Columbia Avenue and I-20 as built. The 2014 map is indicative of the existing land uses described earlier.

4.4.3 Zoning/Land Use Records

For the PSA within the Town of Chapin, there is a Town of Chapin Zoning Ordinance, which was adopted January 2002, revised December 2005, and revised December 2012. The purposes of the Zoning Ordinance are to implement the land use element of the comprehensive plan and for those purposes set forth in S.C. Code § 6-29-710. Outside the Town of Chapin, no other zoning or land use information was available from the County of Lexington.

5.0 PSA Reconnaissance

Lou Raymond, an Environmental Planner with Mead & Hunt, conducted a PSA reconnaissance on December 3, 2015 and February 4, 2016 to observe the current uses within the PSA, adjoining properties, and properties in the surrounding area, as well as the geologic, hydrogeologic, and topographic conditions of the PSA and the surrounding area. Photographs were taken of various portions of the PSA of the *Columbia Avenue (S-48) Corridor Improvement Project* to document existing conditions. Aerial photography was referenced prior to the PSA reconnaissance (Figure 3). Copies of pertinent photographs are included in Appendix B of this report.

5.1 Methodology and Limiting Conditions

A vehicular tour of the area was made to confirm the nearby land uses. The tour involved viewing nearby properties from publicly accessible areas. Observation was limited to areas visible in the line of sight from the public roadways. Mead & Hunt did not enter adjacent properties within the PSA.

5.2 General Project Study Area Setting

5.2.1 Current Land Use(s)

Current land uses along the existing Columbia Avenue roadway from the Chapin Road (S-39) northern project terminus to Peak Street (S-49) in Chapin are generally developed closer to the center of the Town of Chapin (intersection of Columbia Avenue and US 76). However, there are more undeveloped lands east of Chapin High School and approximately 1,500 feet east of the I-26/Columbia Avenue interchange area. From Columbia Avenue in the Town of Chapin, the PSA parallels the Chapin High School property on its' west side (developed school property) heading south and then turning west through some commercial development along East Boundary Street (S-82) and crossing the commercially developed US 76 corridor, and then continuing through undeveloped land at the terminus of Amick's Ferry Road (S-51). Several of the commercial properties identified as listed sites in the EDR DataMap (see Appendix C) have changed names and/or have gone out of business throughout the PSA.

5.2.2 Past Land Use(s)

Several of the commercial properties identified as listed sites in the EDR DataMap (see Appendix C) have changed names and/or have gone out of business throughout the PSA. The EDR Database Report revealed the commercial lands were developed as a day care, wood cabinetry company, furniture manufacturer, and a paper company. Additionally, a property at 106 Columbia Avenue was once the Chapin Fire Department, a municipal land.

5.2.3 Current Uses of Adjoining Properties

Northeast: Undeveloped forestland adjoins the area on the northeast side of the I-26 interchange with Columbia Avenue.

North: Commercial development in the form of gas stations and fast-food restaurants adjoin the I-26 interchange area. A Chapin Furniture store is under construction on the south side of Columbia Avenue across from the BP Gas Station. Additional commercial development along existing Columbia Avenue varies and includes a building supply store, medical center, auto repair store, and a SCE&G facility. Chapin High School is located along the south side of Columbia Avenue and is the municipal land shown in Figure 4-1. Some residential development, in the form of single-family homes, are found throughout the PSA, primarily located between commercial developments. Scattered between the developed areas are sections of undeveloped lands, consisting of wooded areas and follow fields.

South: From Columbia Avenue to the south, the PSA parallels the west boundary of Chapin High School and generally includes residential and commercial development on new location before intersecting the PSA at East Boundary Street (S-82).

West: Undeveloped land lies to the east of Amick's Ferry Road (S-51) and the land near it appeared maintained (mowed) during PSA reconnaissance. Residential development is located along both sides of the Lexington Avenue where the PSA boundary crosses. To the east of this residential development is commercial development to the intersection of East Boundary Street (S-82) and undeveloped forestland between Amick's Ferry Road (S-51) and Lexington Avenue.

Please see Appendix A, Figure 4 for a map depicting Current Uses of Adjoining Properties

5.2.4 Past Uses of Adjoining Properties

North: The property at 106 Columbia Avenue is currently an abandoned residence and is identified as the location of the former Chapin Fire Department.

West: The property at 912 Chapin Road is currently a Mexican restaurant and is identified as the location of the former Union Concrete Plant.

5.2.5 Geologic, Hydrogeologic, Hydrologic, and Topographic Conditions

Topography of the PSA is generally flat, and drains in three general directions. The southern portion of the PSA, located between Amick's Ferry Road (S-51) and East Boundary Street (S-82), drains in a general southerly direction towards Lake Murray. The remainder of the PSA, including Columbia Avenue, is primarily located along a ridge. Areas north of Columbia Avenue flow generally north to Rister's Creek and its tributaries. Areas south of Columbia Avenue drain in a general southeasterly direction to tributaries of Wateree Creek. Rister's Creek drains to Wateree Creek approximately 1.5 miles east of the Columbia Avenue interchange with I-26. No confirmation of groundwater conditions was made during the PSA reconnaissance.

5.2.6 General Description of Roads, Structures & Other Improvements

Columbia Avenue (S-48) and US 76 are the main two roadways that lead into the Town of Chapin. These roadways intersect near the center of the Town. Additionally, Columbia Avenue terminates at US 76 and an existing rail line parallels US 76 on the north side throughout the Town of Chapin and beyond. The only bridge structure within the PSA is the Columbia Avenue overpass of I-26. A new roadway is currently under construction on the north side of Columbia Avenue to the east of Chapin High School. This roadway is Brighton

Boulevard and it intersects Columbia Avenue at the existing T-intersection of Columbia Avenue and Woodthrush Road.

Proposed alternatives will be investigated to improve congestion within the corridor. Many alternatives will be investigated and include such improvements as roadway widening, new alignment, and interchange/intersection reconfiguration. Please see Section 5.3 (External Observations) for a more details.

5.2.7 Potable Water Supply and Sewage Disposal System
Evidence of potable water service and sewer service was observed within the town limits of Chapin, SC.

5.3 Exterior Observations

Current land uses along the existing Columbia Avenue roadway from the Chapin Road (S-39) northern project terminus to Peak Street (S-49) in Chapin are generally developed closer to the center of the Town of Chapin (intersection of Columbia Avenue and US 76). However, there are more undeveloped lands east of Chapin High School and approximately 1,500 feet east of the I-26/Columbia Avenue interchange area. From Columbia Avenue in the Town of Chapin, the PSA parallels the Chapin High School property on its' west side (developed school property) heading south and then turning west through some commercial development along East Boundary Street (S-82) and crossing the commercially developed US 76 corridor, and then continuing through undeveloped land at the terminus of Amick's Ferry Road (S-51). Several of the commercial properties identified as listed sites in the EDR DataMap (see Appendix C) have changed names and/or have gone out of business throughout the PSA.

Except where noted in Section 4.1, no evidence of underground storage tanks, above ground storage tanks, stained soils, stressed vegetation, landfilling, or foul odors were noted. No pits, ponds, or lagoons were identified within the PSA. Please see Section 7.1 for on-site findings of an environmental nature.

6.0 Interviews

6.1 Interview with Owners

Interviews with property owners were not conducted.

6.2 Interview with Occupants

Interviews with occupants were not conducted.

6.3 Interview with Local Government Officials

Interviews with local government officials were not conducted.

6.4 Interviews with Others

No others were interviewed.

7.0 Findings

7.1 Findings inside the project study area

Five findings inside the PSA of an environmental nature were identified during the Phase I ESA.

Four confirmed releases of hazardous materials or petroleum products were identified in the EDR Report inside the PSA. According to the EDR Report, LUSTs were the source of two of the releases, and one of the two was recommended to conduct an investigation/risk assessment (Corner Pantry 132 at 661 Columbia Avenue) and the other was awaiting funding for cleanup (Pitt Stop 7 at 648 Columbia Avenue).

The remaining two of four confirmed releases were SPILLS sites, one was approximately 20 gallons of diesel fuel in 2002 (Diesel Fuel Pump at 650 Columbia Avenue) and the other was 15 gallons of gasoline in 2006 (Fuel Tank at 659 Columbia Avenue).

The fifth finding inside the PSA is the Signode Packaging site (also listed as FB Johnston Graphics and Central Label Production site) at 300 East Boundary Street which comes up on at least six databases including RCRA, SHWS (state Superfund database), and BROWNFIELDS.

7.2 Findings outside the project study area

Two findings outside the PSA of an environmental nature were identified during the Phase I ESA.

Two confirmed releases of hazardous materials or petroleum products were identified in the EDR Report outside the PSA. According to the EDR Report, LUSTs were the source of the releases, and both were recommended to conduct an investigation/risk assessment.

8.0 Opinions

8.1 Opinions inside the project study area

Mead & Hunt offers the following opinion regarding the five findings inside the PSA of an environmental nature identified during the Phase I ESA:

> Four confirmed releases of hazardous materials or petroleum products were identified in the EDR Report inside the PSA.
>
> According to the EDR Report, LUSTs were the source of two of the releases, and one of the two was recommended to conduct an investigation/risk assessment (Corner Pantry 132 at 661 Columbia Avenue) and the other was awaiting funding for cleanup (Pitt Stop 7 at 648 Columbia Avenue). These two sites where LUSTs were the source of releases of hazardous materials or petroleum products are considered *recognized environmental conditions* (*RECs*).

The remaining two of the four confirmed releases were SPILLS sites, one was approximately 20 gallons of diesel fuel in 2002 at the existing Exxon Gas Station (Diesel Fuel Pump at 650 Columbia Avenue) and the other was 15 gallons of gasoline in 2006 at the existing BP Gas Station (Fuel Tank at 659 Columbia Avenue). It is not anticipated that the volumes of these two SPILLS contaminated either property or extended up gradient to existing Columbia Avenue; and therefore is not considered a *REC*.

The fifth finding inside the PSA is the Signode Packaging site (also listed as FB Johnston Graphics and Central Label Production site) at 300 East Boundary Street which comes up on at least six databases including RCRA, SHWS (state Superfund database), and BROWNFIELDS. This site is considered a *REC*.

8.2 Opinions outside the project study area

Mead & Hunt offers the following opinion regarding the findings outside the PSA of an environmental nature identified during the Phase I ESA:

Two confirmed releases of hazardous materials or petroleum products were identified in the EDR Report outside the PSA. According to the EDR Report, LUSTs were the source of the releases, and both were recommended to conduct an investigation/risk assessment. One of the two confirmed releases outside the PSA is related to the Former Union Concrete Plant at 912 Chapin Road. This facility is now developed as a Mexican restaurant. The second of the two confirmed releases outside the PSA is related to the existing S&S Garage at 930 Chapin Road. It is not anticipated the contamination from these two confirmed releases would advance or extend up gradient to existing Chapin Road; and therefore are not considered *RECs*.

8.3 Data Gaps

There is a 15 year aerial photography data gap between 1974 and 1989 in the EDR Database Report in Appendix C. Additionally, there is a 43 year topographic data gap between 1971 and 2014 in the EDR Database Report in Appendix C.

9.0 Conclusions

Mead & Hunt has performed a Phase I ESA of the PSA for the *Columbia Avenue (S-48) Corridor Improvement Project* located in and around the town of Chapin, South Carolina, in the County of Lexington in conformance with our understanding of the scope and limitations of ASTM Practice E 1527-13. Any exceptions to, or deletions from, this practice are described in Sections 1.4 and 10.0 of this report. This assessment has revealed evidence of three *RECs* in connection with the PSA; please see Section 8.0 for Opinions regarding the findings of an environmental nature.

10.0 Deviations

Mead & Hunt has endeavored to perform this Phase I ESA in conformance with our understanding of the scope and limitations of ASTM E 1527-13. However, EDR did not provide environmental lien, or activity and use limitations information on the properties within the PSA. The County of Lexington did not provide environmental lien, or activity and use limitations on the properties within the PSA. No interviews were conducted. No other deviations to ASTM Practice E 1527-13 were made in the completion of this Phase I ESA.

11.0 Additional Services

No other additional services were performed for this Phase I ESA.

12.0 References

1. *ASTM Standards on Environmental Site Assessments for Commercial Real Estate. E1527-13, Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process.* American Society for Testing and Materials (ASTM), Philadelphia, PA, 2013.

2. United States Geological Survey (USGS), 7.5-minute Series, Topographic Map, Chapin Quadrangle, 1971 edition.

3. United States Department of Agriculture - Natural Resource Conservation Service (NRCS) Soil Survey Geographic (SSURGO) Database, Lexington County, South Carolina (2015)

4. EPA Envirofacts Website - http://www.epa.gov/enviro/

13.0 Signature(s) of Environmental Professional(s)

I declare that, to the best of my professional knowledge and belief, I meet the definition of Environmental Professional as defined in Section 312.10 of 40 CFR Part 312. I have the specific qualifications based on education, training, and experience to assess properties of the nature, history, and setting of the project study corridor. I have developed and performed the all appropriate inquiries in conformance with the standards and practices set forth in 40 CFR Part 312.

Lou Raymond, PE, AICP
Environmental Planner

This report was reviewed by:

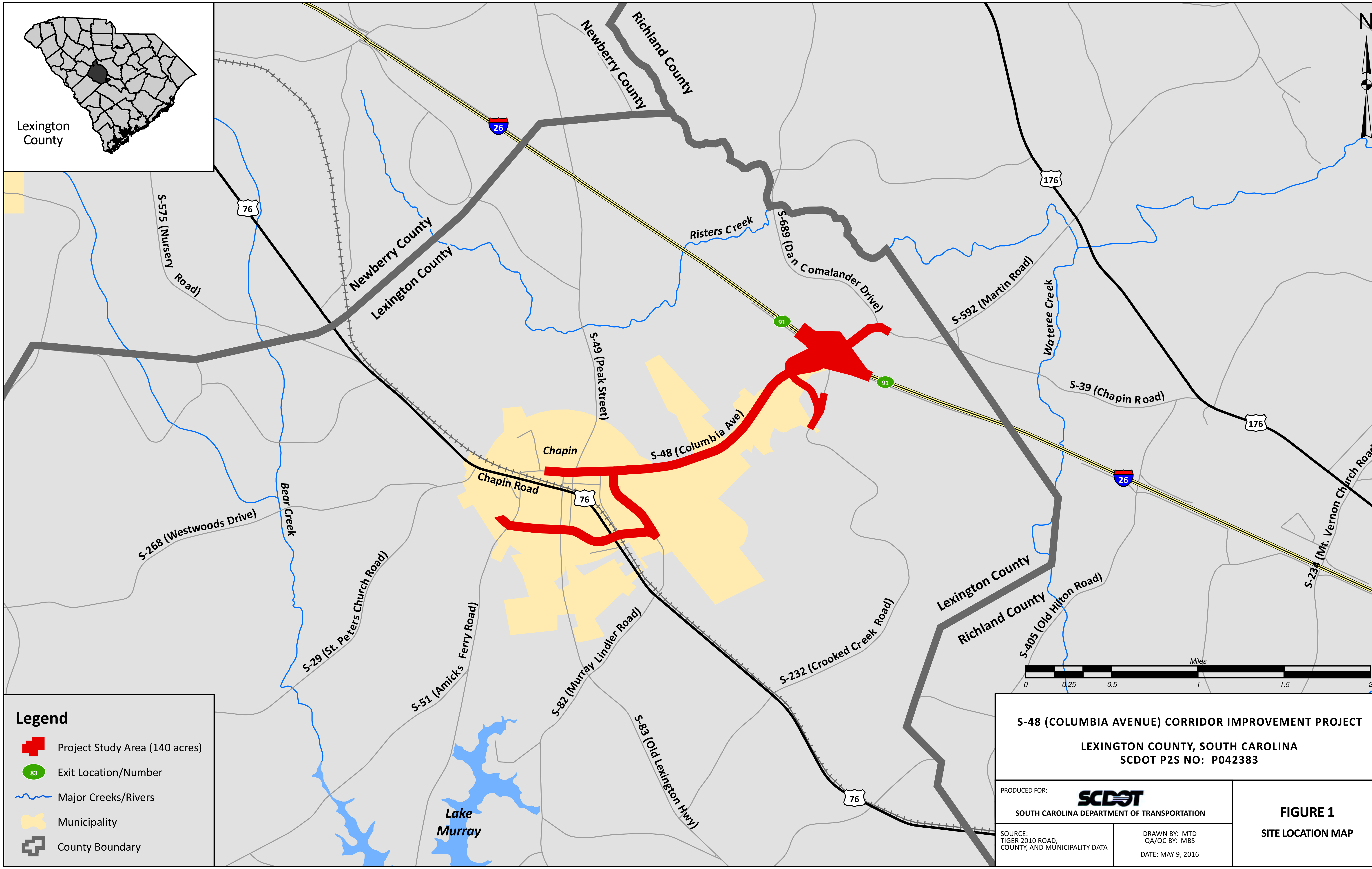
Matthew T. DeWitt, PWS
Environmental Scientist

14.0 Qualification(s) of Environmental Professional(s)

The environmental professional responsible for this project is Mr. Lou Raymond, PE, AICP. Mr. Raymond meets the qualifications per 312.10 of 40 CFR Part 312. Mr. Raymond conducted the site reconnaissance and prepared the report for the Phase I ESA.

Mr. DeWitt conducted the report review for the Phase I ESA. He holds a bachelor's degree in Environment and Natural Resources Management from Clemson University and has over ten years of experience as an environmental consultant. Mr. DeWitt has also attended ASTM training for Phase I Environmental Site Assessments.

Appendix A. Figures



Lexington County
N
Richland County
Newberry County
Newberry County
Lexington County
26
76
S-575 (Nursery Road)
Risters Creek
S-689 (Dan Comalander Drive)
S-592 (Martin Road)
Wateree Creek
176
91
91
S-49 (Peak Street)
S-39 (Chapin Road)
Chapin
S-48 (Columbia Ave)
Chapin Road
76
Bear Creek
S-268 (Westwoods Drive)
S-29 (St. Peters Church Road)
S-51 (Amicks Ferry Road)
S-82 (Murray Lindler Road)
S-83 (Old Lexington Hwy)
S-232 (Crooked Creek Road)
Lexington County
Richland County
S-405 (Old Hilton Road)
S-234 (Mt. Vernon Church Road)
Lake Murray
Miles
0 0.25 0.5 1 1.5 2
Legend
Project Study Area (140 acres)
83
Exit Location/Number
Major Creeks/Rivers
Municipality
County Boundary
S-48 (COLUMBIA AVENUE) CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY, SOUTH CAROLINA
SCDOT P2S NO: P042383
PRODUCED FOR:
SCDOT
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
SOURCE:
TIGER 2010 ROAD,
COUNTY, AND MUNICIPALITY DATA
DRAWN BY: MTD
QA/QC BY: MBS
DATE: MAY 9, 2016
FIGURE 1
SITE LOCATION MAP

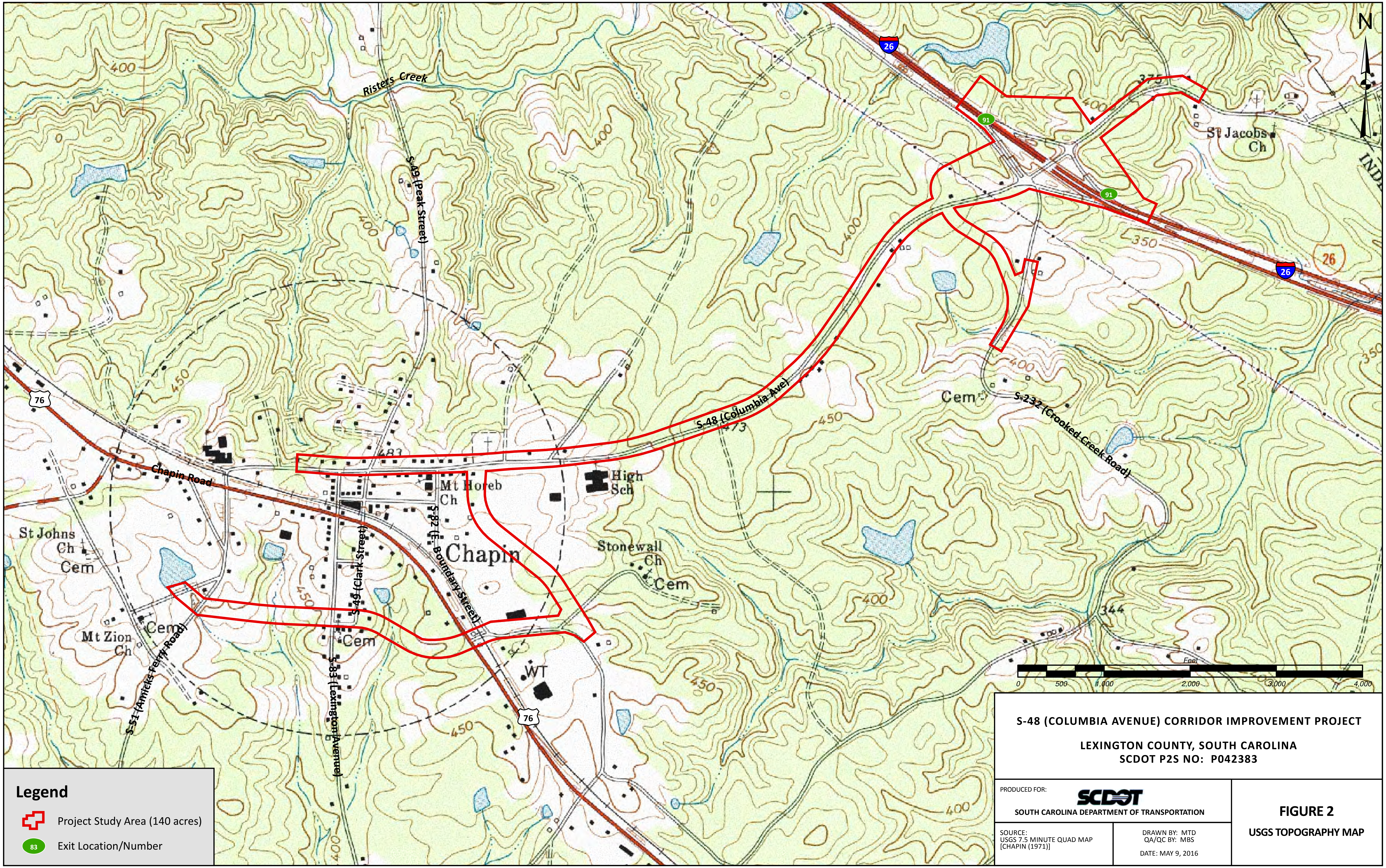
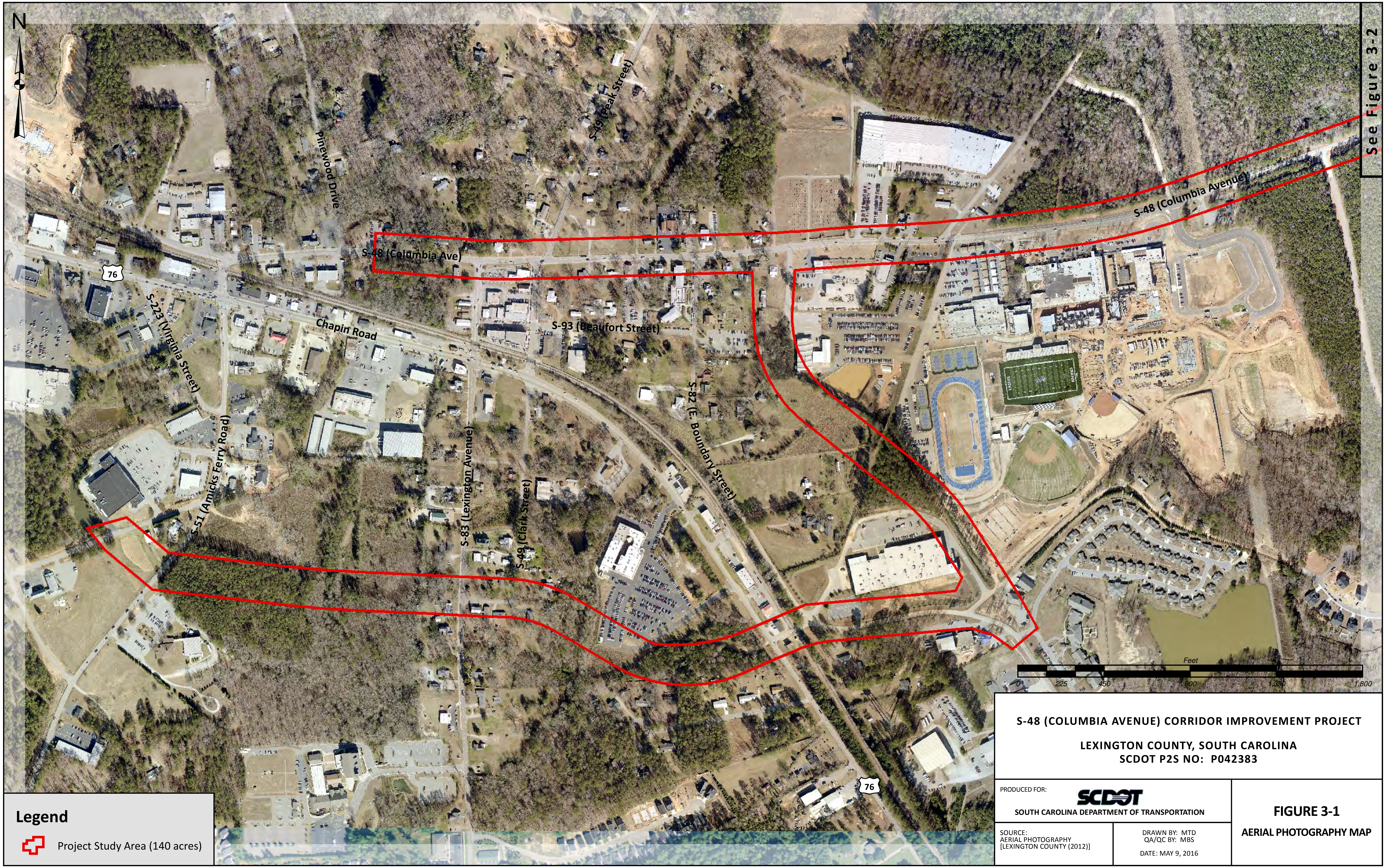


FIGURE 2

USGS TOPOGRAPHY MAP



S-48 (COLUMBIA AVENUE) CORRIDOR IMPROVEMENT PROJECT

LEXINGTON COUNTY, SOUTH CAROLINA
SCDOT P2S NO: P042383

PRODUCED FOR:
SCDOT
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SOURCE:
AERIAL PHOTOGRAPHY
[LEXINGTON COUNTY (2012)]

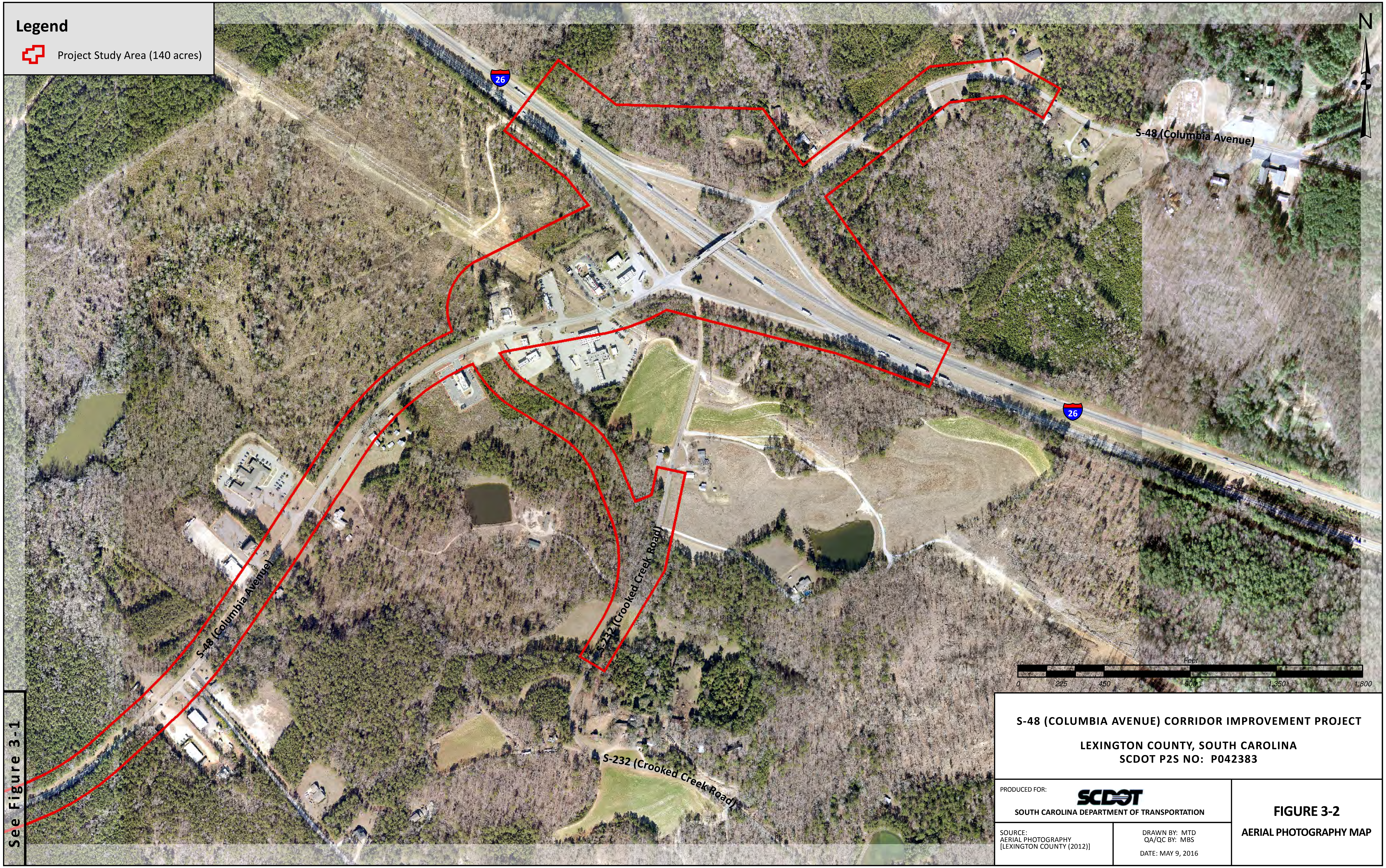
DRAWN BY: MTD
QA/QC BY: MBS

DATE: MAY 9, 2016

FIGURE 3-1
AERIAL PHOTOGRAPHY MAP

Legend

Project Study Area (140 acres)



S-48 (COLUMBIA AVENUE) CORRIDOR IMPROVEMENT PROJECT

LEXINGTON COUNTY, SOUTH CAROLINA
SCDOT P2S NO: P042383

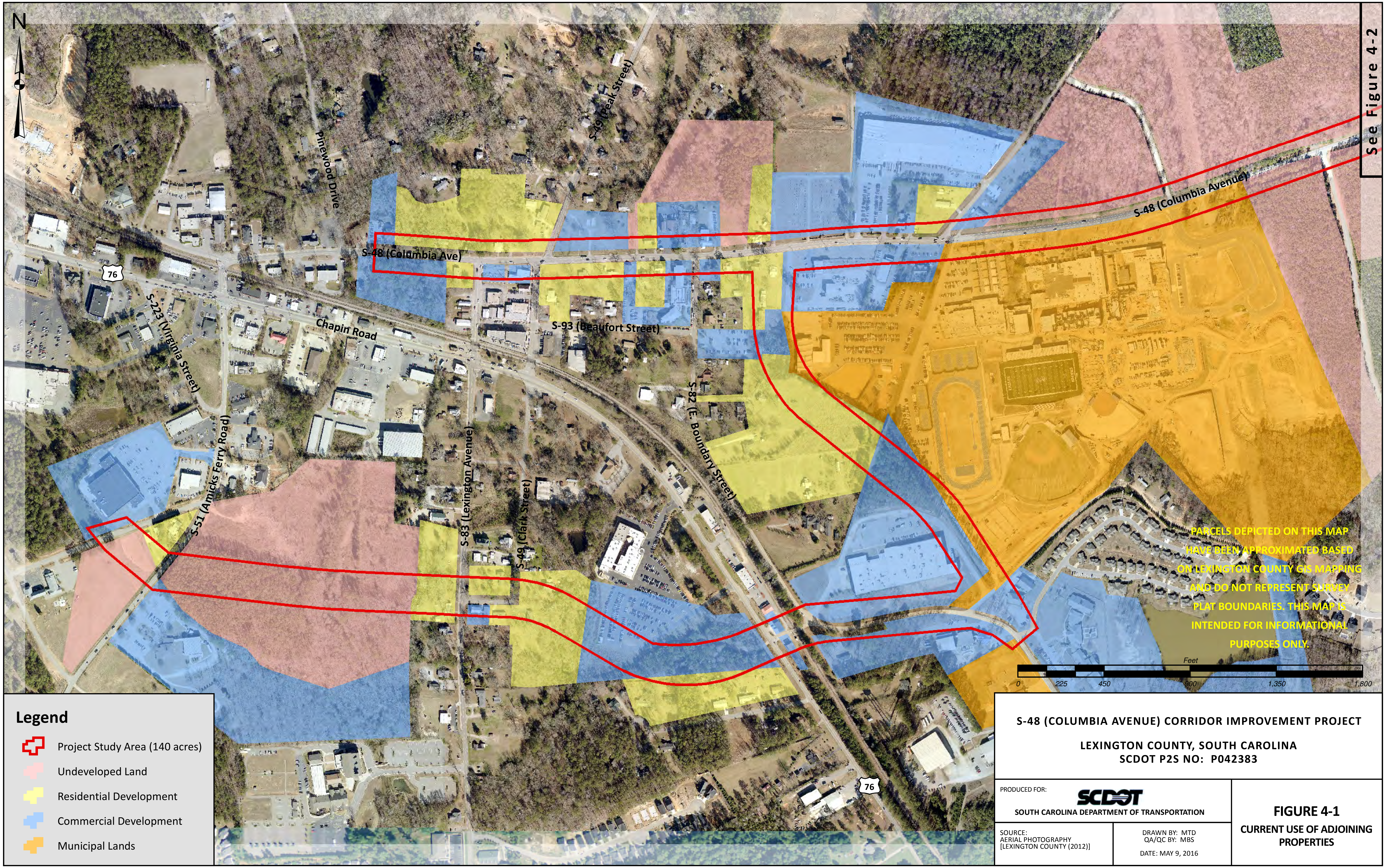
PRODUCED FOR:
SCDOT
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SOURCE:
AERIAL PHOTOGRAPHY
[LEXINGTON COUNTY (2012)]

DRAWN BY: MTD
QA/QC BY: MBS

DATE: MAY 9, 2016

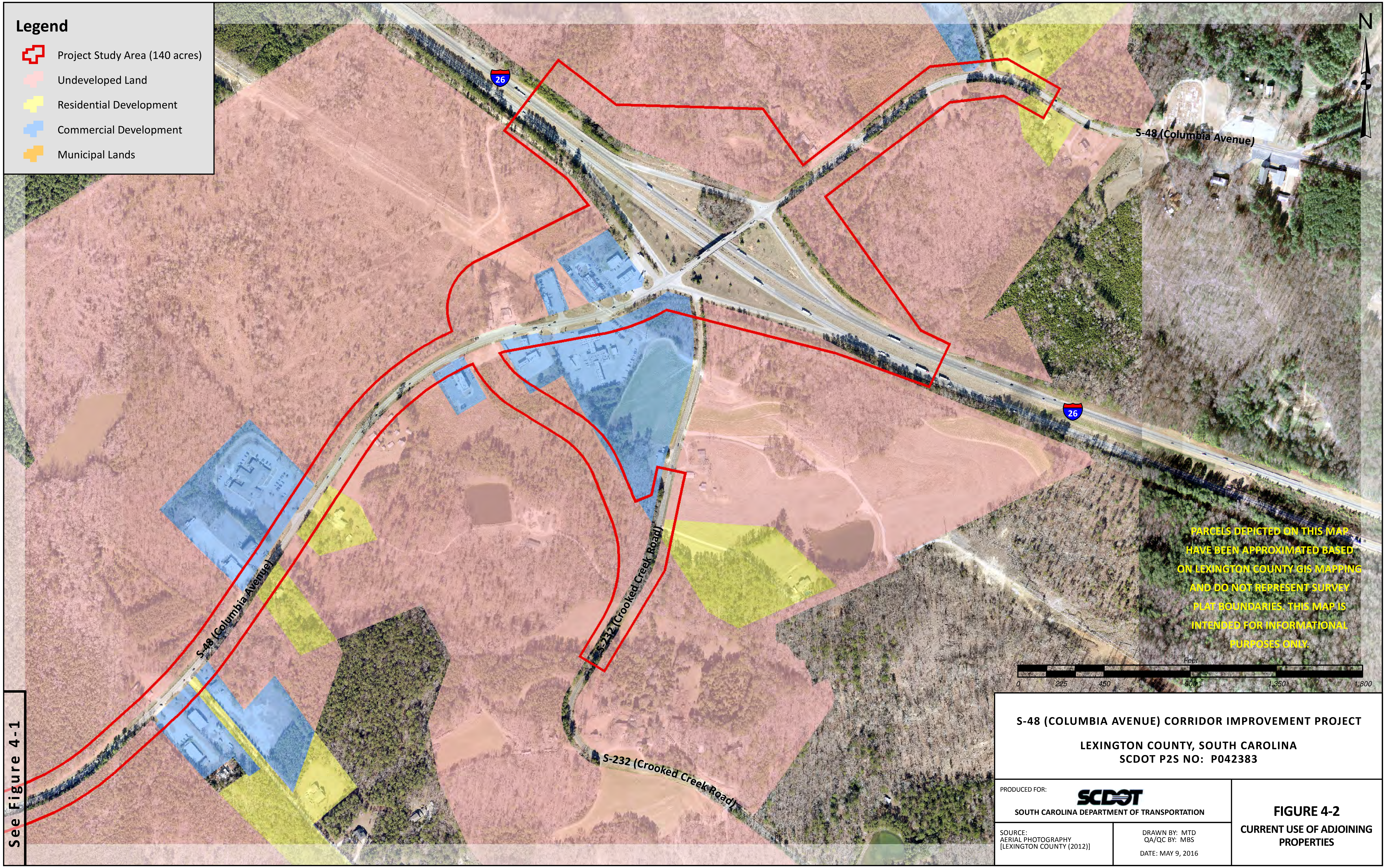
FIGURE 3-2
AERIAL PHOTOGRAPHY MAP



S-48 (COLUMBIA AVENUE) CORRIDOR IMPROVEMENT PROJECT

LEXINGTON COUNTY, SOUTH CAROLINA
SCDOT P2S NO: P042383

FIGURE 4-1
CURRENT USE OF ADJOINING PROPERTIES



S-48 (COLUMBIA AVENUE) CORRIDOR IMPROVEMENT PROJECT

LEXINGTON COUNTY, SOUTH CAROLINA
SCDOT P2S NO: P042383

PRODUCED FOR:
SCDOT
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

SOURCE:
AERIAL PHOTOGRAPHY
[LEXINGTON COUNTY (2012)]

DRAWN BY: MTD
QA/QC BY: MBS
DATE: MAY 9, 2016

FIGURE 4-2
CURRENT USE OF ADJOINING PROPERTIES

Appendix B. Site Photographs

Date:
December 3, 2015

Taken By:
Lou Raymond

Photograph 1

Description:
View of northern side of Columbia Ave at Corner Pantry/BP Gas Station. Photograph is facing north.

Date:
February 4, 2016

Taken By:
Lou Raymond

Photograph 2

Description:
View from Columbia Ave at Corner Pantry/BP Gas Station. Photograph is facing north.

	Date: February 4, 2016 Taken By: Lou Raymond Photograph 3 Description: View from Columbia Ave at Corner Pantry/BP Gas Station. Photograph is facing north.
	Date: February 4, 2016 Taken By: Lou Raymond Photograph 4 Description: View of one groundwater monitoring well at Corner Pantry/BP Gas Station. Photograph is taken within the pavement in the northern portion of site.

Date:
February 4, 2016

Taken By:
Lou Raymond

Photograph 5

Description:
View of one groundwater monitoring well at Corner Pantry/BP Gas Station. Photograph is taken within the pavement in the northern portion of site.

Date:
February 4, 2016

Taken By:
Lou Raymond

Photograph 6

Description:
View of northern side of Corner Pantry/BP Station. Photograph is facing north.

	Date: February 4, 2016 Taken By: Lou Raymond Photograph 7 Description: View of one groundwater monitoring well at Corner Pantry/BP Gas Station. Photograph is taken within the pavement in the southern portion of site.
	Date: February 4, 2016 Taken By: Lou Raymond Photograph 8 Description: View of southern side of Columbia Ave at Pitt Stop/Shell Gas Station. Photograph is facing south.

	Date: February 4, 2016
	Taken By: Lou Raymond
	Photograph 9
	Description: View of southern side of Columbia Ave at Pitt Stop/Shell Gas Station. Photograph is facing east.
	Date: February 4, 2016
	Taken By: Lou Raymond
	Photograph 10
	Description: View of southern side of Columbia Ave at Pitt Stop/Shell Gas Station. Photograph is facing north.

<table>
<tr><td rowspan="4"></td><td>Date:
February 4, 2016</td></tr>
<tr><td>Taken By:
Lou Raymond</td></tr>
<tr><td>Photograph 11</td></tr>
<tr><td>Description:
View of demolition debris and other garbage dumped at Pitt Stop/Shell Gas Station. Photograph is taken in the southeastern corner of the site facing south.</td></tr>
<tr><td rowspan="4"></td><td>Date:
February 4, 2016</td></tr>
<tr><td>Taken By:
Lou Raymond</td></tr>
<tr><td>Photograph 12</td></tr>
<tr><td>Description:
View of demolition debris and other garbage dumped at Pitt Stop/Shell Gas Station. Photograph is taken in the south corner of the site facing south.</td></tr>
</table>

Date:
February 4, 2016

Taken By:
Lou Raymond

Photograph 13

Description:
View south side of Pitt Stop/Shell Gas Station. Photograph is taken in the southwestern corner of the site facing south.

Date:
February 4, 2016

Taken By:
Lou Raymond

Photograph 14

Description:
View south side of Pitt Stop/Shell Gas Station. Photograph is taken in the southeastern corner of the site facing west.

	Date: December 3, 2015 Taken By: Lou Raymond Photograph 15 Description: View of northern side of 300 E. Boundary Street at Signode Packaging. Photograph is facing north.
	Date: February 4, 2016 Taken By: Lou Raymond Photograph 16 Description: View of western side of 300 E. Boundary Street at Signode Packaging. Photograph is facing east.

<table>
<tr><td rowspan="4"></td><td>Date:
February 4, 2016</td></tr>
<tr><td>Taken By:
Lou Raymond</td></tr>
<tr><td>Photograph 17</td></tr>
<tr><td>Description:
View of southern side of 300 E. Boundary Street at Signode Packaging. Photograph is facing north.</td></tr>
<tr><td rowspan="4"></td><td>Date:
February 4, 2016</td></tr>
<tr><td>Taken By:
Lou Raymond</td></tr>
<tr><td>Photograph 18</td></tr>
<tr><td>Description:
View of northern side of 300 E. Boundary Street at Signode Packaging. Photograph is facing west.</td></tr>
</table>

	Date: February 4, 2016 Taken By: Lou Raymond Photograph 19 Description: View of northern side of 300 E. Boundary Street at Signode Packaging. Photograph is facing east.
	Date: February 4, 2016 Taken By: Lou Raymond Photograph 20 Description: View of western side of 300 E. Boundary Street at Signode Packaging. Photograph is facing east.

Appendix C. EDR Database Report

Chapin
Chapin, SC 29036

Inquiry Number: 4470451.5s
November 20, 2015

EDR DataMap™ Area Study

EDR® Environmental Data Resources Inc

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

EXECUTIVE SUMMARY

TARGET PROPERTY INFORMATION

ADDRESS

CHAPIN, SC 29036
CHAPIN, SC 29036

DATABASES WITH NO MAPPED SITES

No mapped sites were found in EDR's search of available ("reasonably ascertainable ") government records within the requested search area for the following databases:

FEDERAL RECORDS

NPL	National Priority List
Proposed NPL	Proposed National Priority List Sites
Delisted NPL	National Priority List Deletions
NPL LIENS	Federal Superfund Liens
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CERCLIS-NFRAP	CERCLIS No Further Remedial Action Planned
LIENS 2	CERCLA Lien Information
CORRACTS	Corrective Action Report
RCRA-TSDF	RCRA - Treatment, Storage and Disposal
RCRA-LQG	RCRA - Large Quantity Generators
RCRA-SQG	RCRA - Small Quantity Generators
US ENG CONTROLS	Engineering Controls Sites List
US INST CONTROL	Sites with Institutional Controls
ERNS	Emergency Response Notification System
HMIRS	Hazardous Materials Information Reporting System
DOT OPS	Incident and Accident Data
US CDL	Clandestine Drug Labs
US BROWNFIELDS	A Listing of Brownfields Sites
DOD	Department of Defense Sites
FUDS	Formerly Used Defense Sites
LUCIS	Land Use Control Information System
CONSENT	Superfund (CERCLA) Consent Decrees
ROD	Records Of Decision
UMTRA	Uranium Mill Tailings Sites
ODI	Open Dump Inventory
DEBRIS REGION 9	Torres Martinez Reservation Illegal Dump Site Locations
US MINES	Mines Master Index File
TRIS	Toxic Chemical Release Inventory System
TSCA	Toxic Substances Control Act
FTTS	FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
HIST FTTS	FIFRA/TSCA Tracking System Administrative Case Listing
SSTS	Section 7 Tracking Systems
ICIS	Integrated Compliance Information System
PADS	PCB Activity Database System

MLTS - Material Licensing Tracking System
RADINFO - Radiation Information Database
RAATS - RCRA Administrative Action Tracking System
RMP - Risk Management Plans
EPA WATCH LIST - EPA WATCH LIST
PRP - Potentially Responsible Parties
2020 COR ACTION - 2020 Corrective Action Program List
COAL ASH DOE - Steam-Electric Plant Operation Data
FEMA UST - Underground Storage Tank Listing
FEDERAL FACILITY - Federal Facility Site Information listing
LEAD SMELTERS - Lead Smelter Sites
US AIRS - Aerometric Information Retrieval System Facility Subsystem
COAL ASH EPA - Coal Combustion Residues Surface Impoundments List
US FIN ASSUR - Financial Assurance Information
US HIST CDL - National Clandestine Laboratory Register
SCRD DRYCLEANERS - State Coalition for Remediation of Drycleaners Listing
PCB TRANSFORMER - PCB Transformer Registration Database

STATE AND LOCAL RECORDS

RCR - Registry of Conditional Remedies
SWF/LF - Permitted Landfills List
UIC - Underground Injection Wells Listing
SWRCY - Solid Waste Recycling Facilities
AUL - Land Use Controls
DRYCLEANERS - Drycleaner Database
CDL - Clandestine Drug Lab Sites
NPDES - Waste Water Treatment Facilities Listing
AIRS - Permitted Airs Facility Listing
COAL ASH - Coal Ash Disposal Sites

TRIBAL RECORDS

INDIAN RESERV - Indian Reservations
INDIAN ODI - Report on the Status of Open Dumps on Indian Lands
INDIAN LUST - Leaking Underground Storage Tanks on Indian Land
INDIAN UST - Underground Storage Tanks on Indian Land
INDIAN VCP - Voluntary Cleanup Priority Listing

EDR PROPRIETARY RECORDS

EDR MGP - EDR Proprietary Manufactured Gas Plants
RGA LF - Recovered Government Archive Solid Waste Facilities List

SURROUNDING SITES: SEARCH RESULTS

Surrounding sites were identified.

Page numbers and map identification numbers refer to the EDR Radius Map report where detailed data on individual sites can be reviewed.

Sites listed in ***bold italics*** are in multiple databases.

Unmappable (orphan) sites are not considered in the foregoing analysis.

EXECUTIVE SUMMARY

FEDERAL RECORDS

RCRA-CESQG: RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Conditionally exempt small quantity generators (CESQGs) generate less than 100 kg of hazardous waste, or less than 1 kg of acutely hazardous waste per month.

A review of the RCRA-CESQG list, as provided by EDR, and dated 06/09/2015 has revealed that there are 2 RCRA-CESQG sites within the searched area.

Site	Address	Map ID	Page
RITE AID 11571	1401 CHAPIN RD	7	18
CENTRAL LABEL PRODUC	300 E BOUNDARY ST	16	32

RCRA NonGen / NLR: RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Non-Generators do not presently generate hazardous waste.

A review of the RCRA NonGen / NLR list, as provided by EDR, and dated 06/09/2015 has revealed that there are 3 RCRA NonGen / NLR sites within the searched area.

Site	Address	Map ID	Page
PWD FINE CABINETRY I	256B COLUMBIA DR	4	12
CHAMPION	***1404 CHAPIN RD***	***7***	***20***
UNITED CHEMICALS SUF	EAST BOUNDARY RD	13	28

FINDS: The Facility Index System contains both facility information and "pointers" to other sources of information that contain more detail. These include: RCRIS; Permit Compliance System (PCS); Aerometric Information Retrieval System (AIRS); FATES (FIFRA [Federal Insecticide Fungicide Rodenticide Act] and TSCA Enforcement System, FTTS [FIFRA/TSCA Tracking System]; CERCLIS; DOCKET (Enforcement Docket used to manage and track information on civil judicial enforcement cases for all environmental statutes); Federal Underground Injection Control (FURS); Federal Reporting Data System (FRDS); Surface Impoundments (SIA); TSCA Chemicals in Commerce Information System (CICS); PADS; RCRA-J (medical waste transporters/disposers); TRIS; and TSCA. The source of this database is the U.S. EPA/NTIS.

A review of the FINDS list, as provided by EDR, and dated 07/20/2015 has revealed that there are 12 FINDS sites within the searched area.

Site	Address	Map ID	Page
PITT STOP 7	648 COLUMBIA AVE	1	4
RAINBOW GAS GARDEN 1	650 COLUMBIA AVE	1	4
CORNER PANTRY 132	661 COLUMBIA RD	1	7
LMC-CHAPIN	557 COLUMBIA AVE	2	10
O CAIN ADVERTISING	500 COLUMBIA AVE	3	11
WEE R KIDS DAY CAR	520 COLUMBIA AVE	3	11
PALMETTO WOOD DESIGN	256-B COLUMBIA AVE	4	11
PWD FINE CABINETRY I	256B COLUMBIA DR	4	16

EXECUTIVE SUMMARY

Site	Address	Map ID	Page
APPLIED BUILDING SCI	205 COLUMBIA AVE	5	17
CHAMPION	***1404 CHAPIN RD***	***7***	***20***
SIGNODE PACKAGING SY	300 E BOUNDARY ST	16	32
CENTRAL LABEL PRODUC	300 E BOUNDARY ST	16	45

STATE AND LOCAL RECORDS

SHWS: State hazardous waste site records are the states' equivalent to CERCLIS. These sites may or may not already be listed on the federal CERCLIS list. Priority sites planned for cleanup using state funds (state equivalent of Superfund) are identified along with sites where cleanup will be paid for by potentially responsible parties. Available information varies by state.

A review of the SHWS list, as provided by EDR, and dated 03/23/2015 has revealed that there are 2 SHWS sites within the searched area.

Site	Address	Map ID	Page
FB JOHNSTON GRAPHICS EPA ID: SCS123457362	***300 E BOUNDARY ST***	***16***	***44***
SUFFOLK CHEMICAL CO EPA ID: SCD980801179	***.5 MILES N OF US-76***	***17***	***47***

ALLSITES: The South Carolina Department of Health and Environmental Control is pleased to have the Public Record for your review. The purpose of this database is two-fold. First, it will provide to communities another form of notice of cleanup activity, allowing them to have more information about assessment and cleanup activities in their area and in the State. Second, it can assist those seeking to redevelop brownfield properties within South Carolina.

A review of the ALLSITES list, as provided by EDR, and dated 09/14/2015 has revealed that there are 2 ALLSITES sites within the searched area.

Site	Address	Map ID	Page
FB JOHNSTON GRAPHICS Project Status Code: ACTIVE	***300 E BOUNDARY ST***	***16***	***44***
SUFFOLK CHEMICAL CO Permit Number: SCD980801179 Project Status Code: ACTIVE	***.5 MILES N OF US-76***	***17***	***47***

GWCI: Groundwater Contamination Inventory Cases. Any site that has groundwater contamination over a federal MCL.

A review of the GWCI list, as provided by EDR, and dated 07/01/2008 has revealed that there are 3 GWCI sites within the searched area.

Site	Address	Map ID	Page
CORNER PANTRY 132	***661 COLUMBIA RD***	***1***	***7***

Solid Waste Permit #: 06038			
W B DERRICK 66	***1209 CHAPIN RD***	***10***	***24***
Solid Waste Permit #: 06152			
S&S GARAGE	***930 CHAPIN RD***	***14***	***29***
Solid Waste Permit #: 10120			

LUST: The Leaking Underground Storage Tank Incident Reports contain an inventory of reported leaking underground storage tank incidents. The data come from the Department of Health & Environmental Control's Leaking UST list.

A review of the LUST list, as provided by EDR, and dated 07/29/2015 has revealed that there are 6 LUST sites within the searched area.

Site	Address	Map ID	Page
PITT STOP 7	***648 COLUMBIA AVE***	***1***	***3***
No Action Required: 01/14/10 Substance: PETROL Facility Status: awaiting funding Facility Id: 10659			
CORNER PANTRY 132	***661 COLUMBIA RD***	***1***	***7***
Substance: PETRO Substance: PETROL Facility Status: conduct invest/risk assessment Facility Id: 06038			
CHAPIN FIRE DEPARTME	***106 COLUMBIA AVE***	***6***	***17***
No Action Required: 03/23/92 Substance: PETRO Facility Id: 09850			
W B DERRICK 66	***1209 CHAPIN RD***	***10***	***24***
No Action Required: 02/22/13 Substance: PETRO Facility Status: monitored natural attenuation Facility Id: 06152			
S&S GARAGE	***930 CHAPIN RD***	***14***	***29***
Substance: PETROL Facility Status: conduct invest/risk assessment Facility Id: 10120			
UNION CONCRETE PLANT	***912 CHAPIN RD***	***15***	***31***
No Action Required: 11/28/01 Substance: PETRO Facility Status: conduct invest/risk assessment Facility Id: 06095			

EXECUTIVE SUMMARY

UST: The Underground Storage Tank database contains registered USTs. USTs are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA). The data come from the Department of Health & Environmental Control's list: Comprehensive Underground Storage Tanks.

A review of the UST list, as provided by EDR, and dated 07/29/2015 has revealed that there are 9 UST sites within the searched area.

Site	Address	Map ID	Page
PITT STOP 7 Facility Id: 10659 Status: CIU	***648 COLUMBIA AVE***	***1***	***3***
RAINBOW GAS GARDEN 1 Facility Id: 18558 Status: CIU	650 COLUMBIA AVE	1	5
CORNER PANTRY 132 Facility Id: 6038 Status: CIU Status: ABD Status: EOU	***661 COLUMBIA RD***	***1***	***7***
CHAPIN FIRE DEPARTME Facility Id: 9850 Status: ABD	***106 COLUMBIA AVE***	***6***	***17***
PANTRY 476 Facility Id: 6100 Status: CIU	1259 CHAPIN RD	9	24
W B DERRICK 66 Facility Id: 6152 Status: ABD	***1209 CHAPIN RD***	***10***	***24***
COLONIAL STATION Facility Id: 11206 Status: ABD	HWY 76 & CLARK ST	11	26
S&S GARAGE Facility Id: 10120 Status: ABD	***930 CHAPIN RD***	***14***	***29***
UNION CONCRETE PLANT Facility Id: 6095 Status: ABD	***912 CHAPIN RD***	***15***	***31***

AST: The Aboveground Storage Tank database contains registered ASTs. The data come from the Department of Health & Environmental Control's list: Comprehensive Aboveground Storage Tanks.

A review of the AST list, as provided by EDR, and dated 03/25/2004 has revealed that there is 1 AST site within the searched area.

Site	Address	Map ID	Page
SCE&G - CHAPIN CREW Facility Id: 1359	256 COLUMBIA AVE	4	15

SPILLS: The Spills Database.

A review of the SPILLS list, as provided by EDR, and dated 03/25/2015 has revealed that there are 2 SPILLS sites within the searched area.

Site	Address	Map ID	Page
DIESEL FUEL PUMP Incident Name: 200202762 Incident ID number: 3845796	650 COLUMBIA AVE	1	5
FUEL TANK Incident Name: 200604634 Incident ID number: 25197287	659 COLUMBIA AVE	1	6

VCP: Voluntary Cleanup Sites from the Department of Health and Environmental Control.

A review of the VCP list, as provided by EDR, and dated 07/14/2014 has revealed that there is 1 VCP site within the searched area.

Site	Address	Map ID	Page
SUFFOLK CHEMICAL CO.	***.5 MILES N OF US-76***	***17***	***46***

BROWNFIELDS: The Brownfields component of the Voluntary Cleanup Program allows a non responsible party to acquire a contaminated property with State Superfund liability protection for existing contamination by agreeing to perform an environmental assessment and/or remediation.

A review of the BROWNFIELDS list, as provided by EDR, and dated 06/29/2015 has revealed that there are 2 BROWNFIELDS sites within the searched area.

Site	Address	Map ID	Page
FB JOHNSTON GRAPHICS Status Code: ACTIVE File Number: 403894	***300 E BOUNDARY ST***	***16***	***44***
SUFFOLK CHEMICAL CO. Status Code: ACTIVE File Number: 52199	***.5 MILES N OF US-76***	***17***	***46***

EDR PROPRIETARY RECORDS

EDR US Hist Auto Stat: EDR has searched selected national collections of business directories and has collected listings of potential gas station/filling station/service station sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include gas station/filling station/service station establishments. The categories reviewed included, but were not limited to gas, gas station, gasoline station, filling station, auto, automobile repair, auto service station, service station, etc. This database falls within a category of information EDR classifies as "High Risk

Historical Records", or HRHR. EDR's HRHR effort presents unique and sometimes proprietary data about past sites and operations that typically create environmental concerns, but may not show up in current government records searches.

A review of the EDR US Hist Auto Stat list, as provided by EDR, has revealed that there are 5 EDR US Hist Auto Stat sites within the searched area.

Site	Address	Map ID	Page
Not reported	650 COLUMBIA AVE	1	6
Not reported	661 COLUMBIA AVE	1	10
Not reported	258 COLUMBIA AVE	4	17
Not reported	110 BEAUFORT ST	8	23
Not reported	930 CHAPIN RD	14	31

EDR US Hist Cleaners: EDR has searched selected national collections of business directories and has collected listings of potential dry cleaner sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include dry cleaning establishments. The categories reviewed included, but were not limited to dry cleaners, cleaners, laundry, laundromat, cleaning/laundry, wash & dry etc. This database falls within a category of information EDR classifies as "High Risk Historical Records", or HRHR. EDR's HRHR effort presents unique and sometimes proprietary data about past sites and operations that typically create environmental concerns, but may not show up in current government records searches.

A review of the EDR US Hist Cleaners list, as provided by EDR, has revealed that there are 4 EDR US Hist Cleaners sites within the searched area.

Site	Address	Map ID	Page
Not reported	105 LEXINGTON AVE	8	23
Not reported	140 AMICKS FERRY RD	12	27
Not reported	138 AMICKS FRY RD	12	27
Not reported	138 AMICKS FERRY RD	12	27

RGA HWS: The EDR Recovered Government Archive State Hazardous Waste database provides a list of SHWS incidents derived from historical databases and includes many records that no longer appear in current government lists. Compiled from Records formerly available from the Department of Health and Environmental Control in South Carolina.

A review of the RGA HWS list, as provided by EDR, has revealed that there is 1 RGA HWS site within the searched area.

Site	Address	Map ID	Page
FB JOHNSTON GRAPHICS	300 E BOUNDARY ST	16	45

EXECUTIVE SUMMARY

RGA LUST: The EDR Recovered Government Archive Leaking Underground Storage Tank database provides a list of LUST incidents derived from historical databases and includes many records that no longer appear in current government lists. Compiled from Records formerly available from the Department of Health and Environmental Control in South Carolina.

A review of the RGA LUST list, as provided by EDR, has revealed that there is 1 RGA LUST site within the searched area.

Site	Address	Map ID	Page
PITT STOP 7	648 COLUMBIA AVE	1	4

EXECUTIVE SUMMARY

Please refer to the end of the findings report for unmapped orphan sites due to poor or inadequate address information.

MAP FINDINGS SUMMARY

Database	Total Plotted
FEDERAL RECORDS	
NPL	0
Proposed NPL	0
Delisted NPL	0
NPL LIENS	0
CERCLIS	0
CERCLIS-NFRAP	0
LIENS 2	0
CORRACTS	0
RCRA-TSDF	0
RCRA-LQG	0
RCRA-SQG	0
RCRA-CESQG	2
RCRA NonGen / NLR	3
US ENG CONTROLS	0
US INST CONTROL	0
ERNS	0
HMIRS	0
DOT OPS	0
US CDL	0
US BROWNFIELDS	0
DOD	0
FUDS	0
LUCIS	0
CONSENT	0
ROD	0
UMTRA	0
ODI	0
DEBRIS REGION 9	0
US MINES	0
TRIS	0
TSCA	0
FTTS	0
HIST FTTS	0
SSTS	0
ICIS	0
PADS	0
MLTS	0
RADINFO	0
FINDS	12
RAATS	0
RMP	0
EPA WATCH LIST	0
PRP	0
2020 COR ACTION	0
COAL ASH DOE	0
FEMA UST	0
FEDERAL FACILITY	0
LEAD SMELTERS	0

Database	Total Plotted
US AIRS	0
COAL ASH EPA	0
US FIN ASSUR	0
US HIST CDL	0
SCRD DRYCLEANERS	0
PCB TRANSFORMER	0

STATE AND LOCAL RECORDS

SHWS	2
ALLSITES	2
GWCI	3
RCR	0
SWF/LF	0
UIC	0
SWRCY	0
LUST	6
UST	9
AST	1
SPILLS	2
AUL	0
VCP	1
DRYCLEANERS	0
BROWNFIELDS	2
CDL	0
NPDES	0
AIRS	0
COAL ASH	0

TRIBAL RECORDS

INDIAN RESERV	0
INDIAN ODI	0
INDIAN LUST	0
INDIAN UST	0
INDIAN VCP	0

EDR PROPRIETARY RECORDS

EDR MGP	0
EDR US Hist Auto Stat	5
EDR US Hist Cleaners	4
RGA HWS	1
RGA LF	0
RGA LUST	1

NOTES:

Sites may be listed in more than one database

MAP FINDINGS

Map ID Direction Distance Distance (ft.)	Site	Database(s)	EDR ID Number EPA ID Number
1	**PITT STOP 7** **648 COLUMBIA AVE** **CHAPIN, SC 29036**	**LUST** **UST**	**U003623556** **N/A**

LUST:

Facility ID:	10659
Release Number:	1
Facility Status:	awaiting funding
Substance:	PETROL
Owner:	BOB BRANDI STATIONS INC
NFA Date:	**01/14/10**
Date Confirmed:	07/30/08
Report Date:	07/23/08
Rank:	2BB

LUST DETAIL:

Release Date:	07/23/2008
Cleanup Complete Date:	01/14/2010
RP Name:	BOB BRANDI STATIONS INC
RP Address:	279 CEDARCREST DR
RP City:	LEXINGTON
RP State:	SC
RP Zip:	29072
SCRBCA Class Code:	CLASS2BB
Depth to Ground Water:	36
Ground Water Flow Direction:	Not reported
Project Manager:	SKOWRONEK, JOHN T
Release Fin Type Code:	Qualifies for Fund with Deductible

UST:

Facility ID:	10659
Owner:	BOB BRANDI STATIONS INC
Owner Contact:	BOB BRANDI
Owner Address:	279 CEDARCREST DR
Owner City,St,Zip:	LEXINGTON, SC 29072
Owner Phone:	803-957-7367
Contact:	BOB BRANDI
Contact Phone:	803-345-1988

Tank ID:	1
Status:	**Currently in use**
Capacity:	10000
Product:	RUL
Calcage:	0

Tank ID:	2
Status:	**Currently in use**
Capacity:	10000
Product:	Diesel
Calcage:	0

Tank ID:	3
Status:	**Currently in use**
Capacity:	10000
Product:	PLUS
Calcage:	0

PITT STOP 7 (Continued) **U003623556**

Tank ID: 4
Status: **Currently in use**
Capacity: 10000
Product: PREM
Calcage: 0

---

1 **PITT STOP 7** **FINDS** **1007239394**
648 COLUMBIA AVE **N/A**
CHAPIN, SC 29036

FINDS:

Registry ID: 110017109653

Environmental Interest/Information System
SC-EFIS (South Carolina - Environmental Facility Information System) integrates information on environmental facilities, permits, violations, enforcement actions, and compliance activities needed to support regulatory requirements and target environmental quality improvements for the water, air, solid waste, and hazardous waste program areas. The EFIS was developed by the state of South Carolina and Maine joined their system in 2004.

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1 **PITT STOP 7** **RGA LUST** **S114818174**
648 COLUMBIA AVE **N/A**
CHAPIN, SC

RGA LUST:

2012	PITT STOP 7	648 COLUMBIA AVE
2011	PITT STOP 7	648 COLUMBIA AVE
2010	PITT STOP 7	648 COLUMBIA AVE
2009	PITT STOP 7	648 COLUMBIA AVE
2008	PITT STOP 7	648 COLUMBIA AVE

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1 **RAINBOW GAS GARDEN 12** **FINDS** **1007242263**
650 COLUMBIA AVE **N/A**
CHAPIN, SC 29036

FINDS:

Registry ID: 110017139791

Environmental Interest/Information System
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1 **RAINBOW GAS GARDEN 12** **UST** **U003730123**
650 COLUMBIA AVE **N/A**
CHAPIN, SC 29036

UST:

Facility ID:	18558
Owner:	ANDERSON OIL CO INC
Owner Contact:	TERRILL TUTEN
Owner Address:	PO BOX 1285
Owner City,St,Zip:	BARNWELL, SC 29812-1285
Owner Phone:	803-259-7578
Contact:	TERRILL TUTEN
Contact Phone:	Not reported

Tank ID:	1
Status:	**Currently in use**
Capacity:	15000
Product:	RUL
Calcage:	0

Tank ID:	2
Status:	**Currently in use**
Capacity:	15000
Product:	Diesel
Calcage:	0

Tank ID:	3
Status:	**Currently in use**
Capacity:	12000
Product:	PREM
Calcage:	0

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1 **DIESEL FUEL PUMP** **SPILLS** **S105585812**
650 COLUMBIA AVE **N/A**
CHAPIN, SC

SPILL:

Incident ID number:	3845796
Incident Name:	200202762
District Logged In:	Not reported
Date DHEC notified:	06/29/2002
DHEC notification:	2044
Observed date:	06/29/2002
observed_t:	2020
Spill Date:	06/29/2002
Spill Time:	2020
Duration:	Not reported
Created Date:	07/01/2002
Updated Date:	09/24/2002
District Name:	Columbia EQC Office
PRP Last Name:	RAINBOW GAS GARDEN 12
PRP First Name:	Not reported
Incident substance type:	Oil
Received by Name:	NICHOLAS DAVIDSON
Revieved by Name:	KENDRICK CHILES
Transportation:	N
Surface water affected:	Yes
Lead Investigator Name:	Not reported

DIESEL FUEL PUMP (Continued) **S105585812**

CCBEP: No
Water body: Storm Drain
Caller Last Name: Not reported
Caller name: Not reported
Caller phone number: Not reported
Caller extension: Not reported
Caller organization: Not reported
Substance: DIESEL
Quantity: 20
Units: Gallons
Recovered: Not reported
Recovered Units: Not reported
Comments: Not reported

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1 **EDR US Hist Auto Stat** **1015590518**
650 COLUMBIA AVE **N/A**
CHAPIN, SC 29036

EDR Historical Auto Stations:
Name: RAINBOW GAS GARDEN
Year: 2010
Address: 650 COLUMBIA AVE

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1 **FUEL TANK** **SPILLS** **S108171047**
659 COLUMBIA AVE **N/A**
CHAPIN, SC

SPILL:
Incident ID number: 25197287
Incident Name: 200604634
District Logged In: Not reported
Date DHEC notified: 10/01/2006
DHEC notification: 1317
Observed date: Not reported
observed_t: Not reported
Spill Date: 10/01/2006
Spill Time: Not reported
Duration: 3.5
Created Date: 10/02/2006
Updated Date: 10/06/2006
District Name: Columbia EQC Office
PRP Last Name: Not reported
PRP First Name: Not reported
Incident substance type: Oil
Received by Name: JIM RICE
Revieved by Name: JOHN ANSELL
Transportation: Y
Surface water affected: No
Lead Investigator Name: Not reported
CCBEP: No
Water body: Not reported
Caller Last Name: Not reported
Caller name: Not reported
Caller phone number: Not reported
Caller extension: Not reported

Map ID Direction Distance Distance (ft.)	Site	Database(s)	EDR ID Number EPA ID Number

FUEL TANK (Continued) **S108171047**

Caller organization: Not reported
Substance: GASOLINE
Quantity: 15
Units: Gallons
Recovered: Not reported
Recovered Units: Not reported
Comments: Not reported

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1 **CORNER PANTRY 132** **FINDS** **1007256286**
661 COLUMBIA RD **N/A**
CHAPIN, SC 29036

FINDS:

Registry ID: 110017292106

Environmental Interest/Information System
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1 **CORNER PANTRY 132** **GWCI** **U003622959**
661 COLUMBIA RD **LUST** **N/A**
CHAPIN, SC 29036 **UST**

SC GWIC:

Bureau:	BLWM
EAP ID:	Not reported
Solid Waste Permit #:	Not reported
Bureau of Land & Waste Management File #:	Not reported
Permit Number:	06038
WPC Permit:	Not reported
Program:	DUST
Contamination:	PETRO
Petroleum Products:	True
Volatile Organic Compounds:	False
Metals:	False
Nitrates or Potential to Nitrate:	False
Pesticides & Herbicides:	False
Polychlorinated Biphenyls:	False
Base, Neutral, & Acid Extractables:	False
Phenols:	False
Radionuclides Over Max Contaminant Levels:	False
Sources Not In Other Categories:	False
Source:	UST
Underground Storage Tanks:	True
Pits, Ponds, & Lagoons:	False
Spills & Leaks:	False
Landfills:	False
Aboveground Storage Tank:	False

CORNER PANTRY 132 (Continued) **U003622959**

Spray Irrigation: False
Single-Event Spill: False
Unpermitted Disposal: False
Septic Tank/Tile Field: False
Substances Not In Other Categories: False
Sources of Contamination Undetermined: False
Assessment: Yes
Monitoring: No
Remediation: No
Surface Impact: No
Drinking Water Well Impact: No
Remarks: Site ID # 06038. RBCA Classification 2BA1. Conducting investigation/Risk Assessment.

LUST:
Facility ID: 06038
Release Number: 1
Facility Status: conduct invest/risk assessment
Substance: PETRO
Owner: TUCKER OIL CO INC
NFA Date: **Not reported**
Date Confirmed: 08/29/86
Report Date: 01/28/86
Rank: 2BB

LUST DETAIL:
Release Date: 01/28/1986
Cleanup Complete Date: Not reported
RP Name: ORPHAN MUNN OIL CO INC
RP Address: 621 COVINGTON ST
RP City: SUMTER
RP State: SC
RP Zip: 29150
SCRBCA Class Code: CLASS2BB
Depth to Ground Water: 26.05
Ground Water Flow Direction: NE
Project Manager: SKOWRONEK, JOHN T
Release Fin Type Code: With Insurance Policy

Release Date: 08/28/2008
Cleanup Complete Date: Not reported
RP Name: TUCKER OIL CO INC
RP Address: 1001 IDLEWILDE BLVD
RP City: COLUMBIA
RP State: SC
RP Zip: 29201
SCRBCA Class Code: CLASS3BC
Depth to Ground Water: Not reported
Ground Water Flow Direction: E
Project Manager: SKOWRONEK, JOHN T
Release Fin Type Code: Qualifies for Fund with Deductible

Facility ID: 06038
Release Number: 2
Facility Status: conduct invest/risk assessment
Substance: PETROL

CORNER PANTRY 132 (Continued) **U003622959**

Owner: TUCKER OIL CO INC
NFA Date: **Not reported**
Date Confirmed: 09/11/08
Report Date: 08/28/08
Rank: 2BB

LUST DETAIL:

Release Date: 01/28/1986
Cleanup Complete Date: Not reported
RP Name: ORPHAN MUNN OIL CO INC
RP Address: 621 COVINGTON ST
RP City: SUMTER
RP State: SC
RP Zip: 29150
SCRBCA Class Code: CLASS2BB
Depth to Ground Water: 26.05
Ground Water Flow Direction: NE
Project Manager: SKOWRONEK, JOHN T
Release Fin Type Code: With Insurance Policy

Release Date: 08/28/2008
Cleanup Complete Date: Not reported
RP Name: TUCKER OIL CO INC
RP Address: 1001 IDLEWILDE BLVD
RP City: COLUMBIA
RP State: SC
RP Zip: 29201
SCRBCA Class Code: CLASS3BC
Depth to Ground Water: Not reported
Ground Water Flow Direction: E
Project Manager: SKOWRONEK, JOHN T
Release Fin Type Code: Qualifies for Fund with Deductible

UST:

Facility ID: 6038
Owner: TUCKER OIL CO INC
Owner Contact: BUCK SPROTT
Owner Address: 1001 IDLEWILDE BLVD
Owner City,St,Zip: COLUMBIA, SC 29201
Owner Phone: 803-254-4806
Contact: BUCK SPROTT
Contact Phone: 803-345-1376

Tank ID: 1
Status: **Currently in use**
Capacity: 15000
Product: RUL
Calcage: 5

Tank ID: 2
Status: **Abandoned**
Capacity: 12000
Product: Diesel
Calcage: 5

CORNER PANTRY 132 (Continued) **U003622959**

Tank ID:	3
Status:	**Extended out of use**
Capacity:	8000
Product:	PLUS
Calcage:	5

Tank ID:	4
Status:	**Currently in use**
Capacity:	8000
Product:	PREM
Calcage:	5

Tank ID:	5
Status:	**Abandoned**
Capacity:	4000
Product:	Diesel
Calcage:	5

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1 **EDR US Hist Auto Stat** **1015593984**
N/A

661 COLUMBIA AVE
CHAPIN, SC 29036

EDR Historical Auto Stations:

Name:	CHAPIN AMOCO
Year:	1999
Address:	661 COLUMBIA AVE
Name:	CHAPIN AMOCO
Year:	2000
Address:	661 COLUMBIA AVE
Name:	CHAPIN AMOCO
Year:	2001
Address:	661 COLUMBIA AVE
Name:	AMOCO OIL
Year:	2007
Address:	661 COLUMBIA AVE

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2 **LMC-CHAPIN** **FINDS** **1007239911**
N/A

557 COLUMBIA AVE
CHAPIN, SC 29036

FINDS:

Registry ID: 110017115049

Environmental Interest/Information System

SC-EFIS (South Carolina - Environmental Facility Information System) integrates information on environmental facilities, permits, violations, enforcement actions, and compliance activities needed to support regulatory requirements and target environmental quality improvements for the water, air, solid waste, and hazardous waste program areas. The EFIS was developed by the state of South Carolina

LMC-CHAPIN (Continued) **1007239911**

and Maine joined their system in 2004.

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3 **O CAIN ADVERTISING** **FINDS** **1008009406**
500 COLUMBIA AVE **N/A**
CHAPIN, SC 29036

FINDS:

Registry ID: 110002202349

Environmental Interest/Information System
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3 **WEE R KIDS DAY CARE** **FINDS** **1007244697**
520 COLUMBIA AVE **N/A**
CHAPIN, SC 29036

FINDS:

Registry ID: 110017165182

Environmental Interest/Information System
SC-EFIS (South Carolina - Environmental Facility Information System) integrates information on environmental facilities, permits, violations, enforcement actions, and compliance activities needed to support regulatory requirements and target environmental quality improvements for the water, air, solid waste, and hazardous waste program areas. The EFIS was developed by the state of South Carolina and Maine joined their system in 2004.

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4 **PALMETTO WOOD DESIGNS** **FINDS** **1008944368**
256-B COLUMBIA AVE **N/A**
CHAPIN, SC 29036

FINDS:

Registry ID: 110023156403

Environmental Interest/Information System
AFS (Aerometric Information Retrieval System (AIRS) Facility Subsystem) replaces the former Compliance Data System (CDS), the National Emission Data System (NEDS), and the Storage and Retrieval of Aerometric Data (SAROAD). AIRS is the national repository for information concerning airborne pollution in the United States. AFS is used to track emissions and compliance data from industrial plants. AFS data are utilized by states to prepare State Implementation Plans

PALMETTO WOOD DESIGNS (Continued) **1008944368**

to comply with regulatory programs and by EPA as an input for the estimation of total national emissions. AFS is undergoing a major redesign to support facility operating permits required under Title V of the Clean Air Act.

AIR MINOR

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4 **PWD FINE CABINETRY INC** **RCRA NonGen / NLR** **1008375201**
256B COLUMBIA DR **SCR000766832**
CHAPIN, SC 29036

RCRA NonGen / NLR:

Date form received by agency:	11/22/2010
Facility name:	PWD FINE CABINETRY INC
Facility address:	256B COLUMBIA DR CHAPIN, SC 29036
EPA ID:	SCR000766832
Mailing address:	COLUMBIA AVE CHAPIN, SC 29036
Contact:	LADAIN OWENS
Contact address:	COLUMBIA AVE CHAPIN, SC 29036
Contact country:	US
Contact telephone:	(803) 932-0970
Contact email:	Not reported
EPA Region:	04
Land type:	Private
Classification:	Non-Generator
Description:	Handler: Non-Generators do not presently generate hazardous waste

Owner/Operator Summary:

Owner/operator name:	PALMETTO WOOD DESIGNS
Owner/operator address:	COLUMBIA DR CHAPIN, SC 29036
Owner/operator country:	US
Owner/operator telephone:	(803) 600-6318
Legal status:	Private
Owner/Operator Type:	Operator
Owner/Op start date:	04/11/2005
Owner/Op end date:	Not reported

Owner/operator name:	LADAIN OWENS
Owner/operator address:	FERNANDINA RD COLUMBIA, SC 29210
Owner/operator country:	US
Owner/operator telephone:	(803) 600-6318
Legal status:	Private
Owner/Operator Type:	Owner
Owner/Op start date:	04/11/2005
Owner/Op end date:	Not reported

Handler Activities Summary:

U.S. importer of hazardous waste:	No
Mixed waste (haz. and radioactive):	No
Recycler of hazardous waste:	No
Transporter of hazardous waste:	No

PWD FINE CABINETRY INC (Continued) **1008375201**

Treater, storer or disposer of HW: No
Underground injection activity: No
On-site burner exemption: No
Furnace exemption: No
Used oil fuel burner: No
Used oil processor: No
User oil refiner: No
Used oil fuel marketer to burner: No
Used oil Specification marketer: No
Used oil transfer facility: No
Used oil transporter: No

. Waste code: D001
. Waste name: IGNITABLE WASTE

. Waste code: F003
. Waste name: THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: XYLENE, ACETONE, ETHYL ACETATE, ETHYL BENZENE, ETHYL ETHER, METHYL ISOBUTYL KETONE, N-BUTYL ALCOHOL, CYCLOHEXANONE, AND METHANOL; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONLY THE ABOVE SPENT NONHALOGENATED SOLVENTS; AND ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONE OR MORE OF THE ABOVE NONHALOGENATED SOLVENTS, AND A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THOSE SOLVENTS LISTED IN F001, F002, F004, AND F005; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

. Waste code: F005
. Waste name: THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: TOLUENE, METHYL ETHYL KETONE, CARBON DISULFIDE, ISOBUTANOL, PYRIDINE, BENZENE, 2-ETHOXYETHANOL, AND 2-NITROPROPANE; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THE ABOVE NONHALOGENATED SOLVENTS OR THOSE SOLVENTS LISTED IN F001, F002, OR F004; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

Historical Generators:
Date form received by agency: 04/15/2010
Site name: PWD FINE CABINETRY INC
Classification: Small Quantity Generator

. Waste code: D001
. Waste name: IGNITABLE WASTE

. Waste code: F003
. Waste name: THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: XYLENE, ACETONE, ETHYL ACETATE, ETHYL BENZENE, ETHYL ETHER, METHYL ISOBUTYL KETONE, N-BUTYL ALCOHOL, CYCLOHEXANONE, AND METHANOL; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONLY THE ABOVE SPENT NONHALOGENATED SOLVENTS; AND ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONE OR MORE OF THE ABOVE NONHALOGENATED SOLVENTS, AND A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THOSE SOLVENTS LISTED IN F001, F002, F004, AND F005; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

. Waste code: F005

PWD FINE CABINETRY INC (Continued) **1008375201**

. Waste name: THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: TOLUENE, METHYL ETHYL KETONE, CARBON DISULFIDE, ISOBUTANOL, PYRIDINE, BENZENE, 2-ETHOXYETHANOL, AND 2-NITROPROPANE; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THE ABOVE NONHALOGENATED SOLVENTS OR THOSE SOLVENTS LISTED IN F001, F002, OR F004; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

Date form received by agency: 04/16/2009
Site name: PWD FINE CABINETRY INC
Classification: Small Quantity Generator

. Waste code: D001
. Waste name: IGNITABLE WASTE

. Waste code: F003
. Waste name: THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: XYLENE, ACETONE, ETHYL ACETATE, ETHYL BENZENE, ETHYL ETHER, METHYL ISOBUTYL KETONE, N-BUTYL ALCOHOL, CYCLOHEXANONE, AND METHANOL; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONLY THE ABOVE SPENT NONHALOGENATED SOLVENTS; AND ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONE OR MORE OF THE ABOVE NONHALOGENATED SOLVENTS, AND A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THOSE SOLVENTS LISTED IN F001, F002, F004, AND F005; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

. Waste code: F005
. Waste name: THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: TOLUENE, METHYL ETHYL KETONE, CARBON DISULFIDE, ISOBUTANOL, PYRIDINE, BENZENE, 2-ETHOXYETHANOL, AND 2-NITROPROPANE; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THE ABOVE NONHALOGENATED SOLVENTS OR THOSE SOLVENTS LISTED IN F001, F002, OR F004; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

Date form received by agency: 01/15/2009
Site name: PALMETTO WOOD DESIGNS
Classification: Small Quantity Generator

. Waste code: D001
. Waste name: IGNITABLE WASTE

. Waste code: F003
. Waste name: THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: XYLENE, ACETONE, ETHYL ACETATE, ETHYL BENZENE, ETHYL ETHER, METHYL ISOBUTYL KETONE, N-BUTYL ALCOHOL, CYCLOHEXANONE, AND METHANOL; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONLY THE ABOVE SPENT NONHALOGENATED SOLVENTS; AND ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONE OR MORE OF THE ABOVE NONHALOGENATED SOLVENTS, AND A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THOSE SOLVENTS LISTED IN F001, F002, F004, AND F005; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

. Waste code: F005
. Waste name: THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: TOLUENE, METHYL ETHYL

PWD FINE CABINETRY INC (Continued) **1008375201**

KETONE, CARBON DISULFIDE, ISOBUTANOL, PYRIDINE, BENZENE, 2-ETHOXYETHANOL, AND 2-NITROPROPANE; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THE ABOVE NONHALOGENATED SOLVENTS OR THOSE SOLVENTS LISTED IN F001, F002, OR F004; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

Date form received by agency: 04/11/2005
Site name: PALMETTO WOOD DESIGNS
Classification: Small Quantity Generator

. Waste code: D001
. Waste name: IGNITABLE WASTE

. Waste code: F003
. Waste name: THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: XYLENE, ACETONE, ETHYL ACETATE, ETHYL BENZENE, ETHYL ETHER, METHYL ISOBUTYL KETONE, N-BUTYL ALCOHOL, CYCLOHEXANONE, AND METHANOL; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONLY THE ABOVE SPENT NONHALOGENATED SOLVENTS; AND ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONE OR MORE OF THE ABOVE NONHALOGENATED SOLVENTS, AND A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THOSE SOLVENTS LISTED IN F001, F002, F004, AND F005; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

. Waste code: F005
. Waste name: THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: TOLUENE, METHYL ETHYL KETONE, CARBON DISULFIDE, ISOBUTANOL, PYRIDINE, BENZENE, 2-ETHOXYETHANOL, AND 2-NITROPROPANE; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THE ABOVE NONHALOGENATED SOLVENTS OR THOSE SOLVENTS LISTED IN F001, F002, OR F004; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

Violation Status: No violations found

Evaluation Action Summary:
Evaluation date: 04/25/2005
Evaluation: COMPLIANCE ASSISTANCE VISIT
Area of violation: Not reported
Date achieved compliance: Not reported
Evaluation lead agency: State

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4 **SCE&G - CHAPIN CREW QUARTERS** **AST** **A100267626**
256 COLUMBIA AVE **N/A**
CHAPIN, SC

AST:
Facility ID: 1359
District: Central Midlands
Mailing Addr: 1426 Main Street
Mailing City,St,Zip: Columbia, SC 29218-
Facility Manager: Amy Monroe
Manager Phone: 8032148351
Facility office location: SCE&G (M/C-D08)
Facility phone number: 8039887306
Facility manager Ext: Not reported

SCE&G - CHAPIN CREW QUARTERS (Continued) **A100267626**

Tank A-How many of size < 250 glns:	0
Tank B-How many of size 250-1000 glns:	0
Tank C-How many of size 1001-2000 glns:	0
Tank D-How many of size 2001-10000 glns:	0
Tank E-How many of size 10001-42000 glns:	0
Tank F-How many of size 42001-250000 glns:	0
Tank G-How many of size 250001-1000000 glns:	0
Tank H-How many of size 10000001-4000000 glns:	0
Tank I-How many of size >4000000 glns:	0
Total site capacity 661-2,000 glns:	False
Total site capacity 2001-10,000 glns:	True
Total site capacity 10,001-42,000 glns:	False
Total site capacity 42,001-100,000 glns:	False
Total site capacity 100,001-250,000 glns:	False
Total site capacity 250,001-1,000,000 glns:	False
Total site capacity 1,000,001-5,000,000 glns:	False
Total site capacity 5,000,0001-10,000,000 glns:	False
Total site capacity >10,000,000 glns:	False
Actual storage amount in gallons:	2200.00000
NAICS code:	27.00000
Is this a registered terminal facility?:	False
If not, does it need to be registered?:	False
Earthen containment:	False
Asphalt containment:	False
Liner:	False
Concrete floor and walls:	False
Concrete walls, earth floor:	False
Block walls, concrete floor:	False
Block walls, earthen floor:	False
Double wall tank:	False
Does containment need repair?:	False
GPS unit make/model:	Trimble XRS
GPS mode uncorrected,Radio beacon,Satellite corrected:	Sat - DGPS
Lat/Long:	34 10 01.39 -81 20 36.27
Date data was collected:	10/12/00
Comments:	Transformers, waste oil. Cleanup cews at most sites. # of transformers is not listed but it is included in the TOTAL site capacity.

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4 **PWD FINE CABINETRY INC** **FINDS** **1008224673**
256B COLUMBIA DR **N/A**
CHAPIN, SC 29036

FINDS:

Registry ID: 110022305450

Environmental Interest/Information System
RCRAInfo is a national information system that supports the Resource Conservation and Recovery Act (RCRA) program through the tracking of events and activities related to facilities that generate, transport, and treat, store, or dispose of hazardous waste. RCRAInfo allows RCRA program staff to track the notification, permit, compliance, and corrective action activities required under RCRA.

4 **258 COLUMBIA AVE**
CHAPIN, SC 29036

EDR US Hist Auto Stat **1015369621**
N/A

EDR Historical Auto Stations:

Name: LAKE MURRAY TIRE AND AUTOMOTIVE
Year: 2005
Address: 258 COLUMBIA AVE

Name: LAKE MURRAY TIRE & AUTOMOTIVE
Year: 2006
Address: 258 COLUMBIA AVE

Name: LAKE MURRAY TIRE & AUTOMOTIVE
Year: 2011
Address: 258 COLUMBIA AVE

Name: LAKE MURRAY TIRE & AUTOMOTIVE
Year: 2012
Address: 258 COLUMBIA AVE

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5 **APPLIED BUILDING SCIENCES, INC**
205 COLUMBIA AVE
CHAPIN, SC 29036

FINDS **1010169380**
N/A

FINDS:

Registry ID: 110030478098

Environmental Interest/Information System

ICIS (Integrated Compliance Information System) is the Integrated Compliance Information System and provides a database that, when complete, will contain integrated Enforcement and Compliance information across most of EPA's programs. The vision for ICIS is to replace EPA's independent databases that contain Enforcement data with a single repository for that information. Currently, ICIS contains all Federal Administrative and Judicial enforcement actions. This information is maintained in ICIS by EPA in the Regional offices and it Headquarters. A future release of ICIS will replace the Permit Compliance System (PCS) which supports the NPDES and will integrate that information with Federal actions already in the system. ICIS also has the capability to track other activities occurring in the Region that support Compliance and Enforcement programs. These include; Incident Tracking, Compliance Assistance, and Compliance Monitoring.

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6 **CHAPIN FIRE DEPARTMENT**
106 COLUMBIA AVE
CHAPIN, SC 29036

LUST **U004019840**
UST **N/A**

LUST:

Facility ID: 09850
Release Number: 1
Facility Status: Not reported
Substance: PETRO
Owner: LEXINGTON COUNTY
NFA Date: **03/23/92**
Date Confirmed: 03/23/92

CHAPIN FIRE DEPARTMENT (Continued) **U004019840**

Report Date:	10/09/91
Rank:	Not reported

UST:

Facility ID:	9850
Owner:	LEXINGTON COUNTY
Owner Contact:	EDWARD PARLER
Owner Address:	212 S LAKE DR
Owner City,St,Zip:	LEXINGTON, SC 29072-3437
Owner Phone:	803-785-8141
Contact:	EDWARD PARLER
Contact Phone:	Not reported
Tank ID:	1
Status:	**Abandoned**
Capacity:	500
Product:	Gasoline
Calcage:	15

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7 **RITE AID 11571** **RCRA-CESQG** **1015750323**
1401 CHAPIN RD **SCR000776096**
CHAPIN, SC 29036

RCRA-CESQG:

Date form received by agency:	09/19/2012
Facility name:	RITE AID 11571
Facility address:	1401 CHAPIN RD CHAPIN, SC 29036
EPA ID:	SCR000776096
Mailing address:	HUNTER LN ATTN EH&S CAMP HILL, PA 17011
Contact:	STEPHANIE CAIATI
Contact address:	HUNTER LN CAMP HILL, PA 17011
Contact country:	US
Contact telephone:	(717) 730-8225
Contact email:	Not reported
EPA Region:	04
Classification:	Conditionally Exempt Small Quantity Generator
Description:	Handler: generates 100 kg or less of hazardous waste per calendar month, and accumulates 1000 kg or less of hazardous waste at any time; or generates 1 kg or less of acutely hazardous waste per calendar month, and accumulates at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste; or generates 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste during any calendar month, and accumulates at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste

Owner/Operator Summary:

Owner/operator name:	EDC DRUG STORES INC
Owner/operator address:	HUNTER LN

RITE AID 11571 (Continued) **1015750323**

CAMP HILL, PA 17011
Owner/operator country: US
Owner/operator telephone: (717) 761-2633
Legal status: Private
Owner/Operator Type: Owner
Owner/Op start date: 09/19/2012
Owner/Op end date: Not reported

Owner/operator name: RITE AID CORP
Owner/operator address: HUNTER LN
CAMP HILL, PA 17011
Owner/operator country: US
Owner/operator telephone: (717) 761-2633
Legal status: Private
Owner/Operator Type: Operator
Owner/Op start date: 09/19/2012
Owner/Op end date: Not reported

Handler Activities Summary:
U.S. importer of hazardous waste: No
Mixed waste (haz. and radioactive): No
Recycler of hazardous waste: No
Transporter of hazardous waste: No
Treater, storer or disposer of HW: No
Underground injection activity: No
On-site burner exemption: No
Furnace exemption: No
Used oil fuel burner: No
Used oil processor: No
User oil refiner: No
Used oil fuel marketer to burner: No
Used oil Specification marketer: No
Used oil transfer facility: No
Used oil transporter: No

. Waste code: D001
. Waste name: IGNITABLE WASTE

. Waste code: D002
. Waste name: CORROSIVE WASTE

. Waste code: D007
. Waste name: CHROMIUM

. Waste code: D009
. Waste name: MERCURY

. Waste code: D010
. Waste name: SELENIUM

. Waste code: D024
. Waste name: M-CRESOL

. Waste code: P001
. Waste name: 2H-1-BENZOPYRAN-2-ONE, 4-HYDROXY-3-(3-OXO-1-PHENYLBUTYL)-, & SALTS, WHEN PRESENT AT CONCENTRATIONS GREATER THAN 0.3% (OR) WARFARIN, & SALTS, WHEN PRESENT AT CONCENTRATIONS GREATER THAN 0.3%

RITE AID 11571 (Continued) **1015750323**

. Waste code:	P075
. Waste name:	NICOTINE, & SALTS (OR) PYRIDINE, 3-(1-METHYL-2-PYRROLIDINYL)-,(S)-, & SALTS

Violation Status: No violations found

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7 **CHAMPION**
1404 CHAPIN RD
CHAPIN, SC 29036

RCRA NonGen / NLR **1000835415**
FINDS **SCD987594298**

RCRA NonGen / NLR:

Date form received by agency:	12/11/2008
Facility name:	CHAMPION
Facility address:	1404 CHAPIN RD CHAPIN, SC 29036
EPA ID:	SCD987594298
Mailing address:	CHAPIN RD CHAPIN, SC 29036
Contact:	MARK SCHNEIDER
Contact address:	1404 CHAPIN RD CHAPIN, SC 29036
Contact country:	US
Contact telephone:	(803) 345-1541
Contact email:	Not reported
EPA Region:	04
Classification:	Non-Generator
Description:	Handler: Non-Generators do not presently generate hazardous waste

Owner/Operator Summary:

Owner/operator name:	MARK SCHNEIDER
Owner/operator address:	1404 CHAPIN RD CHAPIN, SC 29036
Owner/operator country:	Not reported
Owner/operator telephone:	(999) 999-9999
Legal status:	Private
Owner/Operator Type:	Owner
Owner/Op start date:	Not reported
Owner/Op end date:	Not reported

Owner/operator name:	MARK SCHNEIDER
Owner/operator address:	1404 CHAPIN RD CHAPIN, SC 29036
Owner/operator country:	US
Owner/operator telephone:	(999) 999-9999
Legal status:	Private
Owner/Operator Type:	Operator
Owner/Op start date:	12/11/2008
Owner/Op end date:	Not reported

Handler Activities Summary:

U.S. importer of hazardous waste:	No
Mixed waste (haz. and radioactive):	No
Recycler of hazardous waste:	No
Transporter of hazardous waste:	No
Treater, storer or disposer of HW:	No
Underground injection activity:	No
On-site burner exemption:	No
Furnace exemption:	No

CHAMPION (Continued) **1000835415**

Used oil fuel burner: No
Used oil processor: No
User oil refiner: No
Used oil fuel marketer to burner: No
Used oil Specification marketer: No
Used oil transfer facility: No
Used oil transporter: No

. Waste code: D000
. Waste name: Not Defined

. Waste code: D001
. Waste name: IGNITABLE WASTE

. Waste code: D006
. Waste name: CADMIUM

. Waste code: D007
. Waste name: CHROMIUM

. Waste code: D008
. Waste name: LEAD

. Waste code: D018
. Waste name: BENZENE

. Waste code: D035
. Waste name: METHYL ETHYL KETONE

. Waste code: D039
. Waste name: TETRACHLOROETHYLENE

. Waste code: D040
. Waste name: TRICHLORETHYLENE

. Waste code: F003
. Waste name: THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: XYLENE, ACETONE, ETHYL ACETATE, ETHYL BENZENE, ETHYL ETHER, METHYL ISOBUTYL KETONE, N-BUTYL ALCOHOL, CYCLOHEXANONE, AND METHANOL; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONLY THE ABOVE SPENT NONHALOGENATED SOLVENTS; AND ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONE OR MORE OF THE ABOVE NONHALOGENATED SOLVENTS, AND A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THOSE SOLVENTS LISTED IN F001, F002, F004, AND F005; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

. Waste code: F005
. Waste name: THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: TOLUENE, METHYL ETHYL KETONE, CARBON DISULFIDE, ISOBUTANOL, PYRIDINE, BENZENE, 2-ETHOXYETHANOL, AND 2-NITROPROPANE; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THE ABOVE NONHALOGENATED SOLVENTS OR THOSE SOLVENTS LISTED IN F001, F002, OR F004; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

CHAMPION (Continued) **1000835415**

Historical Generators:

Date form received by agency: 07/25/1996
Site name: MARKS AUTO INC
Classification: Small Quantity Generator

. Waste code: D000
. Waste name: Not Defined

. Waste code: D001
. Waste name: IGNITABLE WASTE

. Waste code: D006
. Waste name: CADMIUM

. Waste code: D007
. Waste name: CHROMIUM

. Waste code: D008
. Waste name: LEAD

. Waste code: D018
. Waste name: BENZENE

. Waste code: D035
. Waste name: METHYL ETHYL KETONE

. Waste code: D039
. Waste name: TETRACHLOROETHYLENE

. Waste code: D040
. Waste name: TRICHLORETHYLENE

. Waste code: F003
. Waste name: THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: XYLENE, ACETONE, ETHYL ACETATE, ETHYL BENZENE, ETHYL ETHER, METHYL ISOBUTYL KETONE, N-BUTYL ALCOHOL, CYCLOHEXANONE, AND METHANOL; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONLY THE ABOVE SPENT NONHALOGENATED SOLVENTS; AND ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONE OR MORE OF THE ABOVE NONHALOGENATED SOLVENTS, AND A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THOSE SOLVENTS LISTED IN F001, F002, F004, AND F005; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

. Waste code: F005
. Waste name: THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: TOLUENE, METHYL ETHYL KETONE, CARBON DISULFIDE, ISOBUTANOL, PYRIDINE, BENZENE, 2-ETHOXYETHANOL, AND 2-NITROPROPANE; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THE ABOVE NONHALOGENATED SOLVENTS OR THOSE SOLVENTS LISTED IN F001, F002, OR F004; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

Violation Status: No violations found

FINDS:

CHAMPION (Continued) **1000835415**

Registry ID: 110002246882

Environmental Interest/Information System

SC-EFIS (South Carolina - Environmental Facility Information System) integrates information on environmental facilities, permits, violations, enforcement actions, and compliance activities needed to support regulatory requirements and target environmental quality improvements for the water, air, solid waste, and hazardous waste program areas. The EFIS was developed by the state of South Carolina and Maine joined their system in 2004.

RCRAInfo is a national information system that supports the Resource Conservation and Recovery Act (RCRA) program through the tracking of events and activities related to facilities that generate, transport, and treat, store, or dispose of hazardous waste. RCRAInfo allows RCRA program staff to track the notification, permit, compliance, and corrective action activities required under RCRA.

