

Traffic Impact Study The Wellsley Development Gleason Road, Knoxville, TN

PREPARED FOR:

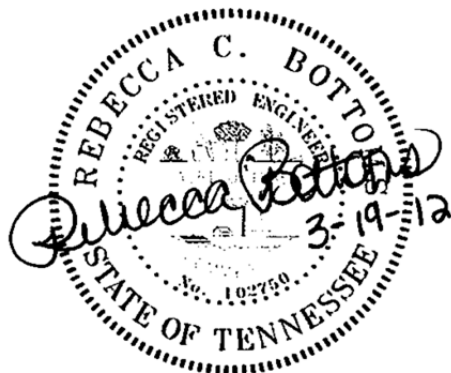
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CCI Project No. 01016-0000

March 19, 2012



Cannon & Cannon, Inc.
Consulting Engineers • Field Surveyors

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EXECUTIVE SUMMARY

This report provides a summary of a traffic impact study that was performed for a proposed multi-use development to be located on approximately 3 acres in West Knoxville. The project site is located on the north side of Gleason Drive between Morrell Road and Wellsley Park Road. The development plan for this project proposes 184 residential apartment units and 14,000 square feet of specialty retail with two accesses to be located on Gleason Drive and one access to be located on the Deane Hill Shopping Center south access driveway.

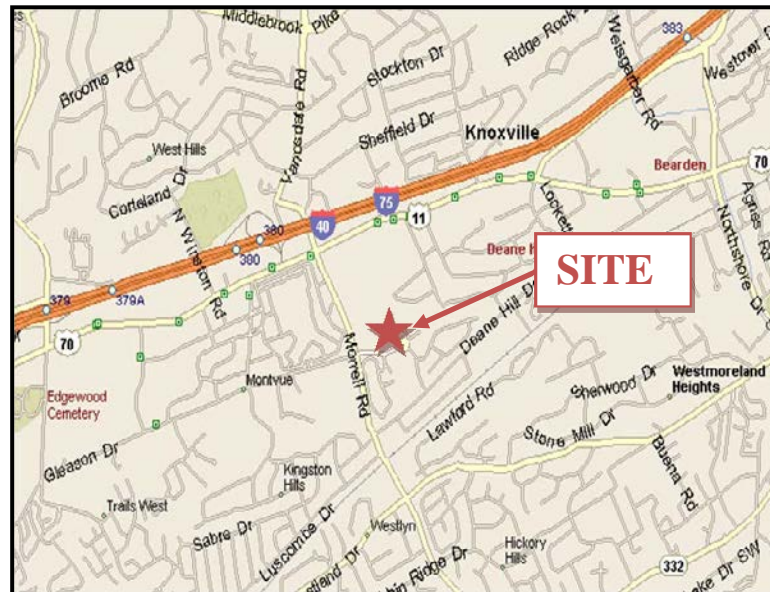
The purpose of this study was the evaluation of the traffic operational and safety impacts of the proposed development upon roadways in the vicinity of the site. Of particular interest were the signalized intersections of Morrell Road at Gleason Drive and Morrell Road at Deane Hill Drive, and the unsignalized intersection of Deane Hill Drive at Wellsley Park Road. Appropriate intersection evaluations were conducted at these locations for existing and future conditions, both with and without traffic volumes generated from the proposed development, in order to determine the anticipated impacts and to establish recommended measures to mitigate these impacts. These evaluations included intersection capacity analyses, corner sight distance reviews and others as appropriate.

The primary conclusion of this study is that the traffic generated from the proposed development will have minimal impact on traffic operations at the study intersections. The proposed site layout includes two site driveways to be located on Gleason Drive and one site driveway to be located on the Deane Hill Shopping Center south access driveway. The following listing is a summary of the improvements and recommendations that resulted from this study:

1. Locate the proposed site access driveways on Gleason Drive to maximize corner sight distance. In addition, ensure that landscaping and site signage is carefully placed in the vicinity of the site entrances to insure recommended sight distance is provided.
2. The intersection of the proposed site driveways shall be STOP controlled on the driveway approach.

INTRODUCTION & PURPOSE OF STUDY

This report provides a summary of a traffic impact study that was performed for a proposed multi-use development to be located on approximately 3 acres in West Knoxville. The project site is located on the north side of Gleason Drive between Morrell Road and Wellsley Park Road. FIGURE 1 is a project location map identifying the project site in relation to the major roadways in the vicinity of the proposed development.



**FIGURE 1
LOCATION MAP**

The development plan for this project proposes 184 residential apartment units and 14,000 square feet of specialty retail with two accesses to be located on Gleason Drive and one access to be located on the Deane Hill Shopping Center south access driveway. FIGURE 2 is a Conceptual Site Plan which details the proposed site configuration.

The purpose of this study was the evaluation of the traffic operational and safety impacts of the proposed development upon roadways in the vicinity of the site. Of particular interest were the signalized intersections of Morrell Road at Gleason Drive and Morrell Road at Deane Hill Drive, and the unsignalized intersection of Deane Hill Drive at Wellsley Park Road. Appropriate intersection evaluations were conducted at these locations for existing and future conditions, both with and without traffic volumes generated from the proposed development, in order to determine the anticipated impacts and to establish recommended measures to mitigate these impacts. These evaluations included intersection capacity analyses, corner sight distance reviews and others as appropriate.

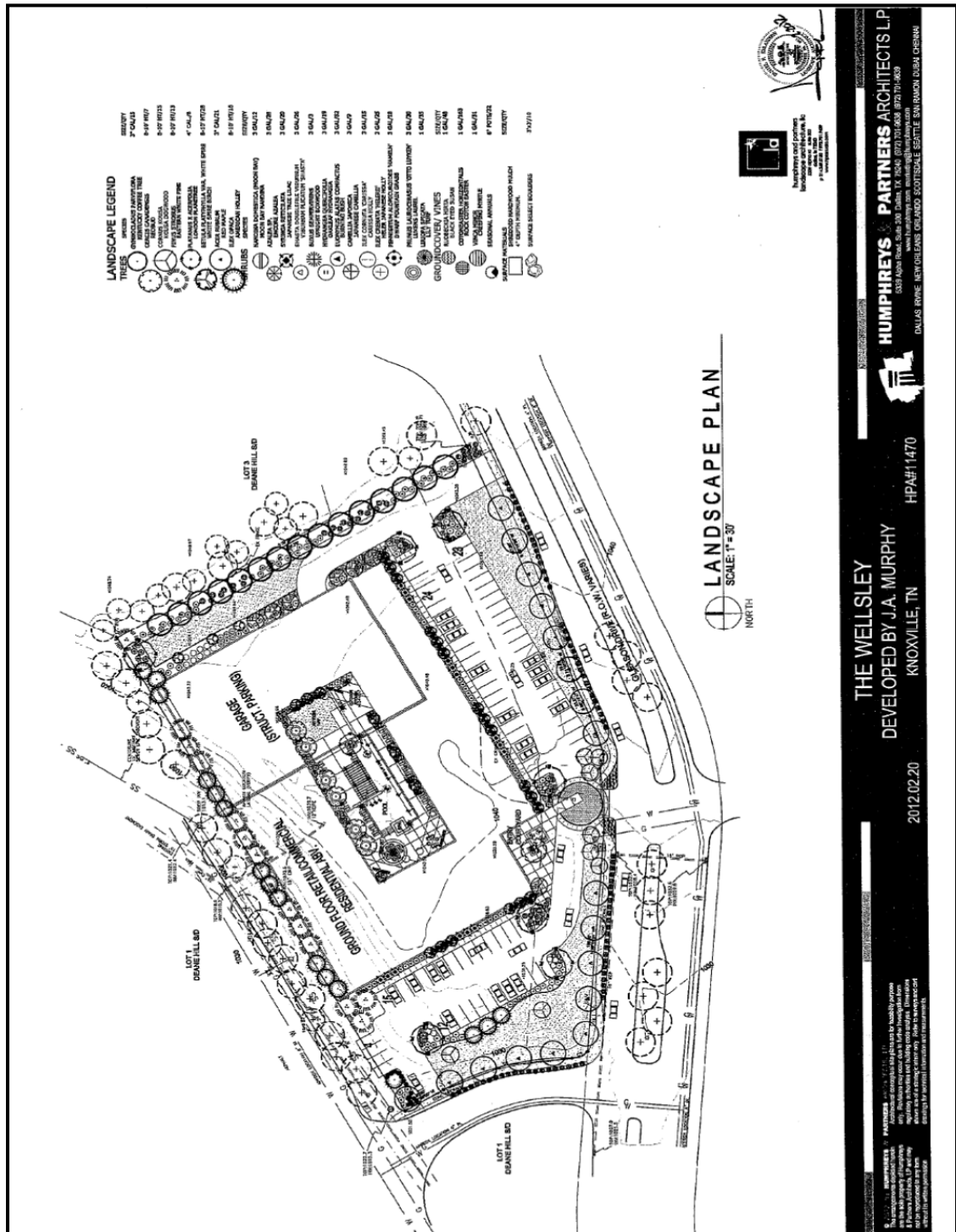


FIGURE 2
CONCEPTUAL SITE PLAN

EXISTING CONDITIONS

EXISTING ROADWAY CONDITIONS

Morrell Road, in the vicinity of the proposed development, is a multi-lane Arterial roadway providing north-south access from Kingston Pike/I-40 to Northshore Drive. The roadway primarily consists of two travel lanes in each direction, a shared center two-way left turn lane, and curb and gutter with sidewalk. The posted speed limit on Morrell Road is 40 mph.

Gleason Drive is a two-lane divided local facility providing direct access to the proposed site. Gleason Drive is curbed with a raised grassed median and sidewalks on both sides of the street. The speed limit on Gleason Drive is unposted and therefore assumed to be 25 mph.

Deane Hill Drive is a two lane Collector roadway consisting of one travel lane in each direction with minimal shoulders. An auxiliary right-turn lane is provided at the intersection with Morrell Road. The speed limit on Deane Hill Drive is posted as 40 mph.

EXISTING TRAFFIC DATA

Existing traffic data was gathered for this study. The Tennessee Department of Transportation (TDOT) collects average daily traffic data (ADT) annually on roadways in the study area. One count station was found near the project site that was felt to have particular relevance for this study. The most currently available data from this count station is contained in TABLE 1.

Station T431 Morrell Road between Gleason Dr and Kingston Pk.	
Count Year	
2010	11,090
2009	14,682
2008	14,482
2007	14,410
2006	15,924

In addition to the available ADT data, intersection turning movement traffic counts were conducted specifically for this study at the study intersections, with the primary purpose of determining the current peak hour operating volumes. The existing traffic counts are summarized on FIGURE 3, and the raw data traffic count summary sheets are contained in the APPENDIX.

EXISTING CAPACITY ANALYSIS / LEVELS-OF-SERVICE

Capacity analyses employing the methods of the Highway Capacity Manual were conducted for the existing study intersections. The analyses were performed with the 2012 existing traffic volumes and existing intersection traffic control and lane configurations. The EVALUATIONS section of this report may be referenced for tabular summaries of these analyses, while more detailed summaries are presented on the computer printouts contained in the APPENDIX. Also contained in the APPENDIX is a section entitled “Intersection Capacity and Level of Service Concepts”, which provides a description of the utilized procedures.

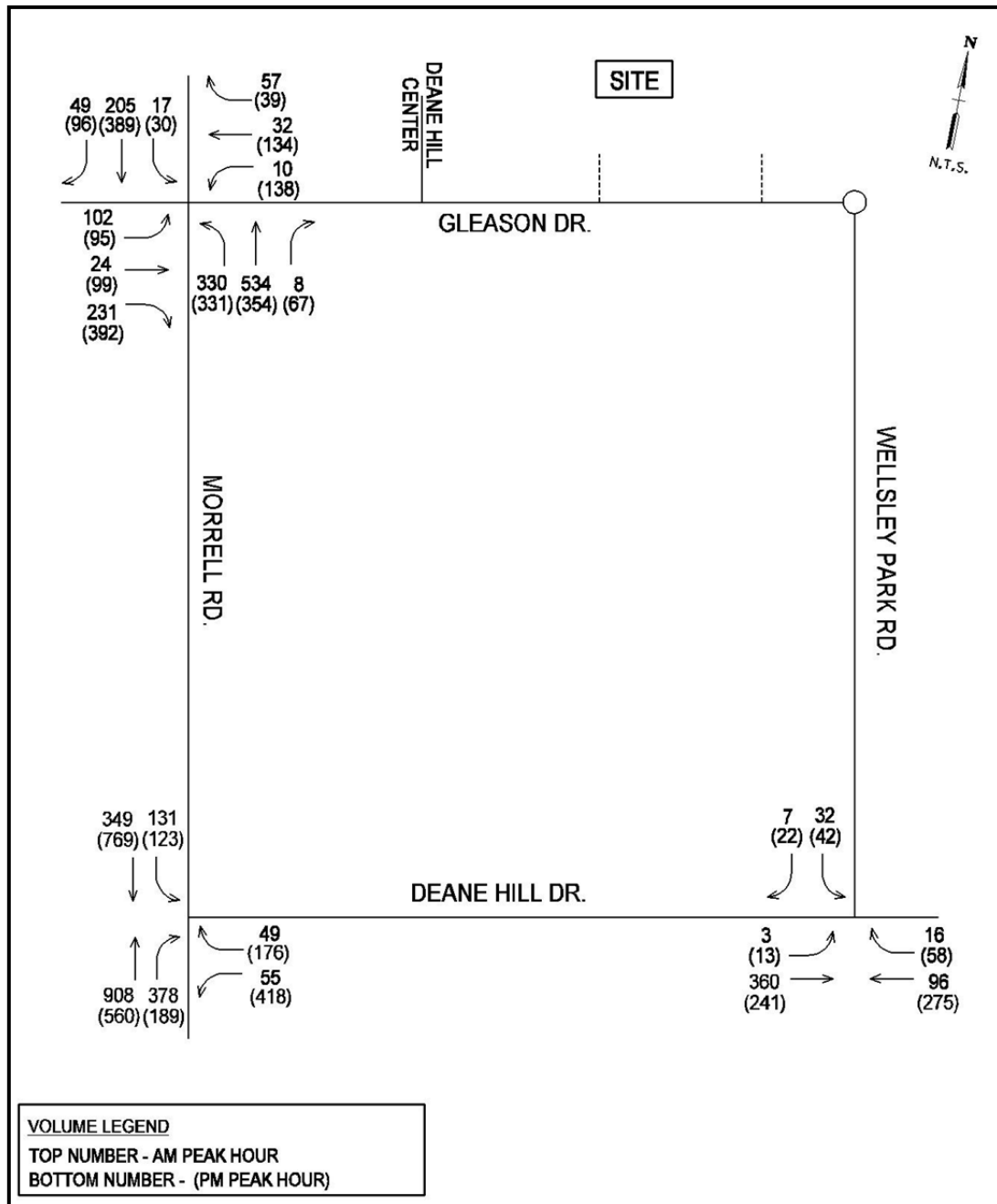


FIGURE 3
 2012 EXISTING TRAFFIC VOLUMES

BACKGROUND CONDITIONS

BACKGROUND TRAFFIC GROWTH

The proposed development is anticipated to be constructed in one general phase with anticipated completion in approximately one year. Therefore, year 2013 was established as the appropriate design/analysis year for this study. In order to determine traffic volumes resulting solely from background traffic growth to year 2013, it was necessary to establish an annual growth rate for existing traffic. The TDOT ADT values previously discussed, as well as knowledge of the area were used to determine an approximate annual growth rate. Based on the available data, a background annual growth rate of two percent was assumed. FIGURE 4 contains the background traffic volumes that would result from a two percent annual growth from year 2012, when the counts were conducted, to year 2013.

BACKGROUND CAPACITY ANALYSES / LEVELS-OF-SERVICE

Capacity analyses as described in the Existing Conditions section of this report were conducted utilizing the FIGURE 4 background traffic volumes and existing intersection traffic control and lane configurations. The EVALUATIONS section of this report may be referenced for tabular summaries of these analyses, while more detailed summaries are presented on the computer printouts contained in the APPENDIX.

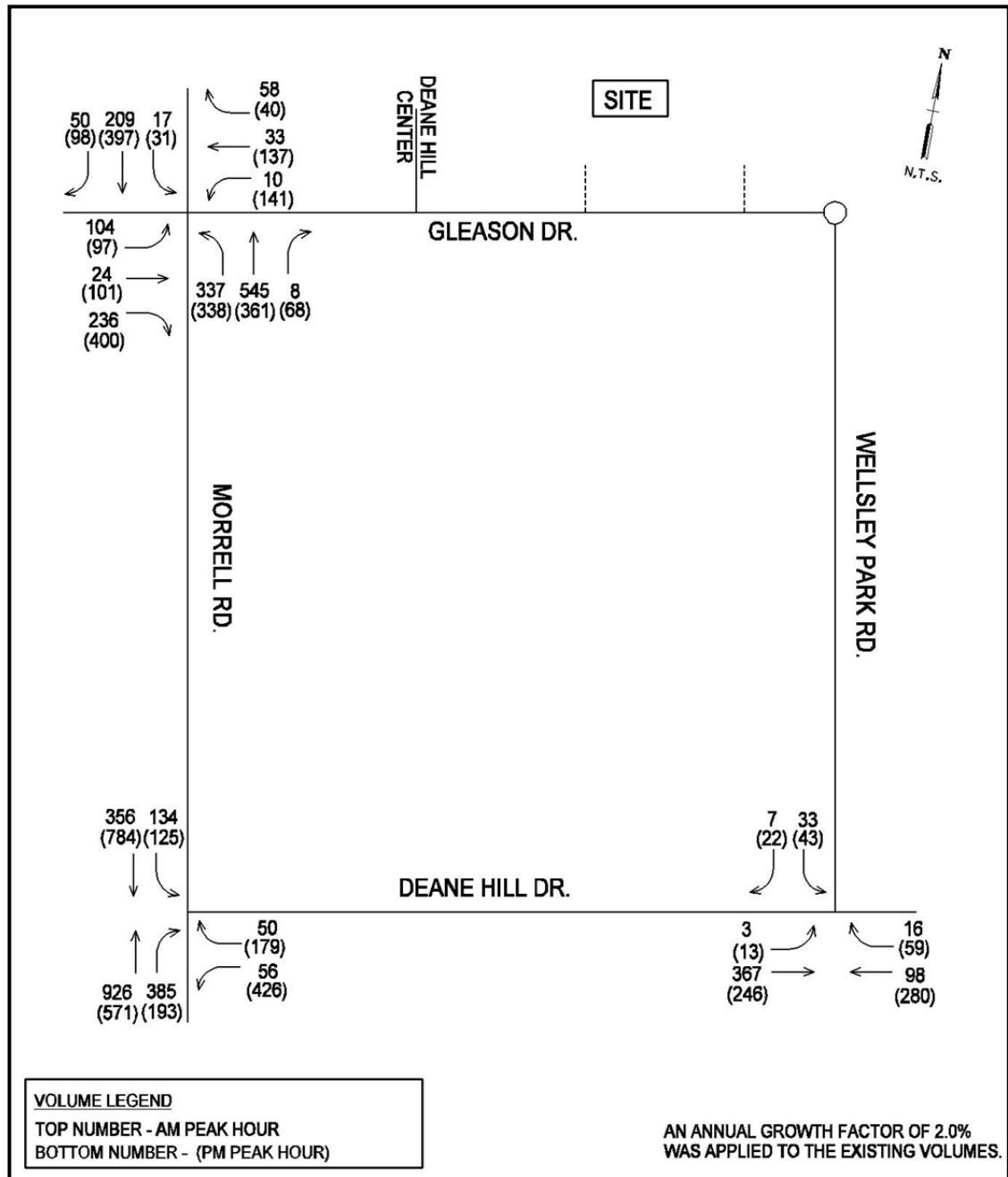


FIGURE 4
 2013 BACKGROUND TRAFFIC VOLUMES

FUTURE CONDITIONS

TRIP GENERATION

In order to estimate the expected traffic volumes to be generated by the proposed development, the procedures of Trip Generation, Eighth Edition (Institute of Transportation Engineers, 2008) were utilized. Local trip generation rates adopted by the Knoxville-Knox County Metropolitan Planning Commission for multi-family developments were utilized to develop the estimated generated trips for the proposed residential portion of the project. The generated traffic volumes were determined based on the data for the peak hours of adjacent street. See TABLE 2 for a summary of the traffic generated for this project. More detailed information is contained in the APPENDIX.

