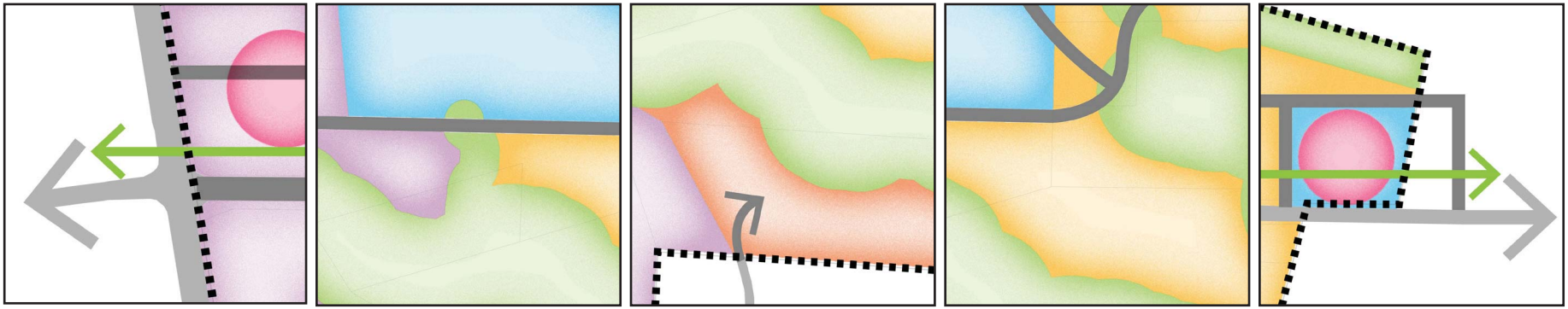
Central West
SMALL AREA PLAN: APPENDICES
Town of Chapel Hill



Prepared for

TOWN OF CHAPEL HILL, NORTH CAROLINA

Consultants

RHODESIDE & HARWELL

VANASSE HANGEN BRUSTLIN, INC.

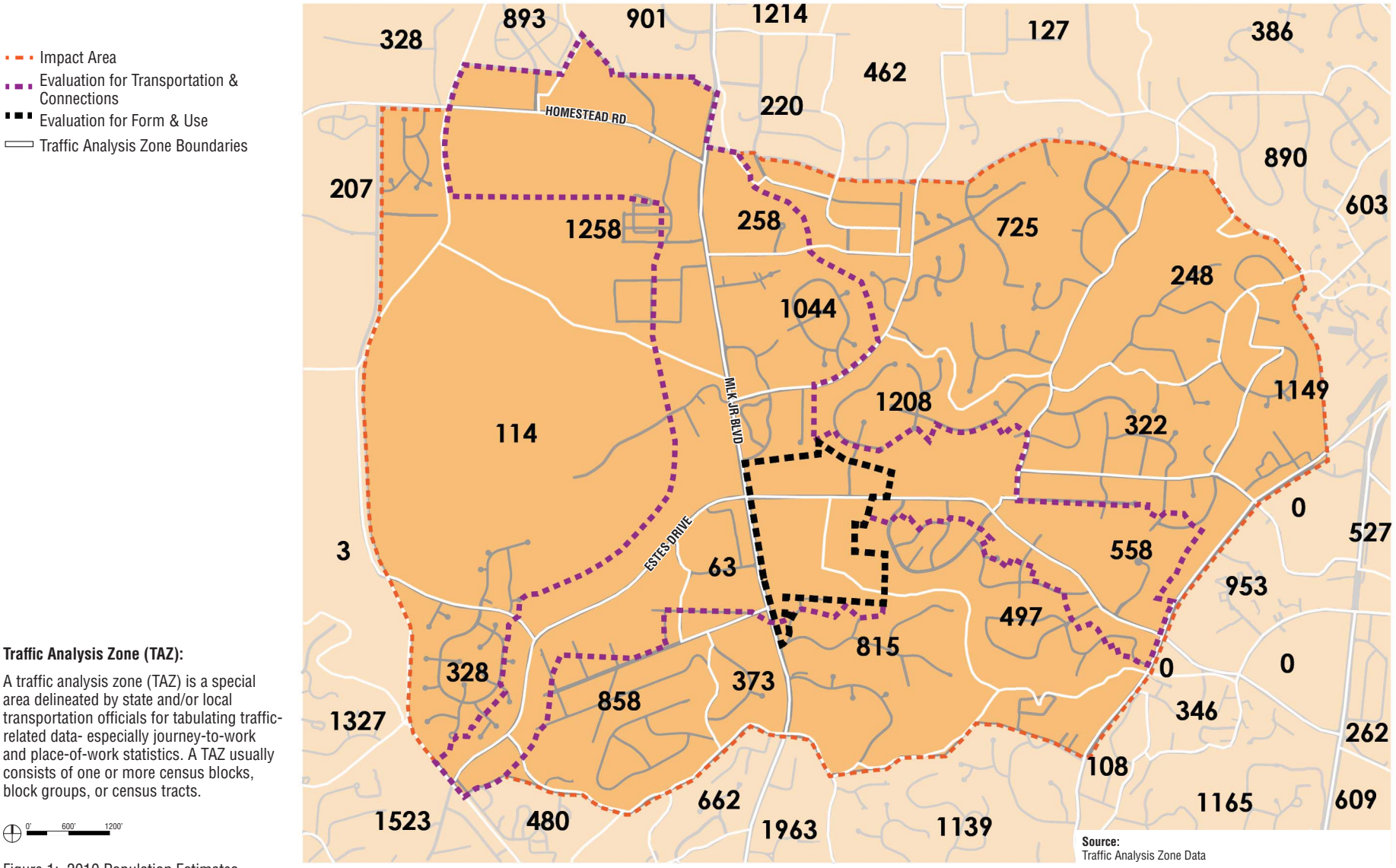
November 26, 2013

APPENDIX A: ADDITIONAL DATA MAPS

Appendix A provides additional data maps that were reviewed by the Central West Steering Committee. These maps provide a snapshot of the area at the time the Central West Small Area Plan was developed.

2010 Population Estimates

Population estimates by traffic analysis zone (TAZ) show a range of population densities within the Impact Area. Several locations along the east side of Martin Luther King, Jr. Boulevard are more densely populated than surrounding areas further from the main transportation corridors. The Carolina North parcels are minimally populated at this time. These TAZ estimates also demonstrate the general size of the population within the Impact Area (Figure 1).



Traffic Analysis Zone (TAZ):

A traffic analysis zone (TAZ) is a special area delineated by state and/or local transportation officials for tabulating traffic-related data- especially journey-to-work and place-of-work statistics. A TAZ usually consists of one or more census blocks, block groups, or census tracts.

Figure 1: 2010 Population Estimates

2010 Household Estimates

Similar to population estimates, household estimates by traffic analysis zone (TAZ) show where households are more or less concentrated within the study area. As with the population estimates, these estimates show higher household numbers along the east portion of Martin Luther King, Jr. Boulevard, lower numbers on the Carolina North parcels, and give a general sense of the number of households currently in the Impact Area (Figure 2).

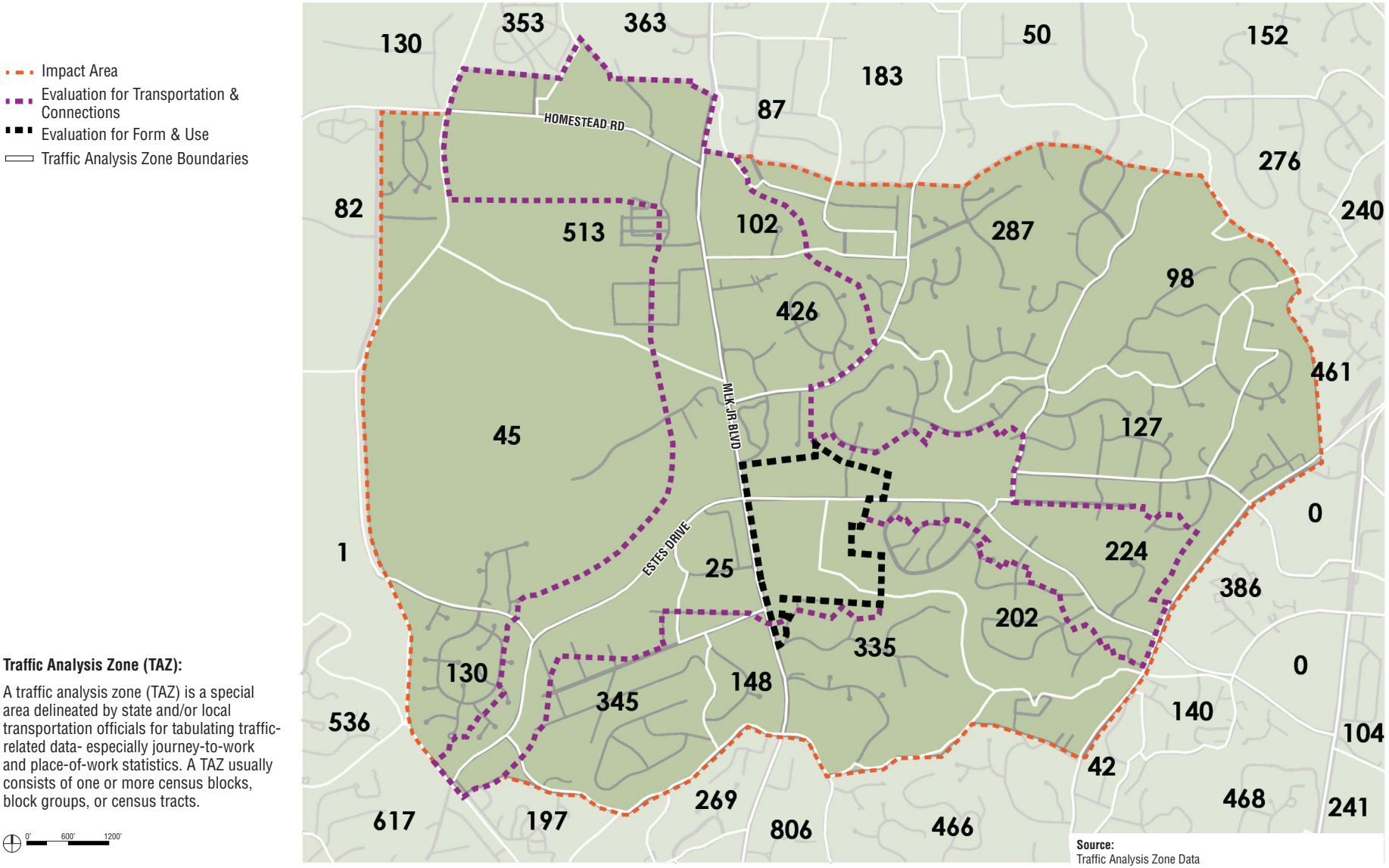


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Figure 2: 2010 Household Estimates

Median Age

In general, residents in the Impact Area are slightly older than those in the Town of Chapel Hill as a whole. The average age in the Impact Area is 30-35, as compared to a median Town age of 25.

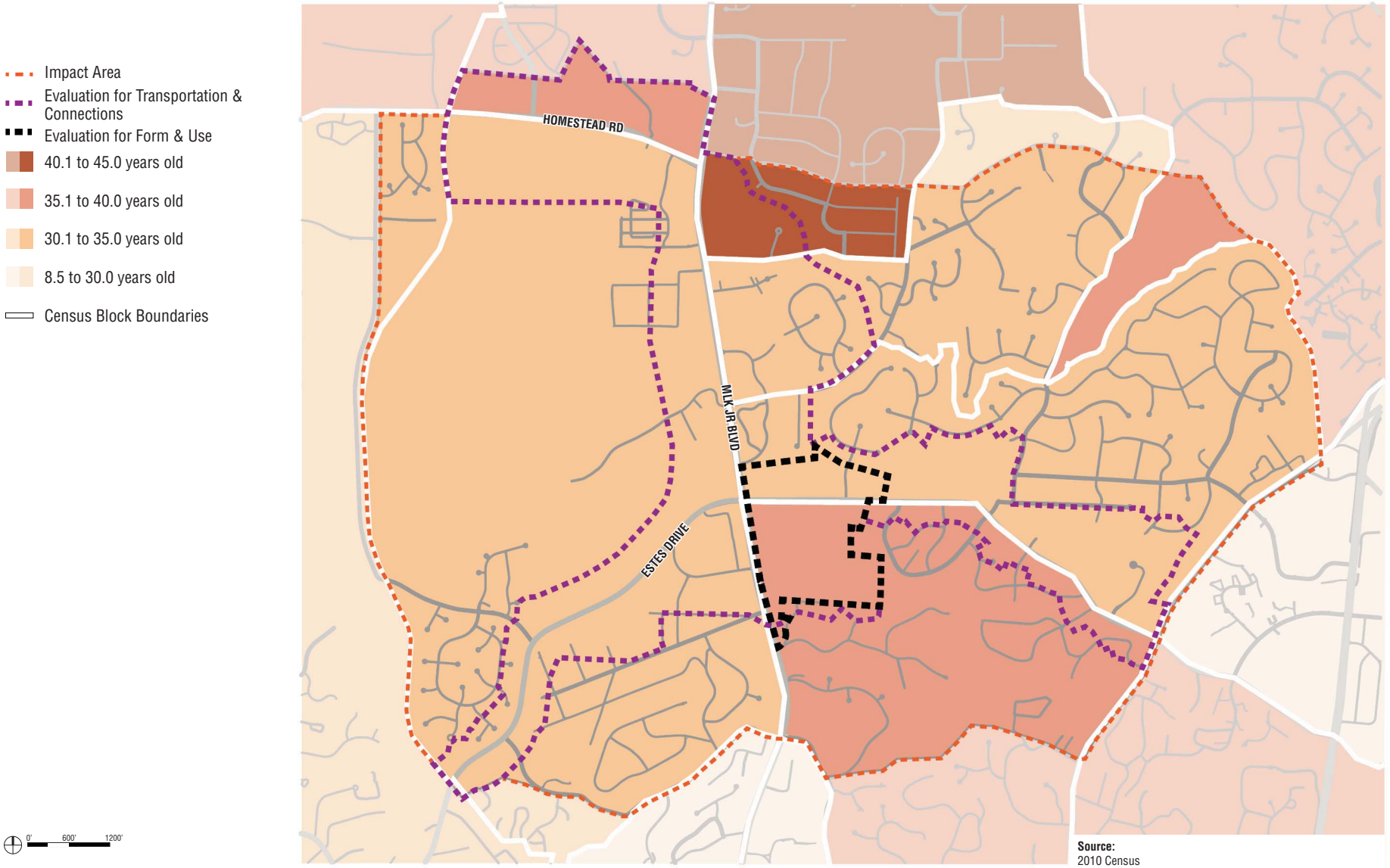


Figure 3: Median Age

Median Household Income

The average household income within the Impact Area is between $41,000 and $70,000 (Figure 4). The median household income for the Town overall is $58,400.