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8 **EDR US Hist Auto Stat** **1015151166**
N/A

110 BEAUFORT ST
CHAPIN, SC 29036

EDR Historical Auto Stations:

Name: CLASSIC AUTO REPLICAS
Year: 2000
Address: 110 BEAUFORT ST

Name: CLASSIC AUTO REPLICAS
Year: 2001
Address: 110 BEAUFORT ST

---

8 **EDR US Hist Cleaners** **1014971000**
N/A

105 LEXINGTON AVE
CHAPIN, SC 29036

EDR Historical Cleaners:

Name: CHAPIN DRY CLEANERS
Year: 2005
Address: 105 LEXINGTON AVE

Name: CHAPIN DRY CLEANERS
Year: 2006
Address: 105 LEXINGTON AVE

Name: CHAPIN DRY CLEANERS
Year: 2007
Address: 105 LEXINGTON AVE

Name: CHAPIN DRY CLEANERS
Year: 2008
Address: 105 LEXINGTON AVE

Name: CHAPIN DRY CLEANERS
Year: 2009
Address: 105 LEXINGTON AVE

(Continued) **1014971000**

Name: CHAPIN DRY CLEANERS
Year: 2011
Address: 105 LEXINGTON AVE

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9 **PANTRY 476** **UST** **U003623018**
1259 CHAPIN RD **N/A**
CHAPIN, SC 29036

UST:

Facility ID: 6100
Owner: PANTRY INC
Owner Contact: MARY BATCHELOR
Owner Address: 1801 DOUGLAS DR
Owner City,St,Zip: SANFORD, NC 27330
Owner Phone: 800-476-7574
Contact: MARY BATCHELOR
Contact Phone: 803-345-1898

Tank ID: 1
Status: **Currently in use**
Capacity: 10000
Product: RUL
Calcage: 5

Tank ID: 2
Status: **Currently in use**
Capacity: 10000
Product: PLUS
Calcage: 5

Tank ID: 3
Status: **Currently in use**
Capacity: 10000
Product: PREM
Calcage: 5

---

10 **W B DERRICK 66** **GWCI** **U003526386**
1209 CHAPIN RD **LUST** **N/A**
CHAPIN, SC 29036 **UST**

SC GWIC:

Bureau: BLWM
EAP ID: Not reported
Solid Waste Permit #: Not reported
Bureau of Land & Waste Management File #: Not reported
Permit Number: 06152
WPC Permit: Not reported
Program: DUST
Contamination: PETRO
Petroleum Products: True
Volatile Organic Compounds: False
Metals: False
Nitrates or Potential to Nitrate: False
Pesticides & Herbicides: False

W B DERRICK 66 (Continued) **U003526386**

Polychlorinated Biphenyls: False
Base, Neutral, & Acid Extractables: False
Phenols: False
Radionuclides Over Max Contaminant Levels: False
Sources Not In Other Categories: False
Source: UST
Underground Storage Tanks: True
Pits, Ponds, & Lagoons: False
Spills & Leaks: False
Landfills: False
Aboveground Storage Tank: False
Spray Irrigation: False
Single-Event Spill: False
Unpermitted Disposal: False
Septic Tank/Tile Field: False
Substances Not In Other Categories: False
Sources of Contamination Undetermined: False
Assessment: No
Monitoring: No
Remediation: Yes
Surface Impact: No
Drinking Water Well Impact: No
Remarks: Site ID # 06152. RBCA Classification 2BB7. Approved Monitored Natural Attenuation (MNA Awaiti.

LUST:
Facility ID: 06152
Release Number: 1
Facility Status: monitored natural attenuation
Substance: PETRO
Owner: KEENAN OIL CO INC
NFA Date: 02/22/13
Date Confirmed: 08/06/91
Report Date: 12/30/89
Rank: 2BB

LUST DETAIL:
Release Date: 12/30/1989
Cleanup Complete Date: Not reported
RP Name: KEENAN OIL CO INC
RP Address: 3923 W BELTLINE BLVD
RP City: COLUMBIA
RP State: SC
RP Zip: 29204-1503
SCRBCA Class Code: CLASS2BB
Depth to Ground Water: 11
Ground Water Flow Direction: SW
Project Manager: BRINEY, STEPHANIE M
Release Fin Type Code: With SUPERB

UST:
Facility ID: 6152
Owner: KEENAN OIL CO INC
Owner Contact: JETHRO JOSEPH
Owner Address: 3923 W BELTLINE BLVD
Owner City,St,Zip: COLUMBIA, SC 29204-1503

W B DERRICK 66 (Continued) **U003526386**

Owner Phone: 803-256-0667
Contact: JETHRO JOSEPH
Contact Phone: Not reported

Tank ID: 1
Status: **Abandoned**
Capacity: 12000
Product: Gasoline
Calcage: Not reported

Tank ID: 2
Status: **Abandoned**
Capacity: 4000
Product: Gasoline
Calcage: Not reported

Tank ID: 3
Status: **Abandoned**
Capacity: 4000
Product: Gasoline
Calcage: Not reported

Tank ID: 4
Status: **Abandoned**
Capacity: 2000
Product: Diesel
Calcage: Not reported

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11 **COLONIAL STATION** **UST** **U001538988**
HWY 76 & CLARK ST **N/A**
CHAPIN, SC 29036

UST:
Facility ID: 11206
Owner: HAILE
Owner Contact: BOBBY HAILE
Owner Address: PO BOX 123
Owner City,St,Zip: CHAPIN, SC 29036-0123
Owner Phone: 803-345-2956
Contact: BOBBY HAILE
Contact Phone: Not reported

Tank ID: 1
Status: **Abandoned**
Capacity: 4000
Product: Gasoline
Calcage: Not reported

Tank ID: 2
Status: **Abandoned**
Capacity: 2000
Product: Gasoline
Calcage: Not reported

COLONIAL STATION (Continued) **U001538988**

Tank ID:	3
Status:	**Abandoned**
Capacity:	1000
Product:	Gasoline
Calcage:	Not reported

Tank ID:	4
Status:	**Abandoned**
Capacity:	200
Product:	Kerosene
Calcage:	Not reported

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12 **EDR US Hist Cleaners** **1014991425** **N/A**

140 AMICKS FERRY RD
CHAPIN, SC 29036

EDR Historical Cleaners:

Name:	CLASS CLEANERS LLC
Year:	2010
Address:	140 AMICKS FERRY RD

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12 **EDR US Hist Cleaners** **1014990663** **N/A**

138 AMICKS FRY RD
CHAPIN, SC 29036

EDR Historical Cleaners:

Name:	BREEZE DRY CLEANING
Year:	2010
Address:	138 AMICKS FRY RD

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12 **EDR US Hist Cleaners** **1014990662** **N/A**

138 AMICKS FERRY RD
CHAPIN, SC 29036

EDR Historical Cleaners:

Name:	BREEZE DRY CLEANING
Year:	2011
Address:	138 AMICKS FERRY RD

Name:	BREEZE DRY CLEANING
Year:	2012
Address:	138 AMICKS FERRY RD

13 **UNITED CHEMICALS SUFFOLK CHEMICAL DIV** **RCRA NonGen / NLR** **1000398579**
EAST BOUNDARY RD **SCD092761865**
CHAPIN, SC 29036

RCRA NonGen / NLR:

Date form received by agency:	11/02/1998
Facility name:	UNITED CHEMICALS SUFFOLK CHEMICAL DIV
Facility address:	EAST BOUNDARY RD CHAPIN, SC 29036
EPA ID:	SCD092761865
Mailing address:	PO BOX 21097 COLUMBIA, SC 29221
Contact:	F NASH
Contact address:	PO BOX 21097 COLUMBIA, SC 29221
Contact country:	US
Contact telephone:	(803) 345-9394
Contact email:	Not reported
EPA Region:	04
Classification:	Non-Generator
Description:	Handler: Non-Generators do not presently generate hazardous waste

Owner/Operator Summary:

Owner/operator name:	Not reported
Owner/operator address:	OWNERSTREET OWNERCITY, WY 99999
Owner/operator country:	Not reported
Owner/operator telephone:	(404) 555-1212
Legal status:	Private
Owner/Operator Type:	Owner
Owner/Op start date:	Not reported
Owner/Op end date:	Not reported

Owner/operator name:	OPERNAME
Owner/operator address:	OPERSTREET OPERCITY, WY 99999
Owner/operator country:	Not reported
Owner/operator telephone:	(404) 555-1212
Legal status:	Private
Owner/Operator Type:	Operator
Owner/Op start date:	Not reported
Owner/Op end date:	Not reported

Handler Activities Summary:

U.S. importer of hazardous waste:	No
Mixed waste (haz. and radioactive):	No
Recycler of hazardous waste:	No
Transporter of hazardous waste:	No
Treater, storer or disposer of HW:	No
Underground injection activity:	No
On-site burner exemption:	No
Furnace exemption:	No
Used oil fuel burner:	No
Used oil processor:	No
User oil refiner:	No
Used oil fuel marketer to burner:	No
Used oil Specification marketer:	No
Used oil transfer facility:	No

UNITED CHEMICALS SUFFOLK CHEMICAL DIV (Continued) **1000398579**

Used oil transporter: No

Violation Status: No violations found

14 **S&S GARAGE** **GWCI** **U004016930**
930 CHAPIN RD **LUST** **N/A**
CHAPIN, SC 29036 **UST**

SC GWIC:

Bureau:	BLWM
EAP ID:	Not reported
Solid Waste Permit #:	Not reported
Bureau of Land & Waste Management File #:	Not reported
Permit Number:	10120
WPC Permit:	Not reported
Program:	DUST
Contamination:	PETRO
Petroleum Products:	True
Volatile Organic Compounds:	False
Metals:	False
Nitrates or Potential to Nitrate:	False
Pesticides & Herbicides:	False
Polychlorinated Biphenyls:	False
Base, Neutral, & Acid Extractables:	False
Phenols:	False
Radionuclides Over Max Contaminant Levels:	False
Sources Not In Other Categories:	False
Source:	UST
Underground Storage Tanks:	True
Pits, Ponds, & Lagoons:	False
Spills & Leaks:	False
Landfills:	False
Aboveground Storage Tank:	False
Spray Irrigation:	False
Single-Event Spill:	False
Unpermitted Disposal:	False
Septic Tank/Tile Field:	False
Substances Not In Other Categories:	False
Sources of Contamination Undetermined:	False
Assessment:	Yes
Monitoring:	No
Remediation:	No
Surface Impact:	No
Drinking Water Well Impact:	No
Remarks:	Site ID # 10120. RBCA Classification 3BF1. Conducting investigation/Risk Assessment.

LUST:

Facility ID:	10120
Release Number:	1
Facility Status:	conduct invest/risk assessment
Substance:	PETROL
Owner:	FLOYD SLICE
NFA Date:	**Not reported**
Date Confirmed:	06/24/02
Report Date:	05/06/02
Rank:	2BB

S&S GARAGE (Continued) **U004016930**

LUST DETAIL:

Release Date:	05/06/2002
Cleanup Complete Date:	Not reported
RP Name:	SLICE
RP Address:	1116 FLOYD SLICE CT
RP City:	CHAPIN
RP State:	SC
RP Zip:	29036-8614
SCRBCA Class Code:	CLASS2BB
Depth to Ground Water:	8
Ground Water Flow Direction:	Not reported
Project Manager:	SKOWRONEK, JOHN T
Release Fin Type Code:	Qualifies for Fund with Deductible

UST:

Facility ID:	10120
Owner:	SLICE
Owner Contact:	FLOYD SLICE
Owner Address:	1116 FLOYD SLICE CT
Owner City,St,Zip:	CHAPIN, SC 29036-8614
Owner Phone:	803-345-3344
Contact:	FLOYD SLICE
Contact Phone:	Not reported

Tank ID:	1
Status:	**Abandoned**
Capacity:	6000
Product:	Gasoline
Calcage:	0

Tank ID:	2
Status:	**Abandoned**
Capacity:	6000
Product:	Gasoline
Calcage:	0

Tank ID:	3
Status:	**Abandoned**
Capacity:	6000
Product:	Gasoline
Calcage:	0

Tank ID:	4
Status:	**Abandoned**
Capacity:	1000
Product:	Diesel
Calcage:	0

Tank ID:	5
Status:	**Abandoned**
Capacity:	1000

S&S GARAGE (Continued) **U004016930**

Product: Kerosene
Calcage: 0

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14 **EDR US Hist Auto Stat** **1015677989**
N/A

930 CHAPIN RD
CHAPIN, SC 29036

EDR Historical Auto Stations:
Name: ELLEDGE AUTOMOTIVE SERVICES
Year: 2011
Address: 930 CHAPIN RD

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15 **LUST** **U003807397**
UST **N/A**

UNION CONCRETE PLANT
912 CHAPIN RD
CHAPIN, SC 29036

LUST:
Facility ID: 06095
Release Number: 1
Facility Status: conduct invest/risk assessment
Substance: PETRO
Owner: C D COLEMAN OIL CO
NFA Date: **11/28/01**
Date Confirmed: 06/29/98
Report Date: 05/18/98
Rank: 3BF

LUST DETAIL:
Release Date: 05/18/1998
Cleanup Complete Date: 11/28/2001
RP Name: C D COLEMAN OIL CO
RP Address: 2613 WINNSBORO RD
RP City: NEWBERRY
RP State: SC
RP Zip: 29108-0128
SCRBCA Class Code: CLASS3BF
Depth to Ground Water: 15
Ground Water Flow Direction: Not reported
Project Manager: AKHVLEDIANI, KONSTANTINE T
Release Fin Type Code: Qualifies for Fund with Deductible

UST:
Facility ID: 6095
Owner: C D COLEMAN OIL CO
Owner Contact: PETE COLEMAN
Owner Address: 2613 WINNSBORO RD
Owner City,St,Zip: NEWBERRY, SC 29108-0128
Owner Phone: 803-276-3391
Contact: PETE COLEMAN
Contact Phone: 804-345-5540

Tank ID: 1
Status: **Abandoned**
Capacity: 1000
Product: Diesel

UNION CONCRETE PLANT (Continued) **U003807397**

Calcage: 15

Tank ID: 2
Status: **Abandoned**
Capacity: 1000
Product: Diesel
Calcage: 15

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16 **SIGNODE PACKAGING SYSTEMS** **FINDS** **1017383196**
300 E BOUNDARY ST **N/A**
CHAPIN, SC 29036

FINDS:

Registry ID: 110062700377

Environmental Interest/Information System
AIR MINOR

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16 **CENTRAL LABEL PRODUCTS DIV OF ILLINOIS T** **RCRA-CESQG** **1000182661**
300 E BOUNDARY ST **SCD005061718**
CHAPIN, SC 29036

RCRA-CESQG:

Date form received by agency:	01/01/2014
Facility name:	CENTRAL LABEL PRODUCTS DIV OF ILLINOIS T
Facility address:	300 E BOUNDARY ST CHAPIN, SC 29036
EPA ID:	SCD005061718
Mailing address:	1 MISSOURI RESEARCH PARK DR ST CHARLES, MO 63304
Contact:	PATRICIA COMPTON
Contact address:	1 MISSOURI RESEARCH PARK DR ST CHARLES, MO 63304
Contact country:	Not reported
Contact telephone:	(803) 394-8782
Contact email:	Not reported
EPA Region:	04
Land type:	Private
Classification:	Conditionally Exempt Small Quantity Generator
Description:	Handler: generates 100 kg or less of hazardous waste per calendar month, and accumulates 1000 kg or less of hazardous waste at any time; or generates 1 kg or less of acutely hazardous waste per calendar month, and accumulates at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste; or generates 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste during any calendar month, and accumulates at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste

CENTRAL LABEL PRODUCTS DIV OF ILLINOIS T (Continued) **1000182661**

Owner/Operator Summary:

Owner/operator name:	FRED B JOHNSTON II
Owner/operator address:	E BOUNDARY ST CHAPIN, SC 29036
Owner/operator country:	US
Owner/operator telephone:	Not reported
Legal status:	Private
Owner/Operator Type:	Owner
Owner/Op start date:	01/25/2006
Owner/Op end date:	Not reported
Owner/operator name:	THE FRED B JOHNSTON CO INC
Owner/operator address:	300 E BOUNDARY ST CHAPIN, SC 29036
Owner/operator country:	Not reported
Owner/operator telephone:	Not reported
Legal status:	Private
Owner/Operator Type:	Operator
Owner/Op start date:	12/31/2009
Owner/Op end date:	Not reported
Owner/operator name:	OPERNAME
Owner/operator address:	E BOUNDARY ST CHAPIN, SC 29036
Owner/operator country:	US
Owner/operator telephone:	Not reported
Legal status:	Municipal
Owner/Operator Type:	Operator
Owner/Op start date:	01/25/2006
Owner/Op end date:	Not reported
Owner/operator name:	FRED B JOHNSTON II
Owner/operator address:	300 E BOUNDARY ST CHAPIN, SC 29036
Owner/operator country:	Not reported
Owner/operator telephone:	Not reported
Legal status:	Private
Owner/Operator Type:	Owner
Owner/Op start date:	12/31/2009
Owner/Op end date:	Not reported
Owner/operator name:	FRED B JOHNSTON II
Owner/operator address:	300 E BOUNDARY ST CHAPIN, SC 29036
Owner/operator country:	Not reported
Owner/operator telephone:	(999) 999-9999
Legal status:	Private
Owner/Operator Type:	Owner
Owner/Op start date:	Not reported
Owner/Op end date:	Not reported
Owner/operator name:	OPERNAME
Owner/operator address:	OPERSTREET OPERCITY, WY 99999
Owner/operator country:	Not reported
Owner/operator telephone:	(404) 555-1212
Legal status:	Municipal

CENTRAL LABEL PRODUCTS DIV OF ILLINOIS T (Continued) **1000182661**

Owner/Operator Type: Operator
Owner/Op start date: Not reported
Owner/Op end date: Not reported

Handler Activities Summary:

U.S. importer of hazardous waste:	No
Mixed waste (haz. and radioactive):	No
Recycler of hazardous waste:	No
Transporter of hazardous waste:	No
Treater, storer or disposer of HW:	No
Underground injection activity:	No
On-site burner exemption:	No
Furnace exemption:	No
Used oil fuel burner:	No
Used oil processor:	No
User oil refiner:	No
Used oil fuel marketer to burner:	No
Used oil Specification marketer:	No
Used oil transfer facility:	No
Used oil transporter:	No

. Waste code: D001
. Waste name: IGNITABLE WASTE

. Waste code: D002
. Waste name: CORROSIVE WASTE

. Waste code: D003
. Waste name: REACTIVE WASTE

. Waste code: D006
. Waste name: CADMIUM

. Waste code: D007
. Waste name: CHROMIUM

. Waste code: D008
. Waste name: LEAD

. Waste code: D009
. Waste name: MERCURY

. Waste code: D018
. Waste name: BENZENE

. Waste code: D035
. Waste name: METHYL ETHYL KETONE

. Waste code: F005
. Waste name: THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: TOLUENE, METHYL ETHYL KETONE, CARBON DISULFIDE, ISOBUTANOL, PYRIDINE, BENZENE, 2-ETHOXYETHANOL, AND 2-NITROPROPANE; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THE ABOVE NONHALOGENATED SOLVENTS OR THOSE SOLVENTS LISTED IN F001, F002, OR F004; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

CENTRAL LABEL PRODUCTS DIV OF ILLINOIS T (Continued) **1000182661**

. Waste code: U055
. Waste name: BENZENE, (1-METHYLETHYL)- (I) (OR) CUMENE (I)

. Waste code: U112
. Waste name: ACETIC ACID, ETHYL ESTER (I) (OR) ETHYL ACETATE (I)

Historical Generators:
Date form received by agency: 03/11/2013
Site name: CENTRAL LABEL PRODUCTS DIV OF ILLINOIS TOOL WORKS
Classification: Conditionally Exempt Small Quantity Generator

. Waste code: D001
. Waste name: IGNITABLE WASTE

. Waste code: D006
. Waste name: CADMIUM

. Waste code: D007
. Waste name: CHROMIUM

. Waste code: D008
. Waste name: LEAD

. Waste code: D009
. Waste name: MERCURY

. Waste code: D018
. Waste name: BENZENE

. Waste code: D035
. Waste name: METHYL ETHYL KETONE

. Waste code: F003
. Waste name: THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: XYLENE, ACETONE, ETHYL ACETATE, ETHYL BENZENE, ETHYL ETHER, METHYL ISOBUTYL KETONE, N-BUTYL ALCOHOL, CYCLOHEXANONE, AND METHANOL; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONLY THE ABOVE SPENT NONHALOGENATED SOLVENTS; AND ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONE OR MORE OF THE ABOVE NONHALOGENATED SOLVENTS, AND A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THOSE SOLVENTS LISTED IN F001, F002, F004, AND F005; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

. Waste code: F005
. Waste name: THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: TOLUENE, METHYL ETHYL KETONE, CARBON DISULFIDE, ISOBUTANOL, PYRIDINE, BENZENE, 2-ETHOXYETHANOL, AND 2-NITROPROPANE; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THE ABOVE NONHALOGENATED SOLVENTS OR THOSE SOLVENTS LISTED IN F001, F002, OR F004; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

Date form received by agency: 02/06/2013
Site name: CENTRAL LABEL PRODUCTS DIV OF ILLINOIS TOOL WORKS
Classification: Large Quantity Generator

CENTRAL LABEL PRODUCTS DIV OF ILLINOIS T (Continued) **1000182661**

. Waste code: D001
. Waste name: IGNITABLE WASTE

. Waste code: D006
. Waste name: CADMIUM

. Waste code: D007
. Waste name: CHROMIUM

. Waste code: D008
. Waste name: LEAD

. Waste code: D009
. Waste name: MERCURY

. Waste code: D018
. Waste name: BENZENE

. Waste code: D035
. Waste name: METHYL ETHYL KETONE

. Waste code: F003
. Waste name: THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: XYLENE, ACETONE, ETHYL ACETATE, ETHYL BENZENE, ETHYL ETHER, METHYL ISOBUTYL KETONE, N-BUTYL ALCOHOL, CYCLOHEXANONE, AND METHANOL; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONLY THE ABOVE SPENT NONHALOGENATED SOLVENTS; AND ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONE OR MORE OF THE ABOVE NONHALOGENATED SOLVENTS, AND A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THOSE SOLVENTS LISTED IN F001, F002, F004, AND F005; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

. Waste code: F005
. Waste name: THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: TOLUENE, METHYL ETHYL KETONE, CARBON DISULFIDE, ISOBUTANOL, PYRIDINE, BENZENE, 2-ETHOXYETHANOL, AND 2-NITROPROPANE; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THE ABOVE NONHALOGENATED SOLVENTS OR THOSE SOLVENTS LISTED IN F001, F002, OR F004; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

Date form received by agency: 01/25/2013
Site name: CENTRAL LABEL PRODUCTS DIV OF ILLINOIS TOOL WORKS
Classification: Small Quantity Generator

. Waste code: D001
. Waste name: IGNITABLE WASTE

. Waste code: D006
. Waste name: CADMIUM

. Waste code: D007
. Waste name: CHROMIUM

. Waste code: D008
. Waste name: LEAD

CENTRAL LABEL PRODUCTS DIV OF ILLINOIS T (Continued) **1000182661**

. Waste code: D009
. Waste name: MERCURY

. Waste code: D018
. Waste name: BENZENE

. Waste code: D035
. Waste name: METHYL ETHYL KETONE

. Waste code: F003
. Waste name: THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: XYLENE, ACETONE, ETHYL ACETATE, ETHYL BENZENE, ETHYL ETHER, METHYL ISOBUTYL KETONE, N-BUTYL ALCOHOL, CYCLOHEXANONE, AND METHANOL; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONLY THE ABOVE SPENT NONHALOGENATED SOLVENTS; AND ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONE OR MORE OF THE ABOVE NONHALOGENATED SOLVENTS, AND A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THOSE SOLVENTS LISTED IN F001, F002, F004, AND F005; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

. Waste code: F005
. Waste name: THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: TOLUENE, METHYL ETHYL KETONE, CARBON DISULFIDE, ISOBUTANOL, PYRIDINE, BENZENE, 2-ETHOXYETHANOL, AND 2-NITROPROPANE; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THE ABOVE NONHALOGENATED SOLVENTS OR THOSE SOLVENTS LISTED IN F001, F002, OR F004; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

Date form received by agency: 01/17/2012
Site name: CENTRAL LABEL PRODUCTS DIV OF ILLINOIS TOOL WORKS
Classification: Small Quantity Generator

. Waste code: D001
. Waste name: IGNITABLE WASTE

. Waste code: D006
. Waste name: CADMIUM

. Waste code: D007
. Waste name: CHROMIUM

. Waste code: D008
. Waste name: LEAD

. Waste code: D009
. Waste name: MERCURY

. Waste code: D018
. Waste name: BENZENE

. Waste code: D035
. Waste name: METHYL ETHYL KETONE

. Waste code: F003
. Waste name: THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: XYLENE, ACETONE, ETHYL

CENTRAL LABEL PRODUCTS DIV OF ILLINOIS T (Continued) **1000182661**

ACETATE, ETHYL BENZENE, ETHYL ETHER, METHYL ISOBUTYL KETONE, N-BUTYL ALCOHOL, CYCLOHEXANONE, AND METHANOL; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONLY THE ABOVE SPENT NONHALOGENATED SOLVENTS; AND ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONE OR MORE OF THE ABOVE NONHALOGENATED SOLVENTS, AND A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THOSE SOLVENTS LISTED IN F001, F002, F004, AND F005; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

. Waste code: F005
. Waste name: THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: TOLUENE, METHYL ETHYL KETONE, CARBON DISULFIDE, ISOBUTANOL, PYRIDINE, BENZENE, 2-ETHOXYETHANOL, AND 2-NITROPROPANE; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THE ABOVE NONHALOGENATED SOLVENTS OR THOSE SOLVENTS LISTED IN F001, F002, OR F004; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

Date form received by agency: 01/19/2011
Site name: CENTRAL LABEL PRODUCTS DIV OF ILLINOIS TOOL WORKS
Classification: Small Quantity Generator

. Waste code: D001
. Waste name: IGNITABLE WASTE

. Waste code: D006
. Waste name: CADMIUM

. Waste code: D007
. Waste name: CHROMIUM

. Waste code: D008
. Waste name: LEAD

. Waste code: D009
. Waste name: MERCURY

. Waste code: D018
. Waste name: BENZENE

. Waste code: D035
. Waste name: METHYL ETHYL KETONE

. Waste code: F003
. Waste name: THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: XYLENE, ACETONE, ETHYL ACETATE, ETHYL BENZENE, ETHYL ETHER, METHYL ISOBUTYL KETONE, N-BUTYL ALCOHOL, CYCLOHEXANONE, AND METHANOL; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONLY THE ABOVE SPENT NONHALOGENATED SOLVENTS; AND ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONE OR MORE OF THE ABOVE NONHALOGENATED SOLVENTS, AND A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THOSE SOLVENTS LISTED IN F001, F002, F004, AND F005; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

. Waste code: F005

CENTRAL LABEL PRODUCTS DIV OF ILLINOIS T (Continued) **1000182661**

. Waste name: THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: TOLUENE, METHYL ETHYL KETONE, CARBON DISULFIDE, ISOBUTANOL, PYRIDINE, BENZENE, 2-ETHOXYETHANOL, AND 2-NITROPROPANE; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THE ABOVE NONHALOGENATED SOLVENTS OR THOSE SOLVENTS LISTED IN F001, F002, OR F004; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

Date form received by agency: 01/22/2010
Site name: CENTRAL LABEL PRODUCTS DIV OF ILLINOIS TOOL WORKS
Classification: Small Quantity Generator

. Waste code: D001
. Waste name: IGNITABLE WASTE

. Waste code: D006
. Waste name: CADMIUM

. Waste code: D007
. Waste name: CHROMIUM

. Waste code: D008
. Waste name: LEAD

. Waste code: D009
. Waste name: MERCURY

. Waste code: D018
. Waste name: BENZENE

. Waste code: D035
. Waste name: METHYL ETHYL KETONE

. Waste code: F003
. Waste name: THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: XYLENE, ACETONE, ETHYL ACETATE, ETHYL BENZENE, ETHYL ETHER, METHYL ISOBUTYL KETONE, N-BUTYL ALCOHOL, CYCLOHEXANONE, AND METHANOL; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONLY THE ABOVE SPENT NONHALOGENATED SOLVENTS; AND ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONE OR MORE OF THE ABOVE NONHALOGENATED SOLVENTS, AND A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THOSE SOLVENTS LISTED IN F001, F002, F004, AND F005; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

. Waste code: F005
. Waste name: THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: TOLUENE, METHYL ETHYL KETONE, CARBON DISULFIDE, ISOBUTANOL, PYRIDINE, BENZENE, 2-ETHOXYETHANOL, AND 2-NITROPROPANE; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THE ABOVE NONHALOGENATED SOLVENTS OR THOSE SOLVENTS LISTED IN F001, F002, OR F004; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

Date form received by agency: 04/06/2009
Site name: FB JOHNSTON GROUP
Classification: Small Quantity Generator

CENTRAL LABEL PRODUCTS DIV OF ILLINOIS T (Continued) **1000182661**

. Waste code: D001
. Waste name: IGNITABLE WASTE

. Waste code: D006
. Waste name: CADMIUM

. Waste code: D007
. Waste name: CHROMIUM

. Waste code: D008
. Waste name: LEAD

. Waste code: D009
. Waste name: MERCURY

. Waste code: D018
. Waste name: BENZENE

. Waste code: D035
. Waste name: METHYL ETHYL KETONE

Date form received by agency: 01/25/2006
Site name: FB JOHNSTON GROUP
Classification: Small Quantity Generator

. Waste code: D001
. Waste name: IGNITABLE WASTE

. Waste code: D006
. Waste name: CADMIUM

. Waste code: D007
. Waste name: CHROMIUM

. Waste code: D008
. Waste name: LEAD

. Waste code: D009
. Waste name: MERCURY

. Waste code: D035
. Waste name: METHYL ETHYL KETONE

Date form received by agency: 01/01/2006
Site name: FB JOHNSTON GROUP
Classification: Small Quantity Generator

Date form received by agency: 04/25/2005
Site name: FB JOHNSTON GROUP
Classification: Large Quantity Generator

. Waste code: D001
. Waste name: IGNITABLE WASTE

. Waste code: D006
. Waste name: CADMIUM

CENTRAL LABEL PRODUCTS DIV OF ILLINOIS T (Continued) **1000182661**

. Waste code: D007
. Waste name: CHROMIUM

. Waste code: D008
. Waste name: LEAD

. Waste code: D035
. Waste name: METHYL ETHYL KETONE

Date form received by agency: 01/21/2003
Site name: FB JOHNSTON GROUP
Classification: Small Quantity Generator

. Waste code: D001
. Waste name: IGNITABLE WASTE

. Waste code: D006
. Waste name: CADMIUM

. Waste code: D007
. Waste name: CHROMIUM

. Waste code: D008
. Waste name: LEAD

. Waste code: D035
. Waste name: METHYL ETHYL KETONE

Date form received by agency: 05/10/1994
Site name: FRED B. JOHNSTON
Classification: Small Quantity Generator

. Waste code: D001
. Waste name: IGNITABLE WASTE

. Waste code: D006
. Waste name: CADMIUM

. Waste code: D007
. Waste name: CHROMIUM

. Waste code: D008
. Waste name: LEAD

. Waste code: D035
. Waste name: METHYL ETHYL KETONE

. Waste code: F003
. Waste name: THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: XYLENE, ACETONE, ETHYL ACETATE, ETHYL BENZENE, ETHYL ETHER, METHYL ISOBUTYL KETONE, N-BUTYL ALCOHOL, CYCLOHEXANONE, AND METHANOL; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONLY THE ABOVE SPENT NONHALOGENATED SOLVENTS; AND ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONE OR MORE OF THE ABOVE NONHALOGENATED SOLVENTS, AND A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THOSE SOLVENTS LISTED IN F001, F002, F004, AND F005; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT

CENTRAL LABEL PRODUCTS DIV OF ILLINOIS T (Continued) **1000182661**

MIXTURES.

. Waste code: 7777
. Waste name: 7777

Facility Has Received Notices of Violations:
Regulation violated: Not reported
Area of violation: TSD IS-Container Use and Management
Date violation determined: 08/16/2006
Date achieved compliance: 09/19/2006
Violation lead agency: State
Enforcement action: LETTER OF INTENT TO INITIATE ENFORCEMENT ACTION
Enforcement action date: 08/17/2006
Enf. disposition status: Not reported
Enf. disp. status date: Not reported
Enforcement lead agency: State
Proposed penalty amount: Not reported
Final penalty amount: Not reported
Paid penalty amount: Not reported

Regulation violated: Not reported
Area of violation: Universal Waste - Small Quantity Handlers
Date violation determined: 08/16/2006
Date achieved compliance: 09/19/2006
Violation lead agency: State
Enforcement action: LETTER OF INTENT TO INITIATE ENFORCEMENT ACTION
Enforcement action date: 08/17/2006
Enf. disposition status: Not reported
Enf. disp. status date: Not reported
Enforcement lead agency: State
Proposed penalty amount: Not reported
Final penalty amount: Not reported
Paid penalty amount: Not reported

Regulation violated: Not reported
Area of violation: Generators - General
Date violation determined: 12/09/1987
Date achieved compliance: 12/30/1987
Violation lead agency: State
Enforcement action: Not reported
Enforcement action date: Not reported
Enf. disposition status: Not reported
Enf. disp. status date: Not reported
Enforcement lead agency: Not reported
Proposed penalty amount: Not reported
Final penalty amount: Not reported
Paid penalty amount: Not reported

Evaluation Action Summary:
Evaluation date: 09/19/2006
Evaluation: COMPLIANCE SCHEDULE EVALUATION
Area of violation: Not reported
Date achieved compliance: Not reported
Evaluation lead agency: State

Evaluation date: 08/16/2006

CENTRAL LABEL PRODUCTS DIV OF ILLINOIS T (Continued) **1000182661**

Evaluation: COMPLIANCE EVALUATION INSPECTION ON-SITE
Area of violation: TSD IS-Container Use and Management
Date achieved compliance: 09/19/2006
Evaluation lead agency: State

Evaluation date: 08/16/2006
Evaluation: COMPLIANCE EVALUATION INSPECTION ON-SITE
Area of violation: Universal Waste - Small Quantity Handlers
Date achieved compliance: 09/19/2006
Evaluation lead agency: State

Evaluation date: 07/25/1997
Evaluation: COMPLIANCE EVALUATION INSPECTION ON-SITE
Area of violation: Not reported
Date achieved compliance: Not reported
Evaluation lead agency: State

Evaluation date: 11/09/1989
Evaluation: COMPLIANCE EVALUATION INSPECTION ON-SITE
Area of violation: Not reported
Date achieved compliance: Not reported
Evaluation lead agency: State

Evaluation date: 10/17/1989
Evaluation: COMPLIANCE EVALUATION INSPECTION ON-SITE
Area of violation: Not reported
Date achieved compliance: Not reported
Evaluation lead agency: State

Evaluation date: 06/24/1989
Evaluation: NON-FINANCIAL RECORD REVIEW
Area of violation: Not reported
Date achieved compliance: Not reported
Evaluation lead agency: State

Evaluation date: 04/11/1989
Evaluation: NON-FINANCIAL RECORD REVIEW
Area of violation: Not reported
Date achieved compliance: Not reported
Evaluation lead agency: State

Evaluation date: 10/21/1988
Evaluation: NON-FINANCIAL RECORD REVIEW
Area of violation: Not reported
Date achieved compliance: Not reported
Evaluation lead agency: State

Evaluation date: 06/17/1988
Evaluation: NON-FINANCIAL RECORD REVIEW
Area of violation: Not reported
Date achieved compliance: Not reported
Evaluation lead agency: State

Evaluation date: 12/09/1987
Evaluation: COMPLIANCE EVALUATION INSPECTION ON-SITE
Area of violation: Generators - General
Date achieved compliance: 12/30/1987

CENTRAL LABEL PRODUCTS DIV OF ILLINOIS T (Continued) **1000182661**

Evaluation lead agency: State

16	**FB JOHNSTON GRAPHICS** **300 E BOUNDARY ST** **CHAPIN, SC 29036**	**SHWS** **ALLSITES** **BROWNFIELDS**	**S108281886** **N/A**

SHWS:

EPA ID: SCS123457362

ALLSITES:

Brownfield:	Not reported
Brownfield Type:	Not reported
Funds Used:	No
Resp Action:	No
Permit Number:	Not reported
Program:	Not reported
Owner:	ILLINOIS TOOL WORKS INC
Project Status Code:	ACTIVE
Execute Date:	12/02/2014
Restrictions Filed Date:	Not yet recorded.
Cleanup Contract Complete Date:	Not reported
Project Complete Date:	Not yet completed.
File Number:	403894
Land Use Restriction:	We do not have enough information yet to determine whether restrictions will be required.
Contamination On Site:	Volatile Organic Compounds
Acreage:	Not reported
Soil Contamination Desc:	Not reported
Soil COCS:	Not reported
SW Sed Contamination Desc:	Not reported
SW COCS:	Not reported
GW Contamination Desc:	Not reported
GW COCS:	Not reported
Air Contamination Desc:	Not reported
Air COCS:	Not reported
Lat:	34.16274298
Long:	-81.34557821

SC BROWNFIELD:

Contract Number:	14-6013-RP
Contract Type:	RP
File Number:	403894
Contract Manager:	Not reported
Person Company:	ILLINOIS TOOL WORKS INC
Primary Address1:	Not reported
Primary Address2:	Not reported
Primary City:	Not reported
Primary State Code:	Not reported
Primary Zip Code:	Not reported
Type Brownfield:	Not reported
Acreage:	Not reported
Contract Executed:	12/2/2014
COC Date Issued:	Not reported
RC Executed:	Not reported
Contact:	KEN BROWN
Status Code:	ACTIVE
IC Received:	Not reported
Workplan Due:	Not reported
Workplan Received:	Not reported

FB JOHNSTON GRAPHICS (Continued) **S108281886**

Workplan Reviewed:	Not reported
Workplan Approved:	Not reported
Report Received:	Not reported
Report Reviewed:	Not reported
Report Approved:	Not reported
Cap Approved:	Not reported
Contract Mailed:	Not reported
Date Terminated:	Not reported

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16 **FB JOHNSTON GRAPHICS** **RGA HWS** **S114826351**
300 E BOUNDARY ST **N/A**
CHAPIN, SC

RGA HWS:

2012	FB JOHNSTON GRAPHICS	300 E BOUNDARY ST
2011	FB JOHNSTON GRAPHICS	300 E BOUNDARY ST

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16 **CENTRAL LABEL PRODUCTS DIV OF ILLINOIS TOOL WORKS** **FINDS** **1014835793**
300 E BOUNDARY ST **N/A**
CHAPIN, SC 29036

FINDS:

Registry ID: 110042030888

Environmental Interest/Information System

SC-EFIS (South Carolina - Environmental Facility Information System) integrates information on environmental facilities, permits, violations, enforcement actions, and compliance activities needed to support regulatory requirements and target environmental quality improvements for the water, air, solid waste, and hazardous waste program areas. The EFIS was developed by the state of South Carolina and Maine joined their system in 2004.

AFS (Aerometric Information Retrieval System (AIRS) Facility Subsystem) replaces the former Compliance Data System (CDS), the National Emission Data System (NEDS), and the Storage and Retrieval of Aerometric Data (SAROAD). AIRS is the national repository for information concerning airborne pollution in the United States. AFS is used to track emissions and compliance data from industrial plants. AFS data are utilized by states to prepare State Implementation Plans to comply with regulatory programs and by EPA as an input for the estimation of total national emissions. AFS is undergoing a major redesign to support facility operating permits required under Title V of the Clean Air Act.

AIR SYNTHETIC MINOR

RCRAInfo is a national information system that supports the Resource Conservation and Recovery Act (RCRA) program through the tracking of events and activities related to facilities that generate, transport, and treat, store, or dispose of hazardous waste. RCRAInfo allows RCRA program staff to track the notification, permit, compliance, and corrective action activities required under RCRA.

CENTRAL LABEL PRODUCTS DIV OF ILLINOIS TOOL WORKS (Continued) **1014835793**

HAZARDOUS WASTE BIENNIAL REPORTER

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17 **SUFFOLK CHEMICAL CO.** **VCP** **S106614208**
.5 MILES N OF US-76 ON CO RD 82 **BROWNFIELDS** **N/A**
CHAPIN, SC 29036

VCP:

File Number:	52199
Exec Date:	Not reported
Contract Mailed Date:	Not reported
Contract Complete Date:	Not reported
Completed:	Not reported

Detail As Of 06/2013:

Contract #:	96-4992-01
Acreage:	Not reported
COC Issued Date:	Not reported
RC Executed Date:	Not reported

File Number:	52199
Exec Date:	07/10/1996
Contract Mailed Date:	Not reported
Contract Complete Date:	06/23/2004
Completed:	Not reported

Detail As Of 06/2013:

Contract #:	96-4992-01
Acreage:	Not reported
COC Issued Date:	Not reported
RC Executed Date:	Not reported

SC BROWNFIELD:

Contract Number:	96-4992-01
Contract Type:	NRP
File Number:	52199
Contract Manager:	Not reported
Person Company:	CAROLINA FIRST BANK
Primary Address1:	Not reported
Primary Address2:	Not reported
Primary City:	Not reported
Primary State Code:	Not reported
Primary Zip Code:	Not reported
Type Brownfield:	Hazardous Substances
Acreage:	Not reported
Contract Executed:	Not reported
COC Date Issued:	Not reported
RC Executed:	Not reported
Contact:	Mike Daly
Status Code:	ACTIVE
IC Received:	Not reported
Workplan Due:	Not reported
Workplan Received:	Not reported
Workplan Reviewed:	Not reported
Workplan Approved:	Not reported
Report Received:	Not reported

SUFFOLK CHEMICAL CO. (Continued) **S106614208**

Report Reviewed:	Not reported
Report Approved:	Not reported
Cap Approved:	Not reported
Contract Mailed:	Not reported
Date Terminated:	Not reported

Contract Number:	96-4992-01
Contract Type:	NRP
File Number:	52199
Contract Manager:	Not reported
Person Company:	DALY CONTRACTING LLC
Primary Address1:	117 YARRABEE CT
Primary Address2:	Not reported
Primary City:	CHAPIN
Primary State Code:	SC
Primary Zip Code:	29036
Type Brownfield:	Hazardous Substances
Acreage:	Not reported
Contract Executed:	7/10/1996
COC Date Issued:	6/23/2004
RC Executed:	Not reported
Contact:	Mike Daly
Status Code:	ACTIVE
IC Received:	Not reported
Workplan Due:	7/10/1996
Workplan Received:	Not reported
Workplan Reviewed:	Not reported
Workplan Approved:	Not reported
Report Received:	Not reported
Report Reviewed:	Not reported
Report Approved:	Not reported
Cap Approved:	Not reported
Contract Mailed:	Not reported
Date Terminated:	Not reported

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17 **SUFFOLK CHEMICAL CO** **SHWS** **S109694601**
.5 MILES N OF US-76 ON CO RD 82 **ALLSITES** **N/A**
CHAPIN, SC 29036

SHWS:
EPA ID: SCD980801179

ALLSITES:

Brownfield:	No
Brownfield Type:	Hazardous Substances
Funds Used:	No
Resp Action:	No
Permit Number:	SCD980801179
Program:	SF
Owner:	DALY CONTRACTING LLC
Project Status Code:	ACTIVE
Execute Date:	07/10/1996
Restrictions Filed Date:	Not yet recorded.
Cleanup Contract Complete Date:	06/23/2004
Project Complete Date:	6/23/2004
File Number:	52199
Land Use Restriction:	There are no restrictions on this site.

SUFFOLK CHEMICAL CO (Continued) **S109694601**

Contamination On Site:	Volatile Organic Compounds
Acreage:	11
Soil Contamination Desc:	Not reported
Soil COCS:	Not reported
SW Sed Contamination Desc:	Not reported
SW COCS:	Not reported
GW Contamination Desc:	G/W Contamination
GW COCS:	1,1 DCA; 1,1 DCE, carbon tetrachloride; chloroform; methylene chloride; tetrachloroethene; 111 TCA; trichloroethene
Air Contamination Desc:	Not reported
Air COCS:	Not reported
Lat:	34.16001129
Long:	-81.34135437

Count: 19 records

ORPHAN SUMMARY

City	EDR ID	Site Name	Site Address	Zip	Database(s)
CAHPIN	1004780194	CHAPIN CLEANERS	LEXINGTON AVE	29036	RCRA-CESQG
CHAPIN	U003519618	BUCKS MARINA	RT 1	29036	UST
CHAPIN	U003522508	INTERNATIONAL PAPER CO	HWY 76 2 MI W CHAPIN	29036	UST
CHAPIN	U003807389	SUFFOLK CHEMICAL CO	E BOUNDARY RD	29036	UST
CHAPIN	U003525315	SOUTHERN BELL CHAPSCCL	CLARK ST	29036	LUST, UST
CHAPIN	S114806192	CHAPIN AMOCO	661 COLUMBIA RD		RGA LUST
CHAPIN	S114803861	AMOCO - CHAPIN AT I-26	661 COLUMBIA RD		RGA LUST
CHAPIN	U003524897	SCE&G	COLUMBIA AVE	29036	UST
CHAPIN	1016680765	CHAPIN SEWAGE SYSTEM	HOLLYOAK LN & I-26	29036	FINDS
CHAPIN	S118178132	MUNN OIL CO INC/CHAPIN AMOCO	SC HWY 48/I-26 FRONTAGE RD	29036	NPDES
CHAPIN	U003521223	FEDERAL PAPER BOARD CO INC	US HWY 76 E	29036	UST
CHAPIN	1016240449	CHAPIN CLEANERS	LEXINGTON AVE	29036	FINDS
CHAPIN	S114806197	CHAPIN PUBLIC WORKS FACILITY	MURRAY LINDLER ROAD		RGA LUST
CHAPIN	S114806196	CHAPIN PUBLIC WORKS FACILITY	MURRAY LINDLER RD		RGA LUST
CHAPIN	S108051499	CHAPIN, TOWN OF WWTP	NEAR WATEREE CRK & I-26	29036	NPDES
CHAPIN	1012246319	CHAPIN WTF	NEAR WATEREE CRK & I-26	29036	FINDS
CHAPIN	1014913729	CHAPIN, TOWN OF WWTP	NEAR WATEREE CRK & I-26	29036	EPA WATCH LIST
LEXINGTON COUNTY	M300004444	BORAL BRICKS INC	LEXINGTON COUNTY CLAY & SHALE MINES		US MINES
LEXINGTON COUNTY	1005652535	TOWN OF CHAPIN	SC		FINDS

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

To maintain currency of the following federal and state databases, EDR contacts the appropriate governmental agency on a monthly or quarterly basis, as required.

Number of Days to Update: Provides confirmation that EDR is reporting records that have been updated within 90 days from the date the government agency made the information available to the public.

FEDERAL RECORDS

NPL: National Priority List

National Priorities List (Superfund). The NPL is a subset of CERCLIS and identifies over 1,200 sites for priority cleanup under the Superfund Program. NPL sites may encompass relatively large areas. As such, EDR provides polygon coverage for over 1,000 NPL site boundaries produced by EPA's Environmental Photographic Interpretation Center (EPIC) and regional EPA offices.

Date of Government Version: 03/26/2015
Date Data Arrived at EDR: 04/08/2015
Date Made Active in Reports: 06/22/2015
Number of Days to Update: 75

Source: EPA
Telephone: N/A
Last EDR Contact: 11/07/2015
Next Scheduled EDR Contact: 01/18/2016
Data Release Frequency: Quarterly

NPL Site Boundaries

Sources:

EPA's Environmental Photographic Interpretation Center (EPIC)
Telephone: 202-564-7333

EPA Region 1
Telephone 617-918-1143

EPA Region 3
Telephone 215-814-5418

EPA Region 4
Telephone 404-562-8033

EPA Region 5
Telephone 312-886-6686

EPA Region 10
Telephone 206-553-8665

EPA Region 6
Telephone: 214-655-6659

EPA Region 7
Telephone: 913-551-7247

EPA Region 8
Telephone: 303-312-6774

EPA Region 9
Telephone: 415-947-4246

Proposed NPL: Proposed National Priority List Sites

A site that has been proposed for listing on the National Priorities List through the issuance of a proposed rule in the Federal Register. EPA then accepts public comments on the site, responds to the comments, and places on the NPL those sites that continue to meet the requirements for listing.

Date of Government Version: 03/26/2015
Date Data Arrived at EDR: 04/08/2015
Date Made Active in Reports: 06/22/2015
Number of Days to Update: 75

Source: EPA
Telephone: N/A
Last EDR Contact: 11/07/2015
Next Scheduled EDR Contact: 01/18/2016
Data Release Frequency: Quarterly

Delisted NPL: National Priority List Deletions

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) establishes the criteria that the EPA uses to delete sites from the NPL. In accordance with 40 CFR 300.425.(e), sites may be deleted from the NPL where no further response is appropriate.

Date of Government Version: 03/26/2015
Date Data Arrived at EDR: 04/08/2015
Date Made Active in Reports: 06/22/2015
Number of Days to Update: 75

Source: EPA
Telephone: N/A
Last EDR Contact: 11/07/2015
Next Scheduled EDR Contact: 01/18/2016
Data Release Frequency: Quarterly

NPL LIENS: Federal Superfund Liens

Federal Superfund Liens. Under the authority granted the USEPA by CERCLA of 1980, the USEPA has the authority to file liens against real property in order to recover remedial action expenditures or when the property owner received notification of potential liability. USEPA compiles a listing of filed notices of Superfund Liens.

Date of Government Version: 10/15/1991
Date Data Arrived at EDR: 02/02/1994
Date Made Active in Reports: 03/30/1994
Number of Days to Update: 56

Source: EPA
Telephone: 202-564-4267
Last EDR Contact: 08/15/2011
Next Scheduled EDR Contact: 11/28/2011
Data Release Frequency: No Update Planned

CERCLIS: Comprehensive Environmental Response, Compensation, and Liability Information System

CERCLIS contains data on potentially hazardous waste sites that have been reported to the USEPA by states, municipalities, private companies and private persons, pursuant to Section 103 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). CERCLIS contains sites which are either proposed to or on the National Priorities List (NPL) and sites which are in the screening and assessment phase for possible inclusion on the NPL.

Date of Government Version: 10/25/2013
Date Data Arrived at EDR: 11/11/2013
Date Made Active in Reports: 02/13/2014
Number of Days to Update: 94

Source: EPA
Telephone: 703-412-9810
Last EDR Contact: 08/28/2015
Next Scheduled EDR Contact: 12/07/2015
Data Release Frequency: Quarterly

CERCLIS-NFRAP: CERCLIS No Further Remedial Action Planned

Archived sites are sites that have been removed and archived from the inventory of CERCLIS sites. Archived status indicates that, to the best of EPA’s knowledge, assessment at a site has been completed and that EPA has determined no further steps will be taken to list this site on the National Priorities List (NPL), unless information indicates this decision was not appropriate or other considerations require a recommendation for listing at a later time. This decision does not necessarily mean that there is no hazard associated with a given site; it only means that, based upon available information, the location is not judged to be a potential NPL site.

Date of Government Version: 10/25/2013
Date Data Arrived at EDR: 11/11/2013
Date Made Active in Reports: 02/13/2014
Number of Days to Update: 94

Source: EPA
Telephone: 703-412-9810
Last EDR Contact: 08/28/2015
Next Scheduled EDR Contact: 12/07/2015
Data Release Frequency: Quarterly

LIENS 2: CERCLA Lien Information

A Federal CERCLA (’Superfund’) lien can exist by operation of law at any site or property at which EPA has spent Superfund monies. These monies are spent to investigate and address releases and threatened releases of contamination. CERCLIS provides information as to the identity of these sites and properties.

Date of Government Version: 02/18/2014
Date Data Arrived at EDR: 03/18/2014
Date Made Active in Reports: 04/24/2014
Number of Days to Update: 37

Source: Environmental Protection Agency
Telephone: 202-564-6023
Last EDR Contact: 10/30/2015
Next Scheduled EDR Contact: 02/08/2016
Data Release Frequency: Varies

CORRACTS: Corrective Action Report

CORRACTS identifies hazardous waste handlers with RCRA corrective action activity.

Date of Government Version: 06/09/2015
Date Data Arrived at EDR: 06/26/2015
Date Made Active in Reports: 09/16/2015
Number of Days to Update: 82

Source: EPA
Telephone: 800-424-9346
Last EDR Contact: 09/29/2015
Next Scheduled EDR Contact: 01/11/2016
Data Release Frequency: Quarterly

RCRA-TSDF: RCRA - Treatment, Storage and Disposal

RCRAInfo is EPA’s comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Transporters are individuals or entities that move hazardous waste from the generator offsite to a facility that can recycle, treat, store, or dispose of the waste. TSDFs treat, store, or dispose of the waste.

Date of Government Version: 06/09/2015
Date Data Arrived at EDR: 06/26/2015
Date Made Active in Reports: 09/16/2015
Number of Days to Update: 82

Source: Environmental Protection Agency
Telephone: (404) 562-8651
Last EDR Contact: 09/29/2015
Next Scheduled EDR Contact: 01/11/2016
Data Release Frequency: Quarterly

RCRA-LQG: RCRA - Large Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Large quantity generators (LQGs) generate over 1,000 kilograms (kg) of hazardous waste, or over 1 kg of acutely hazardous waste per month.

Date of Government Version: 06/09/2015
Date Data Arrived at EDR: 06/26/2015
Date Made Active in Reports: 09/16/2015
Number of Days to Update: 82

Source: Environmental Protection Agency
Telephone: (404) 562-8651
Last EDR Contact: 09/29/2015
Next Scheduled EDR Contact: 01/11/2016
Data Release Frequency: Quarterly

RCRA-SQG: RCRA - Small Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Small quantity generators (SQGs) generate between 100 kg and 1,000 kg of hazardous waste per month.

Date of Government Version: 06/09/2015
Date Data Arrived at EDR: 06/26/2015
Date Made Active in Reports: 09/16/2015
Number of Days to Update: 82

Source: Environmental Protection Agency
Telephone: (404) 562-8651
Last EDR Contact: 09/29/2015
Next Scheduled EDR Contact: 01/11/2016
Data Release Frequency: Quarterly

RCRA-CESQG: RCRA - Conditionally Exempt Small Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Conditionally exempt small quantity generators (CESQGs) generate less than 100 kg of hazardous waste, or less than 1 kg of acutely hazardous waste per month.

Date of Government Version: 06/09/2015
Date Data Arrived at EDR: 06/26/2015
Date Made Active in Reports: 09/16/2015
Number of Days to Update: 82

Source: Environmental Protection Agency
Telephone: (404) 562-8651
Last EDR Contact: 09/29/2015
Next Scheduled EDR Contact: 01/11/2016
Data Release Frequency: Varies

RCRA NonGen / NLR: RCRA - Non Generators / No Longer Regulated

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Non-Generators do not presently generate hazardous waste.

Date of Government Version: 06/09/2015
Date Data Arrived at EDR: 06/26/2015
Date Made Active in Reports: 09/16/2015
Number of Days to Update: 82

Source: Environmental Protection Agency
Telephone: (404) 562-8651
Last EDR Contact: 09/29/2015
Next Scheduled EDR Contact: 01/11/2016
Data Release Frequency: Varies

US ENG CONTROLS: Engineering Controls Sites List

A listing of sites with engineering controls in place. Engineering controls include various forms of caps, building foundations, liners, and treatment methods to create pathway elimination for regulated substances to enter environmental media or effect human health.

Date of Government Version: 09/10/2015
Date Data Arrived at EDR: 09/11/2015
Date Made Active in Reports: 11/03/2015
Number of Days to Update: 53

Source: Environmental Protection Agency
Telephone: 703-603-0695
Last EDR Contact: 08/31/2015
Next Scheduled EDR Contact: 12/14/2015
Data Release Frequency: Varies

US INST CONTROL: Sites with Institutional Controls

A listing of sites with institutional controls in place. Institutional controls include administrative measures, such as groundwater use restrictions, construction restrictions, property use restrictions, and post remediation care requirements intended to prevent exposure to contaminants remaining on site. Deed restrictions are generally required as part of the institutional controls.

Date of Government Version: 09/10/2015
Date Data Arrived at EDR: 09/11/2015
Date Made Active in Reports: 11/03/2015
Number of Days to Update: 53

Source: Environmental Protection Agency
Telephone: 703-603-0695
Last EDR Contact: 08/31/2015
Next Scheduled EDR Contact: 12/14/2015
Data Release Frequency: Varies

ERNS: Emergency Response Notification System

Emergency Response Notification System. ERNS records and stores information on reported releases of oil and hazardous substances.

Date of Government Version: 06/22/2015
Date Data Arrived at EDR: 06/26/2015
Date Made Active in Reports: 09/16/2015
Number of Days to Update: 82

Source: National Response Center, United States Coast Guard
Telephone: 202-267-2180
Last EDR Contact: 09/29/2015
Next Scheduled EDR Contact: 01/11/2016
Data Release Frequency: Annually

HMIRS: Hazardous Materials Information Reporting System

Hazardous Materials Incident Report System. HMIRS contains hazardous material spill incidents reported to DOT.

Date of Government Version: 06/24/2015
Date Data Arrived at EDR: 06/26/2015
Date Made Active in Reports: 09/02/2015
Number of Days to Update: 68

Source: U.S. Department of Transportation
Telephone: 202-366-4555
Last EDR Contact: 09/29/2015
Next Scheduled EDR Contact: 01/11/2016
Data Release Frequency: Annually

DOT OPS: Incident and Accident Data

Department of Transporation, Office of Pipeline Safety Incident and Accident data.

Date of Government Version: 07/31/2012
Date Data Arrived at EDR: 08/07/2012
Date Made Active in Reports: 09/18/2012
Number of Days to Update: 42

Source: Department of Transporation, Office of Pipeline Safety
Telephone: 202-366-4595
Last EDR Contact: 11/07/2015
Next Scheduled EDR Contact: 02/15/2016
Data Release Frequency: Varies

US CDL: Clandestine Drug Labs

A listing of clandestine drug lab locations. The U.S. Department of Justice ("the Department") provides this web site as a public service. It contains addresses of some locations where law enforcement agencies reported they found chemicals or other items that indicated the presence of either clandestine drug laboratories or dumpsites. In most cases, the source of the entries is not the Department, and the Department has not verified the entry and does not guarantee its accuracy. Members of the public must verify the accuracy of all entries by, for example, contacting local law enforcement and local health departments.

Date of Government Version: 08/12/2015
Date Data Arrived at EDR: 09/04/2015
Date Made Active in Reports: 11/03/2015
Number of Days to Update: 60

Source: Drug Enforcement Administration
Telephone: 202-307-1000
Last EDR Contact: 08/31/2015
Next Scheduled EDR Contact: 12/14/2015
Data Release Frequency: Quarterly

US BROWNFIELDS: A Listing of Brownfields Sites

Brownfields are real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. Cleaning up and reinvesting in these properties takes development pressures off of undeveloped, open land, and both improves and protects the environment. Assessment, Cleanup and Redevelopment Exchange System (ACRES) stores information reported by EPA Brownfields grant recipients on brownfields properties assessed or cleaned up with grant funding as well as information on Targeted Brownfields Assessments performed by EPA Regions. A listing of ACRES Brownfield sites is obtained from Cleanups in My Community. Cleanups in My Community provides information on Brownfields properties for which information is reported back to EPA, as well as areas served by Brownfields grant programs.

Date of Government Version: 06/22/2015
Date Data Arrived at EDR: 06/24/2015
Date Made Active in Reports: 09/02/2015
Number of Days to Update: 70

Source: Environmental Protection Agency
Telephone: 202-566-2777
Last EDR Contact: 09/23/2015
Next Scheduled EDR Contact: 01/04/2016
Data Release Frequency: Semi-Annually

DOD: Department of Defense Sites

This data set consists of federally owned or administered lands, administered by the Department of Defense, that have any area equal to or greater than 640 acres of the United States, Puerto Rico, and the U.S. Virgin Islands.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 11/10/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 62

Source: USGS
Telephone: 888-275-8747
Last EDR Contact: 10/16/2015
Next Scheduled EDR Contact: 01/25/2016
Data Release Frequency: Semi-Annually

FUDS: Formerly Used Defense Sites

The listing includes locations of Formerly Used Defense Sites properties where the US Army Corps of Engineers is actively working or will take necessary cleanup actions.

Date of Government Version: 01/31/2015
Date Data Arrived at EDR: 07/08/2015
Date Made Active in Reports: 10/13/2015
Number of Days to Update: 97

Source: U.S. Army Corps of Engineers
Telephone: 202-528-4285
Last EDR Contact: 09/11/2015
Next Scheduled EDR Contact: 12/21/2015
Data Release Frequency: Varies

LUCIS: Land Use Control Information System

LUCIS contains records of land use control information pertaining to the former Navy Base Realignment and Closure properties.

Date of Government Version: 05/28/2015
Date Data Arrived at EDR: 05/29/2015
Date Made Active in Reports: 06/11/2015
Number of Days to Update: 13

Source: Department of the Navy
Telephone: 843-820-7326
Last EDR Contact: 11/13/2015
Next Scheduled EDR Contact: 02/29/2016
Data Release Frequency: Varies

CONSENT: Superfund (CERCLA) Consent Decrees

Major legal settlements that establish responsibility and standards for cleanup at NPL (Superfund) sites. Released periodically by United States District Courts after settlement by parties to litigation matters.

Date of Government Version: 12/31/2014
Date Data Arrived at EDR: 04/17/2015
Date Made Active in Reports: 06/02/2015
Number of Days to Update: 46

Source: Department of Justice, Consent Decree Library
Telephone: Varies
Last EDR Contact: 09/28/2015
Next Scheduled EDR Contact: 01/11/2016
Data Release Frequency: Varies

ROD: Records Of Decision

Record of Decision. ROD documents mandate a permanent remedy at an NPL (Superfund) site containing technical and health information to aid in the cleanup.

Date of Government Version: 11/25/2013
Date Data Arrived at EDR: 12/12/2013
Date Made Active in Reports: 02/24/2014
Number of Days to Update: 74

Source: EPA
Telephone: 703-416-0223
Last EDR Contact: 09/11/2015
Next Scheduled EDR Contact: 12/21/2015
Data Release Frequency: Annually

UMTRA: Uranium Mill Tailings Sites

Uranium ore was mined by private companies for federal government use in national defense programs. When the mills shut down, large piles of the sand-like material (mill tailings) remain after uranium has been extracted from the ore. Levels of human exposure to radioactive materials from the piles are low; however, in some cases tailings were used as construction materials before the potential health hazards of the tailings were recognized.

Date of Government Version: 09/14/2010
Date Data Arrived at EDR: 10/07/2011
Date Made Active in Reports: 03/01/2012
Number of Days to Update: 146

Source: Department of Energy
Telephone: 505-845-0011
Last EDR Contact: 11/19/2015
Next Scheduled EDR Contact: 03/07/2016
Data Release Frequency: Varies

DEBRIS REGION 9: Torres Martinez Reservation Illegal Dump Site Locations

A listing of illegal dump sites location on the Torres Martinez Indian Reservation located in eastern Riverside County and northern Imperial County, California.

Date of Government Version: 01/12/2009
Date Data Arrived at EDR: 05/07/2009
Date Made Active in Reports: 09/21/2009
Number of Days to Update: 137

Source: EPA, Region 9
Telephone: 415-947-4219
Last EDR Contact: 10/26/2015
Next Scheduled EDR Contact: 02/08/2016
Data Release Frequency: No Update Planned

ODI: Open Dump Inventory

An open dump is defined as a disposal facility that does not comply with one or more of the Part 257 or Part 258 Subtitle D Criteria.

Date of Government Version: 06/30/1985
Date Data Arrived at EDR: 08/09/2004
Date Made Active in Reports: 09/17/2004
Number of Days to Update: 39

Source: Environmental Protection Agency
Telephone: 800-424-9346
Last EDR Contact: 06/09/2004
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

US MINES: Mines Master Index File

Contains all mine identification numbers issued for mines active or opened since 1971. The data also includes violation information.

Date of Government Version: 05/14/2015
Date Data Arrived at EDR: 06/03/2015
Date Made Active in Reports: 09/02/2015
Number of Days to Update: 91

Source: Department of Labor, Mine Safety and Health Administration
Telephone: 303-231-5959
Last EDR Contact: 09/01/2015
Next Scheduled EDR Contact: 12/14/2015
Data Release Frequency: Semi-Annually

US MINES 3: Active Mines & Mineral Plants Database Listing

Active Mines and Mineral Processing Plant operations for commodities monitored by the Minerals Information Team of the USGS.

Date of Government Version: 04/14/2011
Date Data Arrived at EDR: 06/08/2011
Date Made Active in Reports: 09/13/2011
Number of Days to Update: 97

Source: USGS
Telephone: 703-648-7709
Last EDR Contact: 09/04/2015
Next Scheduled EDR Contact: 12/14/2015
Data Release Frequency: Varies

US MINES 2: Ferrous and Nonferrous Metal Mines Database Listing

This map layer includes ferrous (ferrous metal mines are facilities that extract ferrous metals, such as iron ore or molybdenum) and nonferrous (Nonferrous metal mines are facilities that extract nonferrous metals, such as gold, silver, copper, zinc, and lead) metal mines in the United States.

Date of Government Version: 12/05/2005	Source: USGS
Date Data Arrived at EDR: 02/29/2008	Telephone: 703-648-7709
Date Made Active in Reports: 04/18/2008	Last EDR Contact: 09/04/2015
Number of Days to Update: 49	Next Scheduled EDR Contact: 12/14/2015
	Data Release Frequency: Varies

TRIS: Toxic Chemical Release Inventory System

Toxic Release Inventory System. TRIS identifies facilities which release toxic chemicals to the air, water and land in reportable quantities under SARA Title III Section 313.

Date of Government Version: 12/31/2013	Source: EPA
Date Data Arrived at EDR: 02/12/2015	Telephone: 202-566-0250
Date Made Active in Reports: 06/02/2015	Last EDR Contact: 08/28/2015
Number of Days to Update: 110	Next Scheduled EDR Contact: 12/07/2015
	Data Release Frequency: Annually

TSCA: Toxic Substances Control Act

Toxic Substances Control Act. TSCA identifies manufacturers and importers of chemical substances included on the TSCA Chemical Substance Inventory list. It includes data on the production volume of these substances by plant site.

Date of Government Version: 12/31/2012	Source: EPA
Date Data Arrived at EDR: 01/15/2015	Telephone: 202-260-5521
Date Made Active in Reports: 01/29/2015	Last EDR Contact: 09/25/2015
Number of Days to Update: 14	Next Scheduled EDR Contact: 01/04/2016
	Data Release Frequency: Every 4 Years

FTTS: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)

FTTS tracks administrative cases and pesticide enforcement actions and compliance activities related to FIFRA, TSCA and EPCRA (Emergency Planning and Community Right-to-Know Act). To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 04/09/2009	Source: EPA/Office of Prevention, Pesticides and Toxic Substances
Date Data Arrived at EDR: 04/16/2009	Telephone: 202-566-1667
Date Made Active in Reports: 05/11/2009	Last EDR Contact: 11/18/2015
Number of Days to Update: 25	Next Scheduled EDR Contact: 03/07/2016
	Data Release Frequency: Quarterly

FTTS INSP: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)

A listing of FIFRA/TSCA Tracking System (FTTS) inspections and enforcements.

Date of Government Version: 04/09/2009	Source: EPA
Date Data Arrived at EDR: 04/16/2009	Telephone: 202-566-1667
Date Made Active in Reports: 05/11/2009	Last EDR Contact: 11/18/2015
Number of Days to Update: 25	Next Scheduled EDR Contact: 03/07/2016
	Data Release Frequency: Quarterly

HIST FTTS: FIFRA/TSCA Tracking System Administrative Case Listing

A complete administrative case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

Date of Government Version: 10/19/2006
Date Data Arrived at EDR: 03/01/2007
Date Made Active in Reports: 04/10/2007
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 12/17/2007
Next Scheduled EDR Contact: 03/17/2008
Data Release Frequency: No Update Planned

HIST FTTS INSP: FIFRA/TSCA Tracking System Inspection & Enforcement Case Listing

A complete inspection and enforcement case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

Date of Government Version: 10/19/2006
Date Data Arrived at EDR: 03/01/2007
Date Made Active in Reports: 04/10/2007
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 12/17/2008
Next Scheduled EDR Contact: 03/17/2008
Data Release Frequency: No Update Planned

SSTS: Section 7 Tracking Systems

Section 7 of the Federal Insecticide, Fungicide and Rodenticide Act, as amended (92 Stat. 829) requires all registered pesticide-producing establishments to submit a report to the Environmental Protection Agency by March 1st each year. Each establishment must report the types and amounts of pesticides, active ingredients and devices being produced, and those having been produced and sold or distributed in the past year.

Date of Government Version: 12/31/2009
Date Data Arrived at EDR: 12/10/2010
Date Made Active in Reports: 02/25/2011
Number of Days to Update: 77

Source: EPA
Telephone: 202-564-4203
Last EDR Contact: 10/26/2015
Next Scheduled EDR Contact: 02/08/2016
Data Release Frequency: Annually

ICIS: Integrated Compliance Information System

The Integrated Compliance Information System (ICIS) supports the information needs of the national enforcement and compliance program as well as the unique needs of the National Pollutant Discharge Elimination System (NPDES) program.

Date of Government Version: 01/23/2015
Date Data Arrived at EDR: 02/06/2015
Date Made Active in Reports: 03/09/2015
Number of Days to Update: 31

Source: Environmental Protection Agency
Telephone: 202-564-5088
Last EDR Contact: 10/08/2015
Next Scheduled EDR Contact: 01/25/2016
Data Release Frequency: Quarterly

PADS: PCB Activity Database System

PCB Activity Database. PADS Identifies generators, transporters, commercial storers and/or brokers and disposers of PCB's who are required to notify the EPA of such activities.

Date of Government Version: 07/01/2014
Date Data Arrived at EDR: 10/15/2014
Date Made Active in Reports: 11/17/2014
Number of Days to Update: 33

Source: EPA
Telephone: 202-566-0500
Last EDR Contact: 10/29/2015
Next Scheduled EDR Contact: 01/25/2016
Data Release Frequency: Annually

MLTS: Material Licensing Tracking System

MLTS is maintained by the Nuclear Regulatory Commission and contains a list of approximately 8,100 sites which possess or use radioactive materials and which are subject to NRC licensing requirements. To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 06/26/2015
Date Data Arrived at EDR: 07/10/2015
Date Made Active in Reports: 10/13/2015
Number of Days to Update: 95

Source: Nuclear Regulatory Commission
Telephone: 301-415-7169
Last EDR Contact: 09/03/2015
Next Scheduled EDR Contact: 12/21/2015
Data Release Frequency: Quarterly

RADINFO: Radiation Information Database

The Radiation Information Database (RADINFO) contains information about facilities that are regulated by U.S. Environmental Protection Agency (EPA) regulations for radiation and radioactivity.

Date of Government Version: 07/07/2015
Date Data Arrived at EDR: 07/09/2015
Date Made Active in Reports: 09/16/2015
Number of Days to Update: 69

Source: Environmental Protection Agency
Telephone: 202-343-9775
Last EDR Contact: 10/07/2015
Next Scheduled EDR Contact: 01/18/2016
Data Release Frequency: Quarterly

FINDS: Facility Index System/Facility Registry System

Facility Index System. FINDS contains both facility information and 'pointers' to other sources that contain more detail. EDR includes the following FINDS databases in this report: PCS (Permit Compliance System), AIRS (Aerometric Information Retrieval System), DOCKET (Enforcement Docket used to manage and track information on civil judicial enforcement cases for all environmental statutes), FURS (Federal Underground Injection Control), C-DOCKET (Criminal Docket System used to track criminal enforcement actions for all environmental statutes), FFIS (Federal Facilities Information System), STATE (State Environmental Laws and Statutes), and PADS (PCB Activity Data System).

Date of Government Version: 07/20/2015
Date Data Arrived at EDR: 09/09/2015
Date Made Active in Reports: 11/03/2015
Number of Days to Update: 55

Source: EPA
Telephone: (404) 562-9900
Last EDR Contact: 09/09/2015
Next Scheduled EDR Contact: 12/21/2015
Data Release Frequency: Quarterly

RAATS: RCRA Administrative Action Tracking System

RCRA Administration Action Tracking System. RAATS contains records based on enforcement actions issued under RCRA pertaining to major violators and includes administrative and civil actions brought by the EPA. For administration actions after September 30, 1995, data entry in the RAATS database was discontinued. EPA will retain a copy of the database for historical records. It was necessary to terminate RAATS because a decrease in agency resources made it impossible to continue to update the information contained in the database.

Date of Government Version: 04/17/1995
Date Data Arrived at EDR: 07/03/1995
Date Made Active in Reports: 08/07/1995
Number of Days to Update: 35

Source: EPA
Telephone: 202-564-4104
Last EDR Contact: 06/02/2008
Next Scheduled EDR Contact: 09/01/2008
Data Release Frequency: No Update Planned

RMP: Risk Management Plans

When Congress passed the Clean Air Act Amendments of 1990, it required EPA to publish regulations and guidance for chemical accident prevention at facilities using extremely hazardous substances. The Risk Management Program Rule (RMP Rule) was written to implement Section 112(r) of these amendments. The rule, which built upon existing industry codes and standards, requires companies of all sizes that use certain flammable and toxic substances to develop a Risk Management Program, which includes a(n): Hazard assessment that details the potential effects of an accidental release, an accident history of the last five years, and an evaluation of worst-case and alternative accidental releases; Prevention program that includes safety precautions and maintenance, monitoring, and employee training measures; and Emergency response program that spells out emergency health care, employee training measures and procedures for informing the public and response agencies (e.g the fire department) should an accident occur.

Date of Government Version: 08/01/2015
Date Data Arrived at EDR: 08/26/2015
Date Made Active in Reports: 11/03/2015
Number of Days to Update: 69

Source: Environmental Protection Agency
Telephone: 202-564-8600
Last EDR Contact: 10/26/2015
Next Scheduled EDR Contact: 02/08/2016
Data Release Frequency: Varies

BRS: Biennial Reporting System

The Biennial Reporting System is a national system administered by the EPA that collects data on the generation and management of hazardous waste. BRS captures detailed data from two groups: Large Quantity Generators (LQG) and Treatment, Storage, and Disposal Facilities.

Date of Government Version: 12/31/2013
Date Data Arrived at EDR: 02/24/2015
Date Made Active in Reports: 09/30/2015
Number of Days to Update: 218

Source: EPA/NTIS
Telephone: 800-424-9346
Last EDR Contact: 08/28/2015
Next Scheduled EDR Contact: 12/07/2015
Data Release Frequency: Biennially

US AIRS MINOR: Air Facility System Data
A listing of minor source facilities.

Date of Government Version: 07/22/2015
Date Data Arrived at EDR: 07/24/2015
Date Made Active in Reports: 09/02/2015
Number of Days to Update: 40

Source: EPA
Telephone: 202-564-2496
Last EDR Contact: 09/28/2015
Next Scheduled EDR Contact: 01/11/2016
Data Release Frequency: Annually

US AIRS (AFS): Aerometric Information Retrieval System Facility Subsystem (AFS)
The database is a sub-system of Aerometric Information Retrieval System (AIRS). AFS contains compliance data on air pollution point sources regulated by the U.S. EPA and/or state and local air regulatory agencies. This information comes from source reports by various stationary sources of air pollution, such as electric power plants, steel mills, factories, and universities, and provides information about the air pollutants they produce. Action, air program, air program pollutant, and general level plant data. It is used to track emissions and compliance data from industrial plants.

Date of Government Version: 07/22/2015
Date Data Arrived at EDR: 07/24/2015
Date Made Active in Reports: 09/02/2015
Number of Days to Update: 40

Source: EPA
Telephone: 202-564-2496
Last EDR Contact: 09/28/2015
Next Scheduled EDR Contact: 01/11/2016
Data Release Frequency: Annually

US HIST CDL: National Clandestine Laboratory Register
A listing of clandestine drug lab locations. The U.S. Department of Justice ("the Department") provides this web site as a public service. It contains addresses of some locations where law enforcement agencies reported they found chemicals or other items that indicated the presence of either clandestine drug laboratories or dumpsites. In most cases, the source of the entries is not the Department, and the Department has not verified the entry and does not guarantee its accuracy. Members of the public must verify the accuracy of all entries by, for example, contacting local law enforcement and local health departments.

Date of Government Version: 08/12/2015
Date Data Arrived at EDR: 09/04/2015
Date Made Active in Reports: 11/03/2015
Number of Days to Update: 60

Source: Drug Enforcement Administration
Telephone: 202-307-1000
Last EDR Contact: 08/31/2015
Next Scheduled EDR Contact: 12/14/2015
Data Release Frequency: No Update Planned

FEMA UST: Underground Storage Tank Listing
A listing of all FEMA owned underground storage tanks.

Date of Government Version: 01/01/2010
Date Data Arrived at EDR: 02/16/2010
Date Made Active in Reports: 04/12/2010
Number of Days to Update: 55

Source: FEMA
Telephone: 202-646-5797
Last EDR Contact: 10/08/2015
Next Scheduled EDR Contact: 01/25/2016
Data Release Frequency: Varies

COAL ASH EPA: Coal Combustion Residues Surface Impoundments List
A listing of coal combustion residues surface impoundments with high hazard potential ratings.

Date of Government Version: 07/01/2014
Date Data Arrived at EDR: 09/10/2014
Date Made Active in Reports: 10/20/2014
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: N/A
Last EDR Contact: 09/11/2015
Next Scheduled EDR Contact: 12/21/2015
Data Release Frequency: Varies

FEDERAL FACILITY: Federal Facility Site Information listing

A listing of National Priority List (NPL) and Base Realignment and Closure (BRAC) sites found in the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) Database where EPA Federal Facilities Restoration and Reuse Office is involved in cleanup activities.

Date of Government Version: 03/26/2015	Source: Environmental Protection Agency
Date Data Arrived at EDR: 04/08/2015	Telephone: 703-603-8704
Date Made Active in Reports: 06/11/2015	Last EDR Contact: 10/09/2015
Number of Days to Update: 64	Next Scheduled EDR Contact: 01/18/2016
	Data Release Frequency: Varies

SCRD DRYCLEANERS: State Coalition for Remediation of Drycleaners Listing

The State Coalition for Remediation of Drycleaners was established in 1998, with support from the U.S. EPA Office of Superfund Remediation and Technology Innovation. It is comprised of representatives of states with established drycleaner remediation programs. Currently the member states are Alabama, Connecticut, Florida, Illinois, Kansas, Minnesota, Missouri, North Carolina, Oregon, South Carolina, Tennessee, Texas, and Wisconsin.

Date of Government Version: 03/07/2011	Source: Environmental Protection Agency
Date Data Arrived at EDR: 03/09/2011	Telephone: 615-532-8599
Date Made Active in Reports: 05/02/2011	Last EDR Contact: 11/19/2015
Number of Days to Update: 54	Next Scheduled EDR Contact: 02/29/2016
	Data Release Frequency: Varies

COAL ASH DOE: Steam-Electric Plant Operation Data

A listing of power plants that store ash in surface ponds.

Date of Government Version: 12/31/2005	Source: Department of Energy
Date Data Arrived at EDR: 08/07/2009	Telephone: 202-586-8719
Date Made Active in Reports: 10/22/2009	Last EDR Contact: 07/13/2015
Number of Days to Update: 76	Next Scheduled EDR Contact: 10/28/2015
	Data Release Frequency: Varies

PRP: Potentially Responsible Parties

A listing of verified Potentially Responsible Parties

Date of Government Version: 10/25/2013	Source: EPA
Date Data Arrived at EDR: 10/17/2014	Telephone: 202-564-6023
Date Made Active in Reports: 10/20/2014	Last EDR Contact: 11/13/2015
Number of Days to Update: 3	Next Scheduled EDR Contact: 02/22/2016
	Data Release Frequency: Quarterly

2020 COR ACTION: 2020 Corrective Action Program List

The EPA has set ambitious goals for the RCRA Corrective Action program by creating the 2020 Corrective Action Universe. This RCRA cleanup baseline includes facilities expected to need corrective action. The 2020 universe contains a wide variety of sites. Some properties are heavily contaminated while others were contaminated but have since been cleaned up. Still others have not been fully investigated yet, and may require little or no remediation. Inclusion in the 2020 Universe does not necessarily imply failure on the part of a facility to meet its RCRA obligations.

Date of Government Version: 04/22/2013	Source: Environmental Protection Agency
Date Data Arrived at EDR: 03/03/2015	Telephone: 703-308-4044
Date Made Active in Reports: 03/09/2015	Last EDR Contact: 11/13/2015
Number of Days to Update: 6	Next Scheduled EDR Contact: 02/22/2016
	Data Release Frequency: Varies

LEAD SMELTER 2: Lead Smelter Sites

A list of several hundred sites in the U.S. where secondary lead smelting was done from 1931and 1964. These sites may pose a threat to public health through ingestion or inhalation of contaminated soil or dust

Date of Government Version: 04/05/2001	Source: American Journal of Public Health
Date Data Arrived at EDR: 10/27/2010	Telephone: 703-305-6451
Date Made Active in Reports: 12/02/2010	Last EDR Contact: 12/02/2009
Number of Days to Update: 36	Next Scheduled EDR Contact: N/A
	Data Release Frequency: No Update Planned

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

LEAD SMELTER 1: Lead Smelter Sites
A listing of former lead smelter site locations.

Date of Government Version: 11/25/2014
Date Data Arrived at EDR: 11/26/2014
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 64

Source: Environmental Protection Agency
Telephone: 703-603-8787
Last EDR Contact: 10/05/2015
Next Scheduled EDR Contact: 01/18/2016
Data Release Frequency: Varies

PCB TRANSFORMER: PCB Transformer Registration Database
The database of PCB transformer registrations that includes all PCB registration submittals.

Date of Government Version: 02/01/2011
Date Data Arrived at EDR: 10/19/2011
Date Made Active in Reports: 01/10/2012
Number of Days to Update: 83

Source: Environmental Protection Agency
Telephone: 202-566-0517
Last EDR Contact: 10/29/2015
Next Scheduled EDR Contact: 02/08/2016
Data Release Frequency: Varies

EPA WATCH LIST: EPA WATCH LIST
EPA maintains a "Watch List" to facilitate dialogue between EPA, state and local environmental agencies on enforcement matters relating to facilities with alleged violations identified as either significant or high priority. Being on the Watch List does not mean that the facility has actually violated the law only that an investigation by EPA or a state or local environmental agency has led those organizations to allege that an unproven violation has in fact occurred. Being on the Watch List does not represent a higher level of concern regarding the alleged violations that were detected, but instead indicates cases requiring additional dialogue between EPA, state and local agencies - primarily because of the length of time the alleged violation has gone unaddressed or unresolved.

Date of Government Version: 08/30/2013
Date Data Arrived at EDR: 03/21/2014
Date Made Active in Reports: 06/17/2014
Number of Days to Update: 88

Source: Environmental Protection Agency
Telephone: 617-520-3000
Last EDR Contact: 11/10/2015
Next Scheduled EDR Contact: 02/22/2016
Data Release Frequency: Quarterly

US FIN ASSUR: Financial Assurance Information
All owners and operators of facilities that treat, store, or dispose of hazardous waste are required to provide proof that they will have sufficient funds to pay for the clean up, closure, and post-closure care of their facilities.

Date of Government Version: 09/01/2015
Date Data Arrived at EDR: 09/03/2015
Date Made Active in Reports: 11/03/2015
Number of Days to Update: 61

Source: Environmental Protection Agency
Telephone: 202-566-1917
Last EDR Contact: 11/13/2015
Next Scheduled EDR Contact: 02/29/2016
Data Release Frequency: Quarterly

STATE AND LOCAL RECORDS

SHWS: Site Assessment Section Project List
State Hazardous Waste Sites. State hazardous waste site records are the states’ equivalent to CERCLIS. These sites may or may not already be listed on the federal CERCLIS list. Priority sites planned for cleanup using state funds (state equivalent of Superfund) are identified along with sites where cleanup will be paid for by potentially responsible parties. Available information varies by state.

Date of Government Version: 03/23/2015
Date Data Arrived at EDR: 03/25/2015
Date Made Active in Reports: 04/07/2015
Number of Days to Update: 13

Source: Department of Health and Environmental Control
Telephone: 803-734-5376
Last EDR Contact: 11/09/2015
Next Scheduled EDR Contact: 12/28/2015
Data Release Frequency: Annually

ALLSITES: Site Assessment & Remediation Public Record Database
The South Carolina Department of Health and Environmental Control is pleased to have the Public Record for your review. The purpose of this database is two-fold. First, it will provide to communities another form of notice of cleanup activity, allowing them to have more information about assessment and cleanup activities in their area and in the State. Second, it can assist those seeking to redevelop brownfield properties within South Carolina.

Date of Government Version: 09/14/2015
Date Data Arrived at EDR: 09/16/2015
Date Made Active in Reports: 11/11/2015
Number of Days to Update: 56

Source: Department of Health & Environmental Control
Telephone: 803-896-4000
Last EDR Contact: 09/16/2015
Next Scheduled EDR Contact: 12/28/2015
Data Release Frequency: Quarterly

GWCI: Groundwater Contamination Inventory
An inventory of all groundwater contamination cases in the state.

Date of Government Version: 07/01/2008
Date Data Arrived at EDR: 11/06/2008
Date Made Active in Reports: 11/19/2008
Number of Days to Update: 13

Source: Department of Health and Environmental Control
Telephone: 803-898-3798
Last EDR Contact: 09/28/2015
Next Scheduled EDR Contact: 01/11/2016
Data Release Frequency: Annually

RCR: Registry of Conditional Remedies
The Bureau of Land and Waste Management established this Registry to help monitor and maintain sites that have conditional remedies. A Conditional Remedy is an environmental remedy that includes certain qualifications. These qualifications are divided into two major categories: Remedies requiring Land Use Controls and Conditional No Further Actions.

Date of Government Version: 09/19/2012
Date Data Arrived at EDR: 09/20/2012
Date Made Active in Reports: 10/22/2012
Number of Days to Update: 32

Source: Department of Health & Environmental Control
Telephone: 803-896-4000
Last EDR Contact: 09/15/2015
Next Scheduled EDR Contact: 12/28/2015
Data Release Frequency: Varies

SWF/LF: Permitted Landfills List
Solid Waste Facilities/Landfill Sites. SWF/LF type records typically contain an inventory of solid waste disposal facilities or landfills in a particular state. Depending on the state, these may be active or inactive facilities or open dumps that failed to meet RCRA Subtitle D Section 4004 criteria for solid waste landfills or disposal sites.

Date of Government Version: 03/23/2015
Date Data Arrived at EDR: 03/24/2015
Date Made Active in Reports: 04/07/2015
Number of Days to Update: 14

Source: Department of Health and Environmental Control
Telephone: 803-734-5165
Source: Department of Health and Environmental Control, GIS Section
Telephone: 803-896-4084
Last EDR Contact: 09/11/2015
Next Scheduled EDR Contact: 12/28/2015
Data Release Frequency: Varies

UIC: Underground Injection Wells Listing
A listing of underground injection wells locations.

Date of Government Version: 08/12/2015
Date Data Arrived at EDR: 08/17/2015
Date Made Active in Reports: 09/15/2015
Number of Days to Update: 29

Source: Department of Health & Environmental Control
Telephone: 803-898-3799
Last EDR Contact: 11/09/2015
Next Scheduled EDR Contact: 02/22/2016
Data Release Frequency: Varies

SWRCY: Solid Waste Recycling Facilities
A listing of recycling center locations.

Date of Government Version: 07/01/2015
Date Data Arrived at EDR: 08/17/2015
Date Made Active in Reports: 09/15/2015
Number of Days to Update: 29

Source: Department of Health & Enviornmental Control
Telephone: 803-896-8985
Last EDR Contact: 08/31/2015
Next Scheduled EDR Contact: 12/14/2015
Data Release Frequency: Varies

LUST: Leaking Underground Storage Tank List
Leaking Underground Storage Tank Incident Reports. LUST records contain an inventory of reported leaking underground storage tank incidents. Not all states maintain these records, and the information stored varies by state.

Date of Government Version: 07/29/2015
Date Data Arrived at EDR: 08/07/2015
Date Made Active in Reports: 09/15/2015
Number of Days to Update: 39

Source: Department of Health and Environmental Control
Telephone: 803-898-4350
Last EDR Contact: 10/22/2015
Next Scheduled EDR Contact: 02/08/2016
Data Release Frequency: Quarterly

UST: Comprehensive Underground Storage Tanks
Registered Underground Storage Tanks. UST's are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA) and must be registered with the state department responsible for administering the UST program. Available information varies by state program.

Date of Government Version: 07/29/2015
Date Data Arrived at EDR: 08/07/2015
Date Made Active in Reports: 09/15/2015
Number of Days to Update: 39

Source: Department of Health and Environmental Control
Telephone: 803-896-7957
Last EDR Contact: 10/22/2015
Next Scheduled EDR Contact: 02/08/2016
Data Release Frequency: Quarterly

AST: Aboveground Storage Tank List
Registered Aboveground Storage Tanks.

Date of Government Version: 03/25/2004
Date Data Arrived at EDR: 08/04/2004
Date Made Active in Reports: 09/23/2004
Number of Days to Update: 50

Source: Department of Health and Environmental Control
Telephone: 803-898-4350
Last EDR Contact: 08/31/2015
Next Scheduled EDR Contact: 12/14/2015
Data Release Frequency: Varies

SPILLS: Spill List
Spills and releases of petroleum and hazardous chemicals reported to the Oil & Chemical Emergency Response division.

Date of Government Version: 03/25/2015
Date Data Arrived at EDR: 03/26/2015
Date Made Active in Reports: 04/07/2015
Number of Days to Update: 12

Source: Department of Health and Environmental Control
Telephone: 803-898-4111
Last EDR Contact: 11/07/2015
Next Scheduled EDR Contact: 12/14/2015
Data Release Frequency: Varies

AUL: Land Use Controls
The term Land Use Controls or "LUCs" encompass institutional controls, such as those involved in real estate interests, governmental permitting, zoning, public advisories, deed notices, and other legal restrictions. The term also includes restrictions on access, whether achieved by means of engineered barriers (e.g., fence or concrete pad) or by human means (e.g., the presence of security guards). Additionally, the term includes both affirmative measures to achieve the desired restrictions (e.g., night lighting of an area) and prohibitive directives (e.g., restrictions on certain types of wells for the duration of the corrective action). Considered altogether, the LUCs for a facility will provide a tool for how the property should be used in order to maintain the level of protectiveness that one or more corrective actions were designed to achieve.

Date of Government Version: 09/14/2015
Date Data Arrived at EDR: 09/16/2015
Date Made Active in Reports: 11/11/2015
Number of Days to Update: 56

Source: Department of Health & Environmental Control
Telephone: 803-896-4049
Last EDR Contact: 09/16/2015
Next Scheduled EDR Contact: 12/28/2015
Data Release Frequency: Varies

VCP: Voluntary Cleanup Sites
Sites participating in the Voluntary Cleanup Program. Once staff and a non-responsible party have agreed upon an approved scope of work for a site investigation and/or remediation, the party enters into a voluntary cleanup contract. Staff oversees the cleanup efforts to ensure that activities are performed to our satisfaction. Upon completion of the negotiated work in the voluntary cleanup contract, the non-responsible party receives State Superfund liability protection.

Date of Government Version: 07/14/2014
Date Data Arrived at EDR: 07/25/2014
Date Made Active in Reports: 08/20/2014
Number of Days to Update: 26

Source: Department of Health and Environmental Control
Telephone: 803-896-4049
Last EDR Contact: 09/01/2015
Next Scheduled EDR Contact: 12/28/2015
Data Release Frequency: Varies

DRYCLEANERS: Drycleaner Database

The Drycleaning Facility Restoration Trust Fund database is used to access, prioritze and cleanup contaminated registered drycleaning sites.

Date of Government Version: 02/01/2015
Date Data Arrived at EDR: 05/06/2015
Date Made Active in Reports: 05/13/2015
Number of Days to Update: 7

Source: Department of Health & Environmental Control
Telephone: 803-898-3882
Last EDR Contact: 11/08/2015
Next Scheduled EDR Contact: 02/15/2016
Data Release Frequency: Varies

BROWNFIELDS: Brownfields Sites Listing

The Brownfields component of the Voluntary Cleanup Program allows a non-responsible party to acquire a contaminated property with State Superfund liability protection for existing contamination by agreeing to perform an environmental assessment and/or remediation.

Date of Government Version: 06/29/2015
Date Data Arrived at EDR: 07/07/2015
Date Made Active in Reports: 07/15/2015
Number of Days to Update: 8

Source: Department of Health & Environmental Control
Telephone: 803-896-4069
Last EDR Contact: 09/28/2015
Next Scheduled EDR Contact: 01/11/2016
Data Release Frequency: Varies

CDL 2: Clandestine Drug Lab Listing

A listing of clandestine drug lab site locations.

Date of Government Version: 09/02/2015
Date Data Arrived at EDR: 09/22/2015
Date Made Active in Reports: 11/11/2015
Number of Days to Update: 50

Source: South Carolina Law Enforcement Division
Telephone: 803-896-7136
Last EDR Contact: 09/14/2015
Next Scheduled EDR Contact: 12/14/2015
Data Release Frequency: Varies

CDL: Clandestine Drug Lab Sites

A listing of clandestine drug lab site locations.

Date of Government Version: 01/24/2012
Date Data Arrived at EDR: 01/26/2012
Date Made Active in Reports: 02/24/2012
Number of Days to Update: 29

Source: Department of Health & Environmental Control
Telephone: 803-896-4288
Last EDR Contact: 09/11/2015
Next Scheduled EDR Contact: 12/21/2015
Data Release Frequency: Varies

NPDES: Waste Water Treatment Facilities Listing

A listing of waste water treatment facility locations.

Date of Government Version: 08/28/2015
Date Data Arrived at EDR: 09/03/2015
Date Made Active in Reports: 11/11/2015
Number of Days to Update: 69

Source: Department of Health & Environmental Control
Telephone: 803-898-4300
Last EDR Contact: 08/03/2015
Next Scheduled EDR Contact: 10/05/2015
Data Release Frequency: Varies

AIRS: Permiited Airs Facility Listing

A listing of permitted airs facilities.

Date of Government Version: 12/31/2014
Date Data Arrived at EDR: 09/16/2015
Date Made Active in Reports: 11/11/2015
Number of Days to Update: 56

Source: Department of Health & Environmental Control
Telephone: 803-898-4279
Last EDR Contact: 08/31/2015
Next Scheduled EDR Contact: 12/14/2015
Data Release Frequency: Varies

COAL ASH: Coal Ash Disposal Sites
A listing of sites with coal ash ponds.

Date of Government Version: 12/30/2014
Date Data Arrived at EDR: 12/31/2014
Date Made Active in Reports: 02/09/2015
Number of Days to Update: 40

Source: Department of Health & Environmental Control
Telephone: 803-898-3964
Last EDR Contact: 11/16/2015
Next Scheduled EDR Contact: 12/14/2015
Data Release Frequency: Varies

TRIBAL RECORDS

INDIAN RESERV: Indian Reservations
This map layer portrays Indian administered lands of the United States that have any area equal to or greater than 640 acres.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 12/08/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 34

Source: USGS
Telephone: 202-208-3710
Last EDR Contact: 10/16/2015
Next Scheduled EDR Contact: 01/25/2016
Data Release Frequency: Semi-Annually

INDIAN ODI: Report on the Status of Open Dumps on Indian Lands
Location of open dumps on Indian land.

Date of Government Version: 12/31/1998
Date Data Arrived at EDR: 12/03/2007
Date Made Active in Reports: 01/24/2008
Number of Days to Update: 52

Source: Environmental Protection Agency
Telephone: 703-308-8245
Last EDR Contact: 11/06/2015
Next Scheduled EDR Contact: 02/15/2016
Data Release Frequency: Varies

INDIAN LUST R1: Leaking Underground Storage Tanks on Indian Land
A listing of leaking underground storage tank locations on Indian Land.

Date of Government Version: 02/03/2015
Date Data Arrived at EDR: 04/30/2015
Date Made Active in Reports: 06/22/2015
Number of Days to Update: 53

Source: EPA Region 1
Telephone: 617-918-1313
Last EDR Contact: 10/27/2015
Next Scheduled EDR Contact: 02/08/2016
Data Release Frequency: Varies

INDIAN LUST R4: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Florida, Mississippi and North Carolina.

Date of Government Version: 07/30/2015
Date Data Arrived at EDR: 08/07/2015
Date Made Active in Reports: 10/13/2015
Number of Days to Update: 67

Source: EPA Region 4
Telephone: 404-562-8677
Last EDR Contact: 10/26/2015
Next Scheduled EDR Contact: 02/08/2016
Data Release Frequency: Semi-Annually

INDIAN LUST R10: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Alaska, Idaho, Oregon and Washington.

Date of Government Version: 07/21/2015
Date Data Arrived at EDR: 07/29/2015
Date Made Active in Reports: 10/13/2015
Number of Days to Update: 76

Source: EPA Region 10
Telephone: 206-553-2857
Last EDR Contact: 10/26/2015
Next Scheduled EDR Contact: 02/08/2016
Data Release Frequency: Quarterly

INDIAN LUST R8: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming.

Date of Government Version: 04/30/2015
Date Data Arrived at EDR: 05/05/2015
Date Made Active in Reports: 06/22/2015
Number of Days to Update: 48

Source: EPA Region 8
Telephone: 303-312-6271
Last EDR Contact: 10/08/2015
Next Scheduled EDR Contact: 02/08/2016
Data Release Frequency: Quarterly

INDIAN LUST R9: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Arizona, California, New Mexico and Nevada

Date of Government Version: 01/08/2015
Date Data Arrived at EDR: 01/08/2015
Date Made Active in Reports: 02/09/2015
Number of Days to Update: 32

Source: Environmental Protection Agency
Telephone: 415-972-3372
Last EDR Contact: 10/30/2015
Next Scheduled EDR Contact: 02/08/2016
Data Release Frequency: Quarterly

INDIAN LUST R5: Leaking Underground Storage Tanks on Indian Land
Leaking underground storage tanks located on Indian Land in Michigan, Minnesota and Wisconsin.

Date of Government Version: 07/28/2015
Date Data Arrived at EDR: 08/07/2015
Date Made Active in Reports: 10/13/2015
Number of Days to Update: 67

Source: EPA, Region 5
Telephone: 312-886-7439
Last EDR Contact: 10/26/2015
Next Scheduled EDR Contact: 02/08/2016
Data Release Frequency: Varies

INDIAN LUST R7: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Iowa, Kansas, and Nebraska

Date of Government Version: 03/30/2015
Date Data Arrived at EDR: 04/28/2015
Date Made Active in Reports: 06/22/2015
Number of Days to Update: 55

Source: EPA Region 7
Telephone: 913-551-7003
Last EDR Contact: 10/08/2015
Next Scheduled EDR Contact: 02/08/2016
Data Release Frequency: Varies

INDIAN LUST R6: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in New Mexico and Oklahoma.

Date of Government Version: 05/13/2015
Date Data Arrived at EDR: 08/03/2015
Date Made Active in Reports: 10/13/2015
Number of Days to Update: 71

Source: EPA Region 6
Telephone: 214-665-6597
Last EDR Contact: 10/26/2015
Next Scheduled EDR Contact: 02/08/2016
Data Release Frequency: Varies

INDIAN UST R5: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 5 (Michigan, Minnesota and Wisconsin and Tribal Nations).

Date of Government Version: 07/28/2015
Date Data Arrived at EDR: 08/07/2015
Date Made Active in Reports: 10/13/2015
Number of Days to Update: 67

Source: EPA Region 5
Telephone: 312-886-6136
Last EDR Contact: 10/26/2015
Next Scheduled EDR Contact: 02/08/2016
Data Release Frequency: Varies

INDIAN UST R10: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 10 (Alaska, Idaho, Oregon, Washington, and Tribal Nations).

Date of Government Version: 07/21/2015
Date Data Arrived at EDR: 07/29/2015
Date Made Active in Reports: 10/13/2015
Number of Days to Update: 76

Source: EPA Region 10
Telephone: 206-553-2857
Last EDR Contact: 10/26/2015
Next Scheduled EDR Contact: 02/08/2016
Data Release Frequency: Quarterly

INDIAN UST R6: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 6 (Louisiana, Arkansas, Oklahoma, New Mexico, Texas and 65 Tribes).