TABLE 2
TRIP GENERATION SUMMARY

Land Use	ITE Code	Size	Weekday (trips/day)	AM Peak (trips/hour)	MD Peak (trips/hour)
Multi-Family Apartment	Local	184	1,650	93	133
Entering Trips		units	825	20	77
Exiting Trips			825	73	60
Specialty Retail Center	814	14,000	620	-	55
Entering Trips		sf	310	-	24
Exiting Trips			310	-	31
TOTALS			2,270	93	188
Entering Trips			1,135	20	97
Exiting Trips			1,135	73	91
INTERNAL CAPTURE			204	-	18
Entering Trips			102	-	9
Exiting Trips			102	-	9
NET TOTALS			2,066	93	170
Entering Trips			1,033	20	88
Exiting Trips			1,033	73	82

To account for anticipated internal trips between the proposed site uses the Trip Generation Handbook (ITE) was consulted. Tables 7.1 and 7.2 of the Handbook provide estimated internal capture rates for trip origins and destinations within development site. The P.M. trips for the proposed development were reduced, as appropriate, to account for likely internal trips occurring between the residential and retail uses within the site. Internal capture estimates for the A.M. peak trips were not available. The resulting peak hour generated trips are contained in TABLE 3. ITE tables and worksheets are provided in the APPENDIX

TRIP DISTRIBUTION AND ASSIGNMENT

FIGURE 5 provides a summary of the trip distribution patterns assumed for the study intersections. These patterns were based on the existing traffic patterns derived from the traffic counts, as well as knowledge of the area. FIGURE 6 shows the generated trips as assigned to the study intersections in accordance with these distribution patterns. FIGURE 7 also shows the combined year 2013 volumes reflecting the existing traffic, the background traffic growth, and the newly generated traffic from the proposed development. These are the combined volumes used in the analysis of the future conditions.

FUTURE CAPACITY ANALYSES / LEVELS-OF-SERVICE

Capacity analyses as described in the Existing Conditions section of this report were conducted for 2013 full build-out conditions utilizing the FIGURE 7 combined traffic volumes and existing intersection traffic control. The EVALUATIONS section of this report may be referenced for tabular summaries of these analyses, while more detailed summaries are presented on the computer printouts contained in the APPENDIX

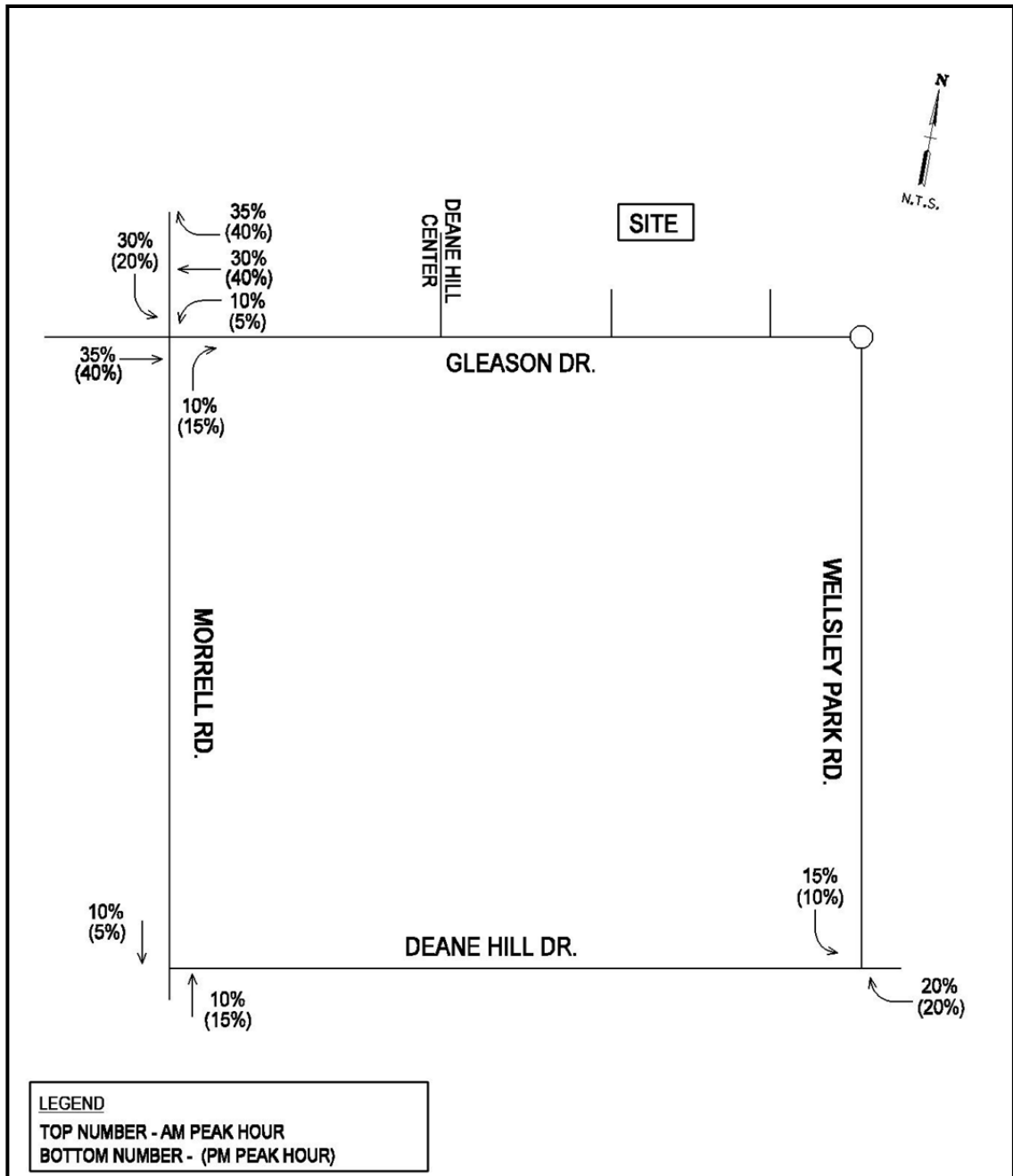


FIGURE 5
TRIP DISTRIBUTION

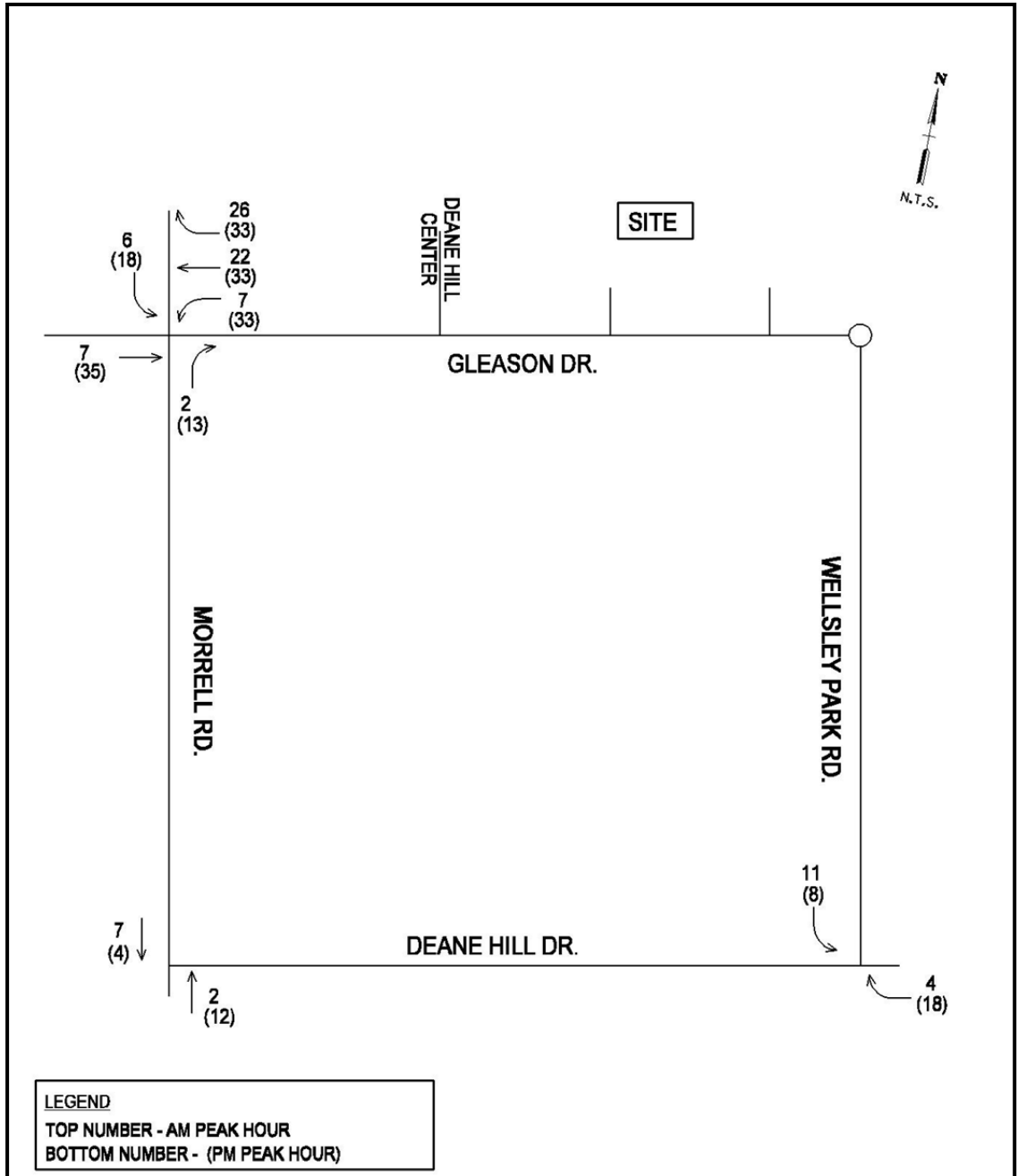


FIGURE 6
TRIP ASSIGNMENTS

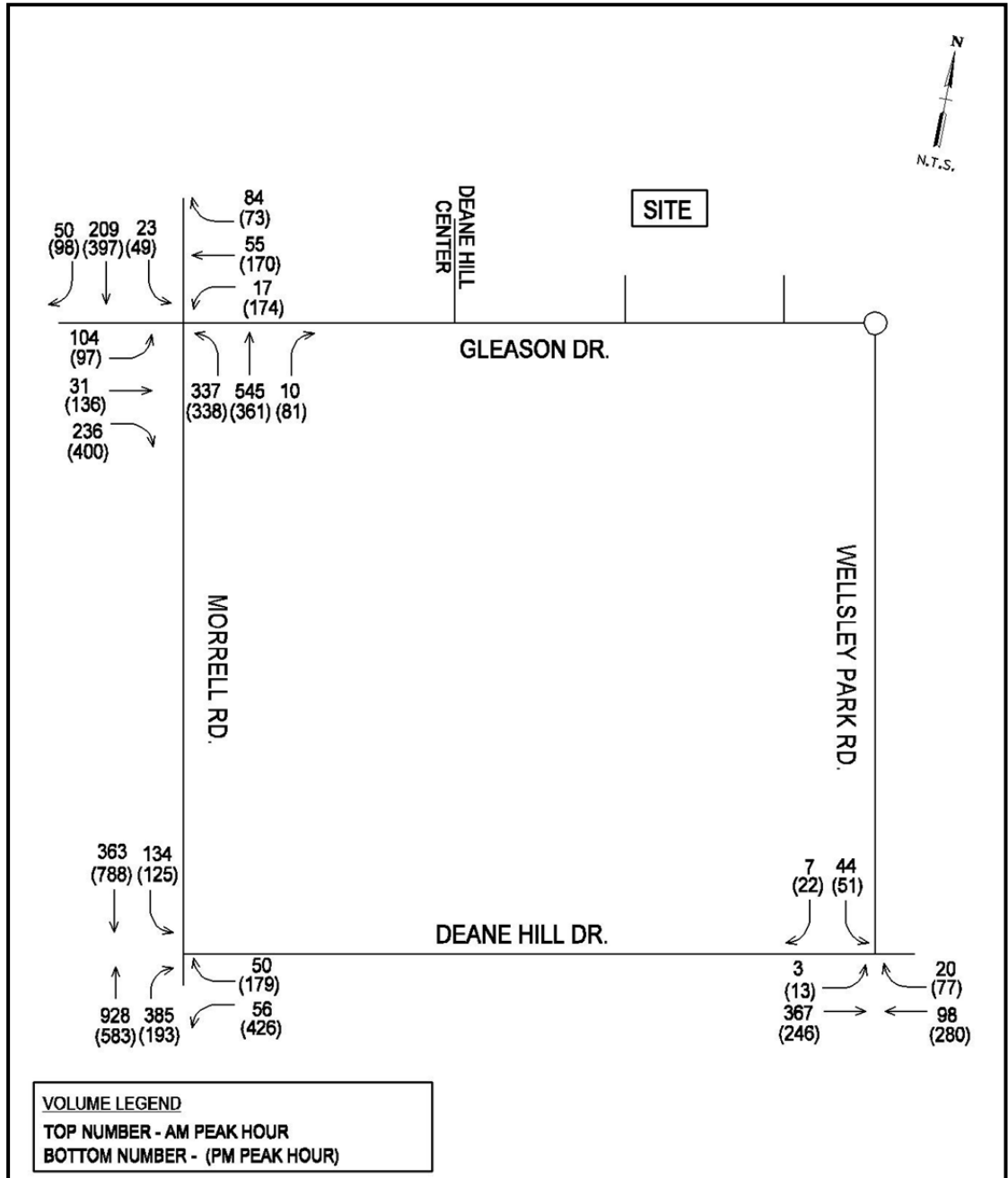


FIGURE 7
 2013 COMBINED TRAFFIC DATA

EVALUATIONS

Capacity analyses employing the methods of the Highway Capacity Manual were conducted for the study intersections. These analyses were performed with the anticipated 2013 combined volumes shown in FIGURE 7 and existing intersection geometry and traffic control. TABLE 3 may be referenced for tabular summaries of these analyses, while more detailed summaries are presented on the computer printouts contained in the APPENDIX.

**TABLE 3
CAPACITY ANALYSIS SUMMARY**

Intersection	Time Period	2012 Existing (LOS/Delay)	Year 2013 Background (LOS/Delay)	Year 2013 Combined (LOS/Delay)
Morrell Road at Gleason Drive Existing Geometry and Control (SIGNALIZED) ¹	A.M.	B 10.1	B 10.4	B 12.7
	P.M.	C 20.7	C 21.0	C 23.7
Morrell Road at Deane Hill Drive Existing Geometry and Control (SIGNALIZED) ¹	A.M.	B 11.1	B 11.5	B 11.6
	P.M.	C 23.7	C 24.0	C 23.8
Deane Hill Drive at Wellsley Park Rd Existing Geometry and Control (SIDE STREET STOP) ²	A.M.	B 12.2	B 12.4	B 12.7
	P.M.	B 13.8	B 14.0	B 14.5

¹SIGNALIZED CONTROL – Level-of-Service and Average Vehicular Delay (seconds) for full intersection.

²SIDE STREET STOP CONTROL – Level-of-Service and Average Vehicular Delay (seconds) for side street approach.

See APPENDIX for detailed computer print-out summaries and discussion of Capacity and Level-of-Service concepts.

Intersection capacity analyses for the projected year of 2013 indicate that the study intersections will continue to operate well during both the AM and PM peak periods.

The proposed intersection geometry of the site driveway intersections consists of two-lane accesses with one entrance lane and one exiting lane. The main site entrance is to be located opposite the existing intersection of Windview Way creating a fourth leg to this intersection. An existing eastbound left-turn storage lane with approximately 60 feet of storage is located on Gleason Drive at the proposed site main entrance. A secondary site entrance is located on Gleason Drive along the eastern side of the site and will operate as a right-in / right-out driveway due to the existing raised grass median on Gleason Drive at this location. Field reviews indicated that adequate corner sight distance should be achievable along Gleason Drive at the proposed site driveway locations. The assumed speed limit on Gleason Drive is 25 mph, which in accordance with City of Knoxville regulations requires a minimum 250 foot sight

distance. During final site design the available sight distance along Gleason Drive should be verified and shrubs, brush, and trees should be removed or maintained in such a manner to maintain the required sight distance.

CONCLUSIONS & RECOMMENDATIONS

The primary conclusion of this study is that the traffic generated from the proposed development will have minimal impact on traffic operations at the study intersections. The proposed site layout includes two site driveways to be located on Gleason Drive and one site driveway to be located on the Deane Hill Shopping Center south access driveway. The following listing is a summary of the improvements and recommendations that resulted from this study:

1. Locate the proposed site access driveways on Gleason Drive to maximize corner sight distance. In addition, ensure that landscaping and site signage is carefully placed in the vicinity of the site entrances to insure recommended sight distance is provided.
2. The intersection of the proposed site driveways shall be STOP controlled on the driveway approach.

