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Memorandum

To	James Nozar, The JBG Companies	Page	15
CC	Steve Sindiong, City of Alexandria & Peter Colarulli, Southern Towers		
Subject	Beauregard Small Area Plan Traffic Analysis for Proposed Southern Towers Development		
From	AECOM and RK&K Engineers, LLP		
Date	April 13, 2012		

Introduction

This technical memorandum summarizes the methodology, assumptions and findings of the traffic impact analysis related to the updated development plans within the Southern Towers area, located to the north of Seminary Road and east of Beauregard Street in the City of Alexandria as part of the Beauregard Small Area Plan. The new development plan of Southern Towers assumes a different roadway network, lane configuration and site layout compared to the existing conditions, but assumes the same development density as assumed in the original draft Beauregard Small Area Plan released on January 23, 2012. The results of this technical memorandum also serves as an addendum to the Beauregard Small Area Plan Transportation Analysis Report, released on January 18, 2012. The analysis also incorporates future transit operations within the site including proposed Corridor C Bus Rapid Transit (BRT) and existing local bus operations. This analysis uses the 2035 Market Demand (Development) Land Use conditions with the development Network, which includes the Ellipse at the Seminary Road and Beauregard Street intersection. Weekday AM and PM peak hour turning movement volume forecasts for the Year 2035 Market Demand development scenario were prepared by RK&K Engineers, LLP. These forecasts were reviewed by the City of Alexandria and incorporated into the traffic operations analysis. This memorandum is organized in the following manner:

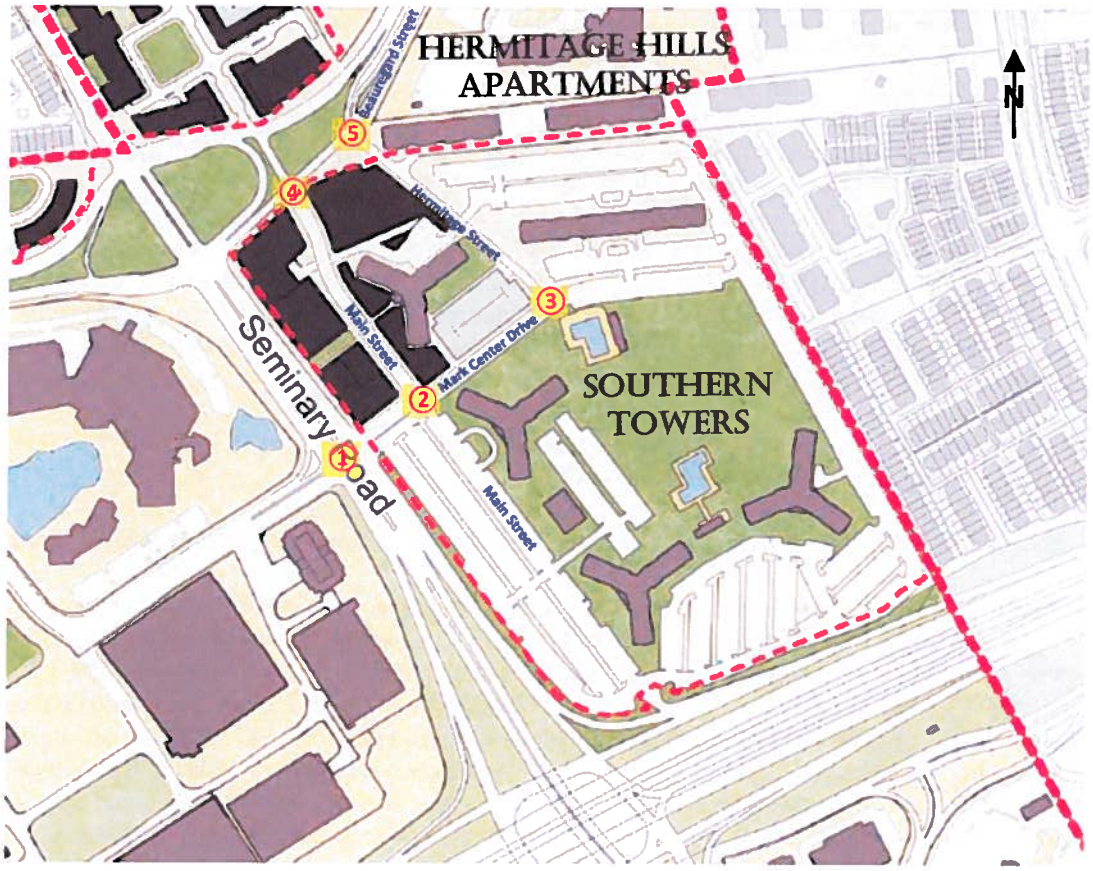
- Assumed 2035 transportation network and lane configurations in Southern Towers,
- Proposed transit facilities and operations,
- 2035 volume projection estimations,
- Analysis methodology and simulation assumptions,
- Findings and recommendations.

Assumed 2035 Transportation Network and Lane Configurations in Southern Towers Area

A new roadway network is proposed to accommodate the proposed Southern Towers redevelopment and provide better circulation within Southern Towers. While the land uses and densities remain the same as previously assumed (195,000 square feet of office, 25,000 square feet of retail, 80,000 square feet of optional retail, and a hotel of 100,000 square feet), all of the additional land use has been shifted to the west of Mark Center Drive. **Figure 1** shows the proposed roadway network as well as the study intersections for this analysis. Main Street is a two-way street parallel to Seminary Road. Westbound Main Street connects I-395 southbound off-ramp and Beauregard Street, and continues west across Beauregard Street to connect to the Hekemian development. A signal is assumed at the intersection of Main Street at Beauregard Street, providing full access at this location. Eastbound

Main Street terminates before the I-395 ramp. Within Southern Towers, Main Street has one-lane in each direction between Beauregard Street and Mark Center Drive. Hermitage Street, parallel to Main Street, is located to the north of Main Street and connects Beauregard Street and Mark Center Drive. Hermitage Street has one lane in both directions. The intersection of Hermitage Street at N. Beauregard Street would operate as a right-in/right-out intersection, except for transit which would have access to the transitway within the median of Beauregard Street. A traffic signal is proposed to facilitate the transit movement at this location. The existing access from the Hermitage Hills apartments (located north of Southern Towers) to Beauregard Street would be closed, and relocated to tie into Hermitage Street. This new access would allow for residents of Hermitage Hills to either access Beauregard Street, or continue through Southern Towers to access the signal at the intersection of Mark Center Drive and Seminary Road. Southbound Mark Center Drive approaching Seminary Road has dual left turn lanes, a single through lane and a right-turn lane. Northbound Mark Center Drive between Seminary Road and Main Street has two travel lanes. Mark Center Drive between Main Street and Hermitage Street contains two lanes in both directions and the curb lane will be primarily used as a transit lane as part of the proposed transit center in this segment. Mark Center Drive north of Hermitage Street has one-lane in each direction. The recommended intersection configuration and control at the Mark Center Drive and Main Street intersection is discussed in the subsequent sections of this memorandum.