Date of Government Version: 05/13/2015
Date Data Arrived at EDR: 08/03/2015
Date Made Active in Reports: 10/13/2015
Number of Days to Update: 71

Source: EPA Region 6
Telephone: 214-665-7591
Last EDR Contact: 10/26/2015
Next Scheduled EDR Contact: 02/08/2016
Data Release Frequency: Semi-Annually

INDIAN UST R1: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 1 (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont and ten Tribal Nations).

Date of Government Version: 02/03/2015
Date Data Arrived at EDR: 04/30/2015
Date Made Active in Reports: 06/22/2015
Number of Days to Update: 53

Source: EPA, Region 1
Telephone: 617-918-1313
Last EDR Contact: 10/27/2015
Next Scheduled EDR Contact: 02/08/2016
Data Release Frequency: Varies

INDIAN UST R7: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 7 (Iowa, Kansas, Missouri, Nebraska, and 9 Tribal Nations).

Date of Government Version: 09/23/2014
Date Data Arrived at EDR: 11/25/2014
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 65

Source: EPA Region 7
Telephone: 913-551-7003
Last EDR Contact: 10/26/2015
Next Scheduled EDR Contact: 02/08/2016
Data Release Frequency: Varies

INDIAN UST R9: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 9 (Arizona, California, Hawaii, Nevada, the Pacific Islands, and Tribal Nations).

Date of Government Version: 12/14/2014
Date Data Arrived at EDR: 02/13/2015
Date Made Active in Reports: 03/13/2015
Number of Days to Update: 28

Source: EPA Region 9
Telephone: 415-972-3368
Last EDR Contact: 10/30/2015
Next Scheduled EDR Contact: 02/09/2016
Data Release Frequency: Quarterly

INDIAN UST R8: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 8 (Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming and 27 Tribal Nations).

Date of Government Version: 07/28/2015
Date Data Arrived at EDR: 08/14/2015
Date Made Active in Reports: 10/13/2015
Number of Days to Update: 60

Source: EPA Region 8
Telephone: 303-312-6137
Last EDR Contact: 07/22/2015
Next Scheduled EDR Contact: 02/08/2016
Data Release Frequency: Quarterly

INDIAN UST R4: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 4 (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee and Tribal Nations)

Date of Government Version: 07/30/2015
Date Data Arrived at EDR: 08/07/2015
Date Made Active in Reports: 10/13/2015
Number of Days to Update: 67

Source: EPA Region 4
Telephone: 404-562-9424
Last EDR Contact: 10/26/2015
Next Scheduled EDR Contact: 02/08/2016
Data Release Frequency: Semi-Annually

INDIAN VCP R1: Voluntary Cleanup Priority Listing

A listing of voluntary cleanup priority sites located on Indian Land located in Region 1.

Date of Government Version: 09/29/2014
Date Data Arrived at EDR: 10/01/2014
Date Made Active in Reports: 11/06/2014
Number of Days to Update: 36

Source: EPA, Region 1
Telephone: 617-918-1102
Last EDR Contact: 09/29/2015
Next Scheduled EDR Contact: 01/11/2016
Data Release Frequency: Varies

INDIAN VCP R7: Voluntary Cleanup Priority Lisitng
A listing of voluntary cleanup priority sites located on Indian Land located in Region 7.

Date of Government Version: 03/20/2008
Date Data Arrived at EDR: 04/22/2008
Date Made Active in Reports: 05/19/2008
Number of Days to Update: 27

Source: EPA, Region 7
Telephone: 913-551-7365
Last EDR Contact: 04/20/2009
Next Scheduled EDR Contact: 07/20/2009
Data Release Frequency: Varies

EDR PROPRIETARY RECORDS

EDR MGP: EDR Proprietary Manufactured Gas Plants
The EDR Proprietary Manufactured Gas Plant Database includes records of coal gas plants (manufactured gas plants) compiled by EDR's researchers. Manufactured gas sites were used in the United States from the 1800's to 1950's to produce a gas that could be distributed and used as fuel. These plants used whale oil, rosin, coal, or a mixture of coal, oil, and water that also produced a significant amount of waste. Many of the byproducts of the gas production, such as coal tar (oily waste containing volatile and non-volatile chemicals), sludges, oils and other compounds are potentially hazardous to human health and the environment. The byproduct from this process was frequently disposed of directly at the plant site and can remain or spread slowly, serving as a continuous source of soil and groundwater contamination.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

EDR US Hist Auto Stat: EDR Exclusive Historic Gas Stations
EDR has searched selected national collections of business directories and has collected listings of potential gas station/filling station/service station sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include gas station/filling station/service station establishments. The categories reviewed included, but were not limited to gas, gas station, gasoline station, filling station, auto, automobile repair, auto service station, service station, etc. This database falls within a category of information EDR classifies as "High Risk Historical Records", or HRHR. EDR's HRHR effort presents unique and sometimes proprietary data about past sites and operations that typically create environmental concerns, but may not show up in current government records searches.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

EDR US Hist Cleaners: EDR Exclusive Historic Dry Cleaners
EDR has searched selected national collections of business directories and has collected listings of potential dry cleaner sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include dry cleaning establishments. The categories reviewed included, but were not limited to dry cleaners, cleaners, laundry, laundromat, cleaning/laundry, wash & dry etc. This database falls within a category of information EDR classifies as "High Risk Historical Records", or HRHR. EDR's HRHR effort presents unique and sometimes proprietary data about past sites and operations that typically create environmental concerns, but may not show up in current government records searches.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

RGA LF: Recovered Government Archive Solid Waste Facilities List

The EDR Recovered Government Archive Landfill database provides a list of landfills derived from historical databases and includes many records that no longer appear in current government lists. Compiled from Records formerly available from the Department of Health and Environmental Control in South Carolina.

Date of Government Version: N/A
Date Data Arrived at EDR: 07/01/2013
Date Made Active in Reports: 01/15/2014
Number of Days to Update: 198

Source: Department of Health and Environmental Control
Telephone: N/A
Last EDR Contact: 06/01/2012
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

RGA HWS: Recovered Government Archive State Hazardous Waste Facilities List

The EDR Recovered Government Archive State Hazardous Waste database provides a list of SHWS incidents derived from historical databases and includes many records that no longer appear in current government lists. Compiled from Records formerly available from the Department of Health and Environmental Control in South Carolina.

Date of Government Version: N/A
Date Data Arrived at EDR: 07/01/2013
Date Made Active in Reports: 01/03/2014
Number of Days to Update: 186

Source: Department of Health and Environmental Control
Telephone: N/A
Last EDR Contact: 06/01/2012
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

RGA LUST: Recovered Government Archive Leaking Underground Storage Tank

The EDR Recovered Government Archive Leaking Underground Storage Tank database provides a list of LUST incidents derived from historical databases and includes many records that no longer appear in current government lists. Compiled from Records formerly available from the Department of Health and Environmental Control in South Carolina.

Date of Government Version: N/A
Date Data Arrived at EDR: 07/01/2013
Date Made Active in Reports: 01/03/2014
Number of Days to Update: 186

Source: Department of Health and Environmental Control
Telephone: N/A
Last EDR Contact: 06/01/2012
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

OTHER DATABASE(S)

Depending on the geographic area covered by this report, the data provided in these specialty databases may or may not be complete. For example, the existence of wetlands information data in a specific report does not mean that all wetlands in the area covered by the report are included. Moreover, the absence of any reported wetlands information does not necessarily mean that wetlands do not exist in the area covered by the report.

CT MANIFEST: Hazardous Waste Manifest Data

Facility and manifest data. Manifest is a document that lists and tracks hazardous waste from the generator through transporters to a tsd facility.

Date of Government Version: 07/30/2013
Date Data Arrived at EDR: 08/19/2013
Date Made Active in Reports: 10/03/2013
Number of Days to Update: 45

Source: Department of Energy & Environmental Protection
Telephone: 860-424-3375
Last EDR Contact: 11/16/2015
Next Scheduled EDR Contact: 02/29/2016
Data Release Frequency: No Update Planned

NJ MANIFEST: Manifest Information

Hazardous waste manifest information.

Date of Government Version: 12/31/2013
Date Data Arrived at EDR: 07/17/2015
Date Made Active in Reports: 08/12/2015
Number of Days to Update: 26

Source: Department of Environmental Protection
Telephone: N/A
Last EDR Contact: 10/13/2015
Next Scheduled EDR Contact: 01/25/2016
Data Release Frequency: Annually

NY MANIFEST: Facility and Manifest Data
Manifest is a document that lists and tracks hazardous waste from the generator through transporters to a TSD facility.

Date of Government Version: 08/01/2015
Date Data Arrived at EDR: 08/06/2015
Date Made Active in Reports: 08/24/2015
Number of Days to Update: 18

Source: Department of Environmental Conservation
Telephone: 518-402-8651
Last EDR Contact: 11/08/2015
Next Scheduled EDR Contact: 02/15/2016
Data Release Frequency: Annually

PA MANIFEST: Manifest Information
Hazardous waste manifest information.

Date of Government Version: 12/31/2014
Date Data Arrived at EDR: 07/24/2015
Date Made Active in Reports: 08/18/2015
Number of Days to Update: 25

Source: Department of Environmental Protection
Telephone: 717-783-8990
Last EDR Contact: 10/19/2015
Next Scheduled EDR Contact: 02/01/2016
Data Release Frequency: Annually

RI MANIFEST: Manifest information
Hazardous waste manifest information

Date of Government Version: 12/31/2013
Date Data Arrived at EDR: 06/19/2015
Date Made Active in Reports: 07/15/2015
Number of Days to Update: 26

Source: Department of Environmental Management
Telephone: 401-222-2797
Last EDR Contact: 11/19/2015
Next Scheduled EDR Contact: 03/07/2016
Data Release Frequency: Annually

WI MANIFEST: Manifest Information
Hazardous waste manifest information.

Date of Government Version: 12/31/2014
Date Data Arrived at EDR: 03/19/2015
Date Made Active in Reports: 04/07/2015
Number of Days to Update: 19

Source: Department of Natural Resources
Telephone: N/A
Last EDR Contact: 09/10/2015
Next Scheduled EDR Contact: 12/28/2015
Data Release Frequency: Annually

Oil/Gas Pipelines
Source: PennWell Corporation
Petroleum Bundle (Crude Oil, Refined Products, Petrochemicals, Gas Liquids (LPG/NGL), and Specialty Gases (Miscellaneous)) N = Natural Gas Bundle (Natural Gas, Gas Liquids (LPG/NGL), and Specialty Gases (Miscellaneous)). This map includes information copyrighted by PennWell Corporation. This information is provided on a best effort basis and PennWell Corporation does not guarantee its accuracy nor warrant its fitness for any particular purpose. Such information has been reprinted with the permission of PennWell.

Electric Power Transmission Line Data
Source: PennWell Corporation
This map includes information copyrighted by PennWell Corporation. This information is provided on a best effort basis and PennWell Corporation does not guarantee its accuracy nor warrant its fitness for any particular purpose. Such information has been reprinted with the permission of PennWell.

Sensitive Receptors: There are individuals deemed sensitive receptors due to their fragile immune systems and special sensitivity to environmental discharges. These sensitive receptors typically include the elderly, the sick, and children. While the location of all sensitive receptors cannot be determined, EDR indicates those buildings and facilities - schools, daycares, hospitals, medical centers, and nursing homes - where individuals who are sensitive receptors are likely to be located.

AHA Hospitals:
Source: American Hospital Association, Inc.
Telephone: 312-280-5991
The database includes a listing of hospitals based on the American Hospital Association's annual survey of hospitals.

Medical Centers: Provider of Services Listing
Source: Centers for Medicare & Medicaid Services
Telephone: 410-786-3000
A listing of hospitals with Medicare provider number, produced by Centers of Medicare & Medicaid Services, a federal agency within the U.S. Department of Health and Human Services.

Nursing Homes
Source: National Institutes of Health
Telephone: 301-594-6248
Information on Medicare and Medicaid certified nursing homes in the United States.

Public Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on elementary and secondary public education in the United States. It is a comprehensive, annual, national statistical database of all public elementary and secondary schools and school districts, which contains data that are comparable across all states.

Private Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on private school locations in the United States.

Daycare Centers: Child Day Care List
Source: Department of Social Services
Telephone: 803-898-7345

Flood Zone Data: This data, available in select counties across the country, was obtained by EDR in 2003 & 2011 from the Federal Emergency Management Agency (FEMA). Data depicts 100-year and 500-year flood zones as defined by FEMA.

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002, 2005 and 2010 from the U.S. Fish and Wildlife Service.

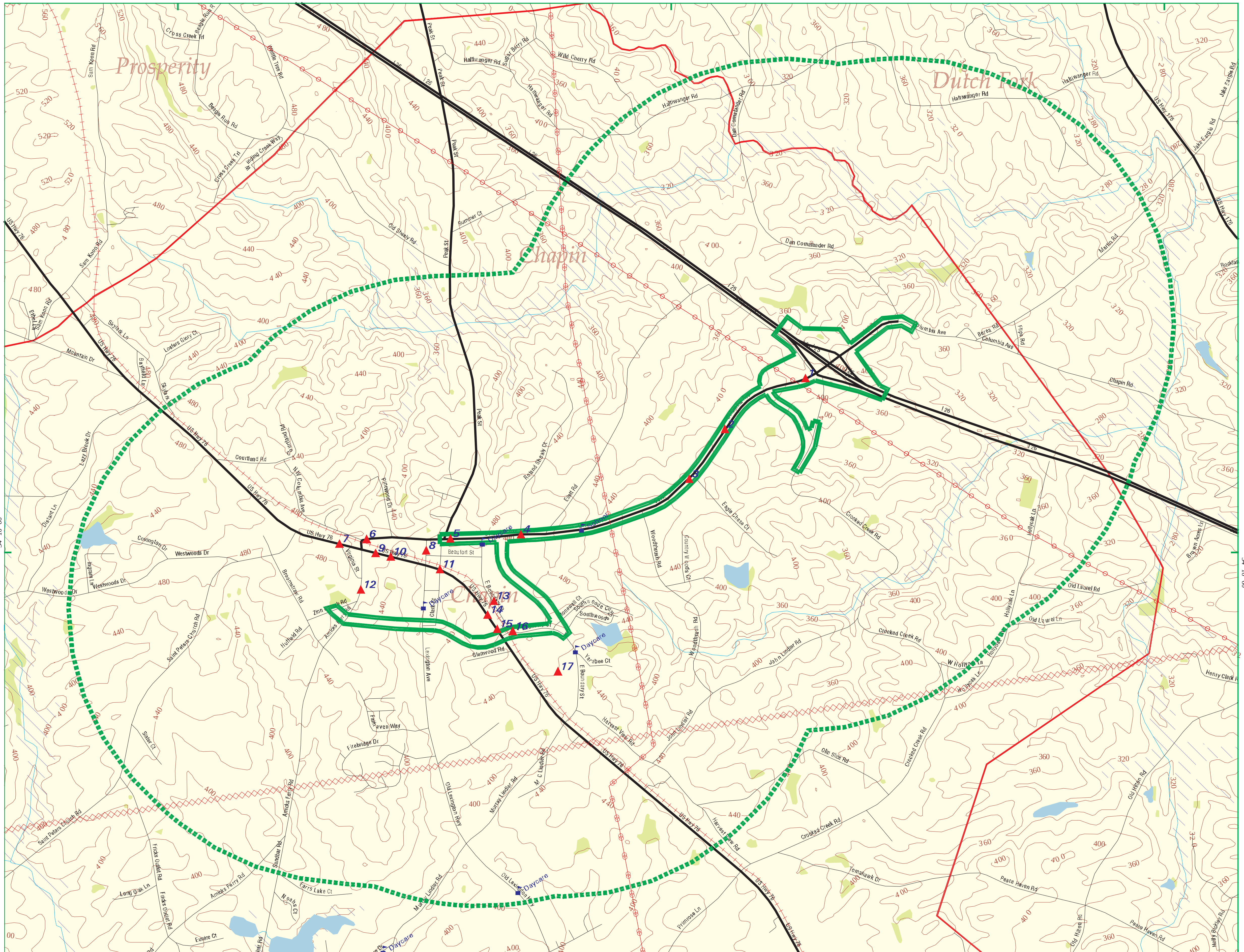
State Wetlands Data: Wetlands Inventory
Source: Department of Natural Resources
Telephone: 803-734-9494

Earthquake Fault Lines: The fault lines displayed on EDR's Topographic map are digitized quaternary faultlines, prepared in 1975 by the United State Geological Survey

STREET AND ADDRESS INFORMATION

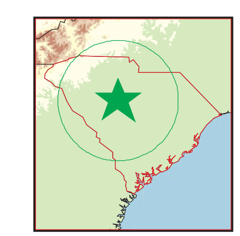
EDR DataMap® Area Study

Chapin



- Listed Sites
- Earthquake Epicenters (Richter 5 or greater)
- Search Boundary
- Roads
- Major Roads
- Waterways
- Railroads
- Contour Lines
- Pipelines
- Powerlines
- Fault Lines
- Water
- Superfund Sites
- Federal DOD Sites
- Indian Reservations BIA
- 100-Yr Flood Zones
- National Wetland Inventory

N



Chapin, SC

0 1/4 1/2

Scale in Miles

EDR® Environmental Data Resources Inc

4470451.5s - 20 Nov 15

Chaplin

Chaplin

Chapin, SC 29036

Inquiry Number: 4550457.2

February 29, 2016

EDR Historical Topo Map Report

with QuadMatch™

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

EDR Historical Topo Map Report

02/29/16

Site Name:
Chaplin
Chaplin
Chapin, SC 29036
EDR Inquiry # 4550457.2

Client Name:
Mead & Hunt
307 W Main Street
Lexington, SC 29072
Contact: Lou Raymond

EDR Topographic Map Library has been searched by EDR and maps covering the target property location as provided by Mead & Hunt were identified for the years listed below. EDR's Historical Topo Map Report is designed to assist professionals in evaluating potential liability on a target property resulting from past activities. EDRs Historical Topo Map Report includes a search of a collection of public and private color historical topographic maps, dating back to the late 1800s.

Search Results:

Site Name:	Chaplin
Address:	Chaplin
City,State,Zip:	Chapin, SC 29036
P.O.#	NA
Project:	NA

Coordinates:

Latitude:	34.1702 34° 10' 13" North
Longitude:	-81.333 -81° 19' 59" West
UTM Zone:	Zone 17 North
UTM X Meters:	469309.58
UTM Y Meters:	3781077.77
Elevation:	445.22' above sea level

Maps Provided:

2014
1971
1904

Topo Sheet Thumbnails

This EDR Topo Map Report is based upon the following USGS topographic map sheets.

2014 Source Sheets

Chapin
2014
7.5-minute, 24000

1971 Source Sheets

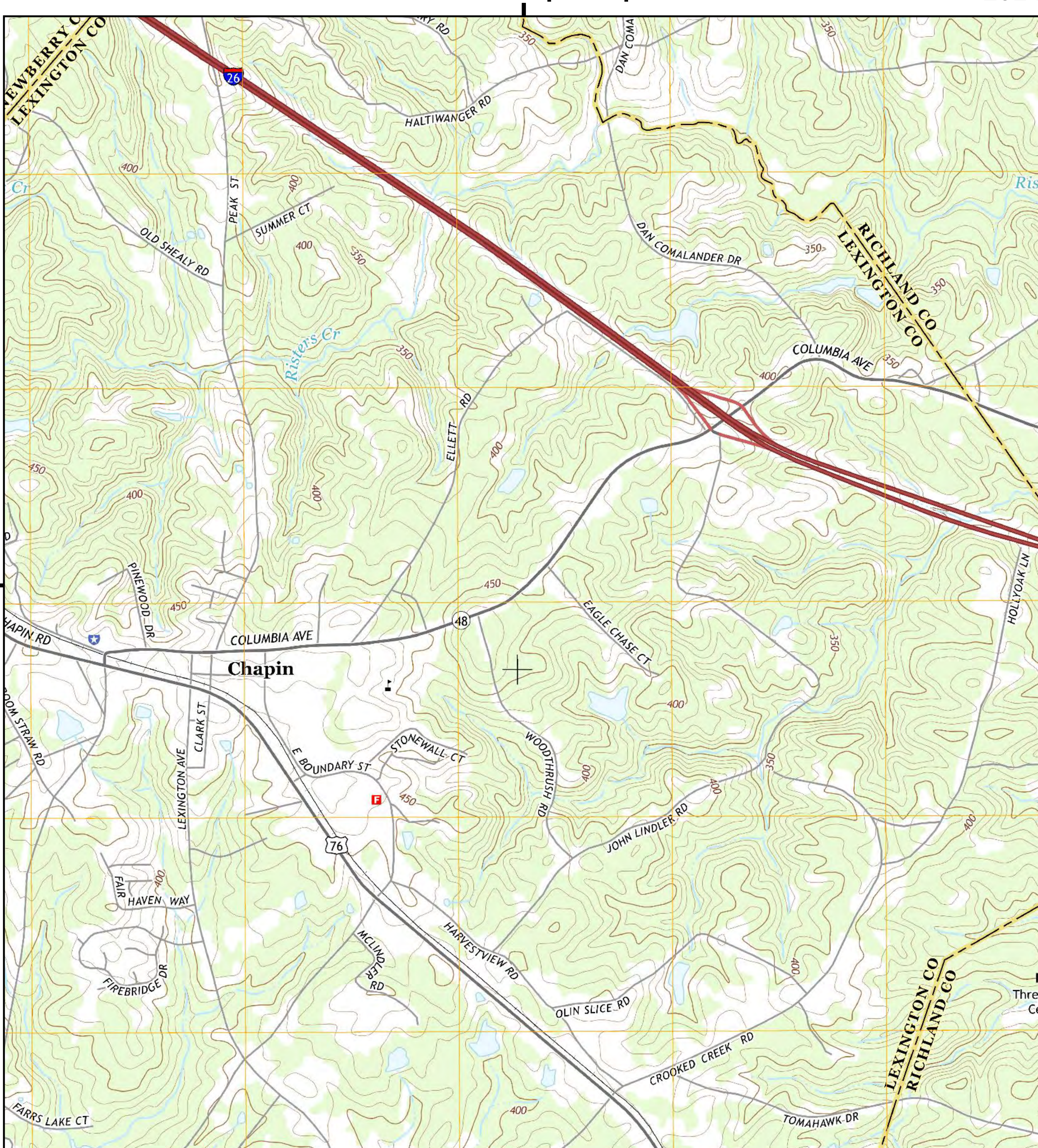
Chapin
1971
7.5-minute, 24000
Aerial Photo Revised 1971

1904 Source Sheets

Columbia
1904
30-minute, 125000

Historical Topo Map

2014



This report includes information from the following map sheet(s).

Miles 0.25 0.5 1 1.5

NW N NE
W E
SW S SE

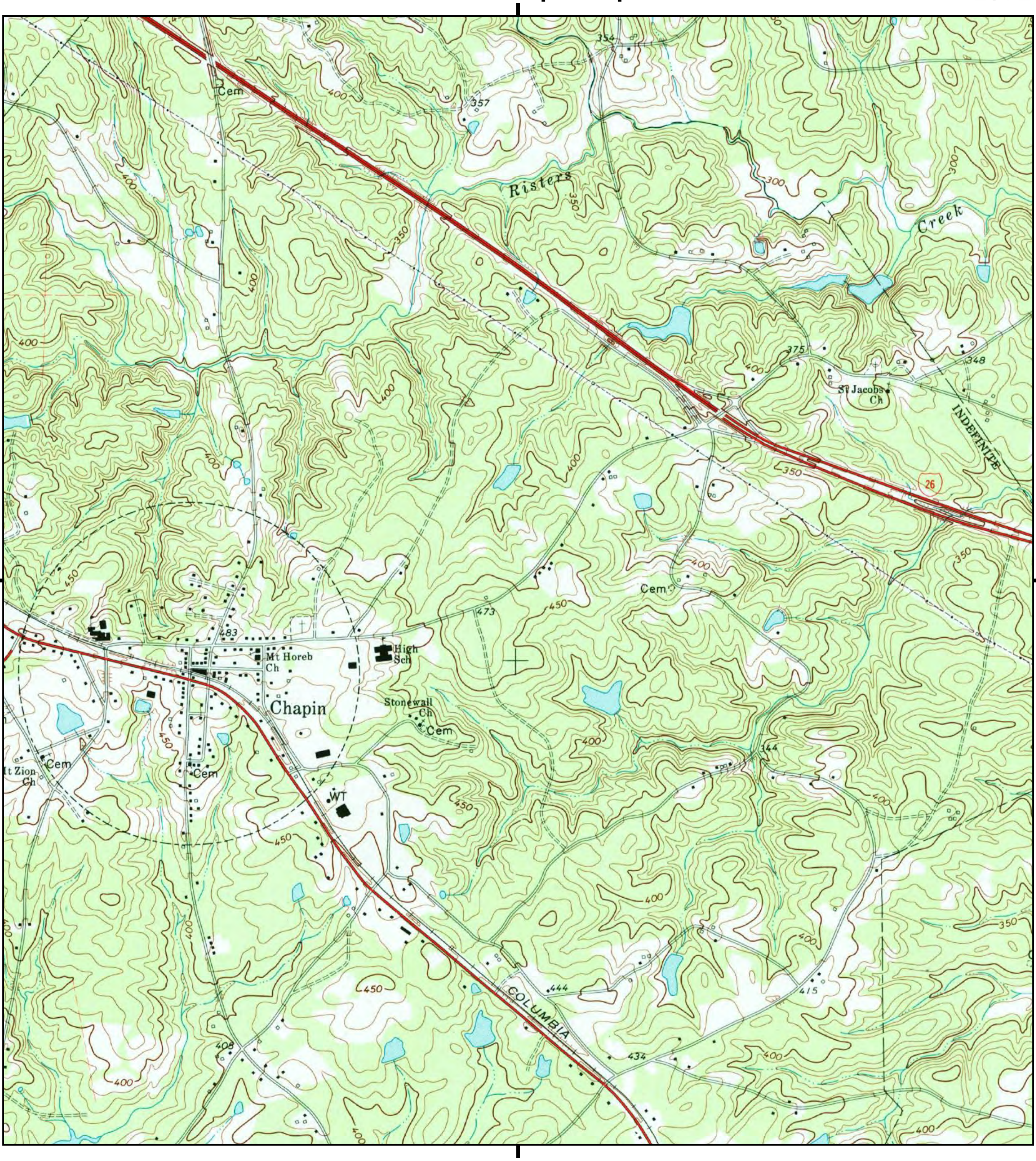
TP, Chapin, 2014, 7.5-minute

SITE NAME: Chaplin
ADDRESS: Chaplin
Chapin, SC 29036
CLIENT: Mead & Hunt

N

Historical Topo Map

1971



This report includes information from the following map sheet(s).

Miles 0.25 0.5 1 1.5

NW	N	NE
W		E
SW	S	SE

TP, Chapin, 1971, 7.5-minute

SITE NAME: Chaplin
ADDRESS: Chaplin
Chapin, SC 29036
CLIENT: Mead & Hunt

N

Historical Topo Map

1904

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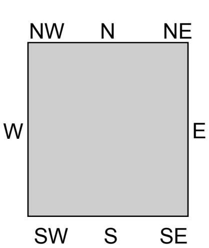


TP, Columbia, 1904, 30-minute

SITE NAME: Chaplin
ADDRESS: Chaplin
Chapin, SC 29036
CLIENT: Mead & Hunt

Chaplin

Chaplin

Chapin, SC 29036

Inquiry Number: 4547336.2

February 26, 2016

The EDR Aerial Photo Decade Package

6 Armstrong Road, 4th Floor
Shelton, Connecticut 06484
Toll Free: 800.352.0050
www.edrnet.com

EDR Aerial Photo Decade Package

Environmental Data Resources, Inc. (EDR) Aerial Photo Decade Package is a screening tool designed to assist environmental professionals in evaluating potential liability on a target property resulting from past activities. EDR's professional researchers provide digitally reproduced historical aerial photographs, and when available, provide one photo per decade.

When delivered electronically by EDR, the aerial photo images included with this report are for ONE TIME USE ONLY. Further reproduction of these aerial photo images is prohibited without permission from EDR. For more information contact your EDR Account Executive.

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

Date EDR Searched Historical Sources:

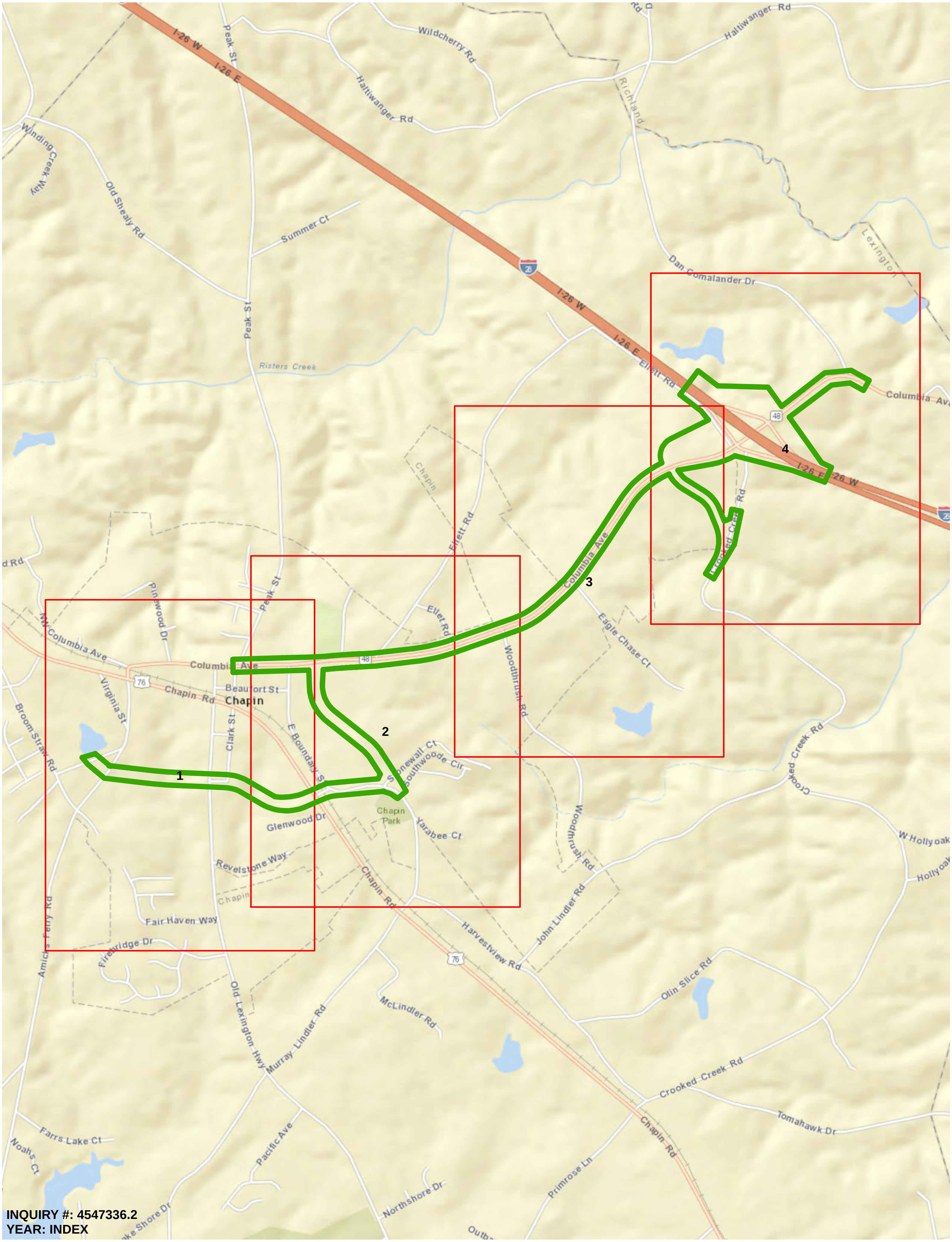
Aerial Photography February 26, 2016

Target Property:

Chaplin

Chapin, SC 29036

Year	***Scale***	***Details***	***Source***
1943	Aerial Photograph. Scale: 1"=500'	Flight Date: May 02, 1943	USGS
1951	Aerial Photograph. Scale: 1"=500'	Flight Date: May 16, 1951	USGS
1964	Aerial Photograph. Scale: 1"=500'	Flight Date: September 01, 1964	USDA
1970	Aerial Photograph. Scale: 1"=500'	Flight Date: March 10, 1970	USGS
1974	Aerial Photograph. Scale: 1"=500'	Flight Date: April 27, 1974	USGS
1989	Aerial Photograph. Scale: 1"=500'	Flight Date: March 12, 1989	USGS
1994	Aerial Photograph. Scale: 1"=500'	DOQQ - acquisition dates: February 01, 1994	USGS/DOQQ
1999	Aerial Photograph. Scale: 1"=500'	Flight Date: March 01, 1999	USGS
2006	Aerial Photograph. Scale: 1"=500'	Flight Year: 2006	USDA/NAIP
2009	Aerial Photograph. Scale: 1"=500'	Flight Year: 2009	USDA/NAIP
2011	Aerial Photograph. Scale: 1"=500'	Flight Year: 2011	USDA/NAIP
2013	Aerial Photograph. Scale: 1"=500'	Flight Year: 2013	USDA/NAIP



INQUIRY #: 4547336.2
YEAR: INDEX


INQUIRY #: 4547336.2
YEAR: 1943
SCALE: 1"=500'


INQUIRY #: 4547336.2
YEAR: 1943
SCALE: 1"=500'


INQUIRY #: 4547336.2
YEAR: 1943
SCALE: 1"=500'


INQUIRY #: 4547336.2
YEAR: 1943
SCALE: 1"=500'


INQUIRY #: 4547336.2
YEAR: 1951
SCALE: 1"=500'


INQUIRY #: 4547336.2
YEAR: 1951
SCALE: 1"=500'


INQUIRY #: 4547336.2
YEAR: 1951
SCALE: 1"=500'

INQUIRY #: 4547336.2
YEAR: 1951
SCALE: 1"=500'


INQUIRY #: 4547336.2
YEAR: 1964
SCALE: 1"=500'


INQUIRY #: 4547336.2
YEAR: 1964
SCALE: 1"=500'

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YEAR: 1964
SCALE: 1"=500'


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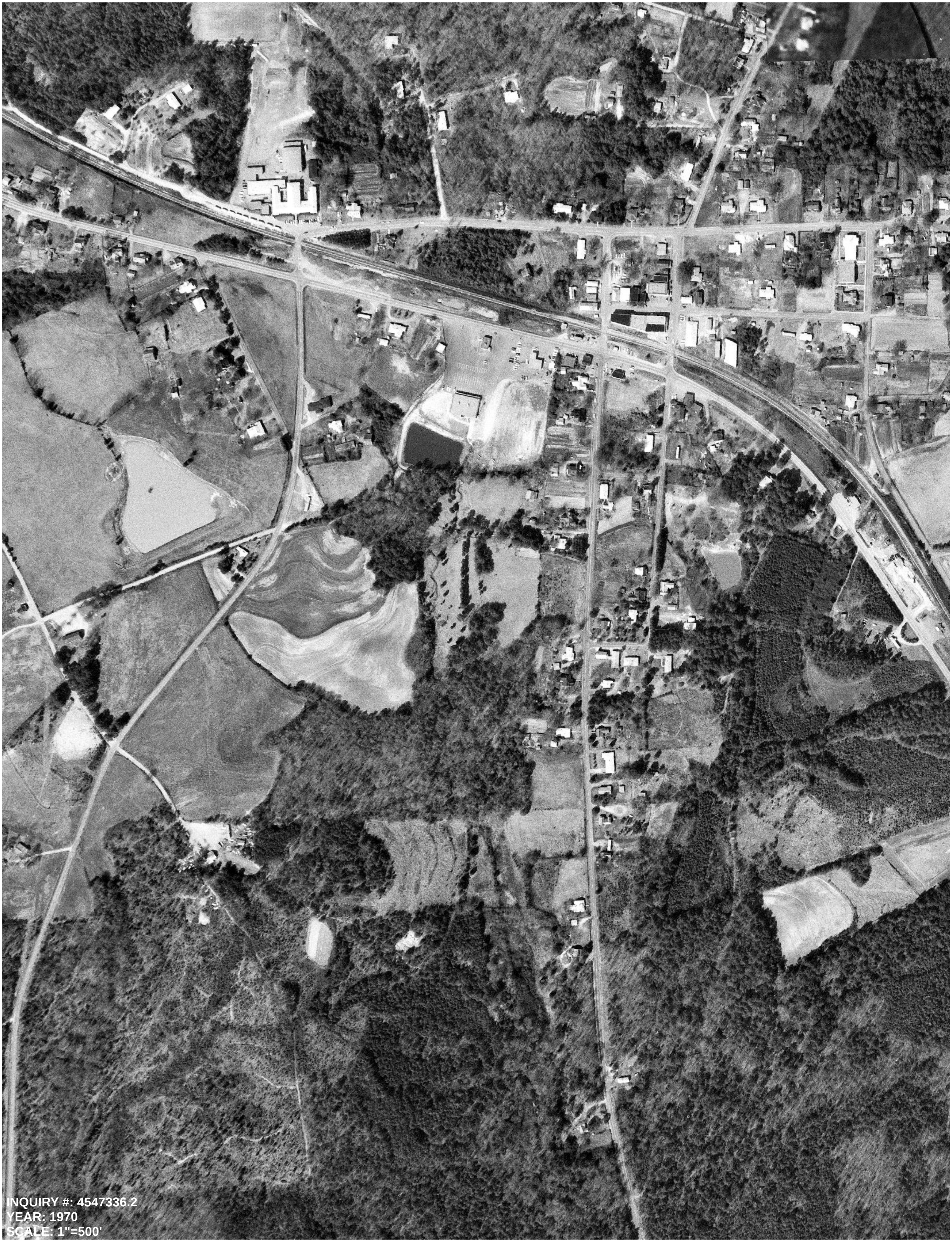
SCALE: 1"=500'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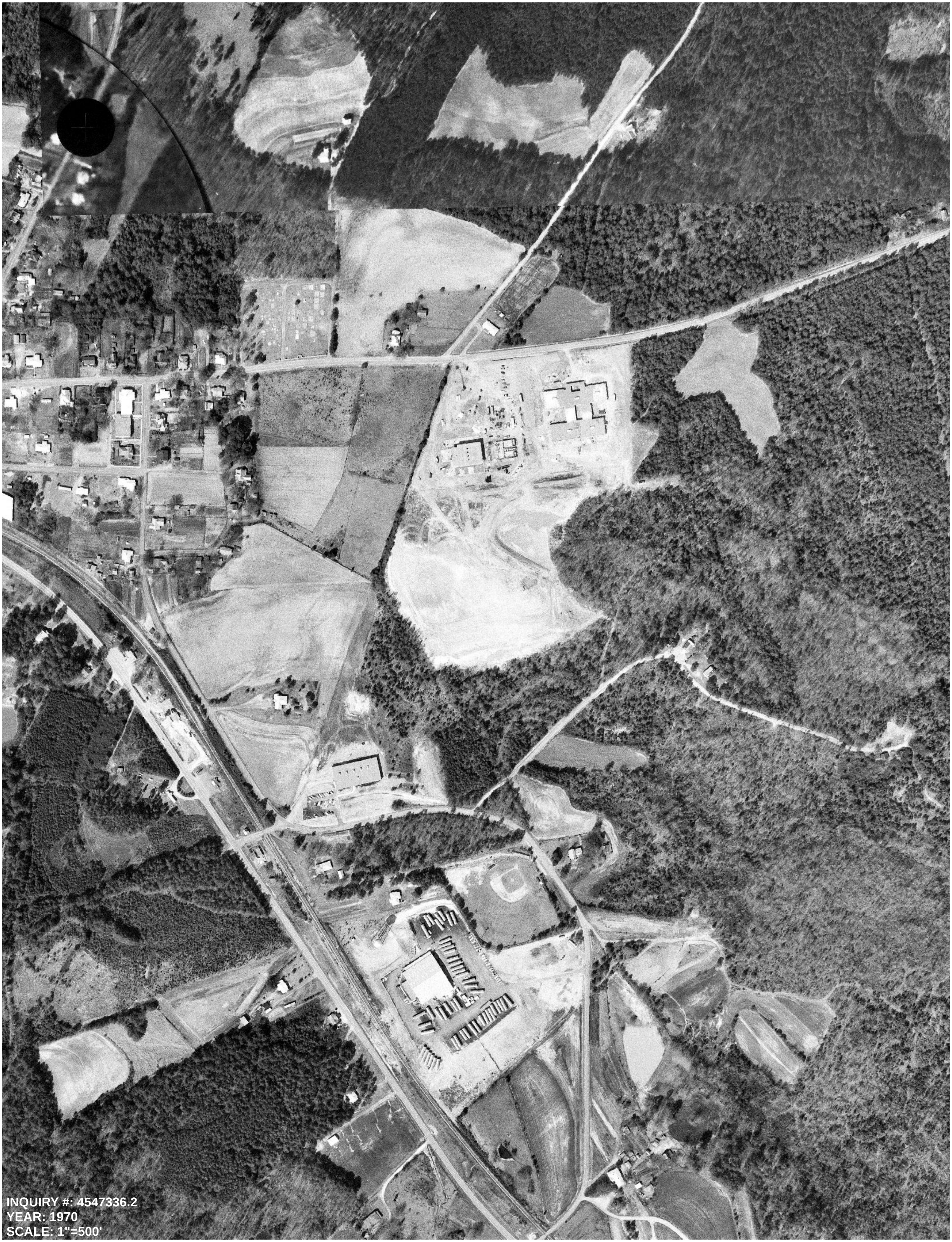
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YEAR: 1970
SCALE: 1"=500'


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YEAR: 1970
SCALE: 1"=500'


INQUIRY #: 4547336.2
YEAR: 1974
SCALE: 1"=500'


INQUIRY #: 4547336.2
YEAR: 1974
SCALE: 1"=500'


INQUIRY #: 4547336.2
YEAR: 1974
SCALE: 1"=500'

INQUIRY #: 4547336.2
YEAR: 1974
SCALE: 1"=500'


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SCALE: 1"=500'


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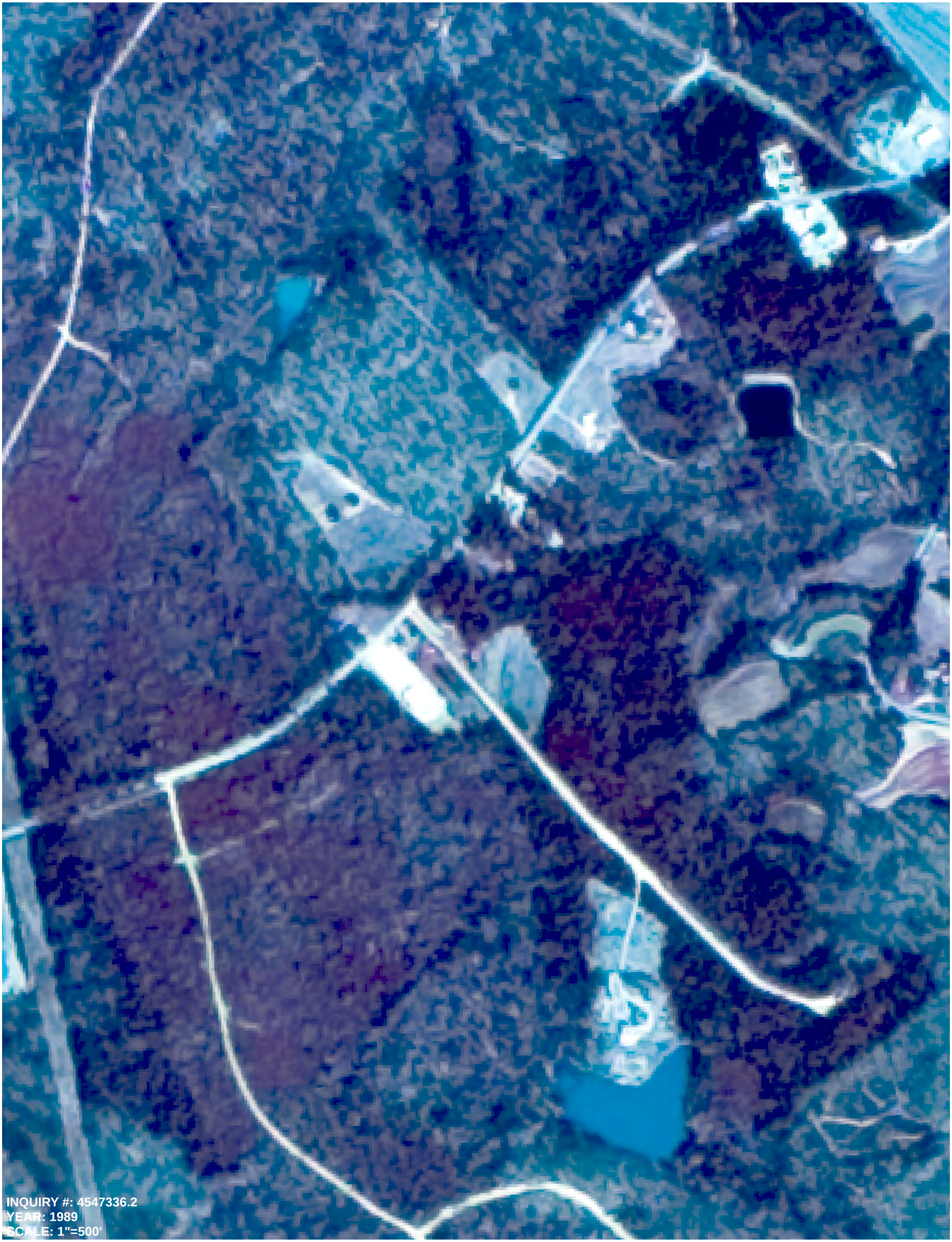
YEAR: 1989
SCALE: 1"=500'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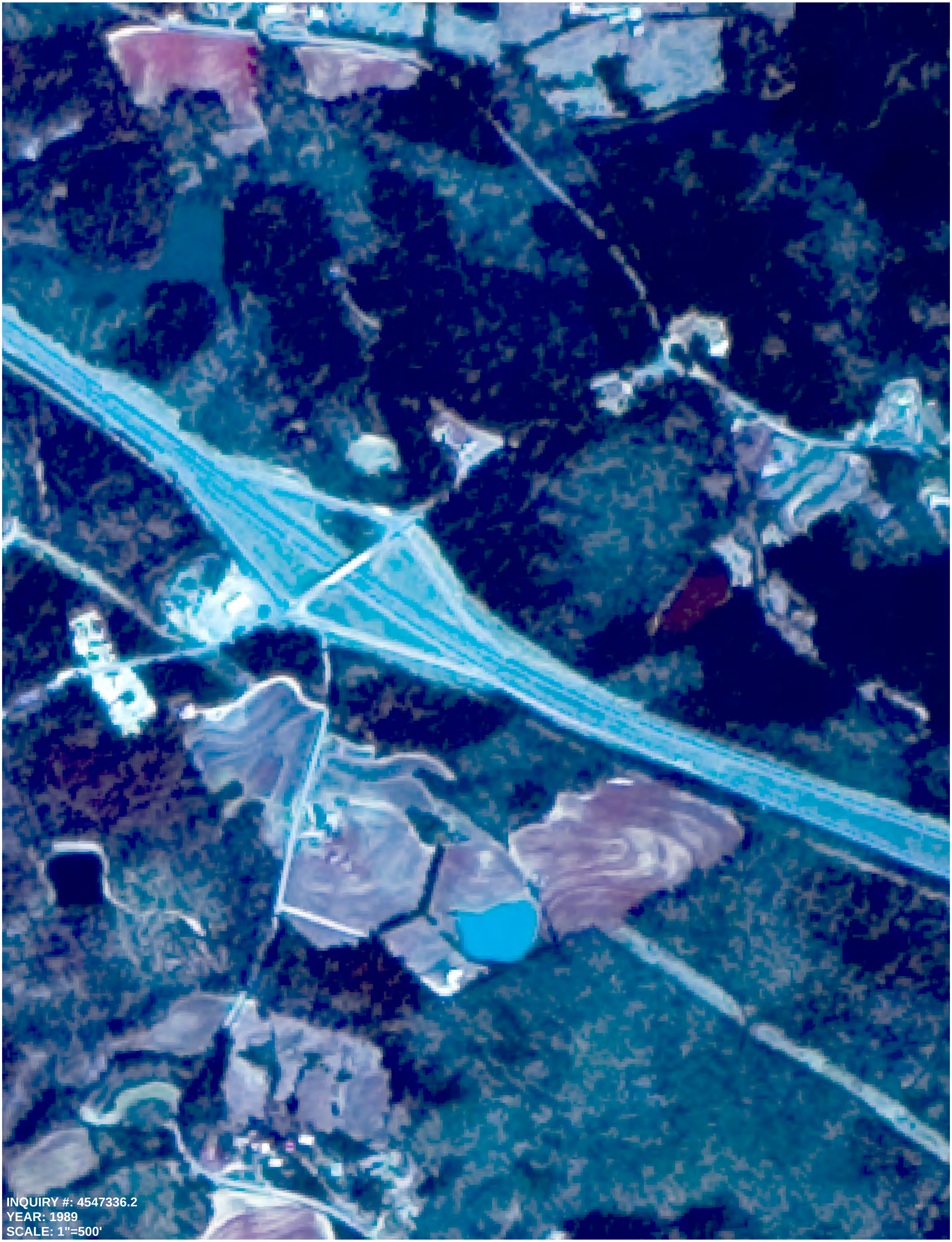
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YEAR: 1989
SCALE: 1"=500'


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YEAR: 1994
SCALE: 1"=500'


INQUIRY #: 4547336.2
YEAR: 1994
SCALE: 1"=500'


INQUIRY #: 4547336.2
YEAR: 1994
SCALE: 1"=500'


INQUIRY #: 4547336.2
YEAR: 1994
SCALE: 1"=500'


INQUIRY #: 4547336.2
YEAR: 1999
SCALE: 1"=500'

INQUIRY #: 4547336.2
YEAR: 1999
SCALE: 1"=500'


INQUIRY #: 4547336.2
YEAR: 1999
SCALE: 1"=500'


INQUIRY #: 4547336.2
YEAR: 1999
SCALE: 1"=500'


INQUIRY #: 4547336.2
YEAR: 2006
SCALE: 1"=500'


INQUIRY #: 4547336.2
YEAR: 2006
SCALE: 1"=500'


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YEAR: 2006
SCALE: 1"=500'


INQUIRY #: 4547336.2
YEAR: 2006
SCALE: 1"=500'


INQUIRY #: 4547336.2
YEAR: 2009
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YEAR: 2009
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YEAR: 2009
SCALE: 1"=500'


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YEAR: 2009
SCALE: 1"=500'


INQUIRY #: 4547336.2
YEAR: 2011
SCALE: 1"=500'


INQUIRY #: 4547336.2
YEAR: 2011
SCALE: 1"=500'


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YEAR: 2011
SCALE: 1"=500'


INQUIRY #: 4547336.2
YEAR: 2011
SCALE: 1"=500'


INQUIRY #: 4547336.2
YEAR: 2013
SCALE: 1"=500'


INQUIRY #: 4547336.2
YEAR: 2013
SCALE: 1"=500'


INQUIRY #: 4547336.2
YEAR: 2013
SCALE: 1"=500'


INQUIRY #: 4547336.2
YEAR: 2013
SCALE: 1"=500'

Appendix D. Contract and Purchase Order between Mead & Hunt and County of Lexington

COUNTY OF LEXINGTON

Procurement Services
212 South Lake Drive, Suite 503, 5th Floor
Lexington, South Carolina 29072-3493

Phone (803) 785-8319
Fax (803) 785-2240

April 28, 2014

Mead & Hunt, Inc.
Attn: Berry Still
307 W. Main Street
Lexington, South Carolina 29072

Re: CONTRACT
RFQ #: PQ13003-04/29/13S
S-48 (COLUMBIA AVENUE) CORRIDOR IMPROVEMENTS

Dear Mr. Still,

Enclosed is a signed original contract for the above referenced contract. Upon review and approval, please have a copy of the contract signed on behalf of your company and return one fully executed copy of the contract along with certificate of insurance to my office.

For all billing inquiries, your Accounts Payable contact will be Kelli Shelton at (803) 785-8165. Please be sure to note this contact information with your company's Accounts Payable department.

We look forward to working with you on this project. Please let me know if you should you have any questions or concerns regarding this contract.

Sincerely,

Angela M. Seymour
Procurement Officer

STATE OF SOUTH CAROLINA)
COUNTY OF LEXINGTON)

CONTRACT FOR S-48 (COLUMBIA AVENUE) CORRIDOR IMPROVEMENTS

THIS AGREEMENT is entered into by and between the **County of Lexington, 212 South Lake Drive, Suite 503, Lexington, South Carolina 29072** (hereinafter referred as "County"), and **Mead & Hunt, Inc., 307 W. Main Street, Lexington, South Carolina, 29072** (hereinafter referred to as "Company").

NOW THEREFORE, for and in consideration of the mutual covenants and conditions set forth herein, the parties hereto agree as follows:

1. **Scope of Contract.** Company shall provide all of the work and services required **PQ13003-04/29/13S**, which is incorporated herein and made a part hereof, for the **S-48 (Columbia Avenue) Corridor Improvements**.

2. **Term of Contract.** This project was approved by Lexington County Council on July 23, 2013. The contract will commence with latest signature and date below. Project start will occur upon Engineer's receipt of an executed Notice to Proceed or Purchase Order.

3. **Compensation.** County agrees to pay Company according to the schedule of charges attached hereto and incorporated herein as Exhibit C and there shall be no deviation from these charges without a written change order as provided for herein. The charges shall include all tariffs, taxes, fees and other assessments imposed from time to time by any federal, state, or local governments.

4. **General Statement of Engineer's Assignment.** For the heretofore described project, Engineer will provide engineering services as described in **Attachment "A", Scope of Services**, attached hereto and specifically made a part of this agreement. Engineer shall provide engineering consultant services as described in **Attachment "B" Schedule for Lexington County Project XXXXX, Columbia Avenue Road Project (S-48).**

5 **Payment Terms.** Payment will be made within thirty (30) days after acceptance of completed order/project.

6. **Insurance.** Company shall provide insurance as set forth in the RFQ.

7. **Modification / Change Orders.** Any change orders, alternations, amendments or other modifications hereunder shall not be effective unless reduced to writing, signed by the County and Company, and executed with the same formality as this contract.

8. **Termination.** This contract may be terminated pursuant to the RFQ.

9. **Warranty.** Company's services are warranted to be performed in a timely and workmanlike manner and such services shall meet in addition to the response to the RFQ.

10. **Indemnification.** Company shall provide indemnification as set forth in the RFQ.

11. **Breach / Waiver.** No term or provision hereof shall be deemed waived unless breach thereof is waived in writing and signed by the party claimed to have waived and consented. No consent by any party to, or waiver of, a breach by the other, whether expressed or implied, shall constitute a consent to, or waiver of, or excuse for, any difference or subsequent breach.

12. **Severability.** If any term or provision of this contract shall be found to be illegal or unenforceable, then, notwithstanding any such illegality or unenforceability, the remainder of said contact shall remain in full force and effect and such term or provision shall be deemed to be deleted and severable there from.

13. **Entire Agreement and Priority of Documents.** This document, together with all subordinate and other documents incorporated by reference herein, will constitute the entire agreement between the parties with respect to the subject matter contained herein and may only be modified by an amendment executed in writing by both parties. Company hereby agrees, except where this contract specifically indicates otherwise, all written RFQs, specifications, brochures and sales materials presented by Company to County leading to this contract, and all other Company representations, commitments, warranties prior to and in connection with this contract, shall be deemed to be, and are, incorporated by reference into and made a part of this contract. Except as otherwise expressly stated, in the event of a conflict in the interpretation of the contract, the order of priority in descending order is (I) this document, (ii) the RFQ, and then (iii) the Response.

IN WITNESS WHEREOF, the Company and the County have signed and executed this contract this 28th day of April, 2014.

WITNESSES:

Leila Affaoui

Angela M. Seymour
Procurement Officer

MEAD & HUNT, INC.

BY: ____________________

ITS: J. Berry Still

COUNTY OF LEXINGTON,
SOUTH CAROLINA

BY: ____________________
Jeffrey A. Hyde
Procurement Manager

ATTACHMENT "A"
SCOPE OF SERVICES FOR
Lexington County Project XXXX, Columbia Avenue Project (S-48)

Project Location

The project is located in the Town of Chapin, Lexington County, South Carolina. The project termini are from the intersection of Zion Church Road and Amicks Ferry Road to approximately 1,500' east of the I-26/Columbia Avenue interchange (Exit 91).

Project Description

Columbia Avenue Project (S-48) is currently a two-lane section that runs from US 76 at its intersection with Amicks Ferry Road (S-51) to the I-26 interchange. Proposed alternatives will be investigated to provide the corridor with capacity and operational improvements, as well as other traffic enhancements such as, reductions in travel time and vehicle queuing. Many alternatives will be investigated and may include such improvements as roadway widening, new alignment, and interchange/intersection reconfiguration.

INTRODUCTION

The work will include all work associated with development of the NEPA Document required to obtain a Finding of No Significant Impact (FONSI). The remaining portion of the contract will be completed through a contract modification.

TASK 1: PROJECT MANAGEMENT/ COORDINATION AND COMMUNITY RELATIONS SUPPORT
TASK 2: SURVEYING AND MAPPING
TASK 3: ENVIRONMENTAL DOCUMENTATION/PROCESS
TASK 4: ROADWAY DESIGN AND PLAN DEVELOPMENT
TASK 5: RAILROAD COORDINATION
TASK 6: TRAFFIC STUDY
TASK 7: INTERCHANGE MODIFICATION REPORT (IMR)
TASK 8: HYDROLOGY/HYDRAULIC DESIGN
TASK 9: VALUE ENGINEERING
TASK 10: UTILITY COORDINATION
TASK 11: SUBSURFACE UTILITIES ENGINEERING (SUE)
TASK 12: GEOTECHNICAL EXPLORATIONS
TASK 13: STRUCTURAL DESIGN AND PLAN DEVELOPMENT
TASK 14: CONTEXT SENSITIVE REVIEW AND OVERSIGHT
TASK 15: LANDSCAPING AND IRRIGATION DESIGN
TASK 16: LIGHTING DESIGN

These tasks are detailed in the following sections.

TASK 1: PROJECT MANAGEMENT/ COORDINATION AND COMMUNITY RELATIONS SUPPORT

Project goals and objectives will be determined through coordination between Mead & Hunt, Inc. (**CONSULTANT**), Lexington County (**COUNTY**) and the South Carolina Department of Transportation (**SCDOT**).

1.1 Project Management and Coordination

The CONSULTANT will manage the project to conform to the "SCDOT standards for Highway Construction in compliance with all Federal standards". The process will include the following duties:

1.1.1 Coordinate with the **COUNTY'S** Project Managers and **SCDOT'S** Program Managers. Arrange and attend project meetings, conferences and on-site review meetings. Prepare and distribute meeting minutes.

1.1.2 Manage and monitor the project schedule as set forth in the contract. Keep the **COUNTY/SCDOT** up to date on the schedule and items that may affect the overall project schedule.

1.1.3 Prepare monthly invoices for **COUNTY** review, approval and payment. Review subconsultant invoices and cost submittals included for payment in monthly invoices. Monitor payments to subconsultants for services provided.

1.1.4 Provide monthly status reports detailing the progress of the project to include milestones reached and issues encountered and satisfactorily resolved during the previous month.

1.1.5 Provide overall management of all design efforts including the management of the **CONSULTANT'S** subconsultants and team members. Monitor subconsultant activities for adherence to overall project schedule and budget.

1.1.6 Coordinate activities and design with other involved Agencies. Implement quality assurance and quality control measures to produce plans that conform to the **COUNTY**, **SCDOT** and Federal Highway Administration **(FHWA)** guidelines and standards.

Assumptions:

1) *Management time for the project is assumed to be 12 months.*
2) *6 project meetings in Lexington.*
3) *6 meetings with **COUNTY/SCDOT**.*
4) *5 miscellaneous meetings.*

Deliverables:

1) *Monthly status reports will be provided.*
2) *Meeting minutes for each meeting.*

TASK 2: SURVEYING AND MAPPING

Surveying and mapping will be provided for the project in accordance with the **SCDOT** Survey Manual, latest edition. Surveying services are as follows:

2.1 Aerial Mapping and Photography – Colored aerial photography including Light Detection and Ranging (LIDAR) will be performed for the survey corridor. The **CONSULTANT** will provide base mapping and color aerial photography following **SCDOT** standards for accuracy.

2.1.1 The **CONSULTANT** will merge field survey data acquired into the final DTM and TIN files.

2.1.2 Specifications & Instructions - **CONSULTANT** shall coordinate between the field and aerial in order to avoid duplication of tasks.

2.1.3 Select-Identify-Control-Layout - Using our Track Air flight planning tools, **CONSULTANT** shall design flight plans suitable for 1"=50' scale mapping. Ground control panels shall be designed to cover the entire mapping area keeping in mind the safety and access of the field crews. LIDAR (Light Detection and Ranging) flight plans shall be designed to maximize point density, penetrate foliage and cover the entire mapping area.

2.1.4 Planimetric Compilation - Using the aerial photography and 3D softcopy mapping stations, **CONSULTANT** shall compile all planimetric features to **SCDOT** standards throughout the mapping corridor at 1"=50' scale- These features include all structures, roadways, utilities, hydro, signage, etc..

2.1.5 DTM Compilation & Verification - Using the aerial photography and 3D softcopy mapping stations, **CONSULTANT** shall compile 3D breaklines at tops, saddles, bottoms and depressions to define the terrain. **CONSULTANT** shall incorporate the bare earth class from the LIDAR and QC in 3D.

2.1.6 File Merging - **CONSULTANT** shall merge all field data with the aerial data. This task involves careful analysis of datasets, studying elevations of features, horizontal components and layer structure.

2.1.7 Aerial Triangulation - Using Trimble Inpho Match-AT software, **CONSULTANT** shall precisely measure in 3D all of the ground control panels, establish tie and pass points between the models. A bundle adjustment of the entire photo block shall be produced to meet or exceed **SCDOT** standards for horizontal and vertical accuracies.

2.1.8 Preliminary Edit - **CONSULTANT** shall edit all planimetric and Digital Terrain modeling features to **SCDOT** Microstation V8i levels; run Geopak and produce a crossing report, and shall generate a TIN for the entire mapping corridor and check for completeness and accuracy.

2.1.9 Final Edit - After identifying any discrepancies in the preliminary edit task, **CONSULTANT** shall add any features and or field data to the main deliverable 3D file and rerun Geopak and the TIN.

2.1.10 Image Rectification - Using the Exterior Orientations from the aerial triangulation and the DTM from the LIDAR, **CONSULTANT** shall perform a rigorous ortho rectification of all the imagery covering the entire boundary. The orthophotos shall have a constant scale and all 3D objects shall be presented in their true locations without disturbing relief displacements. A tiling scheme shall be created and all othos shall be cut at 0.25' pixel in Tiff format with a TFW header file. All ortho tiles shall be seamless and color adjusted.

2.1.11 LIDAR Classification- Using our Trimble Applications Master LIDAR processing and calibration software, **CONSULTANT** shall calibrate all LIDAR flights to each other and to the ground control panels. **CONSULTANT** shall produce a statistics report showing delta X, Y & Z residuals and laser hits vs. ground control check panels. **CONSULTANT** shall classify all LIDAR data and separate the bare earth class. **CONSULTANT** shall produce a 5' grid from the bare earth class and using it in the mapping.

2.2 **Field Surveys –** Field surveys will be used to supplement the aerial photography and mapping along the selected route and for specific features. The complete ground survey will begin once the preferred alternative has been identified, or at the discretion of **SCDOT/COUNTY.** The ground survey will consist of the following:

2.2.1 **CONSULTANT** shall establish a Survey Control Network (SCN) tied to the South Carolina South Plane Coordinate System (NAD83/2007, NAVD88). Sufficient planning in the establishment of the SCN will be required to provide for future use of and/or the accurate re-establishment of the SCN.

2.2.2 Primary Survey Control (PSC) will consist of at least 18" long #5 Rebar with a 2" aluminum cap stamped with a PSC identification number and the Project Control Number (PCN). PSC will be set in pairs beyond the beginning and end of main survey alignment and in pairs at least every mile along long survey alignments.

2.2.3 Main Survey Control (MSC) will consist of sufficient material to last a reasonable amount of time (bridge spikes, rebar, etc) and distributed evenly throughout the project. An effort will be made to position MSC in safe, recoverable, and convenient locations.

2.2.4 **CONSULTANT** will set and establish horizontal location and elevation for approximately 12 temporary benchmarks outside the construction limits using differential leveling that will be located along the project corridor. These TBM's will be clearly marked in the field and plotted on the maps. Benchmarks shall have a third (3rd) order closure accuracy of 0.04 x the square root in miles and will be based on NAVD 88 vertical datum. The elevations will be tied to a minimum of one USGS control monument. Further ties will be made to all USGS monuments in the vicinity of the project corridor.

2.2.5 **CONSULTANT** will conduct courthouse research of approximately 100 parcels to obtain deeds and/or plats of record from the County Register of Deeds in order to plot the property. **CONSULTANT** will obtain **SCDOT** record plans for the most current dockets and other R/W information to assist in the establishment of the right of way and plot existing properties.

2.2.6 **CONSULTANT** will recon and survey sufficient property corners within the project limits to facilitate the plotting of the subject properties from deed or plat information of record. This is considered partial property corner ties and does not constitute full boundary surveys.

2.2.7 **CONSULTANT** will compute a best-fit alignment, based on field survey monumentation, the existing centerline and **SCDOT** record plans, will be computed to assist establishment of existing R/W according to **SCDOT** record plans. The geometry of these roads as shown on the **SCDOT** plans will be held as close as possible if the existing centerline permits.

2.2.8 **CONSULTANT** will obtain pavement elevations along the existing centerlines and edges of pavement at 50’ intervals along curves and 100’ intervals along tangent sections throughout the project limits. Pavement elevations, curb & gutter elevations, pavement crown and other pertinent elevations will be obtained for digital terrain modeling.

2.2.9 **CONSULTANT** will supplement the aerial mapping with topographic surveys as needed for obscured areas of the project corridor in order to produce a detailed DTM to be used for design. It is assumed that 25% of the project area will be obscured from mapping.

2.2.10 **CONSULTANT** will field survey the horizontal location and establish rim, invert, pipe size and pipe type for all storm and sanitary sewer structures within the project limits.

2.2.11 **CONSULTANT** shall provide survey location of the above and below ground utilities such as telephone pedestals, water valves, water meters, gas valves, fire hydrants, fiber optic poles, etc. as marked in the field by the **SUE CONSULTANT**.

2.2.12 **CONSULTANT** will horizontally and vertically locate all potential outfall drainage ditches and streams. At all outfalls obtain cross-sections 300 feet upstream and 600 feet downstream at 100 feet intervals from the mainline centerline. All cross-sections shall include top, toe and centerline and extend from bank to bank of the existing channel plus ten feet on either side.

2.2.13 **CONSULTANT** will field survey wetland boundaries within the project limits and prepare a wetlands map for submittal purposes.

2.2.14 **CONSULTANT** will survey the location of the existing CSXT rail within the project corridor as specified in SCDOT survey manual. **CONSULTANT** will obtain all necessary permits and access permissions prior to survey.

2.2.15 **CONSULTANT** will maintain appropriate signage for traffic control purposes at all times when working within or near the existing traffic areas. **CONSULTANT** will obtain approval from the **COUNTY** and **DEPARTMENT** prior to any necessary lane closures.

2.2.16 Identification and marking of any upland/wetland boundaries with sequentially numbered flags. Additionally, using sub-meter GPS or survey data, the **CONSULTANT** will plot the wetland boundaries on both a surveyed map (in a manner consistent with **SCDOT** Road Design custom line style for wetlands and other waters of the U.S.), and a Digital Ortho Quad or other acceptable aerial photography. The **CONSULTANT** shall also provide electronic copies of any GIS CAD files that are produced.

2.2.17 At the completion of geotechnical field work, **CONSULTANT** will survey all test locations for latitude and longitude, elevation and station.

Assumptions:

1) *Field surveys for property closures will not be performed.*
2) *Obscured areas will only be surveyed upon receipt of defined survey boundaries, which have been approved.*
3) *Any obscured survey work outside the stated scope and fee will be subject to a contract modification.*
4) *For existing roads, the survey will be tied to the existing plan stationing.*
5) *It is assumed that 25% of the project area will be obscured from mapping, this assumption is based off the widening of existing S-48.*
6) *Wetland and other waters of the U.S. boundaries will be surveyed utilizing a sub-meter GPS.*
7) *CONSULTANT will not begin ground surveys until County/SCDOT have approved conceptual alternative corridor. It is anticipated that this will be completed within 45 days from NTP.*

Deliverables

1) *A survey report detailing methods, ID's and coordinates shall be supplied to the **COUNTY** and **DEPARTMENT** in paper format and on CD.*
2) *Copy of the digital color aerial photography.*
3) *Signed and sealed report by a South Carolina Professional Photogrammetric Surveyor (PPS).*
4) *Existing Property Deeds.*
5) *Existing Plats.*
6) *Wetlands Map on CD*
7) *All Survey files on CD: Provide all planimetric and topographic files including property file, DTM and .TIN files, and other files as necessary in Microstation format.*

TASK 3: ENVIRONMENTAL DOCUMENTATION/PROCESS

National Environmental Policy Act (NEPA) Compliance

In the development of the subject project, the **CONSULTANT** shall be responsible for NEPA compliance in accordance with 23 CFR Parts 771 and 772, as well as any related, current/latest guidance promulgated by Federal Highway Administration (**FHWA**), as of the date of executed contract.

Within two weeks of the date the **COUNTY** executes the contract for the subject project(s), and prior to commencement of design and/or NEPA compliance, the **CONSULTANT** shall make a determination of the environmental and/or navigational permits expected to be required for the subject project on a permit determination form which includes environmental and navigational permitting-related information necessary for the **COUNTY** to complete the Notice of Intent (NOI) for NPDES (stormwater) General Permit SCR100000, and provide the completed form to the Environmental Section of **SCDOT**, as well as the appropriate DEA (see Attachment B "SCHEDULE" for details), with a courtesy copy to the **SCDOT** project engineer, the **SCDOT** Hydraulic Design Engineer, and the **SCDOT** Director of Construction. The NOI will be signed by the **CONSULTANT** as SWPPP Preparer and the **COUNTY** as Project Owner.

3.1 **COUNTY** and **SCDOT**, in coordination with **CONSULTANT** and **FHWA**, will determine appropriate level of documentation for the project. The **CONSULTANT** shall use the applicable template / example provided by **SCDOT**. The **COUNTY** will be afforded the opportunity to review and approve any correspondence, contact or communication with the **FHWA**, State and Federal agencies, and regulatory agencies in advance. The **CONSULTANT** shall schedule an onsite meeting with the USACOE, SCDHEC, SCDNR, and USFW to review the proposed project, discuss any particular regulatory concerns, and establish a timetable for acquisition of the permit. The **CONSULTANT** shall make determination of the aquatic significance of the stream(s), and confirm these findings with resource and regulatory agency personnel.

3.1.1 If an Environmental Assessment is required, the **CONSULTANT** shall prepare a Letter of Intent (LOI) in the style/format of an example LOI, disseminate the LOI to the appropriate persons/entities, as outlined in 23 CFR Part 771, together with additional persons/entities as directed by **COUNTY**, and provide copies of the correspondence to **COUNTY**.

3.1.2 For all environmental documentation, **CONSULTANT** shall address the following:

3.1.2.1 Purpose and Need - **CONSULTANT** will outline background that led to initiation of proposed action. A description of the need for the action, along with specific components (i.e. goals, objectives, benefits to be gained by the public, etc.) will be included.

3.1.2.2 Existing Facility - **CONSULTANT** will prepare description of existing roadway characteristics, safety conditions, Level of Service (LOS), etc.

3.1.2.3 Proposed Facility - **CONSULTANT** will prepare description of the proposed roadway facility/improvements, anticipated LOS, etc.

3.1.2.4 Alternatives – The **CONSULTANT** will perform a conceptual review of potential alternatives which will be conducted within the first 45 days of the NTP. Purpose of this conceptual review is to identify up to 5 reasonable alternatives for further review within the NEPA Document. The conceptual review will document alternatives that were considered but eliminated for further consideration based on a uniform evaluation criteria. Upon concurrence by **SCDOT/COUNTY** of the up to 5 reasonable alternatives, the **CONSULTANT** will complete a rigorous alternatives analysis, including a discussion of all alternatives considered and a detailed discussion of reasonable alternatives considered and basis of elimination. Throughout the project development process, from preliminary design through the development of right-of-way identification, the **CONSULTANT** shall maintain a record of any decisions regarding alternatives, and the **CONSULTANT** shall provide such records to **COUNTY** and **SCDOT'S** Program Manager and the Environmental Section at the time that the environmental document is submitted for their review and approval. For Environmental Assessments, an alternatives matrix shall be prepared. If applicable, the **CONSULTANT** shall include a rigorous alternatives analysis regarding the anticipated impacts to natural systems, including documentation of efforts to minimize or avoid impacts to waters of the U.S., as well as a color graphic(s) indicating the anticipated impacts to waters of the U.S. in relation to the surrounding special aquatic sites including wetlands, drainage systems/features and open waters (e.g., a digital ortho-quad, with an NWI map, and county soil survey maps, and the delineated waters of the U.S. superimposed) and Section 404 (Clean Water Act) drawings as an appendix.

3.1.2.5 Impact Assessment Form - The **CONSULTANT** shall also include a completed SCDOT Impact Assessment Form as an appendix to the Environmental Document. The **CONSULTANT** shall fill out the entire SCDOT Impact Assessment Form when preparing any NEPA document. **SCDOT** Environmental Section will review each completed Impact Assessment Form to ensure that the form is completed to **SCDOT'S** satisfaction.

3.1.2.6 Natural Resources / Endangered Species Survey - **CONSULTANT** will perform a natural resources investigation, which will describe the project area, including vegetation, wildlife, wetlands/waters of the U.S., water quality, protected species habitat evaluation, soils, topography and anticipated impacts to each resource. The results of the investigation will be documented in a Natural Resource Technical Memorandum. Three hard copies of the technical memo will be provided to **COUNTY**. If an informal consultation with the U.S. Fish and Wildlife Service (USFWS) is required, then the **CONSULTANT** shall also be responsible for performing this part of the project development process on behalf of **COUNTY**. Any concessions in either the scope of work or construction activities, or mitigation measures will require prior **COUNTY** approval. Also any correspondence or communication with USFWS must receive prior approval by the **COUNTY/SCDOT**. If **COUNTY/SCDOT** chooses to allow the **CONSULTANT** to correspond directly with the USFWS, then the **CONSULTANT** shall communicate/correspond with **SCDOT** and the **COUNTY** shall be copied on all communications.

3.1.2.7 Wetlands / Water Quality - **CONSULTANT** shall quantify the anticipated impacts to waters of the U.S., and provide a qualitative discussion regarding the types of streams, wetlands, and other waters of the U.S. being impacted in the context of the adjacent and surrounding waters of the U.S. (In this section of the document, the **CONSULTANT** shall utilize / reference the natural systems graphics specified in item 3.1.2.6-above and reference the Impact Assessment Form specified in item 3.1.2.5-above). The **CONSULTANT** shall also include a discussion regarding the overall effects of the planned improvements to water quality.

3.1.2.8 Farmlands – **CONSULTANT** will include a discussion of farmland impacts, including a determination of the presence of prime or unique farmlands or farmlands with statewide importance. Coordination with the NRCS, including completion of Form AD-1006, and review of the alternatives pursuant to the Farmland Act will be completed.

3.1.2.9 Hazardous Waste and Underground Storage Tanks – In assessing the environmental liabilities associated with the proposed new right of way, the **CONSULTANT** shall complete the appropriate / applicable elements of a Phase I Environmental Site Assessment (ASTM 1527).

3.1.2.10 Cultural Resources (Historical, Archaeological) – Investigations shall be conducted as required. Cultural resource reports will comply with state and federal requirements. However, with findings of up to five non-significant sites, a form report format (provided by **SCDOT**) will be utilized. All SHPO coordination shall occur through **SCDOT**.

3.1.2.11 Displacements **–** **CONSULTANT** will perform a relocation study to identify all potential business and residential relocations that will occur as a result of the project.

3.1.2.12 Air Quality – New air quality (attainment or non-attainment) zones may be announced during the development of this project. In anticipation of the project location being designated as a non-attainment zone, the **CONSULTANT** shall perform a conformity analysis regarding the overall effects of the project on air quality, and indicate the Attainment or Non-Attainment status of the county if the roadway is to be improved or constructed.

3.1.2.13 Reasonable Availability of Funding - In accordance with the supplemental guidance provided by FHWA on February 9, 2011, the environmental document will include an explanation of how the project is consistent with the Long Range Statewide Transportation Plan or the Transportation Improvement Program. The environmental document will also include how the project would be funded through completion and reference The Statewide Transportation Improvement Program. The **CONSULTANT** will refer to the document entitled *Supplement to January 28, 2008 "Transportation Planning Requirements and Their Relationship to NEPA Process Completion"* for further guidance.

3.2 **CONSULTANT** will also address the following topics, as required, based on project information/ conditions

3.2.1 Floodplains – Based on the results of a hydraulic design study performed according to **SCDOT** Guidelines for Hydraulic Design Studies the following statements shall be included in the environmental document where applicable: Regarding FEMA designated floodways, the **CONSULTANT** shall include either a 'no effect' statement or a 'conditional letter of map revision;' otherwise the **CONSULTANT** shall include a statement that "based on the hydraulic analysis of the pre-construction and post-construction discharges, the planned roadway improvements will have no significant impact on either flood elevations or flood widths."

3.2.2 Noise – For projects involving additional capacity, or shifting alignment closer to receivers (Type II projects as defined in 23 CFR Part 772), the **CONSULTANT** shall perform a Traffic Noise Analysis and Abatement Study according to 23 CFR Part 772 and *SCDOT Traffic Noise Abatement Policy* (March 2011) utilizing the latest software specified by the **FHWA** (e.g., TNM 2.5), which will include identification of sensitive receivers in the project corridor, existing noise levels, existing ambient noise levels and predicted noise levels (20 years). Text and tables presenting results of the noise impact and abatement analysis will be prepared for use in the environmental document. A separate Noise Technical Memorandum may be required; however, the **CONSULTANT** shall provide to **SCDOT/COUNTY** at a minimum, the traffic data used in the study (e.g., ADT, DHV, percentage of heavy, medium trucks, and autos, etc.), the assumptions incorporated into the noise model (e.g. resolving the traffic into a 50/50 or 60/40 split, with the traffic being placed on the center of the travel lanes or the pair of travel lanes in each direction and the exact locations of the receivers) the software utilized, and either the linear curves representing the noise levels vs. distance from the noise source plotted on semi-logarithmic paper, or, preferably, the 66 dBA contours for existing, future No-Build and future Build conditions plotted on the right-of way plans for the proposed roadway improvements. A noise barrier analysis utilizing the same software should also be included, if applicable according the criteria set for the in the SCDOT Noise Abatement Policy. Minimum barrier dimensions to achieve the abatement specified in the SCDOT Noise Abatement Policy shall be provided by the **CONSULTANT**.

3.2.3 Parks and Recreational Areas **–** **CONSULTANT** shall identify these areas within the project area and the impacts of the project on the resource(s).

3.2.4 Section 4(f) / 6(f) **- CONSULTANT** shall identify properties within the project corridor that are protected under Section 4(f) or Section 6(f) and the impacts of the project on the resource(s).

3.2.5 Social and Economic - **CONSULTANT** shall develop a description of the existing demographic, social, and land use conditions.

3.2.6 Environmental Justice **- CONSULTANT** shall identify any low-income and/or minority areas within the general project area, using US census data and determine if there are potentially disproportionately high and adverse effects on these population as a result of the project.

3.2.7 Coordination **- CONSULTANT** shall outline any interagency and/or public involvement activities that occur during the project development process.

3.2.8 Indirect and Cumulative Impacts - The **CONSULTANT** shall use the 8-step process provided by guidance from NCHRP and CEQ for evaluating potential indirect and cumulated impacts. The **CONSULTANT** shall consult with **SCDOT** regarding the particular scope of work involved in completing this section.

3.3 Public Involvement - As required by **FHWA** and **SCDOT**, on a project specific basis, the **CONSULTANT** shall be responsible for coordinating the public involvement associated with NEPA. The **CONSULTANT** shall be responsible for conducting scoping meeting, public information meetings and/or public hearings.

3.3.1 **CONSULTANT** shall coordinate the date and location of the meetings with **COUNTY/SCDOT** personnel and will prepare the newspaper ad for the Public Notice.

3.3.2 **CONSULTANT** shall prepare any and all related public hearing / meeting materials, (deliverables would include public-information-meeting/public-hearing displays, public-hearing booklets and public-information brochures). The information contained in the public hearing booklet will be consistent with the information contained within the environmental document, and the format of the public hearing booklet specified by **SCDOT**.

3.3.3 **CONSULTANT** shall prepare responses to each comment received as a result of a public hearing and/or the public availability of the environmental document for the **COUNTY** to review and distribute. The **CONSULTANT** will allow a period of two (2) weeks after the public hearing to which they will continue to prepare responses to each comment received. After this period the **CONSULTANT** will continue to accept comments but will not be required to respond.

3.3.4 The **CONSULTANT** shall also prepare a public hearing certification according to 23 CFR Part 771 using the format specified by **SCDOT**.

3.3.5 The **CONSULTANT** will perform media briefings and relations. Meetings and briefings with the media will be conducted to coincide with major project milestones and/or public meetings. A necessary method of informing the public is through the electronic and print news media. A controlled flow of information aids in ensuring the accuracy of information being disseminated by the media.

3.3.6 Contacting Property Owners: Consultant will contact property owners by letter (the letter will be submitted for **COUNTY** approval prior to mailing) within the proposed survey area via certified U.S. mail. The letter will contain the name and contact information of the project manager, or person appointed by the **COUNTY**, which will allow residence to open lines of communication with members of the project team.

3.3.7 **CONSULTANT** will prepare nine (9) newsletters, 8.5x11 size, in color. The newsletters will be completed on a quarterly basis and will also be available to be distributed electronically via e-mail.

3.4 If an Environmental Assessment is required, the **CONSULTANT** shall additionally provide a FONSI recommendation letter in the format specified by **SCDOT**.

3.5 Environmental Permitting

3.5.1 **Jurisdictional Determination**

If a Clean Water Act Section 404 permit is applicable, the **CONSULTANT** shall obtain a jurisdictional determination and/or approximation letter for the project site, and deliver it to **SCDOT**.

3.5.1.1 The **CONSULTANT'S** shall perform Jurisdictional Delineations utilizing the three-parameter approach (hydric soils, hydrophytic vegetation and wetland hydrology) set forth in the 1987 USACOE <u>Wetland Delineation Manual</u> and the applicable supplemental specification.

3.5.1.2 The **CONSULTANT** shall provide an assessment and documentation of site conditions as to the presence and/or absence of wetland areas. The **CONSULTANT** shall submit a copy of a completed Jurisdictional Determination Request form as well as completed ACOE Delineation Worksheets to the **COUNTY** and the **SCDOT** Environmental Office.

3.5.1.3 Following the delineation of the upland/wetland boundaries, **SCDOT** shall submit a request to the Charleston District Army Corps of Engineers for either an approximation letter or a Jurisdictional Determination, and copy (cc) **COUNTY** and the **CONSULTANT** with the request.

3.6 Visualization

The **CONSULTANT** will prepare a visualization assessing the Preferred Build Alternative. The VIA will evaluate potential visual impacts of the project within the surrounding landscape, including any significant visual resources that may be present.

3.6.1 Animation

The **CONSULTANT** will prepare a visualization by creating a 3D animated virtual tour of the preferred alternative and an additional alternative at the interchange of S-48/Columbia Ave and I-26. The VIA will evaluate potential visual impacts of the project within the surrounding landscape, including any significant visual resources that may be present.

The virtual tour will be in the form of an HD video, capable of playback on a PC, web site or DVD. The video will be a self-contained description of the widening alternatives, issues with the existing geometry, solutions the proposed alternative will provide and the visual and aesthetic impact on the community. In addition to the video, **CONSULTANT** will also create print versions of scenes from the virtual tour. These printed materials will be large scale display boards and close-up views from adjacent properties, driver's views and special "helicopter-perspective" views. These materials can be used for PowerPoint presentations, web sites, handouts, and press release materials.

3.6.1.1 Video: **CONSULTANT** will create a 3 to 5 minute video that will take the viewer on a virtual tour of the project area. Working with the **COUNTY**, the **CONSULTANT** will create a script that describes the project purpose, needs, and a description of the new improvements. A professional narrator will be used to voice the script. The video will consist of a 3D animated fly over of the project area showing the preferred alternative only. At the intersection with I-26 a 360 degree spin around from a helicopter perspective will be created for the preferred alternative and one additional alternative. In addition to the project flyover, there will be various simulations that show the view point of a driver in certain sections and/or the viewpoint of a pedestrian from local surface streets.

The 3D animation sequence will have two levels of detail; when the camera is at a high level over top the project, the detail will be adequate for easy delineation of the roadway striping, bridges, retaining walls, sign structures, lighting structures, cut and fill slopes and right-of-way impacts. In places where the camera is closer to the ground the model will receive a higher level of detail and contain such items such as, landscape, retaining wall material, sidewalks, pedestrian crosswalks and other details.

3.6.1.2 **Close-up Views: CONSULTANT** will create up to 5 close-up view locations that show the project from a pedestrian, driver or business/resident view point. The location and direction will be determined by the **COUNTY**. These will be created by first taking a photograph from each of the viewpoints in the existing conditions and then overlaying the 3D model onto the photo and creating a realistic view of the proposed condition.

All photographs shall be taken by the **COUNTY** or his representative. Prior to the field photo survey. Photographer should coordinate with visualization staff for information and techniques to obtain the highest quality images, camera settings, photo directions and times.

3.6.1.3 Project Display Board: Once the 3D model of the alternatives has been drafted, the entire project area can be rendered at a very high resolution to be printed on a display board approximately 60” x 36” in size. In addition to the project area being shown in 3D, numerous close-up views can be included on the same board. These will be titled with a number that corresponds to a location arrow on the roadway that will show the location and angle of the close-up image. This same board can be easily shown on a web site as well as the video and individual close-ups.

The display board and close-up views will be supplied as electronic images only. It will be the responsibility of the **COUNTY** to generate printed versions.

Description of the 3D model efforts:
The following is a list of the various components that **CONSULTANT** intends to draft into the model:

1. Create a 3D surface of the project area and use a high resolution color aerial photo to drape over the surface terrain
2. All trees and large landscaping features will be shown
3. The 3D roadway system will be drafted
4. All surface street connections will be drafted in 3D, the other streets that receive no changes will be shown using the aerial photo
5. All pavement striping and markings will be shown
6. Proposed street lighting and major overhead directional signage will be shown
7. Signalization will be shown at all adjacent intersections

8. All bridges will be shown and drafted with enough detail to describe the shape and size of the structure and columns
9. Crash barriers, noise walls and guard rails will be drafted
10. Traffic will be added, the traffic is not meant to be valid volumes, just an aid to help make the project easy to understand. There will not be detailed signal movements at the intersections, just a continuous green light in one direction with cued cars in the other.

Description of the Video production efforts:
The following is a list of the work efforts **CONSULTANT** will provide for the video

1. Record professional narration
2. Generate maps, titles and supporting graphics and close-up views.
3. Provide 50% draft for review via weblink
4. Provide 95% draft for review via weblink
5. Author and encode final master for HD, web and DVD.

Assumptions:

1) *An Environmental Assessment (EA) is the anticipated environmental document to be prepared for the project.*
2) *Three (3) public meetings will be scheduled (includes one scoping meeting, one Public Information Meeting, and one Public Hearing).*
3) *Five (5) alternatives will be evaluated within the EA including No Build.*
4) *Cultural resource investigations will consist of a reconnaissance survey and does not include a Phase II intensive survey or data recovery. Only includes findings of up to five (5) non-significant sites.*
5) *Only a Phase I HAZMAT Assessment will be performed.*
6) *No formal Section 7 Consultation with USF&WS is anticipated.*
7) *The **CONSULTANT** will prepare public information meeting/hearing handouts and displays.*
8) *Lexington County and SCDOT logos will be used on information distributed to the public. The material will be approved by **SCDOT/COUNTY** prior to public distribution.*
9) *Responses will be drafted to reply to public hearing comments only.*
10) *One iteration of reviews, comments, and revisions are assumed by each the **COUNTY/SCDOT/FHWA** and the **CONSULTANT.***
11) *A court reporter will be provided by the **CONSULTANT** for the public hearings.*
12) *Anticipate NCRS coordination but no significant impacts to farmlands.*
13) *The **COUNTY** will provide all relative GIS information to the **CONSULTANT** for the visual impact assessment.*
14) *A Mussel Survey will not be required.*
15) *The Noise Analysis will only be performed on the preferred alternative, once selected.*

Deliverables:

1) *Three (3) copies of the HAZMAT Report will be provided to the **COUNTY/SCDOT**.*
2) *Five (5) copies of the draft EA will be submitted for review and comments by the **COUNTY/SCDOT**.*
3) *Ten (10) copies of the final EA will be provided to the **COUNTY/SCDOT**.*
4) *Two hundred fifty (250) handouts will be provided at each public information meeting.*
5) *One (1) copy of the public hearing certification package will be provided to each the **COUNTY** and **SCDOT**.*
6) *Two (2) sets of displays will be provided for each meeting. Up to one hundred (100) responses will be drafted.*
7) *Three (3) copies of the Natural Resources Technical Memorandum will be provided to the **COUNTY/SCDOT**.*
8) *One (1) copy and one (1) electronic copy of a technical memorandum which will document the field reconnaissance methods, site characteristics, and informal consultation.*
9) *One (1) copy and one (1) electronic copy of a Biological Assessment Report that will document potentially occurring TES and results of the field reconnaissance.*
10) *Approved Jurisdictional Determination Request Form, USACE Delineation Worksheets, and supporting documentation will be provided to the **COUNY/SCDOT**.*
11) *Three (3) hard copies and one (1) electronic copy of Noise Analysis will be provided to **COUNTY/SCDOT**.*
12) *One (1) copy and one (1) electronic copy of the Traffic Noise Analysis and Abatement Report.*
13) *One (1) HD video, capable of playback on a PC, website, or DVD.*
14) *Five (5) close up view images (electronic versions only).*
15) *One (1) display board (electronic version only).*
16) *One (1) electronic copy of report documenting the Visual Impact Assessment.*

TASK 4: ROADWAY DESIGN AND PLAN DEVELOPMENT

4.1 Conceptual Roadway Development

Prior to developing preliminary roadway plans, the **CONSULTANT** will develop conceptual roadway data in order to identify potential issues and define a clear path forward. This data will consist of necessary research and analysis to provide the most economical alternatives and typical sections for the project. The alignment will be evaluated based on impacts associated with roadway alternative alignments. The **CONSULTANT** will submit an aerial map detailing all of the conceptual alternatives with associated alternative analysis to the **COUNTY/SCDOT** for review upon completion of the conceptual roadway alignment study.

The **CONSULTANT** shall conform to the following design standards during the development of the Conceptual Roadway Development.

1. The **SCDOT'S** Standard Specifications for Highway Construction, Latest Edition;
2. The **SCDOT'S** Road Design Reference Material for Consultant Prepared Plans;
3. The **SCDOT'S** Standard Drawings for Road Construction;
4. The **SCDOT'S** Engineering Directive Memoranda and Instructional Bulletins, Latest Edition;
5. Standard Provisions of the **SCDOT**;
6. QA/QC Roadway Design Checklists;
7. The **SCDOT'S** Highway Design Manual, latest edition as of the date of the contract; and
8. 2001 AASHTO "Green Book" or latest edition, and other applicable AASHTO standards
9. The **SCDOT'S** Access and Roadside Management Standards (ARMS) Manual, Latest Edition;

4.1.1 The **CONSULTANT** will develop conceptual design criteria based on **SCDOT** Highway Design Manual dictated by the proposed roadway class in order to develop conceptual alignments based on the proposed design criteria, including proposed intersection realignment and configuration. Finally the **CONSULTANT** shall work with the **COUNTY** and will provide a Budget Validation Estimate within 60 days of the Notice to Proceed. The estimate shall include but not limited to design, right of way, utility relocation and construction.

Assumptions:

1) ***COUNTY/SCDOT*** *is to provide input of the design criteria, typical section(s), and overall project path forward as necessary.*
2) *The use of a closed drainage system will be investigated as required for the bridge over I-26.*
3) *The use of an open drainage system will be investigated for the entrance/exit ramps and the portion of I-26 affected by the project.*

4) *The project will be carried under **SCDOT'S** MS4 Permit and will therefore follow **SCDOT'S** Stormwater Permitting Procedures.*

4.2 Preliminary Roadway Plans

4.2.1 Preliminary roadway plans will include sufficient Project Management, Coordination and preliminary QA/QC at the conclusion of the development of the preliminary roadway plans.

4.2.2 The **CONSULTANT** will establish the roadway geometric alignment and profile in sufficient detail and in the appropriate format, in order to clearly illustrate significant design features of the project.

4.2.3 The **CONSULTANT** will prepare preliminary roadway plans. Development of preliminary plans will begin immediately upon receipt of survey data. Sections of the preliminary plans shall be completed as soon as the requisite decisions of the conceptual roadway development process have been made and the typical sections have been established then approved by the **COUNTY**.

4.2.4 Preliminary plans layout will be developed and serve as the base documents for further refinement into the final right-of-way plans and construction documents.

4.2.5 Representatives from the **COUNTY**, **SCDOT** and the **CONSULTANT**, involved in roadway, traffic, and hydrologic design, will perform one (1) Design Field Review (DFR) meeting during the preliminary plan development. All information gathered during field investigations will be evaluated and the plans revised accordingly.

4.2.6 The **CONSULTANT** will present project information to SCDOT's Value Engineering (VE) Study Team explaining the major project elements once the preliminary road plans are at approximately the 40% stage. The **CONSULTANT** shall review and respond to any recommendations from the VE Study Team's findings.

4.2.7 The preliminary plans shall contain sufficient details of pertinent physical features to illustrate the design which will include:

1. Detail plan layout; including all geometric data.
2. If necessary, section on structure type, size and centerline location;
3. Horizontal and vertical alignments;
4. Typical sections;
5. Limits of existing right-of-way and adjacent properties;
6. Type, size and location of major above ground utility facilities;
7. Preliminary cross-sections per **SCDOT** standards;
8. Limits and configuration of proposed right-of-way;
9. Preliminary cost estimate.

Assumptions:

1) *The **CONSULTANT** will submit the roadway design criteria for approval to the **COUNTY/SCDOT** prior to Preliminary Plan submittal.*

2) *Potential for the modification of the Columbia Avenue/I-26 interchange and the associated entrance and exit ramps.*
3) *Potential intersection realignment/improvements at 17 individual intersections, including the entrances and exits for Chapin High School.*
4) *The signalized intersection at US 76 and Amick's Ferry Road/Columbia Avenue will be evaluated for improvements based on the traffic analysis. It is assumed that reconfiguration of this intersection will be required.*
5) *Potential new alignment of approximately 0.7 miles of Crooked Creek Road to relocate the existing intersection with the I-26 east bound entrance ramp and connect it to a more suitable location along Columbia Avenue.*
6) *Potential new alignment of a portion of Ellet Road to a more suitable location to intersect with Columbia Avenue.*
7) ***COUNTY/SCDOT** to provide one round of written comments after initial submittal.*
8) *One Design Field Review and one VE study will be scheduled at the completion of 30% plans.*
9) *The typical section(s) will be submitted for approval to the **COUNTY/SCDOT** prior to Preliminary Plan submittal.*
10) *The project will be carried under **SCDOT'S** MS4 Permit and will therefore follow **SCDOT'S** Stormwater Permitting Procedures.*
11) *No design is anticipated to be completed that includes the proposed Martin Parkway.*
12) *Preliminary plans will only be developed for the preferred alternative.*

Deliverables:

1) *Ten (10) half size sets of Preliminary Roadway Plans. One (1) electronic copy of all Microstation files upon request.*
2) *Three (3) copies of the Preliminary Construction Cost Estimate.*

4.3 Right-of-Way Plans

4.3.1 The **CONSULTANT** will develop right of way plans. The plan sheets will depict property lines within and immediately adjacent to the project, property ownership, improvements on property, control of access, existing and proposed R/W, existing known utilities, construction limits and erosion control items that affect R/W requirements. Easements, both permanent and temporary, as a result of the proposed construction, will be shown. All plans shall be in accordance with the **SCDOT'S** Design Manual, latest edition as of the contract date.

4.3.2 Prepare right of way data sheets showing a tabular listing of all property owners and mathematize the amount of right of way to be obtained from each.

4.3.3 Right-of-Way plan production and property layout sheets will depict all parcels of property to be acquired as R/W, and will be assigned a parcel number, the property owner identified (name and tax map reference number), and areas of property obtained and remaining indicated. The entire parcel of property from which R/W is to be acquired will be shown. Reduced scale property parcel drawings will be used as appropriate. Finally, a right of way cost estimate will also be prepared based off of the R/W plans.

Assumptions:

1) *The use of an open drainage system will be investigated for the entrance/exit ramps and the portion of I-26 affected by the project.*
2) ***COUNTY/SCDOT** to provide one round of written comments after Right-of-Way plans submittal. Comments related to the Right of Way plan submittal will be addressed and resubmitted for final Right of Way plans. Revisions/comments that are obtained during right of way negotiations will be revised under a contract modification for the second phase of this project.*
3) *Right of way exhibits and individual plats prepared on separate sheets and the corresponding legal descriptions of obtains will be included under a contract modification for the second phase of this project.*

Deliverables:

1) *One (1) full size set of plans, one (1) full size set in plan cover and five (5) half size sets of Final Right-of-Way Plans. Two (2) electronic copies of all Microstation files upon request.*
2) *One (1) copies of the R/W Cost Estimate will be submitted with the submission of final R/W plans.*

TASK 5: RAILROAD COORDINATION

5.1 Railroad Coordination

The **CONSULTANT** will include sufficient Project Management and Coordination in order to coordinate with CSX Transportation (CSXT) for one at-grade rail crossing that will be required to determine what design criteria and guidelines the railroad has for improving the existing at grade crossings of the rail line. In addition, close coordination will be required to determine permitting and insurance requirements with the railroad crossings. This coordination is critical and could drive the overall schedule of the project. **CONSULTANT** will work closely with CSXT, and **COUNTY** to prepare design plans that are compliant with **COUNTY** and CSXT standards.

5.1.1 Prepare CSXT Temporary Right-of-Entry application to facilitate field work for both survey and SUE explorations along S-48 and S-83 within CSX property. Notify members of the team accomplishing the fieldwork of the Railroad's insurance requirements. The $3,000.00 application fee will be paid by the **COUNTY**.

5.1.2 Coordinate the execution of a Preliminary Engineering Agreement between the **COUNTY** and CSXT to facilitate CSXT review and comment for the S-48, S-49, and S-83 Preliminary roadway improvement plans. The estimated $8,000.00 to $25,000.00 cost for such will be paid by the **COUNTY**.

5.1.3 Conduct on-site meeting with CSXT staff to overview the proposed roadway improvements and necessary CSXT crossing equipment modifications.

5.1.4 Submit to CSXT conceptual plans for roadway improvements at three (3) existing crossings, 843375R (S-48), 843374J (S-83) and 843373C (S-49). Receive CSXT comments or requests for design changes and coordinate with roadway design team to implement CSXT requests as required.

TASK 6: TRAFFIC STUDY

6.1 Traffic Forecasting

The **CONSULTANT** will provide a traffic forecast to support the concept analysis of the proposed S-48 corridor improvements. Additionally, 12-hour data will be collected at six (6) locations, and also at all drives at Chapin High School adjacent to Columbia Avenue (S-48), to support MUTCD signal warrant analyses.