APPENDIX

TRAFFIC DATA

TRIP GENERATION

CAPACITY ANALYSES

TRAFFIC DATA

Cannon & Cannon, Inc.
 Consulting Engineers - Field Surveyors
 8550 Kingston Pike
 Knoxville, TN 37919

ICI Project Name: Deane Hill Development
 ICI Project Number: 1000-0000
 Intersection: Morrell @ Gleason
 Counted By: CCI

File Name : Morrell_Gleason_1-11-12
 Site Code : 00000001
 Start Date : 01/11/2012
 Page No : 1

Groups Printed- Unshifted

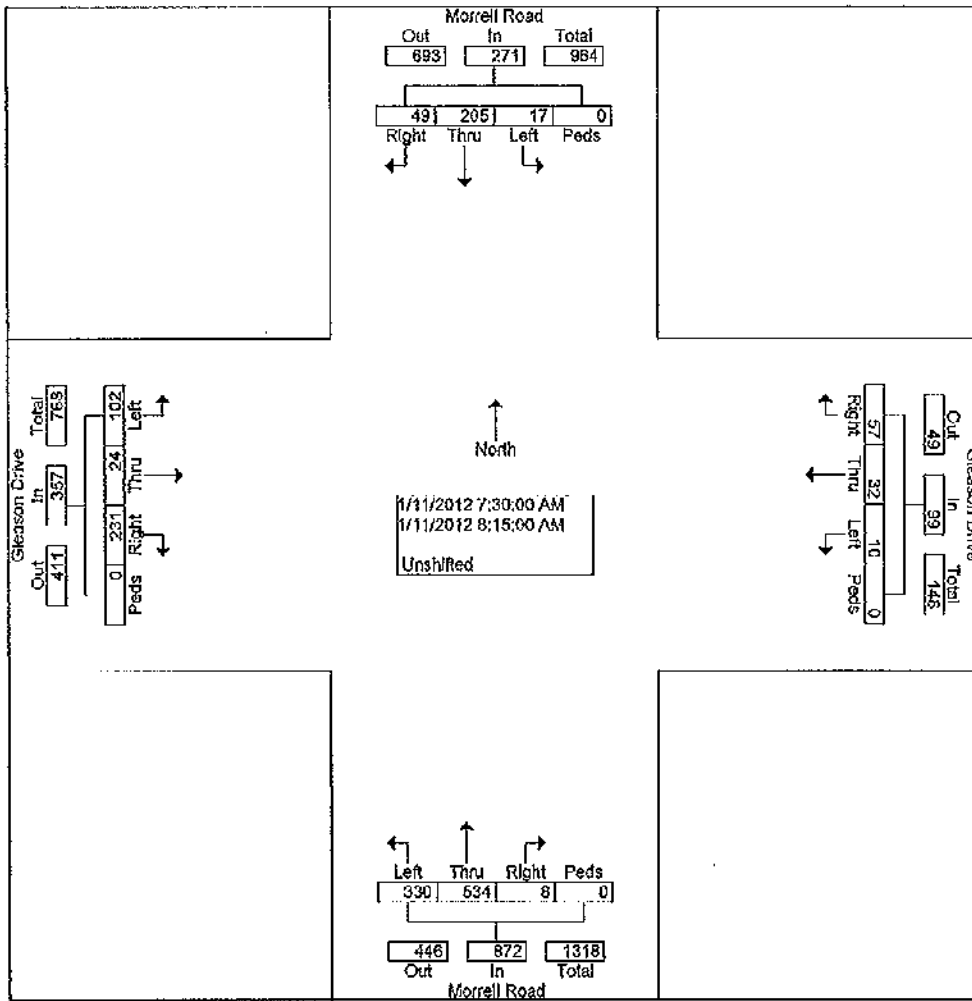
Start Time	Morrell Road Southbound					Gleason Drive Westbound					Morrell Road Northbound					Gleason Drive Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Factor	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		
07:00 AM	2	21	0	0	23	2	4	15	0	21	25	83	2	0	110	10	4	30	0	44	198
07:15 AM	3	41	5	0	49	1	3	7	0	11	73	115	2	0	190	13	4	37	0	54	304
07:30 AM	2	34	12	0	48	0	9	23	0	32	76	152	1	0	229	39	7	59	0	105	414
07:45 AM	1	46	16	0	63	4	5	13	0	22	96	165	1	0	262	19	5	42	0	66	413
Total	8	142	33	0	183	7	21	58	0	86	270	515	6	0	791	81	20	168	0	269	1329
08:00 AM	8	51	8	0	67	5	10	10	0	25	76	132	3	0	213	22	9	58	0	89	394
08:15 AM	6	74	13	0	93	1	8	11	0	20	80	85	3	0	168	22	3	72	0	97	378
08:30 AM	2	69	9	1	81	5	2	13	0	20	63	92	5	0	160	20	7	59	0	86	347
08:45 AM	5	37	8	0	50	2	2	14	0	18	61	101	8	0	170	12	15	55	0	82	320
Total	21	231	38	1	291	13	22	48	0	83	282	410	19	0	711	76	34	244	0	354	1439
** BREAK **																					
04:00 PM	2	85	30	0	117	28	25	5	0	58	83	83	17	0	183	34	25	88	0	147	505
04:15 PM	6	84	32	0	122	18	32	15	0	65	78	88	18	0	184	21	24	92	0	137	508
04:30 PM	9	94	16	0	119	24	19	5	0	48	77	108	9	0	194	23	27	82	0	132	493
04:45 PM	6	92	23	0	121	32	26	10	1	69	84	89	18	0	191	25	28	92	0	145	526
Total	23	355	101	0	479	102	102	35	1	240	322	368	62	0	752	103	104	354	0	561	2032
05:00 PM	9	93	19	0	121	29	34	12	0	75	81	87	17	0	185	32	26	103	0	161	542
05:15 PM	7	95	26	0	128	40	35	12	0	87	80	85	21	0	186	20	28	84	0	132	533
05:30 PM	10	96	28	0	133	35	43	4	0	82	85	74	10	0	169	21	24	110	0	155	539
05:45 PM	4	106	23	0	133	34	22	11	0	67	85	108	19	0	212	22	21	96	0	138	550
Total	30	389	96	0	515	138	134	39	0	311	331	354	67	0	752	95	99	392	0	586	2164
Grand Total	82	1117	268	1	1488	260	279	180	1	720	1205	1647	154	0	3006	355	257	1158	0	1770	6964
Approch %	5.6	78.1	18.3	0.1		36.1	38.8	25.0	0.1		40.1	54.8	5.1	0.0		20.1	14.5	65.4	0.0		
Total %	1.2	16.0	3.8	0.0	21.1	3.7	4.0	2.6	0.0	10.3	17.3	23.7	2.2	0.0	43.2	5.1	3.7	16.8	0.0	25.4	

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Project Name: Deane Hill Development
 Project Number: 1000-0000
 Intersection: Morrell @ Gleason
 Counted By: CCI

File Name : Morrell_Gleason_1-11-12
 Site Code : 00000001
 Start Date : 01/11/2012
 Page No : 2

Start Time	Morrell Road Southbound					Gleason Drive Westbound					Morrell Road Northbound					Gleason Drive Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Intersection	07:30 AM																				
Volume	17	205	49	0	271	10	32	57	0	99	330	534	8	0	872	102	24	231	0	357	1599
Percent	6.3	75.6	18.1	0.0		10.1	32.3	57.6	0.0		37.8	61.2	0.9	0.0		28.6	6.7	64.7	0.0		
07:30 Volume	2	34	12	0	48	0	9	23	0	32	78	152	1	0	229	39	7	59	0	105	414
Peak Factor	0.986																				
High Int. Volume	08:15 AM					07:30 AM					07:45 AM					07:30 AM					
Peak Factor	6	74	13	0	93	0	9	23	0	32	96	165	1	0	262	39	7	59	0	105	0.850
	0.728					0.773					0.832										

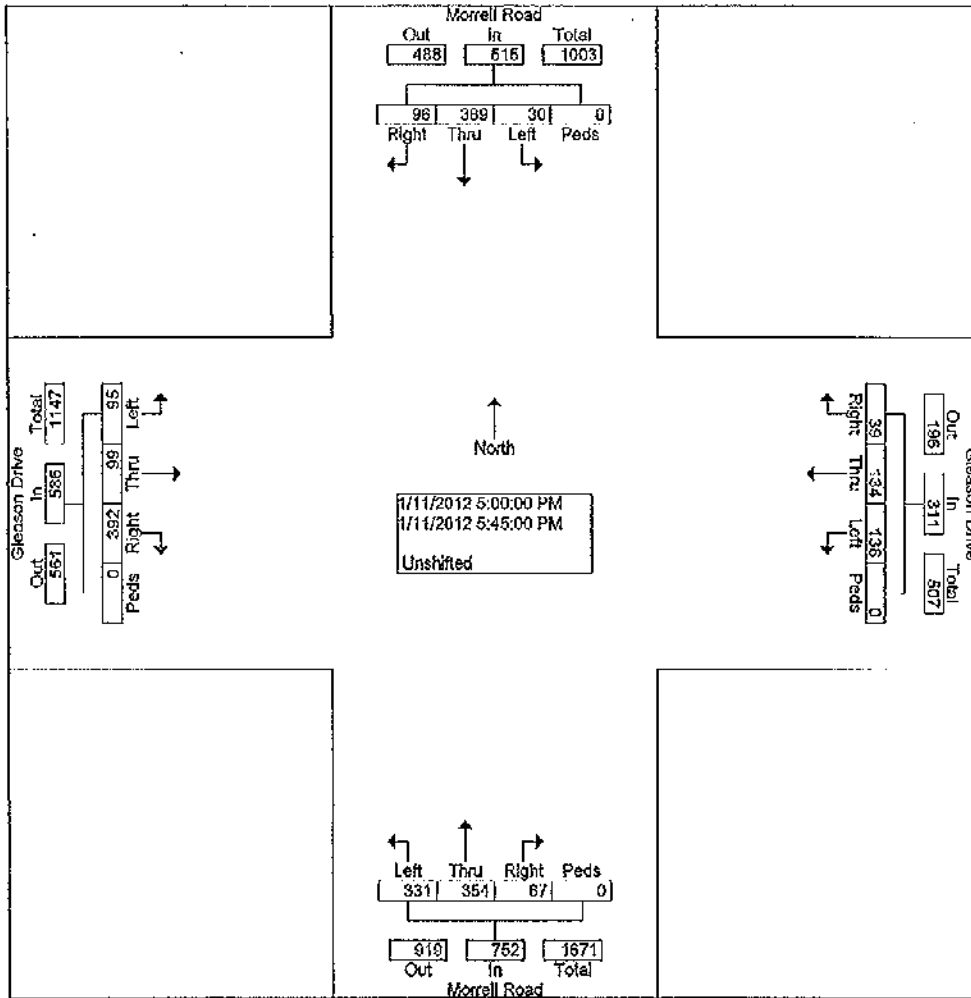


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Start Time	Morrell Road Southbound					Gleason Drive Westbound					Morrell Road Northbound					Gleason Drive Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Intersection	05:00 PM																				
Volume	30	389	98	0	515	138	134	39	0	311	331	354	67	0	752	95	99	392	0	586	2164
Percent	5.8	75.5	18.6	0.0		44.4	43.1	12.5	0.0		44.0	47.1	8.9	0.0		16.2	16.9	66.9	0.0		
05:45 Volume	4	106	23	0	133	34	22	11	0	67	85	108	19	0	212	22	21	95	0	138	550
Peak Factor	0.984																				
High Int. Volume	05:30 PM					05:15 PM					05:45 PM					05:00 PM					
Peak Factor	0.968					0.894					0.887					0.910					



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 Knoxville, TN 37919

DCI Project Name: Deane Hill Development
 DCI Project Number: 1000-0000
 Intersection: Morrell @ Deane Hill
 Counted By: CCI

File Name : Morrell_Deane Hill_1-12-11
 Site Code : 00000002
 Start Date : 01/12/2012
 Page No : 1

Groups Printed- Unshifted

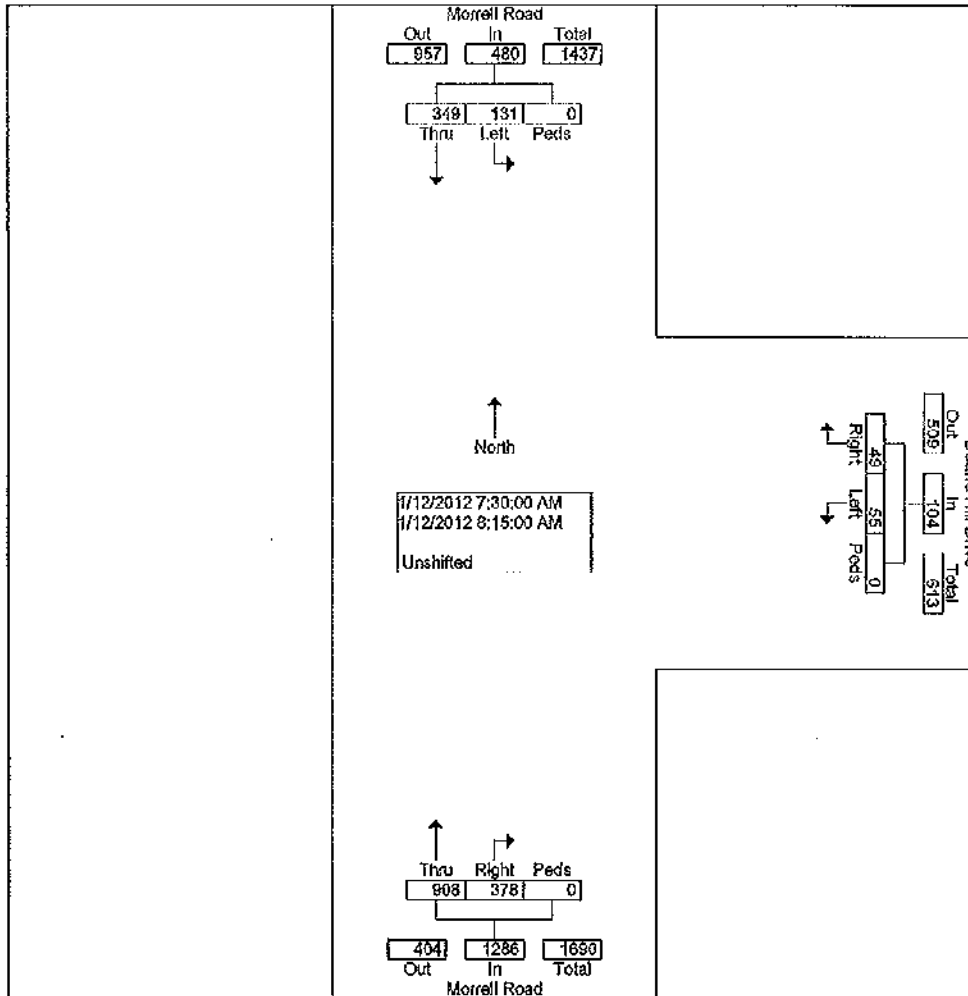
Start Time	Morrell Road Southbound					Deane Hill Drive Westbound					Morrell Road Northbound					Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Factor	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		
07:00 AM	10	50	0	0	60	3	0	3	0	6	0	108	30	0	138	0	0	0	0	0	204
07:15 AM	20	52	0	0	72	12	0	10	0	22	0	163	56	0	219	0	0	0	0	0	313
07:30 AM	23	65	0	0	88	9	0	14	0	23	0	282	93	0	355	0	0	0	0	0	466
07:45 AM	36	85	0	0	121	16	0	11	0	27	0	256	102	0	358	0	0	0	0	0	506
Total	89	252	0	0	341	40	0	38	0	78	0	789	281	0	1070	0	0	0	0	0	1489
08:00 AM	31	83	0	0	114	12	0	16	0	28	0	218	84	0	302	0	0	0	0	0	444
08:15 AM	41	116	0	0	157	18	0	8	0	26	0	172	99	0	271	0	0	0	0	0	454
08:30 AM	32	111	0	0	143	26	0	13	0	39	0	161	61	0	222	0	0	0	0	0	404
08:45 AM	33	94	0	0	127	26	0	14	0	40	0	131	84	0	215	0	0	0	0	0	382
Total	137	404	0	0	541	82	0	51	0	133	0	682	328	0	1010	0	0	0	0	0	1684
*** BREAK ***																					
04:00 PM	20	157	0	0	177	64	0	33	0	97	0	130	33	0	163	0	0	0	0	0	437
04:15 PM	29	142	0	0	171	50	0	22	0	72	0	136	35	0	171	0	0	0	0	0	414
04:30 PM	24	158	0	0	182	69	0	36	0	105	0	128	24	0	152	0	0	0	0	0	439
04:45 PM	17	154	0	0	171	69	0	40	0	109	0	165	58	0	223	0	0	0	0	0	503
Total	90	611	0	0	701	252	0	131	0	383	0	559	150	0	709	0	0	0	0	0	1793
05:00 PM	27	193	0	0	220	106	0	46	0	152	0	136	36	0	172	0	0	0	0	0	544
05:15 PM	31	174	0	0	205	105	0	54	0	159	0	138	40	0	178	0	0	0	0	0	542
05:30 PM	30	205	0	0	235	111	0	39	0	150	0	147	52	0	199	0	0	0	0	0	584
05:45 PM	35	197	0	0	232	96	0	37	0	133	0	139	61	0	200	0	0	0	0	0	565
Total	123	769	0	0	892	418	0	176	0	594	0	580	189	0	749	0	0	0	0	0	2235
Grand Total	439	2036	0	0	2475	792	0	396	0	1188	0	2590	948	0	3538	0	0	0	0	0	7201
Approch %	17.7	82.3	0.0	0.0		66.7	0.0	33.3	0.0		0.0	73.2	26.8	0.0		0.0	0.0	0.0	0.0	0.0	
Total %	6.1	28.3	0.0	0.0	34.4	11.0	0.0	5.5	0.0	16.5	0.0	38.0	13.2	0.0	49.1	0.0	0.0	0.0	0.0	0.0	

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CCI Project Name: Deane Hill Development
 CCI Project Number: 1000-0000
 Intersection: Morrell @ Deane Hill
 Counted By: CCI

File Name : Morrell_Deane Hill_1-12-11
 Site Code : 00000002
 Start Date : 01/12/2012
 Page No : 2

Start Time	Morrell Road Southbound					Deane Hill Drive Westbound					Morrell Road Northbound					Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Intersection	07:30 AM																				
Volume	131	349	0	0	480	55	0	49	0	104	0	908	378	0	1286	0	0	0	0	0	1870
Percent	27.3	72.7	0.0	0.0		52.9	0.0	47.1	0.0		0.0	70.6	29.4	0.0		0.0	0.0	0.0	0.0		
07:45 Volume	36	85	0	0	121	16	0	11	0	27	0	266	102	0	358	0	0	0	0	0	506
Peak Factor	0.924																				
High Int. Volume	08:15 AM					08:00 AM					07:45 AM					6:45:00 AM					
Peak Factor	41	116	0	0	157	12	0	16	0	28	0	266	102	0	358						
	0.764					0.929					0.898										