Figure 1: Proposed Roadway Network and Study Intersections within Southern Towers



Transit Operations

This analysis includes an assessment of transit operations within Southern Towers. To the north, the proposed Bus Rapid Transit (BRT) will enter and exit Southern Towers via the Beauregard Street and Hermitage Street intersection. This intersection will be signalized to facilitate transit access to and from the transitway within the median of Beauregard Street. To the south, the BRT would enter and exit Southern Towers at the intersection of Mark Center Drive and Seminary Road. The BRT would continue across Seminary Road toward Mark Center. Two future BRT stations are proposed within Southern Towers located along Mark Center Drive between Main Street and Hermitage Street on both sides. A local transit stop is located on the north side (westbound) of Main Street about 200 feet east of Mark Center Drive. Some of the existing local buses will share the dedicated BRT lanes and the future transit station on Mark Center Drive, including WMATA bus routes 7A, 7B, 7E, 7Y, 25B, 25D and 28A. Other local buses, including the WMATA bus routes 7M, 7W, 7X, 28G, and Dash bus routes AT1 and AT2 will use the transit station on Main Street. The study assumes existing bus schedules to be maintained in the future. **Figure 2** and **Figure 3** show the future bus routes that will use BRT transitway and circulate through Southern Towers in 2035.

Figure 2: Southern Towers Transit Routes using BRT Transitway

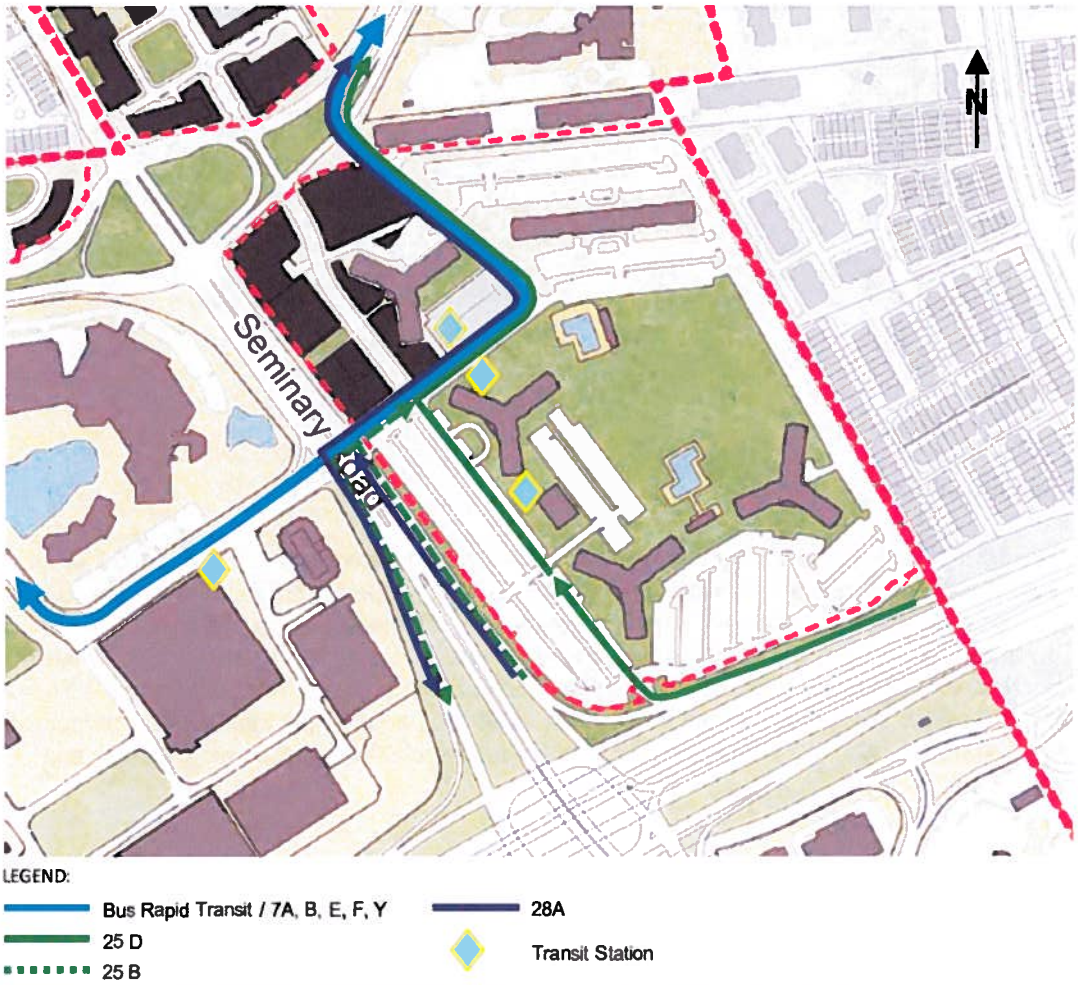
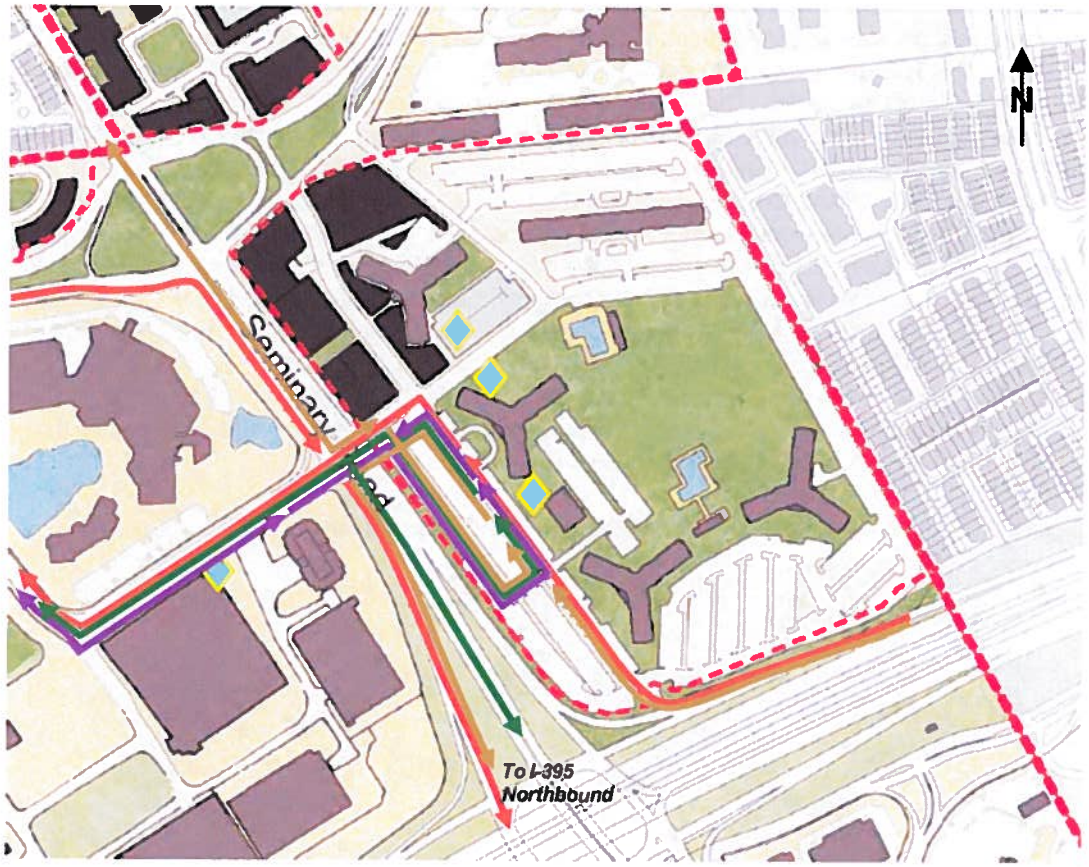