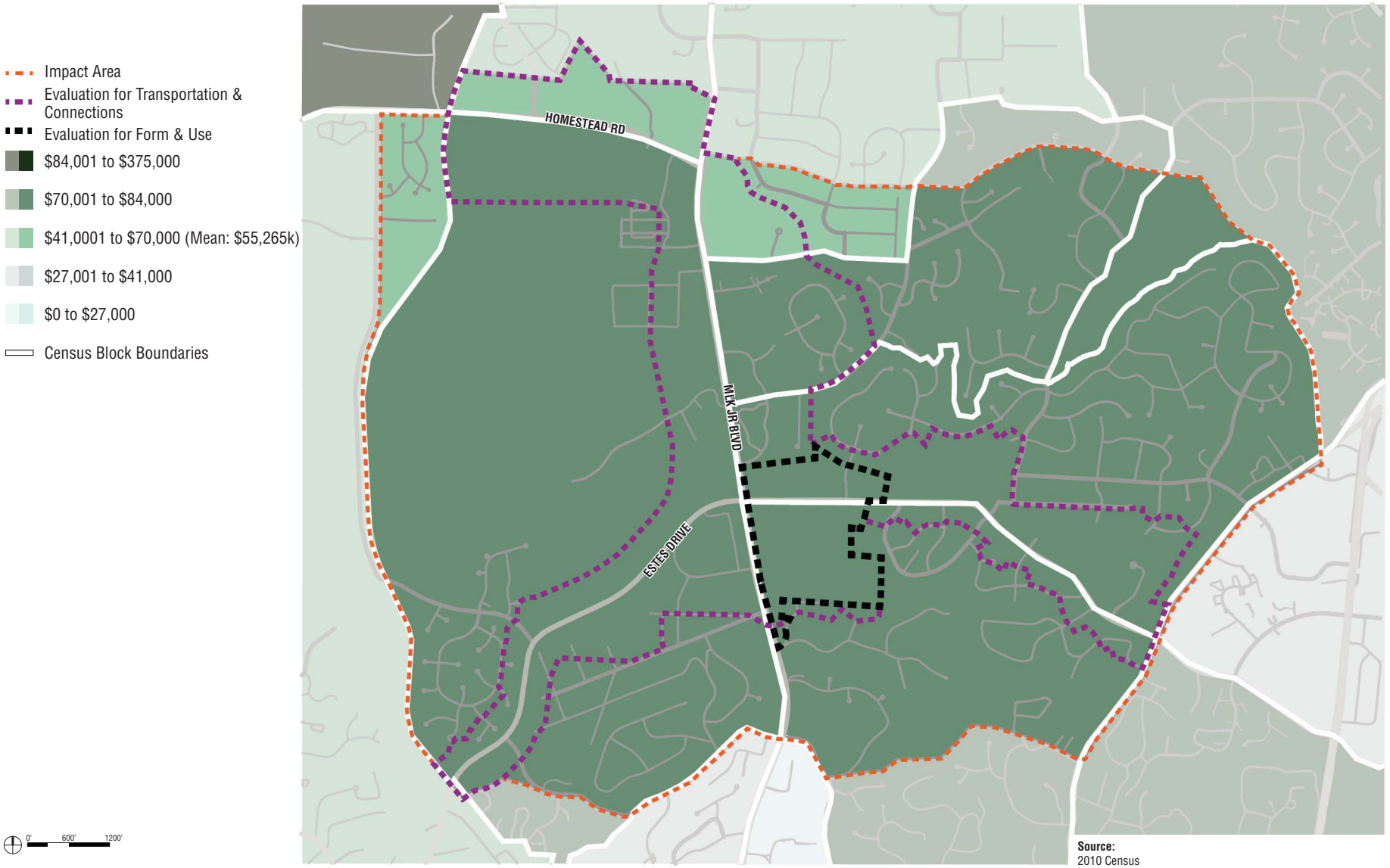


Figure 4: Median Household Income

Median Home Value

The average home value within the Impact Area is between $220,000 and $390,000 (Figure 5). The median home value for owner occupied housing in the Town overall is $368,200 (2007-2011).

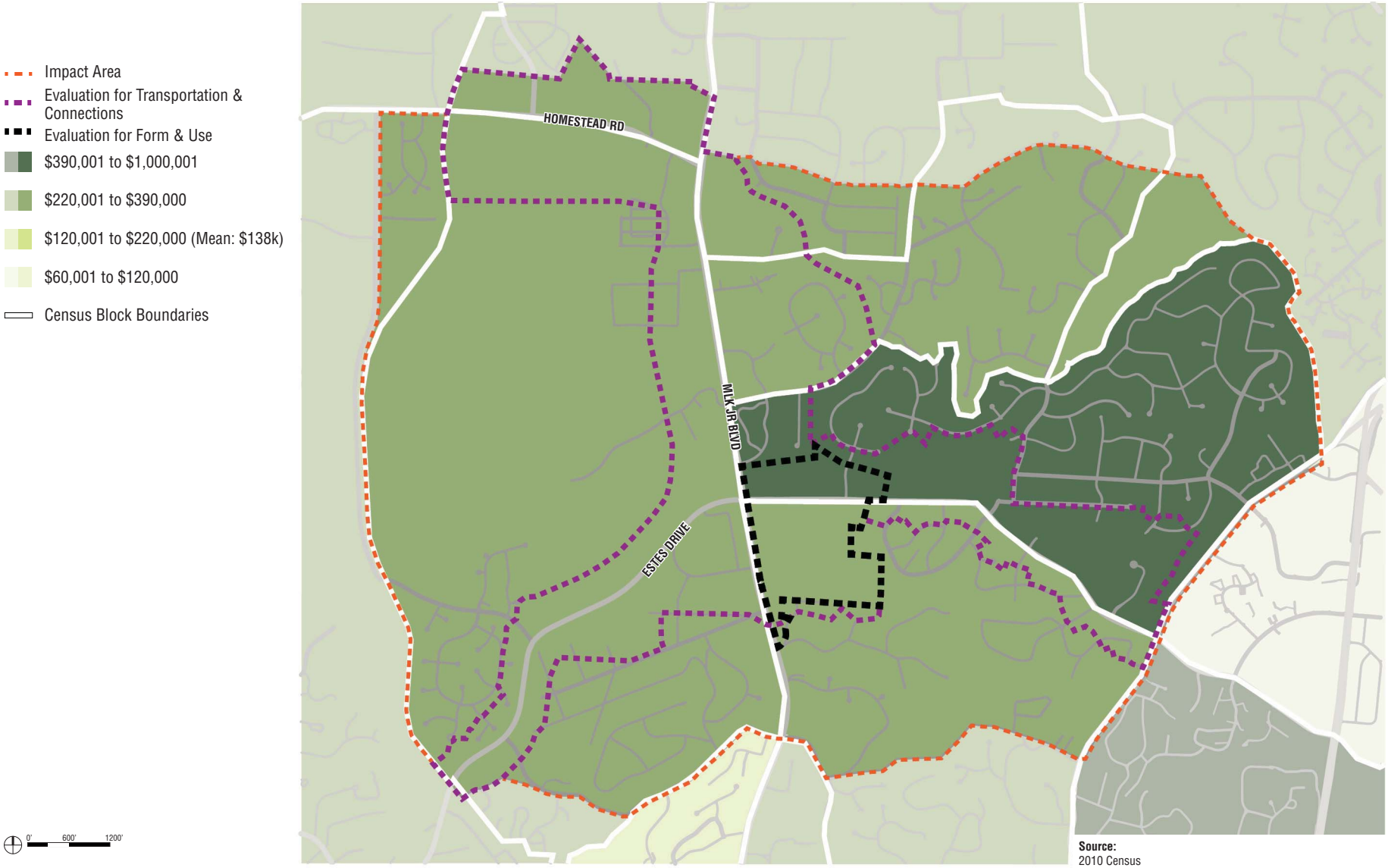


Figure 5: Median Home Value

Land Value

The majority of land within the Impact Area is valued between $150,000 and $500,000 per acre. Land values are lower (<$150,000 per acre) in the northwest portion of the Impact Area and the southeast part of the Evaluation for Form and Use Area. Land value is higher ($500,000 - $750,000 per acre) on Martin Luther King, Jr. Boulevard south of Homestead Road, and in the vicinity of the Estes Drive-Martin Luther King, Jr. Boulevard intersection. Higher land values are also found at and around Eastwood Lake ($500,000 - $1.75 million per acre), and along Franklin Street at the eastern edge of the Impact Area ($1.75 million per acre - $2.75 million per acre) (Figure 6).

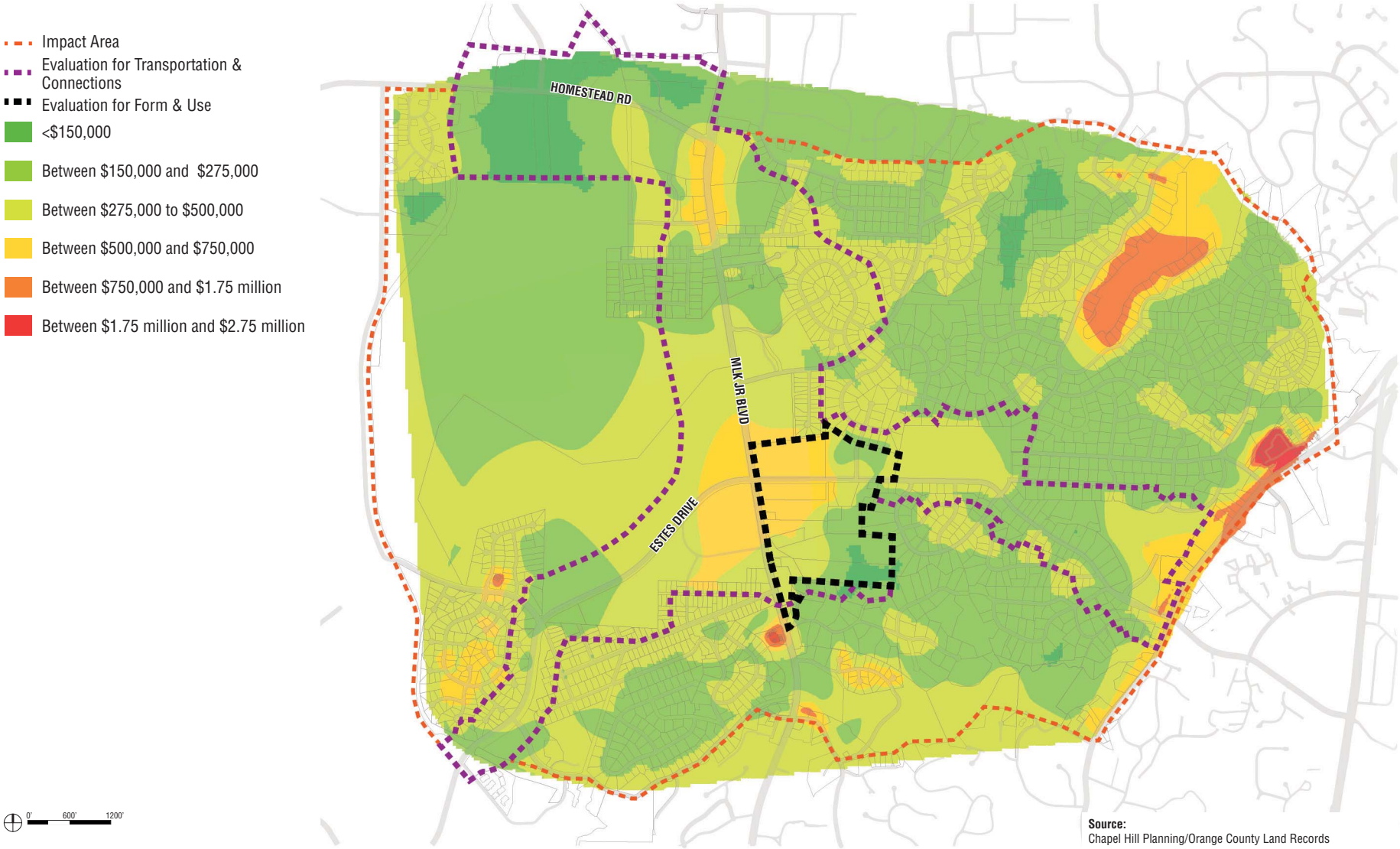


Figure 6: Land Value per Acre

Affordable Housing

Public housing is housing that is owned and maintained by the Town of Chapel Hill. Two public housing communities are located inside the Impact Area boundary: the 32-unit Eastwood community on Piney Mountain Road and the 26-unit Airport Gardens community on Martin Luther King, Jr. Boulevard south of Estes Drive. Additionally, the 44-unit South Estes Drive community is located near but outside of the Impact Area, adjacent to Fordham Boulevard to the east (Figure 7).

In addition to these public housing communities, the Elliott Woods apartment community is also located in the Impact Area. These are affordable apartments which are owned by the Inter-Church Council Housing Corporation.

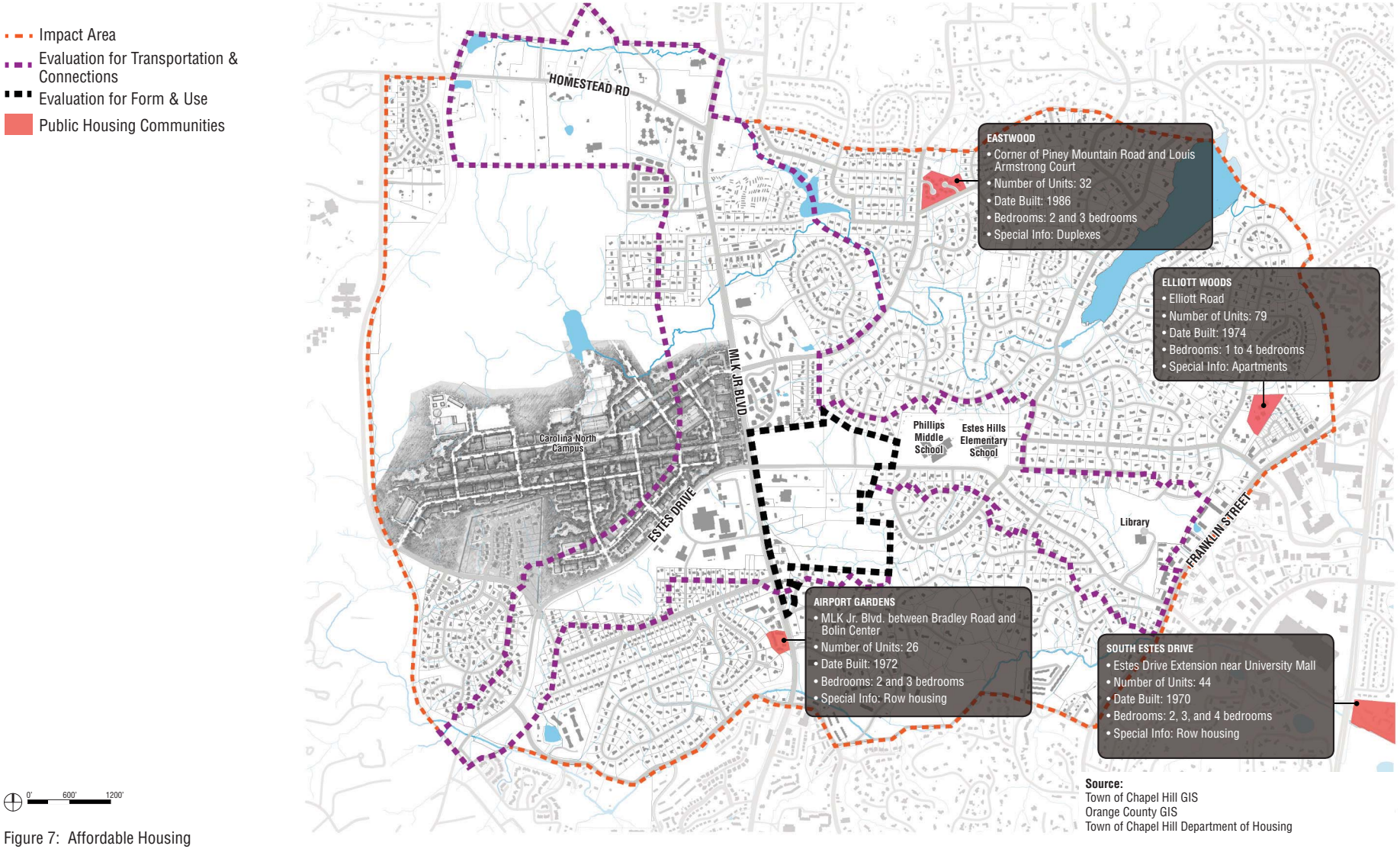


Figure 7: Affordable Housing

APPENDIX B: CENTRAL WEST SURVEY RESPONSES

During the development of the Central West Small Area Plan, two informal, online questionnaires/surveys were conducted, the first in March of 2013, and the second in September of 2013.