6.1.1 Data Collection

The **CONSULTANT** will collect traffic data, including the traffic class, at the following locations:

Weekday AM & PM Peak Period Turning Movement Counts

1. Amicks Ferry Road and Broomstraw Road
2. Amicks Ferry Road and Zion Church Road
3. Amicks Ferry Road and Virginia Street
4. Amicks Ferry Road and Columbia Avenue
5. Lexington Street and Clark Street
6. Lexington Street and Water Street
7. Lexington Street and Beaufort Street
8. Columbia Avenue and Clark Street/Peak Street
9. Columbia Avenue and East Boundary Street
10. Columbia Avenue and Ellet Road/Chapin High School
11. Columbia Avenue and Woodthrush Road
12. Columbia Avenue and Eagle Chase Court
13. Ellet Road and Columbia Avenue (at both locations)

Weekday 12 Hour Turning Movement Counts

1. Columbia Avenue and I-26 Eastbound Ramps
2. Columbia Avenue and I-26 Westbound Ramps

3. Columbia Avenue and Chapin High School
4. Amicks Ferry Road and Chapin Road
5. Lexington Street and Chapin Road
6. Lexington Street and Columbia Avenue
7. All drives at Chapin High School along Columbia Avenue
8. I-26 Eastbound ramp and Crooked Creek Road

Weekday 24 Hour Tube Counts

1. I-26 Westbound Off Ramp to Columbia Avenue
2. I-26 Westbound On Ramp from Columbia Avenue
3. I-26 Eastbound Off Ramp to Columbia Avenue
4. I-26 Eastbound On Ramp from Columbia Avenue
5. Columbia Avenue, East of I-26
6. Columbia Avenue, West of I-26
7. Columbia Avenue, East of Clark Street
8. Columbia Avenue, East of Amicks Ferry Road
9. Amicks Ferry Road, South of Zion Church Road
10. Lexington Road, South of Clark Street
11. I-26 Westbound on either side of the interchange
12. I-26 Eastbound on either side of the interchange

6.1.2 Traffic Projections

The **CONSULTANT** will prepare analysis of the raw traffic counts to test the reasonableness of the provided count volumes. Once verified, the counts will be reviewed to prepare a profile of existing ADT, AM peak hour volumes, and PM peak hour volumes.

Interim year traffic projections will be included along with incremental years at year 10, year 15, and year 20 build year.

The **CONSULTANT** will prepare historical trend analysis of **SCDOT** count locations along the study corridors. This trend analysis will be utilized to develop growth rates along the corridor. The **CONSULTANT** will then utilize the developed growth rates to prepare traffic projections for one (1) future No-Build and two (2) future Build scenarios for the projected opening and design year including:

- No-Build Opening Year ADT
- No-Build Opening Year AM Peak
- No-Build Opening Year PM Peak
- No-Build Design Year ADT
- No-Build Design Year AM Peak
- No-Build Design Year PM Peak
- Build Opening Year ADT
- Build Opening Year AM Peak
- Build Opening Year PM Peak
- Build Design Year ADT
- Build Design Year AM Peak
- Build Design Year PM Peak

6.1.3 The following services are not included in the traffic projection and will be considered additional services if so requested:

6.1.3.1 Additional alternatives beyond one (1) No-Build and (5) Build alternatives.

Assumptions:

1) *The proposed Martin Parkway location will be evaluated as part of the traffic forecasting.*
2) *It was assumed that a manual traffic forecast would be more accurate due to the nature of the project – i.e. not regional, not new location, etc. Therefore the regional demand model would not be used in the forecasting process.*
3) *It is assumed that **SCDOT** will provide historical traffic count data for the area.*
4) ***SCDOT** will provide ATR Count Stations for the project area.*

Deliverables:

1) *One (1) electronic copy of report documenting traffic analysis activities, including traffic projections and vehicle classification data.*

6.2 Signal Warrant Analysis

At the direction of the **COUNTY**, signal warrant analysis will be performed by the **CONSULTANT** in accordance with the Manual on Uniform Traffic Control Devices, latest edition. The **CONSULTANT** will coordinate with **COUNTY/SCDOT** district signal personnel throughout the signal warrant process.

6.3 Traffic Engineering Analysis

The **CONSULTANT** will visit the site to observed existing operations during both peak periods and gather capacity analysis input information. The **CONSULTANT** will conduct intersection capacity analyses for each of the 8 peak hour volume scenarios listed above at each of the intersections listed above plus the access points for Chapin Technology Park, the intersection of Lexington Avenue and Martin Parkway, and the intersection of Amick's Ferry Road and Martin Parkway. If the IMR is not conducted, the **CONSULTANT** will conduct traffic operations analyses for up to two interchange options. The **CONSULTANT** will examine crash data supplied by the County to identify patterns that should be considered in roadway design. The **CONSULTANT** will compare peak hour volumes to signal warrant volumes at each intersection projected to have more than 53 side street vehicles in both peak hours. The **CONSULTANT** will estimate traffic to be generated by Chapin Technology Park and add to the access intersections. The **CONSULTANT** will prepare a report summarizing the Traffic Forecasting, Signal Warrant Analysis, and Traffic Engineering Analysis activities and provide recommendations regarding the improvements within the corridor. The **CONSULTANT** will prepare an Appendix to the report that can be used as the Traffic Impact Study for the Park.

The TIS will include existing conditions, build-out date no-build conditions, and build-out date build conditions.

Deliverables:

1) *Three (3) copies and one (1) electronic copy of the Traffic Study Report.*

TASK 7: INTERCHANGE MODIFICATION REPORT (IMR)

7.1 Interchange Modification Report

The **CONSULTANT** will prepare an IMR for the interchange of S-48 and I-26 in support of the concept analysis of the proposed S-48 corridor improvements. As part of the IMR, the **CONSULTANT** will obtain traffic counts and evaluate the traffic forecast at the adjacent interchanges at SC-202 and US 176. This work will not commence until the **COUNTY** receives written notification from **SCDOT** that FHWA will require a formal IMR be prepared for the project.

7.1.1 Configuration Data Collection - The **CONSULTANT** will collect:

Lane geometry and traffic control data at the following locations:

1. SC 202 and I-26 Eastbound Ramps
2. SC 202 and I-26 Westbound Ramps
3. US 176 and I-26 Eastbound Ramps
4. US 176 and I-26 Westbound Ramps
5. I-26 Eastbound Ramp and Rauch-Metz Road
6. I-26 Westbound Ramp and State Road S-40-959

7.1.2 Traffic Data Collection **–** The **CONSULTANT** will collect:

Weekday AM & PM Peak Period Turning Movement Counts:

1. SC 202 and I-26 Eastbound Ramps
2. SC 202 and I-26 Westbound Ramps
3. US 176 and I-26 Eastbound Ramps
4. US 176 and I-26 Westbound Ramps
5. I-26 Eastbound Ramp and Rauch-Metz Road
6. I-26 Westbound Ramp and State Road S-40-959

Weekday 24 Hour Tube Counts:

1. I-26 Westbound Off Ramp to US 176
2. I-26 Westbound On Ramp from US 176
3. I-26 Eastbound Off Ramp to US 176
4. I-26 Eastbound On Ramp from US 176
5. I-26 Westbound Off Ramp to SC 202
6. I-26 Westbound On Ramp from SC 202
7. I-26 Eastbound Off Ramp to SC 202

8. I-26 Eastbound On Ramp from SC 202

In addition, the **CONSULTANT** anticipates that the **SCDOT/COUNTY** will be able to provide crash data for the past five years and any applicable signal timing data at the ramp termini listed above.

7.1.3 Alternative Development – Utilizing the future traffic forecast for the interchanges, the **CONSULTANT** will prepare an interchange typology analysis to determine what type of interchange treatments may be appropriate to accommodate the anticipated traffic volumes. As part of this process, up to two (2) interchange alternatives will be analyzed at the S-48 and I-26 interchange. The alternatives investigated will be proposed by the **CONSULTANT** and approved by the **COUNTY** before proceeding.

7.1.4 Capacity Analysis – The **CONSULTANT** will prepare a Highway Capacity Manual (HCM) based analysis of the study area for existing conditions, future No-Build conditions, and the two (2) interchange alternatives developed. This shall include:

- Intersection level of service at ramp termini at all locations indicated in Task 7.3.1.
- Freeway segment level of service at the following locations:
  - I-26 between SC 202 and S-48.
  - I-26 between S-48 and US 176.
- Ramp merge/diverge level of service at the ramp junctions of the I-26 interchanges with S-48, SC 202, and US 176.
- Any weaving segments (as defined by the HCM) on I-26 between SC 202 and US 176.

This analysis will then be utilized to develop a preferred alternative for the interchange which will interface with the concept work being prepared for the S-48 corridor. Once a preferred alternative is selected, FHWA will likely require a microsimulation model of the interchange and I-26 corridor. The microsimulation model will be prepared for existing conditions (in order to calibrate the model to currently observed conditions), the future No-Build alternative, and the future preferred alternative.

7.1.5 Agency Coordination – The IMR process typically requires a significant amount of coordination with approval agencies (FHWA and **SCDOT**). As part of this coordination effort, the **CONSULTANT** will perform the following:

- Preparation of a proposed Methodology Document for FHWA, **SCDOT** and **COUNTY** review prior to beginning work. Where appropriate and at the direction of FHWA, **SCDOT** and **COUNTY**, the **CONSULTANT** will modify the methodology in order to accommodate the expectations of FHWA, **SCDOT** and **COUNTY**.
- Ongoing coordination throughout the IMR process in order to maximize the chances of IMR approval by FHWA.

7.1.6 Environmental Screening – The objective of the screening will be to document and alert the study team to environmental resources/issues of concern so that impacts can be assessed as part of the IMR.

Environmental resources/issues of concern may include those related to history, archaeology, neighborhoods, disadvantaged communities, special interest groups, context sensitive design, cemeteries, parks and recreation, wetlands and streams, endangered species, air quality, noise, and UST/hazardous waste sites. The number and types of permits anticipated will also be addressed. This information for the IMR will be performed under Task 3 – Environmental Documentation/Process.

The screening effort will include, as appropriate and when available, a review of maps, aerial photographs, files, and databases maintained by various federal, state, and local agencies/entities such as the United States Fish and Wildlife Service (USFWS), Environmental Protection Agency (EPA), South Carolina Department of Natural Resources (SCDNR), United States Geological Survey (USGS), National Park Service (NPS), Natural, Archaeological, and Historic Resources GIS (NAHRGIS), regional commissions, etc. The **CONSULTANT** will also undertake a site visit in order to identify readily apparent resources not revealed by database research and to evaluate the status of known resources.

Deliverables:

1) *One (1) copy and one (1) electronic copy of report documenting IMR activities.*

TASK 8: HYDROLOGY/HYDRAULIC DESIGN

8.1 Roadway Hydrology/Hydraulic Design

8.1.1 The **CONSULTANT** will perform various aspects of the roadway drainage design and will identify flooding problems associated with the project based on historical information and the utilization of hydrologic computer modeling techniques. The impacts to the existing hydrology due to the proposed project will be evaluated. Based on this evaluation, design alternatives to control flooding and manage the runoff associated with the project will be examined. Preliminary designs will be performed for median and roadside ditches, storm sewer systems, cross line culverts and energy dissipaters to identify an adequate amount of right of way in order to facilitate the proposed drainage improvements. In addition, an erosion and sediment control limits will be identified to aid in controlling erosion during the construction of the project. The drainage will be designed in accordance with the **SCDOT'S** hydraulic design publication "South Carolina Department of Transportation Requirements for Hydraulic Design Studies," latest edition. The design shall also comply with the "S.C. Storm Water Management and Sediment Reduction Regulations", and the NPDES General Permit.

The **CONSULTANT** shall identify the receiving stream(s) for this project. After this determination has been made, the stream(s) should be cross-checked with SCDHEC's most current 303(d) list (http://www.scdhec.gov/environment/water/tmdl/docs/tmdl_08-303d.pdf) and table for water bodies with approved TMDL's (http://www.scdhec.gov/environment/water/tmdl/docs/tmdl_08sites.pdf) to see if this receiving stream(s) has either an approved TMDL or a soon-to-be TMDL target date. If listed, the **CONSULTANT** shall provide the necessary best management practices to bring the project in conformance with SCDHEC requirements as stated in SCDHEC's Storm Water Management BMP Handbook (latest edition).

8.1.2 The **CONSULTANT** will provide the roadway hydrological & hydraulic design through the following services:

8.1.2.1 Establish conceptual hydraulic design criteria based on existing conditions.

8.1.2.2 Perform field investigation(s) to

8.1.2.2.1 Inventory the location and condition of the existing storm drainage appurtenances.

8.1.2.2.2 Determine the boundaries of tributary watersheds draining through the area.

8.1.2.2.3 Identify and evaluate the usability of drainage outfall ditches.

8.1.2.2.4 Determine preliminary location of inlets and catch basins.

8.1.2.2.5 Determine preliminary location of sediment and erosion control ponds.

8.1.2.3 Data Collection

8.1.2.3.1 Land use data for existing and proposed developments.

8.1.2.3.2 Determine if there is any involvement in floodways or flood hazard areas.

8.1.2.3.3 Identify flooding problems associated with the project based on historical information.

8.1.2.3.4 Obtain plans of existing roads that will impact project.

8.1.2.4 Basic Hydrologic and Hydraulic Engineering Services

8.1.2.4.1 Prepare the appropriate drainage basin map using existing topographic maps, information gathered from the field investigation(s) and available information from federal, state and local agencies.

8.1.2.4.2 Perform a hydrological study of the watershed(s) affected by the roadway improvements.

8.1.2.4.3 Verify the adequacy of the existing storm drainage culvert crossings for any additional flows caused by the proposed improvements.

8.1.2.4.4 Design alternatives to control flooding and manage the runoff associated with the road project. The hydraulic analysis will determine the requirements for the proposed culverts required for storm water drainage.

8.1.2.4.5 Determine the need and right of way requirements for any water retention/detention facilities due to impacts to all outfalls.

8.1.2.4.6 Attend DFR meetings with **COUNTY/SCDOT** representatives.

8.1.2.4.7 Identify and incorporate necessary drainage improvements into the roadway and structural preliminary plans.

8.1.2.5 Identify Erosion and Sediment Control Measures

8.1.2.5.1 Identify erosion and sediment control areas for inclusion in the preliminary roadway plans, outlining methods for the minimizing the amount of erosion and sedimentation during construction and for conformance to the NPDES General Permit. The plan will be detailed on the drainage sheets prepared for the project.

8.1.2.6 Preliminary Roadway Drainage Plans

8.1.2.6.1 **CONSULTANT** will prepare preliminary roadway drainage plans to be included with the preliminary roadway plans at a scale of 1" = 50' or at a scale agreed upon by the **CONSULTANT** and the **COUNTY**. A preliminary drainage design will be included in order to identify Right of Way in order to establish additional property acquisitions as an on needed basis.

*All services described herein will be conducted with reference to **SCDOT** requirements and guidelines, such as "Requirements for Hydraulic Design Studies," the "Plan Preparation Guide," and the **SCDOT** standard plans.*

Assumptions:

1) *The use of a closed drainage system will be investigated for the entire roadway portion of the project.*
2) *The use of a closed drainage system will be investigated as required for the bridge over I-26.*
3) *The use of an open drainage system will be investigated for the entrance/exit ramps and the portion of I-26 affected by the project.*
4) *No bridge hydraulic design is anticipated for waterways passing under structures.*
5) *The **CONSULTANT** will include the appropriate drainage on the Right of Way plans to identify necessary right of way.*

Deliverables:

1) *Three (3) hard copies of the Signed and Sealed Stormwater Management Report for the project.*

TASK 9: VALUE ENGINEERING

9.1 The **CONSULTANT** will present the project at a value engineering study at approximately a 35-40% design completion stage. A draft value engineering study report will be prepared by the **COUNTY/SCDOT**. The **CONSULTANT** with review and respond to the comments after the draft value engineering study report has been submitted to the **CONSULTANT**. The **COUNTY** and **SCDOT** will take the responses and incorporate them into a final value engineering study report. A presentation of the final report will be made to **SCDOT'S** Value Engineering Board after all comments from the various reviews have been incorporated.

9.1.2 The **CONSULTANT** shall implement reasonable VE design changes in accordance with accepted recommendations from the final report. The **CONSULTANT'S** redesign cost will be considered when determining accepted value engineering recommendations.

Assumptions:

1) *The VE Study will consist of one day for a field visit to the project site and a presentation of the project and its proposed improvements.*
2) *The VE Study will take place after 30% plans have been completed and before 60% R/W plans are submitted.*
3) ***CONSULTANT** will provide up to 2 individuals to present the project, conduct the field visit and answer any questions the VE Study group may have.*
4) *Comments of the draft value engineering study report will be issued within two (2) weeks of submittal of the draft report.*
5) *The **CONSULTANT** will not participate in the presentation to the **SCDOT** VE Review Board upon completion of the final report, however the **CONSULTANT** will attend the presentation to the VE Review Board.*

Deliverables:

1) *Ten (10) 11"x17" sets of preliminary roadway and bridge plans for the value engineering study.*
2) *One (1) electronic copy of the responses to suggestions and comments proposed by the VE Study review.*
3) ***CONSULTANT** will provide the VE Study Team with all electronic submittals to date necessary to complete the VE Study.*

TASK 10: UTILITY COORDINATION

10.1 The **CONSULTANT** shall have the responsibility of coordinating the Project development with all utilities that may be affected. All utility relocations shall be handled in accordance with the **SCDOT'S** "A Policy for Accommodating Utilities on Highway Rights of Way" and the Code of Federal Regulations, Title 23, Chapter 1, Subchapter G, part 645, subparts A and B.

10.2 These services shall be performed by individuals skilled and experienced in utility coordination services.

10.3 The **CONSULTANT** shall design the Project to avoid conflicts with utilities where possible, and minimize impacts where conflicts cannot be avoided. This may include, but is not limited to, utilizing all available utility data, whether obtained from SUE services, as-builts, or provided by the **COUNTY** or some other source. The **CONSULTANT** will be expected to determine all utility conflict points located within an identified corridor, including all work to properly analyze each conflict point, and make recommendations for resolution of the conflict where possible. The **COUNTY** may request a Utility Conflict Analysis and Remediation Spreadsheet from the **CONSULTANT** as a deliverable.

10.4 The **CONSULTANT** shall initiate early coordination with all utility companies that are located within the Project limits. Coordination shall include, but shall not be limited to, contacting each utility company to advise the company of the proposed project, providing preliminary plans to the utility company, obtaining copies of as-built plans for the existing utility facilities (if available), and determining the companies' requirements for the relocation of their facilities.

10.5 The **CONSULTANT** shall provide the utility companies with Design Field Review plans as soon as the plans have reached a level of completeness adequate to allow the companies to fully understand the Project impacts. These plans shall contain all available data that may be helpful to the utility in assessing the utility impact (stations and offsets, and etc.). The utility company may use the **CONSULTANT** design plans for preparing Relocation Sketches. If a party other than the utility company or its agent prepares Relocation Sketches, there shall be a concurrence box on the plans where the utility company signs and accepts the Relocation Sketches as shown.

10.6 The **CONSULTANT** shall coordinate and conduct a preliminary review meeting with the utility companies to assess and explain the impact of the Project to the companies. The **COUNTY'S** Project Manager, the **CONSULTANT**, the Resident Construction Engineer (RCE), and Utilities Manager (or designee) shall be included in this meeting.

10.7 The **CONSULTANT** shall research the prior rights of each utility company's facilities. If there is a dispute over prior rights with a utility, the **CONSULTANT** shall be responsible for resolving the dispute and making a recommendation. The **CONSULTANT'S** Project Manager shall meet with the **COUNTY'S** RCE to present the prior rights information gathered. This information must be sufficient for the RCE to certify the extent of the utility company's prior rights. The

COUNTY'S shall have final approval authority as to the determination of whether the utility company has prior rights.

10.8 The **CONSULTANT** shall prepare and submit to the **COUNTY** a Preliminary Utility Report one month after Design Field Review plans that includes a listing of all utility companies located within the project limits and a preliminary recommendation as to the extent of each company's prior rights. This report shall also include a preliminary assessment of the impact to each company as can best be determined at the time, as well as a determination of the feasibility of early utility relocations that may begin prior to the start of construction.

Deliverables:

1) *Preliminary Utility Report (<u>due approximately one month after DFR approval)</u>*
   - *List of all utilities*
   - *Preliminary prior rights assessment*
   - *Preliminary utility impact assessment*
   - *Recommendations for early relocations*
   - *Recommendations for in-contract relocations*

<u>TASK 11: SUBSURFACE UTILITIES ENGINEERING (SUE)</u>

11.1 SUE Scoping Recommendations

Within 90 days of the Notice to Proceed for the contract, the **CONSULTANT** will provide the **COUNTY** with a recommendation as to the extent of SUE services to be provided. The **CONSULTANT** shall submit a proposed test hole location map defining the limits of SUE locates. This map must be approved by **SCDOT/COUNTY** in writing prior to the commencement of work. This should include as much information as can be assembled on utility type, approximate location, owner, material type, prior rights, and any preliminary assessment of impact with respect to the scope of the proposed project. This information will be used to specifically define the limits of the SUE work to be performed.

11.2 SUE Work

The **CONSULTANT** shall perform work in two phases. The first phase consists of designating services (Quality Level B, C and D). For the purpose of this *Agreement*, "designate" shall be defined as indicating, by marking, the presence and approximate horizontal position of the subsurface utilities by the use of geophysical prospecting techniques. The second phase consists of test hole services (Quality Level A). For the purpose of this *Agreement*, "locate" means to obtain the accurate horizontal and vertical position of the subsurface utilities by excavating a test hole.

Unless specifically stated otherwise, the **CONSULTANT** shall adhere to the ASCE Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data (CI/ASCE 38-02).

11.2.1 Designating

11.2.1.1 In the performing of designating services under this *Agreement*, the **CONSULTANT** shall,

11.2.1.1.1 Provide all equipment, personnel and supplies necessary for the completion of Quality Level 'B' information for approximately 133,892 LF of underground utilities.

11.2.1.1.2 Provide all equipment, personnel and supplies necessary for the completion of Quality Level 'C' information for approximately 5,000 LF of underground utilities.

11.2.1.1.3 Provide all equipment, personnel and supplies necessary for the accurate recording of information for approximately 19,854 LF of aerial utilities.

11.2.1.1.4 Conduct appropriate records and as-built plans research and investigate site conditions.

11.2.1.1.5 Obtain all necessary permits from city, county, state or any other municipal jurisdictions to allow **CONSULTANT** personnel to work within the existing streets, roads and rights-of-way, including CSXT railroad right of way.

11.2.1.1.6 Designate the approximate horizontal position of existing utilities by paint markings in accordance with the APWA Uniform Color Code scheme along the utility and at all bends in the line in order to establish the trend of the line. All utilities shall be designated as well as their corresponding lateral lines up to the point of distribution, existing right-of-way limits, or whichever is specifically requested and scoped for each individual project.

11.2.1.2 In the performing of designating services under this *Agreement*, **COUNTY** shall,

11.2.1.2.1 When requested, provide reasonable assistance to the **CONSULTANT** in obtaining plans showing the project limits, alignment, centerline, rights-of-way limits (existing and proposed), project controls and other data for selected projects.

11.2.1.2.2 **Provide notification to key COUNTY personnel concerning the upcoming SUE services to be provided by the CONSULTANT.**

11.2.2 Locating

11.2.2.1 In the performance of locating services under this *Agreement*, the **CONSULTANT** shall,

11.2.2.1.1 Provide all equipment, personnel and supplies necessary for the completion of Quality Level ‘A’ information for an estimated 0 test holes.

11.2.2.1.2 Conduct appropriate records and as-built plans research and investigate site conditions.

11.2.2.1.3 Obtain all necessary permits from city, county, state or any other municipal jurisdictions to allow **CONSULTANT** personnel to work within the existing streets, roads and rights-of-way, including CSXT railroad right of way.

11.2.2.1.4 Perform electronic sweep of the proposed conflict and other procedures necessary to adequately “set-up” the test hole.

11.2.2.1.5 Excavate test holes to expose the utility to be measured in such a manner that insures the safety of excavation and the integrity of the utility to be measured. In performing such excavations, the **CONSULTANT** shall comply with all applicable utility damage prevention laws. The **CONSULTANT** shall schedule and coordinate with the utility companies and their inspectors, as required, and shall be responsible for any damage to the utility during excavation.

11.2.2.1.6 Provide notification to **COUNTY** concerning (a) the horizontal and vertical location of the top and/or bottom of the utility referenced to the project survey datum; (b) the elevation of the existing grade over the utility at a test hole referenced to the project survey datum; (c) the outside diameter of the utility and configuration of non-encased, multiconduit systems; (d) the utility structure material composition, when reasonably ascertainable; (e) the benchmarks and/or project survey data used to determine elevations; (f) the paving thickness and type, where applicable; (g) the general soil type and site conditions; and (h) such other pertinent information as is reasonable ascertainable from each test hole site.

11.2.2.1.7 Provide permanent restoration of pavement within the limits of the original cut. When test holes are excavated in areas other than roadway pavement, these disturbed areas shall be restored as nearly as possible to the condition that existed prior to the excavation.

11.2.2.1.8 Draft horizontal location and, if applicable, profile view of the utility on the project plans using CADD standards as outlined above. A station and offset distance and/or northing and easting coordinates (State Plane) with elevations shall be provided with each test hole.

11.2.2.1.9 Test hole information shall be formatted and presented on **CONSULTANT'S** certification form and listed in a test hole data summary sheet.

11.2.2.2 In the performance of locating services under this *Agreement*, **COUNTY** shall,

11.2.2.2.1 When requested, provide reasonable assistance to the **CONSULTANT** in obtaining plans showing the project limits, alignment, centerline, rights-of-way limits (existing and proposed), project controls and other data for selected projects.

11.2.2.2.2 Provide notification to key **COUNTY** personnel concerning the upcoming SUE services to be provided by the **CONSULTANT**.

Assumptions:

1) *No SUE work shall be performed until **COUNTY/SCDOT** has approved in writing the preliminary SUE locate map.*
2) *The above scope does not include the designation of gravity sewer, gravity storm sewer and all service lines and down spouts to/from buildings.*

TASK 12: GEOTECHNICAL EXPLORATIONS

The **CONSULTANT** will perform a preliminary geotechnical investigation for the bridge, roadway culvert, and retaining walls. The **CONSULTANT** shall gather samples, conduct tests, and analyze necessary soil and foundation data for the bridge, roadway embankment, culverts, and retaining walls. The results of the sampling, testing, analysis, and recommendations concerning the design shall be compiled into final reports for submittal to the **COUNTY/SCDOT**.

Design Basis Statement

The following design standards will apply:

- 2007 SCDOT Standard Specifications for Highway Construction
- SCDOT Standard Supplemental Specifications and Special Provisions
- 2010 SCDOT Geotechnical Design Manual (GDM), Version 1.1
- SCDOT Bridge Design Memorandum to RPG Structural Engineers and Design Consultants, issued after April, 2006
- 2008 SCDOT "Seismic Design Specifications for Highway Bridges", Version 2.0
- AASHTO LRFD Bridge Design Specifications, 6th Edition (2012), with latest interims

The outline number/letter in parenthesis following specific tasks below correlate with the **SCDOT**'s Geotechnical Testing Direct Cost Estimate sheet which will be utilized in estimated the geotechnical directs costs for the project.

12.1 Field Exploration (Preliminary Subsurface Investigation)

12.1.1 The field and laboratory data obtained from the preliminary subsurface investigation (under the basic agreement) shall be used to refine the final subsurface investigation.

12.1.2 **CONSULTANT** shall submit a detailed subsurface investigation plan prior to the commencement of field operations. Soil test boring locations and frequencies will be in accordance with the GDM. The plan shall include the following items:

12.1.2.1 Description of the proposed testing types

12.1.2.2 Depth of tests

12.1.2.3 Location of tests

12.1.3 **Borings:** Soil Test Borings (STB) will be conducted as defined in Chapters 4 and 5 of the GDM.

12.1.3.1 A total of thirty-eight (38) borings will be performed.

12.1.3.1.1 **Bridge over I-26**

12.1.3.1.1.1 Two (2) borings to 120 feet for one interior bent. (I.B.)

12.1.3.1.1.2 Two (2) borings to 120 feet for each of the two end bents (4 total). (I.B.)

12.1.3.1.1.3 All bridge STB's shall be performed to the depth indicated above or to refusal. If refusal occurs, rock coring is to be performed in accordance with GDM and is estimated to be 20 feet at each bridge boring.

12.1.3.1.1.4 One (1) boring to 50 feet for each of the approach embankments near the end bents (2 total). (I.B.)

12.1.3.1.1.5 One (1) boring to 30 feet for each of the interchange ramps (4 total). (I.B.)

12.1.3.1.1.6 Boreholes will be backfilled with drill cuttings or clean fill soil. (I.B.)

12.1.3.1.2 **Roadway**

12.1.3.1.2.1 Twenty-Six (26) borings are estimated to be performed in accordance with the GDM. Roadway STB's shall be performed to a depth of 20 feet (I.B.)

12.1.3.1.2.2 Boreholes will be backfilled with drill cuttings or clean fill soil. (I.B.)

12.1.3.1.3 **Roadway Structures**

12.1.3.1.3.1 Roadway retaining wall borings will be performed in the final field exploration once the retaining wall types, sizes and locations have been determined.

12.1.3.1.3.2 Culvert borings will be performed in the final field exploration once the types, sizes and locations have been determined.

12.1.4 Other Field Exploration Items

12.1.4.1 The following additional items are deemed necessary to complete the work as proposed:

12.1.4.1.1 Crew & Equipment Mobilization (I.A.)

12.1.4.1.1.1 Water Truck, per week - 1 EA
12.1.4.1.1.2 Drilling Equipment - 1 EA
12.1.4.1.1.3 ATV Surcharge – 1 EA
12.1.4.1.1.4 CPT Rig - 1EA
12.1.4.1.2 Rock Coring (NX Barrel) – On Land (I.I.)
12.1.4.1.2.1 50 to 100 foot depths - 120 LF
12.1.4.1.3 Hourly Crew Rates – On Land (I.P.)
12.1.4.1.3.1 Weekend or Off-Peak Hour Drilling – 3 Days
12.1.4.1.3.2 Boring layout/hand clearing – 15 HRS
12.1.4.1.4 Out of Town Per Diem (I.R.)
12.1.4.1.4.1 Per Crew – 1 EA
12.1.4.1.5 Fourteen (14) undisturbed samples will be obtained in layers of cohesive soils where consolidation and/or shear strengths testing may be warranted. (I.G.)
12.1.4.1.6 Eight (8) bulk samples shall be collected at locations as necessary. (I.T.)
12.1.4.1.7 Spectral Analysis of Shear Waves or Multi-channel Analysis of Shear Waves (SASW or MASW) testing will be required to obtain shear wave velocity values in the upper 100 feet of the subsurface near each end bent – One (1) Day (I.Y.)
12.1.4.1.8 Water Truck – Two (2) Weeks (I.AA.)
12.1.4.1.9 Traffic control – Thirteen (13) Days (I.BB.)
12.1.4.1.10 Clearing and Grubbing – One (1) Day (I.CC.)
12.1.4.1.11 SPT Hammer Energy Measurements – One (1) Hammers (I.GG.)

12.1.5 **CONSULTANT** will be responsible for submitting Right-of-Way Access permission to the **SCDOT**'s Right-of-Way Office if necessary.

12.2 Laboratory Testing

12.2.1 The **CONSULTANT** shall be AASHTO certified in the anticipated laboratory testing outlined below and/or any additional testing that may be required. See Chapter 6 of the SCDOT GDM for AASHTO and ASTM designations. The laboratory testing will be performed on selected samples in order to evaluate the types of soils encountered, confirm visual classifications, and estimate engineering properties for use in design. Laboratory investigation for the bridge and roadways is to include, as estimation, the following:

12.2.1.1 One-hundred (100) Natural Moisture Content Tests (II.A.2)
12.2.1.2 One-hundred (100) Grain Size Distribution with wash No. 200 Sieve (II.A.10)
12.2.1.3 One-hundred (100) Moisture-Plasticity Relationship Determinations (Atterberg Limits) (II.A.6)
12.2.1.4 Four (4) Organic Loss Tests (II.A.12)
12.2.1.5 Two (2) Standard 8-Increment Consolidation Tests (II.B.1)
12.2.1.6 Ten (10) Each Additional Consolidation Load Increment (II.B.3)
12.2.1.7 Twelve (12) Unconfined Compression Testing of rock if

encountered (II.C.2)

12.2.1.8 Nine (9) Unconfined Compression Testing of Soil

12.2.1.9 Six (6) Remold Charge, Soil (II.C.3)

12.2.1.10 Nine (9) Consolidated, undrained Triaxial shear strength tests (II.C.5)

12.2.1.11 Three (3) Permeability Tests during Consolidated, undrained Triaxial shear strength tests constant head test

12.2.1.12 Eighteen (18) Pore Pressure Measurement (II.C.8)

12.2.1.13 Four (4) Corrosion Series Tests (II.E.1)

12.2.1.14 Two (2) Compaction Tests (II.E.4)

12.3 Preliminary Bridges and Roadway Geotechnical Engineering Report

12.3.1 The Preliminary Geotechnical Report for Bridges shall be conducted in general accordance with the procedures outlined in the GDM. The report shall include a subsurface profile for the final geotechnical subsurface explorations in accordance with the GDM Chapter 7. The preliminary geotechnical engineering report shall be written in accordance with the GDM Chapter 21. The report shall be submitted with the Preliminary Bridge Plans.

12.3.2 The Preliminary Roadway Geotechnical Engineering Report shall be conducted in general accordance with the procedures outlined in the GDM. The report shall include a subsurface profile for the final geotechnical subsurface explorations in accordance with the GDM Chapter 7. The preliminary geotechnical engineering report shall be written in accordance with the GDM Chapter 21. The report shall be submitted with the Preliminary Road Plans.

12.4 Geotechnical Subsurface Data Report

12.4.1 All activities in preparation of the geotechnical subsurface data report shall be conducted in general accordance with the procedures outlined in the GDM and respective bridge design memo.

Assumptions:

1) *The **CONSULTANT** will retain all soil samples obtained until each bridge substructure is completely constructed.*

Deliverables:

1) *One (1) hard copy and one (1) copy in .pdf on CD of Geotechnical Subsurface Data Report.*
2) *Two (2) bound hard copies of the preliminary bridge geotechnical engineering reports. The electronic copy shall include a PDF version of the report.*
3) *Two (2) bound hard copies of the preliminary roadway geotechnical engineering report. The electronic copy shall include a PDF version of the report.*

TASK 13: STRUCTURAL DESIGN AND PLAN DEVELOPMENT

The **CONSULTANT** will develop bridge plans to construct the new interstate interchange bridge over I-26. The **CONSULTANT** will provide the **COUNTY/SCDOT** the following:

Design Basis Statement
The **CONSULTANT** will conform to the following **SCDOT** and **FHWA** design standards in preparation of the bridge plans.

- The SCDOT Bridge Design Manual, 2006
- SCDOT Bridge Design Memoranda to RPG Structural Engineers and Design CONSULTANTs, issued after April, 2006;
- AASHTO LRFD Bridge Design Specifications, 6th Edition (2012), with latest interims
- SCDOT Bridge Drawings and Details, latest versions;
- Road Standard Drawings and Details, latest versions;
- 2010 SCDOT Geotechnical Design Manual, Version 1.1;
- 2008 SCDOT Seismic Design Specifications for Highway Bridges, Version 2.0;
- SCDOT Standard Specifications for Highway Construction, 2007 edition;
- ANSI/AASHTO/AWS D1.5 Bridge Welding Code, the latest edition.
- Standard Special Provisions and Supplemental Specifications used by the **SCDOT**

13.1 Bridge Concepts

13.1.1 **CONSULTANT** will prepare a Bridge Concept Report which discusses the existing bridge and approach roadway, the options for replacing the bridge, an estimate of probable cost for each alternative studied, and illustrations of how the staging will be accomplished for each alternative. The illustrations shall have detail and dimensions to demonstrate the construction sequence of the proposed bridge as compared to the location of the existing bridge.

13.1.2 The bridge design will be coordinated with any future improvements along the interstate. This may require the design of a longer bridge than currently exists.

13.1.3 **CONSULTANT** will prepare a Bridge Design Criteria report that will be submitted to **COUNTY/SCDOT** for review and approval.

13.2 Preliminary Bridge Plans (30%)

The **CONSULTANT** shall develop 30% bridge plans in sufficient detail and appropriate format to clearly illustrate significant design features, dimensions and clearances. The preliminary plans will, as a minimum, include plan sheets as defined in Chapter 3 of the SCDOT Bridge Design Manual. Preliminary plans will also include recommended methods of maintaining traffic during construction. The 30% bridge plans will be approved by the **COUNTY/SCDOT** prior to beginning 95 % bridge plans.

13.3 Field Reviews

Representatives from the **COUNTY/SCDOT** and **CONSULTANT** involved in bridge design will perform one (1) field review meetings of the project during the preliminary plan development. All information gathered during this field investigation will be evaluated and plans revised accordingly.

13.4 Retaining Walls

Due to the confined area in which portions of the project will progress, the **CONSULTANT** anticipates the use of gravity walls, cantilever walls, and/or MSE walls. During the conceptual and preliminary stages of the project, the retaining wall type, sizes and locations will be established in order to determine the work necessary in the next design stage.

Assumptions:

1) *The S-48 (Columbia Ave.) bridge over I-26 is the only bridge structure located on the project corridor.*
2) *Up to four (4) structure options will be considered in the Bridge Concept Report.*
3) *The bridge replacement will be constructed in stages to maintain traffic at the interchange at all times.*
4) *Preliminary seismic criteria will be determined.*
5) *Bridge aesthetics will be investigated.*
6) *Sidewalk/Pedestrian accommodations will be provided.*
7) *It is estimated that there will be 400 LF of retaining walls required at the bridge end bents and 1,000 LF required throughout the project corridor to minimize R/W impacts.*

Deliverables:

1) *Conceptual Submittal*
   i. *Two (2) Hard Copies and (1) Electronic Copy of the Bridge Concept Report.*
2) *Preliminary Submittal*
   i. *Eight (8) Half-size sets of Preliminary Bridge Plans (30%)*
   ii. *Three (3) copies of the Preliminary Seismic Summary Report*
   iii. *One (1) hard copy and PDF of the construction cost estimate.*
   iv. *Ten (10) Half-size sets of additional Preliminary Plans will be provided for the DFR meeting.*

TASK 14: CONTEXT SENSITIVE REVIEW AND OVERSIGHT

14.1 Context Sensitive Solutions

The **CONSULTANT** will oversee Context Sensitive Solutions (CSS) throughout the lifecycle of the preliminary stages of the project. CSS will bridge all design disciplines, community outreach, and agency involvement while incorporating transportation, community, and environmental elements. Focus on CSS will assist in producing a project that provides lasting value to the community.

The **CONSULTANT** will assign a CSS Manager who will be involved in key meetings, discussions, and milestones of the preliminary stages of the project. The CSS Manager will serve as a continuous conduit throughout the lifecycle of the design process, providing continuity and documentation of the process. Elements of CSS to be utilized include:

14.1.1 Communication with all stakeholders, agencies, and the general public will be continuous, transparent, and respectful.

14.1.2 Both the transient public (i.e., drivers in the corridor) and the non-transient public (i.e., property owners, residents, businesses, etc.) will be considered throughout the design process.

14.1.3 Institutional knowledge of the process undertaken to develop the 2006 S-48 Columbia Avenue Corridor Study will be utilized to establish a baseline for initial stakeholder outreach. Goals and objectives of the corridor study will be reviewed and re-vetted with stakeholders and the general public to evaluate their continued validity.

14.1.4 An early public meeting will be conducted prior to any design alternatives being considered. This meeting will solicit ideas and concerns from the public with an open mind to all input received. Input received will be directly reflected in the purpose and need of the project.

14.1.5 Based on the validation of the corridor study goals/objectives and input received during the public meeting, Guiding Principles will be established for the design process that captures the values and concerns of the community. These Guiding Principles will be continuously balanced with technical analyses conducted during the design process.

14.1.6 Multiple alternatives will be considered, resulting in consideration of a range of possible solutions. Following varied levels of analysis, a path forward that is suitable for meeting transportation demand and the community's Guiding Principles will be determined.

14.1.7 Balanced consideration will be given to a variety of modes, including vehicular, transit, bicycle, and pedestrian.

14.1.8 CSS will be monitored and reviewed at key outreach and design milestones. As commitments are made they will be tracked and honored throughout the lifecycle of the design process. Adjustments to the process will be made as needed to preserve the integrity of the project's CSS approach.

<u>*Deliverables:*</u>

1) *Periodic progress documentation of the CSS process, including its monitoring, adjustment, and fulfillment.*

<u>TASK 15: LANDSCAPING AND IRRIGATION DESIGN</u>

The Landscape Design Scope of Services will be limited to identifying locations and species to be used in the planting and irrigation design for the landscaping of the proposed project. Adjust planting and irrigation at I-26 interchange and design a town identification and welcome sign at I-26 recognizing The Town of Chapin will also be included.

Landscape and irrigation design will be limited to identified areas and follow **SCDOT** Highway Beautification Landscaping Guidelines. No vertical-structure design, fountain design, structural design, and/or site/landscape lighting design will be provided under this proposal.

The following specific Scope of Services will be provided under this proposal.

15.1 Conceptual Design

15.1.1 The **CONSULTANT** will meet with the **COUNTY** Program Manager and **SCDOT** Representative, representative(s) from The Town of Chapin, and any involved team members in one (1) joint meeting to discuss median planting and hardscaping location opportunities, to confirm limits, to identify design criteria, and to coordinate local preference if possible. This also includes any necessary project management, coordination, and quality assurance/quality control.

15.1.2 The **CONSULTANT** will take the information received, along with the base plans and will develop within the limits of the project a concept for landscaping and the town sign.

15.2 Preliminary Landscape Plans

15.2.1 Based on the preliminary directions received, the **CONSULTANT** will develop a preliminary landscaping and irrigation cost estimate along with preliminary landscaping and irrigation plans to be included in the preliminary roadway plans.

Deliverables:

1) *One rendering of the suggested plantings along with the potential locations identified on the roadway plans.*
2) *One (1) electronic copy of the preliminary Landscape and Irrigation cost estimate.*

<u>TASK 16: LIGHTING DESIGN</u>

Lighting design will be provided for the project in accordance with AASHTO lighting standards and **SCDOT** specifications. Lighting design services are as follows:

16.1 Conceptual Lighting Development – the **CONSULTANT** shall work with the **COUNTY**/Town of Chapin to gather data on existing roadway lighting systems and electrical services that may need to be modified to accommodate the new road design. The **CONSULTANT** shall also work with **COUNTY**/Town of Chapin to choose a roadway lighting fixture, pole and accessories as a basis of design.

16.1.1 The **CONSULTANT** will coordinate with **COUNTY**/Town of Chapin on objectives desired. Current scope shall cover Columbia Avenue from Amicks Ferry Road to and including the I-26 Interchange.

16.1.2 The **CONSULTANT** will develop a conceptual design as a starting point for the final design. The final design shall be included with the construction contract modification.

16.1.3 The **CONSULTANT** will prepare a conceptual cost estimate for the lighting design.

16.2 Preliminary Lighting Plan – The **CONSULTANT** shall provide a working plan set with a preliminary lighting layout for comments and review.

16.2.1 The **CONSULTANT** shall coordinate with the local Utility Company to determine electrical service locations.

16.2.2 The **CONSULTANT** shall coordinate with the local Utility Company to determine the feasibility and potential cost savings of a lease agreement whereby the Utility Company installs, owns, and operates any proposed lighting facilities based on a monthly charge to the **COUNTY**/Town of Chapin.

16.2.3 The **CONSULTANT** shall prepare and submit a working plan set showing the lighting layout, and supporting documentation showing compliance with current AASHTO standards.

16.2.3.1 The **CONSULTANT** shall coordinate with the local Utility Company to determine electrical service locations.

16.2.4 The **CONSULTANT** will update the cost estimate.

Appendix E. Resumes

LOU RAYMOND, PE, AICP
ENVIRONMENTAL PLANNER / PROJECT MANAGER

Lou has over 20 years of environmental experience in the transportation industry, including more than 15 years of direct experience with environmental planning projects and National Environmental Policy Act (NEPA) documentation while working in both the public and private sectors. During his time with the private sector, he directly coordinated and managed North Carolina Department of Transportation (NCDOT) Project Development and Environmental Analysis Branch (PDEA) projects including several high-profile projects as a project manager. He also coordinated and facilitated public involvement meetings. He has received specialized training in project management, new urbanism and context sensitive solutions (CSS), pedestrian accommodations in design, environmental justice, Section 4(f) and assessing indirect and cumulative impacts of transportation projects in North Carolina.

RELATED PROJECTS

Permitting, Low Country Bridge Package Contract, 2015
South Carolina Department of Transportation (SCDOT)
Various Counties in and around Charleston County

Lou served as the project manager for the SCDOT Low Country Bridge Permitting contract. Tasks involved for each bridge included identifying and locating wetlands and other jurisdictional waters of the US; preparing a Jurisdictional Determination (JD) request package; and coordinating with the US Army Corp of Engineers, US Fish and Wildlife, OCRM and other agencies to keep this project on schedule. This project was completed while Lou was with another firm.

Categorical Exclusion, NCDOT TIP R-2123CE (I-485/I-85 Interchange Modification), 2008
North Carolina Department of Transportation (NCDOT)
Charlotte, North Carolina

Lou served as the project manager for this categorical exclusion of the high-profile I-485/I-85 Interchange Modification project. Due to the high traffic volumes at this freeway-to-freeway interchange, a four-level interchange design was developed during the environmental analysis phase of project development. Project included natural resources studies including endanger species mitigation, complex traffic network analysis and interchange traffic analysis, Interchange Modification Report, design traffic noise analysis, MSAT air quality analysis and Community Impact Assessment and Indirect and Cumulative Effects technical reports. This project was completed while Lou was with another firm.

Categorical Exclusion, STIP U-4910 (Improvements to Derita Road), 2013
City of Concord, North Carolina
Concord, North Carolina

Lou served as the project manager and engineer of record for the categorical exclusion (CE) for the improvements Derita Road. Derita Road is a major north-south route from I-485 to the Concord Airport and Concord Mills Mall area (the largest tourist destination in NC) and is being widened from two to four lanes with medians and limited access control through superstreet design. The major design issue was the proposed changes to the access control for the businesses along the roadway and Concord Airport businesses. Project included traffic and signal design analysis, public involvement, natural resources studies, agency coordination and coordination with NCDOT. The City

Areas of Expertise

- National Environmental Policy Act (NEPA) Documentation
- Project Management
- Section 4(f) Documentation
- New Urbanism and Context Sensitive Solutions (CSS)
- Pedestrian Accommodations in Design

Linkedin url

- https://www.linkedin.com/pub/lou-raymond/72/1a7/93a

Education

- MS, Civil Engineering, University of North Carolina – Charlotte, 1999
- BS, Civil Engineering/Engineering and Public Policy, Carnegie Mellon University, 1993

Registration/Certification

- Licensed Professional Engineer – North Carolina (024466), South Carolina (20689)
- American Institute of Certified Planners (AICP) (023663)

Memberships

- American Planning Association
- American Society of Civil Engineers
- American Society of Highway Engineers

Past Employment

- AECOM Technical Services of North Carolina, Inc.
- ARCADIS G&M of North Carolina, Inc.
- PBS&J, Inc.
- STV/Ralph Whitehead Associates, Inc.
- TGS Engineers
- North Carolina Department of Transportation

No. of Years With Mead & Hunt

- Hired 8/9/2015

No. of Years With Other Firms

- 14

served as the Administrator of the project, but was project was an NCDOT roadway and will be maintained by NCDOT. This project was completed while Lou was with another firm.

Re-Evaluation Documentation, R-2536 (Asheboro Bypass and Zoo Connector), 2015
NCDOT PDEA
Randolph County, North Carolina
Lou served as the project manager and the engineer of record for two re-evaluation documents (2012 and 2015) on the Asheboro Bypass and Zoo Connector. The new bypass is a four-lane, controlled-access highway and is 14.6 miles in length. The Zoo Connector is 1.8 miles, making the entire project 16.4 miles. The first re-evaluation document evaluated design changes and environmental impacts, and the second re-evaluation document evaluated the re-design and inclusion of the Zoo Connector. This project was completed while Lou was with another firm.

Categorical Exclusion, STIP R-5516 (Improvements to Slocum Road), 2011
NCDOT PDEA
Havelock, North Carolina
Lou served as the project manager and the engineer of record for a categorical exclusion (CE) for improvements to US 70 and Slocum Road. The purpose of the project was to improve traffic congestion at the intersection of US 70 and Slocum Road and traffic flow into the Marine Corps Air Station (MCAS) Cherry Point by providing a flyover ramp over US 70 while avoiding a parallel railroad and minimizing traffic impacts to adjacent neighborhoods along US 70. Project included a proposed roadway network modification with a left-out superstreet, widening of US 70 and bicycle and pedestrian connectivity to a nearby school while maintaining close coordination with the City of Havelock and MCAS Cherry Point. Two public meetings and two local officials meetings were held through the development of the CE. This project was completed while Lou was with another firm.

Environmental Assessment, U-5502 (Realignment and Grade Separation of Carpenter Fire State Road), 2014
Town of Cary
Cary, North Carolina
Lou served as the engineer of record for the State Environmental Assessment and Finding of No Significant Impact (SEA/FONSI) documentation for this project to realign Carpenter Fire Station Road in Cary, North Carolina. The project was initially federally funded. Due to the potential Section 4(f) impacts to the Carpenter Historic District, the Town decided to fund the project locally. The roject required multiple agency coordination including NCDOT, SHPO and US Army Corps of Engineers. Tasks included traffic network analysis, development of a strong purpose and need, natural resources studies and property owner coordination. This project was completed while Lou was with another firm.■

MATTHEW DEWITT, PWS
ENVIRONMENTAL SCIENTIST

Matt Dewitt has over eleven years of experience in the environmental consulting industry and is a Professional Wetland Scientist (P.W.S.). Over the past five years, he has served exclusively on environmental activities related to transportation projects. He has specialized in Clean Water Act (CWA) permitting, National Environmental Policy Act (NEPA) documentation, project management, client management and regulatory agency coordination. He maintains strong relationships with the South Carolina Department of Transportation's (SCDOT) environmental management office, as well as other State and Federal agencies, including the US Army Corps of Engineers (USACE), the US Federal Highway Administration (USFHWA), the SC Department of Health and Environmental Control (SCDEC) and the State Historic Preservation Office (SHPO). In addition to regulatory activities and management tasks, Matt has performed numerous natural resources studies, including biological assessments, wetland delineations, jurisdictional determinations, mitigation planning, site identification and environmental compliance investigations throughout South Carolina, North Carolina and Georgia. His background also includes years of experience with AutoCAD, Microstation, Geographic Information Systems (GIS) software and Global Positioning Systems (GPS) technology.

RELATED PROJECTS

Interstate Widening, I-85 Widening Design-Build, On going
South Carolina Department of Transportation (SCDOT)
Cherokee County, South Carolina
Matt manages all aspects of natural resources surveys and documentation, including environmental field work collection, for this 16 mile interstate widening project along I-85 in Cherokee County. The scope of this project includes widening the highway from four lanes to six lanes, improving four interchanges, replacing a railroad crossing and raising the S-11-131 bridge overpass. Mead & Hunt services include hydrology, bridge and roadway design, field surveys, video pipe inspections and environmental services.

Interstate Interchange Design, Carolina Crossroads (I-20/I-26/I-126), On going
South Carolina Department of Transportation (SCDOT)
Columbia, South Carolina
Matt oversees all natural system investigation and permitting within the study area for this multi-interstate project. The Carolina Crossroads project area has been defined as a mainline corridor including I-20 from the Saluda River to the Broad River, I-26 from US 378 to Broad River Road and I-126 from Colonial Life Boulevard to I-26. The corridor is a major hub for Midlands commuters and serves as a primary route into and out of Columbia. Both I-20 and I-26 serve as major cargo routes in the Southeast, and I-26 is the main thoroughfare for recreational travel. In addition, I-26 is an important route for South Carolina business as Lowcountry ports transport their goods to Upstate manufacturers. Our team is tasked with developing a solution to alleviate traffic congestion for this corridor and develop and Environmental Impact Statement. The new design will improve mobility and safety in one of the most congested highway corridors in the state.

Road Widening and Bridge Replacements, Pole Branch Road, On going
York County
York County, South Carolina
Matt is currently managing all environmental services on this roadway improvement

Areas of Expertise
- Clean Water Act permitting
- Regulatory Coordination
- National Environmental Policy Act (NEPA) Documentation
- Wetland Delineations
- Threatened and Endangered Species Surveys
- Water Quality Sampling
- Environmental Compliance Studies
- Mitigation Planning

Education
- BS, Environmental and Natural Resources Management, Clemson University, 2007

Registration/Certification
- Professional Wetland Scientist (#002289)
- Certified Erosion Prevention and Sediment Control Inspector (#4017)
- Certified Site Inspector

Memberships
- Society of Wetland Scientists
- ACEC-SC

Past Employment
- Cushman Enterprises, LLC: 2005 – 2007
- Atkins: 2007 – 2009
- Civil Engineering Consulting Services, Inc.: 2009 – 2010
- STV, Inc.: 2011 – 2013
- Stantec Consulting: 2013 – 2014

No. of Years With Mead & Hunt
- Two

No. of Years With Other Firms
- Nine

and bridge replacement project. Responsibilities include the preparation of an Environmental Assessment (EA) pursuant to the National Environmental Policy Act (NEPA), jurisdictional determination, environmental studies and public involvement. Once constructed, the project will increase capacity, improve safety and enhance operational efficiency on SC 274 and S-177 (Pole Branch Road). Improvements consist of widening approximately 2.4 miles of roadway from its existing two-lane configuration. Specifically, SC 274 will be expanded to a 5-lane section from SC 49 to S-177, and S-177 will be expanded to a 3-lane section from SC 274 to Catawba Cove Drive. Additional improvements include adding capacity to the SC 274/S-177 Intersection to accommodate dual turning movements and the replacement of three existing bridges, one of which spans over a finger of Lake Wylie. Mead & Hunt is performing the road design, project management, utility coordination and environmental services. This project is the second ranked priority project in York County's 2011 Pennies for Progress Program.

Environmental NEPA & Permitting On-Call, On going
South Carolina Department of Transportation (SCDOT)
Various Counties, South Carolina

Matt is responsible for project management to maneuver SCDOT construction and maintenance projects through the NEPA process, permit acquisition and compliance. Our environmental team guides project managers to successfully navigate the state and federal regulations impacting their projects, aiming to balance the natural and built environment. Mead & Hunt has been under contract since 2011 to perform these environmental services statewide.

Environmental SCDOT On-Call, I-85 Bridge Replacements, 2014
South Carolina Department of Transportation (SCDOT)
Cherokee County, South Carolina

Matt was the environmental project manager for this project involving the replacement of dual bridges (northbound and southbound) located on I-85 over the Norfolk Southern Railroad. Mead & Hunt environmental staff prepared a Categorical Exclusion (Type C) in compliance with National Environmental Policy Act (NEPA) regulations on an expedited schedule. Services included evaluation of design alternatives, document preparation and environmental studies. The efforts of our team resulted in approval from the U.S. Federal Highway Administration (USFHWA) within 60 days of Notice to Proceed. Mead & Hunt staff also identified and located wetlands and other jurisdictional waters of the US, prepared a Jurisdictional Determination (JD) request package and continues to coordinate with the U.S. Army Corp of Engineers to keep this project on schedule.■

Appendix J

Traffic Noise Analysis

Traffic Noise Analysis Report for the Columbia Avenue Project (S-48)
Lexington County, South Carolina

Lexington County Project PQ13003-04/29/13S

PREPARED FOR:

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

PREPARED BY:
AECOM

NOVEMBER 2016

EXECUTIVE SUMMARY

The Code of Federal Regulations (CFR) Title 23, Part 772 contains the Federal Highway Administration (FHWA) traffic noise standards. The South Carolina Department of Transportation (SCDOT) has implemented these standards in its *Traffic Noise Abatement Policy*, effective on September 1, 2014. A traffic noise analysis is required for proposed Federal-aid highway projects that will construct a highway on new location or physically alter an existing highway, which will significantly change the horizontal and/or vertical alignment of the road or increase the number of through-traffic lanes. Traffic noise impacts are predicted for this project. Noise abatement measures have been considered for reducing or eliminating the traffic noise impacts in accordance with *SCDOT's Traffic Noise Abatement Policy*.

A preliminary noise analysis was performed on the Columbia Avenue (S-48) Project to determine the effect of the project on traffic noise levels in the immediate area. This investigation includes an inventory of existing noise sensitive land uses, and a field survey of background (existing) noise levels in the project study area. It also includes a comparison of the predicted noise levels and the background noise levels to determine if traffic noise impacts can be expected resulting from the proposed project. Traffic noise impacts are predicted for this project.

Traffic Noise Modeling software version 2.5 (TNM), a Federal Highway Administration (FHWA) traffic noise prediction model was used in the analysis to compare existing and future L_{eq}(h) noise levels. L_{eq}(h) is the average energy of a sound level over a one hour period. A-weighted decibels (dB(A)) are the units of measurement use in the study.

Existing noise measurements were taken in the vicinity of the project to quantify the existing acoustic environment and to provide a base for assessing the impacts of noise level increases. Model inputs include existing and proposed roadway characteristics, estimated traffic volumes, and receiver locations. The appendices contain information regarding the location of the receivers and the traffic volumes used for the modeled roadways.

Table A compares field measurements to modeled noise levels. The calculated noise levels for the measurement sites range from 53.2 to 67.7 dB(A). At six of the seven measurement sites, the difference between the calculated and field measured noise levels is 3.0 dB(A) or less. Site 7 did not provide an acceptable dB(A) difference between the noise model and field-collected noise level. This may be attributed to deteriorating weather conditions during the field measurements, including high wind gusts. Site 6 compares to Site 7 in road geometry, traffic conditions, distance from the roadway, and calculated noise levels. Site 6 L_{eq}(h) measures slightly higher than Site 7 due to higher traffic volumes. Therefore, it can be assumed that the model provided in TNM for the project area around Site 7 is sound and accurate, and that the substantial difference between the field-measured dB(A) and the modeled dB(A) is due to the weather conditions at the time of the measurements.

Table A: Existing TNM Calculated Noise Levels vs. Field Measurements

Site	Location	Field Measurement Noise Level (dB(A))	TNM Calculated Noise Level (dB(A))	Difference (dB(A))
1	432 East Boundary Street	55.0	53.2	1.8
2	232 Columbia Avenue	67.5	67.7	0.2
3	525 Columbia Avenue	64.3	61.9	2.4
4	596 Columbia Avenue	68.2	66.5	1.7
5	742 Columbia Avenue	63.3	64.2	0.9
6	324 Clark Street	68.9	67.1	1.8
7	195 Amicks Ferry Road	81.3	66.3	15.0

The FHWA has developed Noise Abatement Criteria (NAC) and procedures to be used in the planning and design of highways to determine whether highway noise levels are or are not compatible with various land uses. The abatement criteria and procedures set forth in the aforementioned Federal reference (Title 23 CFR Part 772). A summary of the noise abatement criteria for various land uses is presented in Table B.

Table B: Noise Abatement Criteria

Hourly Equivalent A-Weighted Sound Level (decibels (dB(A))				
Activity Category	Activity Criteria[1]		Evaluation Location	Activity Description
	$L_{eq(h)}$[2]	L10(h)[2]		
A	57	60	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B [3]	67	70	Exterior	Residential
C [3]	67	70	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, daycare centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section4(f) sites, schools, television studios, trails, and trail crossings
D	52	55	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios
E [3]	72	75	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F
F	--	--	--	Agriculture, airports, bus yards, emergency services, industrial, logging maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing
G	--	--	--	Undeveloped lands that are not permitted

1 The Activity Criteria values are for impact determination only, and are not design standards for noise abatement measures.
2 Either L_{eq}(h) or L10(h) (but not both) may be used on a project.
3 Includes undeveloped lands permitted for this activity category.

Activity Category A consists of tracts of land that are locally significant for their serenity and quiet surroundings, and typically require approval on a case-by-case basis. Activity Category B consists of residential properties. Activity Category C consists of exterior locations of public outdoor areas, places of worship, cemeteries, recreational areas, etc. Activity Category D consists primarily of the same activities as Activity Category C but for interior locations. Activity Category E consists of hotel/motels, offices, restaurants, and other developed land with activities not included in Activity Categories A-D. Activity F consists of agricultural lands, airports, and commercial/industrial facilities. Activity G is for undeveloped lands not presently permitted. Activity Categories adjacent to the project are mostly residential (B) and businesses (E).

Traffic noise impacts occur when the predicted traffic noise levels either: (a) approach or exceed the FHWA NAC ("approach" meaning within 1 dB(A) of the value listed in Table B), or (b) substantially exceed the existing noise levels. According to the *SCDOT Traffic Noise Abatement Policy*, a 15 dB(A) increase is deemed to be a "substantial increase." Consideration for noise abatement measures must be given to receivers that fall in either or both categories.

The results of the noise analysis indicate that traffic related noise impacts would occur for 20 to 29 receivers under the 2040 Build Scenario, based on the various alternatives analyzed. The number of receivers analyzed in the 2040 Build Alternatives analysis is dependent upon the various alternative alignments, and should be compared to the same corresponding receivers in the existing conditions and no-build analysis. In the entire project area, seven receivers are currently impacted by the 2015 Existing Conditions, and 24 receivers would be impacted under the 2040 No-Build Alternative. Table C shows the number of impacts and type of impact by alternative. It should be noted that several receivers within the study are locations that have been assigned "equivalent receivers" of two receivers or greater, which is due to these locations having a high occupancy of people during certain times of the day (churches, schools, daycare centers, etc). This was done in accordance with the *SCDOT Traffic Noise Abatement Policy*.

Table C: Traffic Noise Impacts

Alternative	Number of Impacted Receivers Approaching or Exceeding NAC Threshold							Substantial Noise Level Increase	Both Types of Impacts	Total Impacts	Total Receivers
	A	B	C	D	E	F	G				
2015 Existing	0	6	1	0	0	0	0	N/A	0	7	360
2040 No-Build	0	13	11	0	0	0	0	0	0	24	360
Alternative 9	0	15	11	0	0	0	0	1	0	27	279
Alternative 9A	0	11	11	0	0	0	0	1	0	23	309
Alternative 18	0	18	11	0	0	0	0	0	0	29	296
Alternative 18A	0	14	11	0	0	0	0	0	0	25	327
Alternative 25	0	11	9	0	0	0	0	0	0	20	235

Predicted build-condition traffic noise level contours are not a definitive means by which to assess traffic noise level impacts; however, they may aid in future land use planning efforts in undeveloped areas. Table D summarizes the predicted distances to the 72, 67, and 66 dB(A) noise level contours from the proposed outside edge of pavement. For an equal comparison across all build alternatives, the contour measurements were performed along Columbia Avenue just west of Chapin High School, where all build alternatives are similar in design characteristics.

Table D: Activity Category Critical Distances

Build Alternative	L_{eq}(h) Noise Levels			Activity Category Distances		
	50 ft.	100 ft.	150 ft.	72 dB(A)	67 dB(A)	66 dB(A)
All	66.5 dB(A)	62.5 dB(A)	60.2 dB(A)	5 ft.	45 ft.	55 ft.

If traffic noise impacts are predicted, noise abatement measures for reducing or eliminating the noise impacts must be considered. Consideration for noise abatement measures have been given to impacted receivers along each alternative. Noise abatement measures were evaluated for this project but were found not to be acoustically feasible since it would not provide at least a 5 dB(A) noise reduction to impacted receivers due to the number of required access breaks. Columbia Avenue is an arterial roadway that provides access to residents and businesses directly from the roadway, with very short segments between access points. Providing noise barriers between the access points would most likely prove to be ineffective due to the frequent breaks the barriers would be required to maintain. As a general rule, an opening of 40 feet in a 400-foot wall will make the wall ineffective.

The major construction elements of this project are expected to be earth removal, hauling, grading, paving, and pile driving. General construction noise impacts, such as temporary speech interference for passers-by and those individuals living or working near the project, can be expected during construction. However, considering the relatively short-term nature of construction noise and the likely limitation of construction to daytime hours, these impacts are not expected to be substantial. The contractor would be required to comply with applicable local noise ordinances and Occupational Safety and Health Administration (OSHA) regulations concerning noise attenuation devices on construction equipment.

This evaluation completes the highway traffic noise requirements of Title 23 CFR Part 772.

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APPENDICES

I. INTRODUCTION

The Code of Federal Regulations (CFR) Title 23, Part 772 contains the Federal Highway Administration (FHWA) traffic noise standards. The South Carolina Department of Transportation (SCDOT) has implemented these standards in its *Traffic Noise Abatement Policy*, Effective on September 1, 2014. A traffic noise analysis is required for proposed Federal-aid highway projects that will construct a highway on new location or physically alter an existing highway, which will significantly change either the horizontal and/or vertical alignment of the road or increase the number of through-traffic lanes. Traffic noise impacts are predicted for this project. Noise abatement measures have been considered for reducing or eliminating the traffic noise impacts in accordance with *SCDOT's Traffic Noise Abatement Policy*.

A preliminary noise analysis was performed on the Columbia Avenue Project to determine the effect of the project on traffic noise levels in the immediate area (Figure 1). This investigation includes an inventory of existing noise sensitive land uses, and a field survey of background (existing) noise levels in the project study area. It also includes a comparison of the predicted noise levels and the background noise levels to determine if traffic noise impacts can be expected resulting from the proposed project. Traffic noise impacts are predicted for this project.

II. PROJECT DESCRIPTION

The project begins along Columbia Avenue just east of the I-26 interchange, and extends westward into downtown Chapin. The project would widen Columbia Avenue providing additional capacity and operational improvements between Chapin and I-26, and to points between. The project consists of five proposed build alternatives and a No-Build Alternative. The project is approximately 2.0 miles in length. Figure 2 shows the project study area, including noise sensitive locations studied as a part of this task.

III. CHARACTERISTICS OF NOISE

Noise is basically defined as unwanted sound. It is emitted from many sources including airplanes, factories, railroads, power generating plants, and roadway vehicles. Roadway noise, or traffic noise, is usually a composite of noises from engine exhaust, drive train, and tire-roadway interaction. Of these sources, tire noise is typically the most offensive at unimpeded travel speeds.

The magnitude of noise is usually described by its sound pressure. Since the range of sound pressure varies greatly, a logarithmic scale is used to relate sound pressures to some common reference level, usually the decibel (dB). Sound pressures described in decibels are called sound pressure levels and are often defined in terms of frequency-weighted scales (A, B, C, or D).

The weighted-A scale is used almost exclusively in vehicle noise measurements because it places the most emphasis on the frequency characteristics that correspond to a human's subjective response to noise. Sound levels measured using A-weighting are often expressed as dB(A). Throughout this report, references will be made to dB(A), which means an A-weighted decibel level. Several examples of noise pressure levels in dB(A) are listed in Table 1.

Review of Table 1 indicates that most individuals in urbanized areas are exposed to fairly high noise levels from many sources as they go about their daily activities. The degree of disturbance or annoyance of unwanted sound depends essentially on three things:

- The amount and nature of the intruding noise;
- The relationship between the background noise and the intruding noise; and
- The type of activity occurring when the intruding noise is heard.

In considering the first of these three factors, it is important to note that individuals have different hearing sensitivity to noise. Loud noises bother some people more than others and some individuals become angered if an unwanted noise persists. The time patterns of noise also enter into a person's judgment of whether or not a noise is objectionable. For example, noises that occur during sleeping hours are usually considered to be more objectionable than the same noises in the daytime.

With regard to the second factor, individuals tend to judge the annoyance of an unwanted sound in terms of its relationship to noise from other sources (background noise). The blowing of a car or truck horn at night, when background noise levels are approximately 45 dB(A), would generally be much more objectionable than the blowing of a car or truck horn in the afternoon, when background noise levels might be 55 dB(A).

Table 1. Noise Pressure Level Examples

	140	Shotgun blast, jet 30m away at takeoff	PAIN
		Motor test chamber	HUMAN EAR PAIN THRESHOLD
	130 ----	----------	----------
		Firecrackers	
	120	Severe thunder, pneumatic jackhammer	
		Hockey crowd	
		Amplified rock music	UNCOMFORTABLY LOUD
	110 ----	----------	----------
		Textile loom	
	100	Subway train, elevated train, farm tractor	
		Power lawn mower, newspaper press	
		Heavy city traffic, noisy factory	LOUD
	90 ----	----------	----------
D		Diesel truck 65 km/h at 15m away	
E	80	Crowded restaurant, garbage disposal	
C		Average factory, vacuum cleaner	
I		Passenger car 80 km/h at 15m away	MODERATELY LOUD
B	70 ----	----------	----------
E		Quiet typewriter	
L	60	Singing birds, window air-conditioner	
S		Quiet automobile	
		Normal conversation, average office	QUIET
	50 -----	----------	----------
		Household refrigerator	
		Quiet office	VERY QUIET
	40 -----	----------	----------
		Average home	
	30	Dripping faucet	
		Whisper at 1.5m away	
	20	Light rainfall, rustle of leaves	

		AVERAGE PERSON'S THRESHOLD OF HEARING
	Whisper	JUST AUDIBLE
10 -----	---	
0		THRESHOLD FOR ACUTE HEARING

Sources: World Book, Rand McNally Atlas of the Human Body, Encyclopedia America, "Industrial Noise and Hearing Conversation" by J. B. Olishifski and E. R. Harford (Researched by N. Jane Hunt and published in the Chicago Tribune in an illustrated graphic by Tom Heinz.)

The third factor is related to the disruption of an individual's activities due to noise. In a 60 dB(A) environment, normal conversation would be possible while sleep might be difficult. Work activities requiring high levels of concentration may be interrupted by loud noises while activities requiring manual effort may not be interrupted to the same degree.

Over a period of time, individuals tend to accept the noises that intrude into their daily lives, particularly if the noises occur at predicted intervals and are expected. Attempts have been made to regulate many of these types of noises including airplane noises, factory noise, railroad noise, and roadway traffic noise. In relation to roadway traffic noise, methods of analysis and control have developed rapidly over the past few years.

IV. NOISE ABATEMENT CRITERIA

The FHWA has developed Noise Abatement Criteria (NAC) and procedures to be used in the planning and design of highways to determine whether highway noise levels are or are not compatible with various land uses. The abatement criteria and procedures set forth in the aforementioned Federal reference (Title 23 CFR Part 772). A summary of the noise abatement criteria for various land uses is presented in Table 2.

Table 2: Noise Abatement Criteria

Hourly Equivalent A-Weighted Sound Level (decibels (dB(A))				
Activity Category	Activity Criteria[1]		Evaluation Location	Activity Description
	$L_{eq(h)}$[2]	L10(h)[2]		
A	57	60	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B [3]	67	70	Exterior	Residential
C [3]	67	70	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, daycare centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section4(f) sites, schools, television studios, trails, and trail crossings
D	52	55	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios
E [3]	72	75	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F
F	--	--	--	Agriculture, airports, bus yards, emergency services, industrial, logging maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing
G	--	--	--	Undeveloped lands that are not permitted

1 The Activity Criteria values are for impact determination only, and are not design standards for noise abatement measures.
2 Either L_{eq}(h) or L10(h) (but not both) may be used on a project.
3 Includes undeveloped lands permitted for this activity category.

Activity Category A consists of tracts of land that are locally significant for their serenity and quiet surroundings. Activity Category B consists of residential properties. Activity Category C consists of exterior locations of public outdoor areas, places of worship, cemeteries, recreational areas, etc. Activity Category D consists primarily of the same activities as Activity Category C but for interior locations. Activity Category E consists of hotel/motels, offices, restaurants, and other developed land with activities not included in Activity Categories A-D. Activity F consists of agricultural lands, airports, and commercial/industrial facilities. Activity G is for undeveloped lands not presently permitted. Activity Categories adjacent to the project are most residential (B) and businesses (E).

Sound pressure levels in this report are referred to as L_{eq}(h). The hourly L_{eq}, or equivalent sound level, is the level of constant sound in a one-hour time period that would have the same energy as a time-varying sound. In other words, the fluctuating sound levels of traffic noise are represented in terms of a steady noise level with the same energy content.

V. Existing Noise Levels

Existing noise measurements were taken in the vicinity of the project to quantify the existing acoustic environment and to provide a base for assessing the impacts of noise level increases. The following seven traffic noise measurement sites were used to measure existing noise levels:

- Site 1 – 432 East Boundary Street, approximately 35 ft. from road, 5 ft. off ground
- Site 2 – 232 Columbia Avenue, approximately 20 ft. from road, 5 ft. off ground
- Site 3 – 525 Columbia Avenue, approximately 75 ft. from road, 5 ft. off ground
- Site 4 – 596 Columbia Avenue, approximately 45 ft. from road, 5 ft. off ground
- Site 5 – 742 Columbia Avenue, approximately 20 ft. from road, 5 ft. off ground
- Site 6 – 324 Clark Street, approximately 35 ft. from Lexington Avenue, 5 ft. off ground
- Site 7 – 195 Amicks Ferry Road, approximately 30 ft. from road, 5 ft. off ground

The existing L_{eq}(h) traffic noise levels, as measured at each site, are found below in Table 3.

Table 3: Existing Noise Levels (L_{eq}(h))

Site	Location	Description	Noise Level (dB(A))
1	432 East Boundary Street	Soft ground / pine straw	55.0
2	232 Columbia Avenue	Grass	67.5
3	525 Columbia Avenue	Parking lot	64.3
4	596 Columbia Avenue	Gravel lot	68.2
5	742 Columbia Avenue	Grass / dirt	63.3
6	324 Clark Street	Grass	68.9
7	195 Amicks Ferry Road	Grass / parking lot	81.3

The existing roadway and traffic conditions were used with the current traffic noise prediction model (TNM version 2.5, February 2004) to calculate existing noise levels for comparison with actual measured noise levels. Project-related traffic noise level increases are based upon the existing loudest-hour noise levels. See Table 4 for more information about the field measurements.

Table 4: Field Noise Measurements

Site	Time Period	Hourly Traffic Based on Concurrent Traffic Counts										Measured L_{eq}
		Near Travel Lane(s)					Far Travel Lane(s)					
		Autos	MT	HT	Bus	MC	Autos	MT	HT	Bus	MC	
1	3:16 PM – 3:31 PM	52	0	0	0	0	52	0	0	0	0	55.0
2	3:41 PM – 3:56 PM	734	12	6	4	0	734	12	6	4	0	67.5
3	4:10 PM – 4:25 PM	540	8	0	0	0	540	8	0	0	0	64.3
4	4:43 PM – 4:58 PM	580	8	8	2	0	580	8	8	2	0	68.2
5	5:06 PM – 5:21 PM	154	0	0	0	0	154	0	0	0	0	63.3
6	5:03 PM – 5:18 PM	423	0	0	3	0	423	0	0	3	0	68.9
7	5:39 PM – 5:54 PM	276	9	0	0	0	276	9	0	0	0	81.3

Table 5 compares field measurements to modeled noise levels. The calculated noise levels for the measurement site range from 53.2 to 67.7 dB(A). At six of the seven measurement sites, the difference between the calculated and field measured noise levels is 3.0 dB(A) or less. Site 7 did not provide an acceptable dB(A) difference between the noise model and field-collected noise level. This may be attributed to deteriorating weather conditions during the field measurements, including high wind gusts. Site 6 compares to Site 7 in road geometry, traffic conditions, distance from the roadway, and calculated noise levels . Site 6 L_{eq}(h) measures slightly higher than Site 7 due to higher traffic volumes. Therefore, it can be assumed that the model provided for the project area around Site 7 is sound and accurate, and that the substantial difference between the field-measured dB(A) and the modeled dB(A) is due to the weather conditions at the time of the measurements.

Table 5: Existing TNM Calculated Noise Levels vs. Field Measurements

Site	Location	Field Measurement Noise Level (dB(A))	TNM Calculated Noise Level (dB(A))	Difference (dB(A))
1	432 East Boundary Street	55.0	53.2	1.8
2	232 Columbia Avenue	67.5	67.7	0.2
3	525 Columbia Avenue	64.3	61.9	2.4
4	596 Columbia Avenue	68.2	66.5	1.7
5	742 Columbia Avenue	63.3	64.2	0.9
6	324 Clark Street	68.9	67.1	1.8
7	195 Amicks Ferry Road	81.3	66.3	15.0

VI. PROCEDURE FOR PREDICTING FUTURE NOISE LEVELS

Based on the *SCDOT Traffic Noise Abatement Policy*, a preliminary noise analysis is required for all build alternatives determined to be reasonable and under consideration in a project's National Environmental Policy Act of 1969 (NEPA) document. The preliminary analysis models the most conservative noise environment to determine if there will be noise impacts, and if there are, the feasibility and reasonableness of noise abatement to mitigate the impacts. The elevations of receiver locations and roadway characteristics *are not* taken into account in a preliminary noise analysis (i.e. everything is considered to be flat and at the same elevation.

Once a preferred alternative has been identified, a detailed noise analysis is required for any noise abatement that was recommended for that alternative in the preliminary analysis. Elevations of the receivers and roadway *are* taken into account in a detailed analysis.

Traffic noise is not constant and varies in time depending upon the number, speed, type, and frequency of vehicles that pass by a given receiver. Furthermore, since traffic noise emissions are different for various types of vehicles, the TNM model distinguishes between the location and strength of noise emissions from the following vehicle types: automobiles, medium trucks, heavy trucks, buses, and motorcycles. The TNM traffic noise prediction model uses the number, type, and speed of vehicles on the planned roadway, the physical characteristics of the road (curves, hills, depressed roadways, elevated roadways, etc.), receiver location and height, and, if applicable, barrier type, barrier ground elevation, and barrier top elevation.

Conceptual designs and aerial photography were used to model the proposed roadways and receivers. The noise predictions made in this report are highway-related noise predictions for the traffic conditions during the year 2040. They only predict roadway noises and do not include noise emitting from secondary sources.

For the 2040 Build alternatives, the interchange configuration at Interstate 26 and Columbia Avenue was modeled as it is currently, which is a spread diamond configuration. After the traffic noise models were constructed and used to determine traffic noise impacts, it was determined that the interchange configuration would be updated to a diverging diamond for the 2040 Build Scenario. However, since this configuration does not substantially alter the traffic characteristics at this location, and because no receivers were impacted in this area based on the spread diamond configuration, it was determined that the traffic noise models with a spread diamond interchange configuration at Interstate 26 and Columbia Avenue would be sufficient for the traffic noise analysis.

During the traffic noise analysis, updated designs for Alternative 9A were provided, which indicated the addition of a northbound turn lane at the intersection of Lexington Avenue and Columbia Avenue. While this design improvement was only shown in Alternative 9A, it is assumed, due to similar traffic characteristics, that Alternatives 9, 18, and 18A would also include the additional turn lane at Lexington Avenue. Therefore, this improvement has been assumed in the traffic noise models for all four of these 2040 Build alternatives.

According to FHWA guidance, the predictions documented in this report are based upon each proposed roadway alignment design and traffic conditions for the year 2040, resulting in the loudest predicted hourly-equivalent traffic noise levels for each receiver. Traffic noise level and location spreadsheets are included in Appendix C and contain a list of all receivers in close proximity to the project along with aerials showing the receiver locations, and summarize the loudest hour equivalent noise levels for the Existing, No-Build, and Build conditions in the year 2040 under traffic conditions within the project area. The land uses of receivers were determined by field observations and reviewing available GIS parcel data.

Appendix B lists the traffic data used in the noise analysis. This data is based on traffic projections approved by SCDOT.

VII. TRAFFIC NOISE IMPACTS AND NOISE THRESHOLDS

Traffic noise impacts occur when the predicted traffic noise levels either: (a) approach or exceed the FHWA NAC ("approach" meaning within 1 dB(A) of the value listed in Table 2), or (b) substantially exceed the existing noise levels. According to the *SCDOT Traffic Noise Abatement Policy*, a 15 dB(A) increase is deemed to be a "substantial increase." Consideration for noise abatement measures must be given to receivers that fall in either or both categories.

The results of the noise analysis indicate that traffic related noise impacts would occur for 20 to 29 receivers under the 2040 Build Scenario, based on the various alternatives analyzed. The number of receivers analyzed in the 2040 Build Alternatives analysis is dependent upon the various alternative alignments, and should be compared to the same corresponding receivers in the existing conditions and no-build analysis. In the entire project area, seven receivers are currently impacted by the 2015 existing conditions, and 24 receivers would be impacted under the 2040 No-Build Alternative. Table 6 shows the number of impacts and type of impact by alternative. Figures 3 through 9 show the impacts graphically. It should be noted that several receivers within the study are locations that have been assigned "equivalent receivers" of two receivers or greater, which is due to these locations having a high occupancy of people during certain times of the day (churches, schools, daycare centers, etc). This was done in accordance with the *SCDOT Traffic Noise Abatement Policy*.

Table 6: Traffic Noise Impacts

Alternative	Number of Impacted Receivers Approaching or Exceeding NAC Threshold							Substantial Noise Level Increase	Both Types of Impacts	Total Impacts	Total Receivers
	A	B	C	D	E	F	G				
2015 Existing	0	6	1	0	0	0	0	N/A	0	7	360
2040 No-Build	0	13	11	0	0	0	0	0	0	24	360
Alternative 9	0	15	11	0	0	0	0	1	0	27	279
Alternative 9A	0	11	11	0	0	0	0	1	0	23	309
Alternative 18	0	18	11	0	0	0	0	0	0	29	296
Alternative 18A	0	14	11	0	0	0	0	0	0	25	327
Alternative 25	0	11	9	0	0	0	0	0	0	20	235

Predicted build-condition traffic noise level contours are not a definitive means by which to assess traffic noise level impacts; however, they can aid in future land use planning efforts in undeveloped areas. Table 7 summarizes the predicted distances to the 72, 67, and 66 dB(A) noise level contours from the proposed outside edge of pavement. For an equal comparison across all build alternatives, the contour measurements were performed along Columbia Avenue just west of Chapin High School, where all build alternatives are similar in design characteristics.

Table 7: Activity Category Critical Distances

Build Alternative	L_{eq}(h) Noise Levels			Activity Category Distances		
	50 ft.	100 ft.	150 ft.	72 dB(A)	67 dB(A)	66 dB(A)
9	66.5 dB(A)	62.5 dB(A)	60.2 dB(A)	5 ft.	45 ft.	55 ft.
9A	66.5 dB(A)	62.5 dB(A)	60.2 dB(A)	5 ft.	45 ft.	55 ft.
18	66.5 dB(A)	62.5 dB(A)	60.2 dB(A)	5 ft.	45 ft.	55 ft.
18A	66.5 dB(A)	62.5 dB(A)	60.2 dB(A)	5 ft.	45 ft.	55 ft.
25	66.5 dB(A)	62.5 dB(A)	60.2 dB(A)	5 ft.	45 ft.	55 ft.

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VIII. TRAFFIC NOISE ABATEMENT MEASURES

If traffic noise impacts are predicted, noise abatement measures for reducing or eliminating the noise impacts must be considered. Consideration for noise abatement measures have been given to impacted receivers along each alternative. The following discussion addresses the applicability of these measures to the proposed project.

a. NOISE BARRIERS

Physical measures to abate anticipated traffic noise levels are often applied on fully controlled facilities using solid mass berms or walls strategically placed between the traffic sound source and the receivers to diffract, absorb, and reflect highway traffic noise emissions. To be effective, a noise barrier must be long enough and tall enough to shield the impacted receiver(s). Generally, the noise wall length must be eight times the distance from the barrier to the receiver. For example, if a receiver is 150 feet from the roadway, an effective barrier would be approximately 1,200 feet long – with the receiver in the horizontal center. Due to the requisite lengths for effectiveness, noise walls are typically not economical for isolated or most low-density areas, or for most uncontrolled access facilities. On facilities where access is allowed for driveways, openings will be needed in the walls. An access opening of 40 feet in a 400-foot wall will make the wall ineffective.

According to the *SCDOT Traffic Noise Abatement Policy*, a noise wall must be considered both reasonable and feasible. The feasibility of a wall is determined by constructability of the wall given the topography, presence of other dominant noise sources, and at least a 5 dB(A) noise reduction must be achieved for 75% of the impacted receivers. Construction of a noise wall is considered reasonable if the cost per benefited receiver is less than $30,000 and if other applicable criteria are met.

b. HIGHWAY ALIGNMENT SELECTION

Highway alignment selection involves the horizontal or vertical orientation of the proposed improvements in such a way as to minimize impacts and costs. The selection of alternative alignments for noise abatement purposes must consider the balance between noise impacts and other engineering and environmental parameters. For noise abatement, horizontal alignment selection is primarily a matter of constructing the proposed roadway at a sufficient distance from noise sensitive areas. At this stage in the project, the shifting of roadway alignments is not considered a practical option since this is a preliminary noise study. The option of shifting roadway alignments will be reviewed once a preferred alternative has been selected and a detailed traffic noise analysis is performed.

c. Traffic System Management Measures

Traffic System Management (TSM) measures, which limit vehicle type, speed, volume and time of operations are often effective noise abatement measures. Past project experience has shown that a reduction in the speed limit of 10 mph would result in a noise level reduction of approximately 1 to 2 dB(A). Further reducing the speed limit would not be appropriate for the functional classification for this project, and limiting the types of vehicles and times of day would re-route traffic to locations where traffic noise is more detrimental than the project location.

d. Other Mitigation Measures Considered

The acquisition of property in order to provide buffer zones to minimize noise impacts is not considered to be a feasible noise mitigation measure. The cost to acquire impacted receivers for buffer zones would exceed the abatement threshold of $30,000 per benefitted receiver. The use of vegetation for noise mitigation is not considered reasonable for projects due to the substantial amount of right-of-way necessary to make vegetative barriers effective. FHWA research has shown that a vegetative barrier should be approximately 100 feet wide to provide 3 dB(A) reduction in noise levels.

IX. Construction Noise

The major construction elements of this project are expected to be earth removal, hauling, grading, paving, and pile driving. General construction noise impacts, such as temporary speech interference for passers-by and those individuals living or working near the project, can be expected during construction. However, considering the relatively short-term nature of construction noise and the likely limitation of construction to daytime hours, these impacts are not expected to be substantial. The contractor would be required to comply with applicable local noise ordinances and Occupational Safety and Health Administration (OSHA) regulations concerning noise attenuation devices on construction equipment.

X. Lexington County Planning Officials

Lexington County Planning and GIS Department
212 South Lake Drive, Suite 302
Lexington, SC 29072

XI. Summary

A detailed analysis was performed for the detail study alternatives. The results of the noise analysis indicate that traffic related noise impacts would occur to 20 to 29 receivers based on the build alternative selected. Seven receivers in the project area are currently impacted, and 24 receivers would be impacted under the 2040 No-Build Alternative. Noise abatement measures were evaluated for this project but were found not to be acoustically feasible since it would not provide at least a 5 dB(A) noise reduction to impacted receivers due to the number of required access breaks and isolated nature of the receivers.

This evaluation completes the highway traffic noise requirements of Title 23 CFR Part 772.

XII. REFERENCES

Federal Highway Administration. *Highway Traffic Noise Analysis and Abatement Policy and Guidance*. 2010.

Federal Highway Administration. *CFR 23 Part 772 – Procedures for Abatement of Highway Traffic Noise and Construction Noise*. [75 FR 39820-39838, July 13, 2010].

South Carolina Department of Transportation. *Traffic Noise Abatement Policy*. August 2014.

Lee, Cynthia S.Y. and Fleming, Gregg G. *Measurement of Highway-Related Noise*. U.S. Department of Transportation Research and Special Programs Administration John A. Volpe National Transportation Systems Center Acoustics Facility, DTS-75. Cambridge, MA. May 1996.