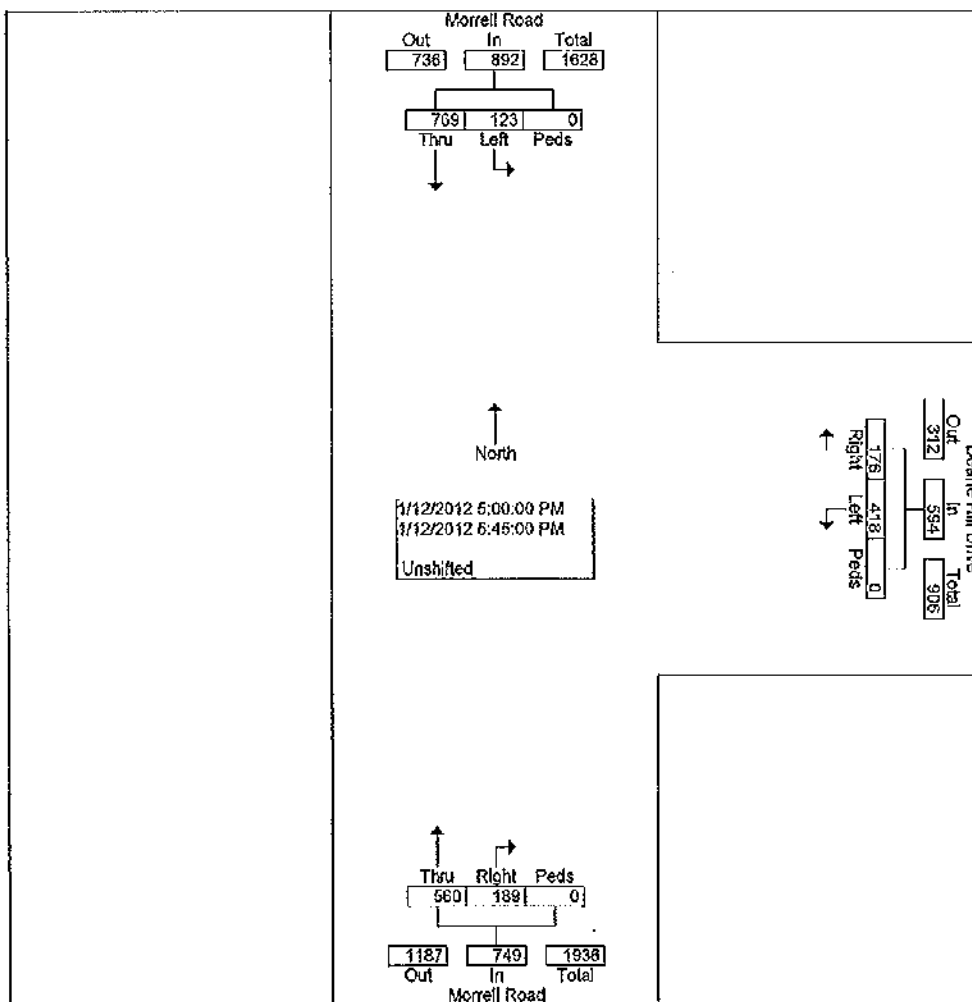


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 Knoxville, TN 37919

DCI Project Name: Deane Hill Development
 DCI Project Number: 1000-0000
 Intersection: Morrell @ Deane Hill
 Counted By: CCI

File Name : Morrell_Deane Hill_1-12-11
 Site Code : 00000002
 Start Date : 01/12/2012
 Page No : 3

Start Time	Morrell Road Southbound					Deane Hill Drive Westbound					Morrell Road Northbound					Eastbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Intersection	05:00 PM																				
Volume	123	769	0	0	892	418	0	176	0	594	0	560	189	0	749	0	0	0	0	0	2235
Percent	13.8	86.2	0.0	0.0		70.4	0.0	29.6	0.0		0.0	74.8	25.2	0.0		0.0	0.0	0.0	0.0		
05:30 Volume	30	205	0	0	235	111	0	39	0	150	0	147	52	0	199	0	0	0	0	0	584
Peak Factor	0.957																				
High Int. Peak	05:30 PM																				
Volume	30	205	0	0	235	105	0	54	0	159	0	139	61	0	200						
Peak Factor	0.949					0.934					0.936										



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XCI Project Name: Deane Hill Development
 XCI Project Number: 1000-0000
 Intersection: Deane Hill @ Wellsley Park
 Counted By: CCI

File Name : Deane Hill_Wesley Park_1-12-12
 Site Code : 00000003
 Start Date : 01/12/2012
 Page No : 1

Groups Printed- Unshifted

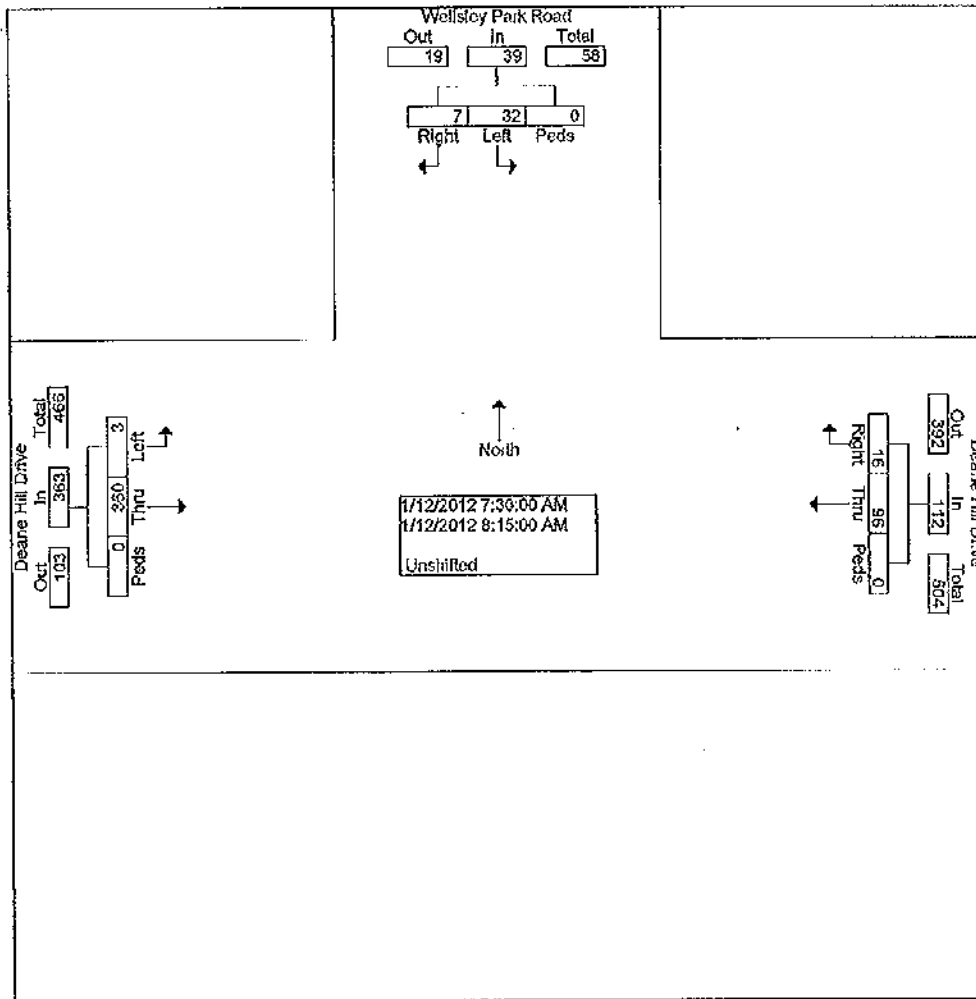
Start Time	Wellsley Park Road Southbound					Deane Hill Drive Westbound					Northbound					Deane Hill Drive Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Factor	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		
07:00 AM	7	0	0	0	7	0	5	5	0	10	0	0	0	0	0	0	30	0	0	30	47
07:15 AM	0	0	0	0	0	0	20	2	0	22	0	0	0	0	0	0	52	0	0	52	74
07:30 AM	11	0	1	0	12	0	18	1	0	19	0	0	0	0	0	0	85	0	0	85	116
07:45 AM	10	0	2	0	12	0	12	2	0	14	0	0	0	0	0	2	84	0	0	86	112
Total	28	0	3	0	31	0	55	10	0	65	0	0	0	0	0	2	251	0	0	253	349
08:00 AM	8	0	3	0	11	0	44	6	0	50	0	0	0	0	0	1	84	0	0	85	146
08:15 AM	3	0	1	0	4	0	22	7	0	29	0	0	0	0	0	0	107	0	0	107	140
08:30 AM	2	0	1	0	3	0	30	3	0	33	0	0	0	0	0	0	69	0	0	69	105
08:45 AM	3	0	0	0	3	0	20	4	0	24	0	0	0	0	0	0	84	0	0	84	111
Total	16	0	5	0	21	0	116	20	0	136	0	0	0	0	0	1	344	0	0	345	502
** BREAK **																					
04:00 PM	15	0	4	0	19	0	60	13	0	73	0	0	0	0	0	1	50	0	0	51	143
04:15 PM	10	0	5	0	15	0	75	18	0	93	0	0	0	0	0	4	67	0	0	71	179
04:30 PM	12	0	8	0	20	0	77	22	0	99	0	0	0	0	0	5	70	0	0	75	194
04:45 PM	5	0	5	0	10	0	63	5	0	68	0	0	0	0	0	3	54	0	0	57	135
Total	42	0	22	0	64	0	275	58	0	333	0	0	0	0	0	13	241	0	0	254	651
05:00 PM	8	0	3	0	11	0	53	12	0	65	0	0	0	0	0	4	51	0	0	55	131
05:15 PM	8	0	4	0	12	0	79	21	0	100	0	0	0	0	0	10	63	0	0	73	185
05:30 PM	9	0	3	0	12	0	79	18	0	97	0	0	0	0	0	11	54	0	0	65	174
05:45 PM	8	0	6	0	14	0	54	8	0	62	0	0	0	0	0	6	51	0	0	57	133
Total	33	0	16	0	49	0	265	59	0	324	0	0	0	0	0	31	219	0	0	250	623
Grand Total	119	0	46	0	165	0	711	147	0	858	0	0	0	0	0	47	1055	0	0	1102	2125
Approch %	72.1	0.0	27.9	0.0		0.0	82.9	17.1	0.0		0.0	0.0	0.0	0.0		4.3	95.7	0.0	0.0		
Total %	5.8	0.0	2.2	0.0	7.8	0.0	33.5	6.9	0.0	40.4	0.0	0.0	0.0	0.0	0.0	2.2	49.6	0.0	0.0	51.9	

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Project Name: Deane Hill Development
 Project Number: 1000-0000
 Intersection: Deane Hill @ Wellsley Park
 Counted By: CCI

File Name : Deane Hill_Wesley Park_1-12-12
 Site Code : 00000003
 Start Date : 01/12/2012
 Page No : 2

Start Time	Wellsley Park Road Southbound					Deane Hill Drive Westbound					Northbound					Deane Hill Drive Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Intersection	07:30 AM																				
Volume	32	0	7	0	39	0	96	16	0	112	0	0	0	0	0	3	360	0	0	363	514
Percent	82.1	0.0	17.9	0.0		0.0	85.7	14.3	0.0		0.0	0.0	0.0	0.0		0.8	99.2	0.0	0.0		
08:00 Volume	8	0	3	0	11	0	44	6	0	50	0	0	0	0	0	1	84	0	0	85	146
Peak Factor	0.880																				
High Int. Volume	07:30 AM					08:00 AM					6:45:00 AM					08:15 AM					
Peak Factor	11	0	1	0	12	0	44	6	0	50	0	0	0	0	0	0	107	0	0	107	0.848
	0.813					0.560															

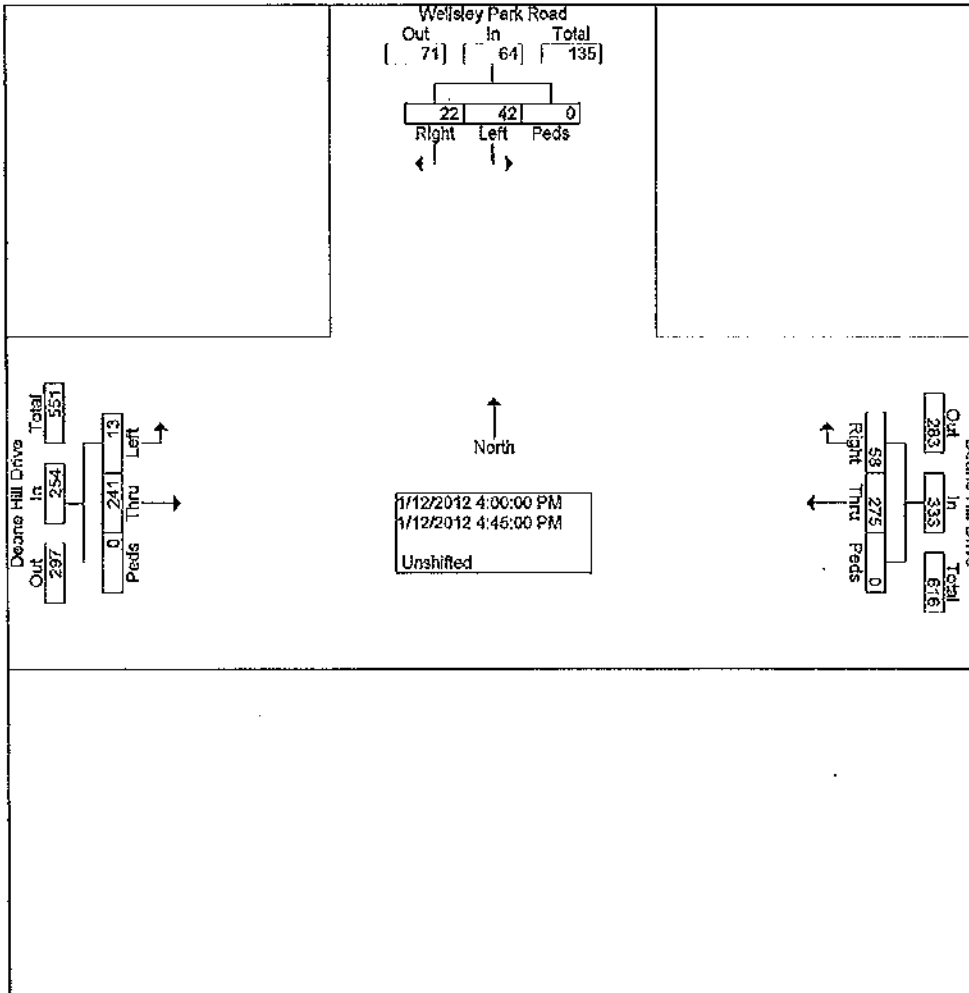


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 Knoxville, TN 37919

CI Project Name: Deane Hill Development
 CI Project Number: 1000-0000
 Intersection: Deane Hill @ Wellsley Park
 Counted By: CCI

File Name : Deane Hill_Wesley Park_1-12-12
 Site Code : 00000003
 Start Date : 01/12/2012
 Page No : 3

Start Time	Wesley Park Road Southbound					Deane Hill Drive Westbound					Northbound					Deane Hill Drive Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Intersection	04:00 PM																				
Volume	42	0	22	0	64	0	275	58	0	333	0	0	0	0	0	13	241	0	0	254	651
Percent	65.6	0.0	34.4	0.0		0.0	82.6	17.4	0.0		0.0	0.0	0.0	0.0		5.1	94.9	0.0	0.0		
04:30 Volume	12	0	8	0	20	0	77	22	0	99	0	0	0	0	0	5	70	0	0	75	194
Peak Factor																					0.839
High Int. Volume	04:30 PM					04:30 PM					04:30 PM										
Peak Factor	12	0	8	0	20	0	77	22	0	99	0	0	0	0	0	5	70	0	0	75	
	0.800					0.841					0.847										



TRIP GENERATION

TRIP GENERATION

THE WELLSLEY COMMERCIAL

MULTI-FAMILY APARTMENTS (LOCAL)

184 UNITS

SPECIALTY RETAIL (814)

14,000 SF

14 /1000 SF

WEEKDAY

$$T = 15.193 \cdot (184)^{.899}$$

$$T = 1650.88$$

$$T = 14 \cdot 44.32$$

$$T = 620.48$$

$$50\% \text{ ENTERING} = 825$$

$$50\% \text{ EXITING} = 825$$

$$50\% \text{ ENTERING} = 310$$

$$50\% \text{ EXITING} = 310$$

AM PEAK OF ADJACENT STREET TRAFFIC 7-9

$$T = 0.758 \cdot (184)^{.924}$$

$$T = 93.83$$

$$22\% \text{ ENTERING} = 20$$

$$78\% \text{ EXITING} = 73$$

PM PEAK OF ADJACENT STREET TRAFFIC 4-6

$$T = .669 \cdot (184) + 10.069$$

$$T = 133.17$$

$$T = 2.4 \cdot (14) + 21.48$$

$$T = 55.08$$

$$55\% \text{ ENTERING} = 73$$

$$45\% \text{ EXITING} = 60$$

$$44\% \text{ ENTERING} = 24$$

$$56\% \text{ EXITING} = 31$$

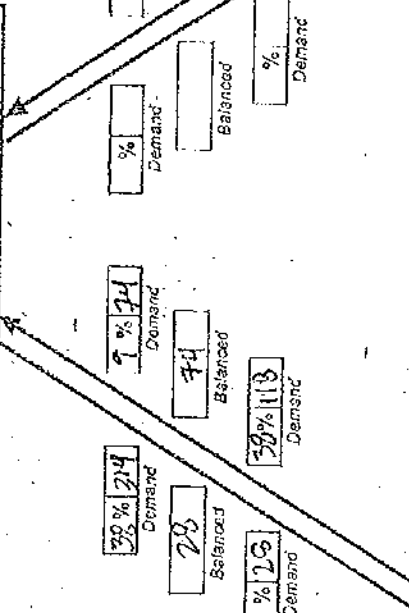
Analyst AWK
Date 3/9/12

**MULTI-USE DEVELOPMENT
TRIP GENERATION
AND INTERNAL CAPTURE SUMMARY**

Name of Project The Wellness Commercial
Time Period 10/20/10

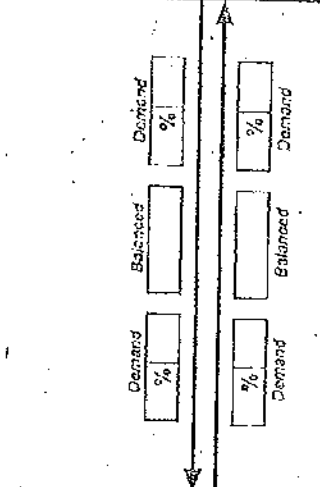
LAND USE A *Residential*

ITLU Code	Multi-Use Facility	Size	Total	Internal	External
Enter			825	74	751
Exit			825	28	797
Total			1650	102	1548
%			100	6	94



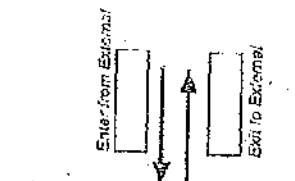
LAND USE B *Retail*

ITLU Code	Size	Total	Internal	External
Enter	14,000 sf	310	78	232
Exit		310	74	236
Total		620	152	468
%		100	16	84



LAND USE C

ITLU Code	Size	Total	Internal	External
Enter				
Exit				
Total				
%				



Net External Trips for Multi-Use Development

	LAND USE A	LAND USE B	LAND USE C	TOTAL
Enter	751	232		1033
Exit	797	236		1033
Total	1548	468		2060
Single-Use Trip Gen. Est.	1650	620		2270
INTERNAL CAPTURE				9%

Source: Kaku Associates, Inc.