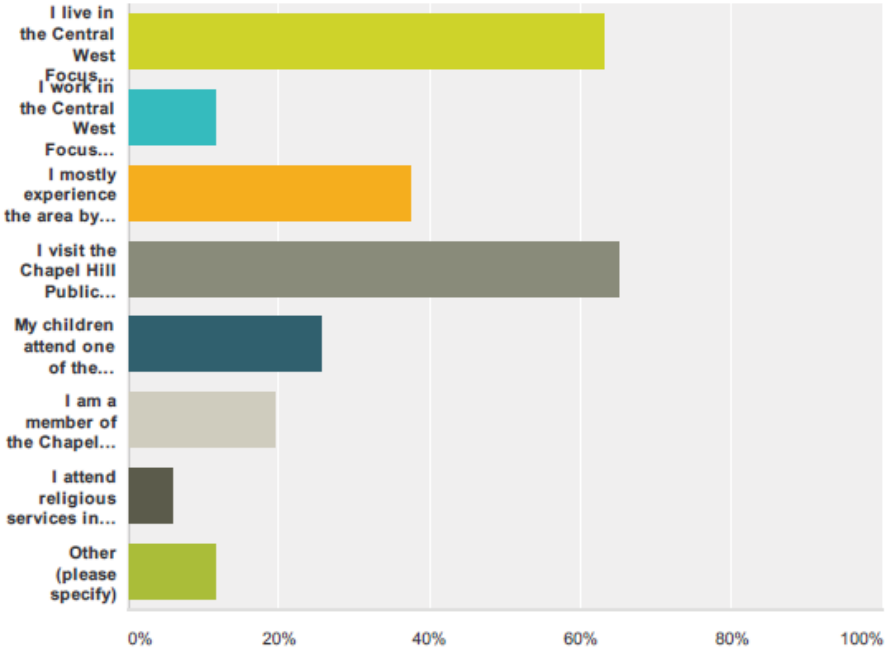
Appendix B provides an overview of the responses to the September survey.

Central West Survey Responses

Closed September 18, 2013

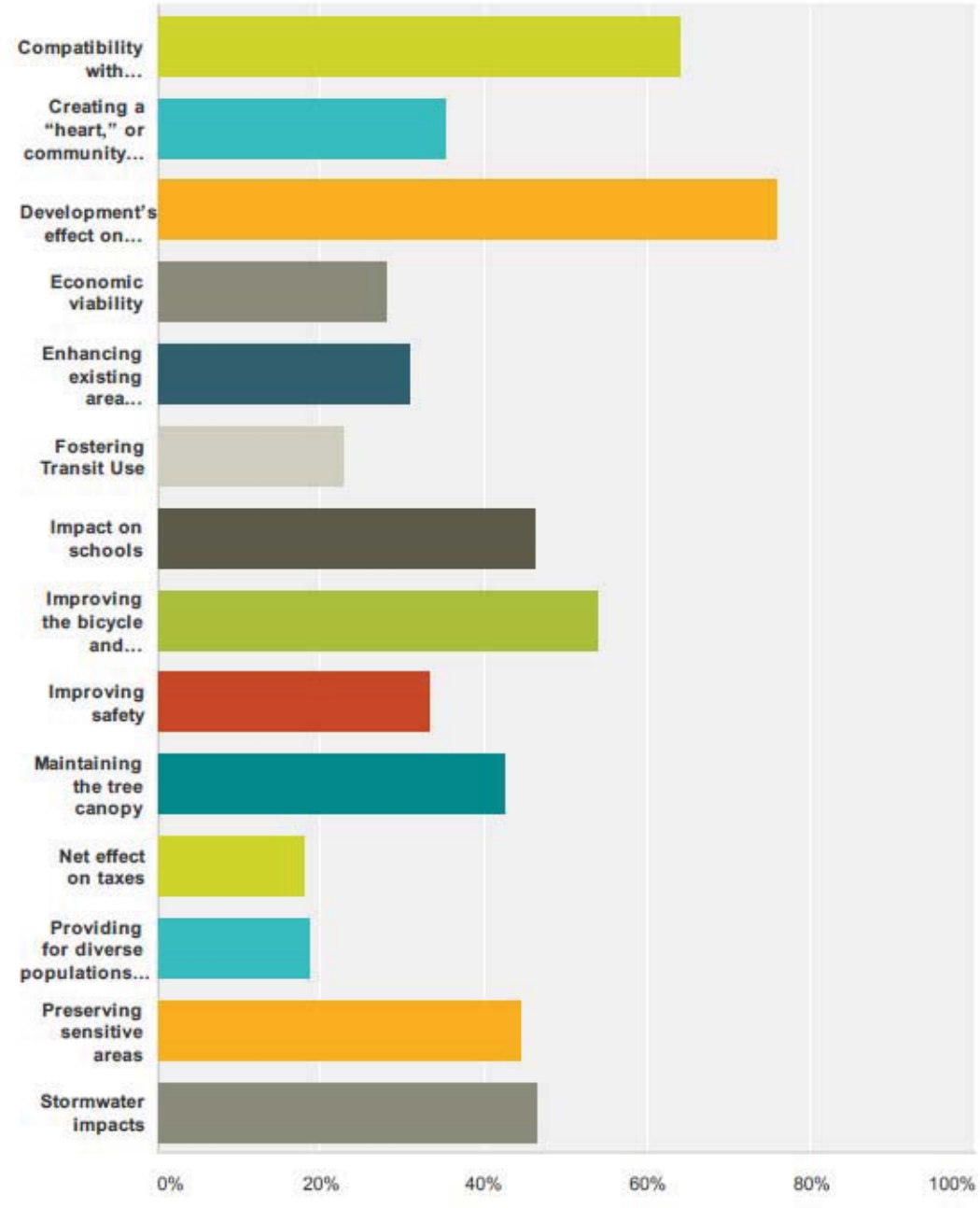
Q1 Which of the following applies to you? Please mark all that apply.

Answered: 477 Skipped: 0

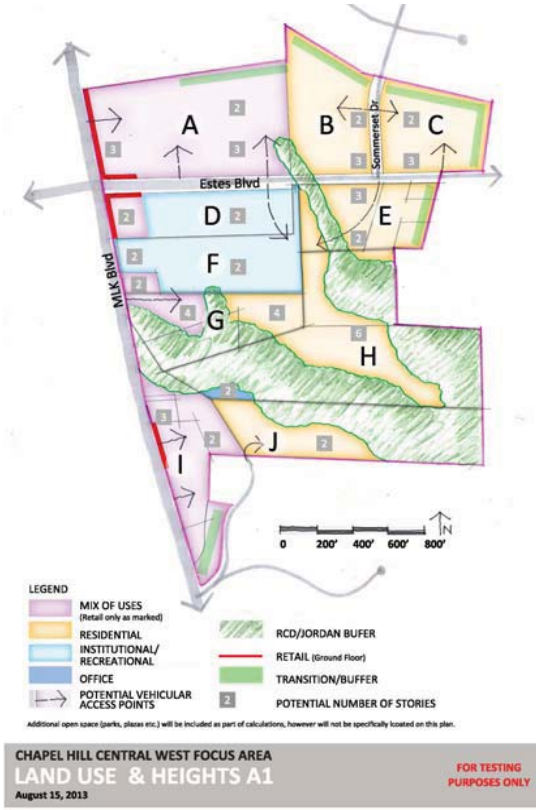


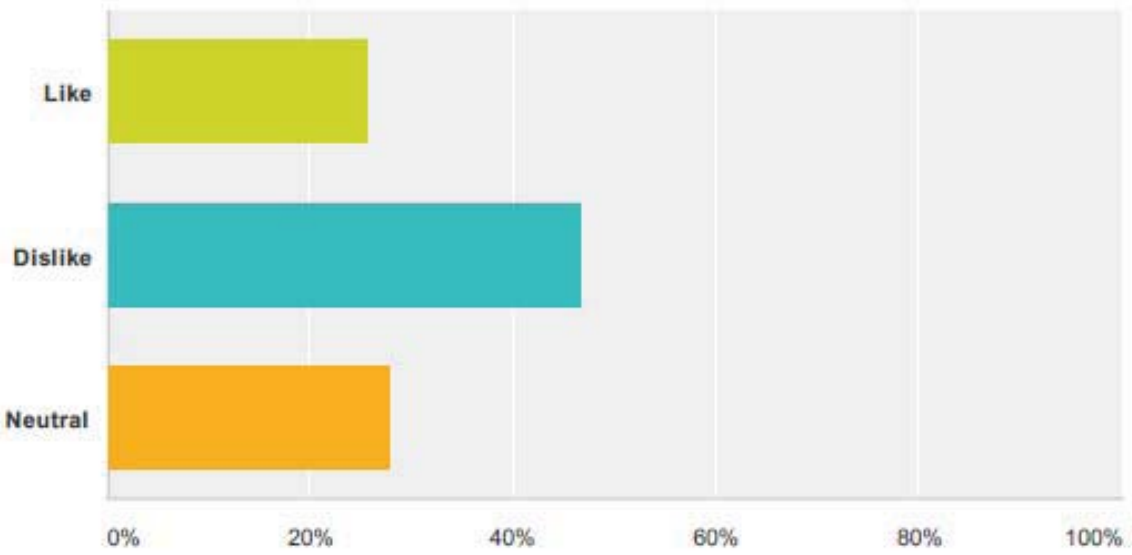
Answer Choices	Responses – Percentages	Number of Respondents
I live in the Central West Focus Area.	63.10%	301
I work in the Central West Focus Area.	11.74%	56
I mostly experience the area by driving through it.	37.32%	178
I visit the Chapel Hill Public Library.	64.99%	310
My children attend one of the schools there (Phillips Middle or Estes Hills Elementary).	25.58%	122
I am a member of the Chapel Hill-Carrboro YMCA.	19.50%	93
I attend religious services in the Central West Focus Area.	5.87%	28
Other	11.74%	56

Dot Exercise Responses from the Survey Prioritizing the items that should receive the most focus in the Central West Small Area Plan		
Items	**Percentages**	**Number of Checks**
Development's effect on traffic	75.70%	349
Compatibility with existing neighborhoods	63.77%	294
Improving the bicycle and pedestrian system	53.80%	248
Stormwater impacts	46.42%	214
Impact on schools	46.20%	213
Preserving sensitive areas	44.47%	205
Maintaining the Tree Canopy	42.52%	196
Creating a "heart" or walkable destinations	35.14%	162
Improving Safety	33.41%	154
Enhancing existing area character	31.02%	143
Economic viability	28.20%	130
Fostering Transit Use	22.78%	105
Providing for diverse populations and uses	18.66%	86
Net effect on taxes	18.00%	83



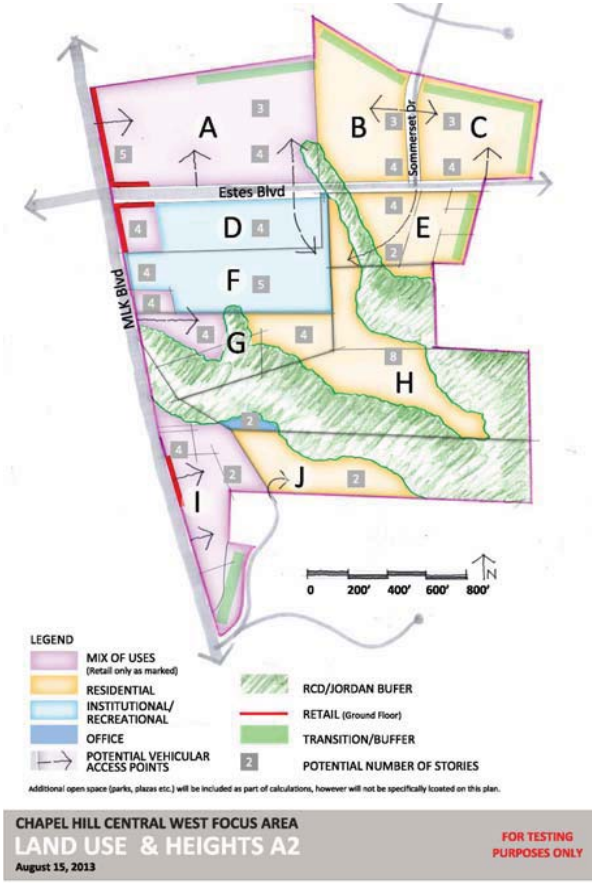
What do you think about Concept A1?

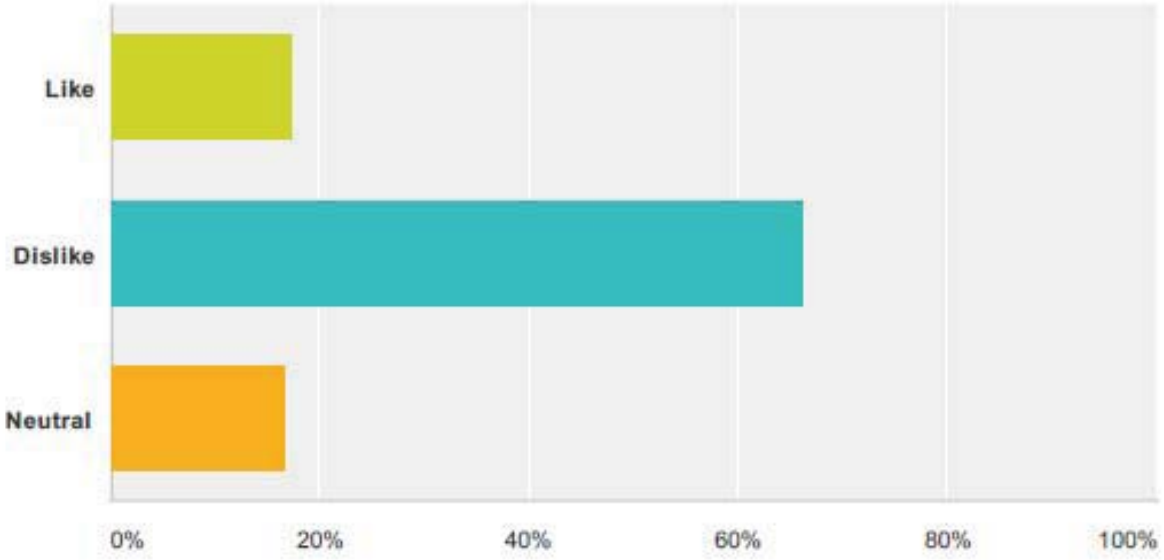




Responses	Responses – Percentages	Number of Respondents
Like	25.64%	111
Dislike	46.65%	202
Neutral	27.71%	120

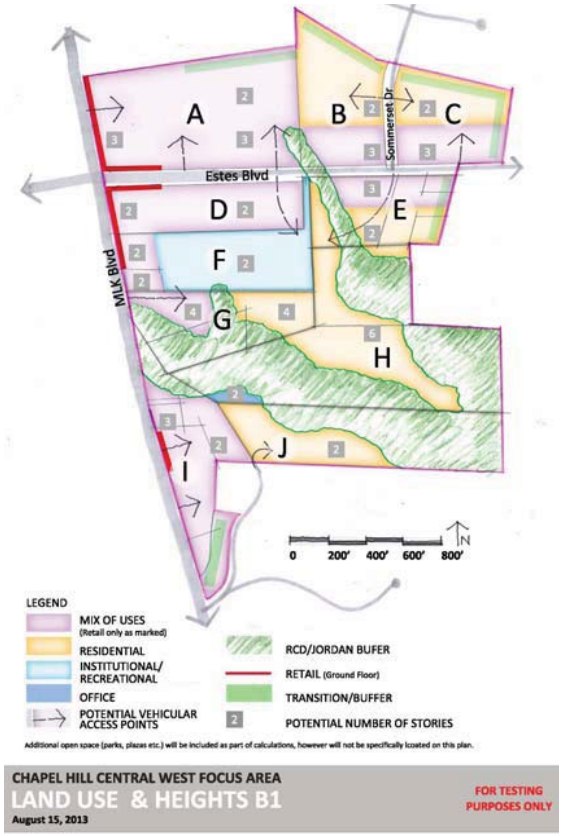
What do you think about Concept A2?