Figure 3: Southern Towers Transit Routes circulating through Southern Towers



Volume Projections

Weekday AM and PM peak hour turning movement volume forecasts for the Year 2035 Market Demand development scenario were prepared by RK&K Engineers, LLP, for several intersections along Beauregard Street and Seminary Road that would provide access to and from the Southern Towers site, as well as for several proposed intersections that would be located within the site. The "external" volumes along Beauregard Street and along Seminary Road were based on the Year 2035 Market Demand scenario volumes that were previously prepared for the Beauregard Corridor Plan study. ***Appendix A*** shows RK&K Engineers, LLP's future volume projection methodology and calculations.

Methodology and Simulation

Traffic impact analysis for the updated development within Southern Towers was conducted using VISSIM. Network updates and transit route updates relevant to the Southern Towers redevelopment were applied to 2035 simulation models that were previously developed as part of the Beauregard Small Area.

Preliminary analysis indicated that redevelopment within Southern Towers did not impact traffic operations outside the Southern Towers area but modified traffic volumes and patterns in the vicinity of Southern Towers – between Seminary Road and Hermitage Street in the north-south direction; Beauregard Street and

I-395 in the east-west direction. Various alternatives were tested to improve traffic operations within Southern Towers. Three different traffic control type and lane configuration assumptions were tested at the intersection of Main Street and Mark Center Drive.

Scenario 1:

- Three-way stop sign control on eastbound and westbound Main Street, and southbound Mark Center Drive; free-flow traffic on northbound Mark Center Drive.
- Single traffic lane on westbound Main Street at Mark Center Drive.

Scenario 2:

- Three-way stop sign control on eastbound and westbound Main Street, and southbound Mark Center Drive; free-flow traffic on northbound Mark Center Drive.
- A single left-turn traffic lane with a shared through/right-turn pocket of 150 feet on westbound Main Street approaching Mark Center Drive.

Scenario 3:

- Fully-actuated free running (uncoordinated) signalized intersection.
- Single left-turn lane with a shared left-turn/through/right-turn pocket of 150 feet on westbound Main Street approaching Mark Center Drive.
- Split phase operation for westbound and eastbound Main Street, and permitted left-turn operation for northbound and southbound Mark Center Drive.

Figure 5 shows these three scenarios at the Main Street and Mark Center Drive intersection.

Figure 5: Lane Configuration and Traffic Control Device Alternatives at the Main Street and Mark Center Drive Intersection

In order to fully utilize the two left-turn lanes on southbound Mark Center Drive at Seminary Road, the left-turn lane needs to be striped to direct drivers to the right two most lanes on eastbound Seminary Road. In this case, the drivers on the outside left-turn can immediately reach the I-395 southbound on-ramp without changing lanes while drivers on the inside left-turn lane have options to go to either the I-395 southbound on-ramp, I-395 northbound via rotary, or continue on Seminary Road.

Pedestrian activities at the Mark Center Drive and Main Street intersection were modeled in VISSIM. Pedestrian crosswalks are only assumed for the west side, north side and east side of the intersection. Note that these three crosswalks provide adequate access to the proposed transit center as well as the existing and proposed developments. The absence of a pedestrian crosswalk on the south leg of the intersection will help the traffic operation to be more efficient without adversely affecting pedestrian access.

Analysis Results

The 2035 Market AM model was used to test and compare the three scenarios. **Table 1** shows the delay and Level of Service (LOS) by approach at the Mark Center Drive and Main Street intersection for all scenarios. **Table 2** shows the queue length by approach and total number of vehicles that were not able to enter the network during the simulation period.

Table 1: Delay and LOS by approach at the Mark Center Drive and Main Street intersection (AM Peak Period)

Delay and LOS	Northbound		Southbound		Eastbound		Westbound		Overall Intersection	
	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS
Scenario 1	0.7	A	226.6	F	30.3	C	206.5	F	155.8	F
Scenario 2	0.4	A	125.0	F	24.2	C	237.1	F	117.3	F
Scenario 3	12.6	B	29.2	C	49.0	D	104.8	F	58.6	E

**Northbound/southbound is Mark Center Drive and eastbound/westbound is Main Street.*

Table 2: Queue length by approach and total number of vehicles that could not enter the network (AM Peak Period)

	Queue Length (ft)								Number of vehicles unable to enter the network
	Northbound		Southbound		Eastbound		Westbound		
	Avg Queue (ft)	Max Queue (ft)	Avg Queue (ft)	Max Queue (ft)	Avg Queue (ft)	Max Queue (ft)	Avg Queue (ft)	Max Queue (ft)	
Scenario 1	0	16	466	532	5	106	656	931	170
Scenario 2	0	8	361	524	10	106	654	780	160
Scenario 3	11	116	82	340	13	133	217	620	0

**Northbound/southbound is Mark Center Drive and eastbound/westbound is Main Street.*

As shown in **Table 1** and **Table 2**, Scenario 3 provides better traffic operations at the Mark Center Drive and Main Street intersection during the AM peak hour. The overall intersection LOS is F for Scenario 1 and Scenario 2, and LOS E for Scenario 3. All of the vehicles in Scenario 3 can be processed within the simulation period while more than 160 vehicles were not able to enter the simulation network in Scenarios 1 and 2.

Traffic Operations with the Implementation of Scenario 3

Based on the alternative analysis, Scenario 3 was used to analyze traffic impacts of the revised Southern Towers redevelopment on the entire Beauregard Small Area Plan study area during both AM and PM peak hours. **Table 3** and **Table 4** show the delay and LOS by lane group at all study intersections within the network. **Table 5** shows the queue length by approach at major intersections. Please note all the results shown below assume that with the revised Southern Towers redevelopment in 2035, Scenario 3 will be implemented.