Analyst AWG
Date 3/3/82

MULTI-USE DEVELOPMENT TRIP GENERATION AND INTERNAL CAPTURE SUMMARY

Name of Div/pt The Wellcity Commercial
Time Period 9M

LAND USE A Residential

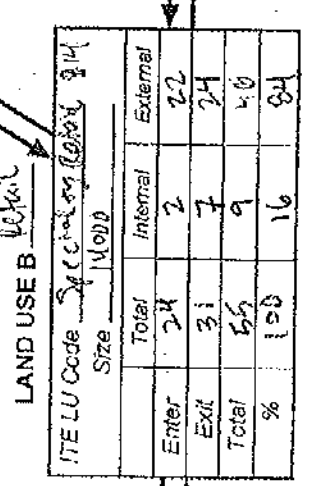
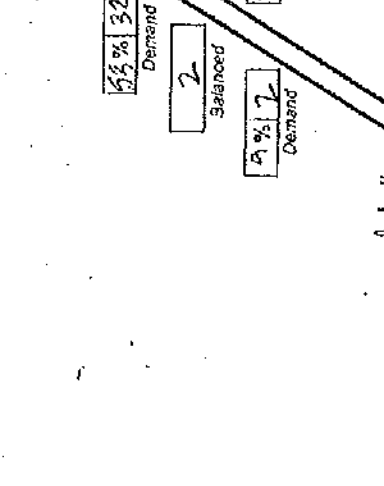
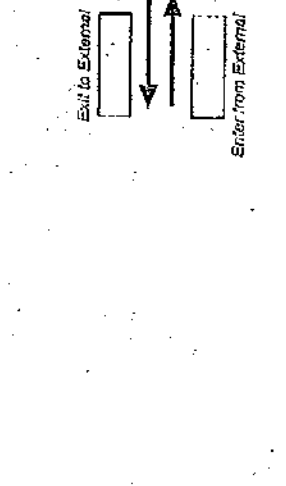
ITE LU Code	Size	Total	Internal	External
Enter		73	7	66
Exit		60	2	58
Total		133	9	124
%		100	7	93

LAND USE B Retail

ITE LU Code	Size	Total	Internal	External
Enter		24	2	22
Exit		31	7	24
Total		55	9	46
%		100	16	84

LAND USE C

ITE LU Code	Size	Total	Internal	External
Enter				
Exit				
Total				
%				



Net External Trips for Multi-Use Development

	LAND USE A	LAND USE B	LAND USE C	TOTAL
Enter	66	22		88
Exit	58	24		82
Total	124	46		170
Single-Use Trip Gen. Est.	133	55		188
INTERNAL CAPTURE				10%

Source: Kaku Associates, Inc.

Table 7.1 Unconstrained Internal Capture Rates for Trip Origins within a Multi-Use Development

		WEEKDAY		
		MIDDAY PEAK HOUR	p.m. PEAK HOUR OF ADJACENT STREET TRAFFIC	DAILY
from OFFICE	to Office	2%	1%	2%
	to Retail	20%	23%	22%
	to Residential	0%	2%	2%
from RETAIL	to Office	3%	3%	3%
	to Retail	29%	20%	30%
	to Residential	7%	12%	11%
from RESIDENTIAL	to Office	N/A	N/A	N/A
	to Retail	34%	53%	38%
	to Residential	N/A	N/A	N/A

Caution: The estimated typical internal capture rates presented in this table rely directly on data collected at a limited number of multi-use sites in Florida. While ITE recognizes the limitations of these data, they represent the only known credible data on multi-use internal capture rates and are provided as illustrative of typical rates. *If local data on internal capture rates by paired land uses can be obtained, the local data may be given preference.*

N/A—Not Available; logic indicates there is some interaction between these two land uses; however, the limited data sample on which this table is based did not record any interaction.

Table 7.2 Unconstrained Internal Capture Rates for Trip Destinations Within a Multi-Use Development

		WEEKDAY		
		MIDDAY PEAK HOUR	p.m. PEAK HOUR OF ADJACENT STREET TRAFFIC	DAILY
to OFFICE	from Office	6%	6%	2%
	from Retail	38%	31%	15%
	from Residential	0%	0%	N/A
to RETAIL	from Office	4%	2%	4%
	from Retail	31%	20%	28%
	from Residential	6%	9%	9%
to RESIDENTIAL	from Office	0%	2%	3%
	from Retail	37%	31%	33%
	from Residential	N/A	N/A	N/A

Caution: The estimated typical internal capture rates presented in this table rely directly on data collected at a limited number of multi-use sites in Florida. While ITE recognizes the limitations of these data, they represent the only known credible data on multi-use internal capture rates and are provided as illustrative of typical rates. *If local data on internal capture rates by paired land uses can be obtained, the local data may be given preference.*

N/A—Not Available; logic indicates there is some interaction between these two land uses; however, the limited data sample on which this table is based did not record any interaction.

Local Apartment Trip Generation Study

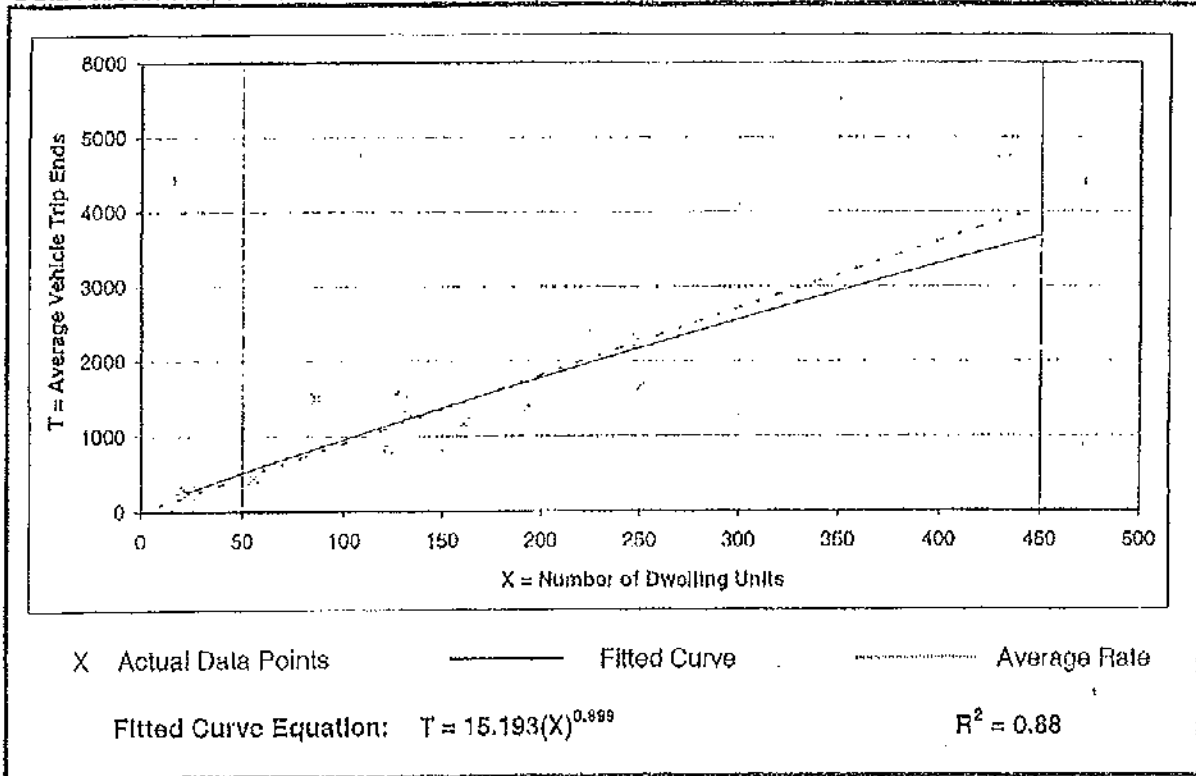
Average Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

Number of Studies: 13
Average Number of Dwelling Units: 193
Directional Distribution: 50% entering, 50% exiting

Trip Generation Per Dwelling Unit

Average Rate	Ranges of Rates	Standard Deviation
9.03	6.59 - 17.41	2.47

Data Plot and Equation



Local Apartment Trip Generation Study

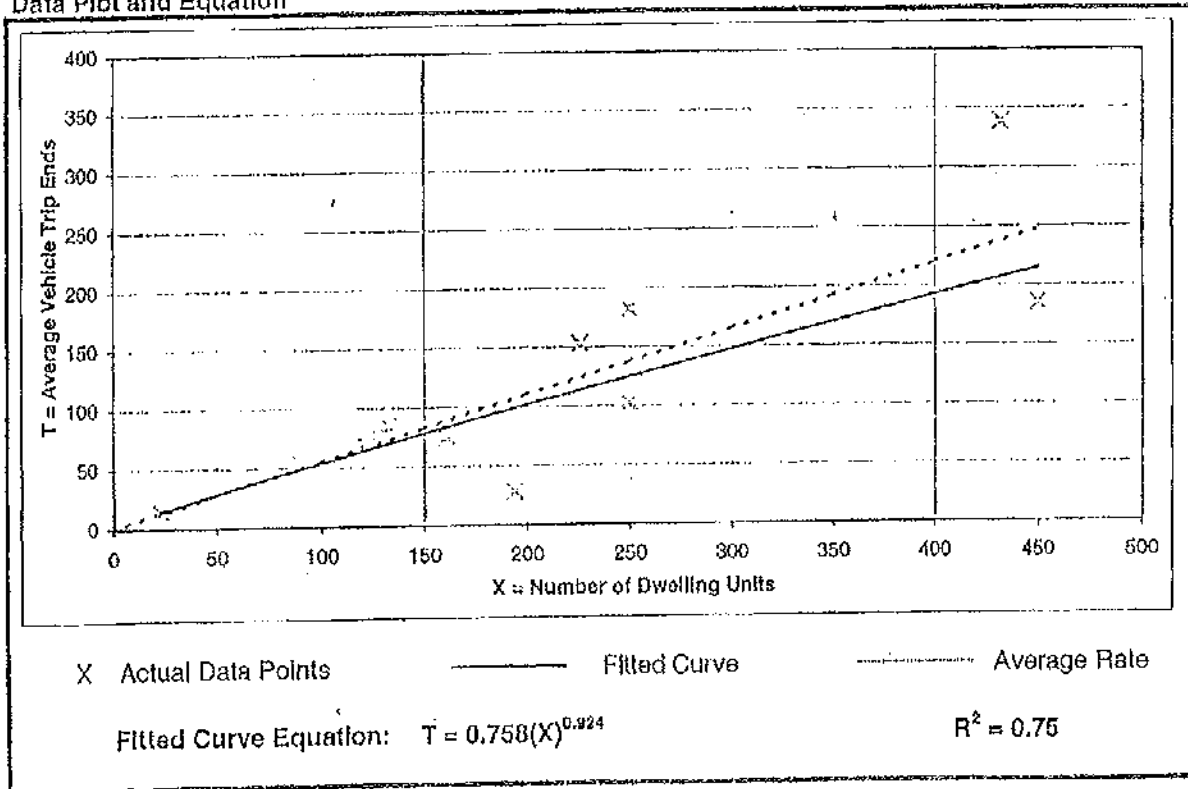
Average Vehicle Trip Ends vs: Dwelling Units
 On a: Weekday,
 Peak Hour of Adjacent Street Traffic,
 One Hour Between 7 and 9 a.m.

Number of Studies: 13
 Average Number of Dwelling Units: 193
 Directional Distribution: 22% entering, 78% exiting

Trip Generation Per Dwelling Unit

Average Rate	Ranges of Rates	Standard Deviation
0.55	0.14 - 0.78	0.18

Data Plot and Equation



Local Apartment Trip Generation Study

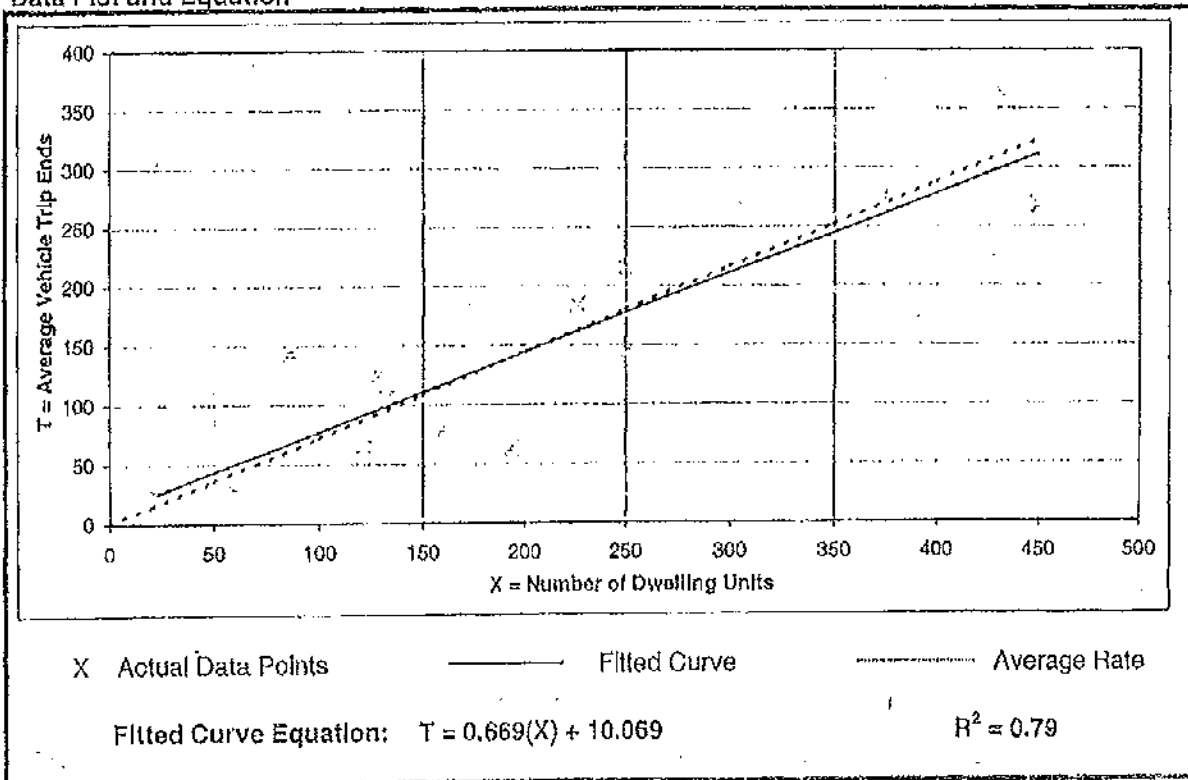
Average Vehicle Trip Ends vs: Dwelling Units
 On a: Weekday,
 Peak Hour of Adjacent Street Traffic,
 One Hour Between 4 and 6 p.m.

Number of Studies: 13
 Average Number of Dwelling Units: 193
 Directional Distribution: 55% entering, 45% exiting

Trip Generation Per Dwelling Unit

Average Rate	Ranges of Rates	Standard Deviation
0.72	0.32 - 1.66	0.25

Data Plot and Equation



Specialty Retail Center (814)

**Average Vehicle Trip Ends vs: 1000 Sq. Feet Gross Leasable Area
On a: Weekday**

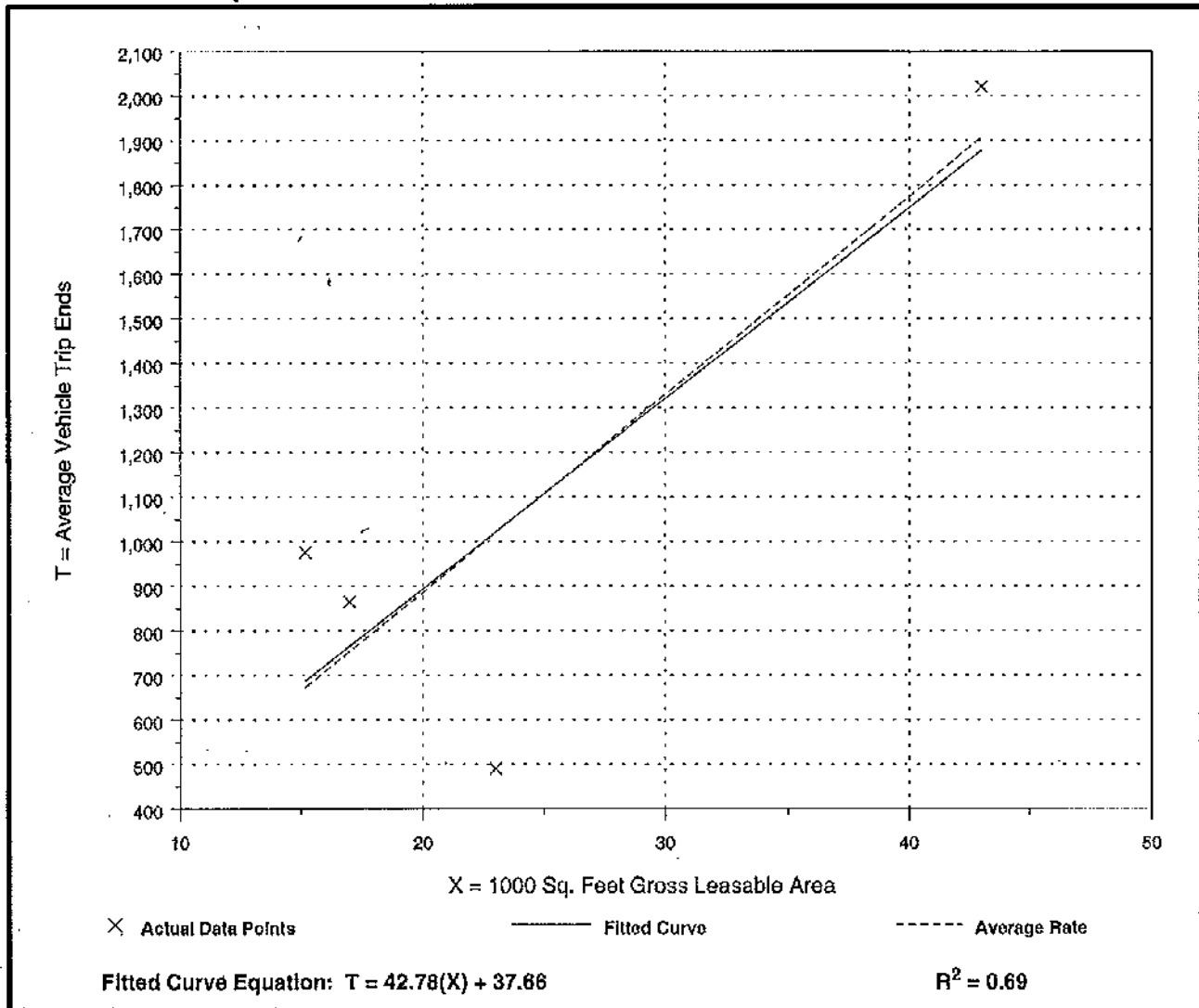
Number of Studies: 4
Average 1000 Sq. Feet GLA: 25
Directional Distribution: 50% entering, 50% exiting

Trip Generation per 1000 Sq. Feet Gross Leasable Area

Average Rate	Range of Rates	Standard Deviation
44.32	21.30 - 64.21	15.52

Data Plot and Equation

Caution - Use Carefully - Small Sample Size



Specialty Retail Center (814)

Average Vehicle Trip Ends vs: 1000 Sq. Feet Gross Leasable Area
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