FIGURES

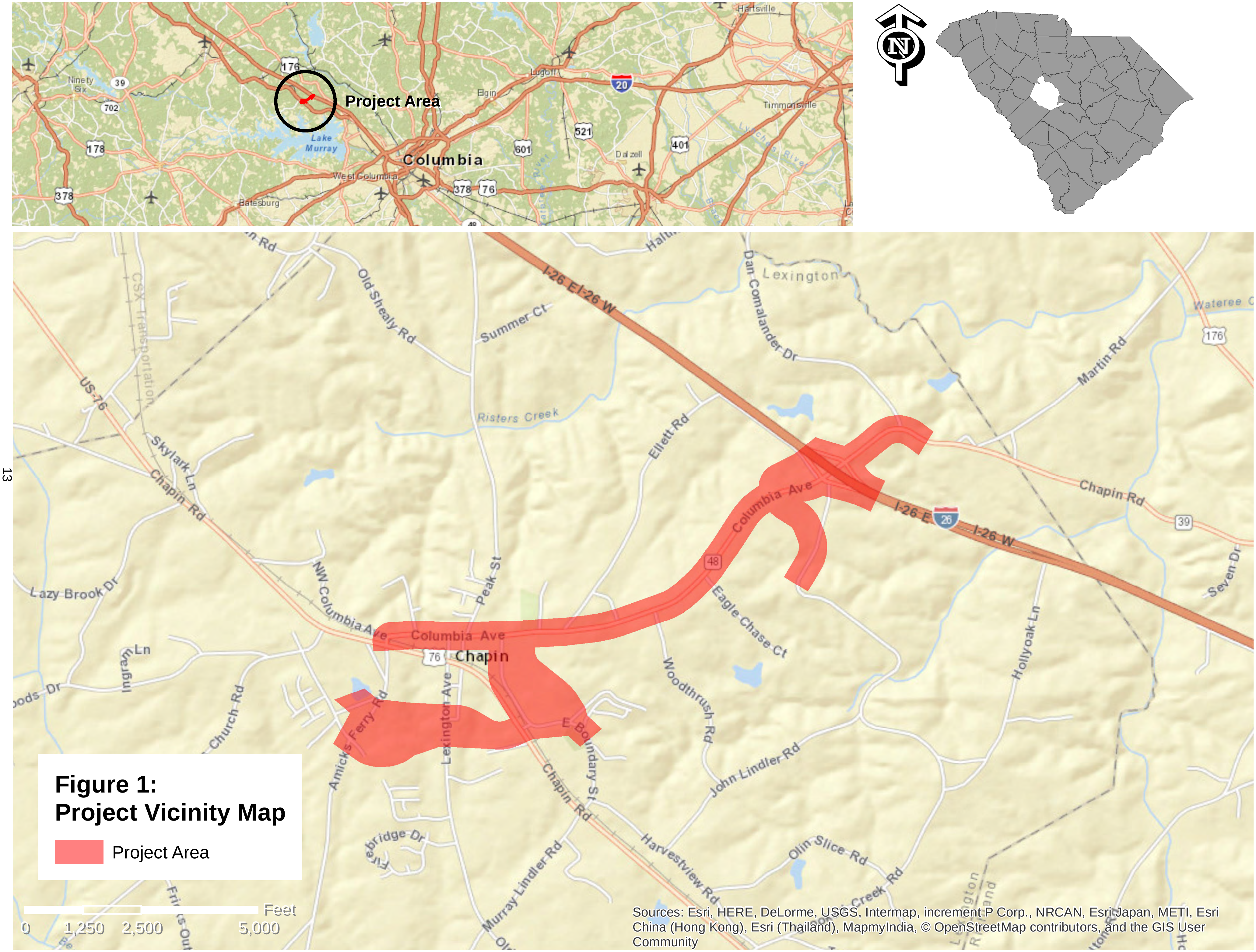
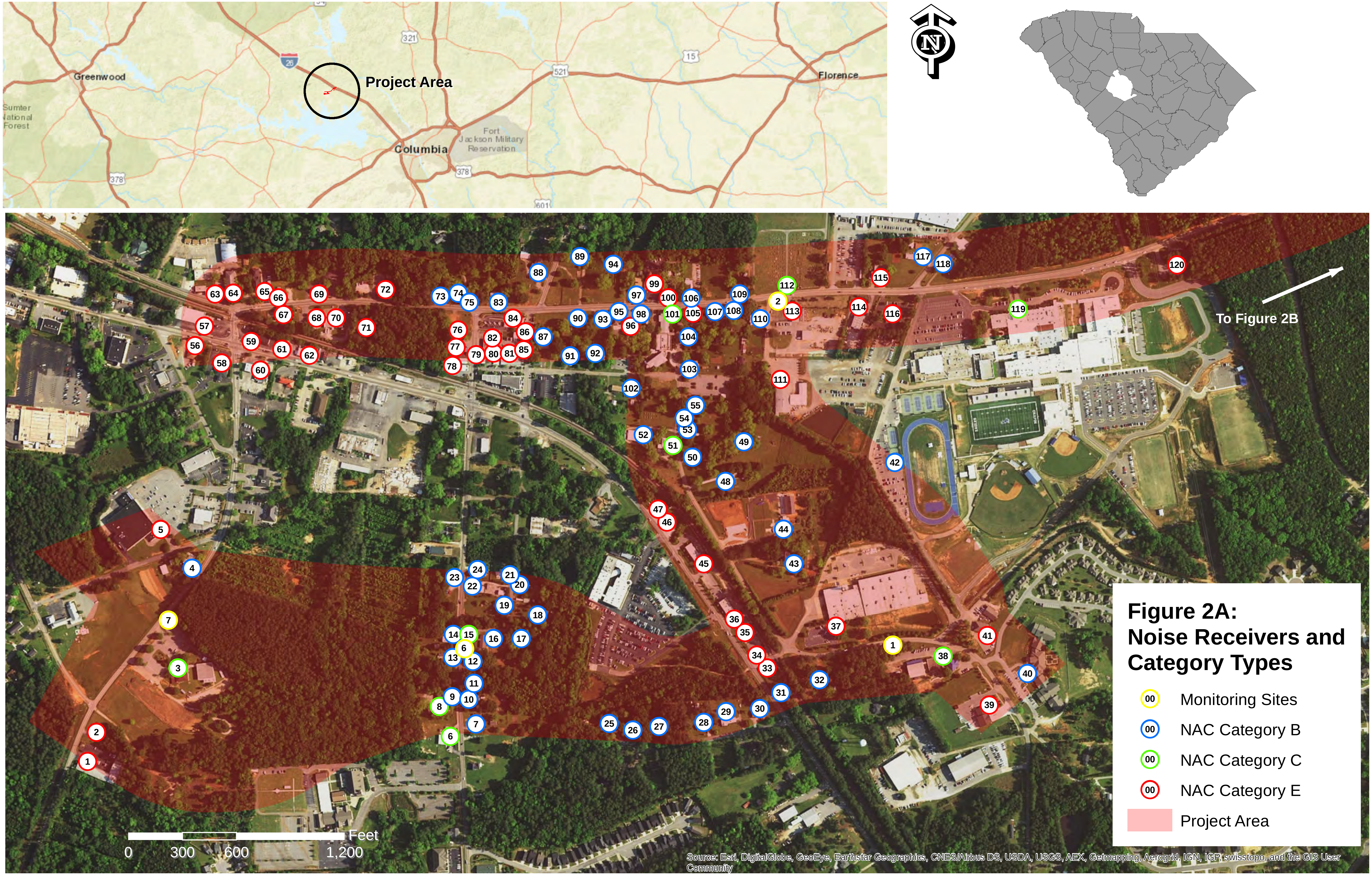


Figure 1:
Project Vicinity Map

Project Area


Greenwood
Project Area
Florence
Sumter National Forest
Columbia
Fort Jackson Military Reservation
To Figure 2B
Figure 2A:
Noise Receivers and Category Types
Monitoring Sites
NAC Category B
NAC Category C
NAC Category E
Project Area
Feet
0 300 600 1,200
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Project Area
Greenwood
Sumter National Forest
Columbia
Fort Jackson Military Reservation
Florence
321
15
521
26
378
601

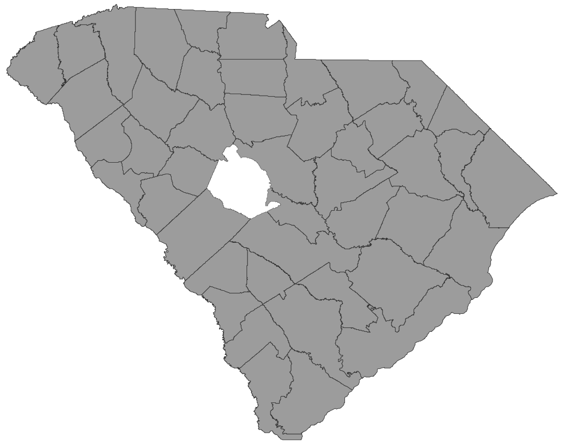


Figure 2B:
Noise Receivers and Category Types
00 Monitoring Sites
00 NAC Category B
00 NAC Category C
00 NAC Category E
Project Area
3
4
5
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
To Figure 2A
Feet
0
325
650
1,300
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

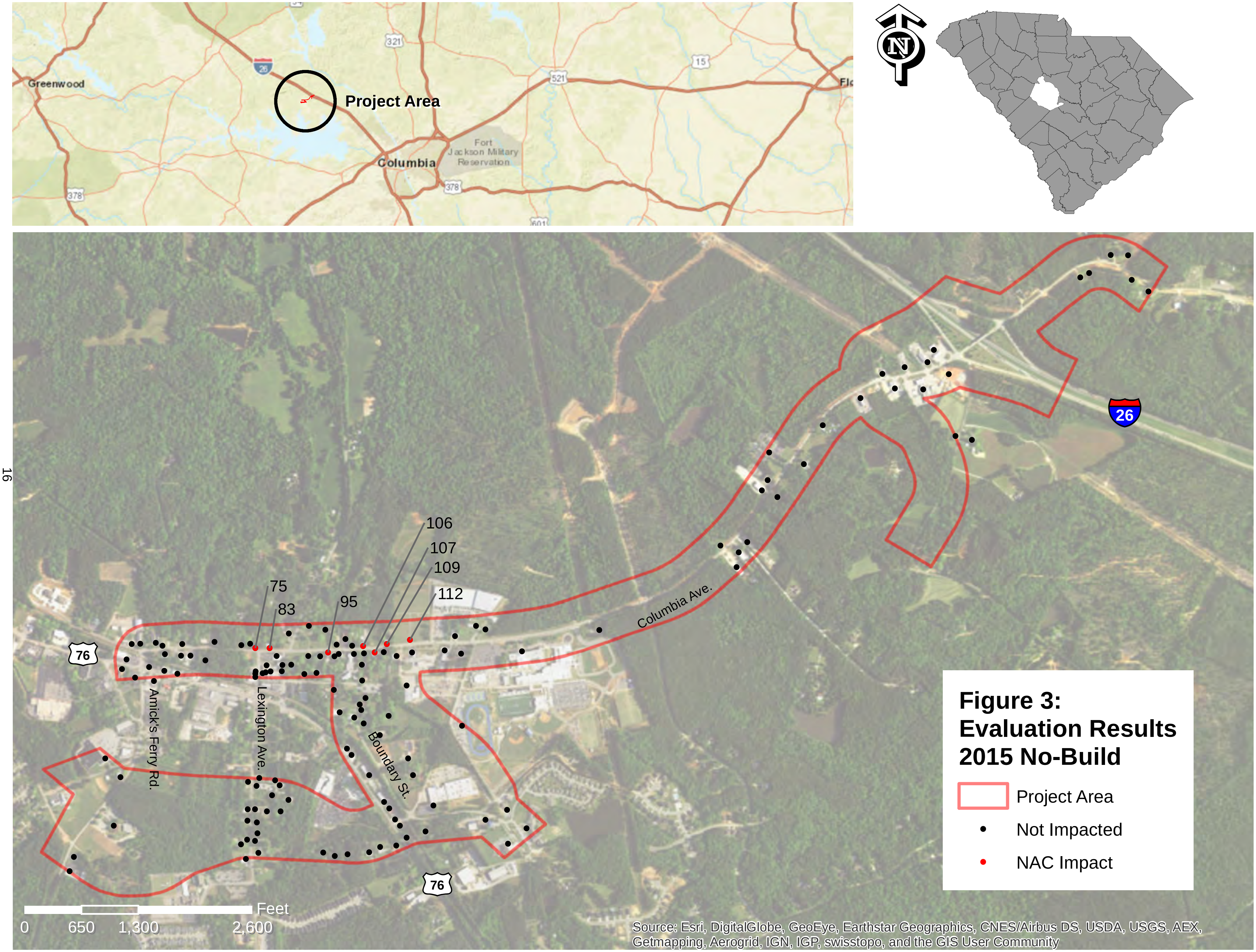
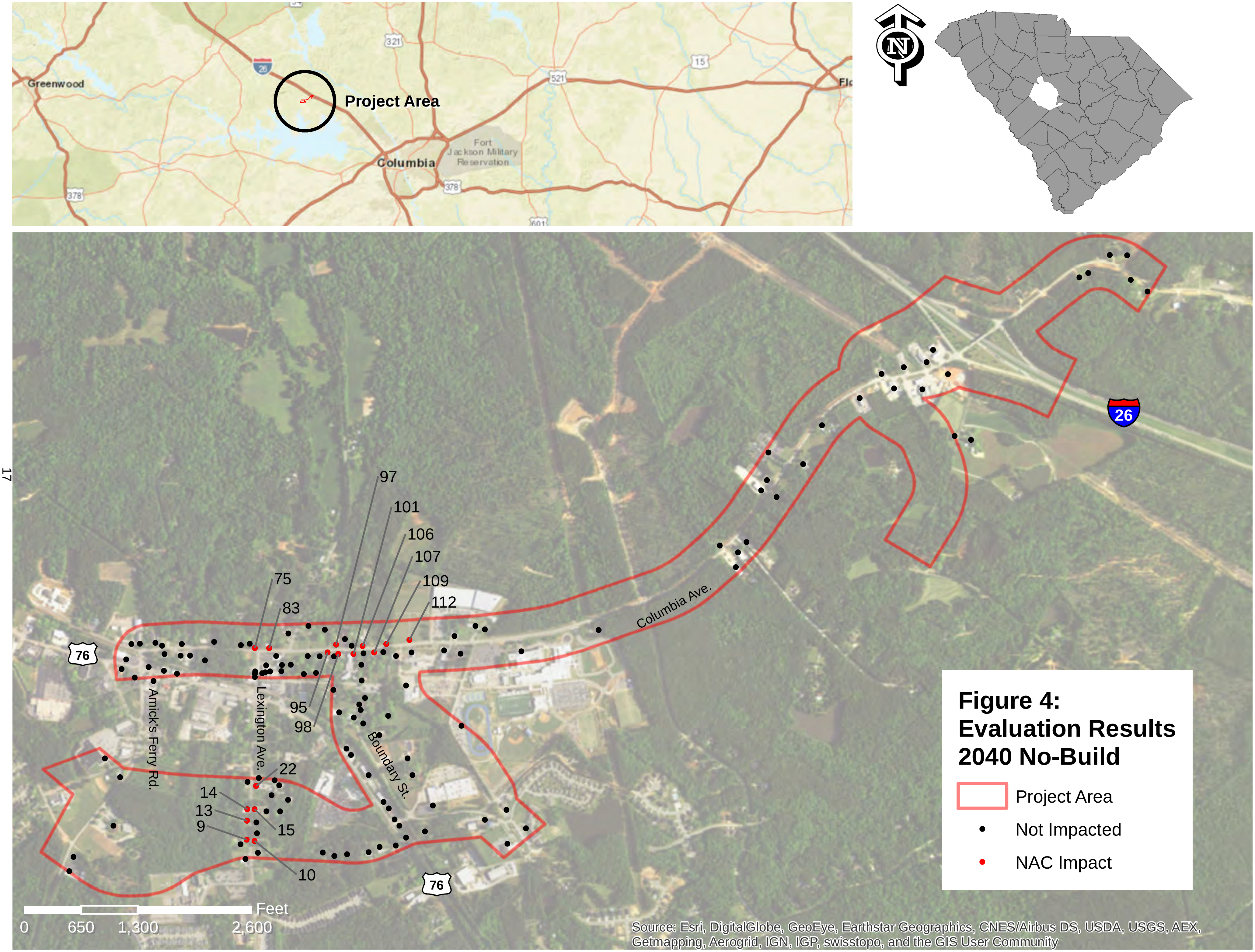
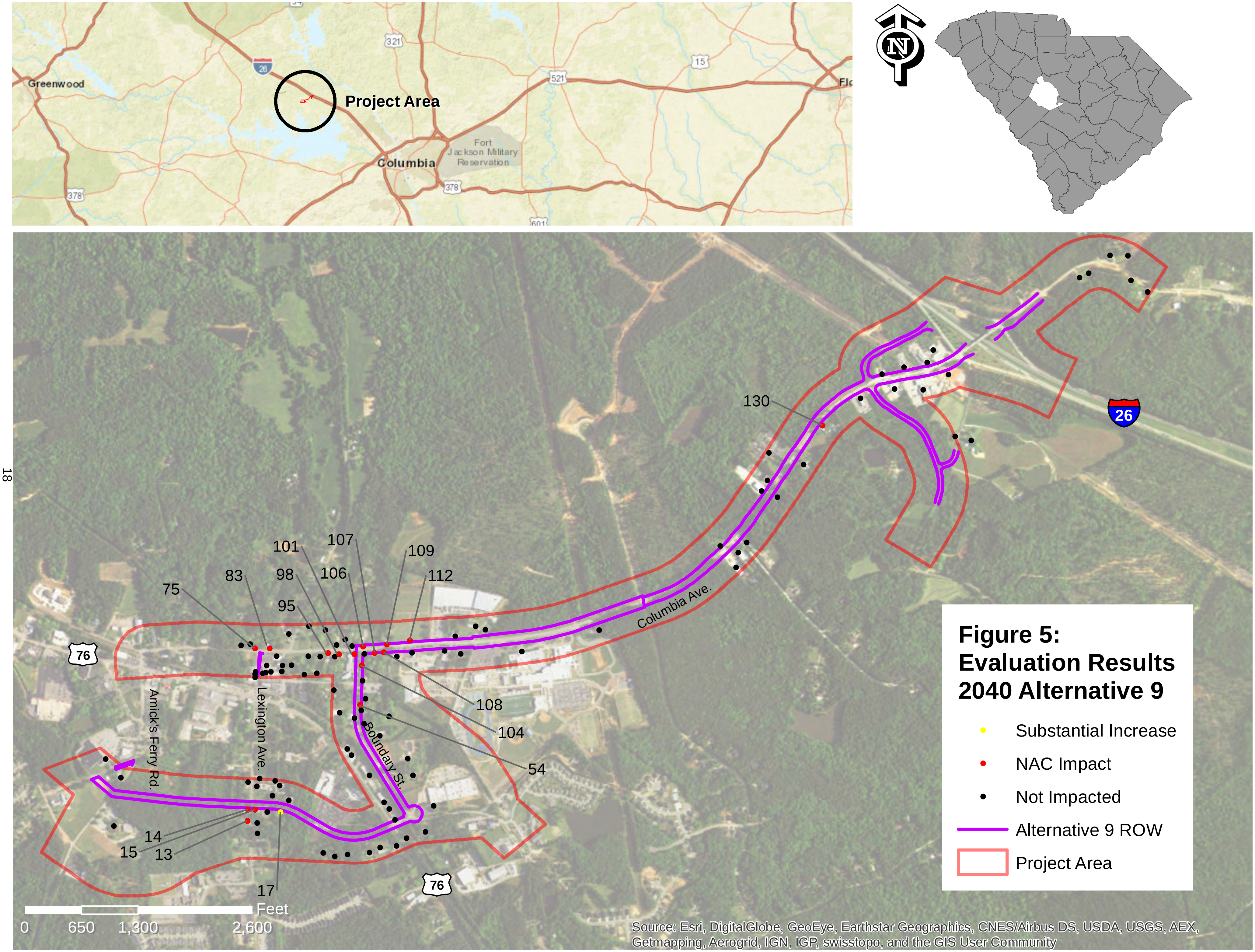
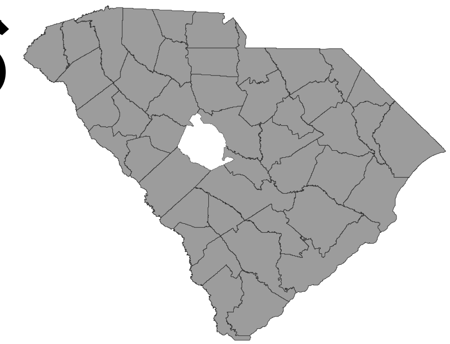


Figure 3:
Evaluation Results
2015 No-Build
Project Area
Not Impacted
NAC Impact
Greenwood
Project Area
Columbia
Fort Jackson Military Reservation
Columbia Ave.
Boundary St.
Lexington Ave.
Amick's Ferry Rd.
75
83
95
106
107
109
112
76
26
Feet
0 650 1,300 2,600
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community


Greenwood
Project Area
Columbia
Fort Jackson Military Reservation
26
321
15
521
378
601
N
Figure 4:
Evaluation Results
2040 No-Build
Project Area
Not Impacted
NAC Impact
Columbia Ave.
Boundary St.
Lexington Ave.
Amick's Ferry Rd.
76
97
101
106
107
109
112
75
83
95
98
22
14
13
9
15
10
Feet
0
650
1,300
2,600
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community


Greenwood
Project Area
Columbia
Fort Jackson Military Reservation
Figure 5:
Evaluation Results
2040 Alternative 9
Substantial Increase
NAC Impact
Not Impacted
Alternative 9 ROW
Project Area
Columbia Ave.
Boundary St.
Lexington Ave.
Amick's Ferry Rd.
130
112
109
108
107
106
104
101
98
95
83
75
54
17
15
14
13
0 650 1,300 2,600
Feet
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community


Greenwood
Project Area
Columbia
Fort Jackson Military Reservation
26
321
15
521
378
601



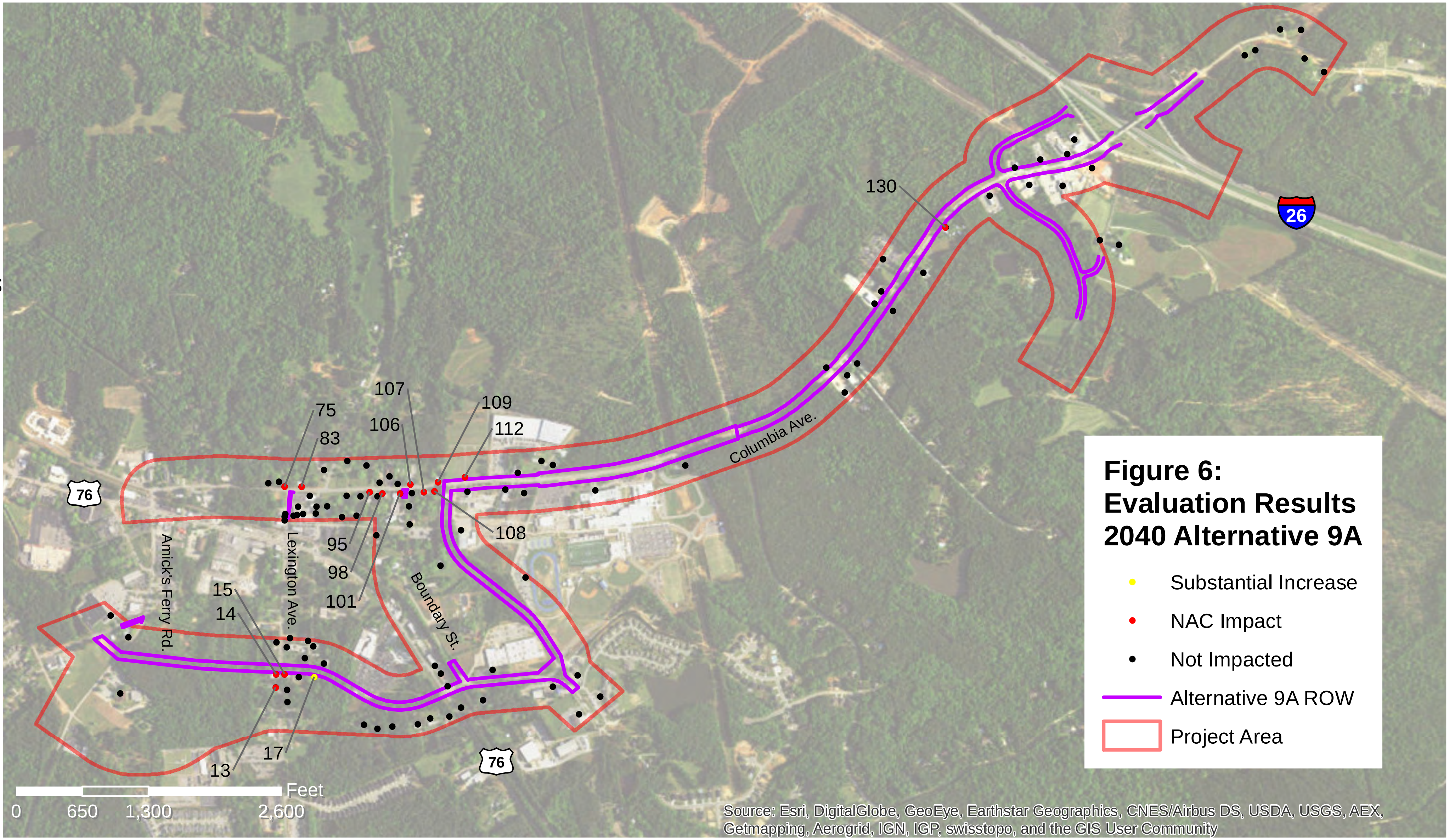


Figure 6:
Evaluation Results
2040 Alternative 9A
Substantial Increase
NAC Impact
Not Impacted
Alternative 9A ROW
Project Area
Columbia Ave.
Boundary St.
Lexington Ave.
Amick's Ferry Rd.
26
76
76
130
107
109
75
106
112
83
108
95
98
101
15
14
17
13
Feet
0
650
1,300
2,600
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

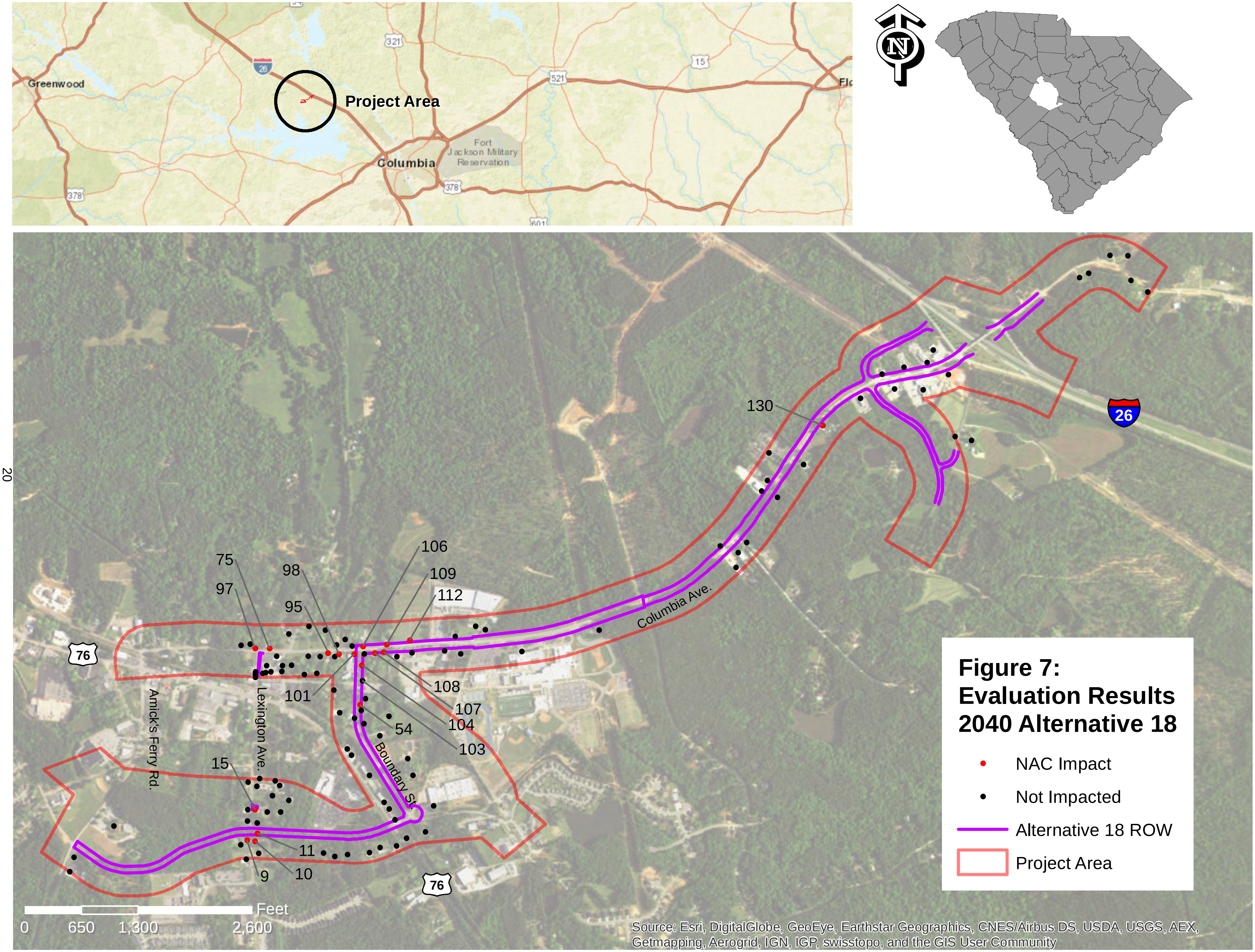
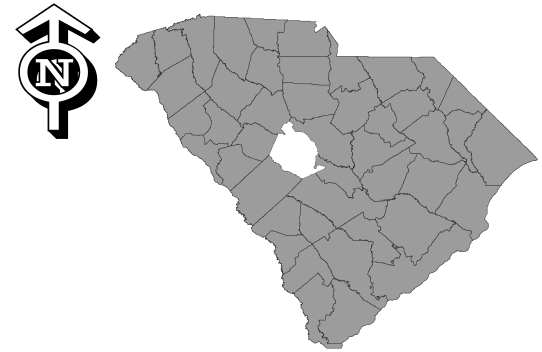


Figure 7: Evaluation Results 2040 Alternative 18


Greenwood
Project Area
Columbia
Fort Jackson Military Reservation
26
321
15
521
378
601


N

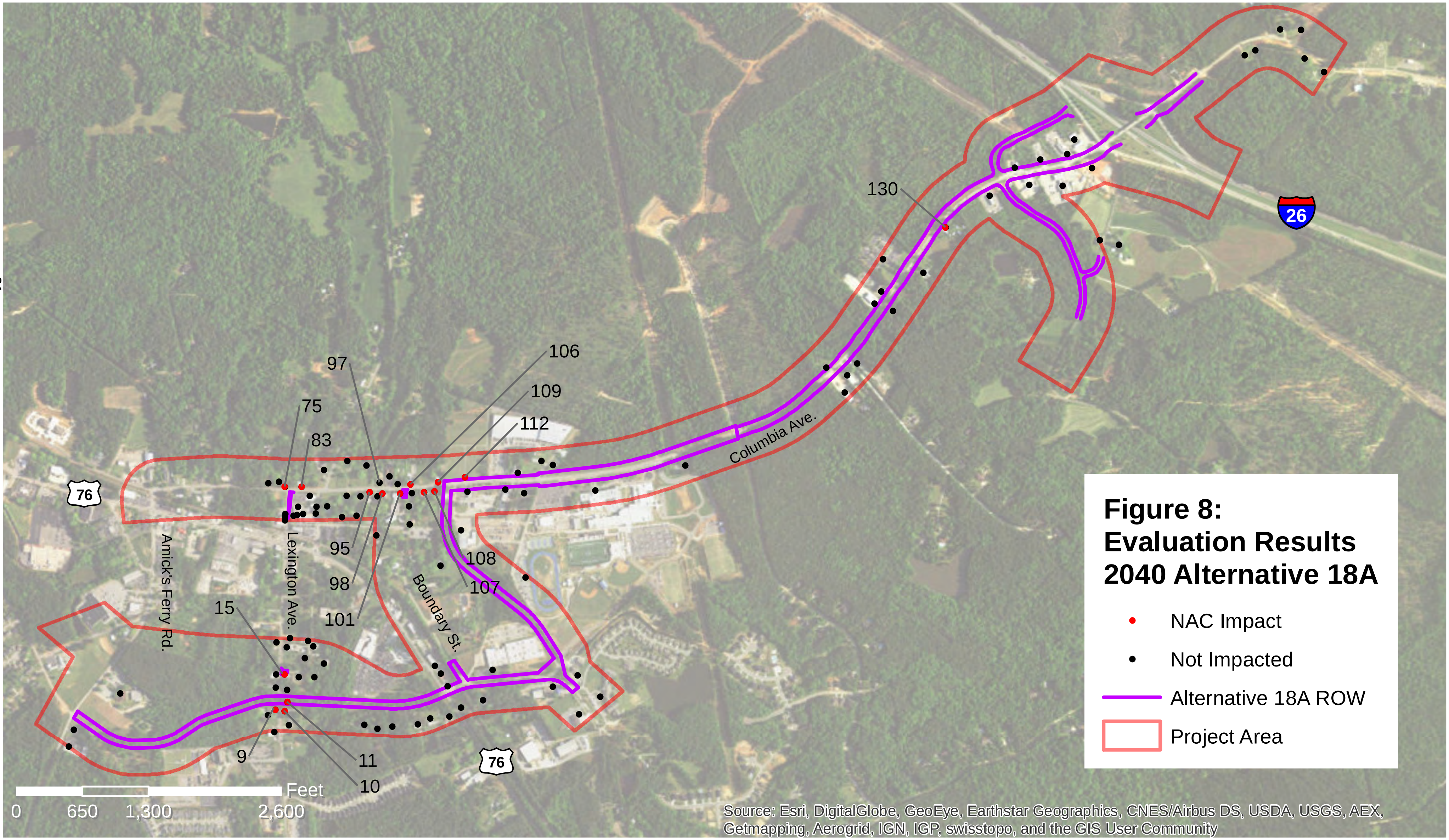


Figure 8:
Evaluation Results
2040 Alternative 18A
NAC Impact
Not Impacted
Alternative 18A ROW
Project Area
Columbia Ave.
Lexington Ave.
Amick's Ferry Rd.
Boundary St.
76
26
130
106
109
112
97
75
83
95
98
101
108
107
15
9
11
10
Feet
0
650
1,300
2,600
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

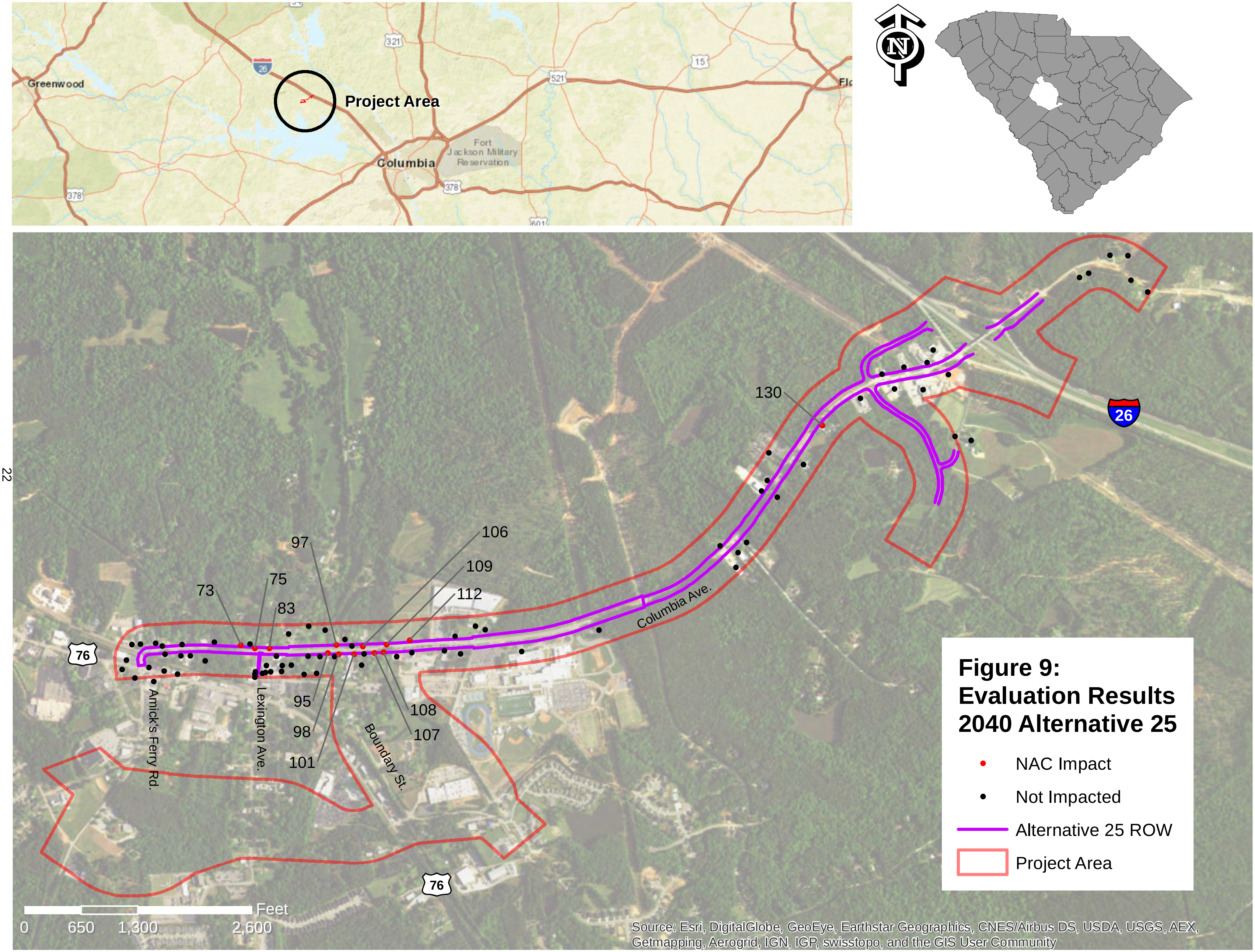


Figure 9: Evaluation Results 2040 Alternative 25

APPENDIX A

TRAFFIC NOISE MODELING RESULTS

S-48 Columbia Avenue
Traffic Noise Analysis Results

Receptor	Latitude	Longitude	Equivalent Receivers	NAC Category	NAC Threshold	2015 Existing	2040 No-Build		2040 Alt. 9		2040 Alt. 9A		2040 Alt. 18		2040 Alt. 18A		2040 Alt. 25	
						dB(A)	dB(A)	+/-	dB(A)	+/-	dB(A)	+/-	dB(A)	+/-	dB(A)	+/-	dB(A)	+/-
1	1,892,026.63	846,880.00	10	E	71	59	61	2					61	2	61	2		
2	1,892,075.13	847,042.50	1	E	71	61	63	2					63	2	63	2		
3	1,892,528.50	847,398.94	14	C	66	50	52	2	52	2	52	2	51	1	51	1		
4	1,892,605.50	847,952.06	1	B	66	63	65	2	63	0	63	0						
5	1,892,431.63	848,165.94	1	E	71	48	50	2	49	1	49	1						
6	1,894,037.25	847,019.69	5	C	66	61	63	2					63	2	63	2		
7	1,894,179.88	847,088.13	1	B	66	60	62	2					62	2	62	2		
8	1,893,977.38	847,185.06	1	C	66	57	58	1					60	3	60	3		
9	1,894,048.63	847,239.25	1	B	66	64	66	2					66	2	66	2		
10	1,894,139.88	847,225.00	1	B	66	65	66	1					67	2	67	2		
11	1,894,168.38	847,313.38	1	B	66	61	62	1	63	2	63	2	71	10	71	10		
12	1,894,162.75	847,436.00	1	B	66	62	63	1	64	2	64	2	64	2	64	2		
13	1,894,051.50	847,455.94	1	B	66	64	66	2	67	3	67	3	66	2	66	2		
14	1,894,054.38	847,584.25	1	B	66	64	66	2	67	3	67	3	66	2	66	2		
15	1,894,139.88	847,584.25	2	C	66	65	67	2	68	3	68	3	66	1	66	1		
16	1,894,276.75	847,561.44	1	B	66	54	55	1	63	9	63	9	57	3	57	3		
17	1,894,430.75	847,561.44	1	B	66	48	50	2	64	16	64	16	54	6	54	6		
18	1,894,522.00	847,692.63	1	B	66	46	48	2	60	14	60	14	50	4	50	4		
19	1,894,336.63	847,746.75	1	B	66	52	53	1	59	7	59	7	54	2	53	1		
20	1,894,422.13	847,860.81	1	B	66	49	51	2	54	5	54	5	51	2	51	2		
21	1,894,368.00	847,915.00	1	B	66	51	52	1	54	3	54	3	52	1	52	1		
22	1,894,159.88	847,852.25	1	B	66	64	66	2	65	1	65	1	65	1	65	1		
23	1,894,060.13	847,900.75	1	B	66	63	65	2	65	2	65	2	64	1	64	1		
24	1,894,188.38	847,943.50	1	B	66	61	62	1	62	1	62	1	62	1	62	1		
25	1,894,918.50	847,091.00	1	B	66	42	44	2	52	10	52	10	54	12	54	12		
26	1,895,049.63	847,053.94	1	B	66	42	43	1	52	10	52	10	53	11	53	11		
27	1,895,195.00	847,073.88	1	B	66	43	44	1	54	11	53	10	53	10	53	10		
28	1,895,443.13	847,096.69	1	B	66	45	47	2	54	9	54	9	53	8	53	8		
29	1,895,565.75	847,156.56	1	B	66	48	50	2	55	7	56	8	55	7	55	7		
30	1,895,753.88	847,173.69	1	B	66	57	58	1	58	1	58	1	58	1	58	1		
31	1,895,870.75	847,262.06	1	B	66	63	65	2	64	1	64	1	64	1	64	1		
32	1,896,084.63	847,333.31	1	B	66	50	52	2	53	3	56	6	53	3	54	4		
33	1,895,793.88	847,398.94	1	E	71	62	63	1										
34	1,895,736.75	847,470.19	1	E	71	63	64	1	66	3	64	1	66	3	66	3		
35	1,895,671.25	847,595.63	1	E	71	61	62	1	62	1	61	0	62	1	61	0		
36	1,895,611.38	847,669.81	4	E	71	62	63	1	62	0	61	-1	62	0	62	-1		
37	1,896,175.88	847,629.88	1	E	71	48	51	3	51	3	57	9	51	3	61	13		
38	1,896,769.25	847,464.50	17	C	66	52	55	3			53	1			56	4		

S-48 Columbia Avenue
Traffic Noise Analysis Results

Receptor	Latitude	Longitude	Equivalent Receivers	NAC Category	NAC Threshold	2015 Existing	2040 No-Build		2040 Alt. 9		2040 Alt. 9A		2040 Alt. 18		2040 Alt. 18A		2040 Alt. 25	
						dB(A)	dB(A)	+/-	dB(A)	+/-	dB(A)	+/-	dB(A)	+/-	dB(A)	+/-	dB(A)	+/-
39	1,897,025.88	847,193.63	1	E	71	49	52	3			49	0			49	0		
40	1,897,236.88	847,367.56	22	B	66	46	49	3			47	1			48	2		
41	1,897,014.50	847,578.56	1	E	71	48	51	3			52	4			53	5		
42	1,896,501.00	848,538.25	1	B	66	43	44	1			51	8			51	8		
43	1,895,942.13	847,976.56	1	B	66	46	48	2	51	5			51	5				
44	1,895,885.13	848,167.56	1	B	66	45	47	2	50	5			50	5				
45	1,895,443.25	847,976.56	1	E	71	59	61	2	60	1			60	1				
46	1,895,237.88	848,207.50	1	E	71	63	64	1	63	0			63	0				
47	1,895,189.50	848,278.81	1	E	71	62	64	2	62	0			62	0				
48	1,895,563.00	848,432.75	1	B	66	47	50	3	55	8			55	8				
49	1,895,665.63	848,652.31	1	B	66	45	47	2	51	6	54	9	51	6	54	9		
50	1,895,380.50	848,566.75	1	B	66	53	56	3	64	11			64	11				
51	1,895,272.13	848,632.38	1	C	66	57	60	3	65	8			65	8				
52	1,895,106.75	848,692.25	1	B	66	48	51	3	54	6			54	6				
53	1,895,352.00	848,720.75	1	B	66	55	58	3	66	11			66	11				
54	1,895,334.88	848,783.44	1	B	66	57	61	4	70	13			70	13				
55	1,895,397.63	848,854.75	1	B	66	51	54	3	61	10			61	10				
56	1,892,622.63	849,186.63	1	E	71	64	65	1									65	1
57	1,892,674.00	849,294.94	1	E	71	64	65	1									65	1
58	1,892,770.88	849,089.63	1	E	71	61	63	2									63	2
59	1,892,933.38	849,209.44	1	E	71	68	68	0									68	0
60	1,892,984.75	849,049.75	1	E	71	61	62	1									62	1
61	1,893,104.50	849,166.63	1	E	71	67	68	1									68	1
62	1,893,255.63	849,132.44	1	E	71	65	66	1									66	1
63	1,892,733.88	849,471.75	1	E	71	57	59	2									59	2
64	1,892,833.63	849,477.44	1	E	71	58	60	2									60	2
65	1,893,007.63	849,486.00	1	E	71	59	62	3									62	3
66	1,893,084.50	849,451.75	1	E	71	64	67	3									67	3
67	1,893,113.13	849,357.69	1	E	71	63	66	3									67	4
68	1,893,295.50	849,340.56	1	E	71	59	62	3									64	5
69	1,893,309.75	849,471.75	1	E	71	64	67	3									66	2
70	1,893,403.88	849,340.56	1	E	71	59	61	2									63	4
71	1,893,572.13	849,286.38	1	E	71	56	58	2									59	3
72	1,893,677.63	849,497.38	1	E	71	61	64	3									63	2
73	1,893,982.75	849,460.31	1	B	66	63	65	2	63	0	63	0	63	0	63	0	66	3
74	1,894,082.50	849,477.44	1	B	66	60	62	2	60	0	60	0	60	0	60	0	63	3
75	1,894,142.38	849,426.13	1	B	66	66	68	2	67	1	67	1	67	1	67	1	69	3
76	1,894,145.50	849,160.94	1	E	71	60	63	3	63	3	63	3	63	3	63	3	63	3

S-48 Columbia Avenue
Traffic Noise Analysis Results

Receptor	Latitude	Longitude	Equivalent Receivers	NAC Category	NAC Threshold	2015 Existing	2040 No-Build		2040 Alt. 9		2040 Alt. 9A		2040 Alt. 18		2040 Alt. 18A		2040 Alt. 25	
						dB(A)	dB(A)	+/-	dB(A)	+/-	dB(A)	+/-	dB(A)	+/-	dB(A)	+/-	dB(A)	+/-
77	1,894,142.63	849,132.44	1	E	71	59	62	3	63	4	63	4	63	4	63	4	62	3
78	1,894,142.63	849,095.38	1	E	71	59	62	3	63	4	63	4	63	4	63	4	62	3
79	1,894,225.38	849,141.00	1	E	71	58	60	2	58	0	58	0	58	0	58	0	61	3
80	1,894,262.38	849,149.50	1	E	71	55	57	2	56	1	56	1	56	1	56	1	58	3
81	1,894,316.63	849,158.06	1	E	71	53	55	2	55	2	55	2	55	2	55	2	57	4
82	1,894,271.00	849,229.38	1	E	71	56	59	3	58	2	58	2	58	2	58	2	59	3
83	1,894,305.13	849,426.13	1	B	66	66	68	2	67	1	67	1	67	1	67	1	69	3
84	1,894,385.00	849,337.69	1	E	71	65	66	1	67	2	67	2	67	2	67	2	66	1
85	1,894,444.88	849,163.81	1	E	71	56	59	3	59	3	59	3	59	3	59	3	60	4
86	1,894,453.50	849,232.19	1	E	71	59	61	2	61	2	61	2	61	2	61	2	61	2
87	1,894,553.25	849,235.06	1	B	66	56	58	2	58	2	58	2	58	2	58	2	59	3
88	1,894,524.75	849,591.50	1	B	66	54	56	2	55	1	55	1	55	1	55	1	57	3
89	1,894,755.63	849,679.88	1	B	66	51	52	1	53	2	52	1	53	2	52	1	54	3
90	1,894,744.25	849,337.69	1	B	66	63	64	1	65	2	65	2	65	2	65	2	65	2
91	1,894,701.50	849,129.56	1	B	66	51	53	2	54	3	53	2	54	3	53	2	54	3
92	1,894,841.25	849,143.81	1	B	66	52	53	1	54	2	53	1	54	2	53	1	54	2
93	1,894,884.00	849,332.00	1	B	66	62	63	1	63	1	63	1	63	1	63	1	64	2
94	1,894,941.00	849,637.13	1	B	66	52	54	2	54	2	54	2	54	2	54	2	56	4
95	1,894,972.38	849,374.75	1	B	66	67	68	1	69	2	69	2	69	2	69	2	69	2
96	1,895,046.50	849,332.00	1	E	71	62	63	1	63	1	63	1	63	1	63	1	63	1
97	1,895,069.38	849,466.00	1	B	66	64	66	2	65	1	65	1	65	1	65	1	66	2
98	1,895,095.00	849,360.50	1	B	66	65	66	1	67	2	66	1	67	2	66	1	66	1
99	1,895,169.13	849,528.75	1	E	71	59	60	1	60	1	59	0	60	1	59	0	61	2
100	1,895,246.13	849,451.75	1	E	71	67	68	1	68	1	67	0	68	1	67	0	69	2
101	1,895,268.88	849,360.50	8	C	66	65	66	1	68	3	66	1	68	3	66	1	67	2
102	1,895,040.75	848,949.94	1	B	66	48	50	2	53	5	50	2	53	5	50	2		
103	1,895,363.25	849,055.44	1	B	66	55	59	4	66	11	56	1	66	11	56	1		
104	1,895,357.63	849,235.06	1	B	66	58	61	3	68	10	59	1	68	10	59	1	62	4
105	1,895,383.25	849,366.25	1	E	71	66	66	0	69	3	66	0	69	3	66	0	69	3
106	1,895,371.88	849,458.94	1	B	66	67	67	0	71	4	67	0	71	4	67	0	71	4
107	1,895,505.88	849,374.75	1	B	66	66	66	0	70	4	67	1	70	4	67	1	70	4
108	1,895,608.50	849,380.50	1	B	66	65	65	0	70	5	67	2	70	5	67	2	70	5
109	1,895,642.75	849,471.75	1	B	66	69	69	0	71	2	68	-1	71	2	68	-1	71	2
110	1,895,756.75	849,334.88	1	B	66	58	59	1	64	6			64	6			64	6
111	1,895,868.00	848,998.44	1	E	71	48	48	0			57	9			57	9		
112	1,895,905.00	849,520.19	1	C	66	66	67	1	67	1	67	1	67	1	67	1	67	1
113	1,895,933.50	849,377.63	1	E	71	60	60	0	67	7	67	7	67	7	67	7	67	7
114	1,896,301.38	849,400.44	1	E	71	61	61	0	68	7	68	7	68	7	68	7	68	7

S-48 Columbia Avenue
Traffic Noise Analysis Results

Receptor	Latitude	Longitude	Equivalent Receivers	NAC Category	NAC Threshold	2015 Existing	2040 No-Build		2040 Alt. 9		2040 Alt. 9A		2040 Alt. 18		2040 Alt. 18A		2040 Alt. 25	
						dB(A)	dB(A)	+/-	dB(A)	+/-	dB(A)	+/-	dB(A)	+/-	dB(A)	+/-	dB(A)	+/-
115	1,896,424.00	849,562.94	1	E	71	64	64	0	66	2	66	2	66	2	66	2	66	2
116	1,896,489.50	849,363.38	1	E	71	59	60	1	64	5	64	5	64	5	64	5	64	5
117	1,896,657.75	849,679.88	1	B	66	57	57	0	60	3	60	3	60	3	60	3	60	3
118	1,896,769.00	849,639.94	1	B	66	59	60	1	63	4	63	4	63	4	63	4	63	4
119	1,897,185.50	849,389.06	141	C	66	57	58	1	60	3	60	3	60	3	60	3	60	3
120	1,898,066.63	849,634.25	1	E	71	59	59	0	62	3	62	3	62	3	62	3	62	3
121	1,899,450.00	850,596.25	1	E	71	65	65	0	69	4	69	4	69	4	69	4	69	4
122	1,899,632.50	850,351.00	1	E	71	53	54	1	58	5	58	5	58	5	58	5	58	5
123	1,899,655.25	850,519.25	1	E	71	58	59	1	62	4	62	4	62	4	62	4	62	4
124	1,899,752.25	850,636.13	1	E	71	58	59	1	62	4	62	4	62	4	62	4	62	4
125	1,899,920.50	851,224.63	1	E	71	62	62	0	65	3	65	3	65	3	65	3	65	3
126	1,900,100.13	851,150.50	1	B	66	61	61	0	65	4	65	4	65	4	65	4	65	4
127	1,899,986.13	851,344.38	1	E	71	61	61	0	64	3	64	3	64	3	64	3	64	3
128	1,900,003.25	851,658.00	1	E	71	52	53	1	57	5	57	5	57	5	57	5	57	5
129	1,900,399.63	851,526.81	1	B	66	58	59	1	62	4	62	4	62	4	62	4	62	4
130	1,900,616.50	851,969.88	1	B	66	65	65	0	69	4	69	4	69	4	69	4	69	4
131	1,901,047.00	852,280.69	1	E	71	61	61	0	66	5	66	5	66	5	66	5	66	5
132	1,901,297.88	852,557.25	1	E	71	63	63	0	67	4	67	4	67	4	67	4	67	4
133	1,901,440.50	852,389.00	1	E	71	59	59	0	64	5	64	5	64	5	64	5	64	5
134	1,901,548.88	852,634.25	1	E	71	61	62	1	66	5	66	5	66	5	66	5	66	5
135	1,901,762.63	852,380.50	1	E	71	56	57	1	60	4	60	4	60	4	60	4	60	4
136	1,901,808.25	852,688.38	1	E	71	63	63	0	66	3	66	3	66	3	66	3	66	3
137	1,901,882.38	852,831.00	1	E	71	61	62	1	63	2	63	2	63	2	63	2	63	2
138	1,902,053.50	852,551.56	1	E	71	61	61	0	64	3	64	3	64	3	64	3	64	3
139	1,902,130.50	851,845.00	1	B	66	56	57	1	51	-5	51	-5	51	-5	51	-5	51	-5
140	1,902,315.75	851,802.25	1	B	66	51	52	1	51	0	51	0	51	0	51	0	51	0
141	1,903,553.88	853,657.75	1	B	66	55	61	6	61	6	61	6	61	6	61	6	61	6
142	1,903,653.63	853,706.25	1	B	66	55	61	6	61	6	61	6	61	6	61	6	61	6
143	1,903,898.88	853,911.56	1	B	66	55	61	6	61	6	61	6	61	6	61	6	61	6
144	1,904,101.25	853,908.69	1	B	66	51	57	6	57	6	57	6	57	6	57	6	57	6
145	1,904,138.38	853,629.25	1	B	66	57	63	6	63	6	63	6	63	6	63	6	63	6
146	1,904,329.38	853,495.25	1	B	66	54	60	6	60	6	60	6	60	6	60	6	60	6

APPENDIX B

TRAFFIC NOISE MEASUREMENTS

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: S-48 Columbia Road | Project #: | Date: 12/1/2015 | Page 1 of 2

Monitoring Location: 1 - Abner Monksseri School | Analyst: Bell/Tyndall

Sound Level Meter		Field Calibration		Weather Data	
Model #:	LD712	Model #:	CAL150	Model #:	Accuweather
Serial #:	415	Serial #:	4883	Serial #:	N/A
Weighting: A / C / Flat		Calibration Level (dBA):	94 / 114	Wind:	Calm
Response: Slow / Fast / Impl		Pre-Test	114.0 dBA	Precipitation: Yes (explain) / No	
Windscreen : Yes / No		Post-Test	114.1 dBA	Avg Wind Speed/Direction:	—
Topo: Flat / Hilly		GPS Coordinates (at SLM location)*		Temp (°F): 58	RH (%): 96
Terrain: Hard/Soft/Mixed/Snow		1,896,491.13; 847,524.75		Bar Psr (Hg): 30.06	Cloud Cover (%): ~~[illegible]~~ 100

ID	Start Time	Stop Time	L_{eq}	L_{max}	L_{min}				Notes/Events
0									
1	3:16 PM	3:17 PM	54.4						Car Arrived
2			57.2						
3			52.8						
4			53.1						
5	3:20 PM	3:21 PM	55.5						Kids Walking By
6	↓	↓	54.7						↓
7	3:22 PM	3:23 PM	59.4						
8			56.6						
9			48.8						
10			51.4						
11			53.2						
12	3:27 PM		49.8						Car Arrived
13	3:28 PM		49.1						Car Arrived
14			56.8						
15	3:30 PM	3:31 PM	56.5						
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									

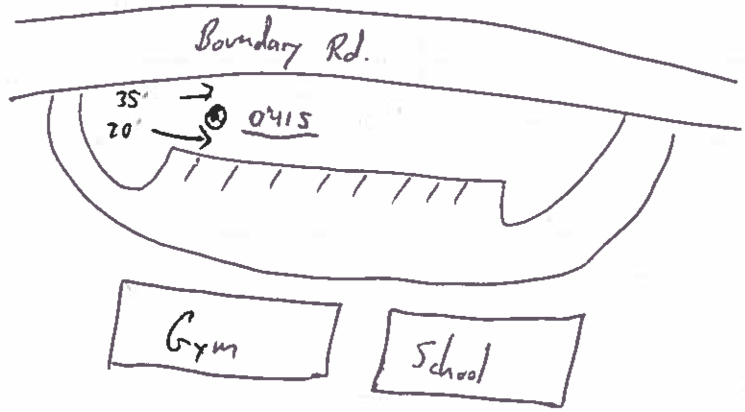
URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Roadway Name/Dir	Boundary Rd.	
Speed (post/obs)*	20 mph	
Number of Lanes	2	
Width (pave/row)	22'	
1- or 2- way	2	
Grade	–	
Bus Stops	–	
Stoplights	–	
Motorcycles	–	
Automobiles	26	
Medium Trucks	–	
Heavy Trucks	–	
Buses	–	
Count duration	15 min	

compass

Site Diagram:

Meter | Location | Post-Test



- note coordinate system * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No 4

Additional Notes/Comments: Multiple Vehicles pulling in, kids yelling in distance.

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse

<u>Noise Measurement Location 1 Photos</u>

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: S-48 Columbia Road | Project #: ____ | Date: 12/1/2015 | Page 1 of 2

Monitoring Location: 1. Mt. Horeb Cemetery | Analyst: Bell/Tyndall

Sound Level Meter	Field Calibration	Weather Data
Model #: LD712	Model #: CAL150	Model #: Accuweather
Serial #: 415	Serial #: 4883	Serial #: N/A
Weighting: **A** / C / Flat	Calibration Level (dBA): 94 / **114**	Wind: Calm
Response: **Slow** / Fast / Impl	Pre-Test 114.0 dBA	Precipitation: Yes (explain) / **No**
Windscreen : Yes / **No**	Post-Test 114.1 dBA	Avg Wind Speed/Direction: —
Topo: Flat / Hilly	GPS Coordinates (at SLM location)*	Temp (°F): 58 RH (%): 96
Terrain: Hard/Soft/Mixed/Snow	1,895,854.25; 849,432.81	Bar Psr (Hg): 30.06 Cloud Cover (%): 100

ID	Start Time	Stop Time	L_{eq}	L_{max}	L_{min}			Notes/Events
0								
1	3:41 PM	3:42 PM	67.7					
2			67.0					
3			68.4					
4			66.2					
5			67.4					
6			66.4					
7			66.1					
8			66.8					
9			66.3					
10			67.3					
11			65.3					
12			66.5					
13			68.7					
14			67.5					
15	3:55 PM	3:56 PM	70.1					
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								

URS Acoustics and Noise Control Practice

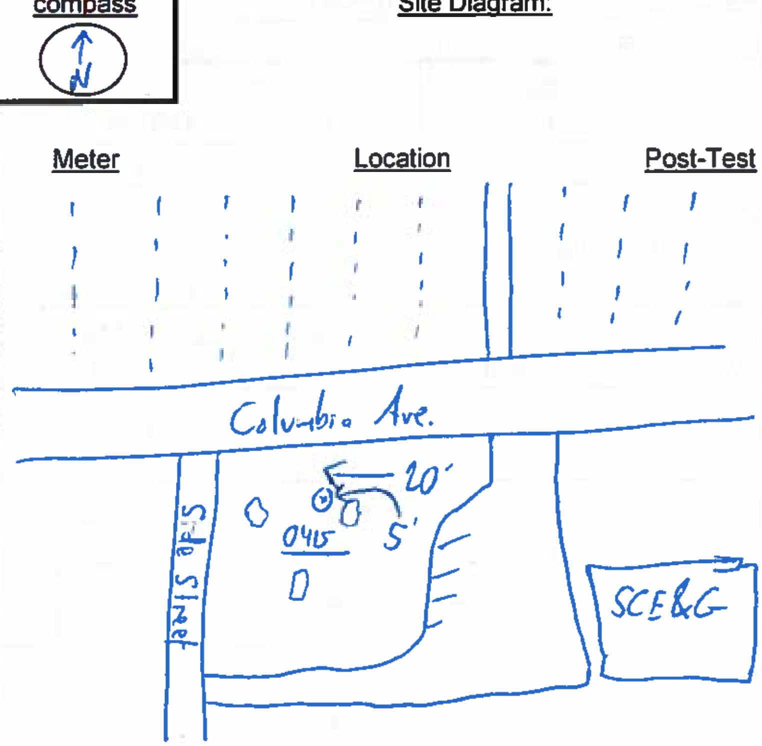
FIELD NOISE MEASUREMENT DATA FORM

Roadway Name/Dir	Columbia	
Speed (post/obs)*	35	
Number of Lanes	2	
Width (pave/row)	24'	
1- or 2- way	2	
Grade	–	
Bus Stops	–	
Stoplights	–	
Motorcycles	–	
Automobiles	367	
Medium Trucks	6	
Heavy Trucks	3	
Buses	~~1~~ 2	
Count duration	15 min.	

compass

Site Diagram:

Meter | Location | Post-Test



- note coordinate system * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No 4

Additional Notes/Comments:

Several Vehicles using side street, WB traffic stopped some.

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/insects

Additional Notes and Sketches on Reverse

<u>Noise Measurement Location 2 Photos</u>

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: S-48 Columbia Road Project #: ______ Date: 12/1/2015 Page 1 of 2
Monitoring Location: 3 - Farm Boy BBQ Analyst: Bell/Tyndall

Sound Level Meter		Field Calibration			Weather Data	
Model #:	LD712	Model #:	CAL150		Model #:	Accuweather
Serial #:	415	Serial #:	4883		Serial #:	N/A
Weighting: A / C / Flat		Calibration Level (dBA):	94 / 114		Wind:	—
Response: Slow / Fast / Impl		Pre-Test	114.0	dBA	Precipitation: Yes (explain) / No	
Windscreen : Yes / No		Post-Test	114.1	dBA	Avg Wind Speed/Direction:	—
Topo: Flat / Hilly		GPS Coordinates (at SLM location)*			Temp (°F): 58°	RH (%): 96
Terrain: Hard/Soft/Mixed/Snow		1,899,932.24; 851,250.83			Bar Psr (Hg): 30.06	Cloud Cover (%): 100

ID	Start Time	Stop Time	L_{eq}	L_{max}	L_{min}			Notes/Events
0								
1	4:10 PM	4:11 PM	64.7					
2	↓	↓	62.5					
3			64.8					
4			63.6					
5			65.6					
6			64.6					
7			63.7					
8			64.9					
9			64.2					
10			62.6					
11			64.0					
12			65.0					
13			64.3					
14			65.6					
15	4:24PM	4:25PM	63.2					
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

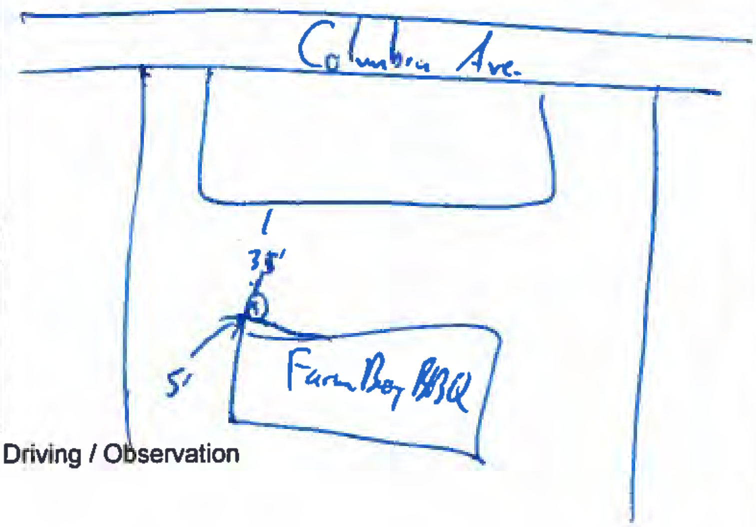
Roadway Name/Dir	Columbia	
Speed (post/obs)*	~~40~~ 45	
Number of Lanes	2	
Width (pave/row)	24'	
1- or 2- way	2	
Grade	-	
Bus Stops	-	
Stoplights	-	
Motorcycles	-	
Automobiles	270	
Medium Trucks	4	
Heavy Trucks	-	
Buses	-	
Count duration	15 min	

compass

N

Site Diagram:

Meter	Location	Post-Test



- note coordinate system * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No 4

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse

C	M	H
270	4	

Motor	Bus

Noise Measurement Location 3 Photos

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: S-48 Columbia Road	Project #:	Date: 12/1/2015	Page 1 of 2
Monitoring Location: 4 - Chapin Bldg Supply		Analyst:	Bell/Tyndall

Sound Level Meter	Field Calibration	Weather Data
Model #: LD712	Model #: CAL150	Model #: Accuweather
Serial #: 415	Serial #: 4883	Serial #: N/A
Weighting: **A** / C / Flat	Calibration Level (dBA): 94 / **114**	Wind: —
Response: **Slow** / Fast / Impl	Pre-Test 114.0 dBA	Precipitation: Yes (explain) / **No**
Windscreen : Yes / **No**	Post-Test 114.1 dBA	Avg Wind Speed/Direction: —
Topo: Flat / Hilly	GPS Coordinates (at SLM location)*	Temp (°F): 58 RH (%): 98
Terrain: Hard/Soft/Mixed/Snow	1,901,199.50 ; 851,503.15	Bar Psr (Hg): 30.04 Cloud Cover (%): 100

ID	Start Time	Stop Time	L_{eq}	L_{max}	L_{min}				Notes/Events
0									
1	4:43 PM	4:44 PM	66.4						
2	↓	↓	67.6						
3			67.7						
4			68.3						
5			67.4						
6			65.7						
7			68.8						
8			67.8						
9			67.3						
10			68.2						
11			69.6						
12			69.3						
13			69.9						
14	↓	↓	69.4						
15	4:57 PM	4:58 PM	67.6						
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									

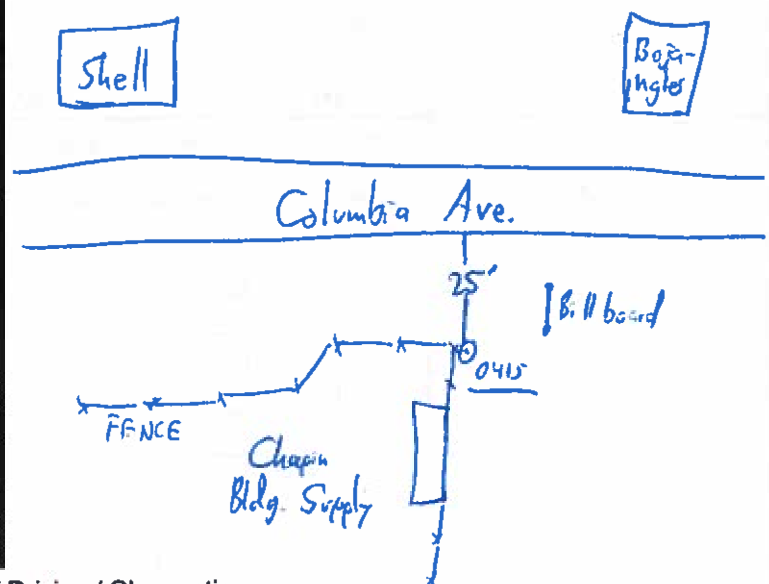
URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Roadway Name/Dir	Columbia	
Speed (post/obs)*	40	
Number of Lanes	2	
Width (pave/row)	24'	
1- or 2- way	2	
Grade	–	
Bus Stops	–	
Stoplights	–	
Motorcycles	–	
Automobiles	290	
Medium Trucks	4	
Heavy Trucks	4	
Buses	1	
Count duration	15 min.	

compass

Site Diagram:

Meter | Location | Post-Test



- note coordinate system * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No 4

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse

<u>Noise Measurement Location 4 Photos</u>

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: S-48 Columbia Road | Project #: | Date: 12/1/2015 | Page 1 of 2

Monitoring Location: 5- East of I-26 | Analyst: Bell/Tyndall

Sound Level Meter		Field Calibration		Weather Data	
Model #:	LD712	Model #:	CAL150	Model #:	Accuweather
Serial #:	415	Serial #:	4883	Serial #:	N/A
Weighting: A / C / Flat		Calibration Level (dBA):	94 / 114	Wind:	—
Response: Slow / Fast / Impl		Pre-Test	114.0 dBA	Precipitation: Yes (explain) / No	
Windscreen : Yes / No		Post-Test	114.1 dBA	Avg Wind Speed/Direction:	—
Topo: Flat / Hilly		GPS Coordinates (at SLM location)*		Temp (°F): 55	RH (%): 98
Terrain: Hard/Soft/Mixed/Snow		1,902,474.54 ; 353,279.41		Bar Psr (Hg): 30.04	Cloud Cover (%): 100

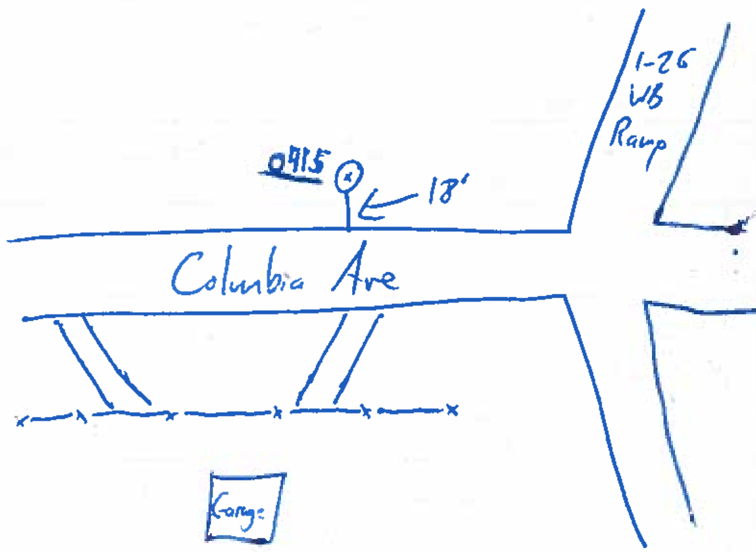
ID*	Start Time	Stop Time	L_{eq}	L_{max}	L_{min}				Notes/Events
0									
1	5:06 PM		62.1						
2			63.1						
3			60.2						
4			61.2						
5			63.1						
6			62.9						
7			60.5						
8			65.2						
9			65.5						
10			58.6						
11			65.6						
12			62.4						
13			66.9						
14			58.5						
15		5:21 PM	63.4						
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									

URS ANCP, Field Noise Measurement Form, Vers. 1.2 111109

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

			compass	Site Diagram:
Roadway Name/Dir	Columbia			
Speed (post/obs)*	45			
Number of Lanes	2			
Width (pave/row)	24'			
1- or 2- way	2			
Grade	–			
Bus Stops	–			
Stoplights	1			
Motorcycles	–			
Automobiles	77			
Medium Trucks	–			
Heavy Trucks	–			
Buses	–			
Count duration	15 min.			

Meter | Location | Post-Test



\# - note coordinate system * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No 4

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse

Noise Measurement Location 5 Photos

(6)

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: S-48 Columbia Road Project #: Date: 1/4/2016 Page 1 of 2

Monitoring Location: Christ Church Lexington Ave Analyst: Tyndall

Sound Level Meter		Field Calibration		Weather Data	
Model #:	LD712	Model #:	CAL150	Model #:	Accuweather
Serial #:	415	Serial #:	4883	Serial #:	N/A
Weighting: A / C / Flat		Calibration Level (dBA):	94 / 114	Wind:	5 mph
Response: Slow / Fast / Impl		Pre-Test	114.0 dBA	Precipitation: Yes (explain) / No	
Windscreen : Yes / No		Post-Test	113.9 dBA	Avg Wind Speed/Direction:	
Topo: Flat / Hilly		GPS Coordinates (at SLM location)#		Temp (°F): 46	RH (%):
Terrain: Hard/Soft/Mixed/Snow		1,894,127.38 ; 847,548.25		Bar Psr (Hg):	Cloud Cover (%): 50

ID	Start Time	Stop Time	L_{eq}	L_{max}	L_{min}				Notes/Events
0									
1	5:03 PM	5:04 PM	66.2						
2			67.8						
3			72.1						
4			73.6						
5			68.2						
6			69.8						
7			64.7						
8			67.0						
9			68.9						
10			64.7						
11			64.6						
12			69.8						
13			66.9						
14			69.8						
15	5:17 PM	5:18 PM	66.4						
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									

URS ANCP, Field Noise Measurement Form, Vers. 1.2 111109

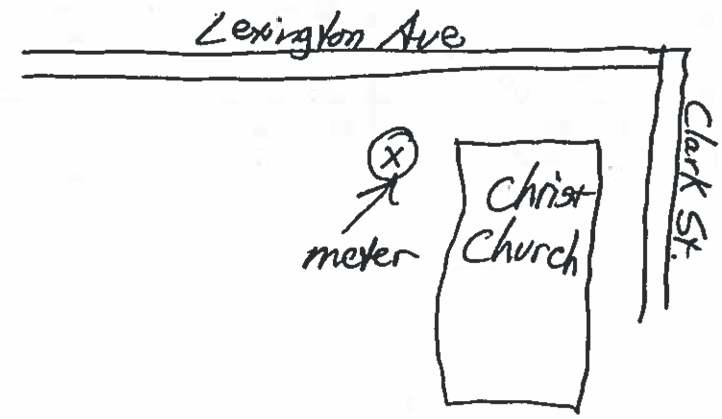
URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Roadway Name/Dir	Lexington Ave		
Speed (post/obs)*	40 ~~35~~ mph		
Number of Lanes	2		
Width (pave/row)	10 ft		
1- or 2- way	2 way		
Grade	flat		
Bus Stops	N/A		
Stoplights	N/A		
Motorcycles			
Automobiles	141		
Medium Trucks	0		
Heavy Trucks	0		
Buses	1		
Count duration	10 min		

compass

Site Diagram:

Meter | Location | Post-Test



- note coordinate system * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/insects

Additional Notes and Sketches on Reverse

~~##~~ A | Med. Trucks

140

Heavy Trucks | Buses | Motorcycle

1

Start Time 5:03pm
End Time 5:21pm

URS ANCP, Field Noise Measurement Form, Vers. 1.2 111109

Noise Measurement Location 6 Photos

7

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: S-48 Columbia Road | Project #: | Date: 1/4/2016 | Page 1 of 2

Monitoring Location: Amicks Ferry Rd @ Catholic Church | Analyst: Tyndall

Sound Level Meter		Field Calibration		Weather Data	
Model #:	LD712	Model #:	CAL150	Model #:	Accuweather
Serial #:	415	Serial #:	4883	Serial #:	N/A
Weighting: A / C / Flat		Calibration Level (dBA):	94 / 114	Wind:	10mph
Response: Slow / Fast / Impl		Pre-Test	114.0 dBA	Precipitation: Yes (explain) / No	
Windscreen : Yes / No		Post-Test	113.9 dBA	Avg Wind Speed/Direction:	12mph
Topo: Flat / Hilly		GPS Coordinates (at SLM location)#		Temp (°F): 41	RH (%):
Terrain: Hard/Soft/Mixed/Snow				Bar Psr (Hg):	Cloud Cover (%): 50%

ID	Start Time	Stop Time	L_{eq}	L_{max}	L_{min}				Notes/Events
0									
1	5:39 PM	5:40 PM	78.0						
2			82.3						
3			83.3						
4			80.8						
5			79.5						
6			83.7						
7			79.8						
8			78.1						
9			73.4						
10			82.8						
11			71.1						
12			79.1						
13			82.7						
14			85.5						
15	5:53 PM	5:54 PM	80.7						
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									

Start time 5:39pm
End Time 5:57pm

URS Acoustics and Noise Control Practice

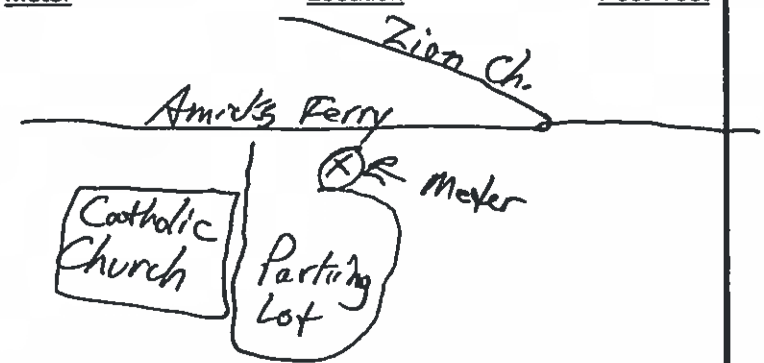
FIELD NOISE MEASUREMENT DATA FORM

Roadway Name/Dir	Amicks Ferry Rd.	
Speed (post/obs)*	40	
Number of Lanes	2 lanes	
Width (pave/row)	11 ft	
1- or 2- way	2 way	
Grade	Flat	
Bus Stops	N/A	
Stoplights	N/A	
Motorcycles	0	
Automobiles	92	
Medium Trucks	3	
Heavy Trucks	0	
Buses	0	
Count duration	10 min	

compass

Site Diagram:

Meter | Location | Post-Test



- note coordinate system * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes/No

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/insects

Additional Notes and Sketches on Reverse

A	Med Truck
𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 //	///
92	3

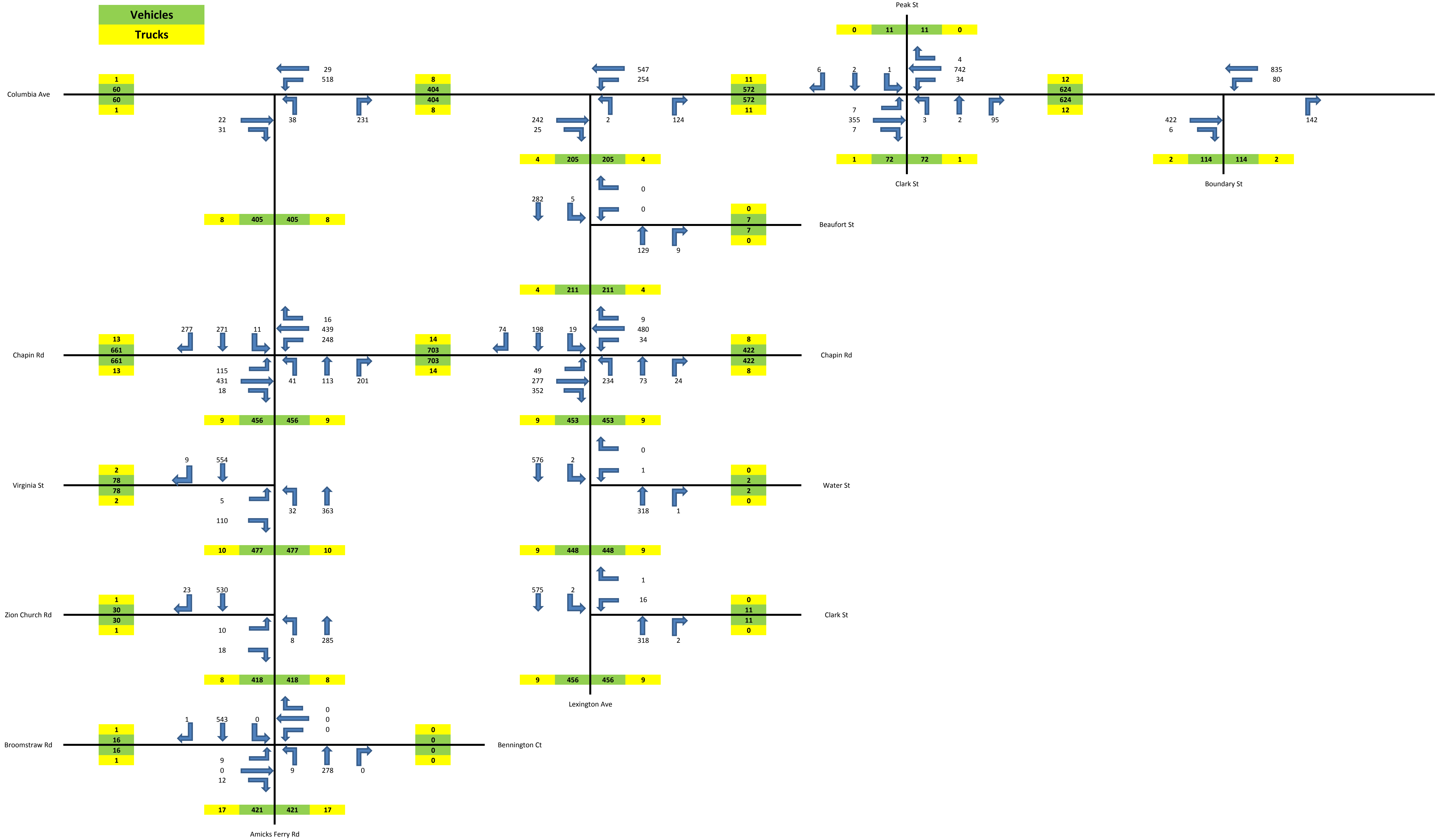
Heavy Truck	M	B

<u>Noise Measurement Location 7 Photos</u>

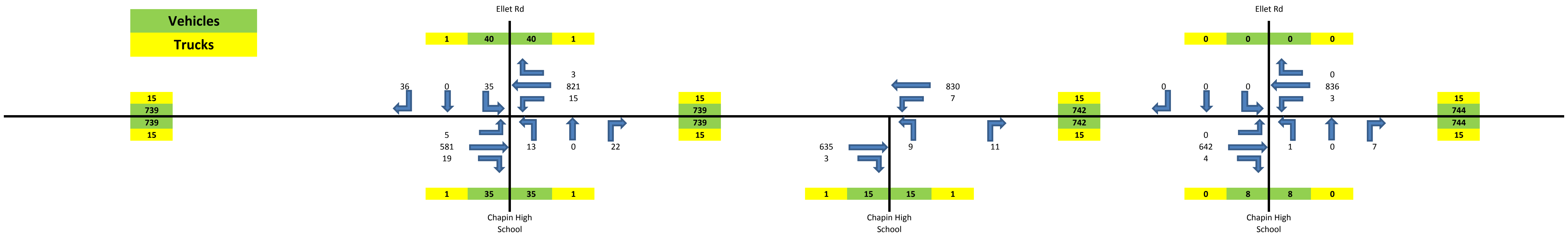
APPENDIX C

TRAFFIC DATA

S-48 Columbia Avenue - PM Peak Hour Volumes
2015 No-Build

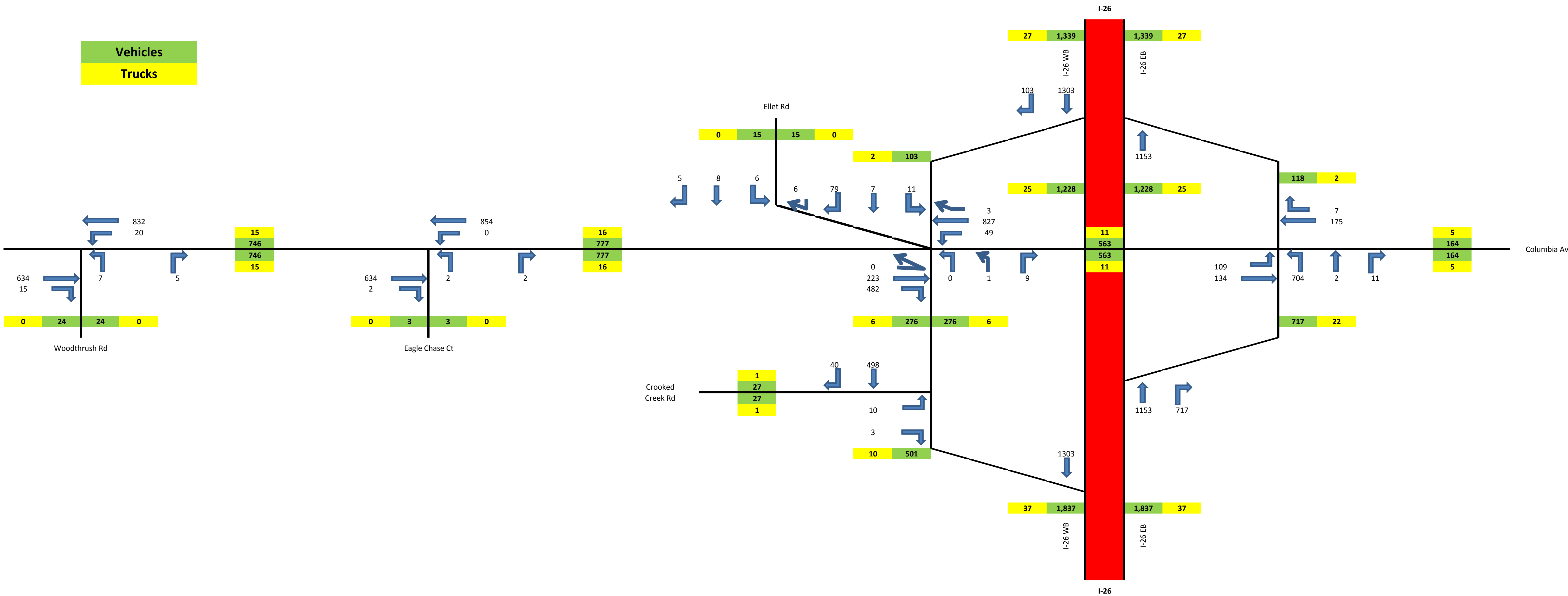


S-48 Columbia Avenue - PM Peak Hour Volumes
2015 No-Build

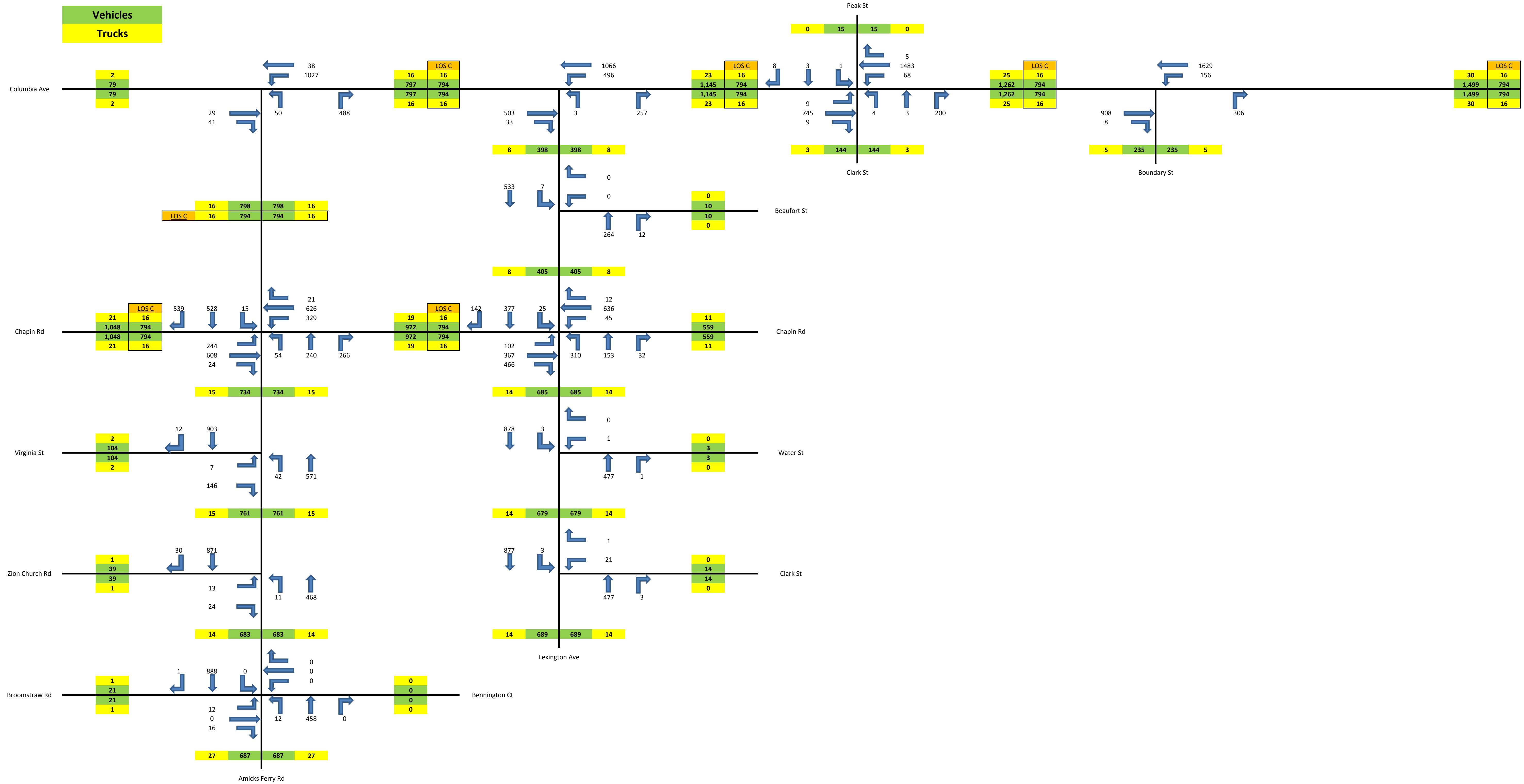


S-48 Columbia Avenue - PM Peak Hour Volumes

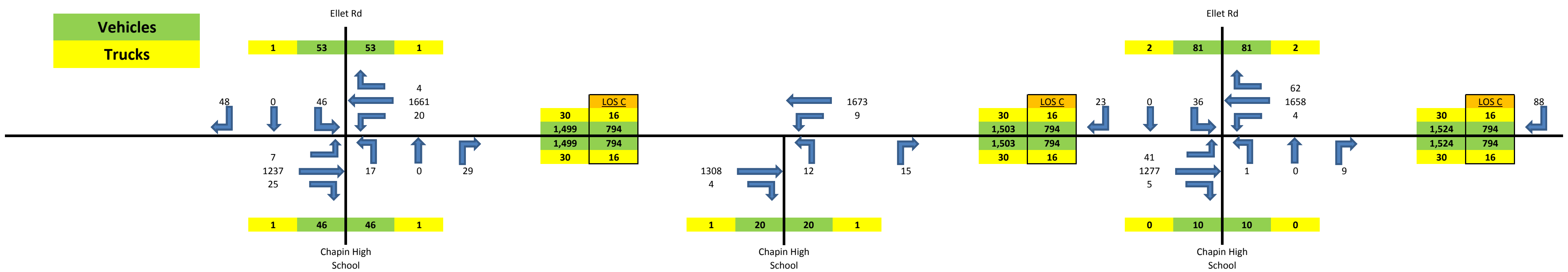
2015 No-Build



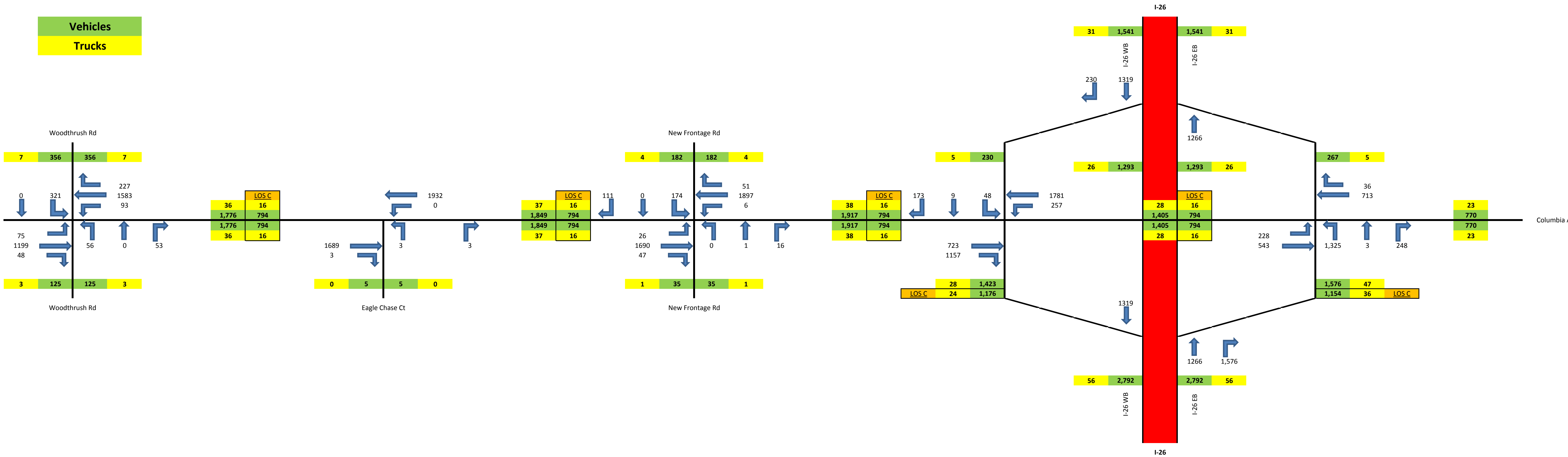
S-48 Columbia Avenue - PM Peak Hour Volumes
2040 No-Build



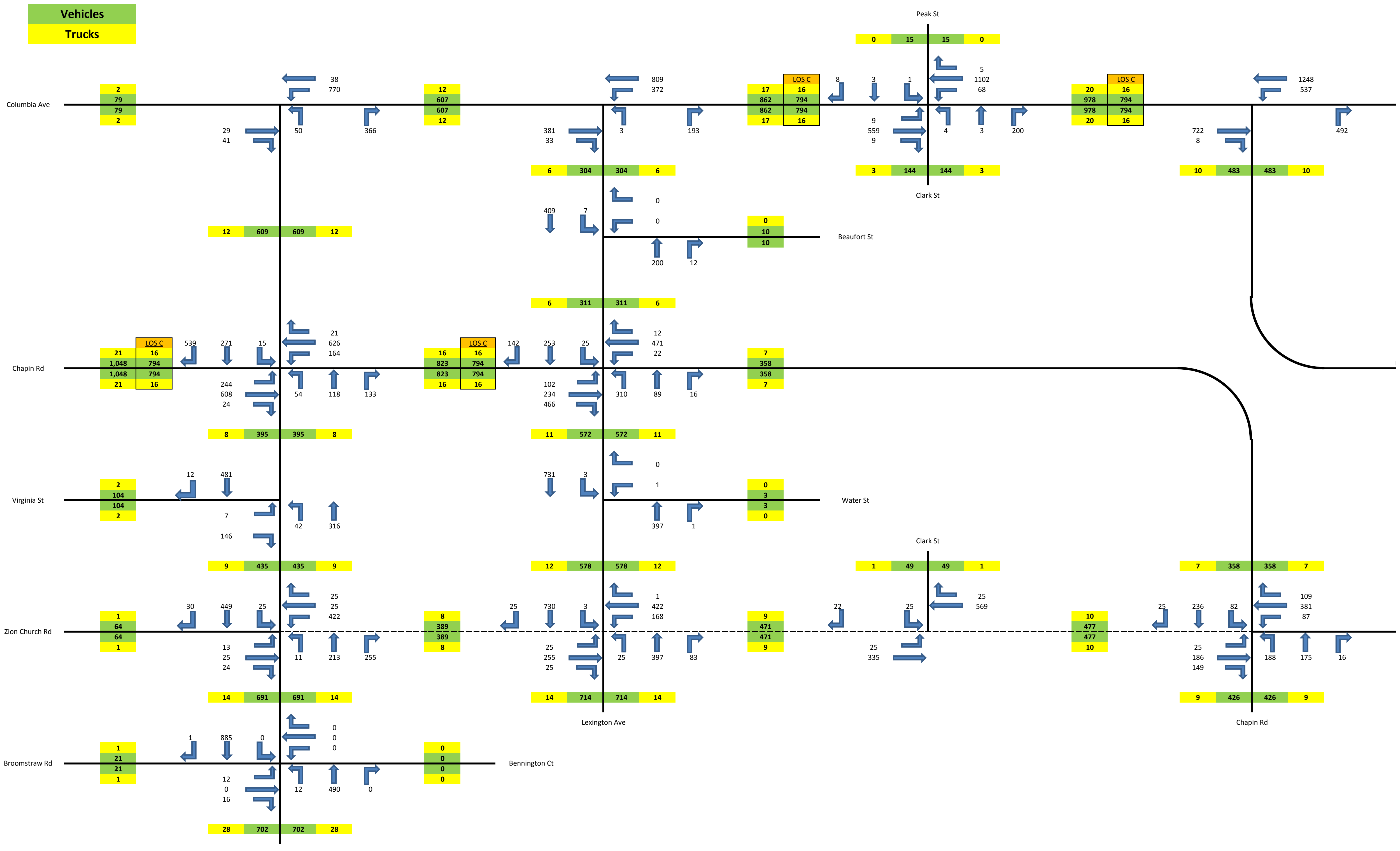
S-48 Columbia Avenue - PM Peak Hour Volumes
2040 No-Build



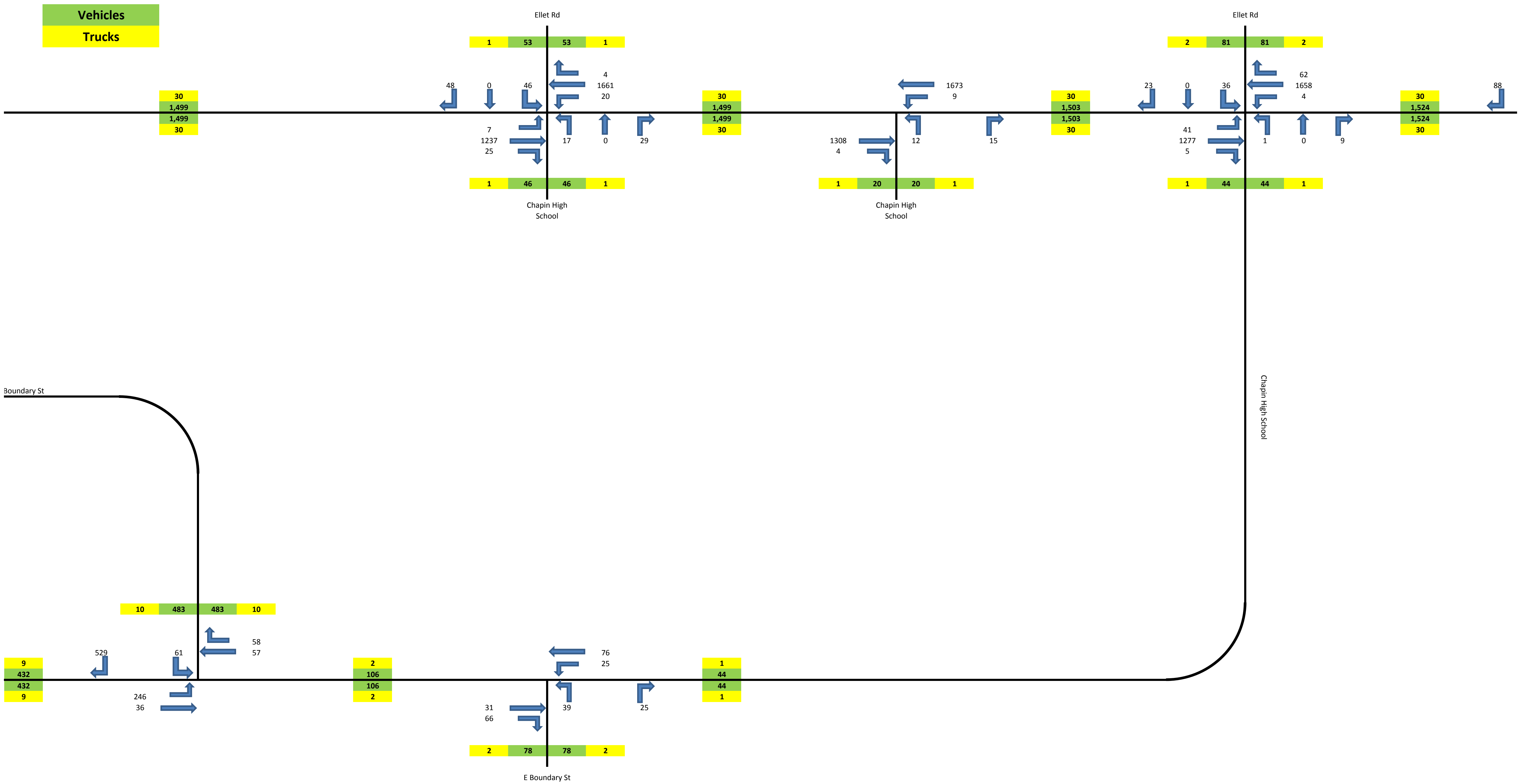
S-48 Columbia Avenue - PM Peak Hour Volumes
2040 No-Build



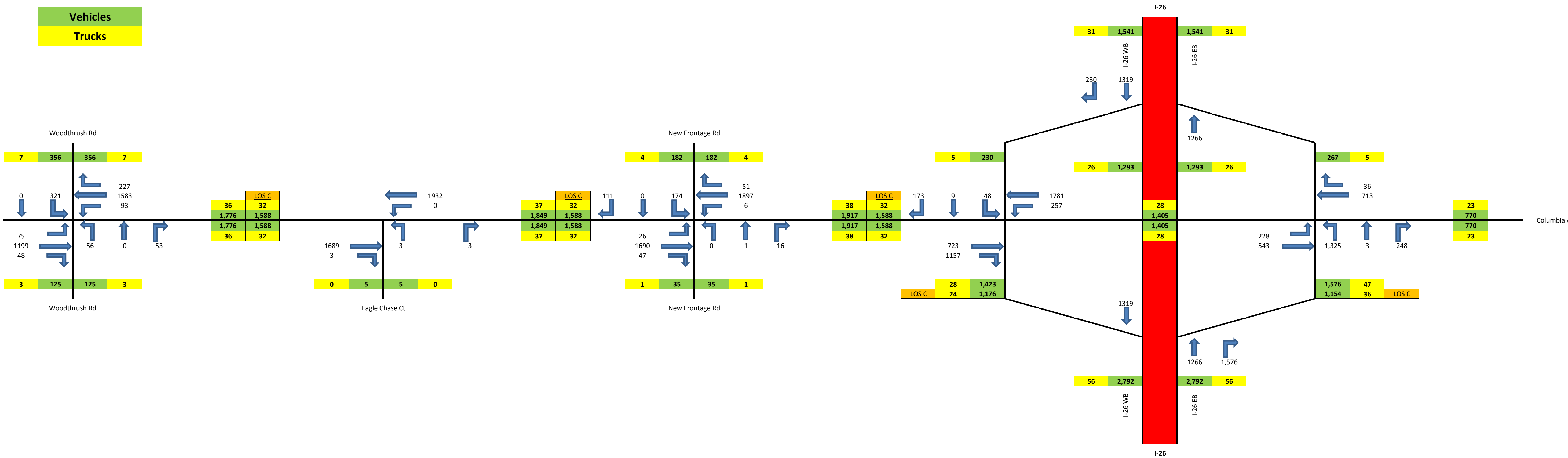
S-48 Columbia Avenue - PM Peak Hour Volumes
2040 Build Alternative 9



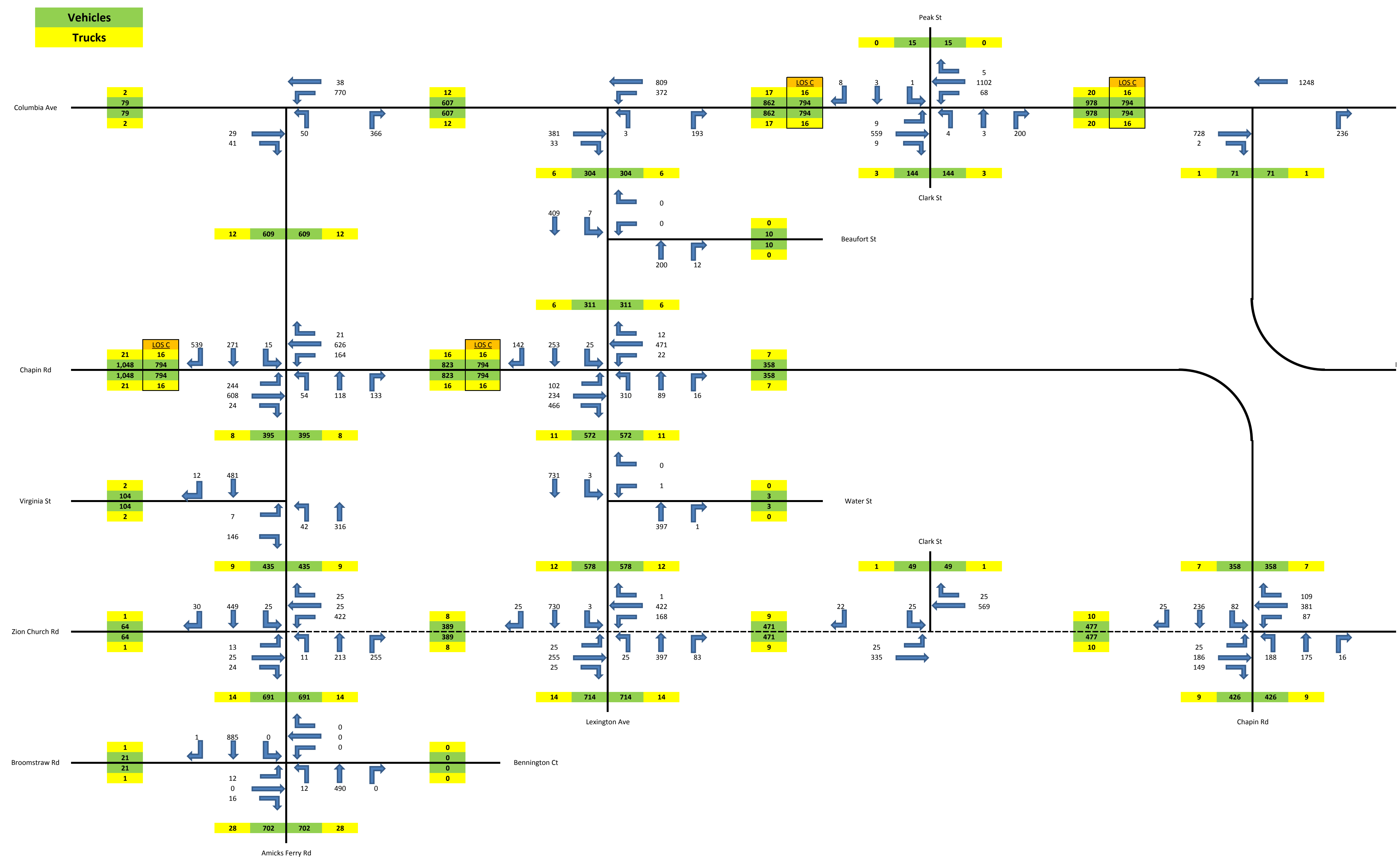
S-48 Columbia Avenue - PM Peak Hour Volumes
2040 Build Alternative 9



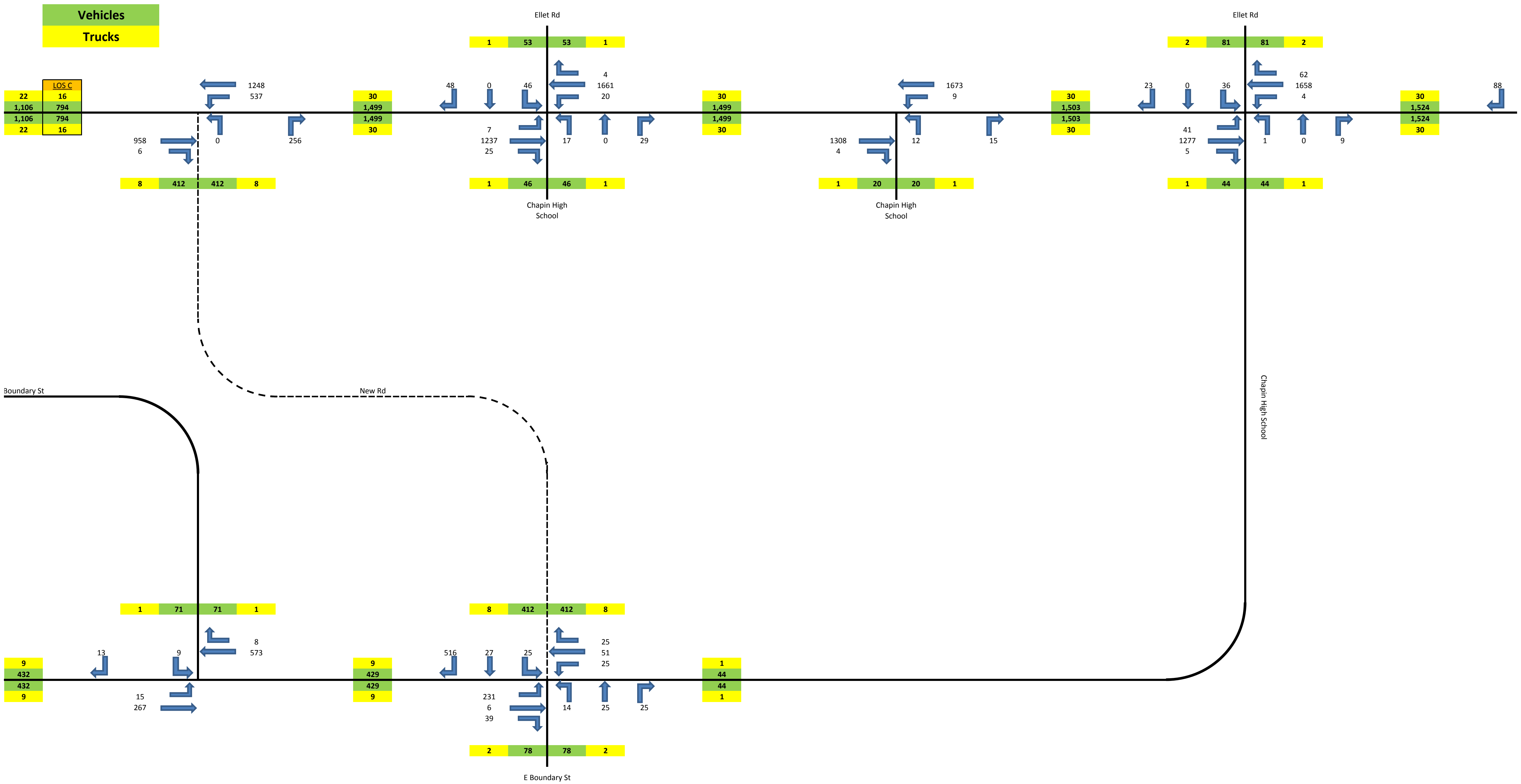
S-48 Columbia Avenue - PM Peak Hour Volumes
2040 Build Alternative 9