In comparison to the original 2035 Market Demand (Development) analysis identified in the January 18, 2012 Traffic Report, changes in delay/LOS are observed at several intersections:

- Beauregard Street and Seminary Road (AM) – Delay increases from 54.3 second/vehicle (LOS D) to 57.3 second/vehicle (LOS E). Please note the change in LOS is due to a small increase in delay because the LOS average delay threshold for LOS D is 55.0 second/vehicle.

- Seminary Road and Mark Center Drive (AM) – Delay increases from 32.8 second/vehicle (LOS C) to 37.3 second/vehicle (LOS D). Please note the change in LOS is due to a small increase in delay because the LOS average delay threshold for LOS D is 35.0 second/vehicle.
- Beauregard Street and Seminary Road (PM) – Delay decreases from 57.3 second/vehicle (LOS E) to 54.1 second/vehicle (LOS D).

Delay and LOS changes at these intersections are due to lane configuration updates and corresponding signal timing adjustments within the Southern Towers site and the vicinity. Although the LOS downgrades by one letter at two intersections as indicated above, the traffic delay increase due to the revised Southern Towers redevelopment is less than 5 seconds per vehicle at these intersections.

The maximum queue on westbound Seminary Road approaching Beauregard Street extends to the upstream intersection during the PM peak. However, the queue length beyond the distance between the two intersections is short and the queuing instances only occur in one or two signal cycles as the average queue indicates a length that is much shorter than the storage length. Other queue results are comparable to the original analysis.

Proposed BRT operations and local bus operations were included in the analysis. Visual inspection of the models indicated that transitway operations at Beauregard Street and Seminary Road were adequate. Furthermore, LOS/queue outputs indicate minimal traffic impacts due to transit within the Southern Towers.

Findings and Recommendations

The results indicate that levels of service at the study intersections with the new Southern Towers site plan and transit operations are comparable to the original analysis results with relatively small delay increases. Proposed BRT operations and local bus operations were included in the analysis. Visual inspection of the models indicated that transitway operations at Beauregard Street and Seminary Road were adequate. Furthermore, LOS/queue outputs indicate minimal traffic impacts due to transit within the Southern Towers.

The recommendations of this analysis include:

- Signalization of the intersection of Main Street and Mark Center Drive (a more detailed signal warrant study is recommended before implementing a signal at this location);
- Providing a single left-turn lane and a shared right/through/left pocket of 150 feet on westbound Main Street at Mark Center Drive;
- Signalization of the intersection of Hermitage Street and Beauregard Street to facilitate transit access to and from the transitway within the median of Beauregard Street (a more detailed signal warrant and transit operations study is recommended before implementing a transit signal at this location);
- Configuring the Beauregard Street and Hermitage Street intersection as right-in/right-out for vehicular access except for transit.

Table 3: Approach delay and LOS by lane group - 2035 Market AM (Scenario 3)

Intersection	Northbound		Southbound		Eastbound		Westbound		Overall Intersection	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Beauregard St / Route 236	63.5	E	62.0	E	85.8	F	39.5	D	63.4	E
Beauregard St / N Chambliss St	9.6	A	40.7	D	120.2	F	74.7	E	52.9	D
Beauregard St / Lincolnia Rd	10.1	B	9.7	A	1.7	A	47.2	D	17.9	B
Beauregard St / Quantrell Ave	7.3	A	3.9	A	-	-	48.8	D	15.5	B
Beauregard St / N Armistead St	3.6	A	5.8	A	18.2	B	26.0	C	10.0	A
Beauregard St / N Morgan St	3.0	A	5.0	A	49.9	D	28.9	C	9.2	A
Beauregard St / Old Sanger Ave	9.6	A	7.4	A	18.4	B	43.4	D	13.4	B
Beauregard St / Relocated Sanger Ave	7.9	A	6.7	A	33.2	C	35.3	D	12.8	B
Beauregard St / Roanoke Ave	14.6	B	21.1	C	49.6	D	20.4	C	18.2	B
Beauregard St / Reading Ave	14.3	B	18.8	B	38.5	D	14.6	B	18.0	B
Beauregard St / Rayburn Ave	14.3	B	5.4	A	57.4	E	19.5	B	18.8	B
Beauregard St / Highview Ln	16.8	B	14.5	B	49.7	D	16.7	B	22.4	C
Beauregard St / Mark Center Dr	25.3	C	58.6	E	53.8	D	39.4	D	40.4	D
Beauregard St / Seminary Rd	24.3	D	90.5	F	48.4	D	70.4	E	57.3	E
Beauregard St / Fillmore Ave	8.3	A	5.5	A	13.4	B	58.2	E	10.0	A
Beauregard St / W Braddock Rd	19.0	B	36.5	D	39.3	D	22.9	C	25.1	C
Beauregard St / King St	55.6	E	168.1	F	52.5	D	46.3	D	62.2	E
Beauregard St / Hermitage St	1.0	A	39.5	D	-	-	10.3	B	2.5	A
Seminary Rd / S. George Mason Dr	16.5	B	20.7	C	7.0	A	24.9	C	14.7	B
Seminary Rd / Dawes Ave	37.1	D	28.8	C	6.6	A	4.4	A	4.6	A
Seminary Rd / Echols Ave	20.2	C	46.9	D	3.6	A	11.9	B	6.6	A
Seminary Rd / Mark Center Dr	26.0	C	55.4	E	39.3	D	33.0	C	37.3	D
Seminary Rd / I-395 Rotary	37.2	D	16.8	B	33.6	C	29.6	C	28.7	C
Seminary Rd / I-395 HOV Ramp	37.3	D	-	-	30.7	C	40.8	D	36.6	D
Seminary Rd / Library Ln	47.7	D	44.5	D	20.5	C	10.1	B	19.7	B
Seminary Rd / Hammond M.S.	51.8	D	24.8	C	2.6	A	1.2	A	3.3	A
Seminary Rd / N Pickett St	38.9	D	-	-	2.6	A	3.7	A	7.1	A
Seminary Rd / N Jordan St	50.3	D	-	-	4.2	A	7.6	A	13.8	B
N Van Dorn St / Taney Ave	16.6	B	6.9	A	-	-	44.3	D	16.4	B
N Van Dorn St / Sanger Ave	17.0	B	21.0	C	91.0	F	39.9	D	32.2	C
N Van Dorn St / Kenmore Ave	8.3	A	6.4	A	-	-	33.3	C	9.7	A
N Van Dorn St / W Braddock Rd	22.0	C	27.1	C	50.8	D	55.6	E	32.9	C
W Braddock Rd / Hampton Dr	43.1	D	27.5	C	3.8	A	5.5	A	9.8	A
Mark Center Dr / Main St	12.6	B	29.2	C	49.0	D	104.8	F	58.6	E
Mark Center Dr / Hermitage Dr	5.2	A	1.0	A	-	-	13.0	B	3.3	A

Note: Beauregard Street and North Van Dorn Street are north-south roadways. Seminary Road and West Braddock Road are east-west roadways. Results are based on 15 simulation runs.