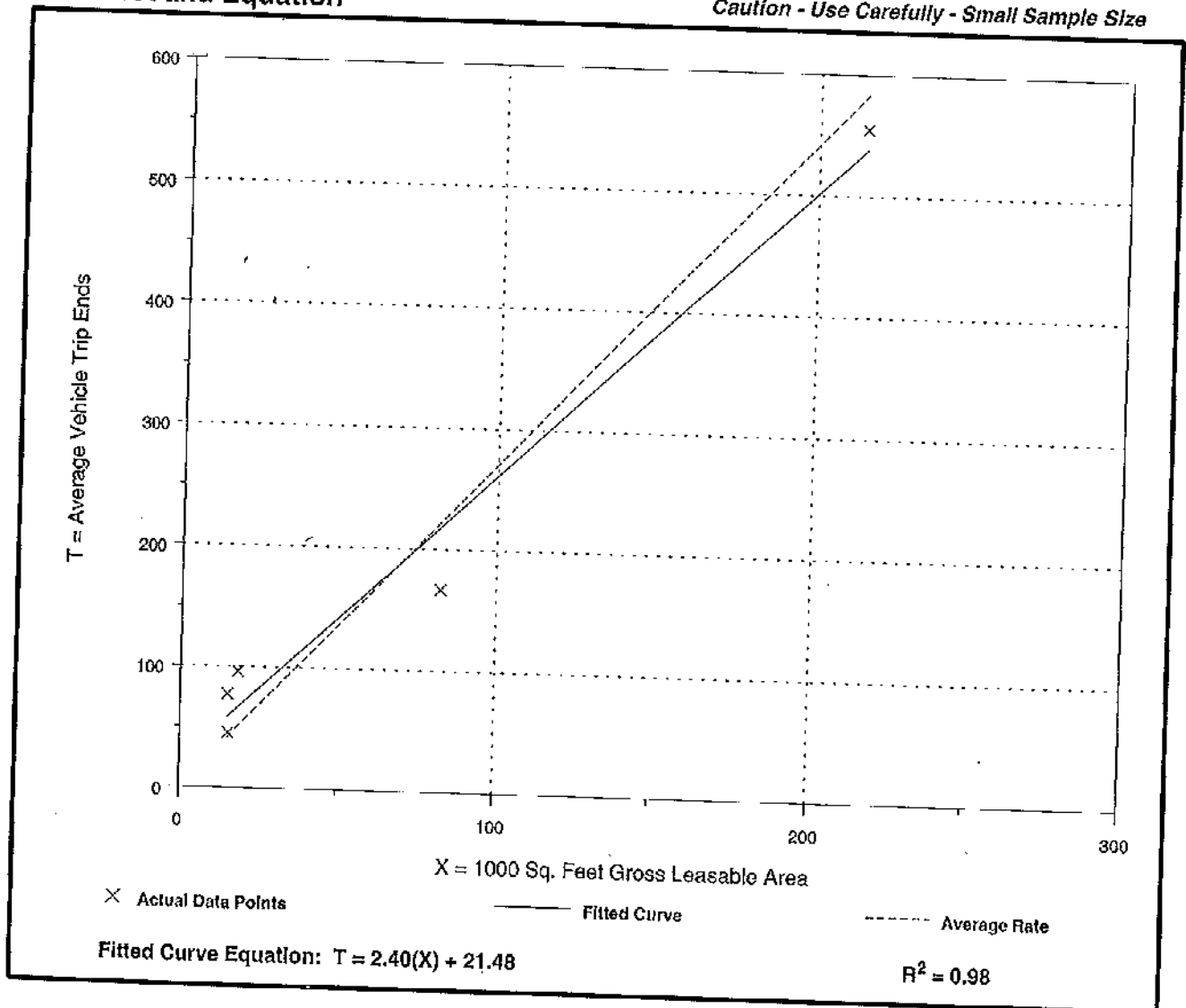
Number of Studies: 5
Average 1000 Sq. Feet GLA: 69
Directional Distribution: 44% entering, 56% exiting

Trip Generation per 1000 Sq. Feet Gross Leasable Area

Average Rate	Range of Rates	Standard Deviation
2.71	2.03 - 5.16	1.83

Data Plot and Equation

Caution - Use Carefully - Small Sample Size



CAPACITY ANALYSES

CAPACITY AND LEVEL-OF-SERVICE CONCEPTS

In a general sense, a roadway is similar to a pipeline or other material carrying conduit in that it has a certain capacity for the amount of material (vehicles) that it can efficiently carry. As the number of vehicles in a given time period gradually increases, the quality of traffic flow gradually decreases. On roadway sections this results in increasing turbulence in the traffic stream, and at intersections it results in increasing stops and delay. As the volumes begin to approach the capacity of the facility, these problems rapidly magnify, with resulting serious levels of congestion, stops, delay, excess fuel consumption, pollutant emissions, etc.

The Federal Highway Administration has published the Year 2000 Highway Capacity Manual (HCM2000), which establishes theoretical techniques to quantify the capacity conditions on all types of roadways, intersections, ramps, pedestrian facilities, etc. A basic concept that is applicable to most of these techniques is the idea of level of service (LOS). This concept establishes a rating system that quantifies the quality of traffic flow, as perceived by motorists and/or passengers. The general system is similar to a school grade scale, and is outlined as follows:

<u>Level of Service (LOS)</u>	<u>General Quality of Traffic Flow</u>	<u>Description of Corresponding Conditions</u>
A	Excellent	Roadways – Free flow, high maneuverability Intersections – Very few stops, very low delay
B	Very Good	Roadways – Free flow, slightly lower maneuverability Intersections – Minor stops, low delay
C	Good	Roadways – Stable flow, restricted maneuverability Intersections – Significant stops, significant delay
D	Fair	Roadways – Marginally stable flow, congestion seriously restricts maneuverability Intersections – High stops, long but tolerable delay
E	Poor	Roadways – Unstable flow*, lower operating speeds, congestion severely restricts maneuverability Intersections – All vehicles stop, very long queues and very long intolerable delay
F	Very Poor	Roadways – Forced flow, stoppages may be lengthy, congestion severely restricts maneuverability Intersections – All vehicles stop, extensive queues and extremely long intolerable delay

*Unstable flow is such that minor fluctuations or disruptions can result in rapid degradation to LOS F.

Another measure of intersection capacity that is often used in the evaluation of intersection operations is the volume to capacity (V/C) ratio. This ratio is defined as “the ratio of flow rate to capacity”, and is a good measure of how much of an intersection’s available capacity has been used up by the analysis volumes. Conversely, it also provides an indication of the reserve capacity available for future growth in traffic volumes.

The Intersection Capacity Utilization (ICU) is another measure that expresses a value similar to the V/C ratio. Specifically, the ICU method “sums the amount of the time required to serve all movements at saturation for a given cycle length and divides by that reference cycle length.” The ICU is considered a more accurate measure of volume to capacity conditions for a signalized intersection, primarily because it accounts for the effects of the signal timing on intersection capacity.

Lanes, Volumes, Timings
1: Gleason Drive & Morrell Road

Existing 2012 AM
Timing Plan: AM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗	↖	↑	↗	↖	↑	↗	↖	↑	↗
Volume (vph)	102	24	231	10	32	57	330	534	8	17	205	49
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.904			0.998			0.971	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1856	1891	1554	1734	1760	0	1734	3346	0	1761	3305	0
Flt Permitted	0.443			0.739			0.511			0.410		
Satd. Flow (perm)	865	1891	1554	1349	1760	0	933	3346	0	760	3305	0
Satd. Flow (RTOR)			272		67			1			30	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Shared Lane Traffic (%)												
Lane Group Flow (vph)	120	28	272	12	105	0	388	637	0	20	299	0
Turn Type	pm+pt		Perm	pm+pt			pm+pt			pm+pt		
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4		4	8			6			2		
Detector Phase	7	4	4	3	8		1	6		5	2	
Switch Phase												
Minimum Initial (s)	6.0	8.0	8.0	6.0	8.0		6.0	12.0		6.0	12.0	
Minimum Split (s)	13.5	16.0	16.0	13.0	34.0		13.0	30.5		13.0	33.5	
Total Split (s)	15.0	35.0	35.0	15.0	35.0	0.0	15.0	36.0	0.0	14.0	35.0	0.0
Total Split (%)	15.0%	35.0%	35.0%	15.0%	35.0%	0.0%	15.0%	36.0%	0.0%	14.0%	35.0%	0.0%
Maximum Green (s)	9.5	29.0	29.0	10.0	29.0		10.0	30.5		9.0	29.5	
Yellow Time (s)	4.0	4.5	4.5	4.0	4.5		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5	1.5	1.0	1.5		1.0	1.5		1.0	1.5	
Lost Time Adjust (s)	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 Lost Time (s)	5.5	6.0	6.0	5.0	6.0	4.0	5.0	5.5	4.0	5.0	5.5	4.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0		2.0	3.0		2.0	3.0	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Walk Time (s)					5.0			5.0			5.0	
Flash Dont Walk (s)					23.0			20.0			23.0	
Pedestrian Calls (#/hr)					0			0			0	
Act Effcl Green (s)	20.8	18.4	18.4	14.0	8.8		68.4	63.5		54.0	47.5	
Actuated g/C Ratio	0.21	0.18	0.18	0.14	0.09		0.68	0.64		0.54	0.48	
v/c Ratio	0.44	0.08	0.54	0.06	0.49		0.51	0.30		0.04	0.19	
Control Delay	36.8	33.8	8.9	28.9	26.6		3.2	3.0		8.4	16.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	36.8	33.8	8.9	28.9	26.6		3.2	3.0		8.4	16.1	
LOS	D	C	A	C	C		A	A		A	B	
Approach Delay		18.5			28.8			3.1			15.7	
Approach LOS		B			C			A			B	
Queue Length 50th (ft)	63	14	0	6	23		8	6		4	52	
Queue Length 95th (ft)	101	39	57	19	66		17	64		12	88	
Internal Link Dist (ft)		1309			987			1616			1284	
Turn Bay Length (ft)	110						150			155		
Base Capacity (vph)	275	548	644	281	558		763	2124		524	1587	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	

Lanes, Volumes, Timings
 1: Gleason Drive & Morrell Road

Existing 2012 AM
 Timing Plan: AM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.44	0.05	0.42	0.04	0.19		0.51	0.30		0.04	0.19	

Intersection Summary

Cycle Length: 100
 Actuated Cycle Length: 100
 Offset: 0 (0%), Referenced to phase 2:SBTL and 6:NBTL, Start of Yellow, Master Intersection
 Natural Cycle: 95
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.54
 Intersection Signal Delay: 10.1
 Intersection Capacity Utilization 54.4%
 Analysis Period (min) 15

Intersection LOS: B
 ICU Level of Service A

Splits and Phases: 1: Gleason Drive & Morrell Road

p1	p2	p3	p4
15s	35s	15s	35s
p5	p6	p7	p8
14s	36s	15s	35s

Lanes, Volumes, Timings
2: Deane Hill Drive & Morrell Road

Existing 2012 AM
Timing Plan: AM Peak



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↵	↶	↕↗		↵	↕↕
Volume (vph)	55	49	908	378	131	349
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	0.95
Frt		0.850	0.956			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1752	1567	3303	0	1711	3421
Flt Permitted	0.950				0.133	
Satd. Flow (perm)	1752	1567	3303	0	239	3421
Satd. Flow (RTOR)		53	81			
Peak Hour Factor	0.93	0.93	0.90	0.90	0.85	0.85
Shared Lane Traffic (%)						
Lane Group Flow (vph)	59	53	1429	0	154	411
Turn Type		Perm			pm+pt	
Protected Phases	4		2		1	12
Permitted Phases		4			12	
Detector Phase	4	4	2		1	12
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0		8.0	
Minimum Split (s)	30.0	30.0	16.5		15.0	
Total Split (s)	31.0	31.0	50.0	0.0	19.0	69.0
Total Split (%)	31.0%	31.0%	50.0%	0.0%	19.0%	69.0%
Maximum Green (s)	26.0	26.0	43.5		14.0	
Yellow Time (s)	4.0	4.0	4.5		4.0	
All-Red Time (s)	1.0	1.0	2.0		1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	6.5	4.0	5.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?						
Vehicle Extension (s)	2.0	2.0	2.0		2.0	
Recall Mode	None	None	C-Max		None	
Walk Time (s)	7.0	7.0				
Flash Dont Walk (s)	18.0	18.0				
Pedestrian Calls (#/hr)	0	0				
Act Effct Green (s)	10.2	10.2	66.0		77.8	83.8
Actuated g/C Ratio	0.10	0.10	0.66		0.78	0.84
y/c Ratio	0.33	0.26	0.65		0.46	0.14
Control Delay	47.1	15.1	12.6		7.1	1.7
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	47.1	15.1	12.6		7.1	1.7
LOS	D	B	B		A	A
Approach Delay	31.9		12.6			3.2
Approach LOS	C		B			A
Queue Length 50th (ft)	36	0	253		9	13
Queue Length 95th (ft)	76	36	404		15	13
Internal Link Dist (ft)	930		2251			1616
Turn Bay Length (ft)		130			165	
Base Capacity (vph)	456	447	2207		404	2851
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0

Lanes, Volumes, Timings
 2: Deane Hill Drive & Morrell Road

Existing 2012 AM
 Timing Plan: AM Peak



Lane Group	WBI	WBR	NBT	NBR	SBL	SBT
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.13	0.12	0.65		0.38	0.14

Intersection Summary

Cycle Length: 100
 Actuated Cycle Length: 100
 Offset: 66.5 (67%), Referenced to phase 2:NBSB, Start of Yellow
 Natural Cycle: 90
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.65
 Intersection Signal Delay: 11.1
 Intersection Capacity Utilization 66.5%
 Analysis Period (min) 15

Intersection LOS: B
 ICU Level of Service C

Splits and Phases: 2: Deane Hill Drive & Morrell Road

p1	p2	p4
13 s	50 s	31 s

TWO-WAY STOP CONTROL SUMMARY								
General Information				Site Information				
Analyst	AWG			Intersection	Deane Hill Dr. @ Wellsley Park			
Agency/Co.	CCI			Jurisdiction	Knoxville			
Date Performed	3/14/2012			Analysis Year	Existing 2012			
Analysis Time Period	AM							
Project Description 01016-0000								
East/West Street: Doano Hill Dr.				North/South Street: Wellsley Park Rd.				
Intersection Orientation: East-West				Study Period (hrs): 0.25				
Vehicle Volumes and Adjustments								
Major Street	Eastbound			Westbound				
Movement	1	2	3	4	5	6		
	L	T	R	L	T	R		
Volume (veh/h)	3	360			96	16		
Peak-Hour Factor, PHF	0.85	0.85	1.00	1.00	0.85	0.85		
Hourly Flow Rate, HFR (veh/h)	3	423	0	0	112	18		
Percent Heavy Vehicles	0	--	--	0	--	--		
Median Type	Undivided							
RT Channelized			0			0		
Lanes	0	1	0	0	1	0		
Configuration	LT					TR		
Upstream Signal		0			0			
Minor Street	Northbound			Southbound				
Movement	7	8	9	10	11	12		
	L	T	R	L	T	R		
Volume (veh/h)				32		7		
Peak-Hour Factor, PHF	1.00	1.00	1.00	0.85	1.00	0.85		
Hourly Flow Rate, HFR (veh/h)	0	0	0	37	0	8		
Percent Heavy Vehicles	0	0	0	0	0	0		
Percent Grade (%)	0			0				
Flared Approach		N			N			
Storage		0			0			
RT Channelized			0			0		
Lanes	0	0	0	0	0	0		
Configuration					LR			
Delay, Queue Length, and Level of Service								
Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	LT						LR	
v (veh/h)	3						45	
C (m) (veh/h)	1468						544	
v/c	0.00						0.08	
95% queue length	0.01						0.27	
Control Delay (s/veh)	7.5						12.2	
LOS	A						B	
Approach Delay (s/veh)	--	--					12.2	
Approach LOS	--	--					B	

Lanes, Volumes, Timings
1: Gleason Drive & Morrell Road

Existing 2012 PM
Timing Plan: PM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗	↖	↗		↖	↗		↖	↗	
Volume (vph)	95	99	392	138	134	39	331	354	67	30	389	96
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.966			0.976			0.970	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1856	1891	1554	1734	1881	0	1734	3272	0	1761	3302	0
Flt Permitted	0.421			0.653			0.377			0.481		
Satd. Flow (perm)	823	1891	1554	1192	1881	0	688	3272	0	892	3302	0
Satd. Flow (RTOR)			431		13			22			27	
Peak Hour Factor	0.91	0.91	0.91	0.89	0.89	0.89	0.89	0.89	0.89	0.97	0.97	0.97
Shared Lane Traffic (%)												
Lane Group Flow (vph)	104	109	431	155	195	0	372	473	0	31	500	0
Turn Type	pm+pt		Perm	pm+pt			pm+pt			pm+pt		
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4		4	8			6			2		
Detector Phase	7	4	4	3	8		1	6		5	2	
Switch Phase												
Minimum Initial (s)	6.0	8.0	8.0	6.0	8.0		6.0	6.0		5.0	12.0	
Minimum Split (s)	13.5	16.0	16.0	13.0	34.0		13.0	30.5		13.0	33.5	
Total Split (s)	15.0	36.0	36.0	15.0	36.0	0.0	24.0	45.0	0.0	14.0	35.0	0.0
Total Split (%)	13.6%	32.7%	32.7%	13.6%	32.7%	0.0%	21.8%	40.9%	0.0%	12.7%	31.8%	0.0%
Maximum Green (s)	9.5	30.0	30.0	10.0	30.0		19.0	39.5		9.0	29.5	
Yellow Time (s)	4.0	4.5	4.5	4.0	4.5		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5	1.5	1.0	1.5		1.0	1.5		1.0	1.5	
Lost Time Adjust (s)	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 Lost Time (s)	5.5	6.0	6.0	5.0	6.0	4.0	5.0	5.5	4.0	5.0	5.5	4.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0		2.0	3.0		2.0	3.0	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Walk Time (s)					5.0			5.0			5.0	
Flash Dont Walk (s)					23.0			20.0			23.0	
Pedestrian Calls (#/hr)					0			0			0	
Act Effct Green (s)	23.6	14.6	14.6	25.8	15.2		69.8	62.8		53.4	47.4	
Actuated g/C Ratio	0.21	0.13	0.13	0.23	0.14		0.63	0.57		0.49	0.43	
w/c Ratio	0.41	0.43	0.74	0.48	0.72		0.62	0.25		0.06	0.35	
Control Delay	34.4	47.8	12.5	35.9	56.7		8.6	7.2		11.4	22.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	34.4	47.8	12.5	35.9	56.7		8.6	7.2		11.4	22.8	
LOS	C	D	B	D	E		A	A		B	C	
Approach Delay		22.0			47.5			7.8			22.2	
Approach LOS		C			D			A			C	
Queue Length 50th (ft)	56	72	0	86	125		28	74		8	115	
Queue Length 95th (ft)	93	119	91	130	188		133	155		22	196	
Internal Link Dist (ft)		1309			987			1616			1284	
Turn Bay Length (ft)	110						150			155		
Base Capacity (vph)	273	516	737	333	522		629	1879		533	1439	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	

Lanes, Volumes, Timings
 1: Gleason Drive & Morrell Road

Existing 2012 PM
 Timing Plan: PM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced w/c Ratio	0.38	0.21	0.58	0.47	0.37		0.59	0.25		0.06	0.35	