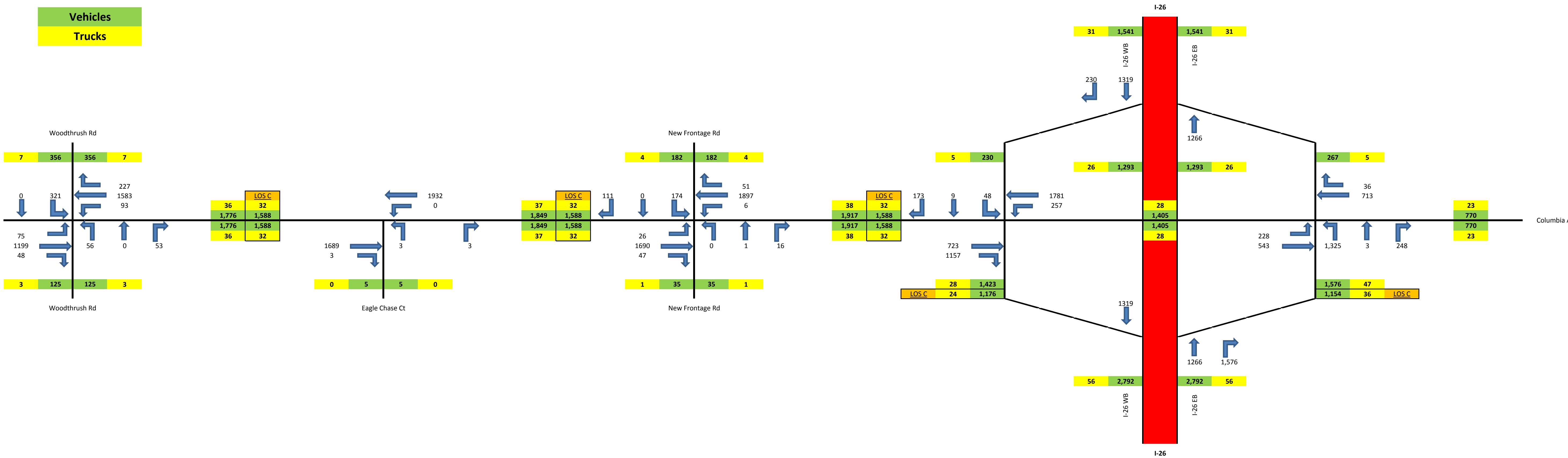
S-48 Columbia Avenue - PM Peak Hour Volumes
2040 Build Alternative 9A



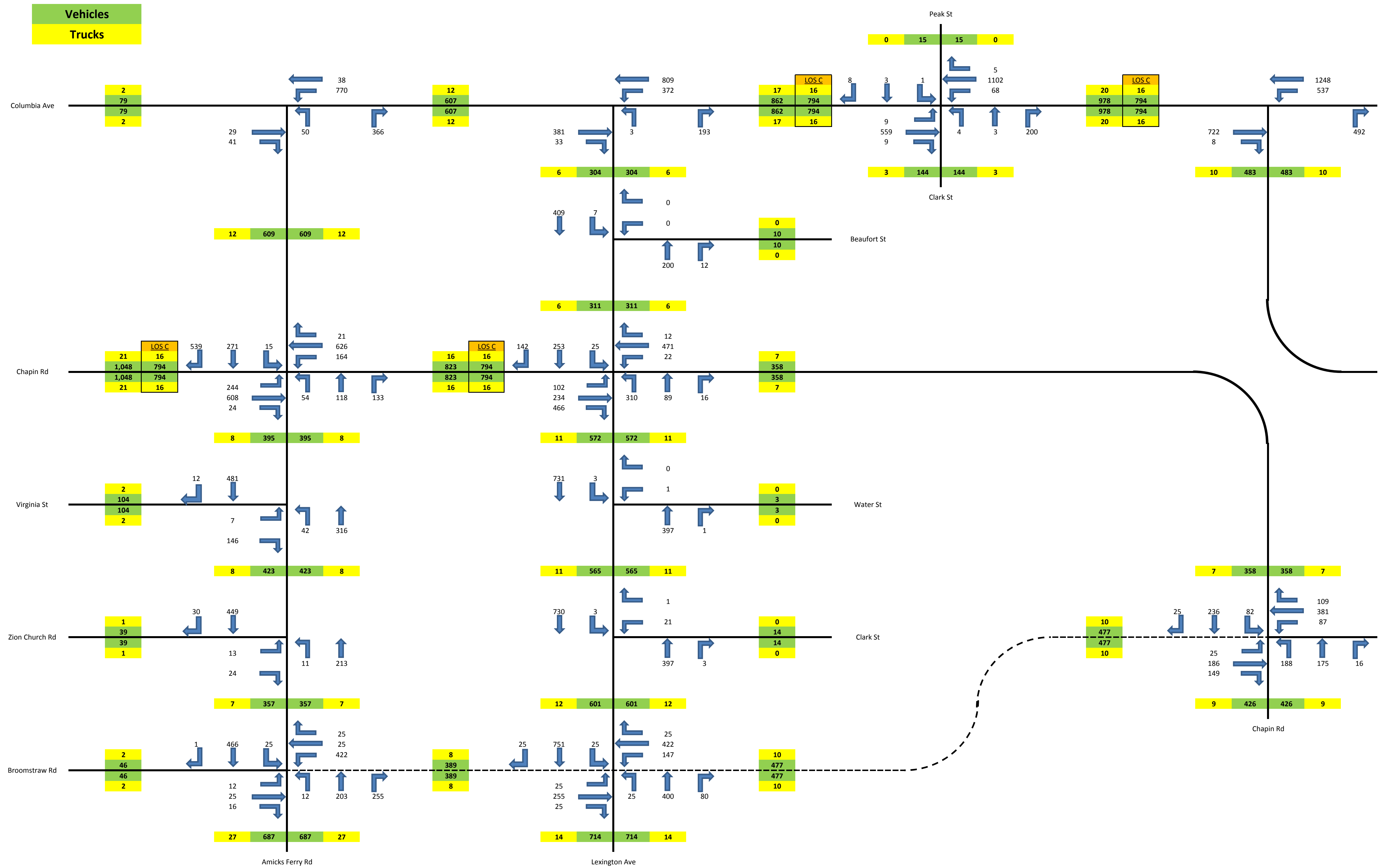
S-48 Columbia Avenue - PM Peak Hour Volumes
2040 Build Alternative 9A



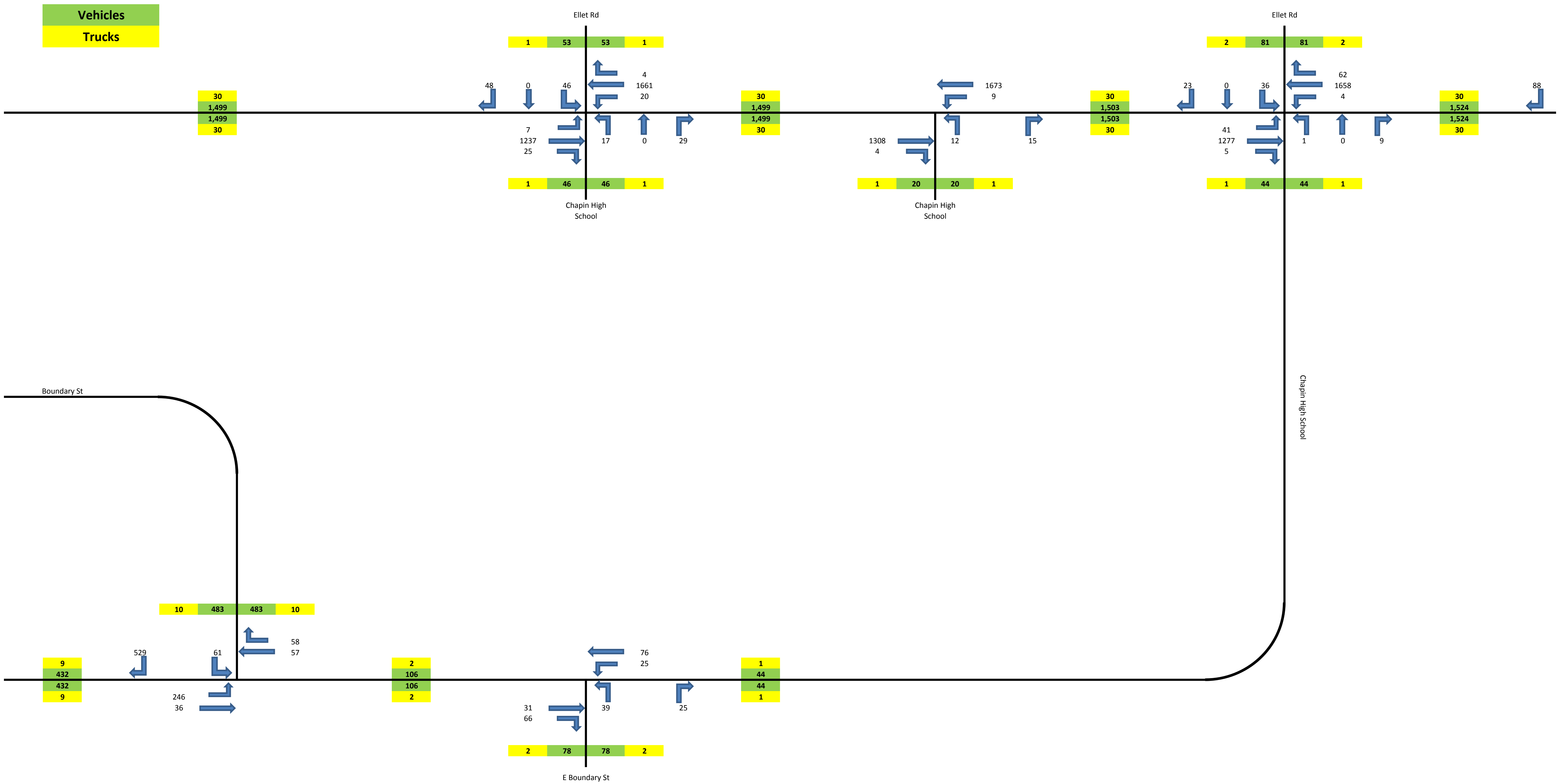
S-48 Columbia Avenue - PM Peak Hour Volumes
2040 Build Alternative 9A



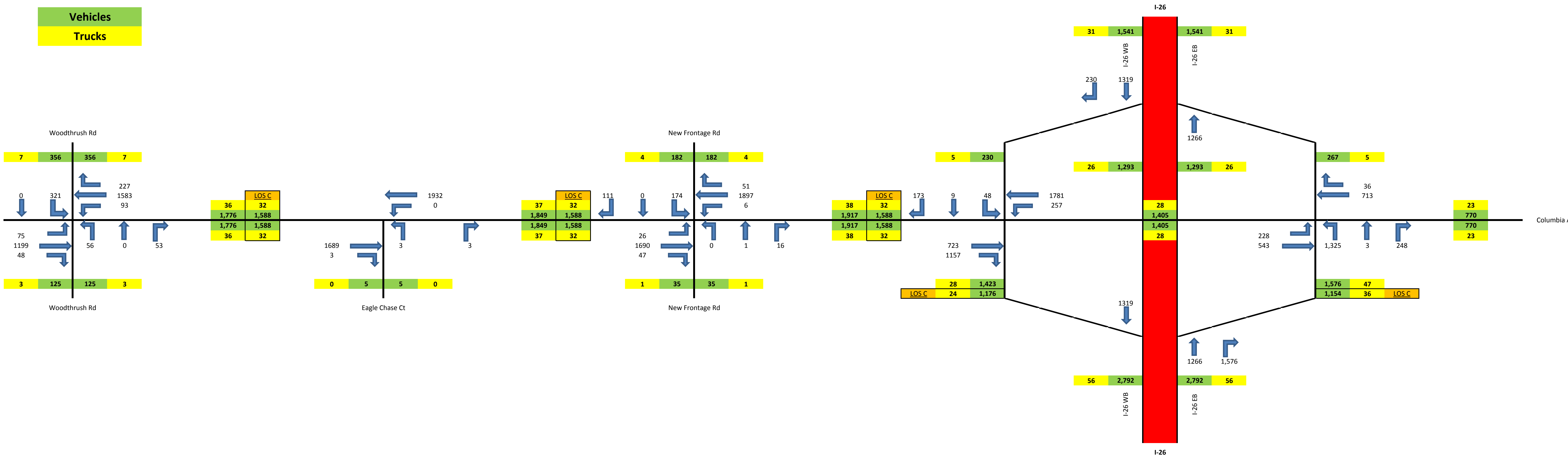
S-48 Columbia Avenue - PM Peak Hour Volumes
2040 Build Alternative 18



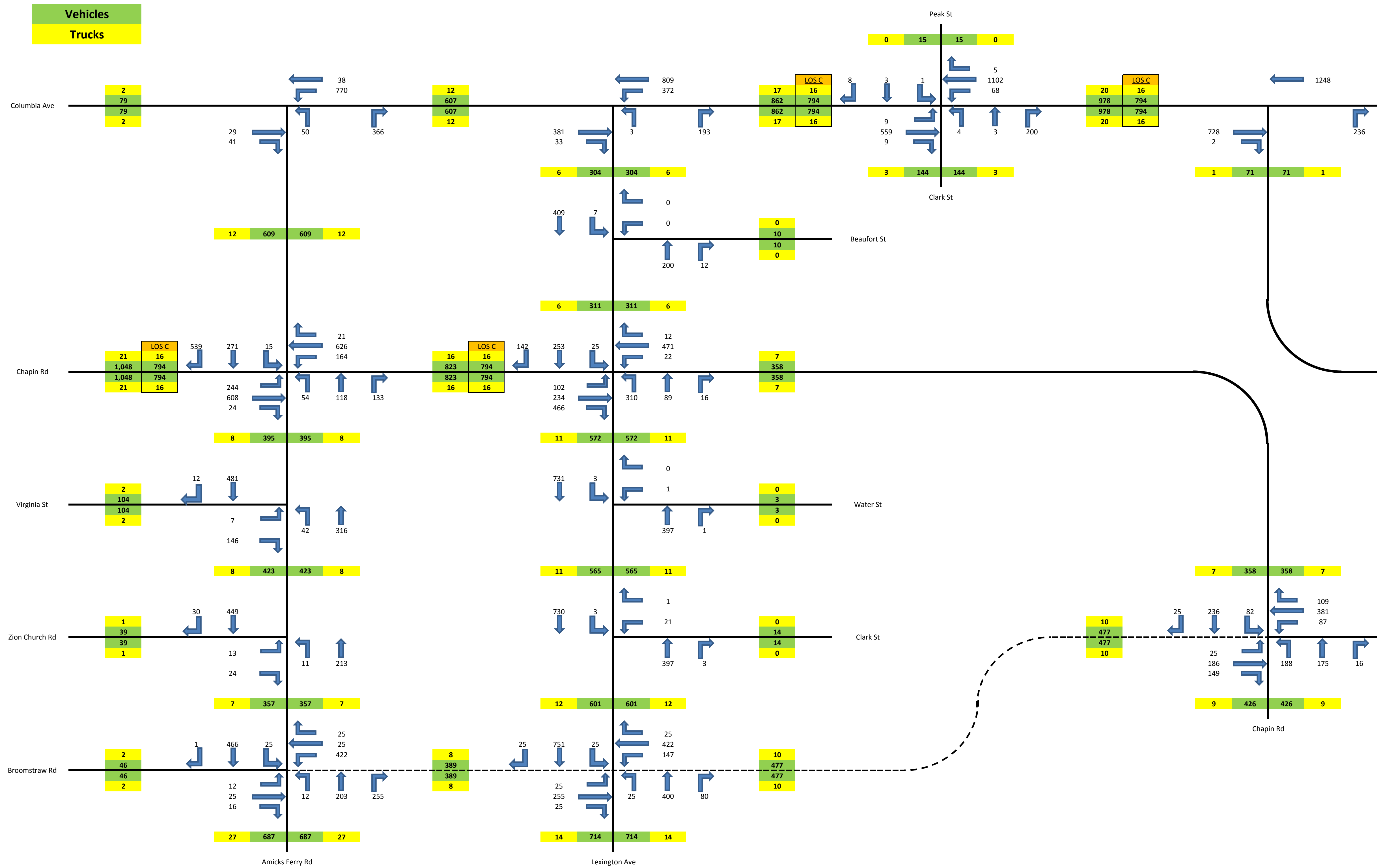
S-48 Columbia Avenue - PM Peak Hour Volumes
2040 Build Alternative 18



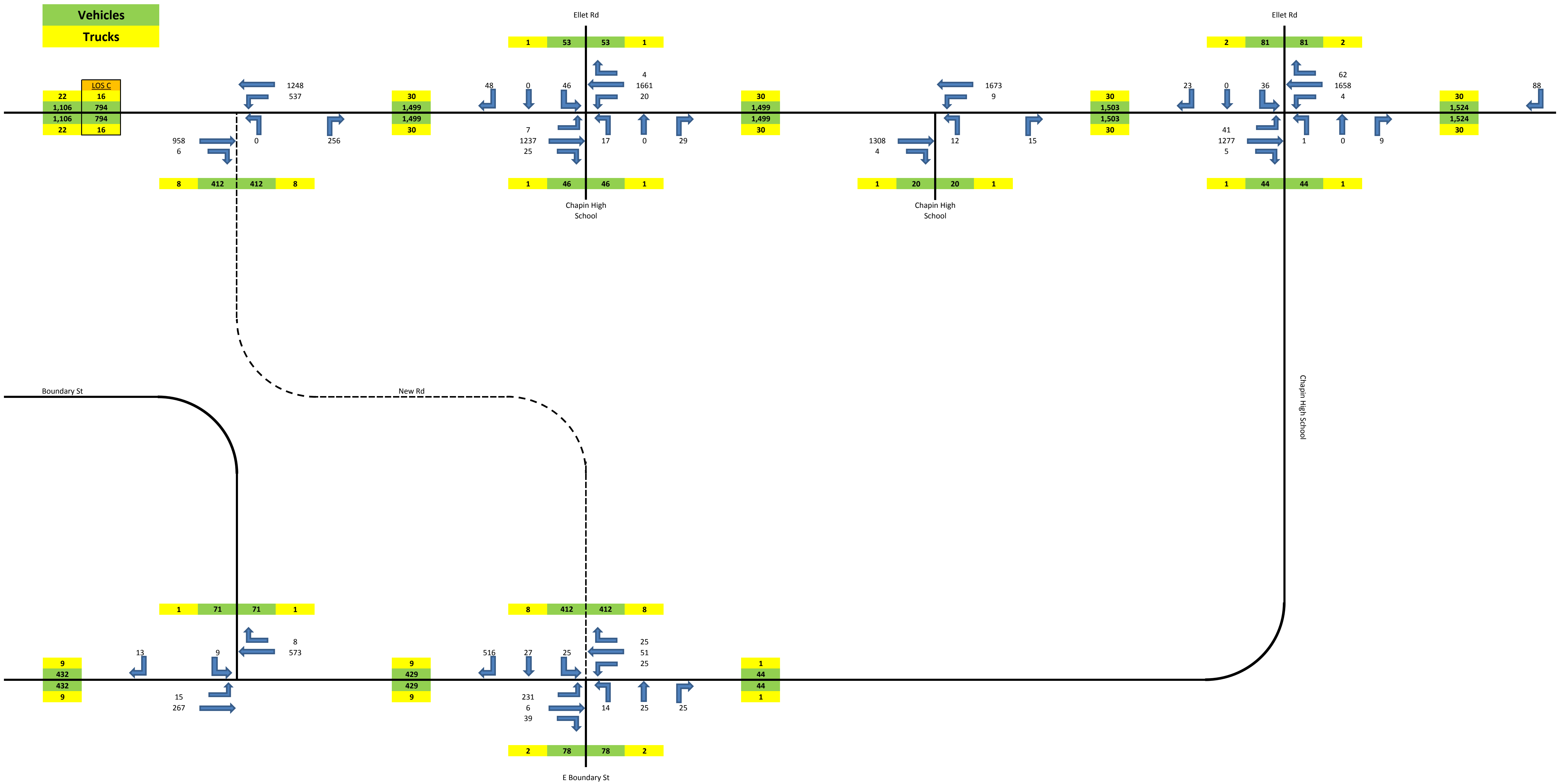
S-48 Columbia Avenue - PM Peak Hour Volumes
2040 Build Alternative 18



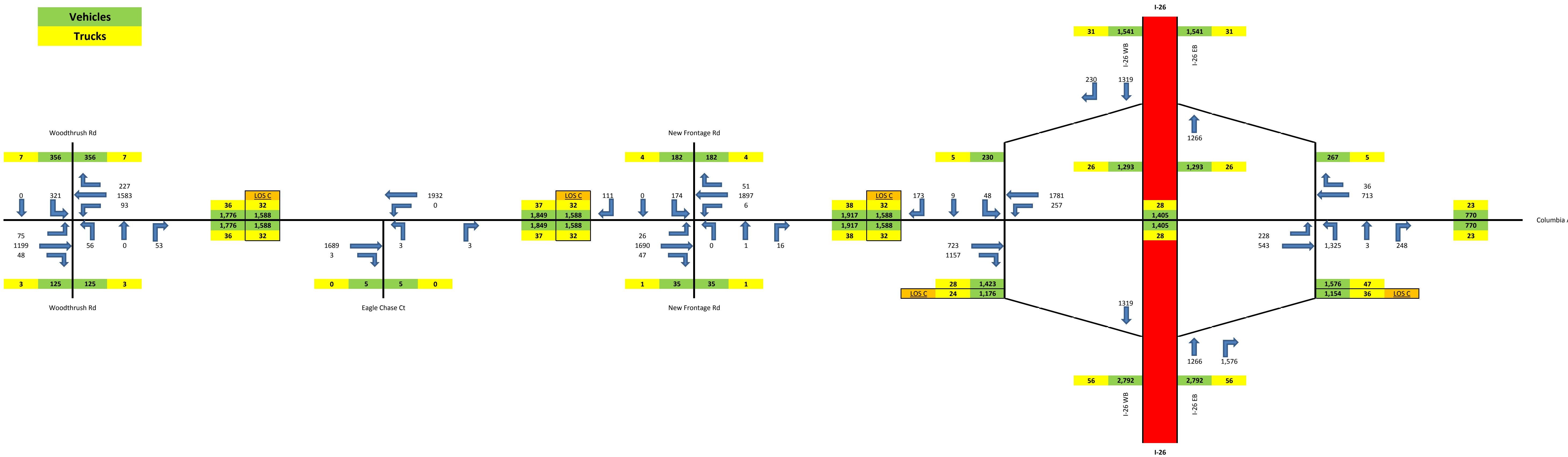
S-48 Columbia Avenue - PM Peak Hour Volumes
2040 Build Alternative 18A



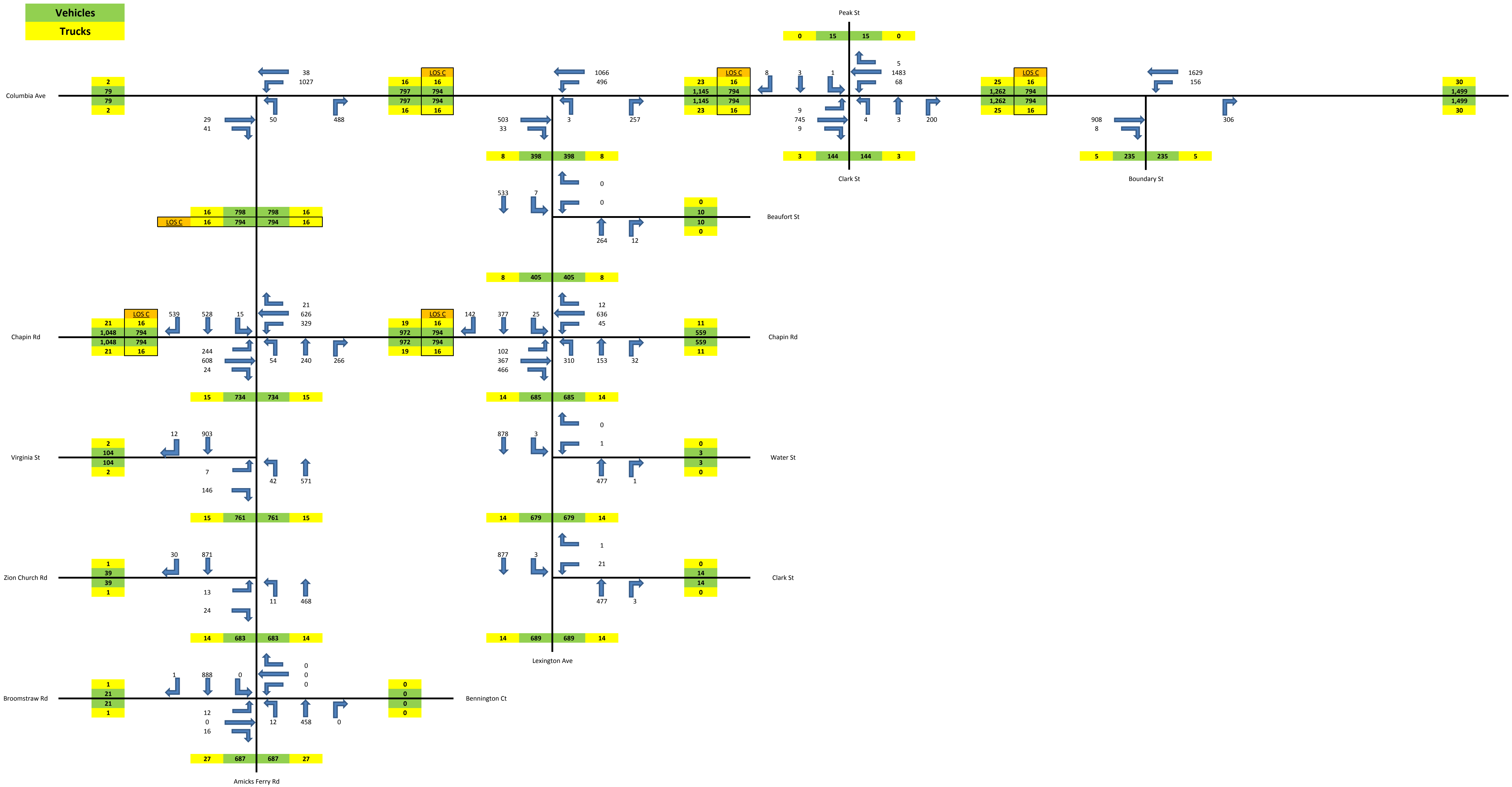
S-48 Columbia Avenue - PM Peak Hour Volumes
2040 Build Alternative 18A



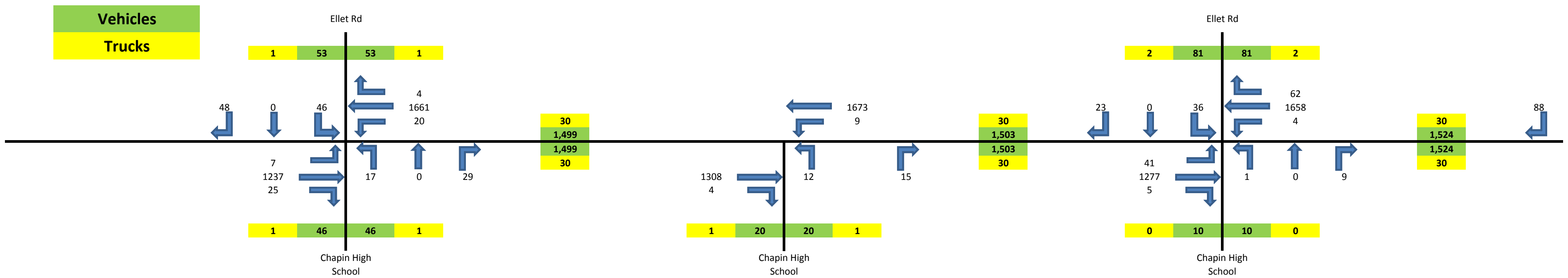
S-48 Columbia Avenue - PM Peak Hour Volumes
2040 Build Alternative 18A



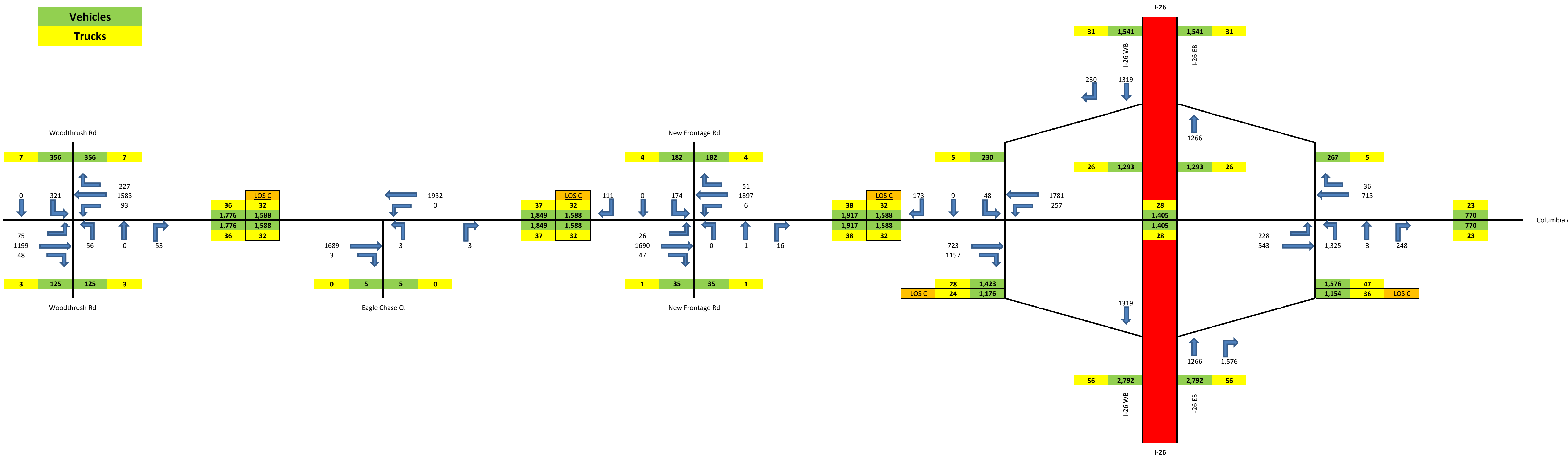
S-48 Columbia Avenue - PM Peak Hour Volumes
2040 Build Alternative 25



S-48 Columbia Avenue - PM Peak Hour Volumes
2040 Build Alternative 25

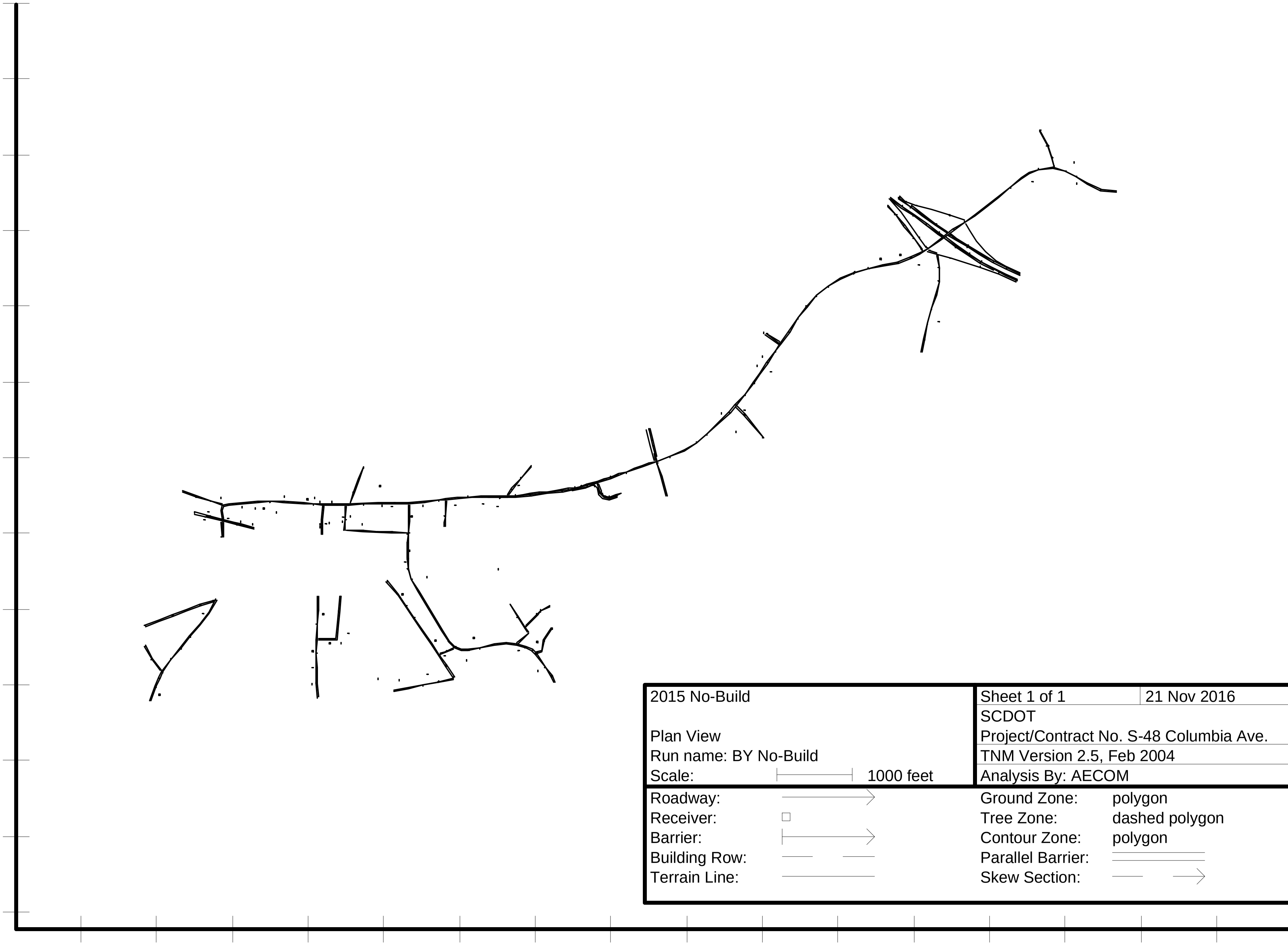


S-48 Columbia Avenue - PM Peak Hour Volumes
2040 Build Alternative 25



APPENDIX D

2015 NO-BUILD NOISE LEVELS



2015 No-Build		Sheet 1 of 1	21 Nov 2016
		SCDOT	
Plan View		Project/Contract No. S-48 Columbia Ave.	
Run name: BY No-Build		TNM Version 2.5, Feb 2004	
Scale:	1000 feet	Analysis By: AECOM	
Roadway:		Ground Zone:	polygon
Receiver:		Tree Zone:	dashed polygon
Barrier:		Contour Zone:	polygon
Building Row:		Parallel Barrier:	
Terrain Line:		Skew Section:	

SCDOT 21 November 2016
AECOM TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: S-48 Columbia Ave.
RUN: 2015 No-Build
BARRIER DESIGN: INPUT HEIGHTS

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

ATMOSPHERICS: 68 deg F, 50% RH

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
1	1	10	0.0	58.8	71	58.8	15	----	58.8	0.0	5	-5.0
2	2	1	0.0	60.7	71	60.7	15	----	60.7	0.0	5	-5.0
3	3	14	0.0	49.8	66	49.8	15	----	49.8	0.0	5	-5.0
4	4	1	0.0	62.9	66	62.9	15	----	62.9	0.0	5	-5.0
5	5	1	0.0	48.4	71	48.4	15	----	48.4	0.0	5	-5.0
6	6	5	0.0	61.0	66	61.0	15	----	61.0	0.0	5	-5.0
7	7	1	0.0	60.2	66	60.2	15	----	60.2	0.0	5	-5.0
8	8	1	0.0	56.7	66	56.7	15	----	56.7	0.0	5	-5.0
9	9	1	0.0	63.8	66	63.8	15	----	63.8	0.0	5	-5.0
10	10	1	0.0	64.6	66	64.6	15	----	64.6	0.0	5	-5.0
11	11	1	0.0	60.6	66	60.6	15	----	60.6	0.0	5	-5.0
12	12	1	0.0	61.5	66	61.5	15	----	61.5	0.0	5	-5.0
13	13	1	0.0	64.4	66	64.4	15	----	64.4	0.0	5	-5.0
14	14	1	0.0	64.2	66	64.2	15	----	64.2	0.0	5	-5.0
15	15	2	0.0	64.9	66	64.9	15	----	64.9	0.0	5	-5.0
16	16	1	0.0	53.6	66	53.6	15	----	53.6	0.0	5	-5.0
17	17	1	0.0	48.0	66	48.0	15	----	48.0	0.0	5	-5.0
18	18	1	0.0	46.3	66	46.3	15	----	46.3	0.0	5	-5.0
19	19	1	0.0	51.5	66	51.5	15	----	51.5	0.0	5	-5.0
20	20	1	0.0	49.3	66	49.3	15	----	49.3	0.0	5	-5.0
21	21	1	0.0	50.5	66	50.5	15	----	50.5	0.0	5	-5.0
22	22	1	0.0	63.7	66	63.7	15	----	63.7	0.0	5	-5.0
23	23	1	0.0	63.3	66	63.3	15	----	63.3	0.0	5	-5.0
24	24	1	0.0	60.5	66	60.5	15	----	60.5	0.0	5	-5.0

25	25	1	0.0	41.9	66	41.9	15	----	41.9	0.0	5	-5.0
26	26	1	0.0	41.8	66	41.8	15	----	41.8	0.0	5	-5.0
27	27	1	0.0	42.5	66	42.5	15	----	42.5	0.0	5	-5.0
28	28	1	0.0	44.9	66	44.9	15	----	44.9	0.0	5	-5.0
29	29	1	0.0	48.2	66	48.2	15	----	48.2	0.0	5	-5.0
30	30	1	0.0	56.5	66	56.5	15	----	56.5	0.0	5	-5.0
31	31	1	0.0	63.4	66	63.4	15	----	63.4	0.0	5	-5.0
32	32	1	0.0	49.9	66	49.9	15	----	49.9	0.0	5	-5.0
33	33	1	0.0	61.8	71	61.8	15	----	61.8	0.0	5	-5.0
34	34	1	0.0	62.8	71	62.8	15	----	62.8	0.0	5	-5.0
35	35	1	0.0	61.0	71	61.0	15	----	61.0	0.0	5	-5.0
36	36	4	0.0	61.9	71	61.9	15	----	61.9	0.0	5	-5.0
37	37	1	0.0	48.1	71	48.1	15	----	48.1	0.0	5	-5.0
38	38	17	0.0	51.8	66	51.8	15	----	51.8	0.0	5	-5.0
39	39	1	0.0	48.5	71	48.5	15	----	48.5	0.0	5	-5.0
40	40	22	0.0	45.8	66	45.8	15	----	45.8	0.0	5	-5.0
41	41	1	0.0	47.6	71	47.6	15	----	47.6	0.0	5	-5.0
42	42	1	0.0	42.7	66	42.7	15	----	42.7	0.0	5	-5.0
43	43	1	0.0	45.6	66	45.6	15	----	45.6	0.0	5	-5.0
44	44	1	0.0	44.9	66	44.9	15	----	44.9	0.0	5	-5.0
45	45	1	0.0	59.0	71	59.0	15	----	59.0	0.0	5	-5.0
46	46	1	0.0	62.9	71	62.9	15	----	62.9	0.0	5	-5.0
47	47	1	0.0	62.2	71	62.2	15	----	62.2	0.0	5	-5.0
48	48	1	0.0	47.3	66	47.3	15	----	47.3	0.0	5	-5.0
49	49	1	0.0	45.4	66	45.4	15	----	45.4	0.0	5	-5.0
50	50	1	0.0	52.7	66	52.7	15	----	52.7	0.0	5	-5.0
51	51	1	0.0	56.7	66	56.7	15	----	56.7	0.0	5	-5.0
52	52	1	0.0	48.3	66	48.3	15	----	48.3	0.0	5	-5.0
53	53	1	0.0	54.8	66	54.8	15	----	54.8	0.0	5	-5.0
54	54	1	0.0	57.3	66	57.3	15	----	57.3	0.0	5	-5.0
55	55	1	0.0	51.1	66	51.1	15	----	51.1	0.0	5	-5.0
56	56	1	0.0	64.4	71	64.4	15	----	64.4	0.0	5	-5.0
57	57	1	0.0	64.1	71	64.1	15	----	64.1	0.0	5	-5.0
58	58	1	0.0	61.4	71	61.4	15	----	61.4	0.0	5	-5.0
59	59	1	0.0	67.5	71	67.5	15	----	67.5	0.0	5	-5.0
60	60	1	0.0	60.5	71	60.5	15	----	60.5	0.0	5	-5.0
61	61	1	0.0	67.0	71	67.0	15	----	67.0	0.0	5	-5.0
62	62	1	0.0	65.3	71	65.3	15	----	65.3	0.0	5	-5.0
63	63	1	0.0	57.0	71	57.0	15	----	57.0	0.0	5	-5.0
64	64	1	0.0	57.9	71	57.9	15	----	57.9	0.0	5	-5.0
65	65	1	0.0	59.2	71	59.2	15	----	59.2	0.0	5	-5.0

66	66	1	0.0	64.1	71	64.1	15	----	64.1	0.0	5	-5.0
67	67	1	0.0	63.0	71	63.0	15	----	63.0	0.0	5	-5.0
68	68	1	0.0	59.4	71	59.4	15	----	59.4	0.0	5	-5.0
69	69	1	0.0	63.9	71	63.9	15	----	63.9	0.0	5	-5.0
70	70	1	0.0	58.7	71	58.7	15	----	58.7	0.0	5	-5.0
71	71	1	0.0	55.5	71	55.5	15	----	55.5	0.0	5	-5.0
72	72	1	0.0	60.6	71	60.6	15	----	60.6	0.0	5	-5.0
73	73	1	0.0	62.5	66	62.5	15	----	62.5	0.0	5	-5.0
74	74	1	0.0	59.7	66	59.7	15	----	59.7	0.0	5	-5.0
75	75	1	0.0	65.7	66	65.7	15	----	65.7	0.0	5	-5.0
76	76	1	0.0	59.7	71	59.7	15	----	59.7	0.0	5	-5.0
77	77	1	0.0	59.3	71	59.3	15	----	59.3	0.0	5	-5.0
78	78	1	0.0	59.3	71	59.3	15	----	59.3	0.0	5	-5.0
79	79	1	0.0	57.6	71	57.6	15	----	57.6	0.0	5	-5.0
80	80	1	0.0	54.7	71	54.7	15	----	54.7	0.0	5	-5.0
81	81	1	0.0	53.2	71	53.2	15	----	53.2	0.0	5	-5.0
82	82	1	0.0	56.4	71	56.4	15	----	56.4	0.0	5	-5.0
83	83	1	0.0	66.2	66	66.2	15	Snd Lvl	66.2	0.0	5	-5.0
84	84	1	0.0	64.5	71	64.5	15	----	64.5	0.0	5	-5.0
85	85	1	0.0	56.3	71	56.3	15	----	56.3	0.0	5	-5.0
86	86	1	0.0	58.5	71	58.5	15	----	58.5	0.0	5	-5.0
87	87	1	0.0	56.3	66	56.3	15	----	56.3	0.0	5	-5.0
88	88	1	0.0	54.2	66	54.2	15	----	54.2	0.0	5	-5.0
89	89	1	0.0	50.9	66	50.9	15	----	50.9	0.0	5	-5.0
90	90	1	0.0	63.3	66	63.3	15	----	63.3	0.0	5	-5.0
91	91	1	0.0	51.3	66	51.3	15	----	51.3	0.0	5	-5.0
92	92	1	0.0	51.6	66	51.6	15	----	51.6	0.0	5	-5.0
93	93	1	0.0	61.9	66	61.9	15	----	61.9	0.0	5	-5.0
94	94	1	0.0	52.4	66	52.4	15	----	52.4	0.0	5	-5.0
95	95	1	0.0	67.2	66	67.2	15	Snd Lvl	67.2	0.0	5	-5.0
96	96	1	0.0	61.6	71	61.6	15	----	61.6	0.0	5	-5.0
97	97	1	0.0	64.4	66	64.4	15	----	64.4	0.0	5	-5.0
98	98	1	0.0	65.0	66	65.0	15	----	65.0	0.0	5	-5.0
99	99	1	0.0	58.7	71	58.7	15	----	58.7	0.0	5	-5.0
100	100	1	0.0	66.5	71	66.5	15	----	66.5	0.0	5	-5.0
101	101	8	0.0	65.1	66	65.1	15	----	65.1	0.0	5	-5.0
102	102	1	0.0	48.1	66	48.1	15	----	48.1	0.0	5	-5.0
103	103	1	0.0	55.4	66	55.4	15	----	55.4	0.0	5	-5.0
104	104	1	0.0	58.2	66	58.2	15	----	58.2	0.0	5	-5.0
105	105	1	0.0	65.6	66	65.6	15	----	65.6	0.0	5	-5.0
106	106	1	0.0	66.7	66	66.7	15	Snd Lvl	66.7	0.0	5	-5.0

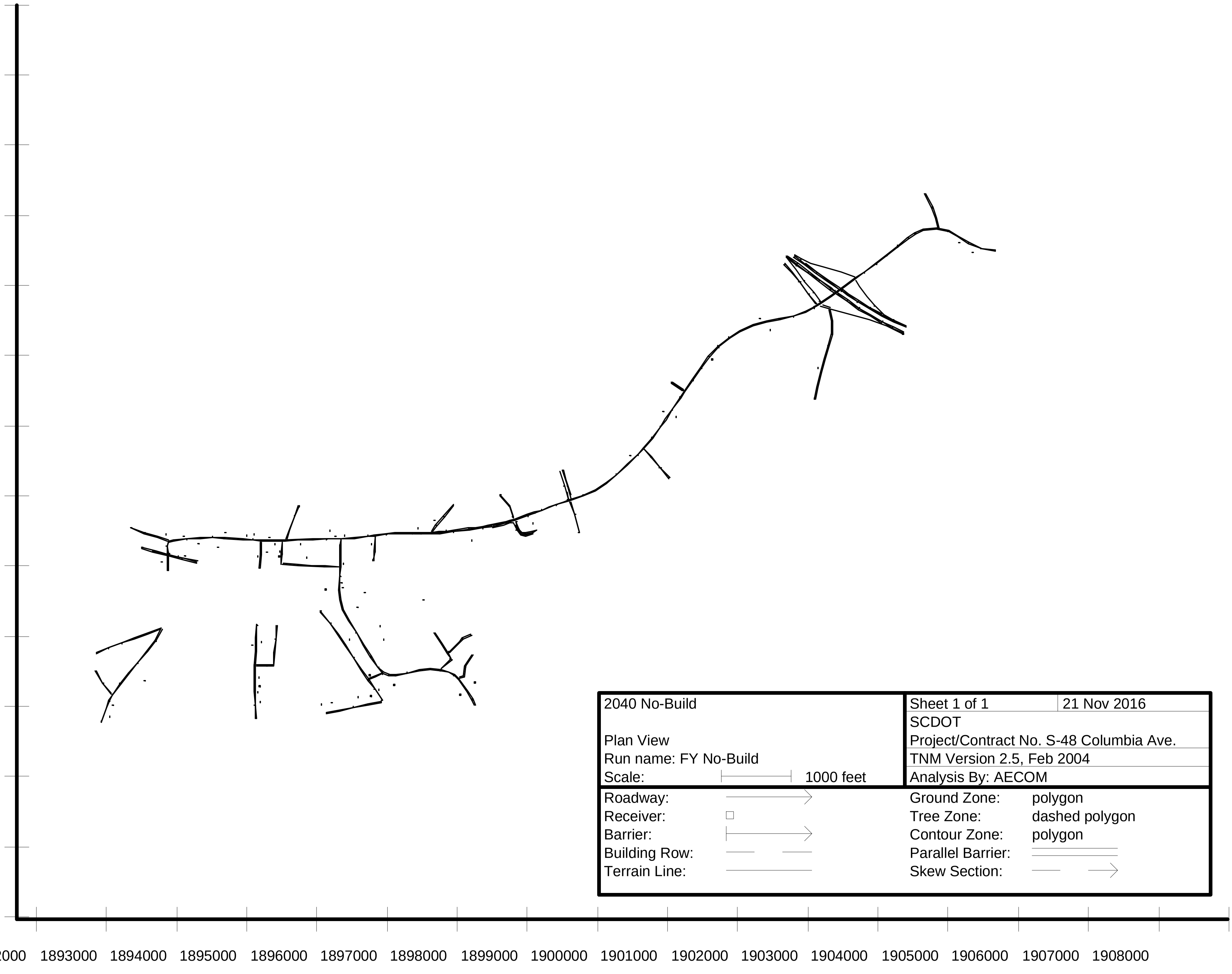
107	107	1	0.0	65.5	66	65.5	15	----	65.5	0.0	5	-5.0
108	108	1	0.0	64.7	66	64.7	15	----	64.7	0.0	5	-5.0
109	109	1	0.0	68.6	66	68.6	15	Snd Lvl	68.6	0.0	5	-5.0
110	110	1	0.0	58.4	66	58.4	15	----	58.4	0.0	5	-5.0
111	111	1	0.0	47.5	71	47.5	15	----	47.5	0.0	5	-5.0
112	112	1	0.0	66.2	66	66.2	15	Snd Lvl	66.2	0.0	5	-5.0
113	113	1	0.0	59.9	71	59.9	15	----	59.9	0.0	5	-5.0
114	114	1	0.0	61.1	71	61.1	15	----	61.1	0.0	5	-5.0
115	115	1	0.0	63.5	71	63.5	15	----	63.5	0.0	5	-5.0
116	116	1	0.0	59.2	71	59.2	15	----	59.2	0.0	5	-5.0
117	117	1	0.0	56.6	66	56.6	15	----	56.6	0.0	5	-5.0
118	118	1	0.0	59.3	66	59.3	15	----	59.3	0.0	5	-5.0
119	119	141	0.0	57.3	66	57.3	15	----	57.3	0.0	5	-5.0
120	120	1	0.0	58.5	71	58.5	15	----	58.5	0.0	5	-5.0
121	121	1	0.0	64.5	71	64.5	15	----	64.5	0.0	5	-5.0
122	122	1	0.0	53.4	71	53.4	15	----	53.4	0.0	5	-5.0
123	123	1	0.0	58.4	71	58.4	15	----	58.4	0.0	5	-5.0
124	124	1	0.0	58.3	71	58.3	15	----	58.3	0.0	5	-5.0
125	125	1	0.0	61.5	71	61.5	15	----	61.5	0.0	5	-5.0
126	126	1	0.0	60.5	66	60.5	15	----	60.5	0.0	5	-5.0
127	127	1	0.0	60.5	71	60.5	15	----	60.5	0.0	5	-5.0
128	128	1	0.0	52.4	71	52.4	15	----	52.4	0.0	5	-5.0
129	129	1	0.0	58.4	66	58.4	15	----	58.4	0.0	5	-5.0
130	130	1	0.0	64.8	66	64.8	15	----	64.8	0.0	5	-5.0
131	131	1	0.0	61.1	71	61.1	15	----	61.1	0.0	5	-5.0
132	132	1	0.0	62.8	71	62.8	15	----	62.8	0.0	5	-5.0
133	133	1	0.0	58.7	71	58.7	15	----	58.7	0.0	5	-5.0
134	134	1	0.0	61.4	71	61.4	15	----	61.4	0.0	5	-5.0
135	135	1	0.0	56.1	71	56.1	15	----	56.1	0.0	5	-5.0
136	136	1	0.0	62.6	71	62.6	15	----	62.6	0.0	5	-5.0
137	137	1	0.0	60.5	71	60.5	15	----	60.5	0.0	5	-5.0
138	138	1	0.0	60.7	71	60.7	15	----	60.7	0.0	5	-5.0
139	139	1	0.0	56.0	66	56.0	15	----	56.0	0.0	5	-5.0
140	140	1	0.0	51.2	66	51.2	15	----	51.2	0.0	5	-5.0
141	141	1	0.0	54.6	66	54.6	15	----	54.6	0.0	5	-5.0
142	142	1	0.0	54.7	66	54.7	15	----	54.7	0.0	5	-5.0
143	143	1	0.0	55.0	66	55.0	15	----	55.0	0.0	5	-5.0
144	144	1	0.0	51.2	66	51.2	15	----	51.2	0.0	5	-5.0
145	145	1	0.0	56.7	66	56.7	15	----	56.7	0.0	5	-5.0
146	146	1	0.0	54.1	66	54.1	15	----	54.1	0.0	5	-5.0
Dwelling Units		**# DUs**	**Noise Reduction**									

RESULTS: SOUND LEVELS **S-48 Columbia Ave.**

		Min	Avg	Max
		dB	dB	dB
All Selected	360	0.0	0.0	0.0
All Impacted	5	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

APPENDIX E

2040 NO-BUILD NOISE LEVELS



2040 No-Build		Sheet 1 of 1	21 Nov 2016
		SCDOT	
Plan View		Project/Contract No. S-48 Columbia Ave.	
Run name: FY No-Build		TNM Version 2.5, Feb 2004	
Scale:	1000 feet	Analysis By: AECOM	
Roadway:		Ground Zone:	polygon
Receiver:		Tree Zone:	dashed polygon
Barrier:		Contour Zone:	polygon
Building Row:		Parallel Barrier:	
Terrain Line:		Skew Section:	

SCDOT 21 November 2016
AECOM TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: S-48 Columbia Ave.
RUN: 2040 No-Build
BARRIER DESIGN: INPUT HEIGHTS

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

ATMOSPHERICS: 68 deg F, 50% RH

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	No Barrier Crit'n	Increase over existing Calculated	Increase over existing Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Noise Reduction Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
1	1	10	0.0	60.9	71	60.9	15	----	60.9	0.0	5	-5.0
2	2	1	0.0	62.8	71	62.8	15	----	62.8	0.0	5	-5.0
3	3	14	0.0	51.9	66	51.9	15	----	51.9	0.0	5	-5.0
4	4	1	0.0	65.1	66	65.1	15	----	65.1	0.0	5	-5.0
5	5	1	0.0	50.2	71	50.2	15	----	50.2	0.0	5	-5.0
6	6	5	0.0	62.8	66	62.8	15	----	62.8	0.0	5	-5.0
7	7	1	0.0	61.9	66	61.9	15	----	61.9	0.0	5	-5.0
8	8	1	0.0	58.4	66	58.4	15	----	58.4	0.0	5	-5.0
9	9	1	0.0	65.6	66	65.6	15	----	65.6	0.0	5	-5.0
10	10	1	0.0	66.4	66	66.4	15	Snd Lvl	66.4	0.0	5	-5.0
11	11	1	0.0	62.3	66	62.3	15	----	62.3	0.0	5	-5.0
12	12	1	0.0	63.2	66	63.2	15	----	63.2	0.0	5	-5.0
13	13	1	0.0	66.2	66	66.2	15	Snd Lvl	66.2	0.0	5	-5.0
14	14	1	0.0	66.0	66	66.0	15	Snd Lvl	66.0	0.0	5	-5.0
15	15	2	0.0	66.7	66	66.7	15	Snd Lvl	66.7	0.0	5	-5.0
16	16	1	0.0	55.4	66	55.4	15	----	55.4	0.0	5	-5.0
17	17	1	0.0	49.7	66	49.7	15	----	49.7	0.0	5	-5.0
18	18	1	0.0	47.9	66	47.9	15	----	47.9	0.0	5	-5.0
19	19	1	0.0	53.2	66	53.2	15	----	53.2	0.0	5	-5.0
20	20	1	0.0	50.9	66	50.9	15	----	50.9	0.0	5	-5.0
21	21	1	0.0	52.1	66	52.1	15	----	52.1	0.0	5	-5.0
22	22	1	0.0	65.5	66	65.5	15	----	65.5	0.0	5	-5.0
23	23	1	0.0	65.1	66	65.1	15	----	65.1	0.0	5	-5.0
24	24	1	0.0	62.3	66	62.3	15	----	62.3	0.0	5	-5.0

25	25	1	0.0	43.5	66	43.5	15	----	43.5	0.0	5	-5.0
26	26	1	0.0	43.4	66	43.4	15	----	43.4	0.0	5	-5.0
27	27	1	0.0	44.1	66	44.1	15	----	44.1	0.0	5	-5.0
28	28	1	0.0	46.5	66	46.5	15	----	46.5	0.0	5	-5.0
29	29	1	0.0	49.7	66	49.7	15	----	49.7	0.0	5	-5.0
30	30	1	0.0	57.8	66	57.8	15	----	57.8	0.0	5	-5.0
31	31	1	0.0	64.7	66	64.7	15	----	64.7	0.0	5	-5.0
32	32	1	0.0	52.3	66	52.3	15	----	52.3	0.0	5	-5.0
33	33	1	0.0	63.1	71	63.1	15	----	63.1	0.0	5	-5.0
34	34	1	0.0	64.2	71	64.2	15	----	64.2	0.0	5	-5.0
35	35	1	0.0	62.3	71	62.3	15	----	62.3	0.0	5	-5.0
36	36	4	0.0	63.2	71	63.2	15	----	63.2	0.0	5	-5.0
37	37	1	0.0	51.1	71	51.1	15	----	51.1	0.0	5	-5.0
38	38	17	0.0	55.1	66	55.1	15	----	55.1	0.0	5	-5.0
39	39	1	0.0	51.9	71	51.9	15	----	51.9	0.0	5	-5.0
40	40	22	0.0	49.1	66	49.1	15	----	49.1	0.0	5	-5.0
41	41	1	0.0	50.6	71	50.6	15	----	50.6	0.0	5	-5.0
42	42	1	0.0	43.7	66	43.7	15	----	43.7	0.0	5	-5.0
43	43	1	0.0	47.8	66	47.8	15	----	47.8	0.0	5	-5.0
44	44	1	0.0	47.0	66	47.0	15	----	47.0	0.0	5	-5.0
45	45	1	0.0	60.5	71	60.5	15	----	60.5	0.0	5	-5.0
46	46	1	0.0	64.2	71	64.2	15	----	64.2	0.0	5	-5.0
47	47	1	0.0	63.5	71	63.5	15	----	63.5	0.0	5	-5.0
48	48	1	0.0	49.7	66	49.7	15	----	49.7	0.0	5	-5.0
49	49	1	0.0	47.1	66	47.1	15	----	47.1	0.0	5	-5.0
50	50	1	0.0	55.9	66	55.9	15	----	55.9	0.0	5	-5.0
51	51	1	0.0	60.0	66	60.0	15	----	60.0	0.0	5	-5.0
52	52	1	0.0	50.5	66	50.5	15	----	50.5	0.0	5	-5.0
53	53	1	0.0	58.1	66	58.1	15	----	58.1	0.0	5	-5.0
54	54	1	0.0	60.7	66	60.7	15	----	60.7	0.0	5	-5.0
55	55	1	0.0	54.1	66	54.1	15	----	54.1	0.0	5	-5.0
56	56	1	0.0	65.3	71	65.3	15	----	65.3	0.0	5	-5.0
57	57	1	0.0	65.1	71	65.1	15	----	65.1	0.0	5	-5.0
58	58	1	0.0	63.0	71	63.0	15	----	63.0	0.0	5	-5.0
59	59	1	0.0	68.4	71	68.4	15	----	68.4	0.0	5	-5.0
60	60	1	0.0	61.7	71	61.7	15	----	61.7	0.0	5	-5.0
61	61	1	0.0	67.6	71	67.6	15	----	67.6	0.0	5	-5.0
62	62	1	0.0	65.9	71	65.9	15	----	65.9	0.0	5	-5.0
63	63	1	0.0	58.7	71	58.7	15	----	58.7	0.0	5	-5.0
64	64	1	0.0	60.3	71	60.3	15	----	60.3	0.0	5	-5.0
65	65	1	0.0	61.9	71	61.9	15	----	61.9	0.0	5	-5.0

66	66	1	0.0	66.9	71	66.9	15	----	66.9	0.0	5	-5.0
67	67	1	0.0	65.7	71	65.7	15	----	65.7	0.0	5	-5.0
68	68	1	0.0	62.1	71	62.1	15	----	62.1	0.0	5	-5.0
69	69	1	0.0	66.8	71	66.8	15	----	66.8	0.0	5	-5.0
70	70	1	0.0	61.4	71	61.4	15	----	61.4	0.0	5	-5.0
71	71	1	0.0	58.2	71	58.2	15	----	58.2	0.0	5	-5.0
72	72	1	0.0	63.5	71	63.5	15	----	63.5	0.0	5	-5.0
73	73	1	0.0	65.4	66	65.4	15	----	65.4	0.0	5	-5.0
74	74	1	0.0	62.3	66	62.3	15	----	62.3	0.0	5	-5.0
75	75	1	0.0	68.4	66	68.4	15	Snd Lvl	68.4	0.0	5	-5.0
76	76	1	0.0	62.5	71	62.5	15	----	62.5	0.0	5	-5.0
77	77	1	0.0	62.1	71	62.1	15	----	62.1	0.0	5	-5.0
78	78	1	0.0	62.1	71	62.1	15	----	62.1	0.0	5	-5.0
79	79	1	0.0	60.3	71	60.3	15	----	60.3	0.0	5	-5.0
80	80	1	0.0	57.1	71	57.1	15	----	57.1	0.0	5	-5.0
81	81	1	0.0	55.3	71	55.3	15	----	55.3	0.0	5	-5.0
82	82	1	0.0	58.6	71	58.6	15	----	58.6	0.0	5	-5.0
83	83	1	0.0	67.7	66	67.7	15	Snd Lvl	67.7	0.0	5	-5.0
84	84	1	0.0	66.0	71	66.0	15	----	66.0	0.0	5	-5.0
85	85	1	0.0	59.0	71	59.0	15	----	59.0	0.0	5	-5.0
86	86	1	0.0	60.9	71	60.9	15	----	60.9	0.0	5	-5.0
87	87	1	0.0	58.1	66	58.1	15	----	58.1	0.0	5	-5.0
88	88	1	0.0	55.6	66	55.6	15	----	55.6	0.0	5	-5.0
89	89	1	0.0	52.2	66	52.2	15	----	52.2	0.0	5	-5.0
90	90	1	0.0	64.4	66	64.4	15	----	64.4	0.0	5	-5.0
91	91	1	0.0	52.8	66	52.8	15	----	52.8	0.0	5	-5.0
92	92	1	0.0	52.8	66	52.8	15	----	52.8	0.0	5	-5.0
93	93	1	0.0	63.0	66	63.0	15	----	63.0	0.0	5	-5.0
94	94	1	0.0	53.5	66	53.5	15	----	53.5	0.0	5	-5.0
95	95	1	0.0	68.3	66	68.3	15	Snd Lvl	68.3	0.0	5	-5.0
96	96	1	0.0	62.7	71	62.7	15	----	62.7	0.0	5	-5.0
97	97	1	0.0	65.5	66	65.5	15	----	65.5	0.0	5	-5.0
98	98	1	0.0	66.0	66	66.0	15	Snd Lvl	66.0	0.0	5	-5.0
99	99	1	0.0	59.7	71	59.7	15	----	59.7	0.0	5	-5.0
100	100	1	0.0	67.5	71	67.5	15	----	67.5	0.0	5	-5.0
101	101	8	0.0	66.2	66	66.2	15	Snd Lvl	66.2	0.0	5	-5.0
102	102	1	0.0	49.8	66	49.8	15	----	49.8	0.0	5	-5.0
103	103	1	0.0	58.5	66	58.5	15	----	58.5	0.0	5	-5.0
104	104	1	0.0	60.7	66	60.7	15	----	60.7	0.0	5	-5.0
105	105	1	0.0	66.2	66	66.2	15	Snd Lvl	66.2	0.0	5	-5.0
106	106	1	0.0	67.1	66	67.1	15	Snd Lvl	67.1	0.0	5	-5.0

107	107	1	0.0	65.8	66	65.8	15	----	65.8	0.0	5	-5.0
108	108	1	0.0	65.0	66	65.0	15	----	65.0	0.0	5	-5.0
109	109	1	0.0	68.9	66	68.9	15	Snd Lvl	68.9	0.0	5	-5.0
110	110	1	0.0	58.8	66	58.8	15	----	58.8	0.0	5	-5.0
111	111	1	0.0	48.2	71	48.2	15	----	48.2	0.0	5	-5.0
112	112	1	0.0	66.6	66	66.6	15	Snd Lvl	66.6	0.0	5	-5.0
113	113	1	0.0	60.2	71	60.2	15	----	60.2	0.0	5	-5.0
114	114	1	0.0	61.4	71	61.4	15	----	61.4	0.0	5	-5.0
115	115	1	0.0	63.8	71	63.8	15	----	63.8	0.0	5	-5.0
116	116	1	0.0	59.5	71	59.5	15	----	59.5	0.0	5	-5.0
117	117	1	0.0	57.0	66	57.0	15	----	57.0	0.0	5	-5.0
118	118	1	0.0	59.6	66	59.6	15	----	59.6	0.0	5	-5.0
119	119	141	0.0	57.5	66	57.5	15	----	57.5	0.0	5	-5.0
120	120	1	0.0	58.8	71	58.8	15	----	58.8	0.0	5	-5.0
121	121	1	0.0	64.7	71	64.7	15	----	64.7	0.0	5	-5.0
122	122	1	0.0	53.6	71	53.6	15	----	53.6	0.0	5	-5.0
123	123	1	0.0	58.6	71	58.6	15	----	58.6	0.0	5	-5.0
124	124	1	0.0	58.5	71	58.5	15	----	58.5	0.0	5	-5.0
125	125	1	0.0	61.6	71	61.6	15	----	61.6	0.0	5	-5.0
126	126	1	0.0	60.6	66	60.6	15	----	60.6	0.0	5	-5.0
127	127	1	0.0	60.6	71	60.6	15	----	60.6	0.0	5	-5.0
128	128	1	0.0	52.6	71	52.6	15	----	52.6	0.0	5	-5.0
129	129	1	0.0	58.5	66	58.5	15	----	58.5	0.0	5	-5.0
130	130	1	0.0	64.9	66	64.9	15	----	64.9	0.0	5	-5.0
131	131	1	0.0	61.2	71	61.2	15	----	61.2	0.0	5	-5.0
132	132	1	0.0	62.9	71	62.9	15	----	62.9	0.0	5	-5.0
133	133	1	0.0	58.9	71	58.9	15	----	58.9	0.0	5	-5.0
134	134	1	0.0	61.6	71	61.6	15	----	61.6	0.0	5	-5.0
135	135	1	0.0	56.6	71	56.6	15	----	56.6	0.0	5	-5.0
136	136	1	0.0	62.9	71	62.9	15	----	62.9	0.0	5	-5.0
137	137	1	0.0	61.6	71	61.6	15	----	61.6	0.0	5	-5.0
138	138	1	0.0	61.4	71	61.4	15	----	61.4	0.0	5	-5.0
139	139	1	0.0	56.9	66	56.9	15	----	56.9	0.0	5	-5.0
140	140	1	0.0	52.1	66	52.1	15	----	52.1	0.0	5	-5.0
141	141	1	0.0	60.6	66	60.6	15	----	60.6	0.0	5	-5.0
142	142	1	0.0	60.8	66	60.8	15	----	60.8	0.0	5	-5.0
143	143	1	0.0	61.4	66	61.4	15	----	61.4	0.0	5	-5.0
144	144	1	0.0	57.4	66	57.4	15	----	57.4	0.0	5	-5.0
145	145	1	0.0	63.2	66	63.2	15	----	63.2	0.0	5	-5.0
146	146	1	0.0	60.4	66	60.4	15	----	60.4	0.0	5	-5.0
Dwelling Units		**# DUs**	**Noise Reduction**									

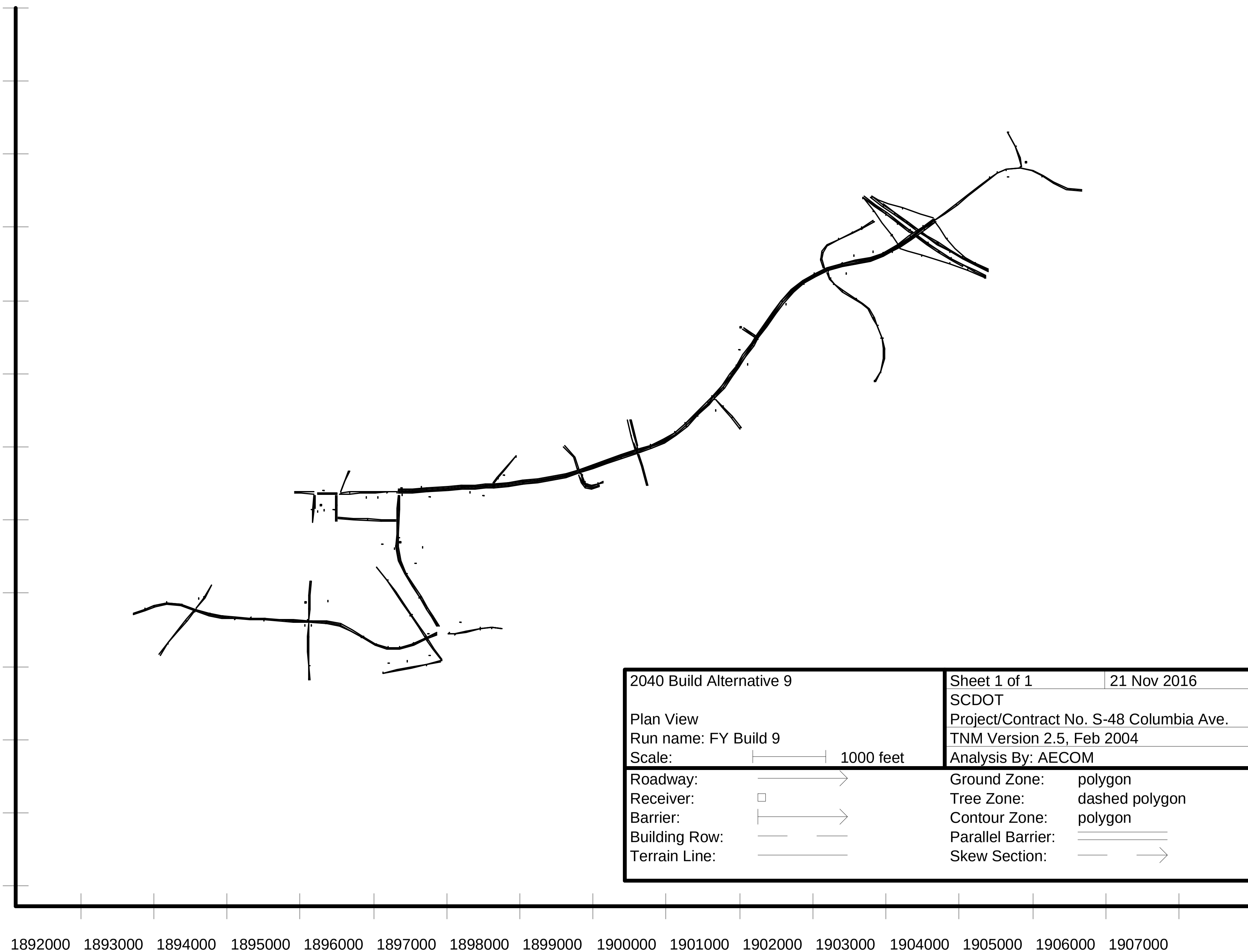
RESULTS: SOUND LEVELS **S-48 Columbia Ave.**

		Min	Avg	Max
		dB	dB	dB
All Selected	360	0.0	0.0	0.0
All Impacted	21	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

APPENDIX F

2040 BUILD NOISE LEVELS

ALTERNATIVE 9



2040 Build Alternative 9		Sheet 1 of 1	21 Nov 2016
		SCDOT	
Plan View		Project/Contract No. S-48 Columbia Ave.	
Run name: FY Build 9		TNM Version 2.5, Feb 2004	
Scale:	1000 feet	Analysis By: AECOM	
Roadway:		Ground Zone:	polygon
Receiver:		Tree Zone:	dashed polygon
Barrier:		Contour Zone:	polygon
Building Row:		Parallel Barrier:	
Terrain Line:		Skew Section:	

SCDOT							21 November 2016					
AECOM							TNM 2.5					
							Calculated with TNM 2.5					
RESULTS: SOUND LEVELS												
PROJECT/CONTRACT:	S-48 Columbia Ave.											
RUN:	2040 Build Alternative 9											
BARRIER DESIGN:	INPUT HEIGHTS							Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.				
ATMOSPHERICS:	68 deg F, 50% RH											

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
3	148	14	0.0	52.1	66	52.1	15	----	52.1	0.0	5	-5.0
4	149	1	0.0	63.4	66	63.4	15	----	63.4	0.0	5	-5.0
5	150	1	0.0	48.7	71	48.7	15	----	48.7	0.0	5	-5.0
11	151	1	0.0	62.6	66	62.6	15	----	62.6	0.0	5	-5.0
12	152	1	0.0	63.6	66	63.6	15	----	63.6	0.0	5	-5.0
13	153	1	0.0	66.5	66	66.5	15	Snd Lvl	66.5	0.0	5	-5.0
14	154	1	0.0	67.3	66	67.3	15	Snd Lvl	67.3	0.0	5	-5.0
15	155	2	0.0	68.0	66	68.0	15	Snd Lvl	68.0	0.0	5	-5.0
16	156	1	0.0	62.6	66	62.6	15	----	62.6	0.0	5	-5.0
17	157	1	0.0	64.4	66	64.4	15	----	64.4	0.0	5	-5.0
18	158	1	0.0	59.5	66	59.5	15	----	59.5	0.0	5	-5.0
19	159	1	0.0	58.9	66	58.9	15	----	58.9	0.0	5	-5.0
20	160	1	0.0	53.7	66	53.7	15	----	53.7	0.0	5	-5.0
21	161	1	0.0	53.5	66	53.5	15	----	53.5	0.0	5	-5.0
22	162	1	0.0	65.1	66	65.1	15	----	65.1	0.0	5	-5.0
23	163	1	0.0	64.7	66	64.7	15	----	64.7	0.0	5	-5.0
24	164	1	0.0	61.9	66	61.9	15	----	61.9	0.0	5	-5.0
25	165	1	0.0	52.1	66	52.1	15	----	52.1	0.0	5	-5.0
26	166	1	0.0	52.0	66	52.0	15	----	52.0	0.0	5	-5.0
27	167	1	0.0	53.9	66	53.9	15	----	53.9	0.0	5	-5.0
28	168	1	0.0	54.2	66	54.2	15	----	54.2	0.0	5	-5.0
29	169	1	0.0	55.4	66	55.4	15	----	55.4	0.0	5	-5.0
30	170	1	0.0	57.7	66	57.7	15	----	57.7	0.0	5	-5.0
31	171	1	0.0	63.8	66	63.8	15	----	63.8	0.0	5	-5.0

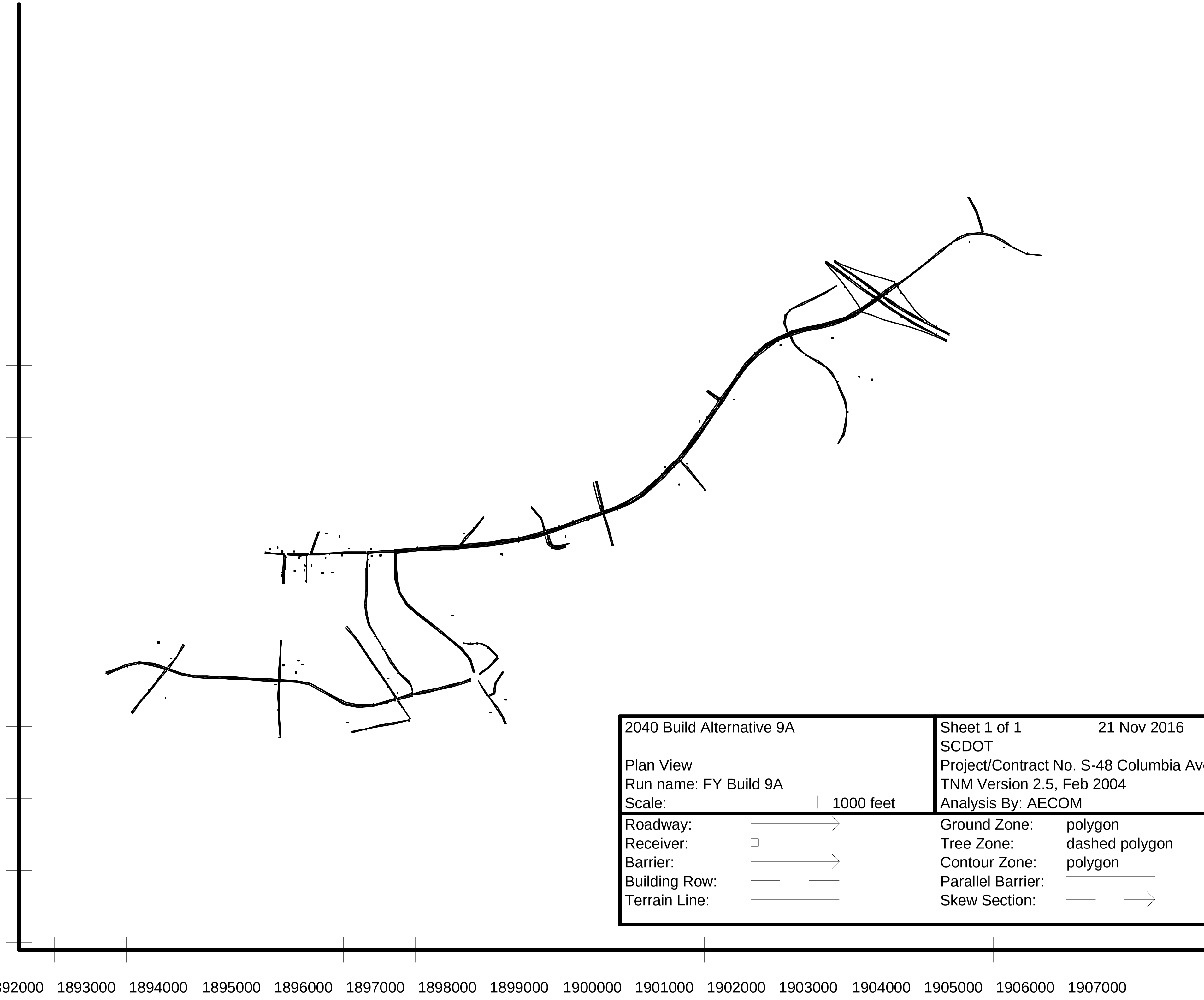
32	172	1	0.0	52.7	66	52.7	15	----	52.7	0.0	5	-5.0
34	174	1	0.0	66.0	71	66.0	15	----	66.0	0.0	5	-5.0
35	175	1	0.0	61.6	71	61.6	15	----	61.6	0.0	5	-5.0
36	176	4	0.0	62.1	71	62.1	15	----	62.1	0.0	5	-5.0
37	177	1	0.0	51.4	71	51.4	15	----	51.4	0.0	5	-5.0
43	178	1	0.0	51.2	66	51.2	15	----	51.2	0.0	5	-5.0
44	179	1	0.0	50.0	66	50.0	15	----	50.0	0.0	5	-5.0
45	180	1	0.0	60.0	71	60.0	15	----	60.0	0.0	5	-5.0
46	181	1	0.0	62.8	71	62.8	15	----	62.8	0.0	5	-5.0
47	182	1	0.0	62.0	71	62.0	15	----	62.0	0.0	5	-5.0
48	183	1	0.0	54.6	66	54.6	15	----	54.6	0.0	5	-5.0
49	184	1	0.0	51.0	66	51.0	15	----	51.0	0.0	5	-5.0
50	185	1	0.0	63.8	66	63.8	15	----	63.8	0.0	5	-5.0
51	186	1	0.0	65.0	66	65.0	15	----	65.0	0.0	5	-5.0
52	187	1	0.0	54.4	66	54.4	15	----	54.4	0.0	5	-5.0
53	188	1	0.0	65.7	66	65.7	15	----	65.7	0.0	5	-5.0
54	189	1	0.0	69.5	66	69.5	15	Snd Lvl	69.5	0.0	5	-5.0
55	190	1	0.0	60.8	66	60.8	15	----	60.8	0.0	5	-5.0
96	191	1	0.0	63.2	71	63.2	15	----	63.2	0.0	5	-5.0
97	192	1	0.0	65.3	66	65.3	15	----	65.3	0.0	5	-5.0
98	193	1	0.0	66.6	66	66.6	15	Snd Lvl	66.6	0.0	5	-5.0
99	194	1	0.0	60.3	71	60.3	15	----	60.3	0.0	5	-5.0
100	195	1	0.0	67.7	71	67.7	15	----	67.7	0.0	5	-5.0
101	196	8	0.0	67.6	66	67.6	15	Snd Lvl	67.6	0.0	5	-5.0
102	197	1	0.0	53.2	66	53.2	15	----	53.2	0.0	5	-5.0
103	198	1	0.0	65.7	66	65.7	15	----	65.7	0.0	5	-5.0
104	199	1	0.0	67.7	66	67.7	15	Snd Lvl	67.7	0.0	5	-5.0
105	200	1	0.0	69.3	66	69.3	15	Snd Lvl	69.3	0.0	5	-5.0
106	202	1	0.0	71.3	66	71.3	15	Snd Lvl	71.3	0.0	5	-5.0
107	203	1	0.0	69.6	66	69.6	15	Snd Lvl	69.6	0.0	5	-5.0
108	204	1	0.0	69.9	66	69.9	15	Snd Lvl	69.9	0.0	5	-5.0
109	205	1	0.0	70.8	66	70.8	15	Snd Lvl	70.8	0.0	5	-5.0
110	206	1	0.0	64.4	66	64.4	15	----	64.4	0.0	5	-5.0
112	207	1	0.0	66.9	66	66.9	15	Snd Lvl	66.9	0.0	5	-5.0
113	208	1	0.0	67.3	71	67.3	15	----	67.3	0.0	5	-5.0
114	209	1	0.0	67.5	71	67.5	15	----	67.5	0.0	5	-5.0
115	210	1	0.0	65.9	71	65.9	15	----	65.9	0.0	5	-5.0
116	211	1	0.0	63.5	71	63.5	15	----	63.5	0.0	5	-5.0
117	212	1	0.0	60.3	66	60.3	15	----	60.3	0.0	5	-5.0
118	213	1	0.0	63.1	66	63.1	15	----	63.1	0.0	5	-5.0
119	214	141	0.0	60.4	66	60.4	15	----	60.4	0.0	5	-5.0

120	215	1	0.0	62.2	71	62.2	15	----	62.2	0.0	5	-5.0
121	216	1	0.0	68.6	71	68.6	15	----	68.6	0.0	5	-5.0
122	217	1	0.0	58.1	71	58.1	15	----	58.1	0.0	5	-5.0
123	218	1	0.0	62.0	71	62.0	15	----	62.0	0.0	5	-5.0
124	219	1	0.0	62.3	71	62.3	15	----	62.3	0.0	5	-5.0
125	220	1	0.0	65.4	71	65.4	15	----	65.4	0.0	5	-5.0
126	221	1	0.0	64.5	66	64.5	15	----	64.5	0.0	5	-5.0
127	222	1	0.0	64.3	71	64.3	15	----	64.3	0.0	5	-5.0
128	223	1	0.0	57.4	71	57.4	15	----	57.4	0.0	5	-5.0
129	224	1	0.0	62.1	66	62.1	15	----	62.1	0.0	5	-5.0
130	225	1	0.0	69.0	66	69.0	15	Snd Lvl	69.0	0.0	5	-5.0
131	226	1	0.0	65.5	71	65.5	15	----	65.5	0.0	5	-5.0
132	227	1	0.0	67.4	71	67.4	15	----	67.4	0.0	5	-5.0
133	228	1	0.0	63.6	71	63.6	15	----	63.6	0.0	5	-5.0
134	229	1	0.0	65.5	71	65.5	15	----	65.5	0.0	5	-5.0
135	230	1	0.0	59.9	71	59.9	15	----	59.9	0.0	5	-5.0
136	231	1	0.0	66.3	71	66.3	15	----	66.3	0.0	5	-5.0
137	232	1	0.0	62.8	71	62.8	15	----	62.8	0.0	5	-5.0
138	233	1	0.0	63.7	71	63.7	15	----	63.7	0.0	5	-5.0
139	234	1	0.0	51.0	66	51.0	15	----	51.0	0.0	5	-5.0
140	235	1	0.0	50.6	66	50.6	15	----	50.6	0.0	5	-5.0
141	236	1	0.0	60.6	66	60.6	15	----	60.6	0.0	5	-5.0
142	237	1	0.0	60.8	66	60.8	15	----	60.8	0.0	5	-5.0
143	238	1	0.0	61.4	66	61.4	15	----	61.4	0.0	5	-5.0
144	239	1	0.0	57.4	66	57.4	15	----	57.4	0.0	5	-5.0
145	240	1	0.0	63.2	66	63.2	15	----	63.2	0.0	5	-5.0
146	299	1	0.0	60.4	66	60.4	15	----	60.4	0.0	5	-5.0
73	302	1	0.0	62.6	66	62.6	15	----	62.6	0.0	5	-5.0
74	303	1	0.0	60.2	66	60.2	15	----	60.2	0.0	5	-5.0
75	304	1	0.0	66.7	66	66.7	15	Snd Lvl	66.7	0.0	5	-5.0
76	305	1	0.0	63.1	66	63.1	15	----	63.1	0.0	5	-5.0
77	306	1	0.0	62.5	66	62.5	15	----	62.5	0.0	5	-5.0
78	307	1	0.0	62.7	66	62.7	15	----	62.7	0.0	5	-5.0
79	308	1	0.0	57.9	66	57.9	15	----	57.9	0.0	5	-5.0
80	309	1	0.0	55.9	66	55.9	15	----	55.9	0.0	5	-5.0
81	310	1	0.0	55.3	66	55.3	15	----	55.3	0.0	5	-5.0
82	311	1	0.0	57.9	66	57.9	15	----	57.9	0.0	5	-5.0
83	312	1	0.0	67.4	66	67.4	15	Snd Lvl	67.4	0.0	5	-5.0
84	313	1	0.0	66.5	66	66.5	15	Snd Lvl	66.5	0.0	5	-5.0
85	314	1	0.0	58.7	66	58.7	15	----	58.7	0.0	5	-5.0
86	315	1	0.0	60.7	66	60.7	15	----	60.7	0.0	5	-5.0

87	316	1	0.0	58.1	66	58.1	15	----	58.1	0.0	5	-5.0
88	317	1	0.0	55.1	66	55.1	15	----	55.1	0.0	5	-5.0
89	318	1	0.0	52.5	66	52.5	15	----	52.5	0.0	5	-5.0
90	319	1	0.0	64.9	66	64.9	15	----	64.9	0.0	5	-5.0
91	320	1	0.0	53.5	66	53.5	15	----	53.5	0.0	5	-5.0
92	321	1	0.0	53.9	66	53.9	15	----	53.9	0.0	5	-5.0
93	322	1	0.0	63.4	66	63.4	15	----	63.4	0.0	5	-5.0
94	323	1	0.0	54.4	66	54.4	15	----	54.4	0.0	5	-5.0
95	324	1	0.0	68.7	66	68.7	15	Snd Lvl	68.7	0.0	5	-5.0

Dwelling Units		# DUs	Noise Reduction		
			Min	Avg	Max
			dB	dB	dB
All Selected		279	0.0	0.0	0.0
All Impacted		26	0.0	0.0	0.0
All that meet NR Goal		0	0.0	0.0	0.0

ALTERNATIVE **9A**



2040 Build Alternative 9A	Sheet 1 of 1 / 21 Nov 2016
	SCDOT
Plan View	Project/Contract No. S-48 Columbia Ave.
Run name: FY Build 9A	TNM Version 2.5, Feb 2004
Scale: 1000 feet	Analysis By: AECOM

Roadway:		Ground Zone:	polygon
Receiver:		Tree Zone:	dashed polygon
Barrier:		Contour Zone:	polygon
Building Row:		Parallel Barrier:	
Terrain Line:		Skew Section:	

SCDOT 21 November 2016
AECOM TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: S-48 Columbia Ave.
RUN: 2040 Build Alternative 9A
BARRIER DESIGN: INPUT HEIGHTS

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

ATMOSPHERICS: 68 deg F, 50% RH

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
3	3	14	0.0	52.1	66	52.1	15	----	52.1	0.0	5	-5.0
4	4	1	0.0	63.4	66	63.4	15	----	63.4	0.0	5	-5.0
5	5	1	0.0	48.7	71	48.7	15	----	48.7	0.0	5	-5.0
11	11	1	0.0	62.6	66	62.6	15	----	62.6	0.0	5	-5.0
12	12	1	0.0	63.6	66	63.6	15	----	63.6	0.0	5	-5.0
13	13	1	0.0	66.5	66	66.5	15	Snd Lvl	66.5	0.0	5	-5.0
14	14	1	0.0	67.3	66	67.3	15	Snd Lvl	67.3	0.0	5	-5.0
15	15	2	0.0	68.0	66	68.0	15	Snd Lvl	68.0	0.0	5	-5.0
16	16	1	0.0	62.6	66	62.6	15	----	62.6	0.0	5	-5.0
17	17	1	0.0	64.4	66	64.4	15	----	64.4	0.0	5	-5.0
18	18	1	0.0	59.5	66	59.5	15	----	59.5	0.0	5	-5.0
19	19	1	0.0	58.9	66	58.9	15	----	58.9	0.0	5	-5.0
20	20	1	0.0	53.6	66	53.6	15	----	53.6	0.0	5	-5.0
21	21	1	0.0	53.5	66	53.5	15	----	53.5	0.0	5	-5.0
22	22	1	0.0	65.1	66	65.1	15	----	65.1	0.0	5	-5.0
23	23	1	0.0	64.7	66	64.7	15	----	64.7	0.0	5	-5.0
24	24	1	0.0	61.9	66	61.9	15	----	61.9	0.0	5	-5.0
25	25	1	0.0	51.7	66	51.7	15	----	51.7	0.0	5	-5.0
26	26	1	0.0	51.6	66	51.6	15	----	51.6	0.0	5	-5.0
27	27	1	0.0	53.3	66	53.3	15	----	53.3	0.0	5	-5.0
28	28	1	0.0	53.9	66	53.9	15	----	53.9	0.0	5	-5.0
29	29	1	0.0	55.5	66	55.5	15	----	55.5	0.0	5	-5.0
30	30	1	0.0	58.2	66	58.2	15	----	58.2	0.0	5	-5.0
31	31	1	0.0	64.0	66	64.0	15	----	64.0	0.0	5	-5.0

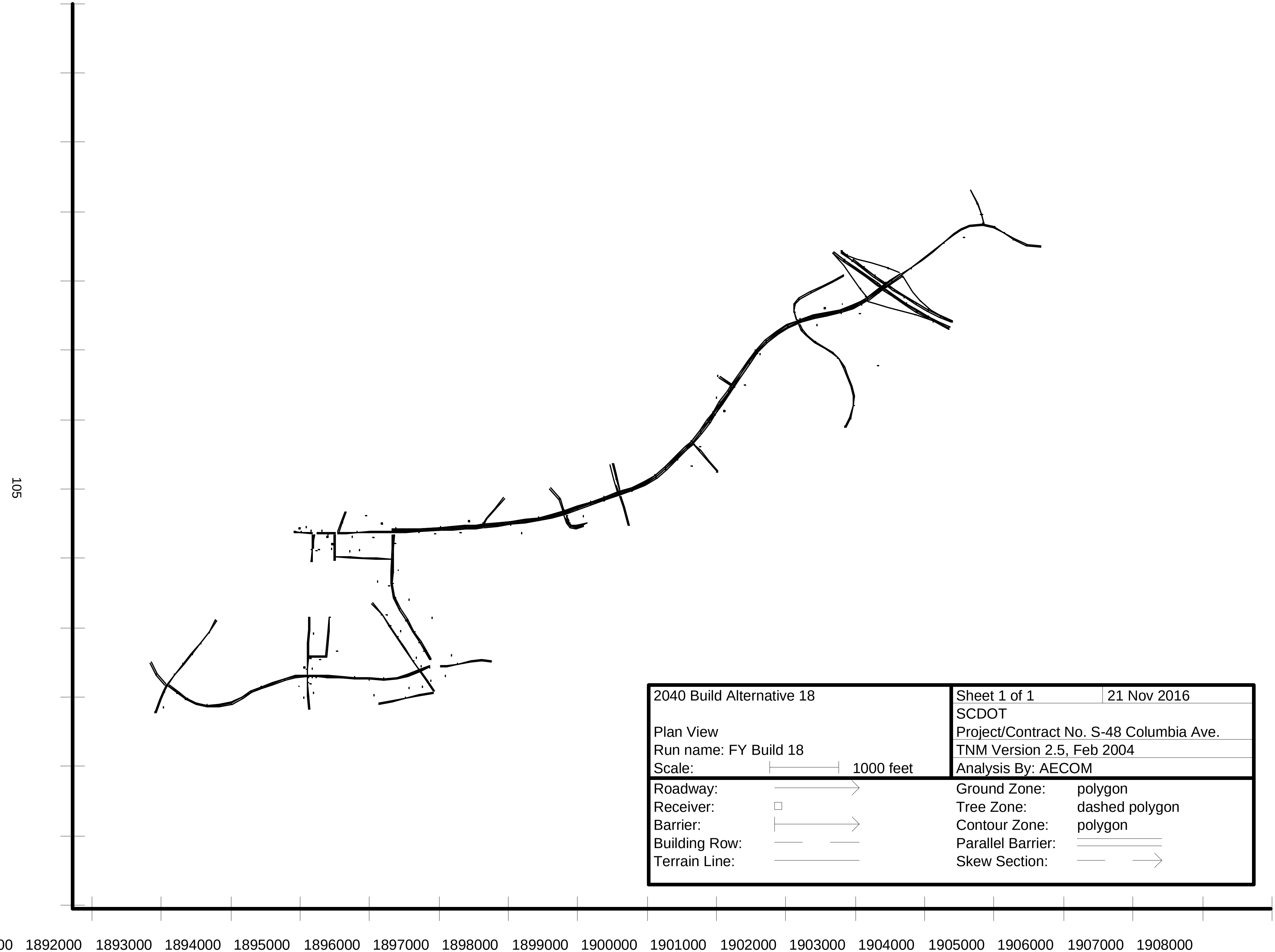
32	32	1	0.0	56.4	66	56.4	15	----	56.4	0.0	5	-5.0
34	33	1	0.0	63.7	71	63.7	15	----	63.7	0.0	5	-5.0
35	34	1	0.0	60.8	71	60.8	15	----	60.8	0.0	5	-5.0
36	35	4	0.0	61.4	71	61.4	15	----	61.4	0.0	5	-5.0
37	36	1	0.0	56.9	71	56.9	15	----	56.9	0.0	5	-5.0
38	37	17	0.0	52.9	66	52.9	15	----	52.9	0.0	5	-5.0
39	38	1	0.0	49.2	71	49.2	15	----	49.2	0.0	5	-5.0
40	39	22	0.0	47.1	66	47.1	15	----	47.1	0.0	5	-5.0
41	40	1	0.0	52.0	71	52.0	15	----	52.0	0.0	5	-5.0
42	41	1	0.0	51.0	66	51.0	15	----	51.0	0.0	5	-5.0
49	42	1	0.0	53.8	66	53.8	15	----	53.8	0.0	5	-5.0
96	49	1	0.0	62.9	71	62.9	15	----	62.9	0.0	5	-5.0
97	96	1	0.0	65.1	66	65.1	15	----	65.1	0.0	5	-5.0
98	97	1	0.0	66.4	66	66.4	15	Snd Lvl	66.4	0.0	5	-5.0
99	98	1	0.0	59.4	71	59.4	15	----	59.4	0.0	5	-5.0
100	99	1	0.0	67.1	71	67.1	15	----	67.1	0.0	5	-5.0
101	100	8	0.0	66.2	66	66.2	15	Snd Lvl	66.2	0.0	5	-5.0
102	101	1	0.0	49.9	66	49.9	15	----	49.9	0.0	5	-5.0
103	102	1	0.0	55.5	66	55.5	15	----	55.5	0.0	5	-5.0
104	103	1	0.0	58.7	66	58.7	15	----	58.7	0.0	5	-5.0
105	104	1	0.0	66.3	66	66.3	15	Snd Lvl	66.3	0.0	5	-5.0
106	105	1	0.0	66.9	66	66.9	15	Snd Lvl	66.9	0.0	5	-5.0
107	106	1	0.0	66.5	66	66.5	15	Snd Lvl	66.5	0.0	5	-5.0
108	107	1	0.0	67.1	66	67.1	15	Snd Lvl	67.1	0.0	5	-5.0
109	108	1	0.0	67.7	66	67.7	15	Snd Lvl	67.7	0.0	5	-5.0
111	111	1	0.0	56.9	71	56.9	15	----	56.9	0.0	5	-5.0
112	112	1	0.0	66.8	66	66.8	15	Snd Lvl	66.8	0.0	5	-5.0
113	113	1	0.0	67.3	71	67.3	15	----	67.3	0.0	5	-5.0
114	114	1	0.0	67.5	71	67.5	15	----	67.5	0.0	5	-5.0
115	115	1	0.0	65.9	71	65.9	15	----	65.9	0.0	5	-5.0
116	116	1	0.0	63.5	71	63.5	15	----	63.5	0.0	5	-5.0
117	117	1	0.0	60.3	66	60.3	15	----	60.3	0.0	5	-5.0
118	118	1	0.0	63.1	66	63.1	15	----	63.1	0.0	5	-5.0
119	119	141	0.0	60.4	66	60.4	15	----	60.4	0.0	5	-5.0
120	120	1	0.0	62.2	71	62.2	15	----	62.2	0.0	5	-5.0
121	121	1	0.0	68.6	71	68.6	15	----	68.6	0.0	5	-5.0
122	122	1	0.0	58.1	71	58.1	15	----	58.1	0.0	5	-5.0
123	123	1	0.0	62.0	71	62.0	15	----	62.0	0.0	5	-5.0
124	124	1	0.0	62.3	71	62.3	15	----	62.3	0.0	5	-5.0
125	125	1	0.0	65.4	71	65.4	15	----	65.4	0.0	5	-5.0
126	126	1	0.0	64.5	66	64.5	15	----	64.5	0.0	5	-5.0