Table 4: Approach delay and LOS by lane group - 2035 Market PM (Scenario 3)

Intersection	Northbound		Southbound		Eastbound		Westbound		Overall Intersection	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Beauregard St / Route 236	60.3	E	40.7	D	105.7	F	86.4	F	79.3	E
Beauregard St / N Chambliss St	13.3	B	35.4	D	38.2	D	123.3	F	37.7	D
Beauregard St / Lincolnia Rd	9.6	A	10.8	B	1.8	A	45.3	D	16.5	B
Beauregard St / Quantrell Ave	2.8	A	4.7	A	-	-	46.1	D	8.1	A
Beauregard St / N Armistead St	8.8	A	3.8	A	10.0	B	18.5	B	7.5	A
Beauregard St / N Morgan St	3.3	A	4.3	A	50.2	D	28.4	C	6.4	A
Beauregard St / Old Sanger Ave	22.3	C	7.0	A	9.6	A	51.4	D	18.2	B
Beauregard St / Relocated Sanger Ave	5.3	A	7.7	A	23.7	C	30.2	C	10.1	B
Beauregard St / Roanoke Ave	25.5	C	38.9	D	25.8	C	16.2	B	32.5	C
Beauregard St / Reading Ave	14.4	B	17.4	B	25.2	C	9.3	A	16.3	B
Beauregard St / Rayburn Ave	9.8	A	9.5	A	44.7	D	41.7	D	15.1	B
Beauregard St / Highview Ln	5.1	A	6.0	A	56.7	E	30.3	C	9.4	A
Beauregard St / Mark Center Dr	24.4	C	15.6	B	50.0	D	38.1	D	24.9	C
Beauregard St / Seminary Rd	35.3	D	52.6	D	35.4	D	85.1	F	54.1	D
Beauregard St / Fillmore Ave	9.5	A	7.6	A	19.2	B	48.8	D	10.9	B
Beauregard St / W Braddock Rd	23.0	C	28.8	C	53.6	D	18.9	B	26.9	C
Beauregard St / King St	53.5	D	82.5	F	73.9	E	33.7	C	61.9	E
Beauregard St / Hermitage St	1.3	A	62.1	E	-	-	14.1	B	3.3	A
Seminary Rd / S. George Mason Dr	28.8	C	22.0	C	9.4	A	33.2	C	21.8	C
Seminary Rd / Dawes Ave	37.1	D	40.5	D	5.6	A	7.5	A	8.8	A
Seminary Rd / Echols Ave	17.8	B	46.1	D	3.7	A	5.2	A	4.9	A
Seminary Rd / Mark Center Dr	25.9	C	43.1	D	34.3	C	46.4	D	35.6	D
Seminary Rd / I-395 Rotary	10.2	B	27.3	C	18.4	B	10.2	B	15.9	B
Seminary Rd / I-395 HOV Ramp	-	-	-	-	10.7	B	13.8	B	11.8	B
Seminary Rd / Library Ln	40.5	D	40.5	D	23.6	C	14.3	B	23.0	C
Seminary Rd / Hammond M.S.	30.1	C	16.3	B	1.4	A	0.8	A	1.4	A
Seminary Rd / N Pickett St	31.4	C	-	-	3.5	A	4.2	A	5.1	A
Seminary Rd / N Jordan St	54.2	D	-	-	5.7	A	8.5	A	11.4	B
N Van Dorn St / Taney Ave	8.5	A	5.5	A	-	-	41.9	D	8.9	A
N Van Dorn St / Sanger Ave	39.1	D	51.4	D	98.8	F	70.3	E	60.6	E
N Van Dorn St / Kenmore Ave	4.4	A	9.3	A	-	-	58.9	E	15.8	B
N Van Dorn St / W Braddock Rd	36.2	D	35.5	D	35.8	D	41.3	D	36.7	D
W Braddock Rd / Hampton Dr	31.7	C	46.6	D	2.8	A	7.6	A	15.7	B
Mark Center Dr / Main St	11.4	B	34.2	C	26.8	C	31.1	C	26.5	C
Mark Center Dr / Hermitage St	1.7	A	2.4	A	-	-	20.1	C	4.3	A

Note: Beauregard Street and North Van Dorn Street are north-south roadways. Seminary Road and West Braddock Road are east-west roadways. Results are based on 15 simulation runs.

Table 5: Queue length by lane group – 2035 Market AM/PM (Scenario 3)

Intersection	Approach	Road	2035 Market AM		2035 Market PM		Storage Length (ft)
			Avg Queue (ft)	Max Queue (ft)	Avg Queue (ft)	Max Queue (ft)	
Seminary Rd @ I-395 Rotary	WB	I-395 NB On-Ramp	106	336	23	145	580
	SB	I-395 SB Off-Ramp	29	126	17	98	1830
	EBTH	I-395 SB On-Ramp	112	462	66	286	870
	EBRT[1]	I-395 SB On-Ramp	-	-	13	231	1700
	NB	I-395 NB Off-Ramp	53	205	49	199	1110
Seminary Rd @ Mark Center Dr	WBLT	Seminary Rd	287	527	34	200	1100
	WBTH	Seminary Rd	110	523	124	424	960
	WBRT	Seminary Rd	98	324	19	216	960
	EBLT	Seminary Rd	16	92	31	194	570
	EBTH	Seminary Rd	117	453	119	539	570
	EBRT	Seminary Rd	16	223	9	309	570
	NBLT	Mark Center Dr	52	207	112	463	760
	NBTH	Mark Center Dr	52	207	112	463	760
	NBRT	Mark Center Dr	52	207	112	463	760
	SBLT	Mark Center Dr	107	237	69	241	245
	SBTH	Mark Center Dr	107	237	69	241	245
	SBRT	Mark Center Dr	107	237	69	241	245
Beauregard St @ Mark Center Dr	WBLT	Mark Center Dr	15	105	93	370	920
	WBTH	Mark Center Dr	15	105	93	370	920
	WBRT	Mark Center Dr	0	0	22	239	920
	EBLT	Mark Center Dr	54	204	77	263	275
	EBTH	Mark Center Dr	54	204	77	263	275
	EBRT	Mark Center Dr	1	71	8	140	275
	NBLT	Beauregard St	171	770	87	446	690
	NBTH	Beauregard St	171	770	87	446	690
	NBRT	Beauregard St	171	770	87	446	690
	SBLT	Beauregard St	191	412	62	307	670
	SBTH	Beauregard St	191	412	62	307	670
	SBRT	Beauregard St	14	162	0	57	670
Seminary Rd @ Echols Ave	WBLT	Seminary Rd	0	36	1	61	840
	WBTH	Seminary Rd	35	395	20	376	840
	WBRT	Seminary Rd	24	336	9	286	840
	EBLT	Seminary Rd	1	29	1	24	940
	EBTH	Seminary Rd	10	258	12	287	940
	EBRT	Seminary Rd	2	180	1	173	940
	NBLT	Echols Ave	10	133	4	69	435
	NBRT	Echols Ave	1	58	0	7	435