Intersection Summary

Cycle Length: 110
 Actuated Cycle Length: 110
 Offset: 0 (0%), Referenced to phase 2:SBTL and 6:NBTL, Start of Yellow, Master Intersection
 Natural Cycle: 95
 Control Type: Actuated-Coordinated
 Maximum w/c Ratio: 0.74
 Intersection Signal Delay: 20.7
 Intersection Capacity Utilization 65.2%
 Analysis Period (min) 15

Intersection LOS: C
 ICU Level of Service C

Splits and Phases: 1: Gleason Drive & Morrell Road

ø1	ø2	ø3	ø4
24 s	35 s	15 s	36 s
ø5	ø6	ø7	ø8
14 s	45 s	15 s	36 s

Lanes, Volumes, Timings
 2: Deane Hill Drive & Morrell Road

Existing 2012 PM
 Timing Plan: PM Peak



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↵	↵	↕	↕	↘	↘
Volume (vph)	418	176	560	189	123	769
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	0.95
Frt		0.850	0.962			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1752	1567	3324	0	1711	3421
Flt Permitted	0.950				0.257	
Satd. Flow (perm)	1752	1567	3324	0	463	3421
Satd. Flow (RTOR)		125	50			
Peak Hour Factor	0.93	0.93	0.94	0.94	0.95	0.95
Shared Lane Traffic (%)						
Lane Group Flow (vph)	449	189	797	0	129	809
Turn Type		Perm			pm+pt	
Protected Phases	4		2		1	1 2
Permitted Phases		4			1 2	
Detector Phase	4	4	2		1	1 2
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0		8.0	
Minimum Split (s)	30.0	30.0	16.5		15.0	
Total Split (s)	40.0	40.0	50.0	0.0	20.0	70.0
Total Split (%)	36.4%	36.4%	45.5%	0.0%	18.2%	63.6%
Maximum Green (s)	35.0	35.0	43.5		15.0	
Yellow Time (s)	4.0	4.0	4.5		4.0	
All-Red Time (s)	1.0	1.0	2.0		1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	6.5	4.0	5.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?						
Vehicle Extension (s)	2.0	2.0	2.0		2.0	
Recall Mode	None	None	C-Max		None	
Walk Time (s)	7.0	7.0				
Flash Dont Walk (s)	18.0	18.0				
Pedestrian Calls (#/hr)	0	0				
Act Effct Green (s)	31.3	31.3	47.3		63.7	68.7
Actuated g/C Ratio	0.28	0.28	0.43		0.58	0.62
v/c Ratio	0.90	0.35	0.55		0.30	0.38
Control Delay	60.0	12.6	24.4		7.7	7.9
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	60.0	12.6	24.4		7.7	7.9
LOS	E	B	C		A	A
Approach Delay	46.0		24.4			7.9
Approach LOS	D		C			A
Queue Length 50th (ft)	297	33	215		29	160
Queue Length 95th (ft)	#448	88	280		33	83
Internal Link Dist (ft)	930		2251			1616
Turn Bay Length (ft)		130			155	
Base Capacity (vph)	557	584	1459		448	2128
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0

Lanes, Volumes, Timings
 2: Deane Hill Drive & Morrell Road

Existing 2012 PM
 Timing Plan: PM Peak



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.81	0.32	0.55		0.29	0.38

Intersection Summary:

Cycle Length: 110
 Actuated Cycle Length: 110
 Offset: 56 (51%), Referenced to phase 2:NBSB, Start of Yellow
 Natural Cycle: 70
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.90
 Intersection Signal Delay: 23.7
 Intersection Capacity Utilization 65.2%
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Intersection LOS: C
 ICU Level of Service C

Splits and Phases: 2: Deane Hill Drive & Morrell Road

01	02	04
20s	50s	40s

TWO-WAY STOP CONTROL SUMMARY								
General Information				Site Information				
Analyst	AWG			Intersection	Doano Hill Dr. @ Wellsley Park			
Agency/Co.	CCI			Jurisdiction	Knoxville			
Date Performed	3/14/2012			Analysis Year	Existing 2012			
Analysis Time Period	PM							
Project Description 01016-0000								
East/West Street: Deane Hill Dr.				North/South Street: Wellsley Park Rd.				
Intersection Orientation: East-West				Study Period (hrs): 0.25				
Vehicle Volumes and Adjustments								
Major Street	Eastbound			Westbound				
Movement	1	2	3	4	5	6		
	L	T	R	L	T	R		
Volume (veh/h)	13	241			275	58		
Peak-Hour Factor, PHF	0.85	0.85	1.00	1.00	0.85	0.85		
Hourly Flow Rate, HFR (veh/h)	15	283	0	0	323	68		
Percent Heavy Vehicles	0	--	--	0	--	--		
Median Type	Undivided							
RT Channelized			0			0		
Lanes	0	1	0	0	1	0		
Configuration	LT						TR	
Upstream Signal		0			0			
Minor Street	Northbound			Southbound				
Movement	7	8	9	10	11	12		
	L	T	R	L	T	R		
Volume (veh/h)				42		22		
Peak-Hour Factor, PHF	1.00	1.00	1.00	0.85	1.00	0.85		
Hourly Flow Rate, HFR (veh/h)	0	0	0	49	0	25		
Percent Heavy Vehicles	0	0	0	0	0	0		
Percent Grade (%)	0			0				
Flared Approach		N			N			
Storage		0			0			
RT Channelized			0			0		
Lanes	0	0	0	0	0	0		
Configuration				LR				
Delay, Queue Length, and Level of Service								
Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	LT					LR		
v (veh/h)	15						74	
C (m) (veh/h)	1179						484	
v/c	0.01						0.15	
95% queue length	0.04						0.54	
Control Delay (s/veh)	8.1						13.8	
LOS	A					B		
Approach Delay (s/veh)	--	--				13.8		
Approach LOS	--	--				B		

Lanes, Volumes, Timings
1: Gleason Drive & Morrell Road

Background 2013 AM
Timing Plan: AM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↶	↷	↷	↶	↷	↷	↶	↷	↷	↶	↷	↷
Volume (vph)	104	24	236	10	33	58	337	545	8	17	209	50
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.905			0.998			0.971	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1856	1891	1554	1734	1762	0	1734	3346	0	1761	3305	0
Flt Permitted	0.480			0.739			0.499			0.405		
Satd. Flow (perm)	938	1891	1554	1349	1762	0	911	3346	0	751	3305	0
Satd. Flow (RTOR)			278		68			1			30	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Shared Lane Traffic (%)												
Lane Group Flow (vph)	122	28	278	12	107	0	396	650	0	20	305	0
Turn Type	pm+pt		Perm	pm+pt			pm+pt			pm+pt		
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4		4	8			6			2		
Detector Phase	7	4	4	3	8		1	6		5	2	
Switch Phase												
Minimum Initial (s)	6.0	8.0	8.0	6.0	8.0		6.0	12.0		6.0	12.0	
Minimum Split (s)	13.5	16.0	16.0	13.0	34.0		13.0	30.5		13.0	33.5	
Total Split (s)	15.0	35.0	35.0	15.0	35.0	0.0	15.0	36.0	0.0	14.0	35.0	0.0
Total Split (%)	15.0%	35.0%	35.0%	15.0%	35.0%	0.0%	15.0%	36.0%	0.0%	14.0%	35.0%	0.0%
Maximum Green (s)	9.5	29.0	29.0	10.0	29.0		10.0	30.5		9.0	29.5	
Yellow Time (s)	4.0	4.5	4.5	4.0	4.5		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5	1.5	1.0	1.5		1.0	1.5		1.0	1.5	
Lost Time Adjust (s)	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 Lost Time (s)	5.5	6.0	6.0	5.0	6.0	4.0	5.0	5.5	4.0	5.0	5.5	4.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0		2.0	3.0		2.0	3.0	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Walk Time (s)					5.0			5.0			5.0	
Flash Dont Walk (s)					23.0			20.0			23.0	
Pedestrian Calls (#/hr)					0			0			0	
Act Effct Green (s)	23.2	20.8	20.8	15.8	8.8		65.9	61.0		50.6	44.1	
Actuated g/C Ratio	0.23	0.21	0.21	0.16	0.09		0.66	0.61		0.51	0.44	
v/c Ratio	0.41	0.07	0.51	0.05	0.49		0.54	0.32		0.05	0.21	
Control Delay	35.1	33.6	8.2	28.7	26.6		3.9	3.4		8.6	17.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	35.1	33.6	8.2	28.7	26.6		3.9	3.4		8.6	17.2	
LOS	D	C	A	C	C		A	A		A	B	
Approach Delay		17.6			26.8			3.6			16.7	
Approach LOS		B			C			A			B	
Queue Length 50th (ft)	64	14	0	6	24		8	6		4	54	
Queue Length 95th (ft)	102	39	58	18	67		17	62		12	91	
Internal Link Dist (ft)		1309			987			1616			1284	
Turn Bay Length (ft)	110						150			155		
Base Capacity (vph)	305	548	648	305	559		735	2043		493	1474	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	

Lanes, Volumes, Timings
 1: Gleason Drive & Morrell Road

Background 2013 AM
 Timing Plan: AM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.40	0.05	0.43	0.04	0.19		0.54	0.32		0.04	0.21	

Intersection Summary

Cycle Length: 100
 Actuated Cycle Length: 100
 Offset: 0 (0%), Referenced to phase 2:SBTL and 6:NBT, Start of Yellow, Master Intersection
 Natural Cycle: 95
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.54
 Intersection Signal Delay: 10.4
 Intersection Capacity Utilization 54.8%
 Analysis Period (min) 15

Intersection LOS: B
 ICU Level of Service A

Splits and Phases: 1: Gleason Drive & Morrell Road

ø1	ø2	ø3	ø4
15s	35s	15s	35s
ø5	ø6	ø7	ø8
14s	36s	15s	35s

Lanes, Volumes, Timings
2: Deane Hill Drive & Morrell Road

Background 2013 AM
Timing Plan: AM Peak



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↵	↶	↕	↷	↵	↷
Volume (vph)	56	50	926	385	134	356
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	0.95
Frt		0.850	0.956			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1752	1567	3303	0	1711	3421
Flt Permitted	0.950				0.126	
Satd. Flow (perm)	1752	1567	3303	0	227	3421
Satd. Flow (RTOR)		54	80			
Peak Hour Factor	0.93	0.93	0.90	0.90	0.85	0.85
Shared Lane Traffic (%)						
Lane Group Flow (vph)	60	54	1457	0	158	419
Turn Type		Perm			pm+pt	
Protected Phases	4		2		1	12
Permitted Phases		4			12	
Defector Phase	4	4	2		1	12
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0		8.0	
Minimum Split (s)	30.0	30.0	16.5		15.0	
Total Split (s)	31.0	31.0	50.0	0.0	19.0	69.0
Total Split (%)	31.0%	31.0%	50.0%	0.0%	19.0%	69.0%
Maximum Green (s)	26.0	26.0	43.5		14.0	
Yellow Time (s)	4.0	4.0	4.5		4.0	
All-Red Time (s)	1.0	1.0	2.0		1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	6.5	4.0	5.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?						
Vehicle Extension (s)	2.0	2.0	2.0		2.0	
Recall Mode	None	None	C-Max		None	
Walk Time (s)	7.0	7.0				
Flash Dont Walk (s)	18.0	18.0				
Pedestrian Calls (#/hr)	0	0				
Act Effct Green (s)	10.2	10.2	65.7		77.8	83.8
Actuated g/C Ratio	0.10	0.10	0.66		0.78	0.84
w/c Ratio	0.34	0.26	0.66		0.47	0.15
Control Delay	47.1	15.0	13.1		7.6	1.6
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	47.1	15.0	13.1		7.6	1.6
LOS	D	B	B		A	A
Approach Delay	31.9		13.1			3.2
Approach LOS	C		B			A
Queue Length 50th (ft)	36	0	264		10	13
Queue Length 95th (ft)	75	36	424		17	13
Internal Link Dist (ft)	930		2261			1616
Turn Bay Length (ft)		130			155	
Base Capacity (vph)	456	447	2196		396	2842
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0

Lanes, Volumes, Timings
 2: Deane Hill Drive & Morrell Road

Background 2013 AM
 Timing Plan: AM Peak



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.13	0.12	0.66		0.40	0.15

Intersection Summary

Cycle Length: 100
 Actuated Cycle Length: 100
 Offset: 66.5 (67%), Referenced to phase 2:NBSB, Start of Yellow
 Natural Cycle: 90
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.66
 Intersection Signal Delay: 11.5
 Intersection Capacity Utilization 67.4%
 Analysis Period (min) 15

Intersection LOS: B
 ICU Level of Service C

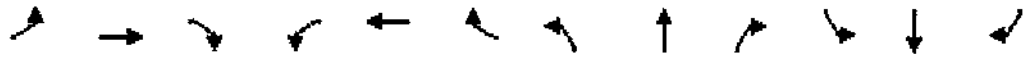
Splits and Phases: 2: Deane Hill Drive & Morrell Road

Phase	Split	Phase	Split	Phase	Split
ϕ1	19s	ϕ2	50s	ϕ4	31s

TWO-WAY STOP CONTROL SUMMARY								
General Information				Site Information				
Analyst	AWG			Intersection	Deane Hill Dr. @ Wellsley Park			
Agency/Co.	CCI			Jurisdiction	Knoxville			
Date Performed	3/14/2012			Analysis Year	Background 2013			
Analysis Time Period	AM							
Project Description 01016-0000								
East/West Street: Doano Hill Dr.				North/South Street: Wellsley Park Rd.				
Intersection Orientation: East-West				Study Period (hrs): 0.25				
Vehicle Volumes and Adjustments								
Major Street	Eastbound			Westbound				
Movement	1	2	3	4	5	6		
	L	T	R	L	T	R		
Volume (veh/h)	3	367			98	16		
Peak-Hour Factor, PHF	0.85	0.85	1.00	1.00	0.85	0.85		
Hourly Flow Rate, HFR (veh/h)	3	431	0	0	115	18		
Percent Heavy Vehicles	0	--	--	0	--	--		
Median Type	Undivided							
RT Channelized			0			0		
Lanes	0	1	0	0	1	0		
Configuration	LT					TR		
Upstream Signal		0			0			
Minor Street	Northbound			Southbound				
Movement	7	8	9	10	11	12		
	L	T	R	L	T	R		
Volume (veh/h)				33		7		
Peak-Hour Factor, PHF	1.00	1.00	1.00	0.85	1.00	0.85		
Hourly Flow Rate, HFR (veh/h)	0	0	0	38	0	8		
Percent Heavy Vehicles	0	0	0	0	0	0		
Percent Grade (%)	0			0				
Flared Approach		N			N			
Storage		0			0			
RT Channelized			0			0		
Lanes	0	0	0	0	0	0		
Configuration					LR			
Delay, Queue Length, and Level of Service								
Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	LT						LR	
v (veh/h)	3						46	
C (m) (veh/h)	1464						535	
v/c	0.00						0.09	
95% queue length	0.01						0.28	
Control Delay (s/veh)	7.5						12.4	
LOS	A						B	
Approach Delay (s/veh)	--	--				12.4		
Approach LOS	--	--				B		

Lanes, Volumes, Timings
1: Gleason Drive & Morrell Road

Background 2013 PM
Timing Plan: PM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗	↖	↗		↖	↗		↖	↗	
Volume (vph)	97	101	400	141	137	40	338	361	68	31	397	98
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.966			0.976			0.970	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1856	1891	1554	1734	1881	0	1734	3272	0	1761	3302	0
Flt Permitted	0.414			0.648			0.368			0.477		
Satd. Flow (perm)	809	1891	1554	1183	1881	0	672	3272	0	884	3302	0
Satd. Flow (RTOR)			440		13			22			27	
Peak Hour Factor	0.91	0.91	0.91	0.89	0.89	0.89	0.89	0.89	0.89	0.97	0.97	0.97
Shared Lane Traffic (%)												
Lane Group Flow (vph)	107	111	440	158	199	0	380	482	0	32	510	0
Turn Type	pm+pt		Perm	pm+pt			pm+pt			pm+pt		
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4		4	8			6			2		
Detector Phase	7	4	4	3	8		1	6		5	2	
Switch Phase												
Minimum Initial (s)	6.0	8.0	8.0	6.0	8.0		6.0	6.0		5.0	12.0	
Minimum Split (s)	13.5	16.0	16.0	13.0	34.0		13.0	30.5		13.0	33.5	
Total Split (s)	15.0	36.0	36.0	15.0	36.0	0.0	24.0	45.0	0.0	14.0	35.0	0.0
Total Split (%)	13.6%	32.7%	32.7%	13.6%	32.7%	0.0%	21.8%	40.9%	0.0%	12.7%	31.8%	0.0%
Maximum Green (s)	9.5	30.0	30.0	10.0	30.0		19.0	39.5		9.0	29.5	
Yellow Time (s)	4.0	4.5	4.5	4.0	4.5		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5	1.5	1.0	1.5		1.0	1.5		1.0	1.5	
Lost Time Adjust (s)	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 Lost Time (s)	5.5	6.0	6.0	5.0	6.0	4.0	5.0	5.5	4.0	5.0	5.5	4.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0		2.0	3.0		2.0	3.0	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Walk Time (s)					5.0			5.0			5.0	
Flash Dont Walk (s)					23.0			20.0			23.0	
Pedestrian Calls (#/hr)					0			0			0	
Act Effct Green (s)	23.9	14.9	14.9	26.0	15.4		69.5	62.6		52.4	46.4	
Actuated g/C Ratio	0.22	0.14	0.14	0.24	0.14		0.63	0.57		0.48	0.42	
w/c Ratio	0.42	0.43	0.75	0.48	0.72		0.64	0.26		0.07	0.36	
Control Delay	34.5	47.5	12.4	35.8	56.7		8.9	7.3		11.7	23.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	34.5	47.5	12.4	35.8	56.7		8.9	7.3		11.7	23.7	
LOS	C	D	B	D	E		A	A		B	C	
Approach Delay		21.9			47.4			8.0			23.0	
Approach LOS		C			D			A			C	
Queue Length 50th (ft)	58	73	0	88	127		29	78		8	121	
Queue Length 95th (ft)	95	120	92	133	191		145	159		23	204	
Internal Link Dist (ft)		1309			987			1616			1284	
Turn Bay Length (ft)	110						150			155		
Base Capacity (vph)	273	516	744	335	522		624	1870		521	1409	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	

Lanes, Volumes, Timings
 1: Gleason Drive & Morrell Road

Background 2013 PM
 Timing Plan: PM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.39	0.22	0.59	0.47	0.38		0.61	0.26		0.06	0.36	

Intersection Summary

Cycle Length: 110
 Actuated Cycle Length: 110
 Offset: 0 (0%), Referenced to phase 2:SBTL and 6:NBTL, Start of Yellow, Master Intersection
 Natural Cycle: 95
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.75
 Intersection Signal Delay: 21.0
 Intersection Capacity Utilization 66.2%
 Analysis Period (min) 15