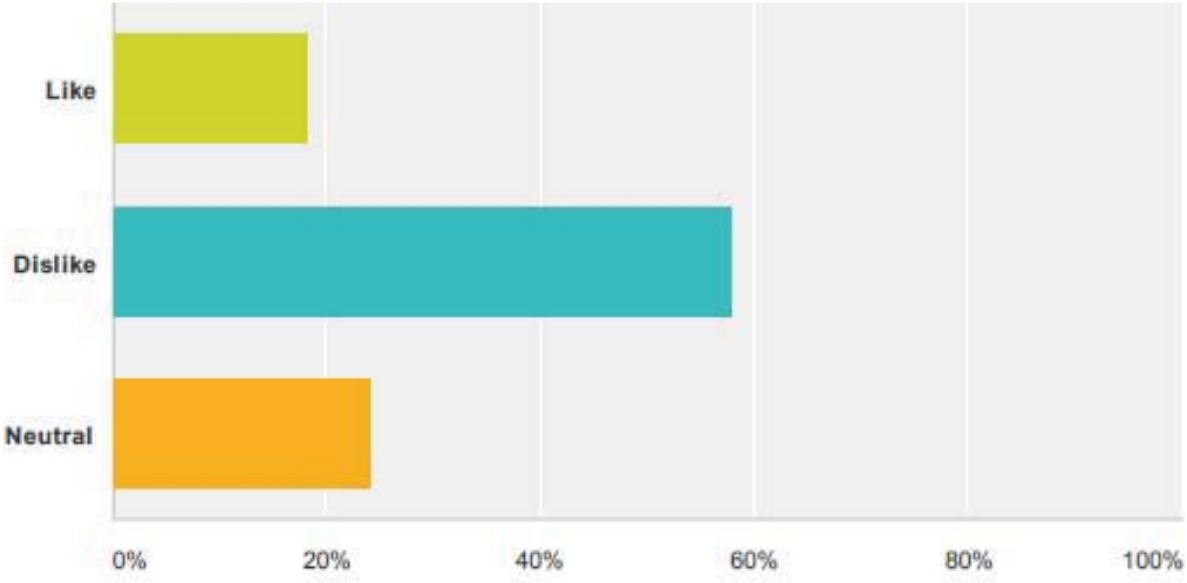




Responses	Responses – Percentages	Number of Respondents
Like	17.37%	74
Dislike	65.96%	281
Neutral	16.67%	71

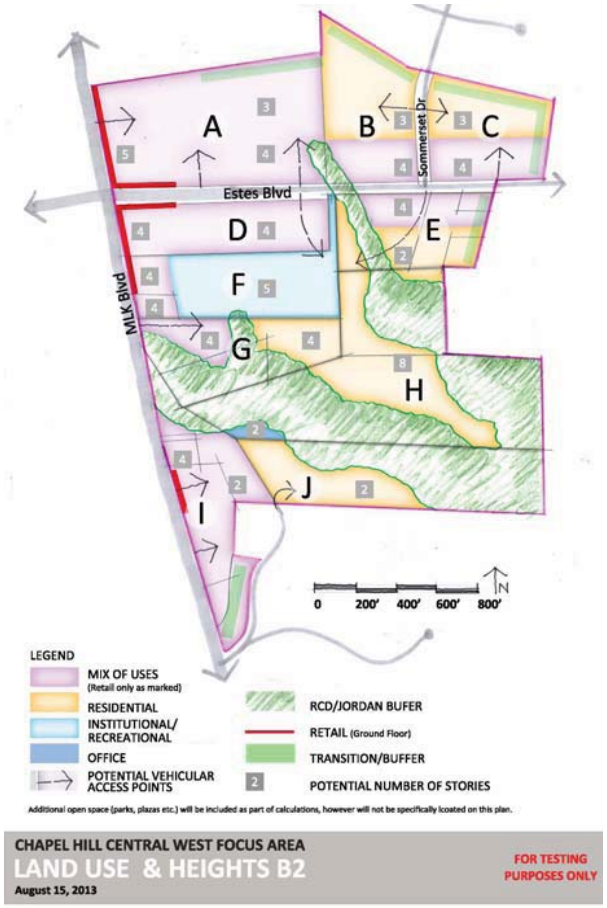
What do you think about Concept B1?

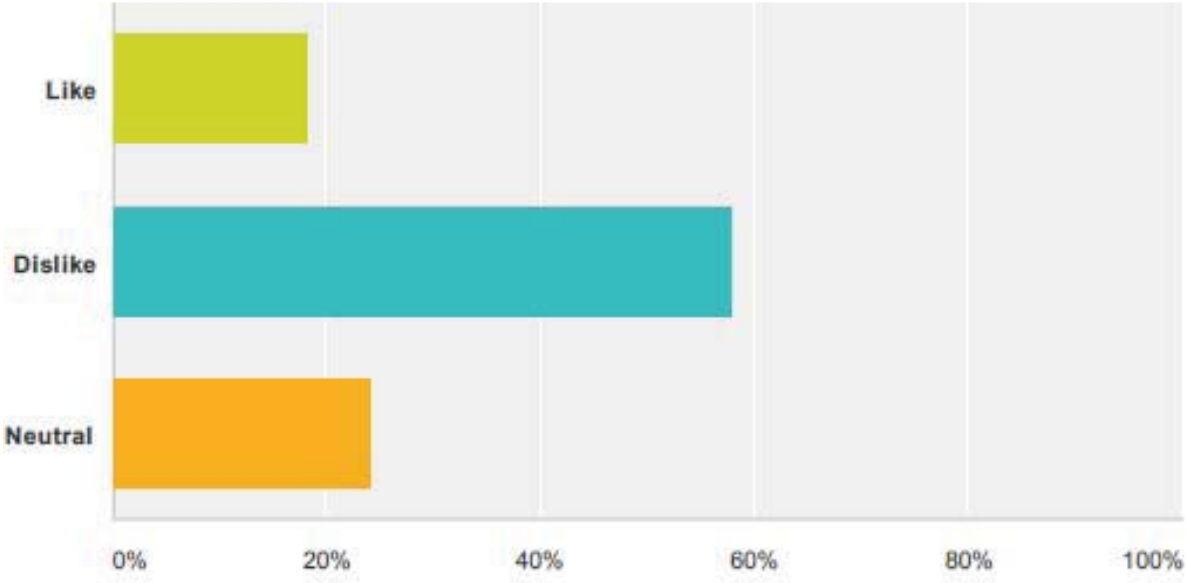




Responses	Responses – Percentages	Number of Respondents
Like	18.10%	76
Dislike	57.86%	243
Neutral	24.05%	101

What do you think about Concept B2?





Responses	Responses – Percentages	Number of Respondents
Like	15.87%	66
Dislike	71.39%	297
Neutral	12.74%	53

APPENDIX C: RESIDENTIAL UNITS & FLOOR AREA BY LAND USE

Appendix C provides an overview of the estimates for residential units and floor area by land use. These numbers were used to perform the traffic analysis.

RESIDENTIAL UNITS AND FLOOR AREA BY LAND USE

Use	Area										Total
	A	B	C	D	E	F	G	H	I	J	
Residential (units)	175	80	70	36	76	0	32	139	0	12	**620**
Office (square feet)	40,000					10,000	10,000		40,000		**100,000**
Retail (square feet)	20,000								5,000		**25,000**
Hotel (square feet)	65,000										**65,000**
Commercial (square feet)	20,000			10,000							**30,000**
Institutional (square feet)			20,000			30,000					**50,000**

Table 1: Residential Units and Floor Area by Land Use

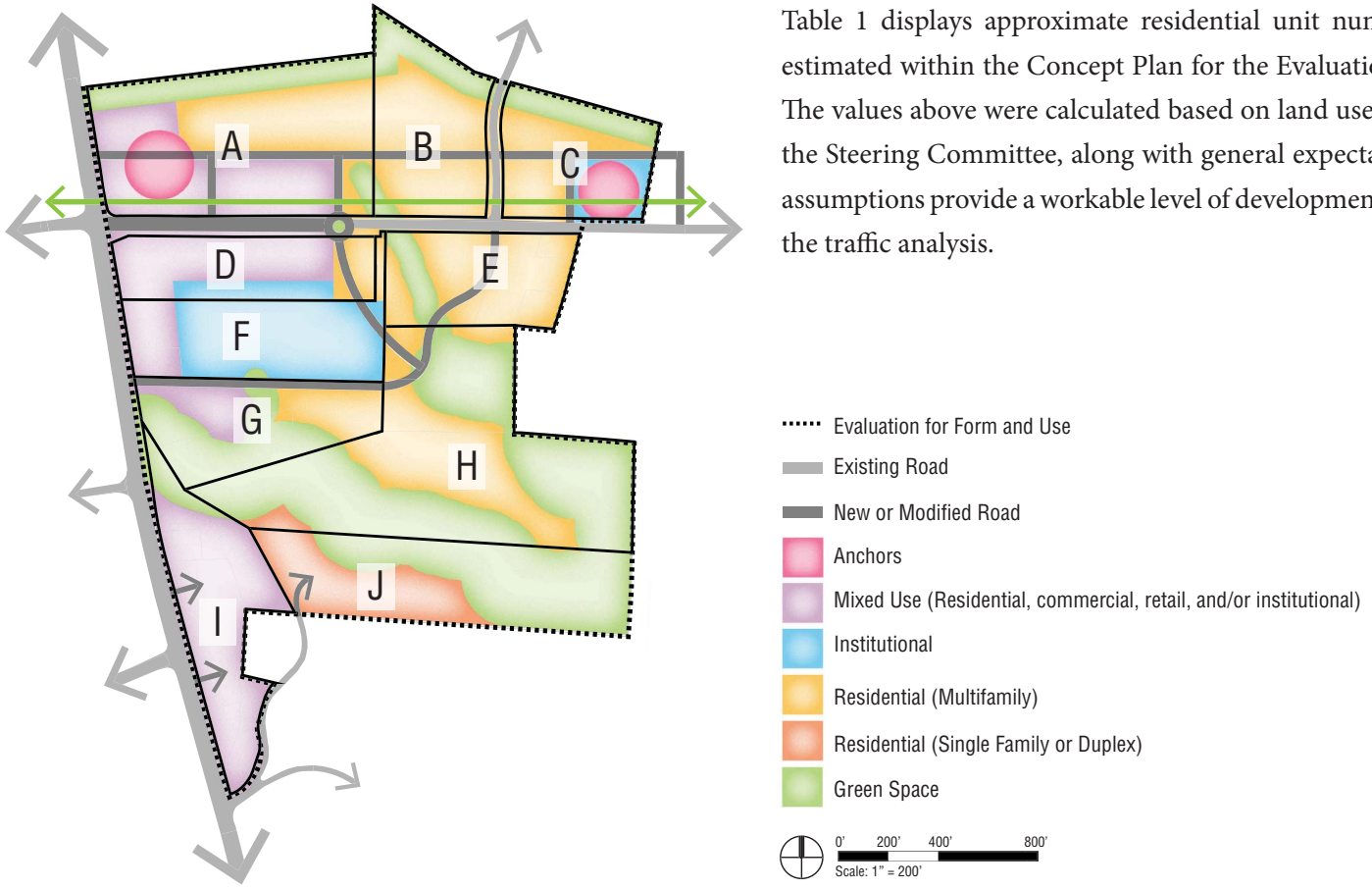


Table 1 displays approximate residential unit numbers and floor area by land use as estimated within the Concept Plan for the Evaluation for Form and Use Area (Figure 1). The values above were calculated based on land uses and building heights determined by the Steering Committee, along with general expectations of parking requirements. These assumptions provide a workable level of development and traffic, and were used to perform the traffic analysis.

APPENDIX D: TRAFFIC ANALYSIS DATA

Appendix D provides the traffic analysis data for the Central West Concept Plan. For more information about the Concept Plan, see the Central West Small Area Plan, Chapter 4.

Central West Focus Area (Chapel Hill, NC)
Final Scenario AM and PM Peak Hour Trip Generation and Traffic Assignment Summary

AM Peak Hour

Residential				Non Residential				Total			
Parcel	In	Out	%	Parcel	In	Out	%	Parcel	In	Out	%
A	9	36	31%	A	76	28	50%	A	85	64	42%
B	4	17	14%	B	0	0	0%	B	4	17	6%
C	8	17	17%	C	14	14	13%	C	22	31	15%
D	2	7	6%	D	0	0	0%	D	2	7	3%
E	5	15	14%	E	0	0	0%	E	5	15	6%
F	0	0	0%	F	31	23	26%	F	31	23	15%
G	2	7	6%	G	10	1	5%	G	12	8	6%
H	4	8	8%	H	0	0	0%	H	4	8	3%
I	3	1	3%	I	5	8	6%	I	8	9	5%
Total	37	108	100%	Total	136	74	100%	Total	173	182	100%
Total In and Out		145		Total In and Out		210		Total In and Out		355	

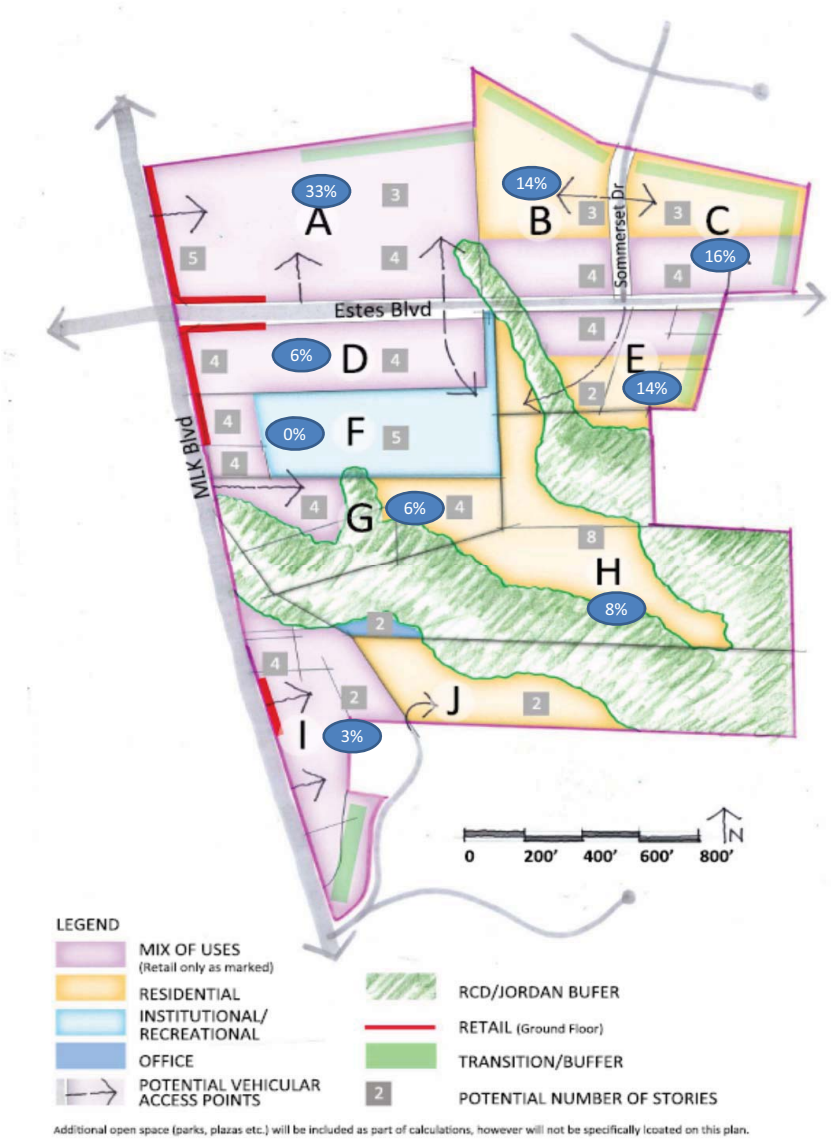
PM Peak Hour

Residential				Non Residential				Total			
Parcel	In	Out	%	Parcel	In	Out	%	Parcel	In	Out	%
A	36	19	32%	A	88	106	45%	A	124	125	41%
B	16	9	15%	B			0%	B	16	9	4%
C	13	12	15%	C	40	30	16%	C	53	42	16%
D	7	4	6%	D			0%	D	7	4	2%
E	15	9	14%	E			0%	E	15	9	4%
F			0%	F	60	46	24%	F	60	46	17%
G	7	4	6%	G	2	9	3%	G	9	13	4%
H	8	7	9%	H			0%	H	8	7	2%
I	4	2	3%	I	12	42	12%	I	16	44	10%
Total	106	66	100%	Total	202	233	100%	Total	308	299	100%
Total In and Out		172		Total In and Out		435		Total In and Out		607	