Intersection	Approach	Road	2035 Market AM		2035 Market PM		Storage Length (ft)
			Avg Queue (ft)	Max Queue (ft)	Avg Queue (ft)	Max Queue (ft)	
	SBLT	Echols Ave	4	47	4	52	390
	SBRT	Echols Ave	0	0	0	0	390
Seminary Rd @ Library Ln	WBLT	Seminary Rd	1	27	2	52	370
	WBTH	Seminary Rd	22	205	29	219	370
	WBRT	Seminary Rd	22	205	29	219	370
	EBLT	Seminary Rd	59	374	133	880	950
	EBTH	Seminary Rd	59	374	133	880	950
	EBRT	Seminary Rd	59	374	130	881	950
	NBLT	Library Ln	14	99	11	90	330
	NBTH	Library Ln	14	99	11	90	330
	NBRT	Library Ln	14	99	1	47	330
	SBLT	Library Ln	9	74	27	220	650
	SBTH	Library Ln	9	74	27	220	650
	SBRT	Library Ln	65	387	57	380	650
Mark Center Dr @ Main St	WBLT	Main St	216	617	46	365	900
	WBTH	Main St	216	618	47	365	900
	WBRT	Main St	217	620	52	375	900
	EBLT	Main St	13	133	21	161	612
	EBTH	Main St	13	133	21	161	612
	EBRT	Main St	12	134	19	162	612
	NBLT	Mark Center Dr	8	104	12	158	170
	NBTH	Mark Center Dr	8	104	12	158	170
	NBRT	Mark Center Dr	11	116	17	172	170
	SBLT	Mark Center Dr	81	337	67	407	420
	SBTH	Mark Center Dr	81	337	67	407	420
	SBRT	Mark Center Dr	82	340	68	408	420
Seminary Rd @ Beauregard St[2]	WBLT *	Seminary Rd	97	365	153	365	365
	WBLT	Seminary Rd	158	420	186	567	550
	WBTH	Seminary Rd	158	420	186	567	550
	WBRT	Seminary Rd	158	420	186	567	550
	EBLT	Seminary Rd	27	408	74	587	920
	EBTH	Seminary Rd	96	517	74	587	920
	EBRT	Seminary Rd	27	408	74	587	920
	NBLT	Beauregard St	19	198	33	328	430
	NBTH	Beauregard St	19	198	33	328	430
	NBRT	Beauregard St	19	198	33	328	430
	SBLT	Beauregard St	117	306	112	336	1106
	SBTH	Beauregard St	117	306	112	336	1106

Intersection	Approach	Road	2035 Market AM		2035 Market PM		Storage Length (ft)
			Avg Queue (ft)	Max Queue (ft)	Avg Queue (ft)	Max Queue (ft)	
	SBRT	Beauregard St	117	306	112	336	1106
	WBLT **	Southern Towers	109	501	39	358	612
	WBTH **	Southern Towers	109	501	39	358	612
	WBRT **	Southern Towers	109	501	39	358	612
	EBLT **	Hekemian	34	176	26	163	181
	EBTH **	Hekemian	34	176	26	163	181
	EBRT **	Hekemian	34	176	26	163	181
Beauregard St @ Highview Ln	WBLT	Mark Center Dr	2	34	16	99	235
	WBTH	Mark Center Dr	2	34	16	99	235
	WBRT	Mark Center Dr	0	0	0	10	235
	EBLT	Mark Center Dr	102	378	38	190	430
	EBTH	Mark Center Dr	102	378	38	190	430
	EBRT	Mark Center Dr	36	272	1	81	430
	NBLT	Beauregard St	46	449	13	123	610
	NBTH	Beauregard St	46	449	13	123	610
	NBRT	Beauregard St	2	210	0	21	610
	SBLT	Beauregard St	17	129	26	294	690
	SBTH	Beauregard St	17	129	26	294	690
	SBRT	Beauregard St	0	2	1	58	690
Beauregard St @ Rayburn Ave	WBLT	Rayburn Ave	5	50	20	108	470
	WBTH	Rayburn Ave	5	50	20	108	470
	WBRT	Rayburn Ave	5	50	0	8	470
	EBLT	Rayburn Ave	111	396	66	299	910
	EBTH	Rayburn Ave	111	396	66	299	910
	EBRT	Rayburn Ave	111	396	16	204	910
	NBLT	Beauregard St	27	203	22	129	625
	NBTH	Beauregard St	27	203	22	129	625
	NBRT	Beauregard St	3	83	2	54	625
	SBLT	Beauregard St	5	121	34	337	610
	SBTH	Beauregard St	5	121	34	337	610
	SBRT	Beauregard St	0	0	0	60	610
Beauregard St @Reading Ave	WBLT	Reading Ave	6	62	7	77	470
	WBTH	Reading Ave	6	62	7	77	470
	WBRT	Reading Ave	3	61	8	81	470
	EBLT	Reading Ave	29	138	18	119	1020
	EBTH	Reading Ave	29	138	18	119	1020
	EBRT	Reading Ave	30	140	15	120	1020
	NBLT	Beauregard St	60	276	40	163	850

Intersection	Approach	Road	2035 Market AM		2035 Market PM		Storage Length (ft)
			Avg Queue (ft)	Max Queue (ft)	Avg Queue (ft)	Max Queue (ft)	
	NBTH	Beauregard St	60	276	40	163	850
	NBRT	Beauregard St	12	271	3	119	850
	SBLT	Beauregard St	17	98	49	256	625
	SBTH	Beauregard St	17	98	49	256	625
	SBRT	Beauregard St	12	101	37	253	625
Beauregard St @Roanoke Ave	WBLT	Roanoke Ave	12	164	5	85	280
	WBTH	Roanoke Ave	12	164	5	85	280
	WBRT	Roanoke Ave	0	7	0	0	280
	EBLT	Roanoke Ave	19	116	8	91	500
	EBTH	Roanoke Ave	19	116	8	91	500
	EBRT	Roanoke Ave	0	0	0	0	500
	NBLT	Beauregard St	84	363	65	320	415
	NBTH	Beauregard St	84	363	65	320	415
	NBRT	Beauregard St	12	221	3	157	415
	SBLT	Beauregard St	33	179	154	569	850
	SBTH	Beauregard St	33	179	154	569	850
	SBRT	Beauregard St	0	70	43	392	850
Beauregard St @New Sanger Ave	WBTH	New Sanger Ave	30	185	17	129	730
	WBRT	New Sanger Ave	30	185	17	129	730
	EBLT	New Sanger Ave	23	146	24	226	380
	EBTH	New Sanger Ave	23	146	24	226	380
	EBRT	New Sanger Ave	23	147	22	226	380
	NBLT	Beauregard St	3	120	2	67	370
	NBTH	Beauregard St	19	342	7	226	370
	NBRT	Beauregard St	19	342	5	228	370
	SBLT	Beauregard St	10	77	18	176	415
	SBTH	Beauregard St	10	77	18	176	415
	SBRT	Beauregard St	1	79	15	176	415
Beauregard St @ Old Sanger Ave	WBLT	Old Sanger Ave	35	155	56	216	840
	WBTH	Old Sanger Ave	35	155	56	216	840
	WBRT	Old Sanger Ave	42	168	66	230	840
	EBLT	Old Sanger Ave	12	102	7	70	540
	EBTH	Old Sanger Ave	12	102	7	70	540
	EBRT	Old Sanger Ave	11	110	11	83	540
	NBLT	Beauregard St	0	20	1	36	860
	NBTH	Beauregard St	25	281	56	350	860
	NBRT	Beauregard St	24	282	56	351	860
	SBLT	Beauregard St	7	106	4	89	910