127	127	1	0.0	64.3	71	64.3	15	----	64.3	0.0	5	-5.0
128	128	1	0.0	57.4	71	57.4	15	----	57.4	0.0	5	-5.0
129	129	1	0.0	62.1	66	62.1	15	----	62.1	0.0	5	-5.0
130	130	1	0.0	69.0	66	69.0	15	Snd Lvl	69.0	0.0	5	-5.0
131	131	1	0.0	65.5	71	65.5	15	----	65.5	0.0	5	-5.0
132	132	1	0.0	67.4	71	67.4	15	----	67.4	0.0	5	-5.0
133	133	1	0.0	63.6	71	63.6	15	----	63.6	0.0	5	-5.0
134	134	1	0.0	65.5	71	65.5	15	----	65.5	0.0	5	-5.0
135	135	1	0.0	59.9	71	59.9	15	----	59.9	0.0	5	-5.0
136	136	1	0.0	66.3	71	66.3	15	----	66.3	0.0	5	-5.0
137	137	1	0.0	62.8	71	62.8	15	----	62.8	0.0	5	-5.0
138	138	1	0.0	63.7	71	63.7	15	----	63.7	0.0	5	-5.0
139	139	1	0.0	51.0	66	51.0	15	----	51.0	0.0	5	-5.0
140	140	1	0.0	50.6	66	50.6	15	----	50.6	0.0	5	-5.0
141	141	1	0.0	60.6	66	60.6	15	----	60.6	0.0	5	-5.0
142	142	1	0.0	60.8	66	60.8	15	----	60.8	0.0	5	-5.0
143	143	1	0.0	61.4	66	61.4	15	----	61.4	0.0	5	-5.0
144	144	1	0.0	57.4	66	57.4	15	----	57.4	0.0	5	-5.0
145	145	1	0.0	63.2	66	63.2	15	----	63.2	0.0	5	-5.0
146	146	1	0.0	60.4	66	60.4	15	----	60.4	0.0	5	-5.0
73	148	1	0.0	62.6	66	62.6	15	----	62.6	0.0	5	-5.0
74	149	1	0.0	60.2	66	60.2	15	----	60.2	0.0	5	-5.0
75	150	1	0.0	66.7	66	66.7	15	Snd Lvl	66.7	0.0	5	-5.0
76	151	1	0.0	63.3	66	63.3	15	----	63.3	0.0	5	-5.0
77	152	1	0.0	63.0	66	63.0	15	----	63.0	0.0	5	-5.0
78	153	1	0.0	63.4	66	63.4	15	----	63.4	0.0	5	-5.0
79	154	1	0.0	58.3	66	58.3	15	----	58.3	0.0	5	-5.0
80	155	1	0.0	56.1	66	56.1	15	----	56.1	0.0	5	-5.0
81	156	1	0.0	55.3	66	55.3	15	----	55.3	0.0	5	-5.0
82	157	1	0.0	57.9	66	57.9	15	----	57.9	0.0	5	-5.0
83	158	1	0.0	67.4	66	67.4	15	Snd Lvl	67.4	0.0	5	-5.0
84	159	1	0.0	66.5	66	66.5	15	Snd Lvl	66.5	0.0	5	-5.0
85	160	1	0.0	58.6	66	58.6	15	----	58.6	0.0	5	-5.0
86	161	1	0.0	60.6	66	60.6	15	----	60.6	0.0	5	-5.0
87	162	1	0.0	58.0	66	58.0	15	----	58.0	0.0	5	-5.0
88	163	1	0.0	54.9	66	54.9	15	----	54.9	0.0	5	-5.0
89	164	1	0.0	52.0	66	52.0	15	----	52.0	0.0	5	-5.0
90	165	1	0.0	64.9	66	64.9	15	----	64.9	0.0	5	-5.0
91	166	1	0.0	53.1	66	53.1	15	----	53.1	0.0	5	-5.0
92	167	1	0.0	53.1	66	53.1	15	----	53.1	0.0	5	-5.0
93	168	1	0.0	63.3	66	63.3	15	----	63.3	0.0	5	-5.0

94	169	1	0.0	53.7	66	53.7	15	----	53.7	0.0	5	-5.0
95	170	1	0.0	68.6	66	68.6	15	Snd Lvl	68.6	0.0	5	-5.0

Dwelling Units		**# DUs**	**Noise Reduction**		
			Min	**Avg**	**Max**
			dB	**dB**	**dB**
All Selected		309	0.0	0.0	0.0
All Impacted		24	0.0	0.0	0.0
All that meet NR Goal		0	0.0	0.0	0.0

ALTERNATIVE 18


2040 Build Alternative 18
Plan View
Run name: FY Build 18
Scale: 1000 feet
Sheet 1 of 1
21 Nov 2016
SCDOT
Project/Contract No. S-48 Columbia Ave.
TNM Version 2.5, Feb 2004
Analysis By: AECOM
Roadway:
Receiver:
Barrier:
Building Row:
Terrain Line:
Ground Zone: polygon
Tree Zone: dashed polygon
Contour Zone: polygon
Parallel Barrier:
Skew Section:
00 1892000 1893000 1894000 1895000 1896000 1897000 1898000 1899000 1900000 1901000 1902000 1903000 1904000 1905000 1906000 1907000 1908000

SCDOT 21 November 2016
AECOM TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: S-48 Columbia Ave.
RUN: 2040 Build Alternative 18
BARRIER DESIGN: INPUT HEIGHTS

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

ATMOSPHERICS: 68 deg F, 50% RH

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
1	148	10	0.0	61.0	71	61.0	15	----	61.0	0.0	5	-5.0
2	149	1	0.0	63.1	71	63.1	15	----	63.1	0.0	5	-5.0
3	150	14	0.0	50.8	66	50.8	15	----	50.8	0.0	5	-5.0
6	151	5	0.0	63.1	66	63.1	15	----	63.1	0.0	5	-5.0
7	153	1	0.0	62.4	66	62.4	15	----	62.4	0.0	5	-5.0
8	154	1	0.0	60.4	66	60.4	15	----	60.4	0.0	5	-5.0
9	155	1	0.0	66.3	66	66.3	15	Snd Lvl	66.3	0.0	5	-5.0
10	156	1	0.0	66.9	66	66.9	15	Snd Lvl	66.9	0.0	5	-5.0
11	157	1	0.0	70.7	66	70.7	15	Snd Lvl	70.7	0.0	5	-5.0
12	158	1	0.0	63.8	66	63.8	15	----	63.8	0.0	5	-5.0
13	159	1	0.0	65.9	66	65.9	15	----	65.9	0.0	5	-5.0
14	160	1	0.0	65.5	66	65.5	15	----	65.5	0.0	5	-5.0
15	161	2	0.0	66.2	66	66.2	15	Snd Lvl	66.2	0.0	5	-5.0
16	162	1	0.0	56.7	66	56.7	15	----	56.7	0.0	5	-5.0
17	163	1	0.0	53.6	66	53.6	15	----	53.6	0.0	5	-5.0
18	164	1	0.0	50.3	66	50.3	15	----	50.3	0.0	5	-5.0
19	165	1	0.0	53.5	66	53.5	15	----	53.5	0.0	5	-5.0
20	166	1	0.0	51.2	66	51.2	15	----	51.2	0.0	5	-5.0
21	167	1	0.0	52.1	66	52.1	15	----	52.1	0.0	5	-5.0
22	168	1	0.0	64.7	66	64.7	15	----	64.7	0.0	5	-5.0
23	169	1	0.0	64.3	66	64.3	15	----	64.3	0.0	5	-5.0
24	170	1	0.0	61.6	66	61.6	15	----	61.6	0.0	5	-5.0
25	171	1	0.0	53.7	66	53.7	15	----	53.7	0.0	5	-5.0
26	172	1	0.0	52.5	66	52.5	15	----	52.5	0.0	5	-5.0

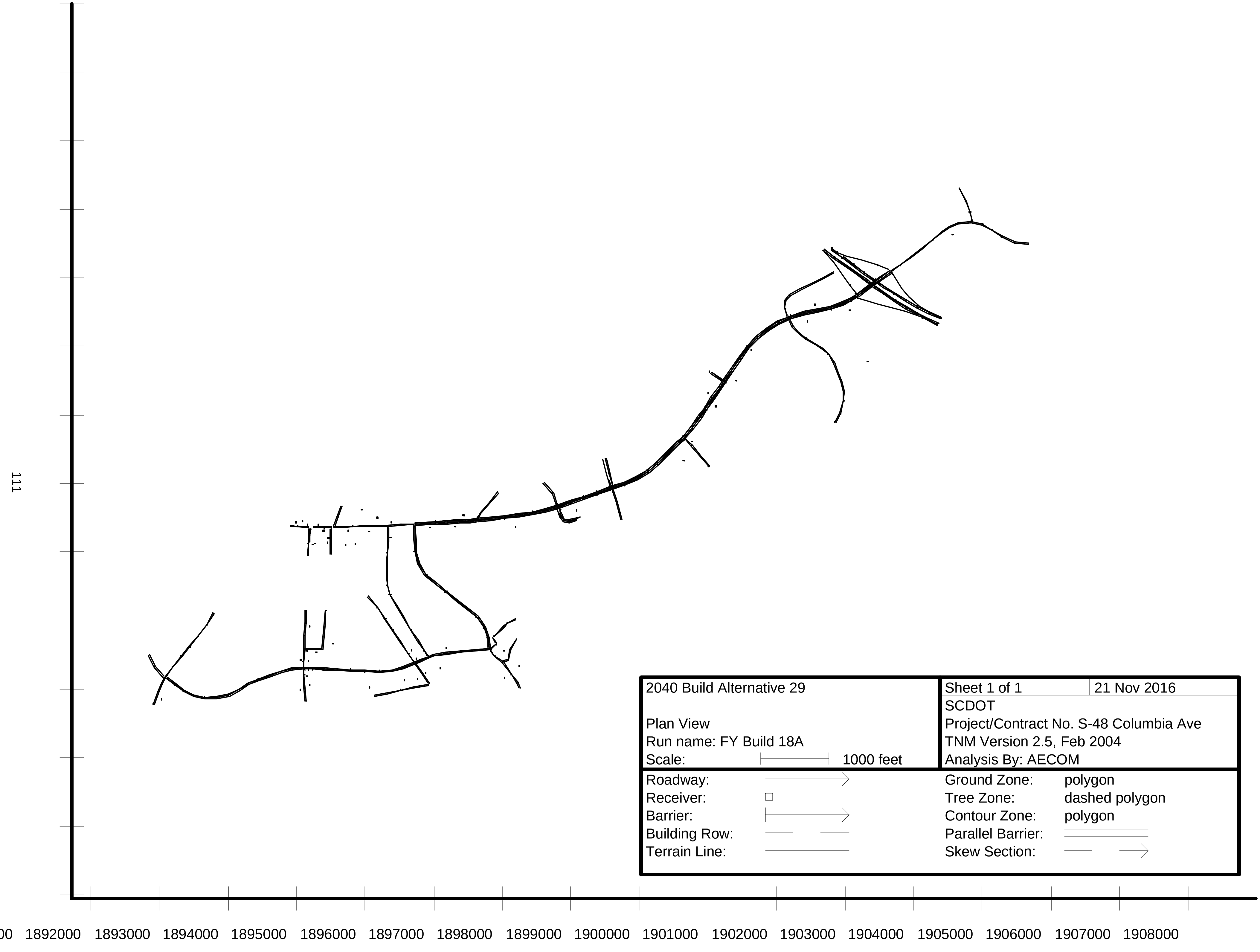
27	173	1	0.0	53.1	66	53.1	15	----	53.1	0.0	5	-5.0
28	174	1	0.0	53.1	66	53.1	15	----	53.1	0.0	5	-5.0
29	175	1	0.0	54.6	66	54.6	15	----	54.6	0.0	5	-5.0
30	176	1	0.0	57.8	66	57.8	15	----	57.8	0.0	5	-5.0
31	177	1	0.0	63.8	66	63.8	15	----	63.8	0.0	5	-5.0
32	178	1	0.0	52.9	66	52.9	15	----	52.9	0.0	5	-5.0
34	180	1	0.0	66.0	71	66.0	15	----	66.0	0.0	5	-5.0
35	181	1	0.0	61.6	71	61.6	15	----	61.6	0.0	5	-5.0
36	182	4	0.0	62.1	71	62.1	15	----	62.1	0.0	5	-5.0
37	183	1	0.0	51.4	71	51.4	15	----	51.4	0.0	5	-5.0
44	184	1	0.0	50.0	66	50.0	15	----	50.0	0.0	5	-5.0
45	185	1	0.0	60.0	71	60.0	15	----	60.0	0.0	5	-5.0
46	186	1	0.0	62.8	71	62.8	15	----	62.8	0.0	5	-5.0
47	187	1	0.0	62.0	71	62.0	15	----	62.0	0.0	5	-5.0
48	188	1	0.0	54.5	66	54.5	15	----	54.5	0.0	5	-5.0
49	189	1	0.0	51.0	66	51.0	15	----	51.0	0.0	5	-5.0
50	190	1	0.0	63.8	66	63.8	15	----	63.8	0.0	5	-5.0
51	191	1	0.0	65.0	66	65.0	15	----	65.0	0.0	5	-5.0
52	192	1	0.0	54.3	66	54.3	15	----	54.3	0.0	5	-5.0
53	193	1	0.0	65.7	66	65.7	15	----	65.7	0.0	5	-5.0
54	194	1	0.0	69.5	66	69.5	15	Snd Lvl	69.5	0.0	5	-5.0
55	195	1	0.0	60.8	66	60.8	15	----	60.8	0.0	5	-5.0
96	196	1	0.0	63.2	71	63.2	15	----	63.2	0.0	5	-5.0
97	197	1	0.0	65.3	66	65.3	15	----	65.3	0.0	5	-5.0
98	198	1	0.0	66.6	66	66.6	15	Snd Lvl	66.6	0.0	5	-5.0
99	199	1	0.0	60.3	71	60.3	15	----	60.3	0.0	5	-5.0
100	200	1	0.0	67.7	71	67.7	15	----	67.7	0.0	5	-5.0
101	201	8	0.0	67.6	66	67.6	15	Snd Lvl	67.6	0.0	5	-5.0
102	202	1	0.0	53.2	66	53.2	15	----	53.2	0.0	5	-5.0
103	203	1	0.0	65.7	66	65.7	15	----	65.7	0.0	5	-5.0
104	204	1	0.0	67.7	66	67.7	15	Snd Lvl	67.7	0.0	5	-5.0
105	205	1	0.0	69.3	66	69.3	15	Snd Lvl	69.3	0.0	5	-5.0
106	206	1	0.0	71.3	66	71.3	15	Snd Lvl	71.3	0.0	5	-5.0
107	208	1	0.0	69.6	66	69.6	15	Snd Lvl	69.6	0.0	5	-5.0
108	209	1	0.0	69.9	66	69.9	15	Snd Lvl	69.9	0.0	5	-5.0
109	210	1	0.0	70.8	66	70.8	15	Snd Lvl	70.8	0.0	5	-5.0
110	211	1	0.0	64.4	66	64.4	15	----	64.4	0.0	5	-5.0
112	212	1	0.0	66.9	66	66.9	15	Snd Lvl	66.9	0.0	5	-5.0
113	213	1	0.0	67.3	71	67.3	15	----	67.3	0.0	5	-5.0
114	214	1	0.0	67.5	71	67.5	15	----	67.5	0.0	5	-5.0
115	215	1	0.0	65.9	71	65.9	15	----	65.9	0.0	5	-5.0

116	216	1	0.0	63.5	71	63.5	15	----	63.5	0.0	5	-5.0
117	217	1	0.0	60.3	66	60.3	15	----	60.3	0.0	5	-5.0
118	218	1	0.0	63.1	66	63.1	15	----	63.1	0.0	5	-5.0
119	219	141	0.0	60.4	66	60.4	15	----	60.4	0.0	5	-5.0
120	221	1	0.0	62.2	71	62.2	15	----	62.2	0.0	5	-5.0
121	222	1	0.0	68.6	71	68.6	15	----	68.6	0.0	5	-5.0
122	223	1	0.0	58.1	71	58.1	15	----	58.1	0.0	5	-5.0
123	224	1	0.0	62.0	71	62.0	15	----	62.0	0.0	5	-5.0
124	225	1	0.0	62.3	71	62.3	15	----	62.3	0.0	5	-5.0
125	226	1	0.0	65.4	71	65.4	15	----	65.4	0.0	5	-5.0
126	227	1	0.0	64.5	66	64.5	15	----	64.5	0.0	5	-5.0
127	228	1	0.0	64.3	71	64.3	15	----	64.3	0.0	5	-5.0
128	229	1	0.0	57.4	71	57.4	15	----	57.4	0.0	5	-5.0
129	230	1	0.0	62.1	66	62.1	15	----	62.1	0.0	5	-5.0
130	231	1	0.0	69.0	66	69.0	15	Snd Lvl	69.0	0.0	5	-5.0
131	232	1	0.0	65.5	71	65.5	15	----	65.5	0.0	5	-5.0
132	233	1	0.0	67.4	71	67.4	15	----	67.4	0.0	5	-5.0
133	234	1	0.0	63.6	71	63.6	15	----	63.6	0.0	5	-5.0
134	235	1	0.0	65.5	71	65.5	15	----	65.5	0.0	5	-5.0
135	236	1	0.0	59.9	71	59.9	15	----	59.9	0.0	5	-5.0
136	237	1	0.0	66.3	71	66.3	15	----	66.3	0.0	5	-5.0
137	238	1	0.0	62.8	71	62.8	15	----	62.8	0.0	5	-5.0
138	239	1	0.0	63.7	71	63.7	15	----	63.7	0.0	5	-5.0
139	240	1	0.0	51.0	66	51.0	15	----	51.0	0.0	5	-5.0
140	241	1	0.0	50.6	66	50.6	15	----	50.6	0.0	5	-5.0
141	242	1	0.0	60.6	66	60.6	15	----	60.6	0.0	5	-5.0
142	243	1	0.0	60.8	66	60.8	15	----	60.8	0.0	5	-5.0
143	244	1	0.0	61.4	66	61.4	15	----	61.4	0.0	5	-5.0
144	245	1	0.0	57.4	66	57.4	15	----	57.4	0.0	5	-5.0
145	246	1	0.0	63.2	66	63.2	15	----	63.2	0.0	5	-5.0
146	247	1	0.0	60.4	66	60.4	15	----	60.4	0.0	5	-5.0
73	260	1	0.0	54.0	66	54.0	15	----	54.0	0.0	5	-5.0
74	261	1	0.0	54.4	66	54.4	15	----	54.4	0.0	5	-5.0
75	262	1	0.0	60.2	66	60.2	15	----	60.2	0.0	5	-5.0
76	263	1	0.0	62.7	66	62.7	15	----	62.7	0.0	5	-5.0
77	264	1	0.0	62.2	66	62.2	15	----	62.2	0.0	5	-5.0
78	265	1	0.0	62.5	66	62.5	15	----	62.5	0.0	5	-5.0
79	266	1	0.0	57.2	66	57.2	15	----	57.2	0.0	5	-5.0
80	267	1	0.0	55.2	66	55.2	15	----	55.2	0.0	5	-5.0
81	268	1	0.0	54.8	66	54.8	15	----	54.8	0.0	5	-5.0
82	269	1	0.0	57.2	66	57.2	15	----	57.2	0.0	5	-5.0

83	270	1	0.0	67.2	66	67.2	15	Snd Lvl	67.2	0.0	5	-5.0
84	271	1	0.0	66.4	66	66.4	15	Snd Lvl	66.4	0.0	5	-5.0
85	272	1	0.0	58.6	66	58.6	15	----	58.6	0.0	5	-5.0
86	273	1	0.0	60.6	66	60.6	15	----	60.6	0.0	5	-5.0
87	274	1	0.0	58.0	66	58.0	15	----	58.0	0.0	5	-5.0
88	275	1	0.0	54.9	66	54.9	15	----	54.9	0.0	5	-5.0
89	276	1	0.0	52.4	66	52.4	15	----	52.4	0.0	5	-5.0
90	277	1	0.0	64.9	66	64.9	15	----	64.9	0.0	5	-5.0
91	278	1	0.0	53.4	66	53.4	15	----	53.4	0.0	5	-5.0
92	279	1	0.0	53.8	66	53.8	15	----	53.8	0.0	5	-5.0
93	280	1	0.0	63.4	66	63.4	15	----	63.4	0.0	5	-5.0
94	281	1	0.0	54.4	66	54.4	15	----	54.4	0.0	5	-5.0
95	282	1	0.0	68.6	66	68.6	15	Snd Lvl	68.6	0.0	5	-5.0

Dwelling Units	**# DUs**	**Noise Reduction**		
		Min	**Avg**	**Max**
		dB	**dB**	**dB**
All Selected	296	0.0	0.0	0.0
All Impacted	26	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

ALTERNATIVE **18A**



2040 Build Alternative 29	Sheet 1 of 1 — 21 Nov 2016
	SCDOT
Plan View	Project/Contract No. S-48 Columbia Ave
Run name: FY Build 18A	TNM Version 2.5, Feb 2004
Scale: 1000 feet	Analysis By: AECOM

Roadway:		Ground Zone:	polygon
Receiver:		Tree Zone:	dashed polygon
Barrier:		Contour Zone:	polygon
Building Row:		Parallel Barrier:	
Terrain Line:		Skew Section:	

SCDOT 21 November 2016
AECOM TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: S-48 Columbia Ave
RUN: 2040 Build Alternative 29
BARRIER DESIGN: INPUT HEIGHTS

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

ATMOSPHERICS: 68 deg F, 50% RH

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Increase over existing Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
1	148	10	0.0	61.0	71	61.0	15	----	61.0	0.0	5	-5.0
2	149	1	0.0	63.1	71	63.1	15	----	63.1	0.0	5	-5.0
3	150	14	0.0	50.8	66	50.8	15	----	50.8	0.0	5	-5.0
6	151	5	0.0	63.1	66	63.1	15	----	63.1	0.0	5	-5.0
7	152	1	0.0	62.4	66	62.4	15	----	62.4	0.0	5	-5.0
8	153	1	0.0	60.4	66	60.4	15	----	60.4	0.0	5	-5.0
9	154	1	0.0	66.3	66	66.3	15	Snd Lvl	66.3	0.0	5	-5.0
10	155	1	0.0	66.9	66	66.9	15	Snd Lvl	66.9	0.0	5	-5.0
11	156	1	0.0	70.7	66	70.7	15	Snd Lvl	70.7	0.0	5	-5.0
12	157	1	0.0	63.8	66	63.8	15	----	63.8	0.0	5	-5.0
13	158	1	0.0	65.9	66	65.9	15	----	65.9	0.0	5	-5.0
14	159	1	0.0	65.5	66	65.5	15	----	65.5	0.0	5	-5.0
15	160	2	0.0	66.2	66	66.2	15	Snd Lvl	66.2	0.0	5	-5.0
16	161	1	0.0	56.7	66	56.7	15	----	56.7	0.0	5	-5.0
17	162	1	0.0	53.6	66	53.6	15	----	53.6	0.0	5	-5.0
18	163	1	0.0	50.3	66	50.3	15	----	50.3	0.0	5	-5.0
19	164	1	0.0	53.4	66	53.4	15	----	53.4	0.0	5	-5.0
20	165	1	0.0	51.2	66	51.2	15	----	51.2	0.0	5	-5.0
21	166	1	0.0	52.1	66	52.1	15	----	52.1	0.0	5	-5.0
22	167	1	0.0	64.7	66	64.7	15	----	64.7	0.0	5	-5.0
23	168	1	0.0	64.3	66	64.3	15	----	64.3	0.0	5	-5.0
24	169	1	0.0	61.6	66	61.6	15	----	61.6	0.0	5	-5.0
25	170	1	0.0	53.7	66	53.7	15	----	53.7	0.0	5	-5.0
26	171	1	0.0	52.5	66	52.5	15	----	52.5	0.0	5	-5.0

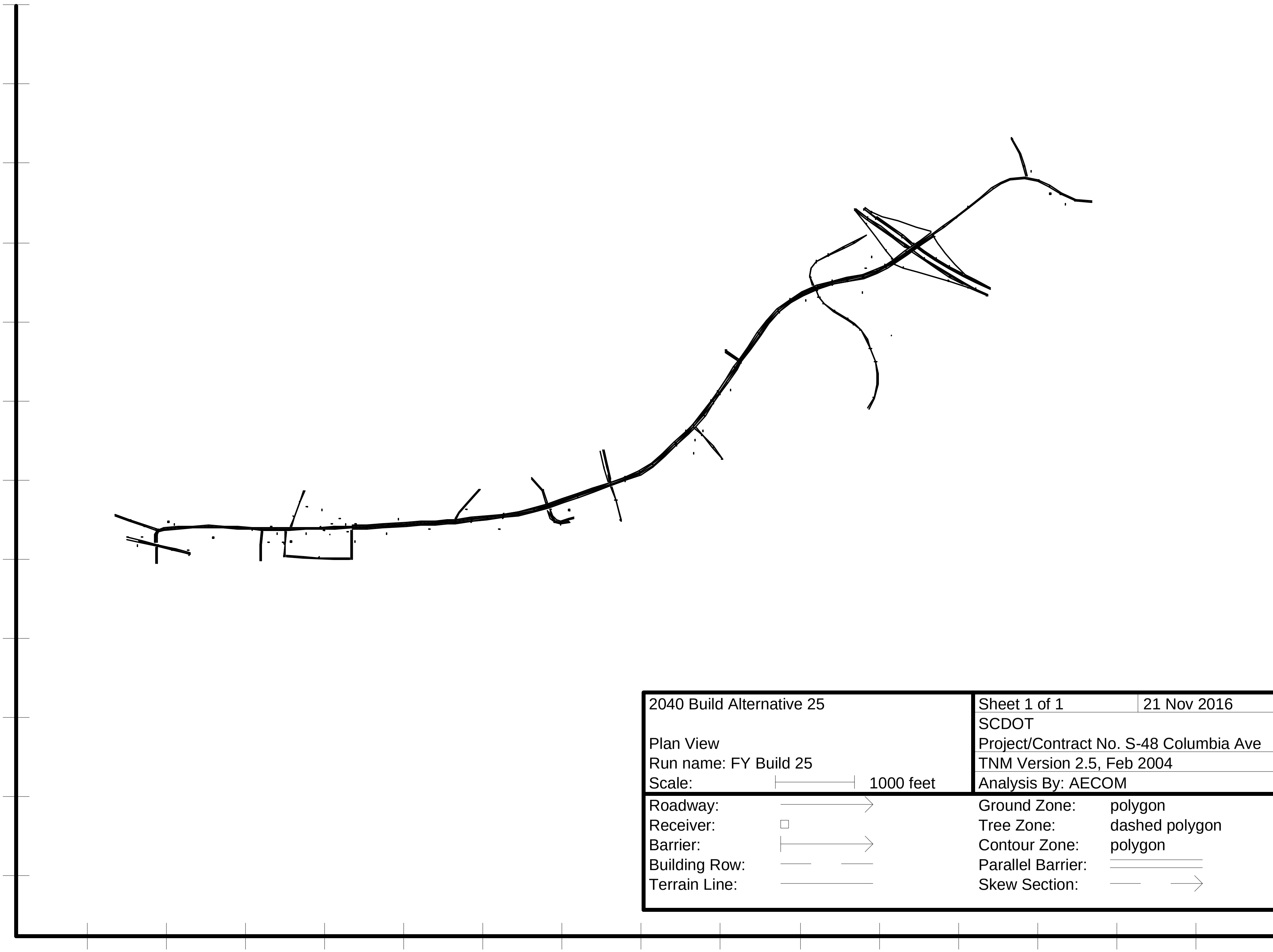
27	172	1	0.0	53.1	66	53.1	15	----	53.1	0.0	5	-5.0
28	173	1	0.0	53.0	66	53.0	15	----	53.0	0.0	5	-5.0
29	174	1	0.0	54.8	66	54.8	15	----	54.8	0.0	5	-5.0
30	175	1	0.0	57.8	66	57.8	15	----	57.8	0.0	5	-5.0
31	176	1	0.0	63.9	66	63.9	15	----	63.9	0.0	5	-5.0
32	177	1	0.0	54.3	66	54.3	15	----	54.3	0.0	5	-5.0
34	179	1	0.0	66.2	71	66.2	15	----	66.2	0.0	5	-5.0
35	180	1	0.0	61.2	71	61.2	15	----	61.2	0.0	5	-5.0
36	181	4	0.0	61.5	71	61.5	15	----	61.5	0.0	5	-5.0
37	182	1	0.0	61.0	71	61.0	15	----	61.0	0.0	5	-5.0
38	183	17	0.0	55.7	66	55.7	15	----	55.7	0.0	5	-5.0
39	184	1	0.0	49.4	71	49.4	15	----	49.4	0.0	5	-5.0
40	185	22	0.0	47.8	66	47.8	15	----	47.8	0.0	5	-5.0
41	186	1	0.0	53.2	71	53.2	15	----	53.2	0.0	5	-5.0
42	187	1	0.0	50.9	66	50.9	15	----	50.9	0.0	5	-5.0
49	188	1	0.0	53.8	66	53.8	15	----	53.8	0.0	5	-5.0
96	189	1	0.0	62.9	71	62.9	15	----	62.9	0.0	5	-5.0
97	190	1	0.0	65.1	66	65.1	15	----	65.1	0.0	5	-5.0
98	191	1	0.0	66.4	66	66.4	15	Snd Lvl	66.4	0.0	5	-5.0
99	192	1	0.0	59.4	71	59.4	15	----	59.4	0.0	5	-5.0
100	193	1	0.0	67.1	71	67.1	15	----	67.1	0.0	5	-5.0
101	194	8	0.0	66.2	66	66.2	15	Snd Lvl	66.2	0.0	5	-5.0
102	195	1	0.0	49.9	66	49.9	15	----	49.9	0.0	5	-5.0
103	196	1	0.0	55.5	66	55.5	15	----	55.5	0.0	5	-5.0
104	197	1	0.0	58.7	66	58.7	15	----	58.7	0.0	5	-5.0
105	198	1	0.0	66.3	66	66.3	15	Snd Lvl	66.3	0.0	5	-5.0
106	199	1	0.0	66.9	66	66.9	15	Snd Lvl	66.9	0.0	5	-5.0
107	200	1	0.0	66.5	66	66.5	15	Snd Lvl	66.5	0.0	5	-5.0
108	201	1	0.0	67.1	66	67.1	15	Snd Lvl	67.1	0.0	5	-5.0
109	202	1	0.0	67.7	66	67.7	15	Snd Lvl	67.7	0.0	5	-5.0
111	203	1	0.0	56.9	71	56.9	15	----	56.9	0.0	5	-5.0
112	204	1	0.0	66.8	66	66.8	15	Snd Lvl	66.8	0.0	5	-5.0
113	205	1	0.0	67.3	71	67.3	15	----	67.3	0.0	5	-5.0
114	206	1	0.0	67.5	71	67.5	15	----	67.5	0.0	5	-5.0
115	207	1	0.0	65.9	71	65.9	15	----	65.9	0.0	5	-5.0
116	208	1	0.0	63.5	71	63.5	15	----	63.5	0.0	5	-5.0
117	209	1	0.0	60.3	66	60.3	15	----	60.3	0.0	5	-5.0
118	211	1	0.0	63.1	66	63.1	15	----	63.1	0.0	5	-5.0
119	212	141	0.0	60.4	66	60.4	15	----	60.4	0.0	5	-5.0
120	213	1	0.0	62.2	71	62.2	15	----	62.2	0.0	5	-5.0
121	214	1	0.0	68.6	71	68.6	15	----	68.6	0.0	5	-5.0

122	215	1	0.0	58.1	71	58.1	15	----	58.1	0.0	5	-5.0
123	216	1	0.0	62.0	71	62.0	15	----	62.0	0.0	5	-5.0
124	217	1	0.0	62.3	71	62.3	15	----	62.3	0.0	5	-5.0
125	218	1	0.0	65.4	71	65.4	15	----	65.4	0.0	5	-5.0
126	219	1	0.0	64.5	66	64.5	15	----	64.5	0.0	5	-5.0
127	220	1	0.0	64.3	71	64.3	15	----	64.3	0.0	5	-5.0
128	221	1	0.0	57.4	71	57.4	15	----	57.4	0.0	5	-5.0
129	222	1	0.0	62.1	66	62.1	15	----	62.1	0.0	5	-5.0
130	223	1	0.0	69.0	66	69.0	15	Snd Lvl	69.0	0.0	5	-5.0
131	224	1	0.0	65.5	71	65.5	15	----	65.5	0.0	5	-5.0
132	225	1	0.0	67.4	71	67.4	15	----	67.4	0.0	5	-5.0
133	226	1	0.0	63.6	71	63.6	15	----	63.6	0.0	5	-5.0
134	227	1	0.0	65.5	71	65.5	15	----	65.5	0.0	5	-5.0
135	228	1	0.0	59.9	71	59.9	15	----	59.9	0.0	5	-5.0
136	229	1	0.0	66.3	71	66.3	15	----	66.3	0.0	5	-5.0
137	230	1	0.0	62.8	71	62.8	15	----	62.8	0.0	5	-5.0
138	231	1	0.0	63.7	71	63.7	15	----	63.7	0.0	5	-5.0
139	232	1	0.0	51.0	66	51.0	15	----	51.0	0.0	5	-5.0
140	233	1	0.0	50.6	66	50.6	15	----	50.6	0.0	5	-5.0
141	234	1	0.0	60.6	66	60.6	15	----	60.6	0.0	5	-5.0
142	235	1	0.0	60.8	66	60.8	15	----	60.8	0.0	5	-5.0
143	236	1	0.0	61.4	66	61.4	15	----	61.4	0.0	5	-5.0
144	237	1	0.0	57.4	66	57.4	15	----	57.4	0.0	5	-5.0
145	238	1	0.0	63.2	66	63.2	15	----	63.2	0.0	5	-5.0
146	239	1	0.0	60.4	66	60.4	15	----	60.4	0.0	5	-5.0
73	249	1	0.0	62.6	66	62.6	15	----	62.6	0.0	5	-5.0
74	250	1	0.0	60.2	66	60.2	15	----	60.2	0.0	5	-5.0
75	251	1	0.0	66.7	66	66.7	15	Snd Lvl	66.7	0.0	5	-5.0
76	252	1	0.0	63.3	66	63.3	15	----	63.3	0.0	5	-5.0
77	253	1	0.0	63.0	66	63.0	15	----	63.0	0.0	5	-5.0
78	254	1	0.0	63.4	66	63.4	15	----	63.4	0.0	5	-5.0
79	255	1	0.0	58.3	66	58.3	15	----	58.3	0.0	5	-5.0
80	256	1	0.0	56.1	66	56.1	15	----	56.1	0.0	5	-5.0
81	257	1	0.0	55.3	66	55.3	15	----	55.3	0.0	5	-5.0
82	258	1	0.0	57.9	66	57.9	15	----	57.9	0.0	5	-5.0
83	259	1	0.0	67.3	66	67.3	15	Snd Lvl	67.3	0.0	5	-5.0
84	260	1	0.0	66.5	66	66.5	15	Snd Lvl	66.5	0.0	5	-5.0
85	261	1	0.0	58.6	66	58.6	15	----	58.6	0.0	5	-5.0
86	262	1	0.0	60.6	66	60.6	15	----	60.6	0.0	5	-5.0
87	263	1	0.0	58.0	66	58.0	15	----	58.0	0.0	5	-5.0
88	264	1	0.0	54.9	66	54.9	15	----	54.9	0.0	5	-5.0

89	265	1	0.0	52.0	66	52.0	15	----	52.0	0.0	5	-5.0
90	266	1	0.0	64.9	66	64.9	15	----	64.9	0.0	5	-5.0
91	267	1	0.0	53.1	66	53.1	15	----	53.1	0.0	5	-5.0
92	268	1	0.0	53.1	66	53.1	15	----	53.1	0.0	5	-5.0
93	269	1	0.0	63.3	66	63.3	15	----	63.3	0.0	5	-5.0
94	270	1	0.0	53.7	66	53.7	15	----	53.7	0.0	5	-5.0
95	271	1	0.0	68.6	66	68.6	15	Snd Lvl	68.6	0.0	5	-5.0

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	327	0.0	0.0	0.0
All Impacted	25	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

ALTERNATIVE 25



2040 Build Alternative 25	Sheet 1 of 1 — 21 Nov 2016
	SCDOT
Plan View	Project/Contract No. S-48 Columbia Ave
Run name: FY Build 25	TNM Version 2.5, Feb 2004
Scale: 1000 feet	Analysis By: AECOM
Roadway:	Ground Zone: polygon
Receiver:	Tree Zone: dashed polygon
Barrier:	Contour Zone: polygon
Building Row:	Parallel Barrier:
Terrain Line:	Skew Section:

SCDOT							21 November 2016					
AECOM							TNM 2.5					
							Calculated with TNM 2.5					
RESULTS: SOUND LEVELS												
PROJECT/CONTRACT:	S-48 Columbia Ave											
RUN:	2040 Build Alternative 25											
BARRIER DESIGN:	INPUT HEIGHTS							Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.				
ATMOSPHERICS:	68 deg F, 50% RH											
Receiver												
Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h		Increase over existing		Type	With Barrier Calculated	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc	Impact	LAeq1h	Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
56	148	1	0.0	65.2	71	65.2	15	----	65.2	0.0	5	-5.0
57	149	1	0.0	65.1	71	65.1	15	----	65.1	0.0	5	-5.0
58	150	1	0.0	62.9	71	62.9	15	----	62.9	0.0	5	-5.0
59	151	1	0.0	68.2	71	68.2	15	----	68.2	0.0	5	-5.0
60	152	1	0.0	61.6	71	61.6	15	----	61.6	0.0	5	-5.0
61	153	1	0.0	67.6	71	67.6	15	----	67.6	0.0	5	-5.0
62	154	1	0.0	66.0	71	66.0	15	----	66.0	0.0	5	-5.0
63	155	1	0.0	58.7	71	58.7	15	----	58.7	0.0	5	-5.0
64	156	1	0.0	59.8	71	59.8	15	----	59.8	0.0	5	-5.0
65	157	1	0.0	61.9	71	61.9	15	----	61.9	0.0	5	-5.0
66	158	1	0.0	66.5	71	66.5	15	----	66.5	0.0	5	-5.0
67	159	1	0.0	66.7	71	66.7	15	----	66.7	0.0	5	-5.0
68	160	1	0.0	63.5	71	63.5	15	----	63.5	0.0	5	-5.0
69	161	1	0.0	65.9	71	65.9	15	----	65.9	0.0	5	-5.0
70	162	1	0.0	63.0	71	63.0	15	----	63.0	0.0	5	-5.0
71	163	1	0.0	59.3	71	59.3	15	----	59.3	0.0	5	-5.0
72	164	1	0.0	62.9	71	62.9	15	----	62.9	0.0	5	-5.0
73	165	1	0.0	65.8	66	65.8	15	----	65.8	0.0	5	-5.0
74	166	1	0.0	63.1	66	63.1	15	----	63.1	0.0	5	-5.0
75	167	1	0.0	69.4	66	69.4	15	Snd Lvl	69.4	0.0	5	-5.0
76	168	1	0.0	62.8	71	62.8	15	----	62.8	0.0	5	-5.0
77	169	1	0.0	62.3	71	62.3	15	----	62.3	0.0	5	-5.0
78	170	1	0.0	62.3	71	62.3	15	----	62.3	0.0	5	-5.0
79	171	1	0.0	60.5	71	60.5	15	----	60.5	0.0	5	-5.0

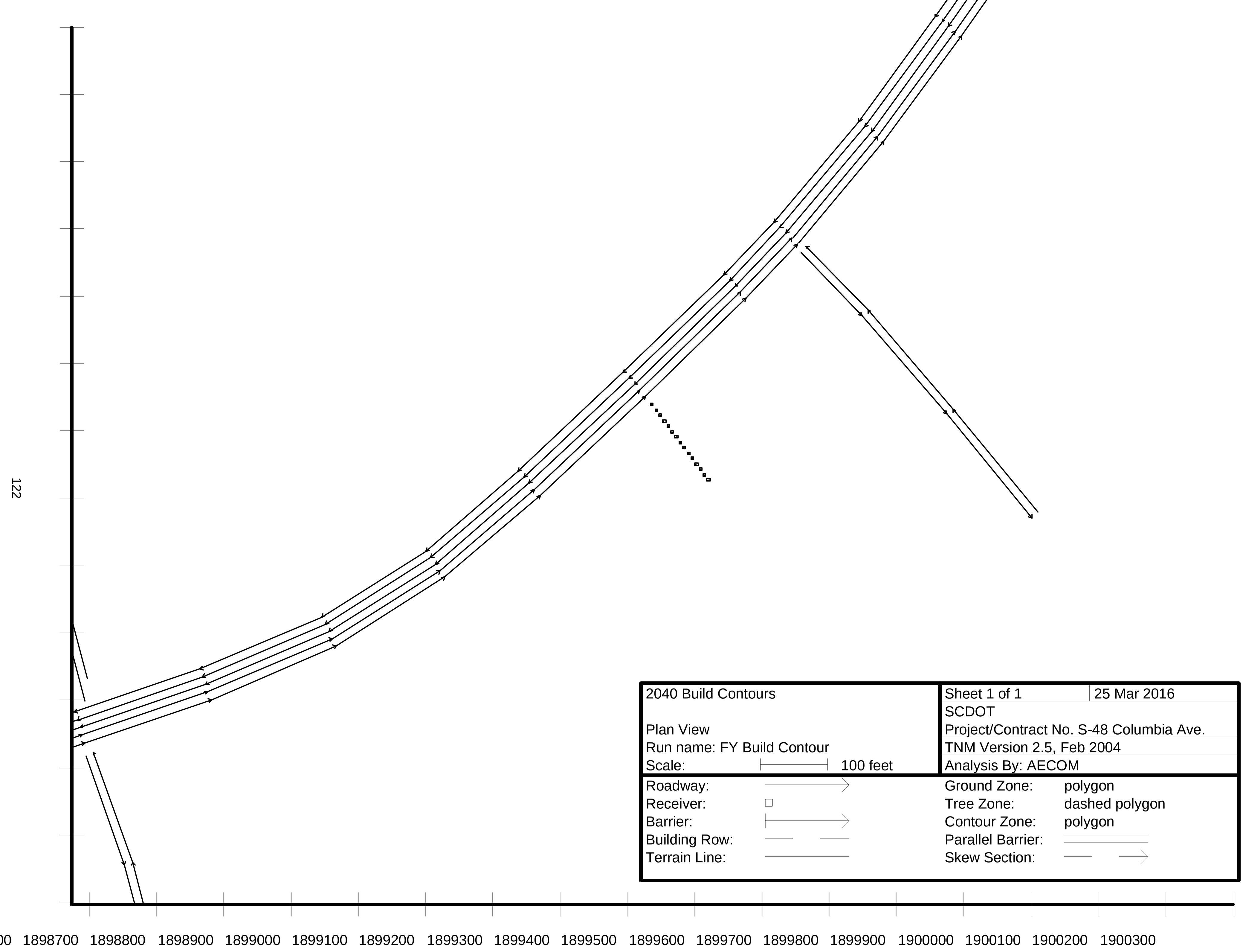
80	172	1	0.0	57.7	71	57.7	15	----	57.7	0.0	5	-5.0
81	173	1	0.0	56.5	71	56.5	15	----	56.5	0.0	5	-5.0
82	174	1	0.0	59.3	71	59.3	15	----	59.3	0.0	5	-5.0
83	175	1	0.0	68.8	66	68.8	15	Snd Lvl	68.8	0.0	5	-5.0
84	176	1	0.0	65.9	71	65.9	15	----	65.9	0.0	5	-5.0
85	177	1	0.0	59.5	71	59.5	15	----	59.5	0.0	5	-5.0
86	178	1	0.0	61.2	71	61.2	15	----	61.2	0.0	5	-5.0
87	179	1	0.0	59.0	66	59.0	15	----	59.0	0.0	5	-5.0
88	180	1	0.0	57.0	66	57.0	15	----	57.0	0.0	5	-5.0
89	181	1	0.0	53.9	66	53.9	15	----	53.9	0.0	5	-5.0
90	183	1	0.0	64.9	66	64.9	15	----	64.9	0.0	5	-5.0
91	184	1	0.0	54.2	66	54.2	15	----	54.2	0.0	5	-5.0
92	185	1	0.0	54.4	66	54.4	15	----	54.4	0.0	5	-5.0
93	186	1	0.0	63.7	66	63.7	15	----	63.7	0.0	5	-5.0
94	187	1	0.0	55.6	66	55.6	15	----	55.6	0.0	5	-5.0
95	188	1	0.0	68.6	66	68.6	15	Snd Lvl	68.6	0.0	5	-5.0
96	189	1	0.0	63.1	71	63.1	15	----	63.1	0.0	5	-5.0
97	190	1	0.0	66.2	66	66.2	15	Snd Lvl	66.2	0.0	5	-5.0
98	191	1	0.0	66.2	66	66.2	15	Snd Lvl	66.2	0.0	5	-5.0
99	192	1	0.0	61.3	71	61.3	15	----	61.3	0.0	5	-5.0
100	193	1	0.0	68.8	71	68.8	15	----	68.8	0.0	5	-5.0
101	194	8	0.0	66.8	66	66.8	15	Snd Lvl	66.8	0.0	5	-5.0
104	195	1	0.0	61.8	66	61.8	15	----	61.8	0.0	5	-5.0
105	196	1	0.0	68.8	66	68.8	15	Snd Lvl	68.8	0.0	5	-5.0
106	198	1	0.0	71.2	66	71.2	15	Snd Lvl	71.2	0.0	5	-5.0
107	199	1	0.0	69.5	66	69.5	15	Snd Lvl	69.5	0.0	5	-5.0
108	200	1	0.0	69.9	66	69.9	15	Snd Lvl	69.9	0.0	5	-5.0
109	201	1	0.0	70.7	66	70.7	15	Snd Lvl	70.7	0.0	5	-5.0
110	202	1	0.0	64.4	66	64.4	15	----	64.4	0.0	5	-5.0
112	203	1	0.0	66.9	66	66.9	15	Snd Lvl	66.9	0.0	5	-5.0
113	204	1	0.0	67.3	71	67.3	15	----	67.3	0.0	5	-5.0
114	205	1	0.0	67.5	71	67.5	15	----	67.5	0.0	5	-5.0
115	206	1	0.0	65.9	71	65.9	15	----	65.9	0.0	5	-5.0
116	207	1	0.0	63.5	71	63.5	15	----	63.5	0.0	5	-5.0
117	208	1	0.0	60.3	66	60.3	15	----	60.3	0.0	5	-5.0
118	209	1	0.0	63.1	66	63.1	15	----	63.1	0.0	5	-5.0
119	210	141	0.0	60.4	66	60.4	15	----	60.4	0.0	5	-5.0
120	211	1	0.0	62.2	71	62.2	15	----	62.2	0.0	5	-5.0
121	212	1	0.0	68.6	71	68.6	15	----	68.6	0.0	5	-5.0
122	213	1	0.0	58.1	71	58.1	15	----	58.1	0.0	5	-5.0
123	214	1	0.0	62.0	71	62.0	15	----	62.0	0.0	5	-5.0

124	215	1	0.0	62.3	71	62.3	15	----	62.3	0.0	5	-5.0
125	216	1	0.0	65.4	71	65.4	15	----	65.4	0.0	5	-5.0
126	217	1	0.0	64.5	66	64.5	15	----	64.5	0.0	5	-5.0
127	218	1	0.0	64.3	71	64.3	15	----	64.3	0.0	5	-5.0
128	219	1	0.0	57.4	71	57.4	15	----	57.4	0.0	5	-5.0
129	221	1	0.0	62.1	66	62.1	15	----	62.1	0.0	5	-5.0
130	222	1	0.0	69.0	66	69.0	15	Snd Lvl	69.0	0.0	5	-5.0
131	223	1	0.0	65.5	71	65.5	15	----	65.5	0.0	5	-5.0
132	224	1	0.0	67.4	71	67.4	15	----	67.4	0.0	5	-5.0
133	225	1	0.0	63.6	71	63.6	15	----	63.6	0.0	5	-5.0
134	226	1	0.0	65.5	71	65.5	15	----	65.5	0.0	5	-5.0
135	227	1	0.0	59.9	71	59.9	15	----	59.9	0.0	5	-5.0
136	228	1	0.0	66.3	71	66.3	15	----	66.3	0.0	5	-5.0
137	229	1	0.0	62.8	71	62.8	15	----	62.8	0.0	5	-5.0
138	230	1	0.0	63.7	71	63.7	15	----	63.7	0.0	5	-5.0
139	231	1	0.0	51.0	66	51.0	15	----	51.0	0.0	5	-5.0
140	232	1	0.0	50.6	66	50.6	15	----	50.6	0.0	5	-5.0
141	233	1	0.0	60.6	66	60.6	15	----	60.6	0.0	5	-5.0
142	234	1	0.0	60.8	66	60.8	15	----	60.8	0.0	5	-5.0
143	235	1	0.0	61.4	66	61.4	15	----	61.4	0.0	5	-5.0
144	236	1	0.0	57.4	66	57.4	15	----	57.4	0.0	5	-5.0
145	237	1	0.0	63.2	66	63.2	15	----	63.2	0.0	5	-5.0
146	252	1	0.0	60.4	66	60.4	15	----	60.4	0.0	5	-5.0

Dwelling Units		**# DUs**	**Noise Reduction**		
			Min	**Avg**	**Max**
			dB	**dB**	**dB**
All Selected		235	0.0	0.0	0.0
All Impacted		20	0.0	0.0	0.0
All that meet NR Goal		0	0.0	0.0	0.0

APPENDIX G

CONTOURS



2040 Build Contours	Sheet 1 of 1 — 25 Mar 2016
	SCDOT
Plan View	Project/Contract No. S-48 Columbia Ave.
Run name: FY Build Contour	TNM Version 2.5, Feb 2004
Scale: 100 feet	Analysis By: AECOM

Roadway:		Ground Zone:	polygon
Receiver:		Tree Zone:	dashed polygon
Barrier:		Contour Zone:	polygon
Building Row:		Parallel Barrier:	
Terrain Line:		Skew Section:	

SCDOT 25 March 2016
AECOM TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS

PROJECT/CONTRACT: S-48 Columbia Ave.
RUN: 2040 Build Contours
BARRIER DESIGN: INPUT HEIGHTS

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

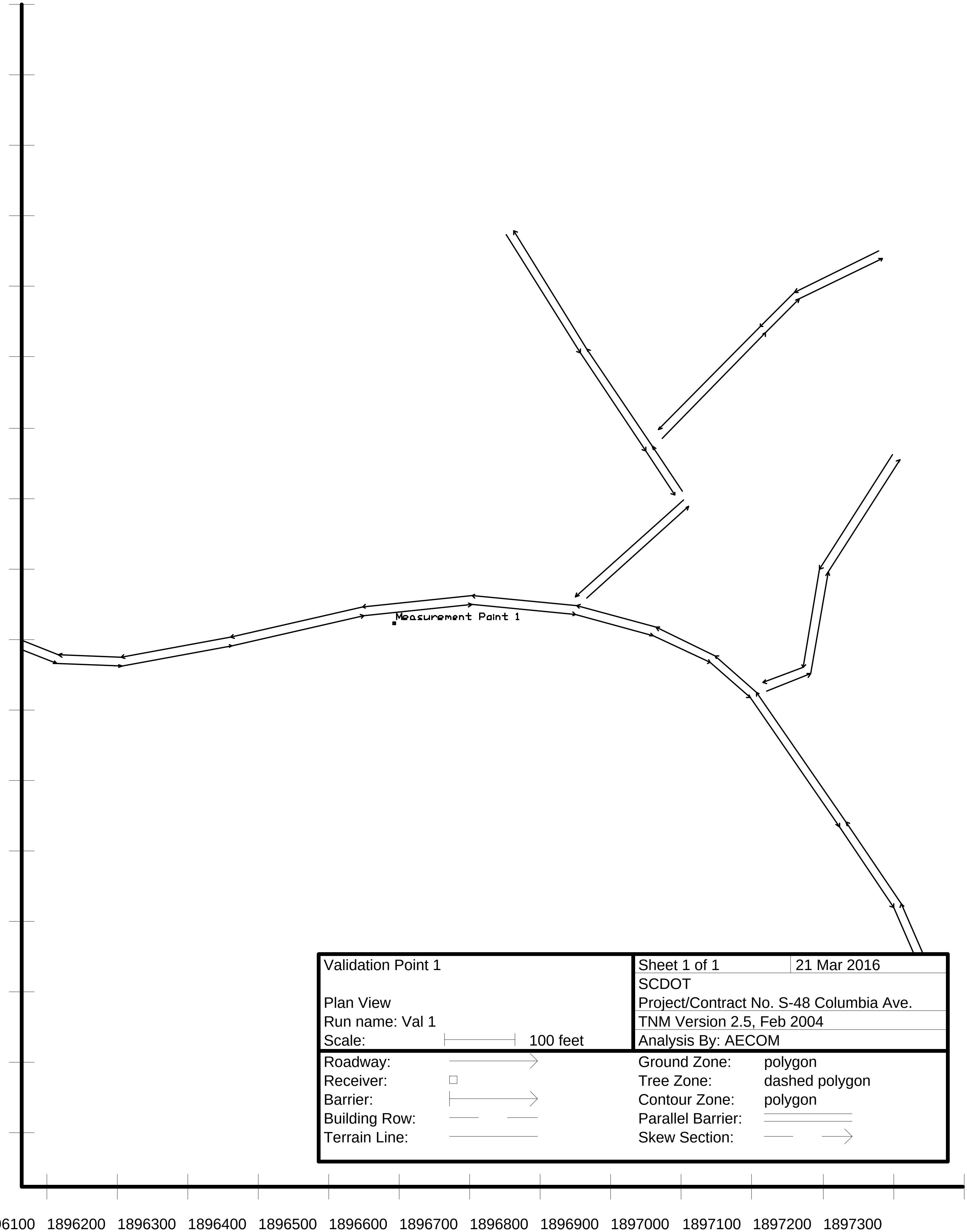
ATMOSPHERICS: 68 deg F, 50% RH

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Contour 10	148	1	0.0	71.3	66	71.3	15	Snd Lvl	71.3	0.0	5	-5.0
Contour 20	149	1	0.0	69.9	66	69.9	15	Snd Lvl	69.9	0.0	5	-5.0
Contour 30	150	1	0.0	68.7	66	68.7	15	Snd Lvl	68.7	0.0	5	-5.0
Contour 40	151	1	0.0	67.6	66	67.6	15	Snd Lvl	67.6	0.0	5	-5.0
Contour 50	152	1	0.0	66.5	66	66.5	15	Snd Lvl	66.5	0.0	5	-5.0
Contour 60	153	1	0.0	65.4	66	65.4	15	----	65.4	0.0	5	-5.0
Contour 70	154	1	0.0	64.6	66	64.6	15	----	64.6	0.0	5	-5.0
Contour 80	155	1	0.0	63.8	66	63.8	15	----	63.8	0.0	5	-5.0
Contour 90	156	1	0.0	63.1	66	63.1	15	----	63.1	0.0	5	-5.0
Contour 100	157	1	0.0	62.5	66	62.5	15	----	62.5	0.0	5	-5.0
Contour 110	158	1	0.0	62.2	66	62.2	15	----	62.2	0.0	5	-5.0
Contour 120	159	1	0.0	61.2	66	61.2	15	----	61.2	0.0	5	-5.0
Contour 130	161	1	0.0	61.0	66	61.0	15	----	61.0	0.0	5	-5.0
Contour 140	162	1	0.0	60.6	66	60.6	15	----	60.6	0.0	5	-5.0
Contour 150	163	1	0.0	60.2	66	60.2	15	----	60.2	0.0	5	-5.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	15	0.0	0.0	0.0
All Impacted	5	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

APPENDIX H

TNM VALIDATIONS


Measurement Point 1
Validation Point 1
Plan View
Run name: Val 1
Scale: 100 feet
Sheet 1 of 1
21 Mar 2016
SCDOT
Project/Contract No. S-48 Columbia Ave.
TNM Version 2.5, Feb 2004
Analysis By: AECOM
Roadway:
Receiver:
Barrier:
Building Row:
Terrain Line:
Ground Zone: polygon
Tree Zone: dashed polygon
Contour Zone: polygon
Parallel Barrier:
Skew Section:
1896100
1896200
1896300
1896400
1896500
1896600
1896700
1896800
1896900
1897000
1897100
1897200
1897300

SCDOT 21 March 2016
AECOM TNM 2.5
Calculated with TNM 2.5

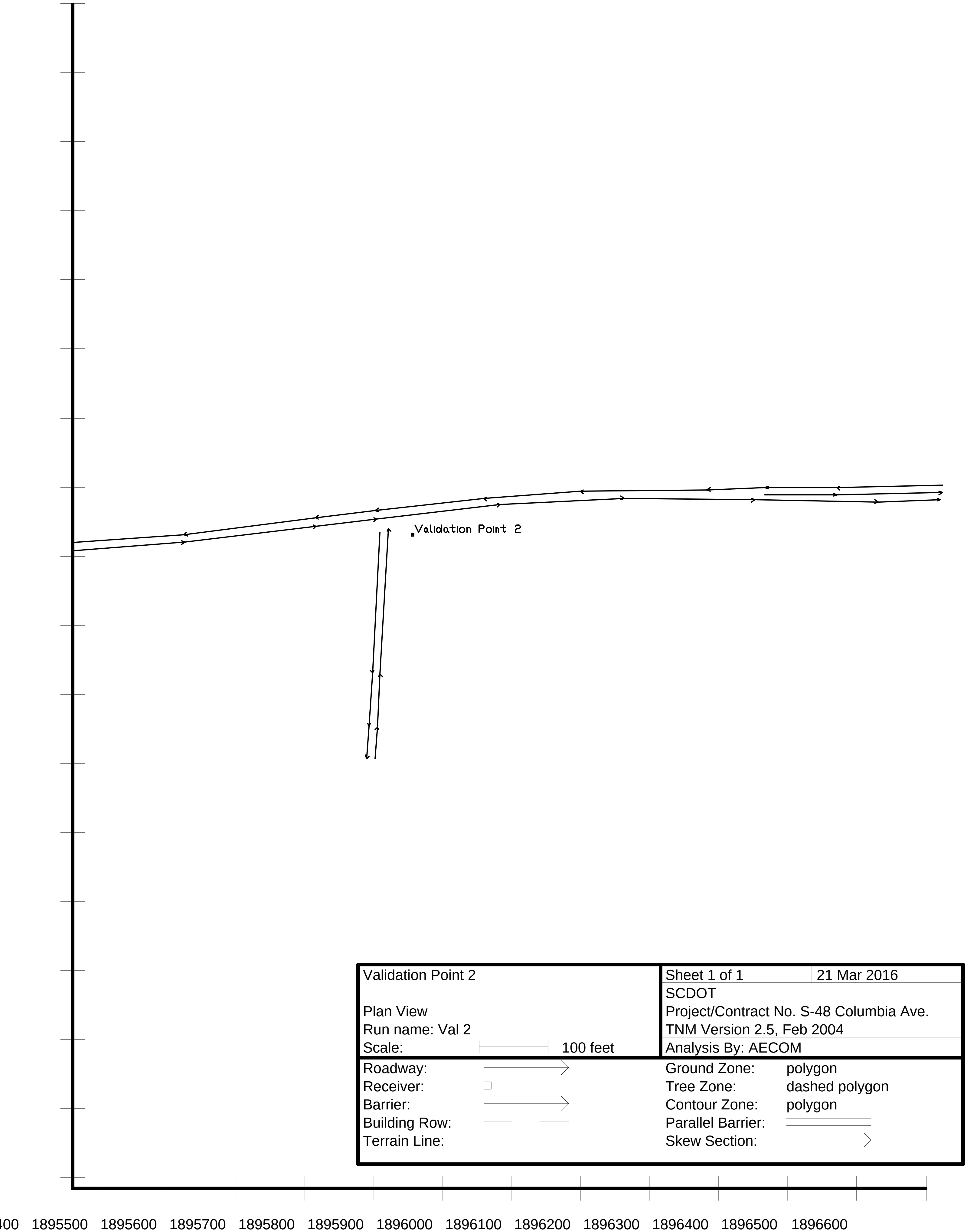
RESULTS: SOUND LEVELS
PROJECT/CONTRACT: S-48 Columbia Ave.
RUN: Validation Point 1
BARRIER DESIGN: INPUT HEIGHTS

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

ATMOSPHERICS: 68 deg F, 50% RH

Receiver												
Name	No.	#DUs	Existing	No Barrier					With Barrier			
			LAeq1h	LAeq1h		Increase over existing		Type	Calculated	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc	Impact	LAeq1h	Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Measurement Point 1	1	1	0.0	53.2	66	53.2	10	----	53.2	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	1	0.0	0.0	0.0
All Impacted	0	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0



Validation Point 2	Sheet 1 of 1 — 21 Mar 2016
	SCDOT
Plan View	Project/Contract No. S-48 Columbia Ave.
Run name: Val 2	TNM Version 2.5, Feb 2004
Scale: 100 feet	Analysis By: AECOM

Roadway:		Ground Zone:	polygon
Receiver:		Tree Zone:	dashed polygon
Barrier:		Contour Zone:	polygon
Building Row:		Parallel Barrier:	
Terrain Line:		Skew Section:	

SCDOT — 21 March 2016
AECOM — TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS

PROJECT/CONTRACT: S-48 Columbia Ave.
RUN: Validation Point 2
BARRIER DESIGN: INPUT HEIGHTS

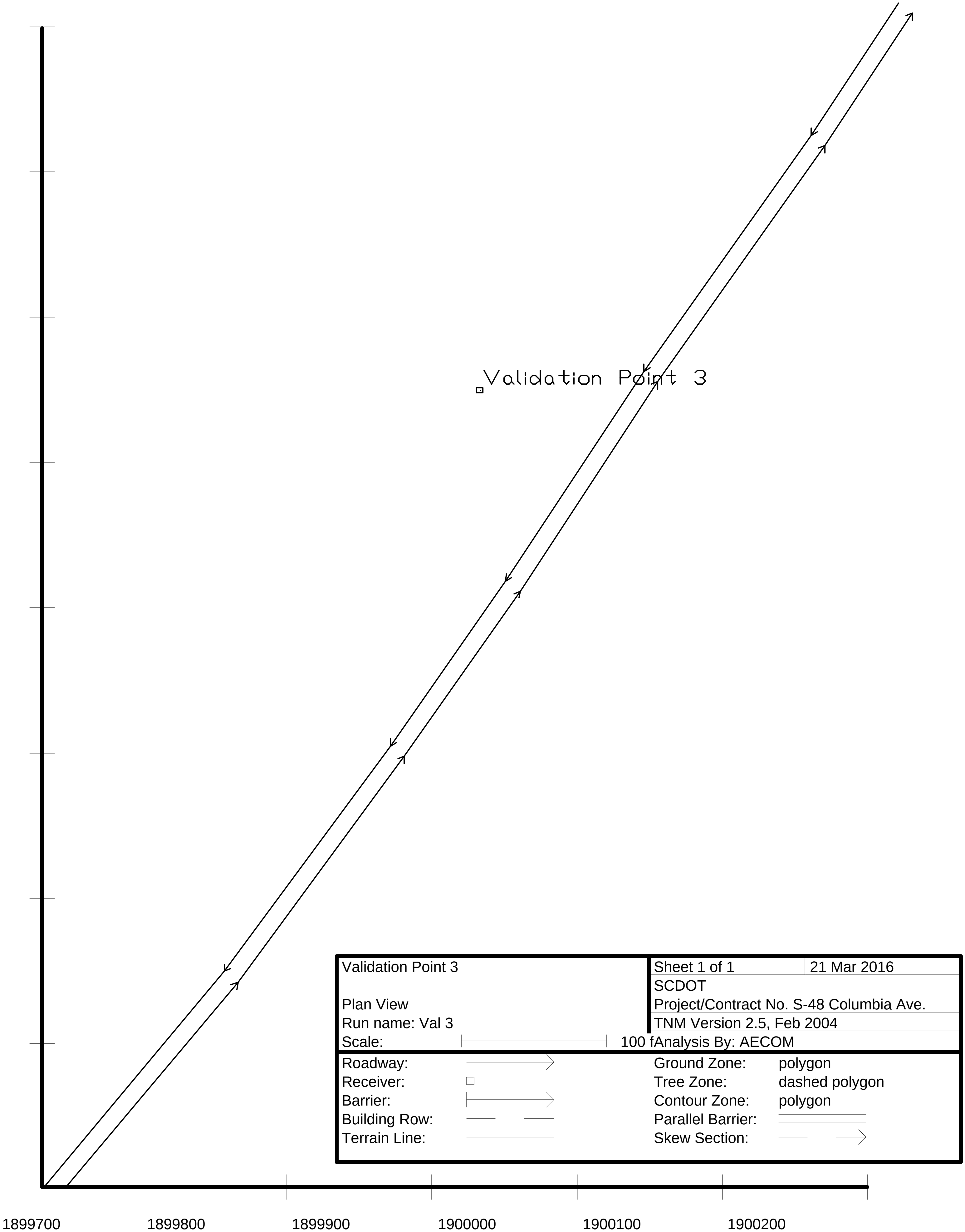
Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

ATMOSPHERICS: 68 deg F, 50% RH

Receiver

Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	No Barrier Crit'n	Increase over existing Calculated	Increase over existing Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Noise Reduction Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Validation Point 2	1	1	0.0	67.7	66	67.7	10	Snd Lvl	67.7	0.0	8	-8.0

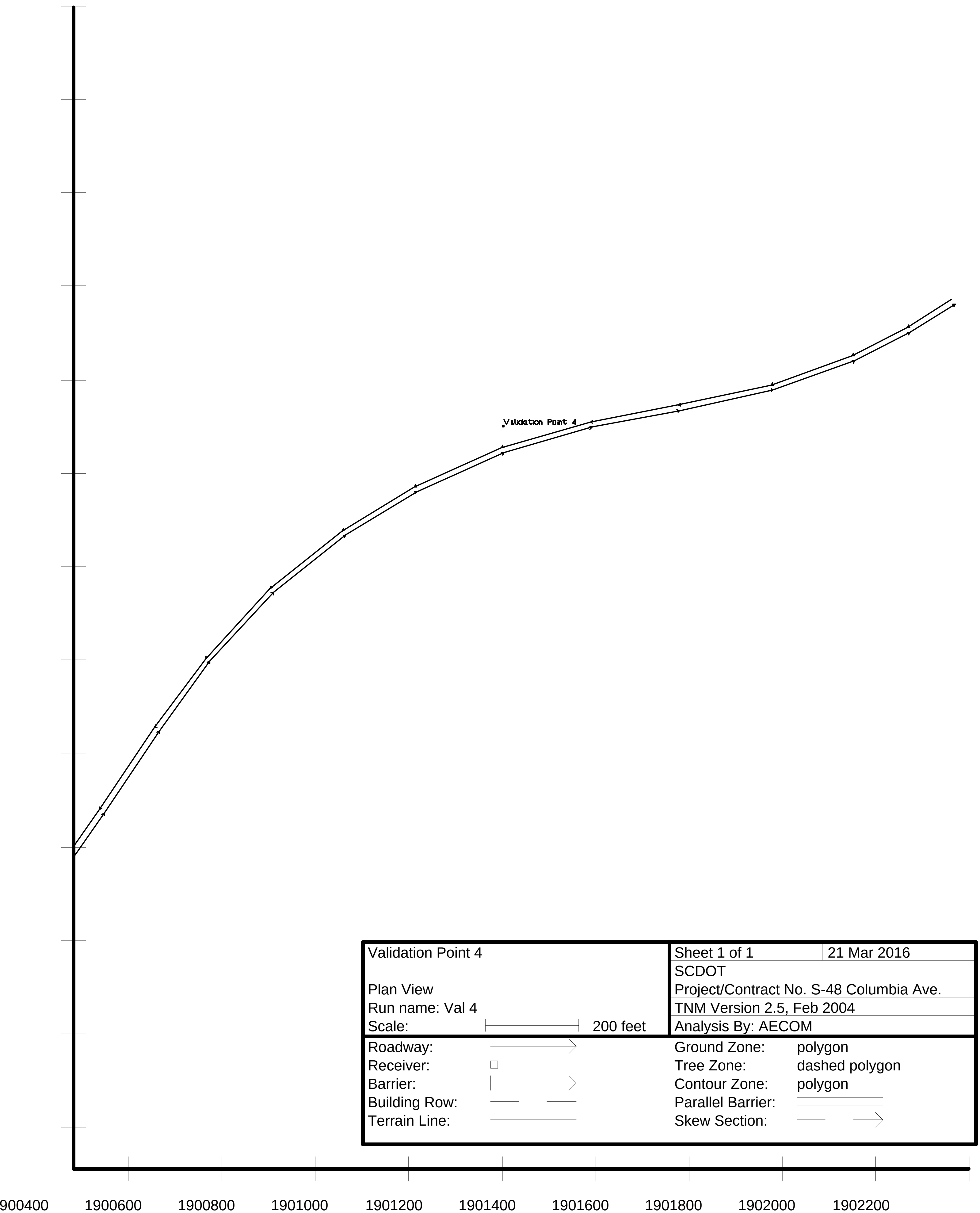
Dwelling Units	# DUs	Noise Reduction Min	Noise Reduction Avg	Noise Reduction Max
		dB	dB	dB
All Selected	1	0.0	0.0	0.0
All Impacted	1	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0


Validation Point 3
Validation Point 3
Plan View
Run name: Val 3
Scale:
100 f
Sheet 1 of 1
21 Mar 2016
SCDOT
Project/Contract No. S-48 Columbia Ave.
TNM Version 2.5, Feb 2004
Analysis By: AECOM
Roadway:
Receiver:
Barrier:
Building Row:
Terrain Line:
Ground Zone: polygon
Tree Zone: dashed polygon
Contour Zone: polygon
Parallel Barrier:
Skew Section:
1899700
1899800
1899900
1900000
1900100
1900200

SCDOT		21 March 2016
AECOM		TNM 2.5
		Calculated with TNM 2.5
RESULTS: SOUND LEVELS		
PROJECT/CONTRACT:	S-48 Columbia Ave.	
RUN:	Validation Point 3	
BARRIER DESIGN:	INPUT HEIGHTS	Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.
ATMOSPHERICS:	68 deg F, 50% RH	

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	No Barrier Crit'n	Increase over existing Calculated	Increase over existing Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Noise Reduction Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Validation Point 3	1	1	0.0	61.9	66	61.9	10	----	61.9	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	1	0.0	0.0	0.0
All Impacted	0	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

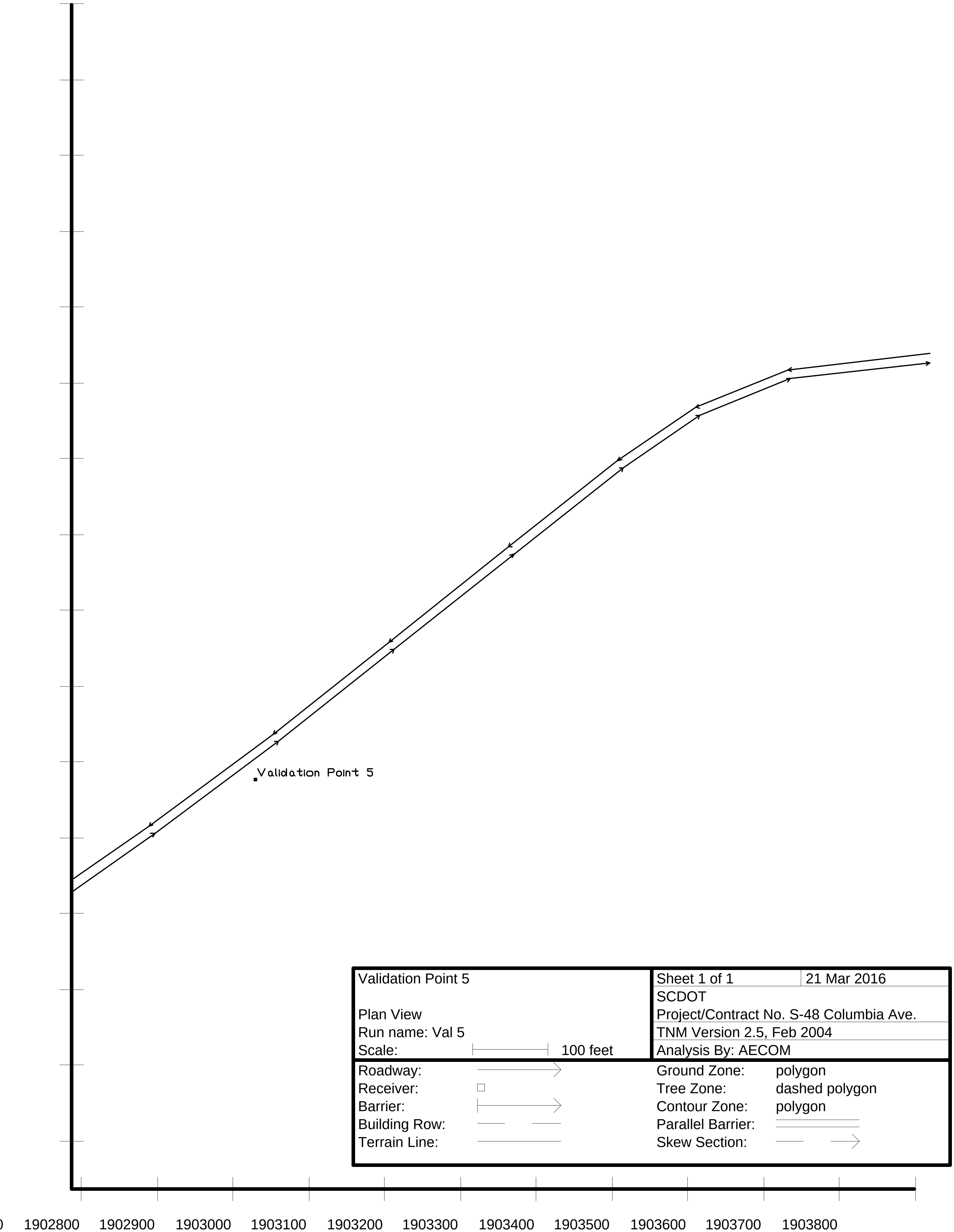


Validation Point 4		Sheet 1 of 1	21 Mar 2016
		SCDOT	
Plan View		Project/Contract No. S-48 Columbia Ave.	
Run name: Val 4		TNM Version 2.5, Feb 2004	
Scale:	200 feet	Analysis By: AECOM	
Roadway:		Ground Zone:	polygon
Receiver:		Tree Zone:	dashed polygon
Barrier:		Contour Zone:	polygon
Building Row:		Parallel Barrier:	
Terrain Line:		Skew Section:	

SCDOT			21 March 2016		
AECOM			TNM 2.5		
			Calculated with TNM 2.5		
RESULTS: SOUND LEVELS					
PROJECT/CONTRACT:	S-48 Columbia Ave.				
RUN:	Validation Point 4				
BARRIER DESIGN:	INPUT HEIGHTS			Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.	
ATMOSPHERICS:	68 deg F, 50% RH				

Receiver													
Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h					With Barrier				
				Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Validation Point 4	1	1	0.0	66.5	66	66.5	10	Snd Lvl	66.5	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	1	0.0	0.0	0.0
All Impacted	1	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0



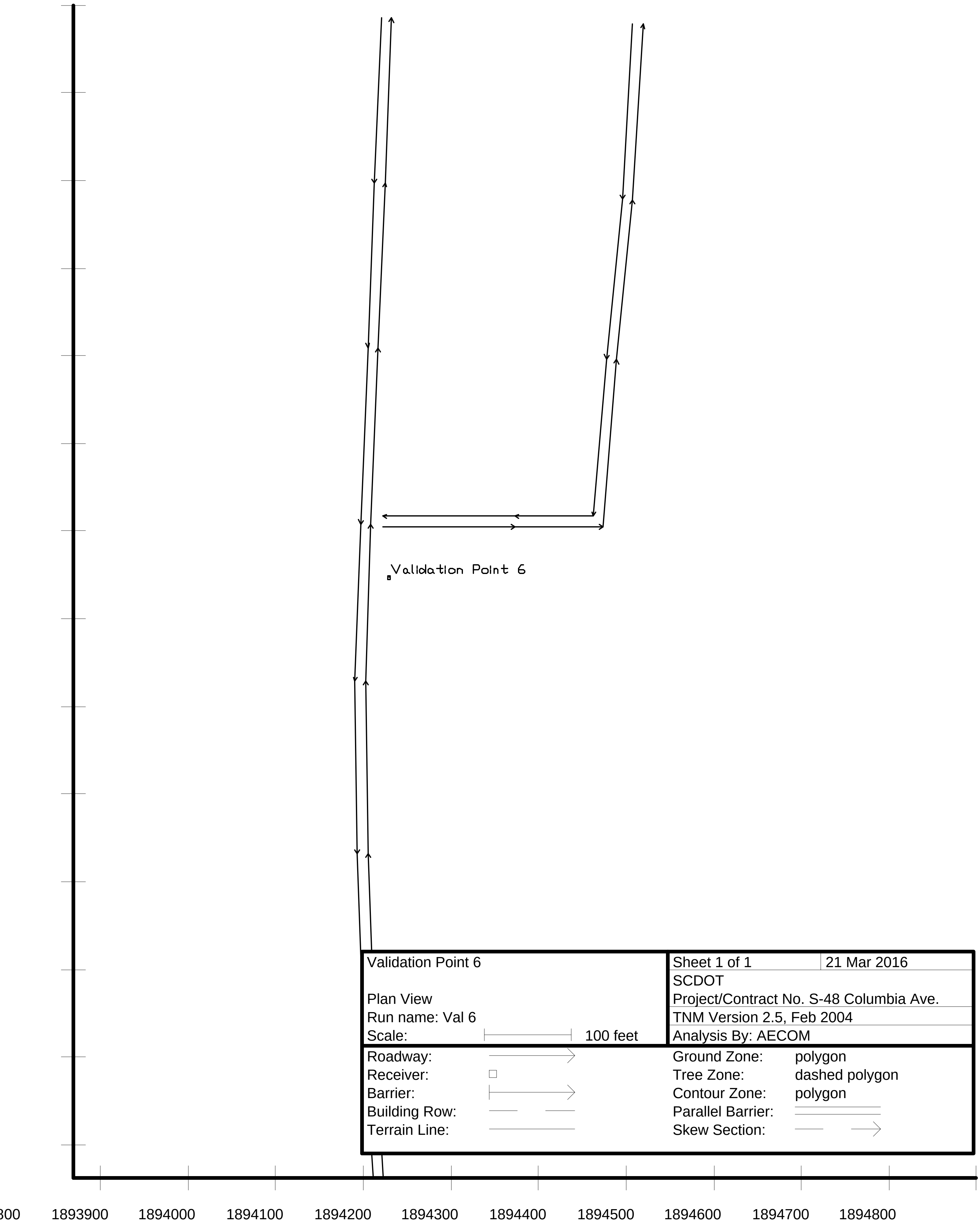
Validation Point 5	Sheet 1 of 1	21 Mar 2016
	SCDOT	
Plan View	Project/Contract No. S-48 Columbia Ave.	
Run name: Val 5	TNM Version 2.5, Feb 2004	
Scale: 100 feet	Analysis By: AECOM	

Roadway:		Ground Zone:	polygon
Receiver:		Tree Zone:	dashed polygon
Barrier:		Contour Zone:	polygon
Building Row:		Parallel Barrier:	
Terrain Line:		Skew Section:	

SCDOT		21 March 2016
AECOM		TNM 2.5
		Calculated with TNM 2.5
RESULTS: SOUND LEVELS		
PROJECT/CONTRACT:	S-48 Columbia Ave.	
RUN:	Validation Point 5	
BARRIER DESIGN:	INPUT HEIGHTS	Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.
ATMOSPHERICS:	68 deg F, 50% RH	

Receiver												
Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h					With Barrier			
				Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Validation Point 5	1	1	0.0	64.2	66	64.2	10	----	64.2	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	1	0.0	0.0	0.0
All Impacted	0	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0



Validation Point 6	Sheet 1 of 1 — 21 Mar 2016
	SCDOT
Plan View	Project/Contract No. S-48 Columbia Ave.
Run name: Val 6	TNM Version 2.5, Feb 2004
Scale: 100 feet	Analysis By: AECOM

Roadway:		Ground Zone:	polygon
Receiver:		Tree Zone:	dashed polygon
Barrier:		Contour Zone:	polygon
Building Row:		Parallel Barrier:	
Terrain Line:		Skew Section:	

SCDOT 21 March 2016
AECOM TNM 2.5
Calculated with TNM 2.5

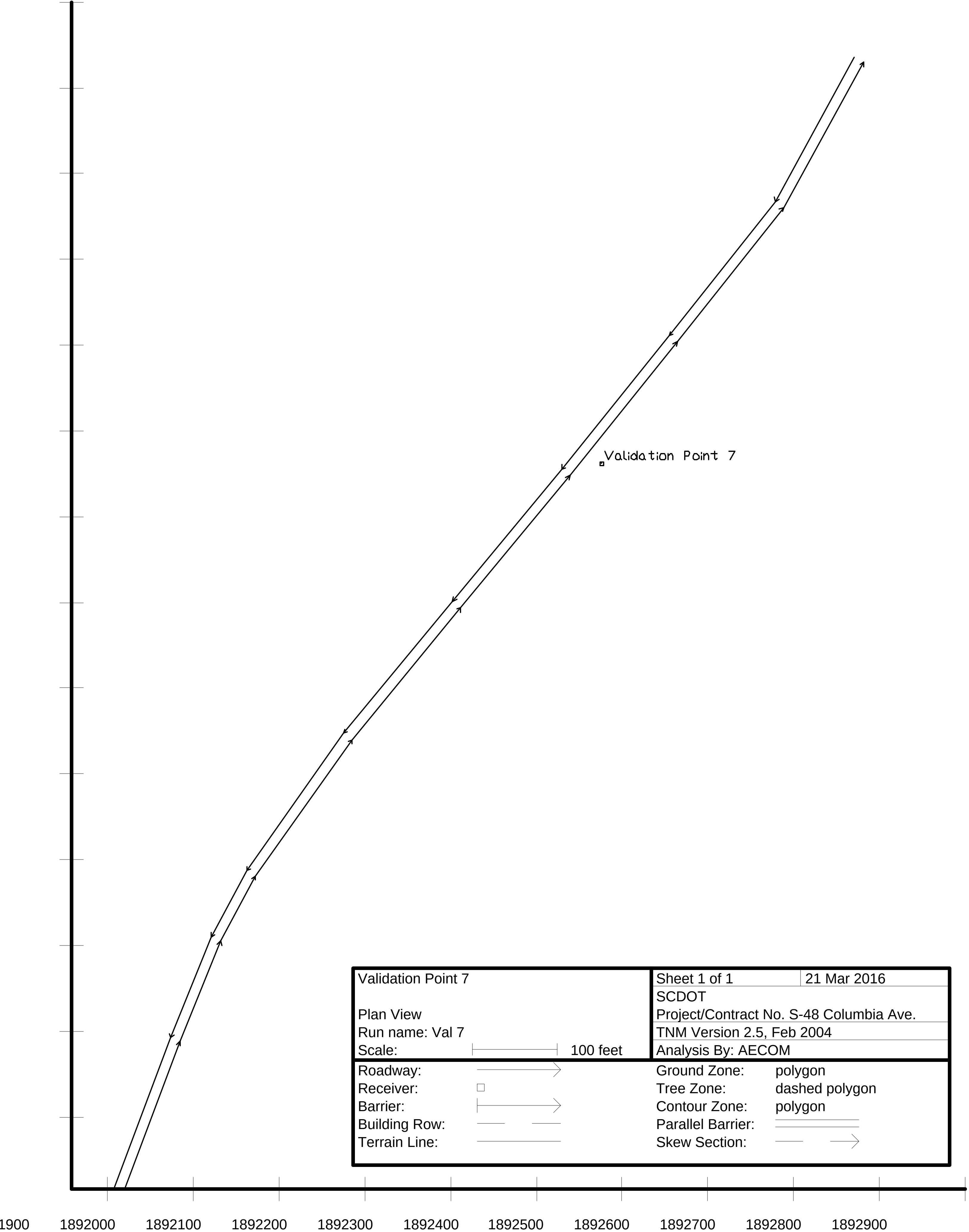
RESULTS: SOUND LEVELS
PROJECT/CONTRACT: S-48 Columbia Ave.
RUN: Validation Point 6
BARRIER DESIGN: INPUT HEIGHTS

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

ATMOSPHERICS: 68 deg F, 50% RH

Receiver												
Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	No Barrier Crit'n	Increase over existing Calculated	Increase over existing Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Noise Reduction Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Validation Point 6	1	1	0.0	67.1	66	67.1	10	Snd Lvl	67.1	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Noise Reduction Avg	Noise Reduction Max
		dB	dB	dB
All Selected	1	0.0	0.0	0.0
All Impacted	1	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0



Validation Point 7	Sheet 1 of 1 / 21 Mar 2016
	SCDOT
Plan View	Project/Contract No. S-48 Columbia Ave.
Run name: Val 7	TNM Version 2.5, Feb 2004
Scale: 100 feet	Analysis By: AECOM

Roadway:		Ground Zone:	polygon
Receiver:		Tree Zone:	dashed polygon
Barrier:		Contour Zone:	polygon
Building Row:		Parallel Barrier:	
Terrain Line:		Skew Section:	

SCDOT		21 March 2016
AECOM		TNM 2.5
		Calculated with TNM 2.5
RESULTS: SOUND LEVELS		
PROJECT/CONTRACT:	S-48 Columbia Ave.	
RUN:	Validation Point 7	
BARRIER DESIGN:	INPUT HEIGHTS	Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.
ATMOSPHERICS:	68 deg F, 50% RH	

Receiver												
Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h		Increase over existing		Type	With Barrier Calculated LAeq1h	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc	Impact		Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Validation Point 7	1	1	0.0	66.3	66	66.3	10	Snd Lvl	66.3	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	1	0.0	0.0	0.0
All Impacted	1	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

APPENDIX I

SCDOT FEASIBILITY AND REASONABLENESS WORKSHEETS

SCDOT Feasibility and Reasonableness Worksheet

Date: November 21, 2016

Project Name Columbia Avenue (S-48) Widening

Highway Traffic Noise Abatement Measure Noise Barrier

Feasibility

Number of Impacted Receivers: 20 thru 29

Number of Benefited Receivers: 0

Percentage of Impacted Receivers that would achieve a 5 dBA reduction from the proposed noise abatement measure: 0

Is the proposed noise abatement measure acoustically feasible?
NOTE:SCDOT Policy indicates that 75% of the impacted receivers must achieve at least a 5 dBA reduction for it to be acoustically feasible.

☐ Yes ☒ No

Would any of the following issues limit the ability of the abatement measure to achieve the noise reduction goal?

	Yes	No
Topography	☐	☐
Safety	☐	☐
Drainage	☐	☐
Utilities	☐	☐
Maintenance	☐	☐
Access	☒	☐
Exposed Height of Wall	☐	☐

If "Yes" was marked for any of the questions above, please explain below.

Implemenetation of a noise barrier which would benefit the impacted receivers would require closure of access to the impacted receivers, which would undermind the purpose for the noise barrier.

Reasonableness

According to 23 CFR 772.13(d)(2)(iv) the abatement measure must collectively achieve each of these criteria to be reasonable. Therefore if any of the three mandatory reasonable factors are not achieved, then the abatement measure is determined NOT to be reasonable. When completing the form it is not necessary to detail each of the criteria if one was determined not to be reasonable.

#1: Noise Reduction Design Goal

Number of Benefited Receivers: 0

Number of Benefited Receivers that achieve at least an 8 dBA reduction: 0

Percentage of Benefited Receivers in the first two building rows that would achieve at least a 8 dBA reduction from the proposed noise abatement measure. NOTE: SCDOT Policy indicates that 80% of the benefited receivers in the first two building rows must achieve at least a 8 dBA reduction for it to be reasonable.: 0

Does the proposed noise abatement measure meet the noise reduction design goal? ☐ Yes ☒ No

If "Yes" is marked, continue to #2. If "No" is marked, then abatement is determined NOT to be reasonable.

#2: Cost Effectiveness

Estimated cost per square foot for noise abatement measure:

Estimated construction cost for noise abatement measure:

Estimated cost per Benefited Receiver:

Based on the SCDOT policy of $30,000 per Benefited Receiver, would the abatement measure be reasonable? ☐ Yes ☐ No

NOTE: SCDOT Policy states that the preliminary noise analysis is based on $35.00 per square foot and a more project-specific construction cost should be applied at a cost per square foot basis during the detailed noise abatement evaluation.

If "Yes" is marked, continue to #3. If "No" is marked, then abatement is determined NOT to be reasonable.

#3: Viewpoints of the property owners and residents of the benefitted receivers

Number of Benefited Receivers (same as above):

Number of Benefited Receivers in **support** of noise abatement measure:

Percentage of Benefited Receivers in **support** of noise abatement measure:

Number of Benefited Receivers **opposed** to noise abatement measure:

Percentage of Benefited Receivers **opposed** to noise abatement measure:

Number of Benefited Receivers **that did not respond** to solicitation on noise abatement measure:

Percentage of Benefited Receivers **that did not respond** to solicitation on noise abatement measure:

Based on the viewpoints of the property owners and residents of the Benefited Receivers, would the abatement measure be reasonable? NOTE: SCDOT Policy indicates that the noise abatement shall be constructed unless greater than 50% of the benefited receptors are opposed to noise abatement. ☐ Yes ☐ No

Final Determination for Noise Abatement Measure

Appendix K

Agency Correspondence

SCDOT
South Carolina
Department of Transportation

August 28, 2014

Re: Proposed S-48 (Columbia Avenue) Corridor Improvement Project in Lexington County, South Carolina, Project ID.: 0042383

To Whom It May Concern:

The South Carolina Department of Transportation (SCDOT) proposes improvements to the existing S-48 (Columbia Avenue) Corridor located between U.S. Highway 76 (Chapin Road) and Interstate 26 (I-26) in Lexington County, South Carolina; please see the attached Figure 1 for a Location Map. As an integral part of the environmental process, SCDOT is soliciting input from agencies and individuals concerning the potential social, economic and environmental impacts of the proposed improvements. An Environmental Assessment (EA) will be prepared reflecting the benefits and impacts for the proposed project, in accordance with regulations of the Federal Highway Administration and the National Environmental Policy Act (NEPA).

The S-48 (Columbia Avenue) corridor is located within the Town of Chapin and serves as the primary access to I-26 for residents of Chapin and the growing residential areas south of Chapin and along Lake Murray. The corridor also provides access to Chapin High School, as well as businesses and residences located along S-48 (Columbia Avenue).

The corridor is approximately 1.9 miles in total length and is comprised of both undeveloped forestland and developed areas. The western portion of the corridor, located between U.S. Highway 76 (Chapin Road) and Ellett Road, is primarily comprised of established commercial and residential development. Chapin High School is located immediately east of Ellett Road and south of S-48 (Columbia Avenue). East of Chapin High School, the corridor primarily consists of undeveloped forestland with sparse residential and commercial development. Furthermore, the eastern extent of the corridor is primarily comprised of commercial development associated with the I-26 interchange.

The scope of the proposed improvements consists of improving traffic congestion within the corridor. Design alternatives and the most appropriate and effective methods for improving the corridor are currently being evaluated.

To ensure that issues of the proposed project are fully evaluated, SCDOT requests that you respond in writing concerning any beneficial or adverse impacts of the project relating to the interest of your agency. SCDOT looks forward to receiving your comments on the project within 30 days of the receipt of this letter. Comments should be addressed to the following:

Mr. Edward W. Frierson
South Carolina Department of Transportation
Environmental Services Division, Room 506
Post Office Box 191
Columbia, South Carolina 29202-0191

Or by email: FriersonEW@scdot.org

Your expeditious handling of this notice will be appreciated. If you have any questions or need additional information concerning this project, please contact me at 803-737-1861.

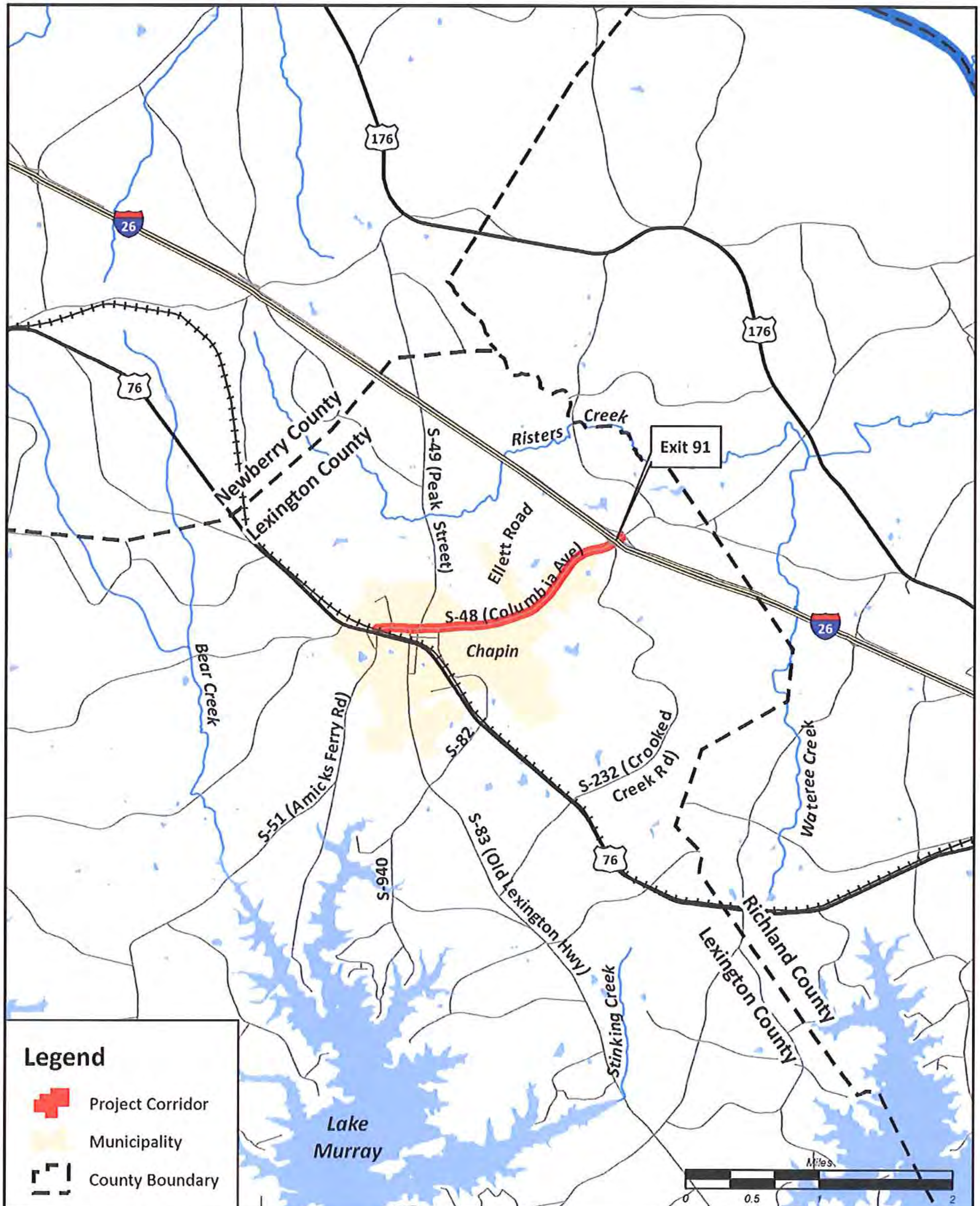
Sincerely,

Edward W. Frierson

Edward W. Frierson
NEPA Coordinator – Midlands RPG

Enclosure

ec: Mr. Ladd Gibson, Program Manager
Mr. Wrenn Barrett, Director of Public Works, Lexington County
Mr. Jeff McNesby, County Engineer, Lexington County



SCDOT South Carolina Department of Transportation

S-48 (COLUMBIA AVENUE) CORRIDOR IMPROVEMENTS

LEXINGTON COUNTY, SOUTH CAROLINA

FIGURE 1

LOCATION MAP

Matt DeWitt

From: Frierson, Ed W <FriersonEW@scdot.org>
Sent: Friday, August 29, 2014 2:01 PM
To: Matt DeWitt
Subject: FW: Letter of Intent for Proposed Improvements to SC 48 (Columbia Ave.) in Lexington County
Attachments: LOI for S-48 (Columbia Ave) Improvements in Lexington County.pdf

Matt,
See below, the LOI went out yesterday.
Ed

-----Original Message-----
From: Frierson, Ed W
Sent: Thursday, August 28, 2014 3:11 PM
To: 'emjohnson@scdah.state.sc.us'; 'leader@sc.edu'; 'daviss@dnr.sc.gov'; 'prestohs@dhec.sc.gov'; 'wilsonde@dhec.sc.gov'; 'giffinma@dhec.sc.gov'; 'reecemc@dhec.sc.gov'; 'neeldg@dhec.sc.gov'; 'sirondl@dhec.sc.gov'; 'brownrj@dhec.sc.gov'; 'walkerpt@dhec.sc.gov'; 'wenonahh@ccppcrafts.com'; 'mathishl@dhec.sc.gov'; 'stephen.a.brumagin@usace.army.mil'; 'tpatton@forestry.state.sc.us'; 'Larry.Knightner@hud.gov'; 'MacToole@schouse.gov'; 'JakeKnotts@scsenate.gov'; 'RonnieCromer@scsenate.gov'; 'SEduComm@scsenate.gov'; 'SLCIComm@scsenate.gov'; 'Mark_Caldwell@fws.gov'; 'krhinehart@budget.sc.gov'; 'james@jamessmith.com'; 'BillHixon@schouse.gov'; 'KennyBingham@schouse.gov'; 'BruceBannister@schouse.gov'; 'ToddAtwater@schouse.gov'; 'RolandSmith@schouse.gov'; 'KitSpires@schouse.gov'; 'BillTaylor@schouse.gov'; 'NathanBallentine@schouse.gov'; 'TomYoung@schouse.gov'; 'NikkiSetzler@scsenate.gov'; 'hughesjr@dhec.sc.gov'; 'mcconney.ramona@epa.gov'; 'russtown@nc-cherokee.com'; 'lstopp@unitedkeetoowahband.org'; 'bhitt@sccommerce.com'; 'gsabin@forestry.state.sc.us'; Belcher, Jeffery - FHWA; Lee, Robert L (Bob) - FHWA; 'vlewis@scprt.com'; 'MarionFrye@schouse.gov'; 'ChipHuggins@schouse.gov'; 'WaltMcLeod@schouse.gov'; 'RickQuinn@schouse.gov'
Cc: Robbins, Heather M.; Gibson, Ladd; Price, Kati
Subject: Letter of Intent for Proposed Improvements to SC 48 (Columbia Ave.) in Lexington County

To all who receive this email:
Attached is the Letter of Intent for the proposed improvements to SC 48 (Columbia Ave.) in Lexington County, South Carolina.

In an effort to save resources and expedite delivery you are receiving this document in an electronic format. Please consider the environment before printing.

Edward W. Frierson
SC Dept. of Transportation NEPA Coordinator - Midlands Region
803-737-1861

D H E C
PROMOTE PROTECT PROSPER
Catherine B. Templeton, Director
Promoting and protecting the health of the public and the environment

RECEIVED
SEP 19 2014
Environmental Management
SCDOT

September 11, 2014

Mr. Edward W. Frierson
South Carolina Department of Transportation
Environmental Service Division, Rm 506
PO Box 191
Columbia SC 29202-0191

RE: Bureau of Water Environmental Review Response for **S-48(Columbia Ave) Corridor Improvement Project in Lexington, Project ID 0042383** CDBG Project

Dear Mr. Frierson:

The South Carolina Department of Health and Environmental Control's Bureau of Water (Bureau) has received your request for a review of the above project. Our Bureau protects water quality through implementation of its regulations. This coordinated response represents all program areas within the Bureau, but does not represent a review of other potential regulatory requirements administered by other SCDHEC Bureaus. To ensure protection and maintenance of water resources, the Bureau recommends the following issues be addressed when planning and carrying out this project:

☐ No apparent impacts to water quality. No Bureau permits required.

X Any non-point discharges into a stream or river from construction areas of one acre or more will require a Bureau administered Stormwater Management and Sediment Control Permit. Construction areas of one acre or more will also be subject to NPDES Stormwater permit regulations.

X Any placement of fill material or dredging in waters of the State, including jurisdictional wetlands, will require a Bureau administered Section 401 Certification and an Army Corps of Engineers administered Section 404 Permit. When evaluating application for fill in wetlands, demonstration of avoidance and minimization of wetland impacts and mitigation of unavoidable wetland impacts provides assurances that impacts have been lessened to the extent possible and that water quality standards will be upheld. Documentation of these measures will be required.

X A Construction in Navigable Waters Permit will be required for all construction within navigable waters of South Carolina.

☐ Drinking water system construction requires a permit from the Bureau. Our review of acceptability will occur with review of application for a permit. Also, the applicant should check with the local water utility on available capacity.

☐ Sewer system construction requires a permit from the Bureau. Our review of acceptability will occur with review of application for a permit. Also, the applicant should check with the local water utility on available capacity.

☐ With new businesses and other commercial or industrial operations, wastewater pretreatment permits or other local approvals may be required.

☐ Other:

Thank you for the opportunity to comment on this project. If you have any questions, please contact Monica Taylor at (803) 898-4176 or taylormn@dhec.sc.gov.