AM and PM Peak Hours

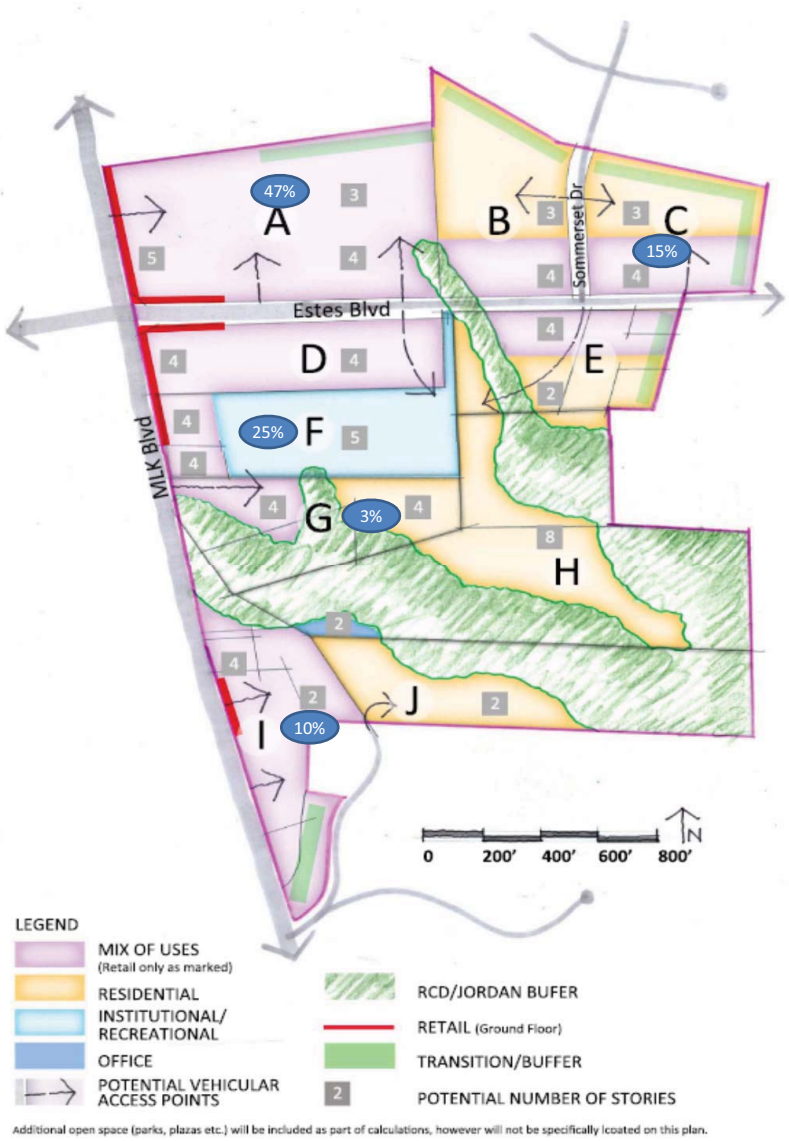
Residential				Non Residential				Total			
Parcel	In	Out	%	Parcel	In	Out	%	Parcel	In	Out	%
A	45	55	**33%**	A	164	134	**47%**	A	209	189	41%
B	20	26	**14%**	B	0	0	**0%**	B	20	26	5%
C	21	29	**16%**	C	54	44	**15%**	C	75	73	15%
D	9	11	**6%**	D	0	0	**0%**	D	9	11	2%
E	20	24	**14%**	E	0	0	**0%**	E	20	24	5%
F	0	0	**0%**	F	91	69	**25%**	F	91	69	17%
G	9	11	**6%**	G	12	10	**3%**	G	21	21	4%
H	12	15	**8%**	H	0	0	**0%**	H	12	15	3%
I	7	3	**3%**	I	17	50	**10%**	I	24	53	8%
Total	143	174	100%	Total	338	307	100%	Total	481	481	100%
Total In and Out		317		Total In and Out		645		Total In and Out		962	

Final Alternative Residential

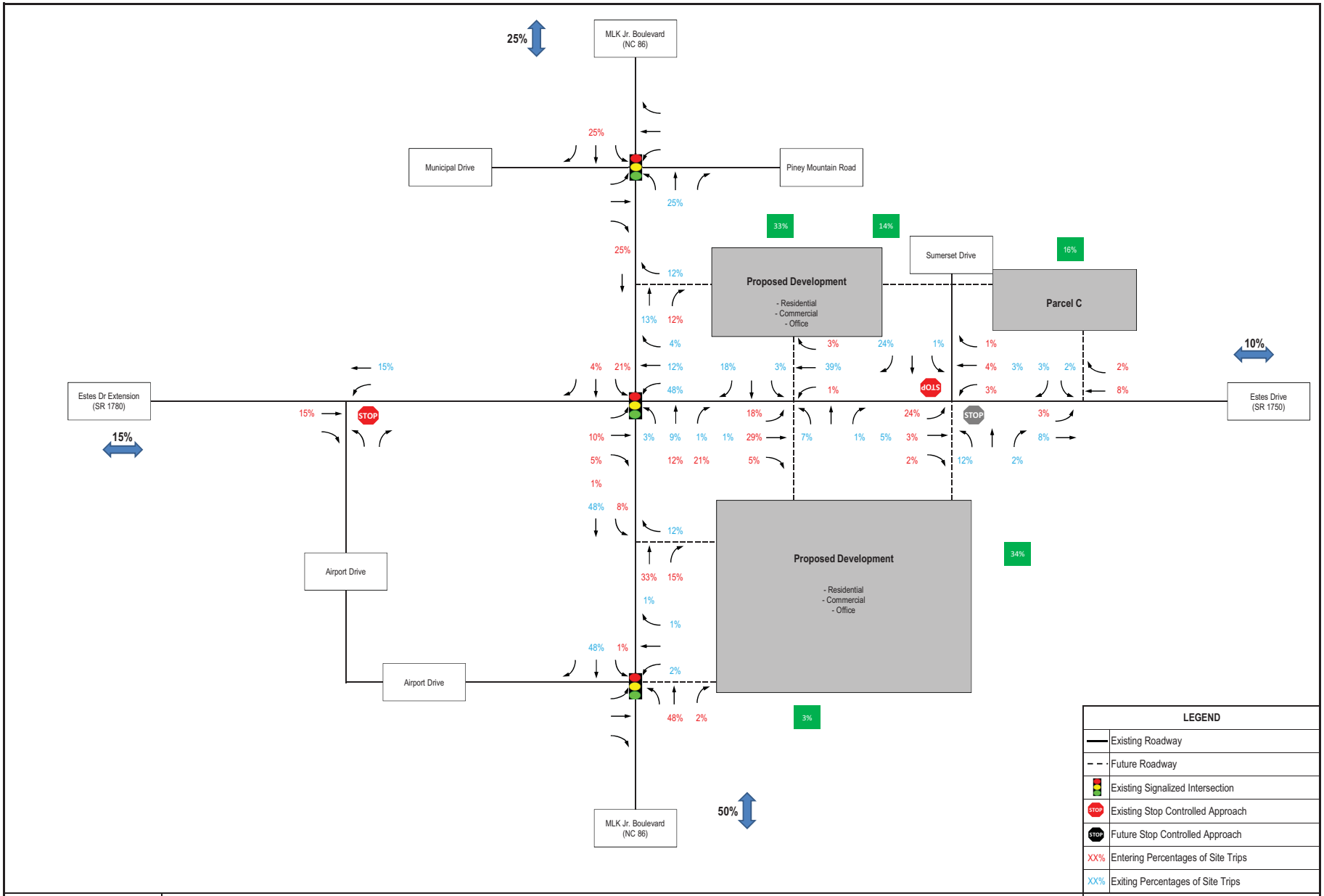


Additional open space (parks, plazas etc.) will be included as part of calculations, however will not be specifically lcoated on this plan.

Final Alternative Non-Residential



Additional open space (parks, plazas etc.) will be included as part of calculations, however will not be specifically lcoated on this plan.