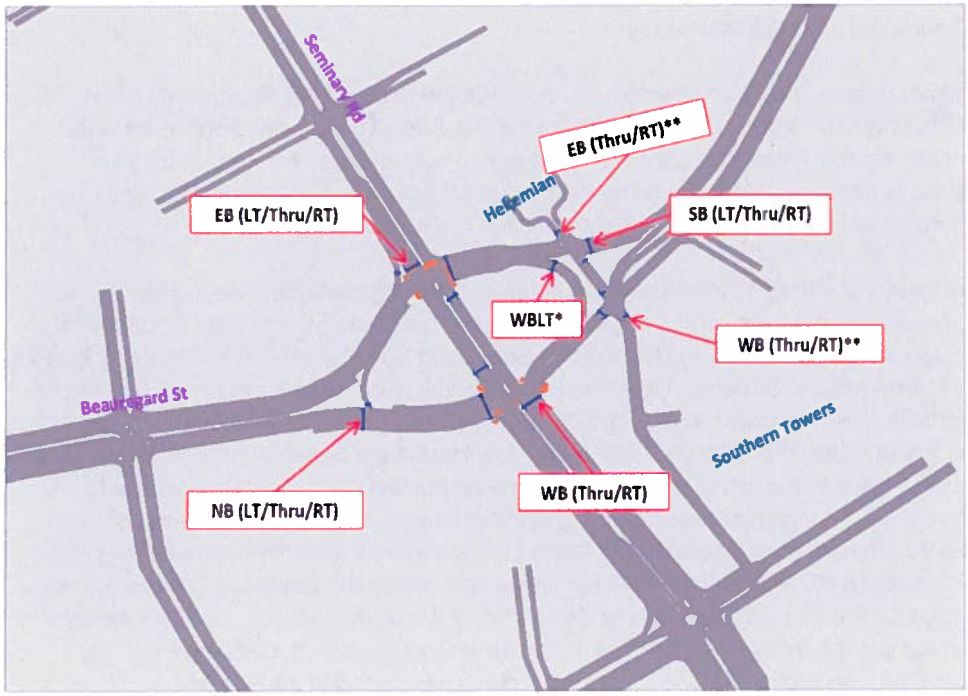
Intersection	Approach	Road	2035 Market AM		2035 Market PM		Storage Length (ft)
			Avg Queue (ft)	Max Queue (ft)	Avg Queue (ft)	Max Queue (ft)	
	SBTH	Beauregard St	7	106	16	209	910
	SBRT	Beauregard St	6	109	14	210	910
Beauregard St @ Hermitage St	WBRT	Hermitage St	3	82	5	112	700
	NBTH	Beauregard St	3	170	3	144	240
	NBRT	Beauregard St	3	176	4	163	240

Notes:

1. Results based on 15 simulation runs

2. I-395 SB Ramp is metered in the PM Peak. The queue results are obtained from a Queue Counter placed at the ramp meter in VISSIM.

3. Refer to the following figure for approach designations at Seminary Rd/Beauregard St (Ellipse).



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APPENDIX A - RK&K Engineers, LLP's Future Volume Projection Methodology and Calculations

Intersection turning movement counts were performed by McMahon Associates, Inc., in early June 2011 for the intersection of Beauregard Street and the Southern Towers driveway, the intersection of the Southern Towers driveway and Mark Center Drive located within the site, the intersection of Seminary Road and Mark Center Drive, and the intersection of the off-ramp from northbound I-395 and the driveway into Southern Towers. These counts show the existing volume of traffic entering and exiting the Southern Towers site. To determine how much traffic would be entering and exiting the Southern Towers site in 2035, a growth factor was applied to these 2011 volumes. This growth factor was determined by entering the proposed Southern Towers redevelopment details (i.e., the floor area of new retail, office and residential development units) into the Institute of Transportation Engineers (ITE) trip generation formulas to obtain site trip estimates for 2010 and 2035, and comparing the change in the estimated number of trips generated between those two years. The trips estimated to be generated by the Southern Towers site in 2010 and 2035, using the ITE methodology, are summarized in **Table 1**. Using this comparison, the Year 2035 site-generated trips would be 36% higher than the existing Year 2011 site trips generated during the AM peak hour, and 45% higher than the existing site trips generated during the PM peak hour. These ITE-based Year 2035 site-generated trips were synthesized with the "external" volumes along Beauregard Street and Seminary Road from the Year 2035 Market Demand scenario volumes previously prepared for the Beauregard Corridor Plan study.

Existing site trip estimates were also calculated for the adjacent Hermitage Hills Apartments using ITE formulas, because the proposed internal street layout for the Southern Towers site would modify the existing access to that property. Since this property is not being redeveloped, the Year 2035 trips generated by these apartments would be the same as the current year trip generation. The trips generated by the Hermitage Hills Apartments are summarized in **Table 2**.

The trips generated by the Southern Towers redevelopment and the adjacent Hermitage Hills Apartments, as well as from the southbound I-395 off-ramp, were distributed throughout the site to and from the following three access points along Beauregard Street and Seminary Road:1) Seminary Road at Mark Center Drive, 2) Beauregard Street at "New Main Street" (which would be located just north of the proposed Beauregard/Seminary ellipse and also provide access to the proposed Hekemian development west of Beauregard Street), and 3) Beauregard Street at "New Hermitage Street" (which would be located near the existing access point to the Hermitage Hills Apartments but would now provide access to Southern Towers as well). The trips generated by the proposed Hekemian development west of Beauregard Street are summarized in **Table 3**, and these trips were used to estimate the future year traffic volumes at intersection #2 listed above. The trip distribution within the Southern Towers site was based on the proposed locations of certain types of development within the site (i.e., such as the location of the proposed parking garage, which would attract trips), as well as the turn percentages (left vs. through vs. right) from the intersection turning movement counts performed in June 2011.