Sincerely,

Monica Taylor
Bureau of Water

D H E C
PROMOTE PROTECT PROSPER
Catherine B. Templeton, Director
Promoting and protecting the health of the public and the environment

RECEIVED
SEP - 9 2014
Environmental Management
SCDOT

September 3, 2014

Mr. Edward W. Frierson
South Carolina Department of Transportation
Environmental Services Division, Room 506
Post Office Box 191
Columbia, SC 29202-0191

Re: Proposed S-48 (Columbia Avenue) Corridor Improvement in Lexington County, South Carolina, Project ID: 0042383

Dear Mr. Frierson:

On August 28, 2014, we received a Letter of Intent for the Proposed S-48 (Columbia Avenue) Corridor Improvement in Lexington County, South Carolina. *Based on the limited information provided in the letter, I am responding on behalf of the South Carolina Department of Health and Environmental Control, Bureau of Air Quality (Bureau).*

The Bureau is tasked with implementing the Federal Clean Air Act (1990, as amended) in the State of South Carolina. The Bureau is required to ensure compliance with the National Ambient Air Quality Standards (NAAQS) for criteria pollutants. Currently two criteria pollutants are of particular concern in South Carolina:

- **Ozone** – The 2008 8-hour ozone standards (primary and secondary) are currently set at 0.075 parts per million (ppm). The area represented in this proposal is meeting the 2008 ozone standards. The Environmental Protection Agency (EPA) is currently reviewing the 2008 ozone standard and the proposal of a new standard is anticipated.

- **Particulate Matter 2.5** (Particulates 2.5 microns in size and smaller) – The 2012 standard for maximum daily concentration is set at 35 micrograms per cubic meter. The 2012 standard for the maximum annual concentration is set at 12 micrograms per cubic meter. The area represented in this proposal is meeting the 2012 particulate matter 2.5 standards.

Presently only the eastern portion of York County has been designated nonattainment for the 2008 8-hour ozone NAAQS. For more information on which areas have been designated nonattainment, please visit http://www.epa.gov/oar/oaqps/greenbk. If a project is located in a nonattainment area, it may be subject to prescriptive requirements such as Transportation Conformity or air quality modeling.

An asbestos survey and project license may be required prior to any demolition activities such as deconstruction of a building or removal of structures in the right-of-way of a road project. If you have any questions regarding asbestos regulatory applicability you may contact Robin Mack (with the Bureau's Asbestos Section) at (803) 898-4270 or mackrs@dhec.sc.gov.

As both bicycle and pedestrian travel are beneficial for health and air quality, and land use in the project area (commercial and residential development, a school, and undeveloped land) appears compatible with bicycle and pedestrian activity, the Bureau encourages the project planners to provide suitable bicycle and pedestrian accommodations along and across Columbia Avenue as a part of this project.

All necessary environmental permits for the subject project must be obtained in accordance with applicable state and federal regulations. If you have not already done so, please contact the Bureau of Water at (803) 898-4300 and the Bureau of Land and Waste Management at (803) 898-2000 for input regarding those program areas' assessments of this proposed project.

Emissions from construction equipment are regulated by federal standards. The Bureau would like to offer the following suggestions on how this project can help us stay in compliance with the NAAQS. More importantly, these strategies are beneficial to the health of citizens of South Carolina.

- Utilize alternatively fueled equipment.
- Utilize emission controls applicable to your equipment.
- Reduce idling time on equipment.
- Fugitive dust emissions should be minimized through good operating practices.

The Bureau can provide model clean construction contract language. A vendor may need to retrofit, repower or replace older and more polluting diesel construction equipment in order to satisfy clean construction requirements. These types of projects can be financed with Congestion Mitigation and Air Quality (CMAQ) funds, and are in fact a high priority for CMAQ funding. Please contact our office if assistance is needed.

Thank you for the opportunity to comment on this project. Should you have any further questions or comments concerning this matter, please do not hesitate to contact me at (803) 898-4122 or at robertln@dhec.sc.gov.

Sincerely,

L. Nelson Roberts Jr.

L. Nelson Roberts, Jr., Manager
Air Quality Standards and Assessment Section
SCDHEC Bureau of Air Quality

ec: Ben Buchanan, Midlands EQC Columbia Office, buchanbr@dhec.sc.gov

Matt DeWitt

To: Berry Still
Subject: RE: Letter of Intent for Proposed Improvements to SC 48 (Columbia Ave.) in Lexington County

Subject: Re: Letter of Intent for Proposed Improvements to SC 48 (Columbia Ave.) in Lexington County
From: "Gibson, Ladd" <GibsonLS@scdot.org>
To: Nathan Ballentine <NathanBallentine@schouse.gov>
CC: "Wrenn Barrett (wbarrett@lex-co.com)" <wbarrett@lex-co.com>,Berry Still <Berry.Still@meadhunt.com>,"Jeff McNesby (jmcnesby@lex-co.com)" <jmcnesby@lex-co.com>,Zack Haney <Zack.Haney@meadhunt.com>

Representative Ballentine,
The S-48 (Columbia Avenue) Corridor Improvement Project is a project being managed by Lexington County as Local Public Agency (LPA) through a participation agreement with the South Carolina Department of Transportation. Lexington County will develop the plans, environmental documents, and acquire the right-of-way for the project, and they will be reimbursed by SCDOT utilizing federal guideshare funds for all eligible expenditures against the project.

At this time, the County and their consultant (Mead & Hunt) are collecting surveys, traffic counts, and other information on the project to assist with the development of various alternatives that will improve the congestion in the area. Any proposed improvements will be shared with the public in future public information meetings/hearings. Just as SCDOT would do if we were directly managing this project, the County will contact you and other community leaders and stakeholders directly regarding any upcoming public meetings.

I am currently transitioning to a new position at SCDOT, so I will not be the primary contact for you regarding projects in your area. However, you can contact Randall Young, the Regional Production Engineer for the Midlands area until my successor in named. He can be reached at 737-1827.

For specific information regarding the S-48 project, you may contact Lexington County Engineer Jeff McNesby or the Director of Public Works, Wrenn Barrett at 785-8201.

Sincerely,

Ladd Gibson, PE

Design Build Engineer
SC Department of Transportation
Alternative Project Delivery Section

955 Park Street, Room 421
Columbia, SC 29202
(803) 737-3511
(803) 727-0540 mobile
gibsonls@scdot.org

From: Frierson, Ed W
Sent: Thursday, September 4, 2014 4:34 PM
To: Nathan Ballentine
Cc: Gibson, Ladd
Subject: RE: Letter of Intent for Proposed Improvements to SC 48 (Columbia Ave.) in Lexington County

Dear Mr. Ballentine,
We appreciate your interest in the Department's proposed improvements to Road S-48 (Columbia Ave.) in Lexington County. The Letter of Intent was sent specifically to regulatory agencies and representatives of the public to ensure that they are up to date on

projects that we are beginning the NEPA process on in the Midlands Region. We would request that you not put a copy of the Letter of Intent on your website, but we will inform you of future public meetings whose information you are welcome to post on your website. The SCDOT Program Manager for this project is Mr. Ladd Gibson, who I am cc:ing with this email. He will be answering your other questions in your email regarding this project.
Thank you,
Ed Frierson

-----Original Message-----
From: Nathan Ballentine [mailto:NathanBallentine@schouse.gov]
Sent: Friday, August 29, 2014 2:17 PM
To: Frierson, Ed W
Subject: RE: Letter of Intent for Proposed Improvements to SC 48 (Columbia Ave.) in Lexington County

Ed, is this simply a "let us know any specific concerns you have" solitication?

Can I post on my website in case constituents have any concerns?

Just don't want to get everyone "excited" that changes are coming since they may be expecting sooner, rather than later.

Can you share what specific improvements are coming - and estimated time frames? IE - additional lanes, etc?

I hope you'll continue to stay in touch with what's going on in the State House and our community by visiting my website (www.nathansnews.com) and sharing your thoughts on my regular posts.

Nathan Ballentine
House of Representatives, District 71
Richland and Lexington Counties
320B Blatt Building
Columbia, SC 29221
803-734-2969
www.nathansnews.com

-----Original Message-----
From: Frierson, Ed W [mailto:FriersonEW@scdot.org]
Sent: Thursday, August 28, 2014 3:11 PM
To: emjohnson@scdah.state.sc.us; leader@sc.edu; daviss@dnr.sc.gov; prestohs@dhec.sc.gov; wilsonde@dhec.sc.gov; giffinma@dhec.sc.gov; reecemc@dhec.sc.gov; neeldg@dhec.sc.gov; sirondl@dhec.sc.gov; brownrj@dhec.sc.gov; walkerpt@dhec.sc.gov; wenonahh@ccppcrafts.com; mathishl@dhec.sc.gov; stephen.a.brumagin@usace.army.mil; tpatton@forestry.state.sc.us; Larry.Knightner@hud.gov; McLain R. "Mac" Toole; JakeKnotts@scsenate.gov; Ronnie W. Cromer; Senate Education Committee; Senate Labor Commerce & Industry Committee; Mark_Caldwell@fws.gov; krhinehart@budget.sc.gov; james@jamessmith.com; Bill Hixon; Kenneth A. "Kenny" Bingham; Bruce Bannister; Todd Atwater; Roland Smith; Kit Spires; Bill Taylor; Nathan Ballentine; TomYoung@schouse.gov; Nikki G. Setzler; hughesjr@dhec.sc.gov; mcconney.ramona@epa.gov; russtown@nc-cherokee.com; lstopp@unitedkeetoowahband.org; bhitt@sccommerce.com; gsabin@forestry.state.sc.us; Belcher, Jeffery - FHWA; Lee, Robert L (Bob) - FHWA; vlewis@scprt.com; MarionFrye@schouse.gov; Chip Huggins; Walton J. "Walt" McLeod; Rick Quinn
Cc: Robbins, Heather M.; DeWitt, Matt; Gibson, Ladd; Price, Kati
Subject: Letter of Intent for Proposed Improvements to SC 48 (Columbia Ave.) in Lexington County

To all who receive this email:
Attached is the Letter of Intent for the proposed improvements to SC 48 (Columbia Ave.) in Lexington County, South Carolina.

In an effort to save resources and expedite delivery you are receiving this document in an electronic format. Please consider the environment before printing.

Edward W. Frierson
SC Dept. of Transportation NEPA Coordinator - Midlands Region
803-737-1861

SCDOT Environmental
ACE Meeting

10:00 am Thursday November 12, 2015
at
SCDOT HEADQUARTERS, COLUMBIA

SCDOT Conference Room 1

AGENDA

1. **Introduction**
2. **Old Business**
3. **New Business**
4. **S-48 (Columbia Avenue) Corridor Improvement Project – Matt Dewitt, Mead & Hunt**
5. **AOB**
6. **Next Meeting – December 10, 2015**
7. **Adjourn**

S-48 (Columbia Avenue)
Corridor Improvement Project

November 2015

The Project

The SCDOT, in partnership with the USFHWA, Lexington County, and the Columbia Area Transportation Study (COATS), proposes to improve the S-48 (Columbia Avenue) corridor from I-26 to US 76 (Chapin Road) within the Town of Chapin. The SCDOT has entered into a Local Public Agency Administrator (LPAA) agreement with Lexington County to manage the Project. An Environmental Assessment (EA) is currently being prepared for the project.

Within the Project Corridor, Columbia Avenue consists of two travel lanes, one in each direction, minimal paved shoulders, and grassed shoulders with an open ditch for stormwater collection and conveyance.

Purpose and Need

The purpose of the Project is to improve traffic congestion along the Columbia Avenue corridor between I-26 and US 76 (Chapin Road).

Segment of S-48	2013 ADT	2040 ADT	V/C	LOS
Peak Street to I-26	12,500	16,700	1.55	F
Amicks Ferry Road to Peak Street	8,900	11,900	1.10	D

The project will also:

- Improve the I-26 Interchange with Columbia Avenue
- Realign Crooked Creek Road
- Improve system linkage
- Provide safety improvements
- Address roadway deficiencies
- Consider providing facilities for bicyclist and pedestrians

The project is also shown as the 2nd highest priority in the *COATS 2035 Long Range Transportation Plan* and is included as a system upgrade in SCDOT's STIP for Lexington County.

Alternatives Analysis Snapshot

Roadway improvement alternatives were developed and presented at a Public Information Meeting in November 2014. These include:

- Improvements to existing roadways
- New location roadways
- Combinations of existing and new location roadways

Please see the attached handout displaying the 31 roadway improvement alternatives evaluated.

These 31 roadway improvement alternatives were assessed based on:

- Ability to satisfy minimum roadway/railroad design criteria
- Significant impacts to the natural environment
- Potential community impacts

This analysis eliminated 21 potential alternatives.

A Traffic Analysis and a Jurisdictional Determination were performed on the remaining 10 roadway improvement alternatives. Seven alternatives were determined to be unable to satisfy the purpose and need of the project and/or would result in significant impacts to waters of the U.S. These alternatives were subsequently eliminated.

The three reasonable alternatives were presented at a 2nd Public Information Meeting in July 2015. Based on additional input from the public, Alternatives 9A and 18A were developed as modifications of previously developed alternatives. Based on the assessment of these alternatives, Alternative 9A has been selected as the Preferred Alternative for roadway improvements.

Please see the attached handout displaying the Preferred Alternative

In addition to roadway improvement alternatives, 3 potential interchange alternatives are currently being evaluated, including:

- Partial Cloverleaf
- Dual Roundabout
- Diverging Diamond

Preferred Alternative

The Preferred Alternative proposes to utilize existing roadways and provide a new location roadway to satisfy the purpose and need of the project. The Preferred Alternative would:

3-Lane Section

- Originate on Zion Church Road
- Close the existing intersection of Zion Church Road and Amicks Ferry Road
- Provide a new location roadway east to Clark Street
- Improve approximately 300 feet of Clark Street
- Provide a new location roadway from Clark Street east to Weisz Street
- Improve approximately 250 feet of Weisz Street
- Utilize and improve the existing at-grade railroad crossing located on Weisz Street
- Improve approximately 900 feet of East Boundary Street
- Provide a new location roadway from East Boundary Street north to Columbia Avenue
- Terminate the new location roadway approximately 425 feet east of East Boundary Street
- Close the existing intersection of East Boundary Street and Columbia Avenue

- Improve Columbia Avenue to five lanes from the terminus of the new location roadway to I-26
- Improve the existing I-26 interchange with Columbia Avenue
- Relocate Crooked Creek Road to terminate at Columbia Avenue

Impacts to Waters of the U.S. / Permits / Mitigation

A Jurisdictional Determination is being finalized and is anticipated to be submitted to the USACE in November 2015. Impacts to tributaries are estimated to total 173 linear feet (lf). The project is not expected to impact wetlands. The project will likely utilize the SCDOT General Permit for impacts to Waters of the U.S.

It is anticipated that compensatory mitigation will be provided through the purchase of credits from an approved mitigation bank (MB). The project is located within the secondary service area of Taylor's Creek MB, and the tertiary service areas of Turner's Branch MB and Sandy Fork MB.

Impact Analysis Studies

Impact analysis studies are currently being conducted, and will be included in the Environmental Assessment. The list below summarizes these studies and the anticipated findings.

Relocations	**One Commercial & One Residential**
Land Use	**14.6 acres of total acquisition**

The project is not anticipated to result in impacts to the following:

Cultural Resources	Protected Species
Section 4(f) / 6(f)	Floodplains
Water Quality	Noise
Air Quality	Hazardous Materials

Anticipated Schedule

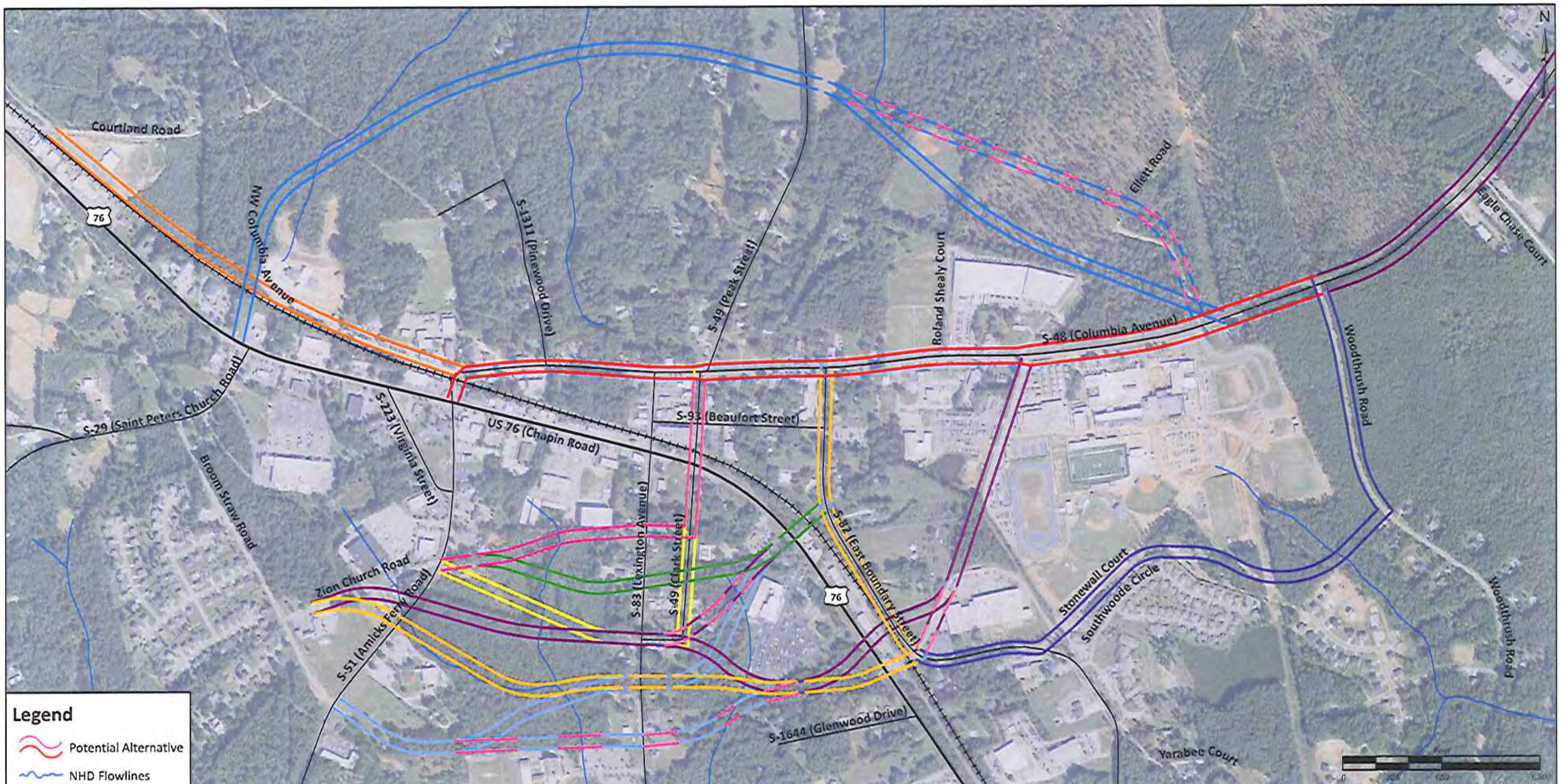
Spring 2016 –
Hold Public Hearing

Summer 2016 –
Federally approved Environmental Assessment

Summer 2016 –
Right-of-Way Acquisition

Winter 2017 –
Construction

SCDOT



SCDOT

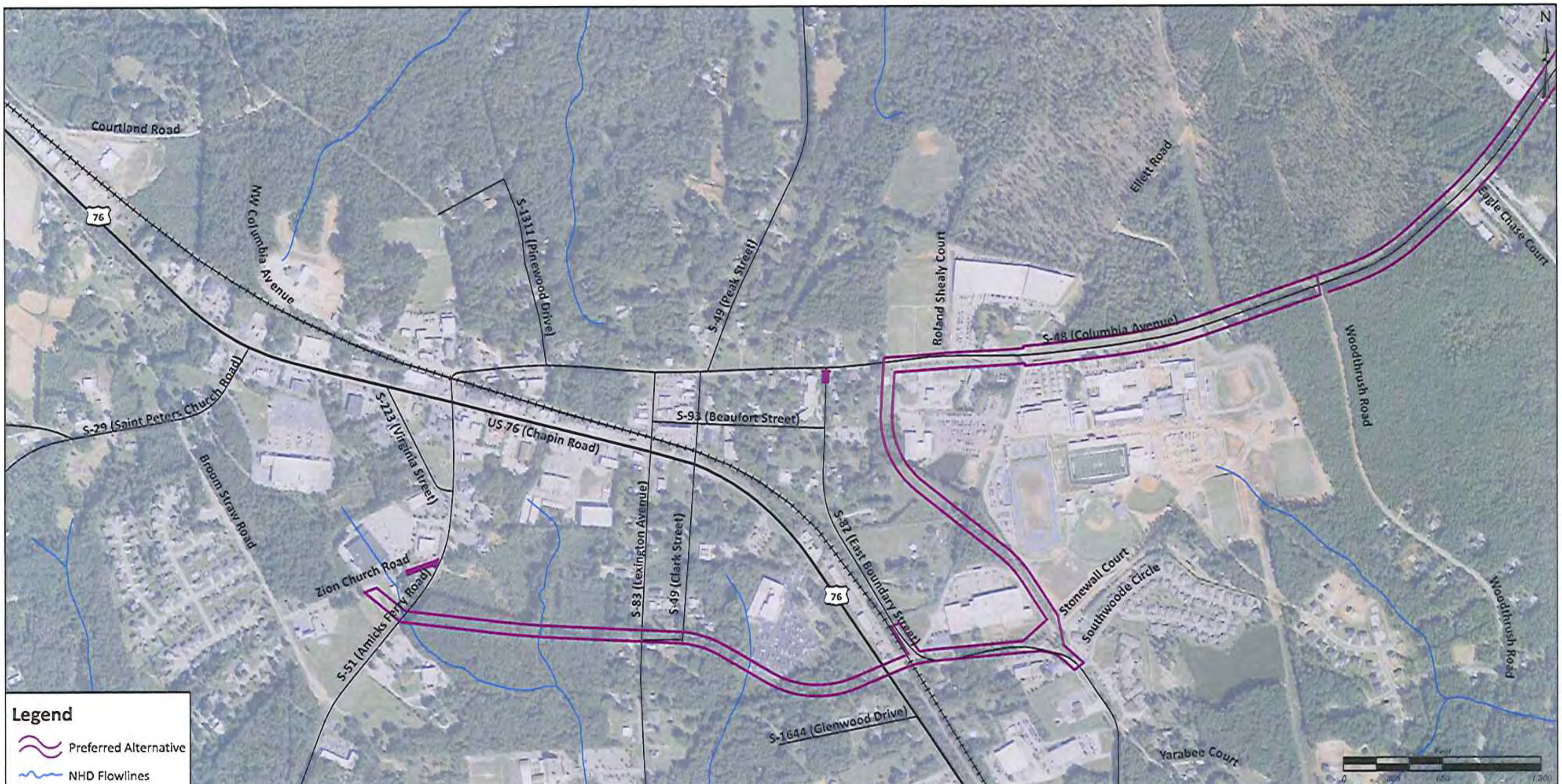
Mead & Hunt

S-48 (COLUMBIA AVENUE) CORRIDOR IMPROVEMENTS

LEXINGTON COUNTY, SOUTH CAROLINA

FIGURE 1

EVALUATED ALTERNATIVES



SCDOT

Mead & Hunt

S-48 (COLUMBIA AVENUE) CORRIDOR IMPROVEMENTS

LEXINGTON COUNTY, SOUTH CAROLINA

FIGURE 2

PREFERRED ALTERNATIVE

Appendix L

Public Involvement Materials

First Public Involvement Meeting

S-48 Columbia Avenue

Public Information Meeting

November 6, 2014
Chapin Town Hall
Chapin, SC

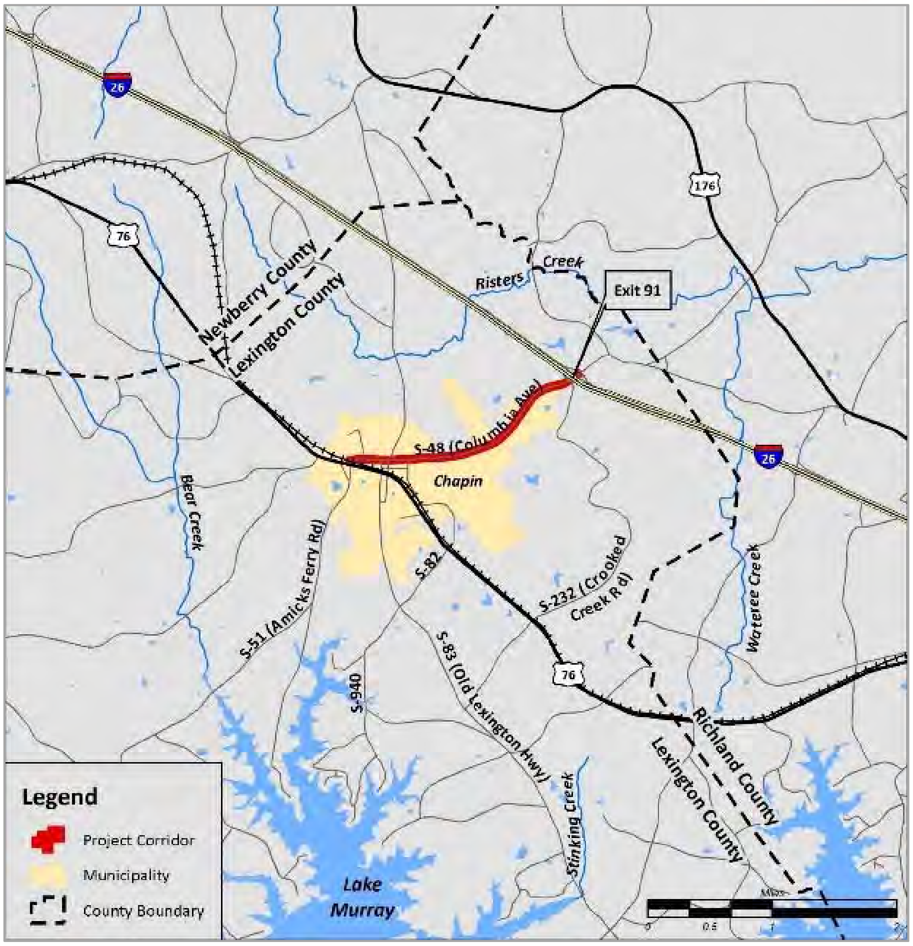
SCDOT

Meeting Purpose

The purpose of this meeting is to provide information related to the proposed project and to solicit input from area residents, businesses, and commuters of the corridor. Engineering and Environmental personnel from Lexington County, the South Carolina Department of Transportation (SCDOT), Federal Highway Administration and the Consultant team will be available to answer questions and discuss the project on an individual basis.

The Project

The Columbia Area Transportation Study Metropolitan Planning Organization (COATS MPO), in partnership with Lexington County, the South Carolina Department of Transportation (SCDOT) and the U.S. Federal Highway Administration, is proposing improvements to the S-48 (Columbia Avenue) Corridor between I-26 and US Hwy 76 (Chapin Road) in Lexington County, South Carolina.



Map of the Project Corridor

Purpose and Need

The project is located within the Town of Chapin and serves as the primary access to I-26 for residents of Chapin and the growing residential areas south of Chapin and along Lake Murray. The Corridor also provides access to Chapin High School, as well as businesses and residences located along Columbia Avenue. The primary purpose of the project is to improve traffic congestion within the Corridor. The project will also improve system linkage, provide safety improvements, address roadway deficiencies and consider providing facilities for bicyclist and pedestrians for improved multi-modal forms of transportation.

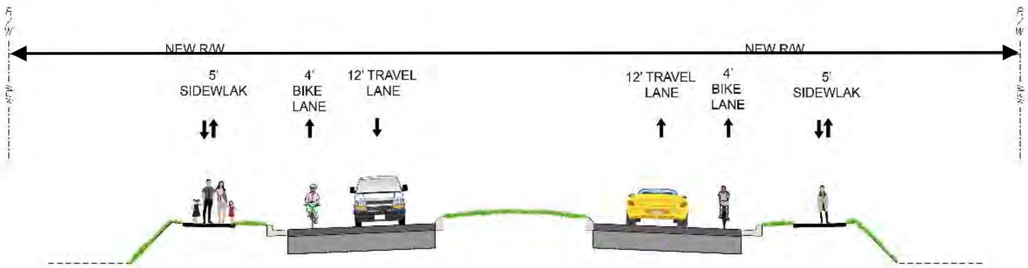
For Additional Information:

Jeff McNesby, PE
Lexington County Project Manager
JMcNesby@lex-co.com
803.785.8201
www.lex-co.sc.gov
www.scdot.org/inside/public_hearings.aspx

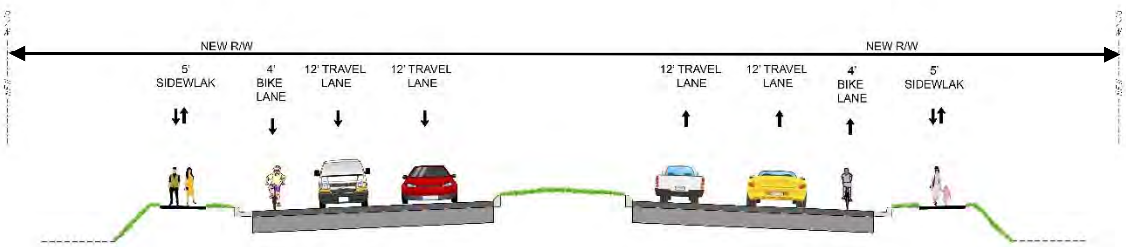
S-48 Columbia Avenue

Project Description

The consultant team, in partnership with Lexington County and the SCDOT, has performed a conceptual analysis of several potential alternative alignments within the vicinity of the project corridor. These alternative alignments may benefit the proposed corridor and satisfy the purpose and need. These alternatives include improvements to existing roadways, new location roadways, and combinations of existing roadway improvements and new location roadways. Potential improvements include providing both a 5 lane roadway section and/or a 3 lane roadway section as illustrated. The project will also include a new overpass over I-26 as well as potential multi-modal improvements such as bike lanes, sidewalks, or multi-use paths.



3 Lane Roadway Section



5 Lane Roadway Section

Your Input Matters

Comments should be submitted no later than November 21, 2014

- Complete a comment form and deposit it in the comment box
- Have your verbal comment recorded at this meeting
- Email your comments to: **JMcNesby@lex-co.com**
- Mail your comments to:
  Lexington County Public Works
  Jeff McNesby, PE
  440 Ball Park Road
  Lexington, South Carolina
- Fax your comment to 803.785.8593

After Today's Meeting

Lexington County will collect public feedback from today's meeting. The County will use this feedback to further develop the potential alternatives and its environmental document. Once the environmental document is completed, it will be made available to the public at the future Public Hearing. Although you will not receive a formal written response from today's comments, formal responses will be provided for future Public Hearing comments. Public involvement is an important part of the planning process, and the County values your opinion. Thank you for your participation.

Anticipated Schedule

Spring 2015 –
Second Public Information Meeting

Fall 2015 –
Select Preferred Alternative (Public Hearing)

Spring 2016 –
Right-of-Way Acquisition

Spring 2017 –
Construction

SCDOT PUBLIC INFORMATION MEETING
COMMENT SHEET
Thursday November 6, 2014

PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs Mark K Bolding
(Please choose one:)
19 Hilton Glen Ct Chapin
MAILING ADDRESS PO Box 1053 Chapin SC 29036
Street/Route City State Zip Code
PHONE NUMBER 803-479-1023

COMMENTS

SEE Attached letter
From M&R Associates, LLC

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

SCDOT

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M&R ASSOCIATES, LLC

PO Box 1053 Chapin, SC 29036 Tel. 803.429.1023

November 6, 2014

Mr. Jeffrey K. McNesby, P.E., County Engineer
Lexington County Public Works
440 Ball Park Road
Lexington, SC 29072

Re: S-48 (Columbia Avenue) Corridor Improvement Project

Dear Mr. McNesby:

M&R Associates, LLC is working with WD&L Enterprises II, LLC on a plan to develop the parcels known as Lexington County TMS Nos. 000300-01-017 (17.21 Acres) and 000300-01-008 (65.41 Acres) located along Columbia Avenue northeast of its intersection with I-26. Preliminarily, the development will be known as the Chapin Commerce Village.

It is our understanding that Lexington County and the SCDOT are conducting a Public Information Meeting on the referenced project today to provide information related to the proposed project and to solicit input from area residents, businesses, and commuters of the corridor.

The design of the S-48 (Columbia Avenue) Corridor Improvement Project is critical to the successful development of the Chapin Commerce Village. We understand that your project will now include the replacement of the bridge across I-26 and as a result, roadway improvements will also take place along S-48 (Columbia Avenue) in front of our properties. We have previously consulted with Lexington County and SCDOT Officials to discuss and share our preliminary plans. We would respectfully request the following accommodations be made for our proposed development:

1. Access drive from S-48 (Columbia Avenue) into the parcel known as Lexington County TMS No. 000300-01-008 at the northeast corner of the property. Said access drive would include a single ingress lane and dual egress lanes. If this access drive can be accommodated, all other existing access drives into the property from S-48 (Columbia Avenue) would be relinquished.
2. Access drive from S-48 (Columbia Avenue) into the parcel known as Lexington County TMS No. 000300-01-017 at a location directly across from the proposed access drive into Lexington County TMS No. 000300-01-008. Said access drive would also include a single ingress lane and dual egress lanes. If this access drive can be accommodated, all other existing access drives into the property from S-48 (Columbia Avenue) would be relinquished.
3. Traffic signalization of the intersection of S-48 (Columbia Avenue) and the above described access drives into the parcels known as Lexington County TMS Nos. 000300-01-017 and 000300-01-008

Thank you in advance for your kind consideration of our requests. Let us know if you have any questions or if we might provide additional information.

Yours sincerely,

M&R Associates, LLC

Mark K. Bolding

Mark K. Bolding, President

cc: WD&L Enterprises II, LLC

SCDOT PUBLIC INFORMATION MEETING
COMMENT SHEET
Thursday November 6, 2014

PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs (Please choose one:) Susan D. Starewicz

MAILING ADDRESS 312 Fairway Pond Ct. / Chapin / SC / 29036
Street/Route | City / State / Zip Code

PHONE NUMBER 812-350-9592

COMMENTS liked concept - plenty of staff to explain. — I felt aerial photos where very helpful - easy to understand the routes.

Node path list excellent - easy to use.

Well Done - + Quick —

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

SCDOT

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SCDOT PUBLIC INFORMATION MEETING
COMMENT SHEET
Thursday November 6, 2014

PROPOSED S-48 (Columbia Avenue) CORRIDOR IMPROVEMENT PROJECT LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs Kay Banks
(Please choose one:)
MAILING ADDRESS 133 Pennsylvania Ct
Street/Route City State Zip Code
PHONE NUMBER email bkaybanks@yahoo.com

COMMENTS Honestly, I do not see a ~~need~~ need to expand Columbia Avenue. While there is congestion caused by the high school, the reasonable solution to me is to offer ~~an~~ alternative routes from the main housing area in the town, which is located off Lexington Avenue. The path #15 A-E-F-K-L-P-Q offers a solution for residents like myself who work in Columbia and offer a route around the high school.

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

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SCDOT PUBLIC INFORMATION MEETING
COMMENT SHEET
Thursday November 6, 2014

PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs (Please choose one:) DR. FRANCIS X. WALTON

MAILING ADDRESS 158 EAGLE CHASE CT. CHAPIN 29036
Street/Route City State Zip Code

PHONE NUMBER 803 345 1905 - 727 8403

COMMENTS 1 THANKS FOR OPPORTUNITY
2 I FAVOR BCWG
3 2nd FAVORITE YTG.

FROM A LAYMANS POINT OF VIEW, IT APPEARS TO ME THE ABOVE CHOICES WOULD REDUCE CONGESTION WHILE HAVING THE BENEFIT OF BEING DIRECT AND POSSIBLY LESS EXPENSIVE.

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

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SCDOT PUBLIC INFORMATION MEETING
COMMENT SHEET
Thursday November 6, 2014

PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs ______________________
(Please choose one:)
MAILING ADDRESS ______________________
Street/Route City State Zip Code
PHONE NUMBER ______________________

COMMENTS Be sure that Clark & Peak Streets are aligned (probably have to move Peak St to line up with Clark)

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

SCDOT

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SCDOT PUBLIC INFORMATION MEETING
COMMENT SHEET
Thursday November 6, 2014

PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME Liesha Huffstetler 29036
Mr, Mrs, Ms, Mr & Mrs
(Please choose one:)

MAILING ADDRESS 861 Amick Ferry Rd Chapin SC
Street/Route City State Zip Code

PHONE NUMBER 803-331-4459

COMMENTS #17 - #19 - Is least Amount of land disturbed a home owners Houses - Best options! Please call if have Questions

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

SCDOT

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SCDOT PUBLIC INFORMATION MEETING
COMMENT SHEET
Thursday November 6, 2014

PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs William Hicks
(Please choose one:)
MAILING ADDRESS 124 Rum Gully Ln Chapin SC 29036
Street/Route City State Zip Code
PHONE NUMBER 803 345-9446

COMMENTS 1st Choice Would Be Outside Your Scope. Route #24 (Dx, K, L, P, Q) To Relieve Amicks Ferry Traffic AND option #3 (U, S, R, Q). In The Future An Interstate Interchange @ The Peak Street Overpass of I 26 Would Add Extra Relief

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

SCDOT

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SCDOT PUBLIC INFORMATION MEETING
COMMENT SHEET
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PROPOSED S-48 (Columbia Avenue) CORRIDOR IMPROVEMENT PROJECT LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs Wm. B Weller
(Please choose one:)

MAILING ADDRESS 132 Rum Gully / Chapin SC 29036
Street/Route / City State Zip Code

PHONE NUMBER 803 345-2812 Cell = 803 730-3994

COMMENTS I don't think using Peak St. or part of it to I-26 has been given due considerations!
With the existing school on one side of 48 & Murray's development on the other side a 10 line Road would still have a ~~little~~ bottleneck. This could be a major disaster in case of emergency since this is our only outlet to I-26 - Should there be an emergency that affected the ~~shool~~ school & the three arteries blocked by the lake, we could not exit rapidly - We have nuclear reactors just up the road also!!!
Peak street is same dis from I-26 as 48 is - R.O.W & improvements would be much less. This would provide 2 ways to reach I-26. Constr of the new interchange would probably req. the largest expense.

Mail Comments to: Mr. Jeff McNesby, PE
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

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SCDOT PUBLIC INFORMATION MEETING
COMMENT SHEET
Thursday November 6, 2014

PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs Sandra Wade
(Please choose one:)

MAILING ADDRESS P.O. Box 578 Chapin SC 29036
Street/Route City State Zip Code

PHONE NUMBER 703-819-1162

COMMENTS I like option 24 best to bypass town traffic. I would expect this to be most heavily used in the mornings, with residents running errands in town on the way home in the evenings. Option 20 would be my second choice
#1 is a must

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

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SCDOT PUBLIC INFORMATION MEETING
COMMENT SHEET
Thursday November 6, 2014

PROPOSED S-48 (Columbia Avenue) CORRIDOR IMPROVEMENT PROJECT LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs MARION FRICK
(Please choose one:)

MAILING ADDRESS 406 FIRESIDE DR, COLUMBIA, SC 29212
Street/Route City State Zip Code

PHONE NUMBER 803-781-5831

COMMENTS PREFERENCE:
1) Option 20
2) Option 15

The above options best bypass
morning & ~~[illegible]~~ evening ~~[illegible]~~ rush
hour traffic around downtown.

Least preferable: option 1

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

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SCDOT PUBLIC INFORMATION MEETING
COMMENT SHEET
Thursday November 6, 2014

PROPOSED S-48 (Columbia Avenue) CORRIDOR IMPROVEMENT PROJECT LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs (Please choose one:) Rosemary C. Frick

MAILING ADDRESS 406 Fireside Dr. Columbia, SC 29212
Street/Route City State Zip Code

PHONE NUMBER 803-781-5831

COMMENTS
I prefer Option 20
or
option 15

Do not prefer
Option 1

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

SCDOT

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SCDOT PUBLIC INFORMATION MEETING
COMMENT SHEET
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PROPOSED S-48 (Columbia Avenue) CORRIDOR IMPROVEMENT PROJECT LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs JAMES W. JOHNSTON
(Please choose one:)

MAILING ADDRESS 928 BEAR POINT CHAPIN SC 29036
Street/Route City State Zip Code

PHONE NUMBER 803-345-3400

COMMENTS OPTION 3 - BEST AND LEAST DESTROYING HOMES LAND MARKS BUSINESS: ETC
NORTH BY PASS U-S-R-Q

NEXT, SECOND BEST IS A COMBINATION FOR SAME REASON FROM AMICKS FERRY RD TO COLUMBIA AVE. VIA WOODTHRUSH START D-X-E-F-K-L-P-Q

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

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COMMENT SHEET
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PROPOSED S-48 (Columbia Avenue) CORRIDOR IMPROVEMENT PROJECT LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs C. DOUGLAS CLARY, JR
(Please choose one:)

MAILING ADDRESS 153 FORTY LOVE PT. DR, CHAPIN, SC 29036
Street/Route City State Zip Code

PHONE NUMBER 803.749.8406

COMMENTS

CHAPIN UMC HAS DESIGNED AN ACCESS DRIVE ACROSS OLD BENNINGTON COURT WHERE ROUTE D-X' IS PLANNED. OUR LADY OF THE LAKE CATHOLIC CHURCH IS PLANNING A NEW, SANCTUARY ADJACENT TO ROUTE D-X (TO ITS NORTH).

ROUTE L-M WILL SURELY NOT BE SUITABLE TO CHAPIN'S NEWEST INDUSTRY, SIGNODE.

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

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Thursday November 6, 2014

PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs CHRIS BIRKMEYER
(Please choose one:)

MAILING ADDRESS 113 PINEWOOD DR. CHAPIN SC 29036
Street/Route City State Zip Code

PHONE NUMBER 303.229.3615

COMMENTS

THE ROUTE OF DXEFKLPQ SHOWS THE MOST PROMISE. THIS ROUTE WOULD DETER SOUTHBOUND TRAFFIC PRIOR TO REACHING THE NARROW AREAS OF COLUMBIA AVE. THIS ROUTE ALSO KEEPS TRAFFIC FROM BISECTING THE SCHOOL SITE. ANY OF THESE ROUTES WILL INCOURAGE DEVELOPMENT SOUTH OF 76 AND WOULD ALLOW THE TOWN TO GROW WITH ADEQUATE DENSITY TO BE SELF-SUSTAINING. THIS WOULD ALSO OPEN 76 UP FOR FUTURE REDEVELOPMENT THAT WILL ACTUALLY MAKE SENSE. A GRADE SEPARATED CROSSING THAT SPANS THE RAILROAD AND HWY 76 WILL ALSO BE POSSIBLE IN THE FUTURE.

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

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SCDOT PUBLIC INFORMATION MEETING
COMMENT SHEET
Thursday November 6, 2014

PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME Harvey E Amick
Mr, Mrs, Ms, Mr & Mrs Hope A. Amick
(Please choose one:)

MAILING ADDRESS 151 Columbia Ave Chapin SC 29036
Street/Route City State Zip Code

PHONE NUMBER 803 345-8309

COMMENTS I have a home on Columbia Ave that would Put my home in the road. The option I think that would be best is #15. Making Columbia Ave a 4 lane or 3 Lane will only Cause more congustion through town.

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

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SCDOT PUBLIC INFORMATION MEETING
COMMENT SHEET
Thursday November 6, 2014

PROPOSED S-48 (Columbia Avenue) CORRIDOR IMPROVEMENT PROJECT LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs James Rister
(Please choose one:)

MAILING ADDRESS 110 Whispering Ct. Chapin SC 29036
Street/Route City State Zip Code

PHONE NUMBER 803-345-3261

COMMENTS I own property off Peak St. and it will split my property in half which I am not interested in having to benifit people on the Lake that otherway to get out Than Threw Chapin.

The only benifital way is Columbia Ave to Goutland.

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

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SCDOT PUBLIC INFORMATION MEETING
COMMENT SHEET
Thursday November 6, 2014

PROPOSED S-48 (Columbia Avenue) CORRIDOR IMPROVEMENT PROJECT LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs MIKE + LIZ HANEY
(Please choose one:)

MAILING ADDRESS 121 HARDING ST CHAPIN SC 29036
Street/Route City State Zip Code

PHONE NUMBER 803.345.9946

COMMENTS

PREFER OPTION 19 - DXEFK LMNQ -
Best to alleviate Timberlake + St Peters Church Rd
traffic.

Mail Comments to: Mr. Jeff McNesby, PE
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

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SCDOT PUBLIC INFORMATION MEETING
COMMENT SHEET
Thursday November 6, 2014

PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs (Please choose one:) Ralph G. Hill

MAILING ADDRESS 344 Night Harbor Dr. Chapin SC 29036
Street/Route City State Zip Code

PHONE NUMBER 803/331-7331

COMMENTS (1) Thank You for your attention to the Road needs in Chapin!

(2) I feel the proposed by-pass(es) will help Reduce much traffic back-up - especially b/t Amicks Ferry Rd & on Lexington Hwy.

(3) I am also pastor at Mt Horeb Lutheran Church at the corner of E. Boundary St. and Columbia Ave. The Church would appreciate any special attention given to our existing building and cemetery wall to ensure some buffer. I would be glad to share/discuss this at any time. (Church # 803/345-2000; cell: 803/331-7331.

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

SCDOT

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SCDOT PUBLIC INFORMATION MEETING
COMMENT SHEET
Thursday November 6, 2014

PROPOSED S-48 (Columbia Avenue) CORRIDOR IMPROVEMENT PROJECT LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs FRED E STUART
(Please choose one:)
MAILING ADDRESS 125 PEAK ST CHAPIN SC 29036
Street/Route City State Zip Code
PHONE NUMBER 803-345-2294

COMMENTS ~~SUGG~~ RECOMMEND PATH #15 ON THE PATH LENGTH

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

NOTE: Information provided, including name and address, will be published and is subject to disclosure under the Freedom of Information Act. **A formal response to your comment will not be provided. Written comments will be accepted until November 21, 2014.**

NODE PATH LENGTH

	PATH	TOTAL LENGTH (MI)
1	V-T-Q	1.56
2	U-S-O-Q	1.60
3	U-S-R-Q	1.61
4	B-C-W-Q	1.19
5	B-C-H-I-J-Q	1.18
6	A-G-H-I-J-Q	1.38
7	A-G-K-M-N-Q	1.43
8	A-G-K-L-M-N-Q	1.43
9	A-G-K-L-I-J-Q	1.66
10	A-G-K-L-P-Q	1.67
11	A-E-F-H-I-J-Q	1.43
12	A-E-F-K-M-N-Q	1.42
13	A-E-F-K-L-I-J-Q	1.65
14	A-E-F-K-L-M-N-Q	1.42
15	A-E-F-K-L-P-Q	1.66
16	D-X-E-F-H-I-J-Q	1.39
17	D-X-E-F-K-M-N-Q	1.37
18	D-X-E-F-K-L-I-J-Q	1.60
19	D-X-E-F-K-L-M-N-Q	1.37
20	D-X-E-F-K-L-P-Q	1.62
21	D-X-K-M-N-Q	1.40
22	D-X-K-L-I-J-Q	1.64
23	D-X-K-L-M-N-Q	1.41
24	D-X-K-L-P-Q	1.65
25	Y-T-Q	1.00

SCDOT PUBLIC INFORMATION MEETING
COMMENT SHEET
Thursday November 6, 2014

PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs Nancy S. DiMascio
(Please choose one:)

MAILING ADDRESS 316 River Crossing Ct., Lexington, S.C. 29072
Street/Route City State Zip Code

PHONE NUMBER 803-957-7290

COMMENTS I own property & house at 206 Columbia Avenue, Chapin, SC. Based on ~~an~~ the proposal to widen Columbia Avenue I am not in favor of because it would make the home unliveable.

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

SCDOT

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Second Public Involvement Meeting

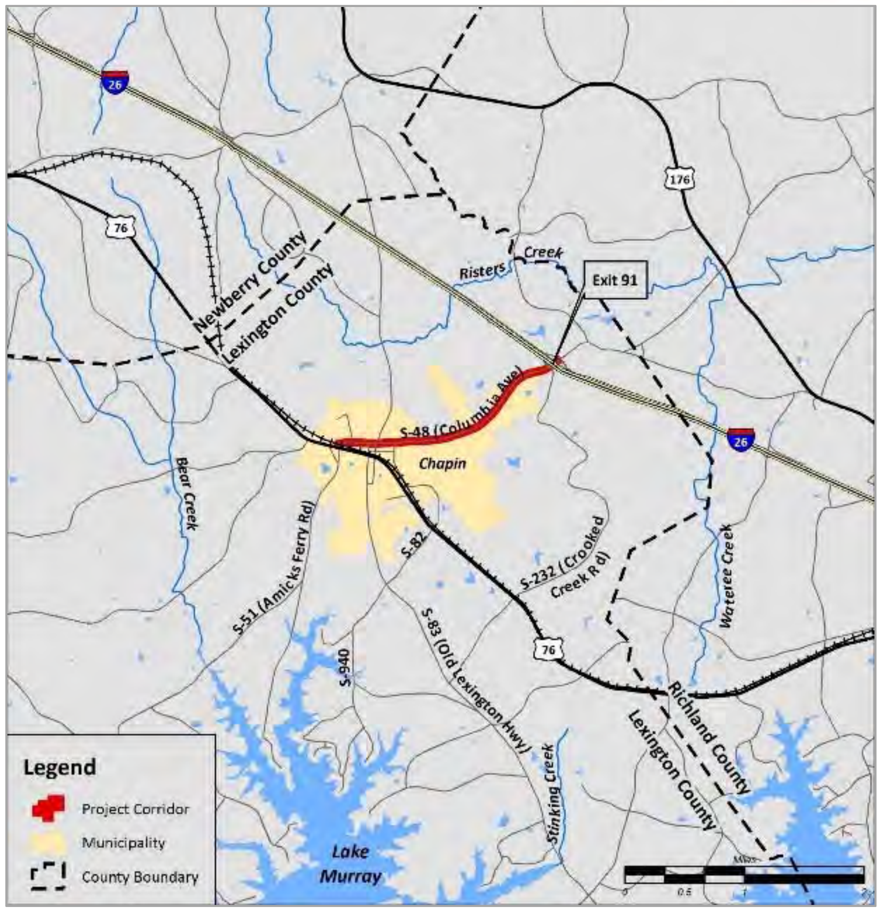
S-48 Columbia Avenue

2nd Public Information Meeting

July 23, 2015
Chapin Town Hall
Chapin, SC

Meeting Purpose

The purpose of this follow up meeting is to provide additional information related to the proposed project and to solicit input from area residents, businesses, and commuters of the corridor. Engineering and Environmental personnel from Lexington County, the South Carolina Department of Transportation (SCDOT), Federal Highway Administration and the Consultant team will be available to answer questions and discuss the project on an individual basis.



Map of the Project Corridor

The Project

The Columbia Area Transportation Study Metropolitan Planning Organization (COATS MPO), in partnership with Lexington County, the South Carolina Department of Transportation (SCDOT) and the U.S. Federal Highway Administration, is proposing improvements to the S-48 (Columbia Avenue) Corridor between I-26 and US Hwy 76 (Chapin Road) in Lexington County, South Carolina.

What's New

Since the November 6th, 2014 Public Information Meeting, the design team has been diligently reviewing the alternatives displayed at the meeting. The review encompassed qualifying evaluation criteria for each alternative such as impacts to the community, surrounding natural resources, and overall traffic operation. Six new alternatives were included to evaluate all the potential traffic movements in order to address the Purpose and Need. From the 31 alternatives, it was determined that 10 of those alternatives would need a more detailed analysis and additional research. From those 10 alternatives, three have been selected to be presented at today's Public Information Meeting for public comment.

Purpose and Need

The project is located within the Town of Chapin and serves as the primary access to I-26 for residents of Chapin and the growing residential areas south of Chapin and along Lake Murray. The Corridor also provides access to Chapin High School, as well as businesses and residences located along Columbia Avenue. The primary purpose of the project is to improve traffic congestion within the Corridor. The project will also improve system linkage, provide safety improvements, address roadway deficiencies and consider providing facilities for bicyclist and pedestrians for improved multi-modal forms of transportation.

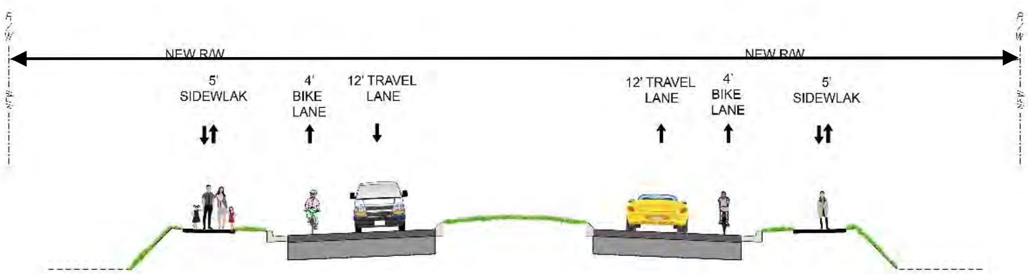
For Additional Information:

Jeff McNesby, PE
Lexington County Project Manager
JMcNesby@lex-co.com
803.785.8201
www.lex-co.sc.gov
www.scdot.org/inside/public_hearings.aspx

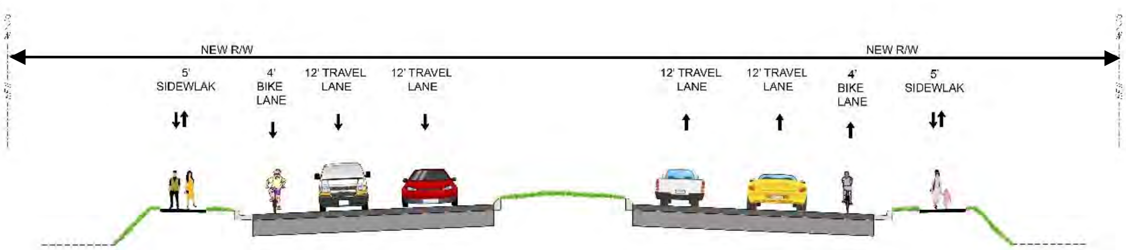
S-48 Columbia Avenue

Project Description

The consultant team, in partnership with Lexington County and the SCDOT, has performed a conceptual analysis of several potential alternative alignments within the vicinity of the project corridor. These alternative alignments satisfy the project's purpose and need by reducing traffic congestion along the S-48 corridor. The improvements will involve a combination of existing roadway upgrades with segments of new location roadway Potential improvements include new 5 lane roadway section with planted median and/or a 3 lane roadway section as illustrated. The project will also include improvements the existing S-48/ I-26 interchange as well as potential multi-modal improvements such as bike lanes and sidewalks.



3 Lane Roadway Section



5 Lane Roadway Section

Your Input Matters

Comments should be submitted no later than August 7, 2015

- Complete a comment form and deposit it in the comment box
- Have your verbal comment recorded at this meeting
- Email your comments to: JMcNesby@lex-co.com
- Mail your comments to:
  Lexington County Public Works
  Jeff McNesby, PE
  440 Ball Park Road
  Lexington, South Carolina
- Fax your comment to 803.785.8593

After Today's Meeting

Lexington County will collect public feedback from today's meeting, similar to the previous Public Information Meeting. The County will use this feedback to further develop the three alternatives and its environmental document. Once the environmental document is completed, it will be made available to the public at the future Public Hearing. Although you will not receive a formal written response from today's comments, formal responses will be provided for future Public Hearing comments. Public involvement is an important part of the planning process, and the County values your opinion. Thank you for your participation.

Anticipated Schedule

Winter 2015 –
Select Preferred Alternative

Winter 2015 –
Hold Public Hearing

Spring 2016 –
Right-of-Way Acquisition

Spring 2017 –
Construction

SCDOT PUBLIC INFORMATION MEETING
COMMENT SHEET
Thursday July 23, 2015

PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

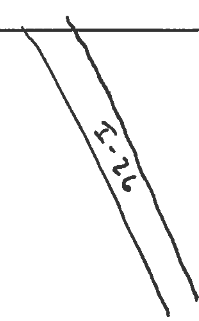
NAME
Mr, Mrs, Ms, Mr & Mrs (Please choose one:) MR. CHRIS BIRKMEYER

MAILING ADDRESS 113 PINEWOOD DR. | CHAPIN | SC | 29036
Street/Route | City | State | Zip Code

PHONE NUMBER (303) 229.3615

COMMENTS THE RED ALTERNATIVE DOES NOT APPEAR TO BE ENOUGH TO ELIMINATE CONGESTION IN TOWN. USING E. BOUNDARY AS SHOWN WOULD NEED TO HAVE SIGNIFICANT ~~for~~ IMPROVEMENTS IN ORDER TO CREATE ENOUGH OF A FREE-FLOW TO GET TRAFFIC TO REROUTE FROM CURRENT PATTERNS. CONNECTING AT NODE "N" STILL SEAMS TO BE A BETTER ALTERNATIVE. D-X-E-F-K-L APPEARS TO BE THE BEST SOUTHERN LOOP.

MOVE WESTERN INTERSECTION @ I-26 TO BE AT BOJANGLES. → SEE OTHER SIDE



Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

Lexington County South Carolina

SCDOT

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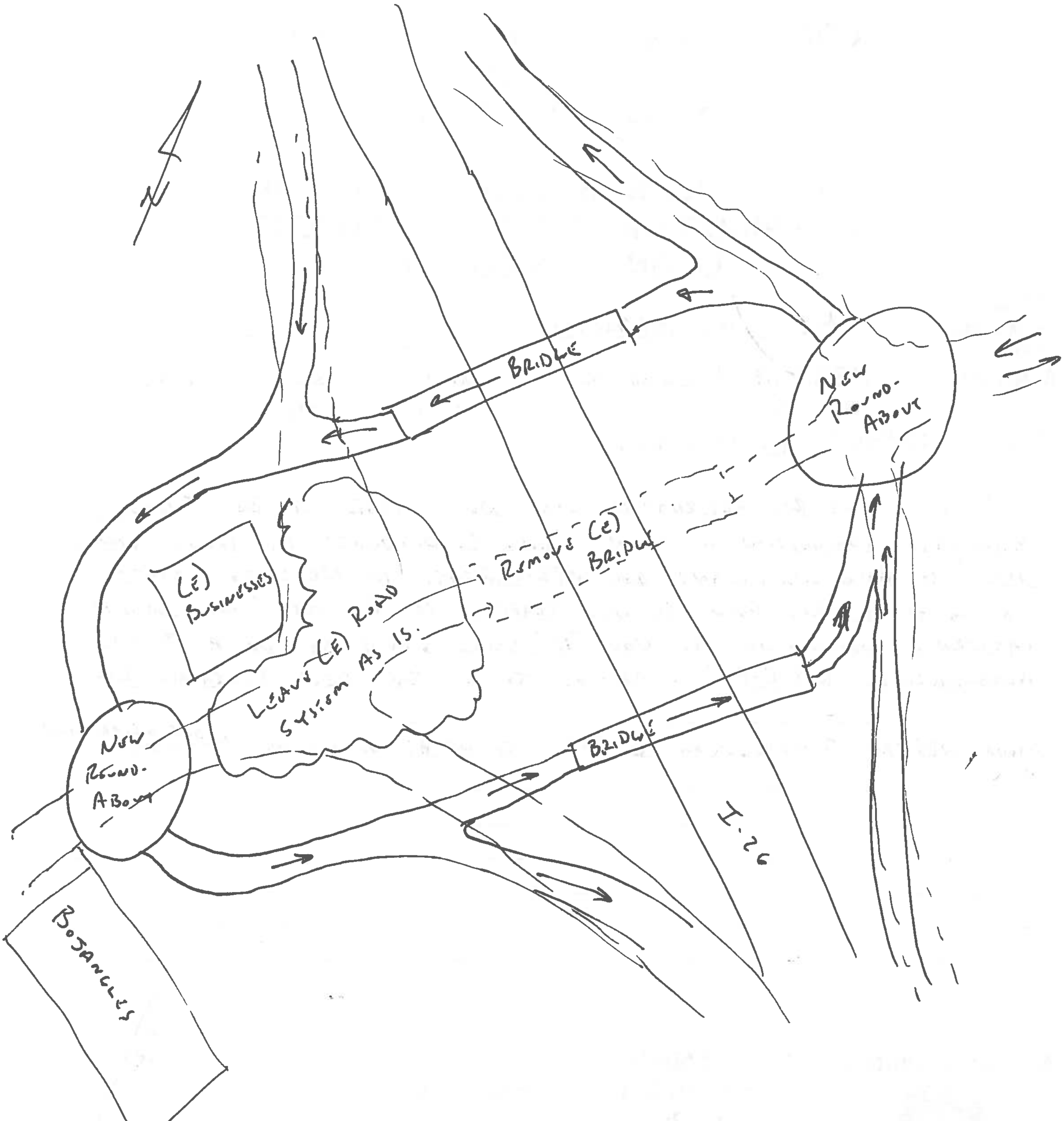

N
BRIDGE
NEW ROUND-ABOUT
(E) BUSINESSES
LEAVE (E) ROAD SYSTEM AS IS.
REMOVE (E) BRIDGE
NEW ROUND-ABOUT
BRIDGE
I-26
BOJANGLES

SCDOT PUBLIC INFORMATION MEETING
COMMENT SHEET
Thursday July 23, 2015

PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs Odeni Russell
(Please choose one:)
MAILING ADDRESS 253 John Rierd Cir Chapin SC 29036
Street/Route City State Zip Code
PHONE NUMBER 1-813 345-7342

COMMENTS I am Odeni Russell I do not want the Rock Wall to come down at no Cost

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

Lexington County South Carolina

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PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs Patricia Delaney
(Please choose one:)
MAILING ADDRESS 946 Sandbar Rd Chapin SC 29036
Street/Route City State Zip Code
PHONE NUMBER 803-345-1909

COMMENTS
I like both alternate Rts but would prefer # 18.

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

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PROPOSED S-48 (Columbia Avenue) CORRIDOR IMPROVEMENT PROJECT LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs SAM DELANEY
(Please choose one:)

MAILING ADDRESS 946 SANDBAR RD. Chapin, SC 2903
Street/Route City State Zip Code

PHONE NUMBER (803) 345-1909 (C) 803 360-9554

COMMENTS I LIKE Alternate #18 off of Columbia Avenue and Connecting to Amicks ferry Road (Just beyond Catholic Church.

the alternates exchanges off I-26 are confusing

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

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PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs MICHAEL KLETTER
(Please choose one:)
MAILING ADDRESS 108 SUNDANCE POINT CHAPIN SC 29036
Street/Route City State Zip Code
PHONE NUMBER 803-767-4270

COMMENTS FAVORED OPTIONS —

ALT #18 - I would hope a traffic light @ Lex. Ave.
THIS OPT 18 is really needed.
INTERCHAGE #2 - SINCE the switch to the metric system
didn't work, I don't believe we are ready for ~~the~~ #3
option.

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

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PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs ______________________________
(Please choose one:)

MAILING ADDRESS ______________________________
Street/Route City State Zip Code

PHONE NUMBER ______________________________

COMMENTS ______________________________

Still to much traffic on Columbia Avenue; everything dumps out on Columbia Avenue! even with 5-lanes.

Of the 3 interchanges the round abouts would be perhaps the better optia

Business & homeowners on Columbia Avenue will suffer — no improvement for us!!

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

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PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs Marshall Fowler
(Please choose one:)

MAILING ADDRESS 455 Greengarden Dr. Chapin SC 29036
Street/Route City State Zip Code

PHONE NUMBER 803-345-9504

COMMENTS

I-26 - Alt. #1 or #3

Consider a "smaller" traffic circle at
Columbia Ave and Amicks Ferry ~~at~~ RR.
Property available from Chapin Theater.

#1 Columbia Ave. option RR to past I-26

Plan work at Night like NC does
on busy Roads.

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

Lexington County South Carolina

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PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs MR. Howard E. McKeone
(Please choose one:)

MAILING ADDRESS 904 Green Meadow Drive Chapin SC 29036
Street/Route City State Zip Code

PHONE NUMBER 803-673-6044

COMMENTS The new bridge and cross over traffic will cause many accidents due to driving on the wrong side of the road. Normal habitual driving patterns of young and old drivers will cause people to Drive in the manner their brain has been programed to drive causing increased potential accidents. My Suggestion is to create two bridges and route the traffic in a normal pattern with no lig
saving a uge cost → with a possible upper and lower sections of bridge to Accomodate the Flow of a normal traffic patterm.
The addition of planted medians is another costly plan. You would have to have city workers maintain the medians and it also takes up space which may relocate residents. without the median costs would be suggnificant reduced now and in the future.

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

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PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs Mike Sorells
(Please choose one:)

MAILING ADDRESS 108 Fire Bridge Chapin
Street/Route City State Zip Code

PHONE NUMBER

COMMENTS
I-26 - prefer 1) RoundAbout (Big one)
2) Diverging Diamond

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

Lexington County South Carolina

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PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs Mr. Bruce Peebles
(Please choose one:)

MAILING ADDRESS 138 Bogater Road Chapin SC 29036
Street/Route City State Zip Code

PHONE NUMBER 803-466-9587

COMMENTS Prefer Interstate intechange option 2.
Prefer new road Alternative 19. for ease of
access from Amicks Ferry area to the
schools

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

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PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs Ms. Bonnye Hughes
(Please choose one:)

MAILING ADDRESS 138 Bogater Road Chapin SC 29036
Street/Route City State Zip Code

PHONE NUMBER 803-537-1477

COMMENTS I would prefer Interstate interchange number 2.

I would prefer new road Alternative 19 for the ease of access for the Amicks Ferry Road area to the Elementary Intermediate & Middle schools.

Mail Comments to:

Mr. Jeff McNesby, PE
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

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PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs DALE GOODING
(Please choose one:)

MAILING ADDRESS 57 RIVERSTONE WAY CHAPIN SC 29036
Street/Route City State Zip Code

PHONE NUMBER 803-924-2198

COMMENTS MY PREFERRED OPTIONS:
1.) OPTION 1B
2.) OPTION 3

* OPTION 2B SEEMS TO DO LITTLE TO ALLEVIATE ALL TRAFFIC FROM THE LAKE (AMICKS FERRY & OLD LEX)

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

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PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs Vivian Lea Ford
(Please choose one:)

MAILING ADDRESS 1633 Old Hilton Rd Chap
Street/Route City State Zip Code

PHONE NUMBER 803 306-3151

COMMENTS I'd like to see 3-D model view of the interstate system of options please.

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

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PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs Terri Phillips
(Please choose one:)
MAILING ADDRESS 152 Milmont Shores Rd, Chapin, SC 29036
Street/Route City State Zip Code
PHONE NUMBER 803-941-7266

COMMENTS
Recommend Alternative 18

Recommend Alternative 1 interchange

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

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PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs James Richard Lindler
(Please choose one:)

MAILING ADDRESS 1028 Crooked Creek Rd Chapin, SC 29036
Street/Route City State Zip Code

PHONE NUMBER 803-238-6100

COMMENTS Based on my professional experience and Common sense experience, + the fact that I have Lived the frustrations of the traffic that needs to be changed. I have Lived on Crooked Creek all my Life (66 years) and experience with getting on & OFF OF I-26 all these years.

the order of my choices are as follows:

#1 choice - Alternate #2 - gives constant unrestricted traffic flow off I26 in the afternoon (from Columbia)

#2 choice - Alternate #1 still will be too congested & make traffic Backup in the afternoons.

#3 choice - Alt #3 - Not Good! too confusing - too many traffic stop Lights

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Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

SCDOT

* I THINK that Mead & Hunt did the Best Job that they could do taking EVERYTHING Into Consideration.

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James Richard Lindler
Jul 23, 2015

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PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs Lawrence Ford
(Please choose one:)

MAILING ADDRESS 1633 Old Hilton Rd 29036
Street/Route City State Zip Code

PHONE NUMBER 803-816-0735

COMMENTS
Interchange - I like the traffic circles
Roads in town - I like the new road from 76 -> Amicks Ferry.

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

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PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs JAMES A. GRIFFIN
(Please choose one:)
MAILING ADDRESS 488 Hollyoak Ln Chapin SC 29036
Street/Route City State Zip Code
PHONE NUMBER 622 6840

COMMENTS ALT 3

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

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PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs PHILIP MURRAY
(Please choose one:)

MAILING ADDRESS 213 CARO LANE CHAPIN SC 2903
Street/Route City State Zip Code

PHONE NUMBER 803-345-1513

COMMENTS THE TRAFFIC CIRCLES ARE GREAT !!

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

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PROPOSED S-48 (Columbia Avenue) CORRIDOR IMPROVEMENT PROJECT LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs Annette Cooke
(Please choose one:)

MAILING ADDRESS 103 Ranch Lake Rd, Chapin, SC 29036
Street/Route City State Zip Code

PHONE NUMBER 803-345-0189

COMMENTS Continue with at least 3 Lanes on Amicks Ferry for Business area. (Turning Lanes).

Please no Circles. (Roundabouts) Hard for old people.

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

Lexington County South Carolina

SCDOT

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SCDOT PUBLIC INFORMATION MEETING
COMMENT SHEET
Thursday July 23, 2015

PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs Thomas Burdick
(Please choose one:)

MAILING ADDRESS 743 Camo Court, Chapin, S.C. 29036
Street/Route, City, State Zip Code

PHONE NUMBER 8033319857

COMMENTS I favor option 2 for the I26/Cola Interchange

I favor the green option with the bypass ~~option~~ down East Boundary St.

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

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COMMENT SHEET
Thursday July 23, 2015

PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs Michael Haney
(Please choose one:)

MAILING ADDRESS 121 Harding St. Chapin, SC, 29036
Street/Route City State Zip Code

PHONE NUMBER ______

COMMENTS I am impressed & very pleased with the open public discussions. Especial with the Rep. you have here from both the DOT and the Engineering firm.
The young lady from DHEC was very helpful in regard to my under-stand of the different Env. Impacts.
Keep up the good work.

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

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Alt 18 green
Alt 9 purple

SCDOT PUBLIC INFORMATION MEETING
COMMENT SHEET
Thursday July 23, 2015

PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs (Please choose one.) Laura & Keith Huggins – Huggins Holdings, LLC

MAILING ADDRESS 219 Columbia Ave Chapin SC 29036
Street/Route City State Zip Code

PHONE NUMBER 8034540657

COMMENTS My law office is located at 219 Columbia Avenue. I absolutely am not in favor of 5 lanes in front of my office. I could support 3 lanes in front of my office, but 5 lanes would likely be directly in front of my front door.

Alterate 25 with 5 lanes to East Boundary (J) would definitely work, but taper from 5 lanes to 3 lanes MUST happen between N & J instead of J & W if I am to have anything left in the front of my law office.

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

Lexington County South Carolina

SCDOT

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SCDOT PUBLIC INFORMATION MEETING
COMMENT SHEET
Thursday July 23, 2015

PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs Early
(Please choose one:)

MAILING ADDRESS 161 Duck Point Ln; Chapin SC 29036
Street/Route City State Zip Code

PHONE NUMBER 803 345 7295

COMMENTS
My opinion is Alternative 9 for the in-town option. It would divert traffic away from RR intersection and straighten out the Zion Church Road for those using that road to turn Right on Amick's Ferry.

In the interchange option, the round about option would be the best option for residents, once they adjusted to the "round about ~~opt~~ concept."

Please, in future meetings please include most up-to-date maps reflecting tech center build, publix; catholic church, etc. Thank you.
(Master Plan of Chapin)

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

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SCDOT PUBLIC INFORMATION MEETING
COMMENT SHEET
Thursday July 23, 2015

PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME Jeffry Dow & Sarah Coler, Jr.
Mr, Mrs, Ms, Mr & Mrs
(Please choose one:)

MAILING ADDRESS 1015 Crooked Creek Rd Chapin SC 29036
Street/Route City State Zip Code

PHONE NUMBER (803) 665-0103

COMMENTS
After viewing the (3) options for Crooked Creek Rd & the Interstate 26 on/off ramp - based on my many years of driving in the traffic at that point - Option #2 makes the most sense for that area.

7/23/15

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

SCDOT

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SCDOT PUBLIC INFORMATION MEETING
COMMENT SHEET
Thursday July 23, 2015

PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs J. Dow Cole, Sr.
(Please choose one:)
MAILING ADDRESS 1009 Crooked Creek Rd. Chapin SC 2903[illegible]
Street/Route City State Zip Code
PHONE NUMBER 803-665-0100

COMMENTS

Option #2 makes good, common sense!
By far, that is the best plan.

J Dow Cole

PS: Plan 3 is a disaster!
Plan 1 is ok, but really only ok.

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

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PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs Ed Smith (Grace)
(Please choose one:)

MAILING ADDRESS 310 Lexington Ave Chapin SC 29036
Street/Route City State Zip Code

PHONE NUMBER

COMMENTS We Like ALT #9 Purple, Also #18 green
Also Like "Partial cloverLeaf"

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

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SCDOT PUBLIC INFORMATION MEETING
COMMENT SHEET
Thursday July 23, 2015

PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs Kirk Bingenheimer
(Please choose one:)

MAILING ADDRESS 140 Pointe Overlook Dr. Chapin, SC 29036
Street/Route City State Zip Code

PHONE NUMBER 843-735-8525

COMMENTS I prefer Alternative #18 for the Columbia cooridor improvements, the most important aspect of the improvement is the connection of ~~a~~ Amicks Ferry to Lexington Hwy.

I prefer Alternative #1 (traffic circles) for the interchange improvement @ I-26.

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

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COMMENT SHEET
Thursday July 23, 2015

PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs Norman J. Howe
(Please choose one:)

MAILING ADDRESS 157 Smallwood Dr Chapin, SC 29036
Street/Route City State Zip Code

PHONE NUMBER 803-816-5044

COMMENTS #1 - All construction should be done @ Night w/ exceptions where local traffic will not be impeded.
#2 Keep the flow of traffic simple
#3 From Chamber of Commerce to Chapin Center - use period lighting, brick sidewalks
#4 Median should have limited access to avoid traffic delays
#5 If the project is worth $30-35 mil, light the Roadway up -
#6 Signage should be as plain & informative as possible
#7 It would add lots of character to have a wood median guard rail - similar type as used in State Parks

Mail Comments to: Mr. Jeff McNesby, PE
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

SCDOT

SCDOT PUBLIC INFORMATION MEETING
COMMENT SHEET
Thursday July 23, 2015

PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs Laura & Keith Huggins – Huggins Holdings
(Please choose one:)
MAILING ADDRESS 219 Columbia Ave Chapin SC 29036
Street/Route City State Zip Code
PHONE NUMBER 8134540657

COMMENTS Interchange Alternatives –

I support the most cost efficient to build & the most traffic efficient of the three.

If Alternate 1 (turn abouts) & 3 (inverted diamonds) are most traffic efficient (according to Mead & Hunt) then pick the least expensive between these 2 to build –

did another comment for other ~~option~~ situation, but support Alt 25 AS LONG AS taper from 5 lane to 3 lane happens between J & N – NOT J & W

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

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PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs SCOTT JANOCH
(Please choose one:)

MAILING ADDRESS ______________________
Street/Route City State Zip Code

PHONE NUMBER ______________________

COMMENTS I PREFER ROUTE #18 (THE GREEN ONE) AND INTERCHANGE PATTERN #2

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

SCDOT

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SCDOT PUBLIC INFORMATION MEETING
COMMENT SHEET
Thursday July 23, 2015

PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs MR WILLIAM RUDS
(Please choose one:)
MAILING ADDRESS 630 WEBSTER POINTE DR, CHAPIN, SC 29036
Street/Route City State Zip Code
PHONE NUMBER 803-521-2675

COMMENTS
PREFER ALTERNATIVE 25

Mail Comments to:
Mr. Jeff McNesby, PE
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

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PROPOSED S-48 (Columbia Avenue) CORRIDOR IMPROVEMENT PROJECT LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs Joan Janocll
(Please choose one:)

MAILING ADDRESS ______________________
Street/Route City State Zip Code

PHONE NUMBER ______________________

COMMENTS

I think the #2 intersection makes the most sense. I believe the RoundAbouts and Diamond design will be confusing to many of the drivers in this area

I prefer #9 road proposal for the least impact to the ~~[illegible]~~ historical part of Chapin and to the new church which is currently being built.

Mail Comments to: Mr. Jeff McNesby, PE
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

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PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs Connie Whitaker
(Please choose one:)

MAILING ADDRESS 924 Crooked Creek Rd Chapin SC 29036
Street/Route City State Zip Code

PHONE NUMBER

COMMENTS

Vote FOR : INterchange #2

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

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Thursday July 23, 2015

PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs Jim (Linda) Gulledge
(Please choose one:)

MAILING ADDRESS 262 Bent Oak Dr. Chapin, SC 29036
Street/Route City State Zip Code

PHONE NUMBER 803-309-7849

COMMENTS

Regarding the Proposed interchange at I-26, I think the roundabout is the least Confusing. Also Proposed Changes to access from Amicks Ferry to Old Lexington Hwy. - either is acceptable because any access off Amicks Ferry is desperately needed. There are certain times of the year that residents out Amicks Ferry are virtually trapped without access to Chapin Rd.

Linda Gulledge

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

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SCDOT PUBLIC INFORMATION MEETING
COMMENT SHEET
Thursday July 23, 2015

PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs LARRY KONARSKI
(Please choose one:)
MAILING ADDRESS 1320 BEAGLE RUN RD CHAP SC
Street/Route City State Zip Code
PHONE NUMBER 803 457-0563
COMMENTS I LIKE PLAN NODE PATH 9

I LIKE FOR INTERSTATE INTERCHANGE
THE ROUNDABOUT #1

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

SCDOT

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Zack Haney

From: McNesby, Jeff <JMcNesby@lex-co.com>
Sent: Tuesday, August 11, 2015 8:28 AM
To: Zack Haney
Subject: FW: Letter and Comment Sheet from Chapin UMC
Attachments: 20150807040214.pdf; chapinumc_cmtst.pdf

Thank you

Jeff McNesby, PE
County Engineer
County of Lexington
440 Ball Park Road
Lexington, SC 29072-2240
(803) 785-8153 (office)
jmcnesby@lex-co.com

From: Jody Flowers [mailto:JodyFlowers@chapinumc.com]
Sent: Friday, August 07, 2015 4:52 PM
To: McNesby, Jeff
Subject: Letter and Comment Sheet from Chapin UMC

Dear Jeff:

Attached please find our letter and comment sheet related to the proposed S-48 Corridor Improvement Project. The faithful witness and future growth of our congregation hangs in the balance, so it is our deepest hope that the green option will be removed from consideration.

Thank you so very much for your time and consideration. Please contact me with any questions, or if I may provide any additional information.

Sincerely,
Jody

Jody Flowers
Lead Minister
Chapin UMC
(803) 345-2801

Blog: JodyFlowers.net

SCDOT PUBLIC INFORMATION MEETING
COMMENT SHEET
Thursday July 23, 2015

PROPOSED S-48 (Columbia Avenue) CORRIDOR IMPROVEMENT PROJECT LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs (Please choose one:) Joseph D. Flowers, Senior Pastor of Chapin United Methodist Church

MAILING ADDRESS PO Box 237 | Chapin | SC | 29036
Street/Route | City | State | Zip Code

PHONE NUMBER 803.345.2801

COMMENTS See attached.

Mail Comments to:

Mr. Jeff McNesby, PE
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

SCDOT

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CHAPIN UNITED METHODIST CHURCH

P.O. BOX 237
415 LEXINGTON AVENUE
CHAPIN, SOUTH CAROLINA 29036

Phone: 803-345-2801
Fax: 803-345-5310

E-mail: chapinum@bellsouth.net
www.chapinumc.com

August 7, 2015

Mr. Jeff McNesby, P.E.
Lexington County Public Works
440 Ball Park Road
Lexington, SC 29072

Re: Proposed S-48 (Columbia Avenue) Corridor Improvement Project

Mr. McNesby,

On behalf of the leadership and congregation of Chapin United Methodist Church (UMC), we are pleased to present our comments on the Proposed S-48 (Columbia Avenue) Corridor Improvement Project as presented at the July 23, 2015 SCDOT Public Meeting at Chapin Town Hall. On the west end of the project, Chapin UMC is strongly opposed to the "green" alternative which proposes to route traffic from East Boundary Street over to Amicks Ferry Road. It is our contention that this option will negatively impact the Church, the surrounding community, and the environment.

We are currently working on two future campus improvement projects that would both be severely impacted by this "green" alternative. Our Engineer on these projects (Doug Clary of Hybrid Engineering, Inc.), my Operations Minister Rick Faulkner, and I met with Zack Haney of Mead & Hunt, Inc. on August 6, 2015 to further discuss the proposed project and explain our situation. Mr. Haney was provided with our engineering and master plans.

First, Chapin UMC has plans and has been in collaboration with SCDOT and Lexington County to rebuild Bennington Court to create an entrance/driveway on the west side of our current campus and allow our congregation to access the campus from Amicks Ferry Road. We purchased 4.1 acres from the Bowers Family in late 2010 and have been moving steadily towards developing this alternative ingress/egress for more than 3 years. We have already invested almost $500,000 in this project, and we anticipate spending an additional $350,000 to complete it.

Secondly, we were less than 24 hours from ratifying a contract to purchase 5.5 acres of property north of our campus that is currently owned by Our Lady of the Lake Catholic Church. The purpose of purchasing that property was to develop an on-grade, on-site parking lot to provide an additional 110 parking spaces for our congregation, particularly suited to our growing senior population, who require close-in parking to the sanctuary. Purchasing and developing this project is expected to involve an investment of approximately $1,000,000.

As you can see, the financial risks for us are huge, but providing a campus plan that allows people to enter/exit and park is incredibly important to the life of our growing Church. Both of these projects are on hold until one of your alternative routes is selected. Our Church has now grown to include more than 2,200 members, with an average of 1,200 to 1,300 folks on the campus every Sunday morning between 7 am and 1 pm. The fact that we have only one entrance creates a chaotic situation on Sunday mornings on Lexington Avenue. Our parishioners saturate Lexington Avenue to the point where we must hire off duty police officers to manage traffic in and out of the campus.

Finally, Chapin UMC is proud of its role as a steward of the environment in the expansion and improvement of the campus. We have taken great care to protect the stream that bisects our campus and the wetlands associated with it. Just north of our campus where your "green" alternative is proposed, two branches of this stream converge. Implementation of your "green" alternative would likely cross and environmentally impact both of these branches and the wetlands associated with them. Surely your other alternatives would result in less stream and wetlands impacts than the "green" alternative.

We urge the elimination of the "green" alternative from this project at the earliest possible time. Thank you in advance for your kind consideration of our comments. We stand ready to provide any further information or clarification that you might need.

Sincerely,

Chapin United Methodist Church

Jody Flowers, Senior Pastor

Zack Haney

From: McNesby, Jeff <JMcNesby@lex-co.com>
Sent: Tuesday, July 28, 2015 8:05 AM
To: Zack Haney
Subject: FW: Public Comment
Attachments: Public Comment (S-48).pdf

See below.

Thank you

Jeff McNesby, PE
County Engineer
County of Lexington
440 Ball Park Road
Lexington, SC 29072-2240
(803) 785-8153 (office)
jmcnesby@lex-co.com

From: Chris Clauson [mailto:chris@chapinsc.com]
Sent: Monday, July 27, 2015 11:19 AM
To: McNesby, Jeff
Subject: Public Comment

Mr. McNesby,

Attached is my public comment form on the S-48 project.

Respectfully,
Chris

Chris Clauson, *Zoning Administrator*
Town of Chapin
157 NW Columbia Ave.
Chapin, SC 29036
Office: (803) 575-8045
Cell: (803) 445-6427
chris@chapinsc.com

SCDOT PUBLIC INFORMATION MEETING
COMMENT SHEET
Thursday July 23, 2015

PROPOSED S-48 (Columbia Avenue) CORRIDOR IMPROVEMENT PROJECT LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs Mr. Chris Clauson
(Please choose one:)

MAILING ADDRESS 74 Top Sail Court | Columbia | SC | 29229
Street/Route | City | State | Zip Code

PHONE NUMBER (803) 445-6427

COMMENTS As a Town employee who commutes into Chapin from Columbia I am greatly interested in this improvement. My feeling on the interchange is that the two roundabout option would be the most beneficial to the Town. The partial clover will not address future growth or evening traffic levels and I expect the divergent diamonds will cause confusion and more traffic delays than anticipated. As for the S-48 corridor I feel alternative 25, the widening of Columbia Ave only, will not adequately address the intersection of Columbia Ave and Chapin Rd and instead just create more of a bottle neck. Either alternative 9 or 18, going down E Boundary St, will allow for a greater dispersal of traffic volumes. Alternative 9 does seem to be more logical due to the intersection with Amicks Ferry Rd. I feel the crossing of Amicks Ferry and tying into Zion Church Road will create more traffic volume concerns. The sooner the Town is informed of the preferred route the better, to ensure that development is discouraged in areas that would fall along the proposed routes.

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

SCDOT

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Zack Haney

From: McNesby, Jeff <JMcNesby@lex-co.com>
Sent: Tuesday, August 11, 2015 8:28 AM
To: Zack Haney
Subject: FW: Proposed S-48 Corridor Improvement Project

Thank you

Jeff McNesby, PE
County Engineer
County of Lexington
440 Ball Park Road
Lexington, SC 29072-2240
(803) 785-8153 (office)
jmcnesby@lex-co.com

From: Ellen Hayhurst [mailto:ellenhayhurst@gmail.com]
Sent: Saturday, August 08, 2015 12:22 PM
To: McNesby, Jeff
Subject: Proposed S-48 Corridor Improvement Project

Have been reviewing the proposed options for the Interchange at I-26 and Columbia Avenue.

Alternative 2 seems to be the most logical option. It's great that access to the frontage road, as well as Crooked Creek Rd will be changed.

The other two alternatives just don't seem workable for our area. Traffic circles are not only nightmares, but awkward for those pulling boats and pontoons. The other option similar to the interchange at 378/Lex Med Ctr is confusing to drivers and really not the best solution for this interchange.

Alternative 2 would be best.

Zack Haney

From: McNesby, Jeff <JMcNesby@lex-co.com>
Sent: Tuesday, August 11, 2015 8:28 AM
To: Zack Haney
Subject: FW: Proposed S-48 Corridor

Thank you

Jeff McNesby, PE
County Engineer
County of Lexington
440 Ball Park Road
Lexington, SC 29072-2240
(803) 785-8153 (office)
jmcnesby@lex-co.com

From: Ellen Hayhurst [mailto:ellenhayhurst@gmail.com]
Sent: Saturday, August 08, 2015 7:33 PM
To: McNesby, Jeff
Subject: Proposed S-48 Corridor

I have studied the three options given for days now. There are parts of it that I can definitely see are needed, but the greater percentage of the options appear to do nothing but destroy people's homes and livelihoods. Not to mention, a bit excessive for what our Town really needs.

My understanding is they are considering widening Columbia Avenue to five lanes from the interstate to roughly right before the cemetery, where it would then transition down to three lanes. I see where this is also including sidewalks and bike lanes on both sides. While I understand everybody is working to make all roads in SC "bike friendly", I would question whether this is needed on Columbia Avenue. When you did traffic studies on Columbia Avenue, how many bicyclists did you actually count? We live on Columbia Avenue. My kitchen windows look out onto the roadway and I can think of two occasions in the last two years that I have seen a bicyclist on Columbia Avenue. We don't need those to be done with the "if you build it, they will come" theory... bike lanes add another 8' of width to an already too-wide road widening proposal.

The "RED" option - #25, I believe, would be a disaster for the Town of Chapin. To widen Columbia Avenue to even three lanes wide from the cemetery to the railroad tracks would destroy most of the Town because of the number of houses and businesses - some that are also located in houses - that sit in close proximity to the roadway now.

Part of what draws people to relocate to the Town of Chapin is its small-town feel and charm. And most of that sits right on Columbia Avenue. The oldest house in Chapin actually sits opposite the T-intersection at Lexington Avenue and Columbia Avenue - right on the roadway - and would, more than likely, end up in your cross-hairs for destruction. This would be a travesty and should not be allowed to happen.

There are numerous old houses on Columbia Avenue from right past the High School all the way around to the railroad tracks. And every single one of them play a part in the overall look, feel and historic charm of this wonderful Town. I realize some will have the argument that "just because a house is old doesn't make it historic". I actually heard that said by one of your people at the meeting at Town Hall in July. And while that may be so, I can think of probably six homes in this stretch that would more than likely qualify for inclusion in the Historic Registry based, not only on their age, but the fact that they are the last remaining structures of those particular architectural styles in the Town of Chapin. History matters. And our small-town feel matters. And we do not want to see it all wiped out simply so a stretch of roadway can be widened.... a stretch of roadway where traffic only stops when someone has to yield to oncoming traffic to make a left turn.

Most who live in these houses have lived there for years. Uprooting them at this point in their lives could be catastrophic for them. Same with the business owners. They would have to relocate thriving businesses - and we all know that the current economy the way it is would make this a truly risky and expensive thing for any of them. Because of the potential loss to the Town residents and business owners, the RED option is NOT an option I would vote for.

Zack Haney

From: McNesby, Jeff <JMcNesby@lex-co.com>
Sent: Tuesday, August 11, 2015 8:29 AM
To: Zack Haney
Subject: FW: S-48 Corridor Road Widening

Thank you

Jeff McNesby, PE
County Engineer
County of Lexington
440 Ball Park Road
Lexington, SC 29072-2240
(803) 785-8153 (office)
jmcnesby@lex-co.com

From: Ellen Hayhurst [mailto:ellenhayhurst@gmail.com]
Sent: Sunday, August 09, 2015 10:11 PM
To: McNesby, Jeff
Subject: S-48 Corridor Road Widening

I've studied both the PURPLE (9) and GREEN (18) options as well.

If you vote for PURPLE, you're voting for the widening on Columbia Ave to go as far as East Boundary, then it turns left onto East Boundary and goes down and around and ends up crossing over 76 and creating a road that will go behind the GIS parking lot and continue where it ends up connecting Lexington Ave with Amicks Ferry behind the new Publix shopping center.

If you vote for GREEN it's basically like the purple, but you're connection further down both Lex Ave and Amicks Ferry.

The problem with both of those options is the proposed widening of East Boundary. The church on the right sits pretty much right on the street, as do at least five old - and historic - houses on the left side of the road. One of the houses spent the better part of its life sitting on Columbia Ave. Family wanted to build a "modern" house, but didn't want to lose the old family home, so it was moved back and turned to face onto East Boundary. Another old house on that road was built by the current occupants grandparents and has remained in the family since that time. And yet another has undergone a wonderful restoration in the last two years. All of these would be in your cross-hairs should you opt to turn left onto East Boundary and widen that road to three lanes, plus bike lanes, plus sidewalks. Is it truly worth that to completely destroy not only the Town of Chapin's history, but these family homes, as well? The answer to that is No. It's not worth it and it's not fair to those families who had planned to live out the rest of their lives in those homes and pass them down to their kids to be lived in and enjoyed for another 100+ years.

If you look at the map of the proposed widening where the letter "N" is, it would make complete sense to make your left turn onto that road and have it cross over East Boundary, Hwy 76 and Lexington Ave and meet up with the existing Purple Option to provide a connection from Lexington Ave to Amicks Ferry. This option has ONE home and any roadway through there would affect only the back corner of their property.

I realize this option has to take into account the new parking lot the High School built because the kids would have to be able to cross over this new 3-lane road in order to get to school. This could be handled easily with a raised pedestrian crosswalk much like they have at Strom on Assembly St in Columbia. There could be fencing similar to what Columbia did to prevent the college kids from crossing at any other place but the crosswalk or a designated intersection. It works for college kids, it should easily work for high school kids.

All in all, this would seem the best way to reroute that traffic with minimal loss of family homes and complete disruption of people's lives who have lived in those homes all their lives that the current yellow option does.

A few other thoughts are Speed Limits. Currently the speed limit is 35 MPH from the time you get off the interstate and continues at that speed basically throughout the entire Town. If Columbia Avenue is turned into a 5-lane road transitioning down to a 3-lane road, what are those speed limits then going to be? And how is a higher speed limit supposed to be safer for those families and businesses that live and work on Columbia Avenue?

We know that there will be development coming - a medical park, and the first (of probably several) Mungo neighborhood will be going in soon as well. But any traffic from these developments will not affect the morning and afternoon traffic on Columbia Avenue beyond the entering and exiting into their neighborhoods at that end of the Avenue. People who will one day live in those yet-to-be-built neighborhoods will not head into Town during that 5-o'clock rush hour to buy groceries, etc. They will pull into their neighborhoods and settle in at home to deal with kids, cook dinner, etc., not increase traffic in the "heart of town" during peak hours on a daily basis.

The residents of the Town of Chapin do not want Columbia Avenue turned into a 5-lane highway. So many of us left the Town of Lexington because of Highway 378 and, yet, here we are looking at a proposal to turn Columbia Avenue into Chapin's version of Highway 378. We are a TOWN, not a City, and we like it that way. We want what drew us to this Town to stay. And we also don't want to see any road widening done on any part of Columbia Avenue that results in any residents or businesses losing their homes or livelihoods.

Zack Haney

From: McNesby, Jeff <JMcNesby@lex-co.com>
Sent: Wednesday, August 05, 2015 8:26 PM
To: Zack Haney
Subject: Fwd: S-48 Columbia Ave.

Sent from my iPhone

Begin forwarded message:

> **From:** Kathy Riley <chapintax@gmail.com>
> **Date:** August 5, 2015 at 10:31:19 AM EDT
> **To:** <JMcNesby@lex-co.com>
> **Subject: S-48 Columbia Ave.**
>
> Thank you for adding the third option for the interstate interchange.
>
> I would like to vote for alternative #9 - purple - yellow - red and Interchange Alternative 1.
>
> Kathy Riley
> Chapin Bookkeeping Services
> 215 Beaufort St
> Chapin, SC 29036
>
> Office
> : (803) 345-3366
> Cell: (803) 606-4147
> Fax:
>
> (803)
>
> 403-9889
>
>

Zack Haney

From: McNesby, Jeff <JMcNesby@lex-co.com>
Sent: Tuesday, July 28, 2015 8:09 AM
To: Zack Haney
Subject: FW: S-48 Columbia Avenue

Zack,

See below.

Thank you

Jeff McNesby, PE
County Engineer
County of Lexington
440 Ball Park Road
Lexington, SC 29072-2240
(803) 785-8153 (office)
jmcnesby@lex-co.com

From: Nancy Dimascio [mailto:ndimascio@sc.rr.com]
Sent: Tuesday, July 28, 2015 8:06 AM
To: McNesby, Jeff
Subject: S-48 Columbia Avenue

I do not agree with the S-48 Columbia Avenue corridor improvement designs for the following reasons;

First: I own property at 206 Columbia Avenue and this would take just about my entire front yard and the house which I own would be in the road. How is one suppose to live in the roadway.

Second: Mt Horeb church which I am a member of would be in the road. This would not be feasible to destroy a church like this.

Third: The rock wall at the cemetery would probably be destroyed. That has been something that has been a part of my entire like and is a big part of history

Why would you want to put what appears to be grass median on the roadway to be maintained and we cannot keep maintained what we have now.
There are already sidewalks that have practically overrun with grass. Sidewalks were built on Highway 6 in Lexington going to the dam and now they are getting overrun with grass. Why add more to do the same.

How many bicycles do you think will be using this corridor to ride everyday. I do not see it now on all the other avenues that they have built bike lanes. Seems we are using taxpayers money needlessly.

Nancy DiMascio

Zack Haney

From: McNesby, Jeff <JMcNesby@lex-co.com>
Sent: Wednesday, July 29, 2015 8:48 AM
To: Zack Haney
Subject: FW: Comments regarding Chapin road improvements

Thank you

Jeff McNesby, PE
County Engineer
County of Lexington
440 Ball Park Road
Lexington, SC 29072-2240
(803) 785-8153 (office)
jmcnesby@lex-co.com

-----Original Message-----
From: Sandy Wade [mailto:swade003@sc.rr.com]
Sent: Tuesday, July 28, 2015 10:21 PM
To: McNesby, Jeff
Subject: Comments regarding Chapin road improvements

Mr. McNesby,

After reviewing the most recent proposals for the road improvements, I have the following comments:
1. Given the two options for the I-26 interchange, I would opt for option 2. The first options, with two traffic circles will be inadequate got the numbers of cars that will eventually be traveling this segment of road, and will be confusing to motorists, especially two in such a small distance. Option 2 is a better choice by far, though I am sure it will be more costly, 2. For Columbia Ave, route 48, to go to three lanes will not do much to alleviate traffic. It's better to go to five lanes, the challenge being how to preserve most of the buildings along this road to preserve the character of Chapin as much as possible. My concern here, is that five lanes funneling to 2 at Amicks Ferry will cause a bottle neck in the evening.
3. With the proposed alternatives to route traffic around Chapin, and out to 26, the new proposals do little to encourage the alternative route, because the traffic is not pulled far enough away from the center of Chapin. I live in Timberlake, and see no reason to take either GKLIJ or DXEFKLIJ, as it is about the same distance, or more, with more lights or stop signs. The current route only requires one stop light, though I realize this plan would probably add two more, but there would be four with the alternative routes. (Amicks Ferry, Old Lexington Hwy, East Boundary and Columbia Ave). I would possibly take one of the new proposed routes coming home to avoid the bottle neck that will be created at Amicks Ferry. I am disappointed that the proposal that would have taken traffic out past the high school on Columbia Ave. is no longer a consideration, as I felt that would have made a significant impact on my travel time. I don't see either of these proposals making a significant impact on Chapin traffic.

Sent from my iPad

Zack Haney

From: McNesby, Jeff <JMcNesby@lex-co.com>
Sent: Friday, July 31, 2015 8:20 AM
To: Zack Haney
Subject: FW: S 48 Commentsfrom Skip - thanks! ko
Attachments: townclerk@chapinsc.com_20150730_142231.pdf

Zack,

Comments from Mayor Skip Wilson.

Thank you

Jeff McNesby, PE
County Engineer
County of Lexington
440 Ball Park Road
Lexington, SC 29072-2240
(803) 785-8153 (office)
jmcnesby@lex-co.com

-----Original Message-----
From: townclerk@chapinsc.com [mailto:townclerk@chapinsc.com] On Behalf Of townclerk@
Sent: Thursday, July 30, 2015 3:23 PM
To: McNesby, Jeff
Subject: S 48 Commentsfrom Skip - thanks! ko

Reply to: townclerk@chapinsc.com <townclerk@chapinsc.com> Device Name: Town of Chapin MX-3140N Device Model: MX-3140N
Location: Not Set

File Format: PDF (Medium)
Resolution: 200dpi x 200dpi

Attached file is scanned image in PDF format.
Use Acrobat(R)Reader(R) or Adobe(R)Reader(R) of Adobe Systems Incorporated to view the document.
Adobe(R)Reader(R) can be downloaded from the following URL:

http://www.adobe.com/

SCDOT PUBLIC INFORMATION MEETING
COMMENT SHEET
Thursday July 23, 2015

PROPOSED S-48 (Columbia Avenue)
CORRIDOR IMPROVEMENT PROJECT
LEXINGTON COUNTY

NAME
Mr, Mrs, Ms, Mr & Mrs Skip + Judy Wilson
(Please choose one:)
MAILING ADDRESS 219 Woodthrush Rd Chapin SC 29036
Street/Route City State Zip Code
PHONE NUMBER 803-331-3731

COMMENTS After Reviewing the S-48 Corridor Routing options, we Believe the greatest traffic relief impact would be to improve all of S-48 to the Railroad tracks

In addition, the Bennington Court alternative is not feasible due to the private ownership of land by Chapin United Methodist Church

The East Boundary Street Alternative is in the Historic District of Chapin + should not be used It will destroy the Historical Perspective of Chapin

Mail Comments to: **Mr. Jeff McNesby, PE**
Lexington County Public Works
440 Ball Park Road
Lexington, South Carolina 29072
Fax 803.785.8201 E-mail JMcNesby@lex-co.com

SCDOT

NOTE: Information provided, including name and address, will be published and is subject to disclosure under the Freedom of Information Act. **A formal response to your comment will not be provided. Written comments will be accepted until August 7, 2015.**