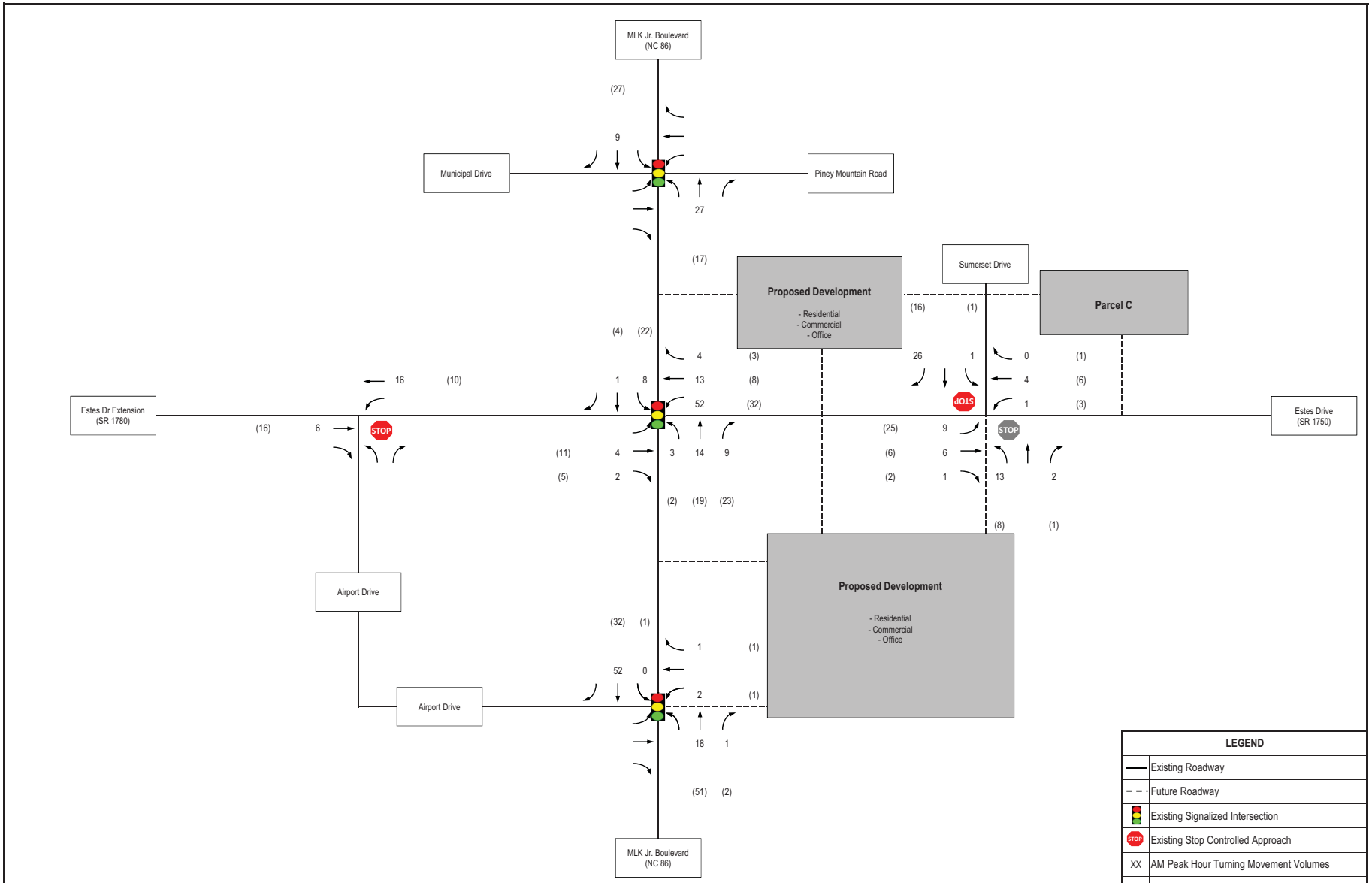


VHB + M/A/B
Joining Forces

Figure 1
Final Alternative Residential Trip Peak Hour Traffic Assignment

Central West Development

Chapel Hill, NC

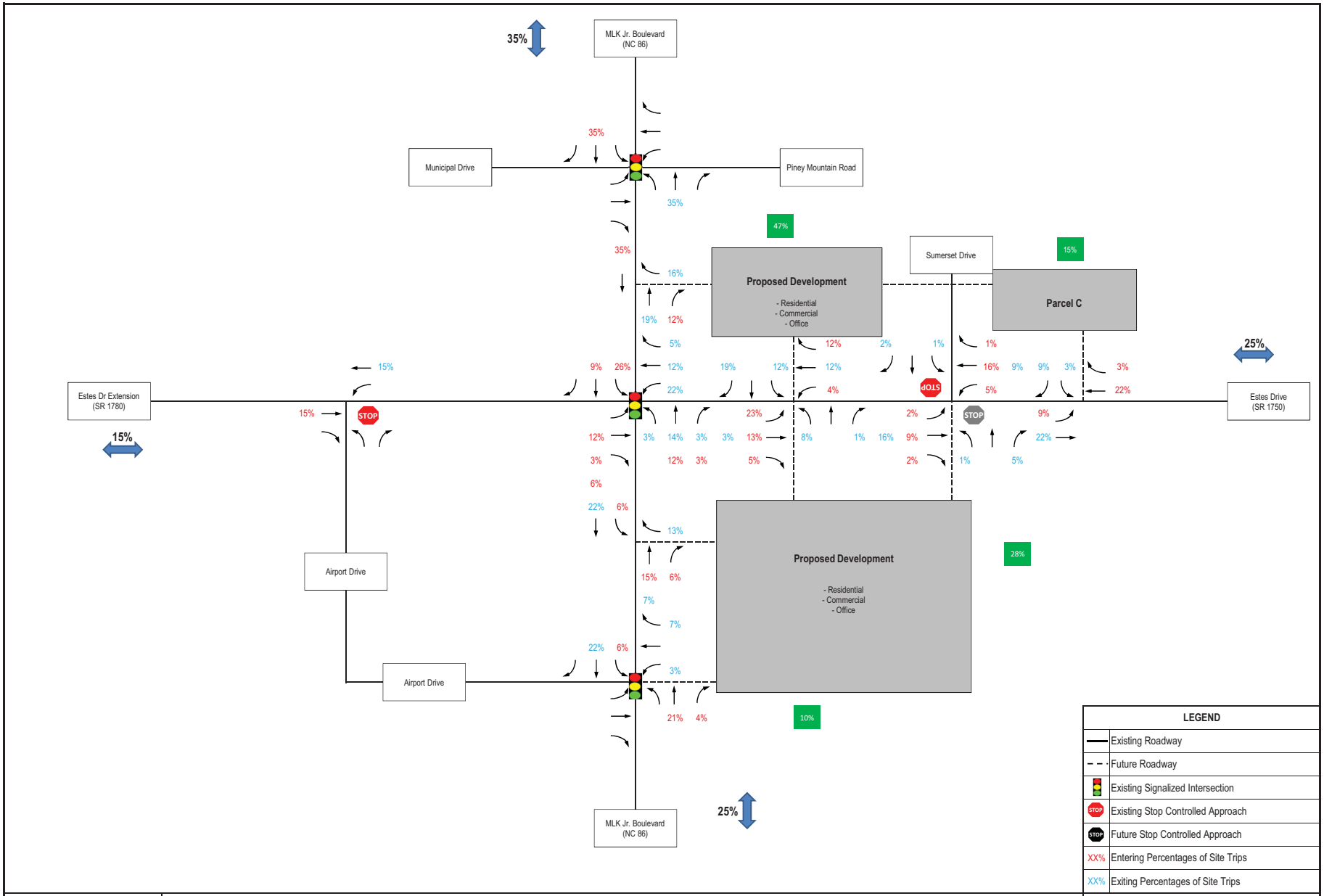


VHB + M/A/B
Joining Forces

Figure 2
Final Alternative Peak Hour Residential Trips

Central West Development

Chapel Hill, NC

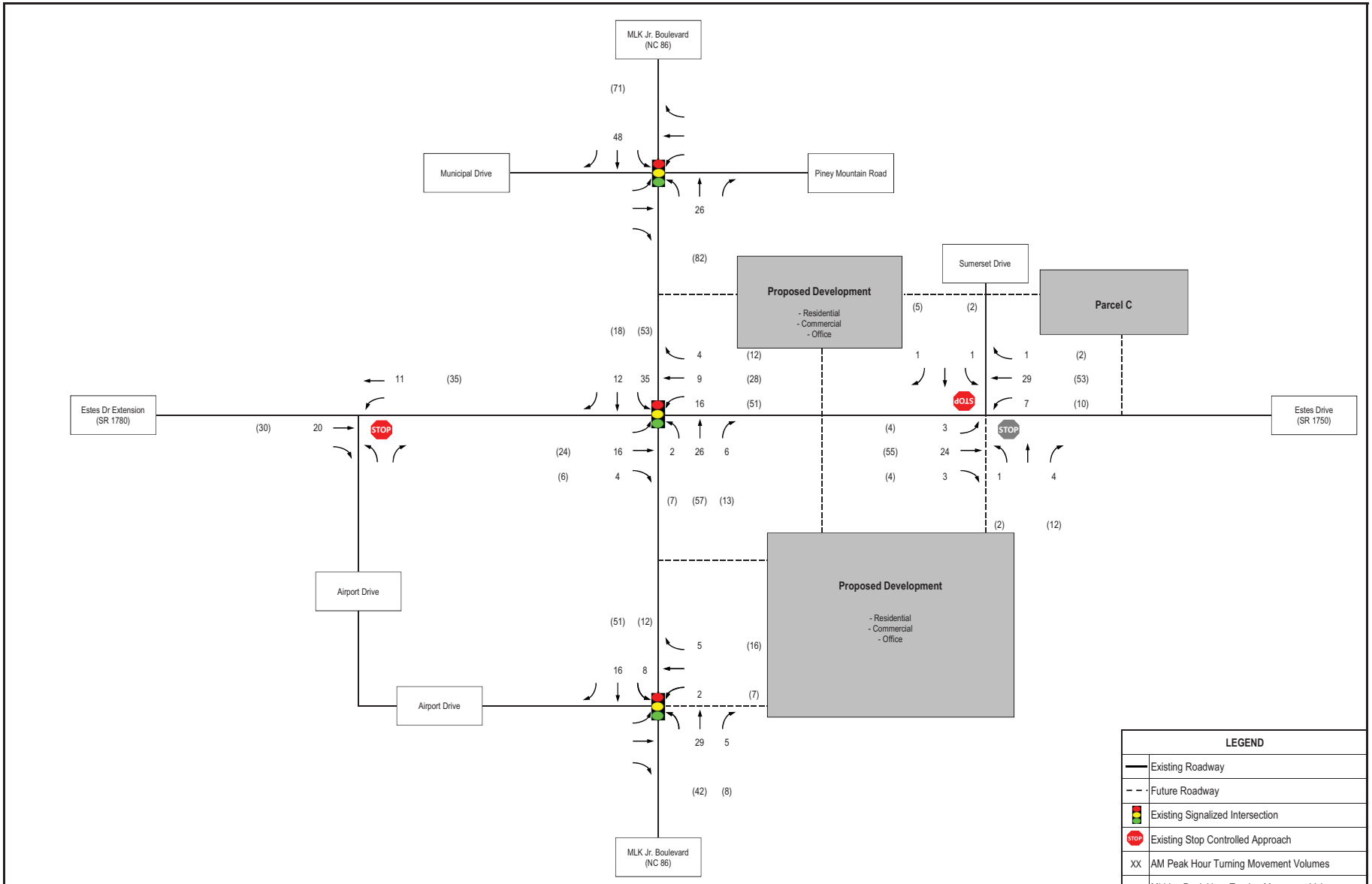


VHB + M/A/B
Joining Forces

Figure 3
Final Alternative Non-Residential Trip Peak Hour Traffic Assignment

Central West Development

Chapel Hill, NC

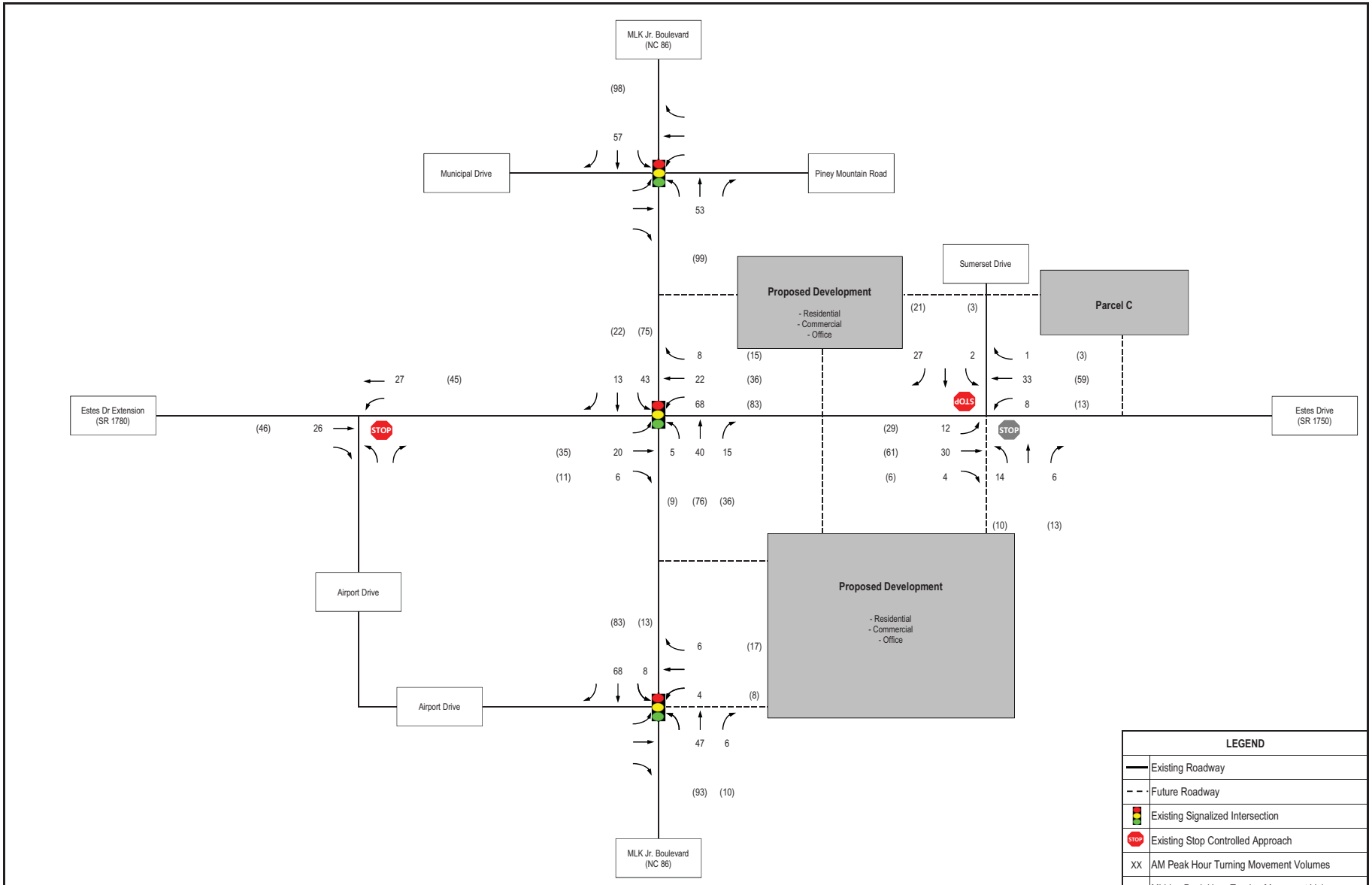


VHB + M/A/B
Joining Forces

Figure 4
Final Alternative Peak Hour Non-Residential Trips

Central West Development

Chapel Hill, NC



VHB + M/A/B Joining Forces

Figure 5
Final Alternative Total Peak Hour Trips

Central West Development

Chapel Hill, NC

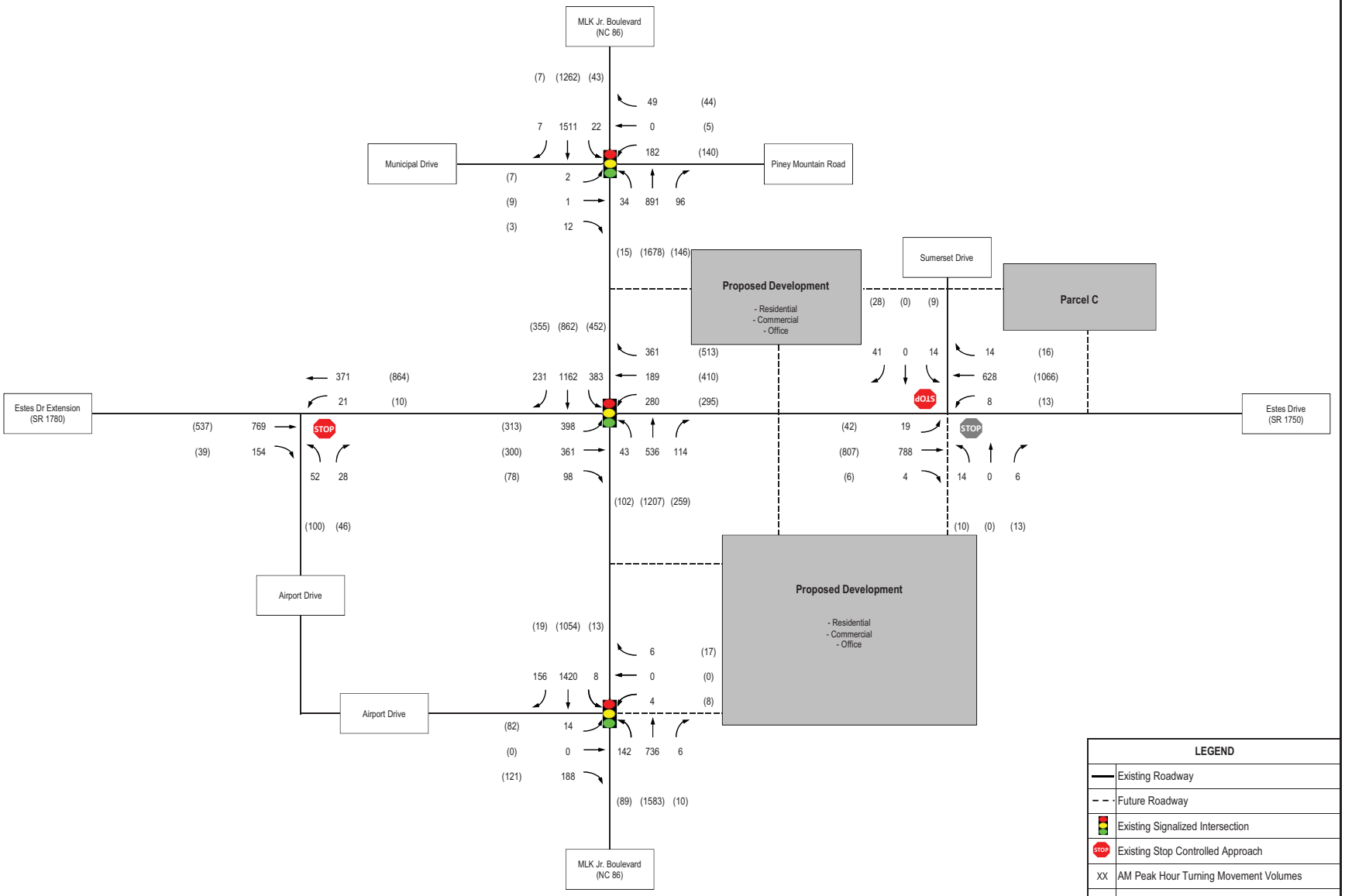


Figure 6
Final Alternative Build (2023) Peak Hour Turning Movement Volumes

Central West Development

Chapel Hill, NC

Central West Focus Area (Chapel Hill, NC)
Final Scenario AM and PM Peak Hour Level of Service Analysis Results

1. without mitigation, HCM results

			Build (2023) Final			
			AM		PM	
Intersection	Control	Approach	LOS	Delay	LOS	Delay
Estes Drive & M.L.K. Jr.	Signalized	**Total**	**E**	**59.5**	**F**	**96.7**
		Eastbound	F	83.1	F	133.5
		Westbound	E	72.2	F	111.5
		Northbound	D	41.2	F	88.0
		Southbound	D	49.5	E	78.9

2. without mitigation, Synchro results

			Build (2023) Final			
			AM		PM	
Intersection	Control	Approach	LOS	Delay	LOS	Delay
Estes Drive & M.L.K. Jr.	Signalized	**Total**	**E**	**58.3**	**F**	**91.5**
		Eastbound	F	81.2	F	126.6
		Westbound	E	68.5	F	103.5
		Northbound	D	40.1	F	84.3
		Southbound	D	49.6	E	74.9

3. with mitigation, HCM results

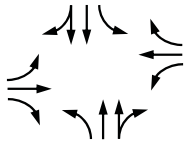
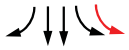
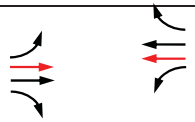
			Build (2023) Final			
			AM		PM	
Intersection	Control	Approach	LOS	Delay	LOS	Delay
Estes Drive & M.L.K. Jr.	Signalized	**Total**	**D**	**47.5**	**D**	**51.4**
		Eastbound	E	66.3	E	65.8
		Westbound	E	58.9	E	55.9
		Northbound	C	30.2	D	47.8
		Southbound	D	39.8	D	45.7

4. with mitigation, Synchro results

			Build (2023) Final			
			AM		PM	
Intersection	Control	Approach	LOS	Delay	LOS	Delay
Estes Drive & M.L.K. Jr.	Signalized	**Total**	**D**	**46.6**	**D**	**49.9**
		Eastbound	E	67.0	E	65.0
		Westbound	E	55.4	D	53.8
		Northbound	C	28.5	D	45.8
		Southbound	D	39.7	D	44.5

Central West Focus Area (Chapel Hill, NC)

Scenario Mitigation Requirement Summary

Illustration	Mitigation Description	Existing (2013)	No-Build (2023)	Option A1	Option A1 V3	Final Alternative	Option A2	Option B1	Option B2
	Existing Geometrics	✓	✓	✓	✓	✓	✓	✓	✓
	NB Right-turn lane on MLK		✓	✓	✓	✓	✓	✓	✓
	SB right-turn lane on MLK		✓	✓	✓	✓	✓	✓	✓
	3rd NB through lane on MLK, requiring a 3rd receiving lane on MLK north of Estes		✓	✓	✓	✓	✓	✓	✓
	2nd SB left-turn lane on MLK, requiring a 2nd receiving lane on Estes east of MLK			✓	✓	✓	✓	✓	✓
	2nd EB and WB through lanes on Estes, requiring 2nd receiving lanes on Estes both east and west of MLK						✓	✓	✓
	2nd WB left-turn lane on Estes				✓		✓	✓	✓
	2nd EB left-turn lane on Estes								✓

Lanes, Volumes, Timings
106: Final Alternative Estes Drive & M.L.K. Jr.