The total Year 2035 AM and PM peak hour intersection turning movement volumes associated with the redevelopment of the Southern Towers property are shown on **Figure 1**. These traffic volumes were subsequently used to perform operational analyses using VISSIM.

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Appendix A -Table 1: Summary of Trips Generated by the Southern Towers Redevelopment (ITE Method)

YEAR 2011 - 2020						
TRIP TOTALS	MORNING PEAK HOUR Adjacent Street Traffic			EVENING PEAK HOUR Adjacent Street Traffic		
	IN	OUT	TOTAL	IN	OUT	TOTAL
General Office (ITE-710)						
75,000 sq.ft.	131	18	149	28	135	163
Transit Reduction (20% for AM and PM)	-26	-4	-30	-6	-27	-33
Trips after Transit Reduction	*105*	*14*	*119*	*22*	*108*	*130*
less internal trips(2% AM, 4% PM)	-2	0	-2	-1	-5	-6
Net New Trips	***103***	***14***	***117***	***21***	***103***	***124***
Shopping Center (ITE-820)						
45,900 sq.ft.	59	38	97	181	197	378
Transit Reduction (20% for AM and PM)	-12	-8	-19	-36	-39	-76
Trips after Transit Reduction	*47*	*30*	*78*	*145*	*158*	*302*
less internal trips(2% AM, 4% PM)	-1	-1	-2	-6	-7	-13
Net External Trips	46	29	76	139	151	289
Pass-by Trips(0% AM, 34% PM)	0	0	0	-48	-52	-100
Net New Trips	***46***	***29***	***76***	***91***	***99***	***189***
2011-2020 New Trips	*149*	*43*	*193*	*112*	*202*	*313*
YEAR 2021 - 2035						
Hotel Rooms (ITE-310)						
140 rooms	**38**	**24**	**62**	**44**	**39**	**83**
General Office (ITE-710)						
120,000 sq.ft.	191	26	217	36	177	213
Transit Reduction (20% for AM and PM)	-38	-5	-43	-7	-35	-43
Trips after Transit Reduction	*153*	*21*	*174*	*29*	*142*	*170*
less internal trips(2% AM, 3% PM)	-3	0	-3	-1	-5	-6
Net New Trips	***150***	***21***	***171***	***28***	***137***	***164***
Shopping Center (ITE-820)						
59,100 sq.ft.	69	44	113	215	232	447
Transit Reduction (20% for AM and PM)	-14	-9	-23	-43	-46	-89
Trips after Transit Reduction	*55*	*35*	*90*	*172*	*186*	*358*
less internal trips (2% AM, 3% PM)	-1	-1	-2	-6	-6	-11
Net External Trips	54	34	88	166	180	347
Pass-by Trips (0% AM, 34% PM)	0	0	0	-57	-62	-118
Net New Trips	***54***	***34***	***88***	***109***	***118***	***229***
2021-2035 New Trips	*242*	*79*	*321*	*181*	*294*	*476*
2011-2035 New Trips	*391*	*122*	*514*	*293*	*496*	*789*
YEAR 2010						
TRIP TOTALS	MORNING PEAK HOUR Adjacent Street Traffic			EVENING PEAK HOUR Adjacent Street Traffic		
	IN	OUT	TOTAL	IN	OUT	TOTAL
Apartment Units (ITE-220)						
2,378 units	234	935	1169	862	464	1326
Transit Reduction (20% for AM and PM)	-47	-187	-234	-172	-93	-265
Trips after Transit Reduction	***187***	***748***	***935***	***690***	***371***	***1061***
less internal trips (3% AM, 8% PM)	-6	-22	-28	-56	-30	-85
Net New Trips	***181***	***726***	***907***	***634***	***341***	***976***
	AM	**PM**				
Growth Factor from 2010 to 2020:	0 18	0 24				
Growth Factor from 2010 to 2035:	0 36	0 45				

Appendix A - Table 2: Summary of Existing Trips Generated by the Hermitage Hills Apartments (ITE Method)

Hermitage Hills Apartments - ITE Trip Generation

AM Peak Hour of Adjacent Street Traffic - Weekday

Dwelling Units	122
Total Trips	64
Entering	*13*
Exiting	*51*

PM Peak Hour of Adjacent Street Traffic - Weekday

Dwelling Units	122
Total Trips	85
Entering	*55*
Exiting	*30*

Appendix A - Table 3: Summary of Existing Trips Generated by the Hekemian Development (ITE Method)

YEAR 2011 - 2020

TRIP TOTALS	MORNING PEAK HOUR Adjacent Street Traffic			EVENING PEAK HOUR Adjacent Street Traffic		
	IN	OUT	TOTAL	IN	OUT	TOTAL
Apartment Units (ITE-220)						
520 units	52	207	259	198	106	304
Transit Reduction (20% for AM and PM)	-10	-41	-52	-40	-21	-61
Trips after Transit Reduction	*42*	*166*	*207*	*158*	*85*	*243*
less internal trips (3% AM, 8% PM)	-1	-5	-6	-13	-7	-20
Net New Trips	***41***	***161***	***201***	***145***	***78***	***223***
Hotel Rooms (ITE-310)						
140 rooms	**38**	**24**	**62**	**44**	**39**	**83**
Shopping Center (ITE-820)						
16,000 sq.ft.	32	20	52	89	97	186
Transit Reduction (20% for AM and PM)	-6	-4	-10	-18	-19	-37
Trips after Transit Reduction	*26*	*16*	*42*	*71*	*78*	*149*
less internal trips (3% AM, 8% PM)	-1	0	-1	-6	-7	-12
Net External Trips	25	16	41	65	71	137
Pass-by Trips (0% AM, 34% PM)	0	0	0	-23	-25	-48
Net New Trips	***25***	***16***	***41***	***42***	***46***	***89***
General Office (ITE-710)						
78,469 sq.ft.	136	18	154	28	139	167
Transit Reduction (20% for AM and PM)	-27	-4	-31	-6	-28	-33
Trips after Transit Reduction	*109*	*14*	*123*	*22*	*111*	*134*
less internal trips (3% AM, 8% PM)	-3	0	-4	-2	-9	-11
Net New Trips	***106***	***14***	***119***	***20***	***102***	***123***
2011-2020 New Trips	*210*	*215*	*423*	*251*	*265*	*518*

YEAR 2021 - 2035 ; No New Trips Generated

2021-2035 New Trips	*0*	*0*	*0*	*0*	*0*	*0*
2011-2035 New Trips	*210*	*215*	*423*	*251*	*265*	*518*

Appendix A - Figure 1: Year 2035 Traffic Volume Forecasts for Southern Towers