Central West Development
10/16/2013

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	398	361	98	280	189	361	43	536	114	383	1162	231
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		-3%			-1%			1%			-2%	
Storage Length (ft)	240		250	175		100	100		100	225		0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (ft)	100		100	100		100	100		100	100		100
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	0.95
Frt			0.850			0.850			0.850		0.975	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1796	1891	1607	1778	1872	1591	1761	3522	1575	1787	3485	0
Flt Permitted	0.234			0.186			0.087			0.245		
Satd. Flow (perm)	442	1891	1607	348	1872	1591	161	3522	1575	461	3485	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			40			65			82		20	
Link Speed (mph)		35			35			40			40	
Link Distance (ft)		1354			805			1068			761	
Travel Time (s)		26.4			15.7			18.2			13.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	442	401	109	311	210	401	48	596	127	426	1291	257
Shared Lane Traffic (%)												
Lane Group Flow (vph)	442	401	109	311	210	401	48	596	127	426	1548	0
Turn Type	pm+pt		pm+ov	pm+pt		pm+ov	pm+pt		pm+ov	pm+pt		
Protected Phases	3	8	1	7	4	5	1	6	7	5	2	
Permitted Phases	8		8	4		4	6		6	2		
Detector Phase	3	8	1	7	4	5	1	6	7	5	2	
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	12.0	7.0	7.0	12.0	
Minimum Split (s)	15.0	15.0	15.0	15.0	15.0	15.0	15.0	36.0	15.0	15.0	19.0	
Total Split (s)	36.0	37.0	15.0	26.0	27.0	47.0	15.0	40.0	26.0	47.0	72.0	0.0
Total Split (%)	24.0%	24.7%	10.0%	17.3%	18.0%	31.3%	10.0%	26.7%	17.3%	31.3%	48.0%	0.0%
Maximum Green (s)	30.0	31.0	9.0	20.5	21.0	40.5	9.0	33.8	20.5	40.5	65.3	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.7	4.0	4.0	4.7	
All-Red Time (s)	2.0	2.0	2.0	1.5	2.0	2.5	2.0	1.5	1.5	2.5	2.0	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-0.5	-1.0	-1.5	-1.0	-1.2	-0.5	-1.5	-1.7	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	1.0	1.0	2.0	
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	
Walk Time (s)								7.0				
Flash Dont Walk (s)								22.0				
Pedestrian Calls (#/hr)								0				
Act Effct Green (s)	58.0	32.0	45.1	43.0	22.0	57.6	54.4	46.4	72.4	82.0	68.9	
Actuated g/C Ratio	0.39	0.21	0.30	0.29	0.15	0.38	0.36	0.31	0.48	0.55	0.46	
v/c Ratio	0.98	1.00	0.21	1.04	0.76	0.62	0.33	0.55	0.16	0.81	0.96	
Control Delay	76.4	101.7	25.7	105.1	79.9	34.0	31.3	47.1	10.4	35.4	53.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	76.4	101.7	25.7	105.1	79.9	34.0	31.3	47.1	10.4	35.4	53.4	

Lanes, Volumes, Timings
106: Final Alternative Estes Drive & M.L.K. Jr.

Central West Development
10/16/2013

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	E	F	C	F	E	C	C	D	B	D	D	
Approach Delay		81.2			68.5			40.1			49.6	
Approach LOS		F			E			D			D	
Queue Length 50th (ft)	350	396	50	~272	200	265	21	256	23	241	752	
Queue Length 95th (ft)	#578	#617	101	#473	#318	333	52	356	71	356	#930	
Internal Link Dist (ft)		1274			725			988			681	
Turn Bay Length (ft)	240		250	175		100	100		100	225		
Base Capacity (vph)	451	403	531	300	275	767	167	1089	802	623	1613	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.98	1.00	0.21	1.04	0.76	0.52	0.29	0.55	0.16	0.68	0.96	

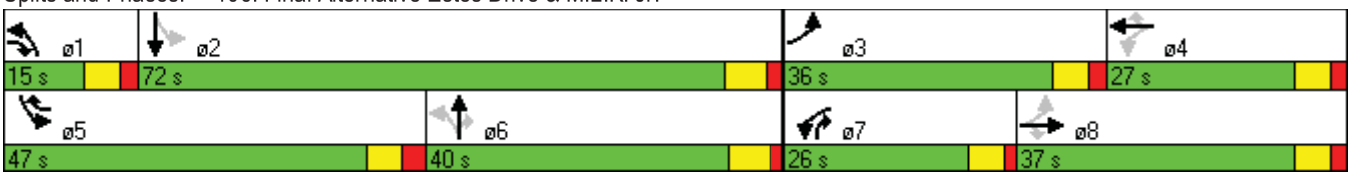
Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 86 (57%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green
Natural Cycle: 145
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.04
Intersection Signal Delay: 58.3 Intersection LOS: E
Intersection Capacity Utilization 96.5% ICU Level of Service F
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: 106: Final Alternative Estes Drive & M.L.K. Jr.



HCM Signalized Intersection Capacity Analysis
106: Final Alternative Estes Drive & M.L.K. Jr.

Central West Development
10/16/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	398	361	98	280	189	361	43	536	114	383	1162	231
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		-3%			-1%			1%			-2%	
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1796	1891	1607	1778	1872	1591	1761	3522	1575	1787	3486	
Flt Permitted	0.23	1.00	1.00	0.19	1.00	1.00	0.09	1.00	1.00	0.24	1.00	
Satd. Flow (perm)	443	1891	1607	348	1872	1591	160	3522	1575	460	3486	
Peak-hour factor, PHF	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)	442	401	109	311	210	401	48	596	127	426	1291	257
RTOR Reduction (vph)	0	0	29	0	0	42	0	0	46	0	11	0
Lane Group Flow (vph)	442	401	80	311	210	359	48	596	81	426	1537	0
Turn Type	pm+pt		pm+ov	pm+pt		pm+ov	pm+pt		pm+ov	pm+pt		
Protected Phases	3	8	1	7	4	5	1	6	7	5	2	
Permitted Phases	8		8	4		4	6		6	2		
Actuated Green, G (s)	57.0	31.0	38.1	41.5	21.0	50.1	52.3	45.2	65.7	80.3	67.2	
Effective Green, g (s)	58.0	32.0	40.1	42.5	22.0	53.1	54.3	46.4	66.7	81.8	68.9	
Actuated g/C Ratio	0.39	0.21	0.27	0.28	0.15	0.35	0.36	0.31	0.44	0.55	0.46	
Clearance Time (s)	6.0	6.0	6.0	5.5	6.0	6.5	6.0	6.2	5.5	6.5	6.7	
Vehicle Extension (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	1.0	1.0	2.0	
Lane Grp Cap (vph)	451	403	483	299	275	563	144	1089	700	522	1601	
v/s Ratio Prot	c0.20	c0.21	0.01	0.15	0.11	0.13	0.02	0.17	0.02	c0.17	c0.44	
v/s Ratio Perm	0.18		0.04	0.15		0.10	0.10		0.04	0.28		
v/c Ratio	0.98	1.00	0.16	1.04	0.76	0.64	0.33	0.55	0.12	0.82	0.96	
Uniform Delay, d1	38.9	58.9	42.1	48.0	61.5	40.4	36.8	43.1	24.4	23.8	39.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	36.9	43.2	0.1	62.9	10.8	1.7	0.5	2.0	0.0	9.1	14.8	
Delay (s)	75.9	102.1	42.2	110.9	72.3	42.2	37.3	45.0	24.4	32.8	54.0	
Level of Service	E	F	D	F	E	D	D	D	C	C	D	
Approach Delay (s)		83.1			72.2			41.2			49.5	
Approach LOS		F			E			D			D	

Intersection Summary

HCM Average Control Delay	59.5	HCM Level of Service	E
HCM Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	96.5%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings
106: Final Alternative Estes Drive & M.L.K. Jr.

Central West Development
10/16/2013

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	313	300	78	295	410	513	102	1207	259	452	862	355
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		-3%			-1%			1%			-2%	
Storage Length (ft)	240		250	175		100	100		100	225		0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (ft)	100		100	100		100	100		100	100		100
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	0.95
Frt			0.850			0.850			0.850		0.956	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1796	1891	1607	1778	1872	1591	1761	3522	1575	1787	3417	0
Flt Permitted	0.148			0.136			0.100			0.070		
Satd. Flow (perm)	280	1891	1607	255	1872	1591	185	3522	1575	132	3417	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			77			18			75		56	
Link Speed (mph)		35			35			40			40	
Link Distance (ft)		1354			805			1068			761	
Travel Time (s)		26.4			15.7			18.2			13.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	348	333	87	328	456	570	113	1341	288	502	958	394
Shared Lane Traffic (%)												
Lane Group Flow (vph)	348	333	87	328	456	570	113	1341	288	502	1352	0
Turn Type	pm+pt		pm+ov	pm+pt		pm+ov	pm+pt		pm+ov	pm+pt		
Protected Phases	3	8	1	7	4	5	1	6	7	5	2	
Permitted Phases	8		8	4		4	6		6	2		
Detector Phase	3	8	1	7	4	5	1	6	7	5	2	
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	12.0	7.0	7.0	12.0	
Minimum Split (s)	15.0	15.0	15.0	15.0	15.0	15.0	15.0	36.0	15.0	15.0	19.0	
Total Split (s)	24.0	32.0	15.0	27.0	35.0	34.0	15.0	57.0	27.0	34.0	76.0	0.0
Total Split (%)	16.0%	21.3%	10.0%	18.0%	23.3%	22.7%	10.0%	38.0%	18.0%	22.7%	50.7%	0.0%
Maximum Green (s)	18.0	26.0	9.0	21.5	29.0	27.5	9.0	50.8	21.5	27.5	69.3	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.7	4.0	4.0	4.7	
All-Red Time (s)	2.0	2.0	2.0	1.5	2.0	2.5	2.0	1.5	1.5	2.5	2.0	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-0.5	-1.0	-1.5	-1.0	-1.2	-0.5	-1.5	-1.7	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	1.0	1.0	2.0	
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	
Walk Time (s)								7.0				
Flash Dont Walk (s)								22.0				
Pedestrian Calls (#/hr)								0				
Act Effct Green (s)	46.0	27.0	41.0	52.0	30.0	64.0	61.0	52.0	79.0	86.0	72.0	
Actuated g/C Ratio	0.31	0.18	0.27	0.35	0.20	0.43	0.41	0.35	0.53	0.57	0.48	
v/c Ratio	1.25	0.98	0.18	1.05	1.22	0.83	0.66	1.10	0.33	1.27	0.81	
Control Delay	176.9	104.2	11.3	107.2	169.5	48.6	44.7	102.3	15.8	178.2	36.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	176.9	104.2	11.3	107.2	169.5	48.6	44.7	102.3	15.8	178.2	36.6	

Lanes, Volumes, Timings
106: Final Alternative Estes Drive & M.L.K. Jr.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	F	F	B	F	F	D	D	F	B	F	D	
Approach Delay		126.6			103.5			84.3			74.9	
Approach LOS		F			F			F			E	
Queue Length 50th (ft)	~374	328	7	~296	~545	477	49	~780	114	~568	562	
Queue Length 95th (ft)	#579	#531	51	#500	#766	651	108	#920	180	#800	670	
Internal Link Dist (ft)		1274			725			988			681	
Turn Bay Length (ft)	240		250	175		100	100		100	225		
Base Capacity (vph)	278	340	505	312	374	689	182	1221	865	396	1669	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	1.25	0.98	0.17	1.05	1.22	0.83	0.62	1.10	0.33	1.27	0.81	

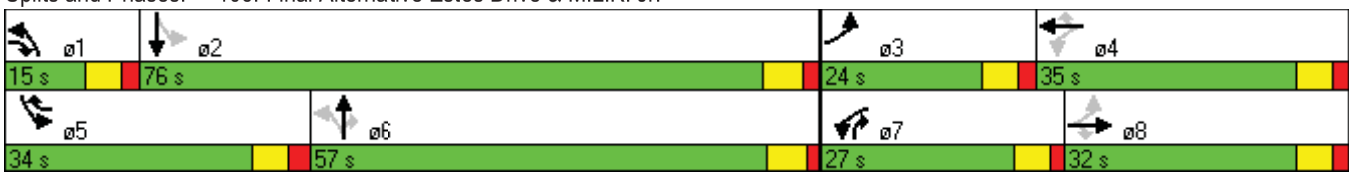
Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 0 (0%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green
Natural Cycle: 135
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.27
Intersection Signal Delay: 91.5 Intersection LOS: F
Intersection Capacity Utilization 114.0% 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: 106: Final Alternative Estes Drive & M.L.K. Jr.



HCM Signalized Intersection Capacity Analysis
106: Final Alternative Estes Drive & M.L.K. Jr.

Central West Development
10/16/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	313	300	78	295	410	513	102	1207	259	452	862	355
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		-3%			-1%			1%			-2%	
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1796	1891	1607	1778	1872	1591	1761	3522	1575	1787	3418	
Flt Permitted	0.15	1.00	1.00	0.14	1.00	1.00	0.10	1.00	1.00	0.07	1.00	
Satd. Flow (perm)	280	1891	1607	254	1872	1591	186	3522	1575	132	3418	
Peak-hour factor, PHF	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)	348	333	87	328	456	570	113	1341	288	502	958	394
RTOR Reduction (vph)	0	0	59	0	0	11	0	0	38	0	29	0
Lane Group Flow (vph)	348	333	28	328	456	559	113	1341	250	502	1323	0
Turn Type	pm+pt		pm+ov	pm+pt		pm+ov	pm+pt		pm+ov	pm+pt		
Protected Phases	3	8	1	7	4	5	1	6	7	5	2	
Permitted Phases	8		8	4		4	6		6	2		
Actuated Green, G (s)	44.0	26.0	34.0	50.5	29.0	56.5	58.8	50.8	72.3	84.3	70.3	
Effective Green, g (s)	46.0	27.0	36.0	51.5	30.0	59.5	60.8	52.0	73.3	85.8	72.0	
Actuated g/C Ratio	0.31	0.18	0.24	0.34	0.20	0.40	0.41	0.35	0.49	0.57	0.48	
Clearance Time (s)	6.0	6.0	6.0	5.5	6.0	6.5	6.0	6.2	5.5	6.5	6.7	
Vehicle Extension (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	1.0	1.0	2.0	
Lane Grp Cap (vph)	278	340	439	311	374	631	170	1221	770	395	1641	
v/s Ratio Prot	c0.16	0.18	0.00	0.15	c0.24	0.17	0.04	0.38	0.05	c0.25	0.39	
v/s Ratio Perm	0.23		0.01	0.21		0.18	0.23		0.11	c0.48		
v/c Ratio	1.25	0.98	0.06	1.05	1.22	0.89	0.66	1.10	0.32	1.27	0.81	
Uniform Delay, d1	44.8	61.2	44.0	46.1	60.0	42.1	31.6	49.0	23.3	50.2	33.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	139.5	42.6	0.0	66.1	120.6	13.7	7.4	57.0	0.1	140.5	4.3	
Delay (s)	184.2	103.8	44.0	112.2	180.6	55.8	38.9	106.0	23.4	190.7	37.4	
Level of Service	F	F	D	F	F	E	D	F	C	F	D	
Approach Delay (s)		133.5			111.5			88.0			78.9	
Approach LOS		F			F			F			E	

Intersection Summary

HCM Average Control Delay	96.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.23		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	114.0%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings
106: Final Alternative Estes Drive & M.L.K. Jr.

Central West Development
10/16/2013

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	398	361	98	280	189	361	43	536	114	383	1162	231
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		-3%			-1%			1%			-2%	
Storage Length (ft)	240		250	175		100	100		100	225		200
Storage Lanes	1		1	1		1	1		1	2		1
Taper Length (ft)	100		100	100		100	100		100	100		100
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	1.00	0.97	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1796	1891	1607	1778	1872	1591	1761	5060	1575	3467	3575	1599
Flt Permitted	0.263			0.226			0.107			0.950		
Satd. Flow (perm)	497	1891	1607	423	1872	1591	198	5060	1575	3467	3575	1599
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			40			84			77			257
Link Speed (mph)		35			35			40			40	
Link Distance (ft)		1354			805			1068			761	
Travel Time (s)		26.4			15.7			18.2			13.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	442	401	109	311	210	401	48	596	127	426	1291	257
Shared Lane Traffic (%)												
Lane Group Flow (vph)	442	401	109	311	210	401	48	596	127	426	1291	257
Turn Type	pm+pt		pm+ov	pm+pt		pm+ov	pm+pt		pm+ov	Prot		pm+ov
Protected Phases	3	8	1	7	4	5	1	6	7	5	2	3
Permitted Phases	8		8	4		4	6		6			2
Detector Phase	3	8	1	7	4	5	1	6	7	5	2	3
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	12.0	7.0	7.0	12.0	7.0
Minimum Split (s)	15.0	15.0	15.0	15.0	15.0	15.0	15.0	36.0	15.0	15.0	19.0	15.0
Total Split (s)	30.0	31.0	15.0	22.0	23.0	28.0	15.0	39.0	22.0	28.0	52.0	30.0
Total Split (%)	25.0%	25.8%	12.5%	18.3%	19.2%	23.3%	12.5%	32.5%	18.3%	23.3%	43.3%	25.0%
Maximum Green (s)	24.0	25.0	9.0	16.5	17.0	21.5	9.0	32.8	16.5	21.5	45.3	24.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.7	4.0	4.0	4.7	4.0
All-Red Time (s)	2.0	2.0	2.0	1.5	2.0	2.5	2.0	1.5	1.5	2.5	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-0.5	-1.0	-1.5	-1.0	-1.2	-0.5	-1.5	-1.7	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	6.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?												
Vehicle Extension (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	1.0	1.0	2.0	1.0
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Walk Time (s)								7.0				
Flash Dont Walk (s)								22.0				
Pedestrian Calls (#/hr)								0				
Act Effct Green (s)	48.0	26.0	39.0	35.2	18.2	42.6	45.6	37.6	59.6	19.4	49.0	77.8
Actuated g/C Ratio	0.40	0.22	0.32	0.29	0.15	0.36	0.38	0.31	0.50	0.16	0.41	0.65
v/c Ratio	0.95	0.98	0.20	0.98	0.74	0.65	0.27	0.38	0.15	0.76	0.88	0.23
Control Delay	61.0	86.5	19.6	81.2	65.1	30.3	20.6	33.4	8.1	57.2	41.5	1.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	61.0	86.5	19.6	81.2	65.1	30.3	20.6	33.4	8.1	57.2	41.5	1.5

Lanes, Volumes, Timings
106: Final Alternative Estes Drive & M.L.K. Jr.

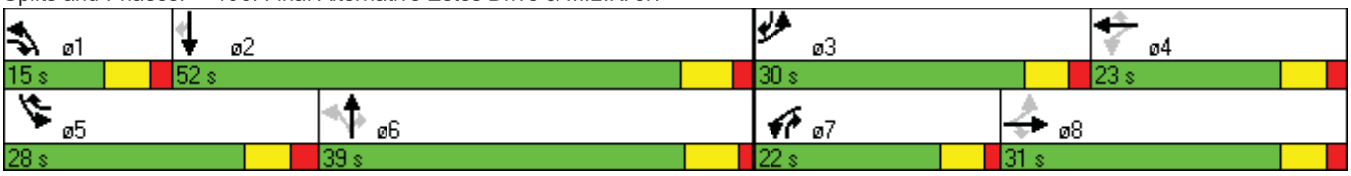
Central West Development
10/16/2013

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	E	F	B	F	E	C	C	C	A	E	D	A
Approach Delay		67.0			55.4			28.5			39.7	
Approach LOS		E			E			C			D	
Queue Length 50th (ft)	269	311	38	188	158	205	18	131	20	163	480	0
Queue Length 95th (ft)	#461	#513	82	#378	#269	304	38	174	57	213	582	28
Internal Link Dist (ft)		1274			725			988			681	
Turn Bay Length (ft)	240		250	175		100	100		100	225		200
Base Capacity (vph)	469	410	575	316	285	665	209	1586	821	665	1460	1129
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.94	0.98	0.19	0.98	0.74	0.60	0.23	0.38	0.15	0.64	0.88	0.23

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBTL, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.98
Intersection Signal Delay: 46.6 Intersection LOS: D
Intersection Capacity Utilization 89.1% ICU Level of Service E
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 106: Final Alternative Estes Drive & M.L.K. Jr.



HCM Signalized Intersection Capacity Analysis
106: Final Alternative Estes Drive & M.L.K. Jr.

Central West Development
10/16/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	398	361	98	280	189	361	43	536	114	383	1162	231
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		-3%			-1%			1%			-2%	
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1796	1891	1607	1778	1872	1591	1761	5060	1575	3467	3575	1599
Flt Permitted	0.26	1.00	1.00	0.23	1.00	1.00	0.11	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	498	1891	1607	423	1872	1591	198	5060	1575	3467	3575	1599
Peak-hour factor, PHF	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)	442	401	109	311	210	401	48	596	127	426	1291	257
RTOR Reduction (vph)	0	0	29	0	0	57	0	0	42	0	0	105
Lane Group Flow (vph)	442	401	80	311	210	344	48	596	85	426	1291	152
Turn Type	pm+pt		pm+ov	pm+pt		pm+ov	pm+pt		pm+ov	Prot		pm+ov
Protected Phases	3	8	1	7	4	5	1	6	7	5	2	3
Permitted Phases	8		8	4		4	6		6			2
Actuated Green, G (s)	47.0	25.0	32.0	33.7	17.2	35.1	43.4	36.4	52.9	17.9	47.3	71.1
Effective Green, g (s)	48.0	26.0	34.0	34.7	18.2	38.1	45.4	37.6	53.9	19.4	49.0	71.1
Actuated g/C Ratio	0.40	0.22	0.28	0.29	0.15	0.32	0.38	0.31	0.45	0.16	0.41	0.59
Clearance Time (s)	6.0	6.0	6.0	5.5	6.0	6.5	6.0	6.2	5.5	6.5	6.7	6.0
Vehicle Extension (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	1.0	1.0	2.0	1.0
Lane Grp Cap (vph)	467	410	522	314	284	505	179	1585	707	560	1460	947
v/s Ratio Prot	c0.20	c0.21	0.01	0.14	0.11	0.11	0.02	0.12	0.02	c0.12	c0.36	0.03
v/s Ratio Perm	0.18		0.04	0.15		0.11	0.08		0.04			0.06
v/c Ratio	0.95	0.98	0.15	0.99	0.74	0.68	0.27	0.38	0.12	0.76	0.88	0.16
Uniform Delay, d1	29.9	46.7	32.2	38.4	48.6	35.7	27.0	32.1	19.2	48.1	32.9	11.0
Progression 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
Incremental Delay, d2	28.1	38.1	0.1	48.0	8.4	3.0	0.3	0.7	0.0	5.4	8.1	0.0
Delay (s)	57.9	84.8	32.3	86.4	57.0	38.7	27.3	32.8	19.3	53.5	41.0	11.0
Level of Service	E	F	C	F	E	D	C	C	B	D	D	B
Approach Delay (s)		66.3			58.9			30.2			39.8	
Approach LOS		E			E			C			D	

Intersection Summary

HCM Average Control Delay	47.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	89.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings
106: Final Alternative Estes Drive & M.L.K. Jr.

Central West Development
10/16/2013

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	313	300	78	295	410	513	102	1207	259	452	862	355
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		-3%			-1%			1%			-2%	
Storage Length (ft)	240		250	175		100	100		100	225		200
Storage Lanes	1		1	1		1	1		1	2		1
Taper Length (ft)	100		100	100		100	100		100	100		100
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	1.00	0.97	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1796	1891	1607	1778	1872	1591	1761	5060	1575	3467	3575	1599
Flt Permitted	0.127			0.304			0.158			0.950		
Satd. Flow (perm)	240	1891	1607	569	1872	1591	293	5060	1575	3467	3575	1599
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			69			31			151			158
Link Speed (mph)		35			35			40			40	
Link Distance (ft)		1354			805			1068			761	
Travel Time (s)		26.4			15.7			18.2			13.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	348	333	87	328	456	570	113	1341	288	502	958	394
Shared Lane Traffic (%)												
Lane Group Flow (vph)	348	333	87	328	456	570	113	1341	288	502	958	394
Turn Type	pm+pt		pm+ov	pm+pt		pm+ov	pm+pt		pm+ov	Prot		pm+ov
Protected Phases	3	8	1	7	4	5	1	6	7	5	2	3
Permitted Phases	8		8	4		4	6		6			2
Detector Phase	3	8	1	7	4	5	1	6	7	5	2	3
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	12.0	7.0	7.0	12.0	7.0
Minimum Split (s)	15.0	15.0	15.0	15.0	15.0	15.0	15.0	36.0	15.0	15.0	19.0	15.0
Total Split (s)	23.0	36.0	15.0	22.0	35.0	23.0	15.0	39.0	22.0	23.0	47.0	23.0
Total Split (%)	19.2%	30.0%	12.5%	18.3%	29.2%	19.2%	12.5%	32.5%	18.3%	19.2%	39.2%	19.2%
Maximum Green (s)	17.0	30.0	9.0	16.5	29.0	16.5	9.0	32.8	16.5	16.5	40.3	17.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.7	4.0	4.0	4.7	4.0
All-Red Time (s)	2.0	2.0	2.0	1.5	2.0	2.5	2.0	1.5	1.5	2.5	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-0.5	-1.0	-1.5	-1.0	-1.2	-0.5	-1.5	-1.7	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	6.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?												
Vehicle Extension (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	1.0	1.0	2.0	1.0
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Walk Time (s)								7.0				
Flash Dont Walk (s)								22.0				
Pedestrian Calls (#/hr)								0				
Act Effct Green (s)	49.6	31.6	45.6	46.4	30.0	53.0	43.0	34.0	55.4	18.0	43.0	65.0
Actuated g/C Ratio	0.41	0.26	0.38	0.39	0.25	0.44	0.36	0.28	0.46	0.15	0.36	0.54
v/c Ratio	1.05	0.67	0.13	0.85	0.97	0.79	0.53	0.94	0.36	0.97	0.75	0.42
Control Delay	96.1	47.4	8.4	45.8	80.8	36.7	28.4	54.8	10.6	82.7	38.3	10.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	96.1	47.4	8.4	45.8	80.8	36.7	28.4	54.8	10.6	82.7	38.3	10.9

Lanes, Volumes, Timings
106: Final Alternative Estes Drive & M.L.K. Jr.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	F	D	A	D	F	D	C	D	B	F	D	B
Approach Delay		65.0			53.8			45.8			44.5	
Approach LOS		E			D			D			D	
Queue Length 50th (ft)	~243	233	9	171	352	354	48	371	61	201	338	98
Queue Length 95th (ft)	#433	338	42	#276	#563	513	83	#464	124	#310	425	174
Internal Link Dist (ft)		1274			725			988			681	
Turn Bay Length (ft)	240		250	175		100	100		100	225		200
Base Capacity (vph)	332	498	666	394	468	720	230	1434	816	520	1282	939
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.05	0.67	0.13	0.83	0.97	0.79	0.49	0.94	0.35	0.97	0.75	0.42

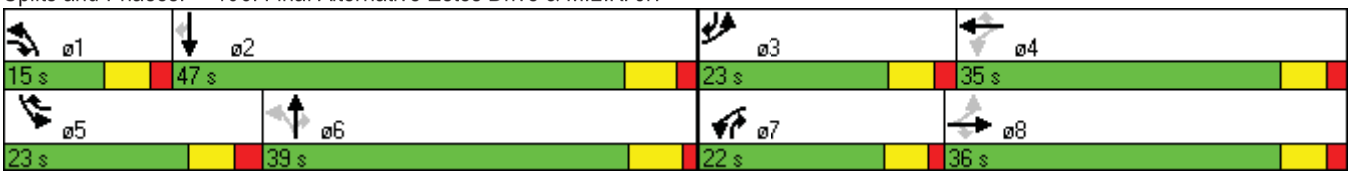
Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBTL, Start of Green
Natural Cycle: 105
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.05
Intersection Signal Delay: 49.9 Intersection LOS: D
Intersection Capacity Utilization 91.8% ICU Level of Service F
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: 106: Final Alternative Estes Drive & M.L.K. Jr.



HCM Signalized Intersection Capacity Analysis
106: Final Alternative Estes Drive & M.L.K. Jr.

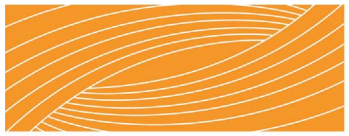
Central West Development
10/16/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	313	300	78	295	410	513	102	1207	259	452	862	355
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		-3%			-1%			1%			-2%	
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1796	1891	1607	1778	1872	1591	1761	5060	1575	3467	3575	1599
Flt Permitted	0.13	1.00	1.00	0.30	1.00	1.00	0.16	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	239	1891	1607	570	1872	1591	292	5060	1575	3467	3575	1599
Peak-hour factor, PHF	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)	348	333	87	328	456	570	113	1341	288	502	958	394
RTOR Reduction (vph)	0	0	46	0	0	18	0	0	88	0	0	81
Lane Group Flow (vph)	348	333	41	328	456	552	113	1341	200	502	958	313
Turn Type	pm+pt		pm+ov	pm+pt		pm+ov	pm+pt		pm+ov	Prot		pm+ov
Protected Phases	3	8	1	7	4	5	1	6	7	5	2	3
Permitted Phases	8		8	4		4	6		6			2
Actuated Green, G (s)	47.6	30.6	38.6	44.9	29.0	45.5	40.8	32.8	48.7	16.5	41.3	58.3
Effective Green, g (s)	49.6	31.6	40.6	45.9	30.0	48.5	42.8	34.0	49.7	18.0	43.0	58.3
Actuated g/C Ratio	0.41	0.26	0.34	0.38	0.25	0.40	0.36	0.28	0.41	0.15	0.36	0.49
Clearance Time (s)	6.0	6.0	6.0	5.5	6.0	6.5	6.0	6.2	5.5	6.5	6.7	6.0
Vehicle Extension (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	1.0	1.0	2.0	1.0
Lane Grp Cap (vph)	332	498	611	383	468	643	214	1434	652	520	1281	777
v/s Ratio Prot	c0.16	0.18	0.01	0.12	0.24	0.13	0.04	c0.27	0.04	c0.14	0.27	0.06
v/s Ratio Perm	c0.28		0.02	0.21		0.22	0.15		0.08			0.14
v/c Ratio	1.05	0.67	0.07	0.86	0.97	0.86	0.53	0.94	0.31	0.97	0.75	0.40
Uniform Delay, d1	35.5	39.5	26.9	29.4	44.6	32.6	27.9	41.9	23.6	50.7	33.7	19.7
Progression 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
Incremental Delay, d2	62.6	2.6	0.0	16.3	34.6	10.6	1.1	12.6	0.1	30.4	4.0	0.1
Delay (s)	98.1	42.2	26.9	45.7	79.2	43.2	29.0	54.6	23.7	81.1	37.8	19.8
Level of Service	F	D	C	D	E	D	C	D	C	F	D	B
Approach Delay (s)		65.8			55.9			47.8			45.7	
Approach LOS		E			E			D			D	

Intersection Summary

HCM Average Control Delay	51.4	HCM Level of Service	D
HCM Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	91.8%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group



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