Intersection LOS: C
 ICU Level of Service C

Splits and Phases: 1: Gleason Drive & Morrell Road

φ1 24s	φ2 35s	φ3 15s	φ4 36s
φ5 14s	φ6 45s	φ7 15s	φ8 36s

Lanes, Volumes, Timings
2: Deane Hill Drive & Morrell Road

Background 2013 PM
Timing Plan: PM Peak



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖	↗	↕	↕	↖	↗
Volume (vph)	426	179	571	193	125	784
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	0.95
Frt		0.850	0.962			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1752	1567	3324	0	1711	3421
Flt Permitted	0.950				0.248	
Satd. Flow (perm)	1752	1567	3324	0	447	3421
Satd. Flow (RTOR)		125	50			
Peak Hour Factor	0.93	0.93	0.94	0.94	0.95	0.95
Shared Lane Traffic (%)						
Lane Group Flow (vph)	458	192	812	0	132	825
Turn Type		Perm			pm+pt	
Protected Phases	4		2		1	1.2
Permitted Phases		4			1.2	
Detector Phase	4	4	2		1	1.2
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0		8.0	
Minimum Split (s)	30.0	30.0	16.5		15.0	
Total Split (s)	40.0	40.0	50.0	0.0	20.0	70.0
Total Split (%)	36.4%	36.4%	45.5%	0.0%	18.2%	63.6%
Maximum Green (s)	35.0	35.0	43.5		15.0	
Yellow Time (s)	4.0	4.0	4.5		4.0	
All-Red Time (s)	1.0	1.0	2.0		1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	6.5	4.0	5.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?						
Vehicle Extension (s)	2.0	2.0	2.0		2.0	
Recall Mode	None	None	C-Max		None	
Walk Time (s)	7.0	7.0				
Flash Dont Walk (s)	18.0	18.0				
Pedestrian Calls (#/hr)	0	0				
Act Effct Green (s)	31.7	31.7	46.9		63.3	68.3
Actuated g/C Ratio	0.29	0.29	0.43		0.58	0.62
v/c Ratio	0.91	0.36	0.56		0.31	0.39
Control Delay	60.6	12.8	24.9		8.0	7.9
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	60.6	12.8	24.9		8.0	7.9
LOS	E	B	C		A	A
Approach Delay	46.5		24.9			7.9
Approach LOS	D		C			A
Queue Length 50th (ft)	302	34	221		29	167
Queue Length 95th (ft)	#463	91	286		34	85
Internal Link Dist (ft)	930		2251			1616
Turn Bay Length (ft)		130			155	
Base Capacity (vph)	557	584	1446		438	2113
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.82	0.33	0.56		0.30	0.39

Intersection Summary

Cycle Length: 110
 Actuated Cycle Length: 110
 Offset: 56 (51%), Referenced to phase 2:NBSB, Start of Yellow
 Natural Cycle: 70
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.91
 Intersection Signal Delay: 24.0
 Intersection Capacity Utilization 66.2%
 Analysis Period (min) 15
 Intersection LOS: C
 ICU Level of Service C
 # - 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 2: Deane Hill Drive & Morrell Road

ø1	ø2	ø4
20 s	50 s	40 s

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	AWG	Intersection	Deane Hill Dr. @ Wellsley Park
Agency/Co.	CCI	Jurisdiction	Knoxville
Date Performed	3/14/2012	Analysis Year	Background 2013
Analysis Time Period	PM		

Project Description 01016-0000	
East/West Street: Deane Hill Dr.	North/South Street: Wellsley Park Rd.
Intersection Orientation: East-West	Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	13	246			280	59
Peak-Hour Factor, PHF	0.85	0.85	1.00	1.00	0.85	0.85
Hourly Flow Rate, HFR (veh/h)	15	289	0	0	329	69
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	0	0	1	0
Configuration	LT					TR
Upstream Signal		0			0	
Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)				43		22
Peak-Hour Factor, PHF	1.00	1.00	1.00	0.85	1.00	0.85
Hourly Flow Rate, HFR (veh/h)	0	0	0	50	0	25
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)	0			0		
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	0	0	0	0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	LT						LR	
v (veh/h)	15						75	
C (m) (veh/h)	1172						476	
v/c	0.01						0.16	
95% queue length	0.04						0.55	
Control Delay (s/veh)	8.1						14.0	
LOS	A						B	
Approach Delay (s/veh)	--	--					14.0	
Approach LOS	--	--					B	

Lanes, Volumes, Timings
1: Gleason Drive & Morrell Road

Combined 2013 AM
Timing Plan: AM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↵	↑	↗	↵	↑	↗	↵	↑↕	↗	↵	↑↕	↗
Volume (vph)	104	31	236	17	55	84	337	545	10	23	209	50
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.909			0.997			0.971	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1856	1891	1554	1734	1770	0	1734	3343	0	1761	3305	0
Flt Permitted	0.372			0.734			0.494			0.404		
Satd. Flow (perm)	727	1891	1554	1340	1770	0	902	3343	0	749	3305	0
Satd. Flow (RTOR)			278		77			2			30	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Shared Lane Traffic (%)												
Lane Group Flow (vph)	122	36	278	20	164	0	396	653	0	27	305	0
Turn Type	pm+pt		Perm	pm+pt			pm+pt			pm+pt		
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4		4	8			6			2		
Detector Phase	7	4	4	3	8		1	6		5	2	
Switch Phase												
Minimum Initial (s)	6.0	8.0	8.0	6.0	8.0		6.0	12.0		6.0	12.0	
Minimum Split (s)	13.5	16.0	16.0	13.0	34.0		13.0	30.5		13.0	33.5	
Total Split (s)	15.0	35.0	35.0	15.0	35.0	0.0	15.0	36.0	0.0	14.0	35.0	0.0
Total Split (%)	15.0%	35.0%	35.0%	15.0%	35.0%	0.0%	15.0%	36.0%	0.0%	14.0%	35.0%	0.0%
Maximum Green (s)	9.5	29.0	29.0	10.0	29.0		10.0	30.5		9.0	29.5	
Yellow Time (s)	4.0	4.5	4.5	4.0	4.5		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5	1.5	1.0	1.5		1.0	1.5		1.0	1.5	
Lost Time Adjust (s)	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 Lost Time (s)	5.5	6.0	6.0	5.0	6.0	4.0	5.0	5.5	4.0	5.0	5.5	4.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0		2.0	3.0		2.0	3.0	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Walk Time (s)					5.0			5.0			5.0	
Flash Dont Walk (s)					23.0			20.0			23.0	
Pedestrian Calls (#/hr)					0			0			0	
Act Effct Green (s)	24.6	20.3	20.3	17.7	10.6		64.2	57.1		48.1	41.6	
Actuated g/C Ratio	0.25	0.20	0.20	0.18	0.11		0.64	0.57		0.48	0.42	
v/c Ratio	0.44	0.09	0.52	0.08	0.64		0.55	0.34		0.06	0.22	
Control Delay	33.9	34.1	8.3	26.8	34.4		4.4	5.5		10.1	19.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	33.9	34.1	8.3	26.8	34.4		4.4	5.5		10.1	19.3	
LOS	C	C	A	C	C		A	A		B	B	
Approach Delay		17.6			33.6			5.1			18.6	
Approach LOS		B			C			A			B	
Queue Length 50th (ft)	63	18	0	10	54		9	104		6	56	
Queue Length 95th (ft)	96	44	55	24	104		18	98		17	100	
Internal Link Dist (ft)		1309			987			1616			1284	
Turn Bay Length (ft)	110						150			155		
Base Capacity (vph)	286	548	648	328	568		721	1908		474	1393	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.43	0.07	0.43	0.06	0.29		0.55	0.34		0.06	0.22	

Intersection Summary

Cycle Length: 100
 Actuated Cycle Length: 100
 Offset: 0 (0%), Referenced to phase 2:SBTL and 6:NBTL, Start of Yellow, Master Intersection
 Natural Cycle: 95
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.64
 Intersection Signal Delay: 12.7
 Intersection Capacity Utilization 60.8%
 Analysis Period (min) 15

Intersection LOS: B
 ICU Level of Service B

Splits and Phases: 1: Gleason Drive & Morrell Road

φ1 15s	φ2 35s	φ3 15s	φ4 35s
φ5 14s	φ6 36s	φ7 15s	φ8 35s

Lanes, Volumes, Timings
2: Deane Hill Drive & Morrell Road

Combined 2013 AM
Timing Plan: AM Peak



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↙	↗	↕	↕	↙	↗
Volume (vph)	56	50	928	385	134	363
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	0.95
Frt		0.850	0.956			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1752	1567	3303	0	1711	3421
Flt Permitted	0.950				0.126	
Satd. Flow (perm)	1752	1567	3303	0	227	3421
Satd. Flow (RTOR)		54	80			
Peak Hour Factor	0.93	0.93	0.90	0.90	0.85	0.85
Shared Lane Traffic (%)						
Lane Group Flow (vph)	60	54	1459	0	158	427
Turn Type		Perm			pm+pt	
Protected Phases	4		2		1	12
Permitted Phases		4			12	
Detector Phase	4	4	2		1	12
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0		8.0	
Minimum Split (s)	30.0	30.0	16.5		15.0	
Total Split (s)	31.0	31.0	50.0	0.0	19.0	69.0
Total Split (%)	31.0%	31.0%	50.0%	0.0%	19.0%	69.0%
Maximum Green (s)	26.0	26.0	43.5		14.0	
Yellow Time (s)	4.0	4.0	4.5		4.0	
All-Red Time (s)	1.0	1.0	2.0		1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	6.5	4.0	5.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?						
Vehicle Extension (s)	2.0	2.0	2.0		2.0	
Recall Mode	None	None	C-Max		None	
Walk Time (s)	7.0	7.0				
Flash Dont Walk (s)	18.0	18.0				
Pedestrian Calls (#/hr)	0	0				
Act Effct Green (s)	10.2	10.2	65.7		77.8	83.8
Actuated g/C Ratio	0.10	0.10	0.66		0.78	0.84
v/c Ratio	0.34	0.26	0.66		0.47	0.15
Control Delay	47.1	15.0	13.2		10.5	1.4
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	47.1	15.0	13.2		10.5	1.4
LOS	D	B	B		B	A
Approach Delay	31.9		13.2			3.9
Approach LOS	C		B			A
Queue Length 50th (ft)	36	0	265		10	13
Queue Length 95th (ft)	75	36	424		28	13
Internal Link Dist (ft)	930		2251			1616
Turn Bay Length (ft)		130			155	
Base Capacity (vph)	456	447	2196		396	2842
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.13	0.12	0.66		0.40	0.15

Intersection Summary:

Cycle Length: 100
 Actuated Cycle Length: 100
 Offset: 66.5 (67%), Referenced to phase 2:NBSB, Start of Yellow
 Natural Cycle: 90
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.66
 Intersection Signal Delay: 11.6
 Intersection Capacity Utilization 87.5%
 Analysis Period (min) 15

Intersection LOS: B
 ICU Level of Service C

Splits and Phases: 2: Deane Hill Drive & Morrell Road

19s	50s	31s

TWO-WAY STOP CONTROL SUMMARY								
General Information				Site Information				
Analyst	AWG			Intersection	Deane Hill Dr. @ Wellsloy Park			
Agency/Co.	CCI			Jurisdiction	Knoxville			
Date Performed	3/14/2012			Analysis Year	Combined 2013			
Analysis Time Period	AM							
Project Description 01016-0000								
East/West Street: Deane Hill Dr.				North/South Street: Wellsloy Park Rd.				
Intersection Orientation: East-West				Study Period (hrs): 0.25				
Vehicle Volumes and Adjustments								
Major Street	Eastbound			Westbound				
Movement	1	2	3	4	5	6		
	L	T	R	L	T	R		
Volume (veh/h)	3	367			98	20		
Peak-Hour Factor, PHF	0.85	0.85	1.00	1.00	0.85	0.85		
Hourly Flow Rate, HFR (veh/h)	3	431	0	0	115	23		
Percent Heavy Vehicles	0	--	--	0	--	--		
Median Type	Undivided							
RT Channelized			0			0		
Lanes	0	1	0	0	1	0		
Configuration	LT					TR		
Upstream Signal		0			0			
Minor Street	Northbound			Southbound				
Movement	7	8	9	10	11	12		
	L	T	R	L	T	R		
Volume (veh/h)				44		7		
Peak-Hour Factor, PHF	1.00	1.00	1.00	0.85	1.00	0.85		
Hourly Flow Rate, HFR (veh/h)	0	0	0	51	0	8		
Percent Heavy Vehicles	0	0	0	0	0	0		
Percent Grade (%)		0			0			
Flared Approach		N			N			
Storage		0			0			
RT Channelized			0			0		
Lanes	0	0	0	0	0	0		
Configuration					LR			
Delay, Queue Length, and Level of Service								
Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	LT						LR	
v (veh/h)	3						59	
C (m) (veh/h)	1458						524	
v/c	0.00						0.11	
95% queue length	0.01						0.38	
Control Delay (s/veh)	7.5						12.7	
LOS	A						B	
Approach Delay (s/veh)	--	--					12.7	
Approach LOS	--	--					B	

Lanes, Volumes, Timings
1: Gleason Drive & Morrell Road

Combined 2013 PM
Timing Plan: PM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗	↖	↗		↖	↕		↖	↕	
Volume (vph)	97	136	400	174	170	73	338	361	81	49	397	98
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.955			0.973			0.970	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1856	1891	1554	1734	1860	0	1734	3262	0	1761	3302	0
Flt Permitted	0.299			0.556			0.352			0.470		
Satd. Flow (perm)	584	1891	1554	1015	1860	0	643	3262	0	871	3302	0
Satd. Flow (RTOR)			440		19			27			27	
Peak Hour Factor	0.91	0.91	0.91	0.89	0.89	0.89	0.89	0.89	0.89	0.97	0.97	0.97
Shared Lane Traffic (%)												
Lane Group Flow (vph)	107	149	440	196	273	0	380	497	0	51	510	0
Turn Type	pm+pt		Perm	pm+pt			pm+pt			pm+pt		
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4		4	8			6			2		
Detector Phase	7	4	4	3	8		1	6		5	2	
Switch Phase												
Minimum Initial (s)	6.0	8.0	8.0	6.0	8.0		6.0	6.0		5.0	12.0	
Minimum Split (s)	13.5	16.0	16.0	13.0	34.0		13.0	30.5		13.0	33.5	
Total Split (s)	15.0	36.0	36.0	15.0	36.0	0.0	24.0	45.0	0.0	14.0	35.0	0.0
Total Split (%)	13.6%	32.7%	32.7%	13.6%	32.7%	0.0%	21.8%	40.9%	0.0%	12.7%	31.8%	0.0%
Maximum Green (s)	9.5	30.0	30.0	10.0	30.0		19.0	39.5		9.0	29.5	
Yellow Time (s)	4.0	4.5	4.5	4.0	4.5		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5	1.5	1.0	1.5		1.0	1.5		1.0	1.5	
Lost Time Adjust (s)	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 Lost Time (s)	5.5	6.0	6.0	5.0	6.0	4.0	5.0	5.5	4.0	5.0	5.5	4.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0		2.0	3.0		2.0	3.0	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Walk Time (s)					5.0			5.0			5.0	
Flash Dont Walk (s)					23.0			20.0			23.0	
Pedestrian Calls (#/hr)					0			0			0	
Act Effct Green (s)	27.7	18.7	18.7	30.5	19.6		65.4	55.9		48.6	42.1	
Actuated g/C Ratio	0.25	0.17	0.17	0.28	0.18		0.59	0.51		0.44	0.38	
v/c Ratio	0.44	0.46	0.70	0.57	0.79		0.68	0.30		0.12	0.40	
Control Delay	31.8	44.3	10.0	35.3	55.8		13.1	11.5		13.8	26.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	31.8	44.3	10.0	35.3	55.8		13.1	11.5		13.8	26.9	
LOS	C	D	A	D	E		B	B		B	C	
Approach Delay		20.7			47.2			12.2			25.7	
Approach LOS		C			D			B			C	
Queue Length 50th (ft)	54	95	0	105	174		63	130		14	132	
Queue Length 95th (ft)	88	146	84	150	243		280	190		37	211	
Internal Link Dist (ft)		1309			987			1616			1284	
Turn Bay Length (ft)	110						150			155		
Base Capacity (vph)	262	516	744	347	521		534	1671		481	1280	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.41	0.29	0.59	0.58	0.52		0.65	0.30		0.11	0.40	

Intersection Summary

Cycle Length: 110
 Actuated Cycle Length: 110
 Offset: 0 (0%), Referenced to phase 2:SBTL and 6:NBTL, Start of Yellow, Master Intersection
 Natural Cycle: 95
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.79
 Intersection Signal Delay: 23.7
 Intersection Capacity Utilization 69.9%
 Analysis Period (min) 15

Intersection LOS: C
 ICU Level of Service C

Splits and Phases: 1: Gleason Drive & Morrell Road

ø1	ø2	ø3	ø4
24s	35s	15s	36s
ø5	ø6	ø7	ø8
14s	45s	15s	36s

Lanes, Volumes, Timings
2: Deane Hill Drive & Morrell Road

Combined 2013 PM
Timing Plan: PM Peak



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↵	↶	↕	↷	↵	↕
Volume (vph)	426	179	583	193	125	788
Lane Util. Factor	1.00	1.00	0.95	0.95	1.00	0.95
Frnt		0.850	0.963			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1752	1567	3328	0	1711	3421
Flt Permitted	0.950				0.242	
Satd. Flow (perm)	1752	1567	3328	0	436	3421
Satd. Flow (RTOR)		125	48			
Peak Hour Factor	0.93	0.93	0.94	0.94	0.95	0.95
Shared Lane Traffic (%)						
Lane Group Flow (vph)	458	192	825	0	132	829
Turn Type		Perm			pm+pt	
Protected Phases	4		2		1	1 2
Permitted Phases		4			1 2	
Detector Phase	4	4	2		1	1 2
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0		8.0	
Minimum Split (s)	30.0	30.0	16.5		15.0	
Total Split (s)	40.0	40.0	50.0	0.0	20.0	70.0
Total Split (%)	36.4%	36.4%	45.5%	0.0%	18.2%	63.6%
Maximum Green (s)	35.0	35.0	43.5		15.0	
Yellow Time (s)	4.0	4.0	4.5		4.0	
All-Red Time (s)	1.0	1.0	2.0		1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	6.5	4.0	5.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?						
Vehicle Extension (s)	2.0	2.0	2.0		2.0	
Recall Mode	None	None	C-Max		None	
Walk Time (s)	7.0	7.0				
Flash Dont Walk (s)	18.0	18.0				
Pedestrian Calls (#/hr)	0	0				
Act Effct Green (s)	31.7	31.7	46.9		63.3	68.3
Actuated g/C Ratio	0.29	0.29	0.43		0.58	0.62
y/c Ratio	0.91	0.36	0.57		0.31	0.39
Control Delay	60.6	12.8	25.1		7.9	7.1
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	60.6	12.8	25.1		7.9	7.1
LOS	E	B	C		A	A
Approach Delay	46.5		25.1			7.2
Approach LOS	D		C			A
Queue Length 50th (ft)	302	34	226		18	118
Queue Length 95th (ft)	#463	91	293		36	92
Internal Link Dist (ft)	930		2251			1616
Turn Bay Length (ft)		130			155	
Base Capacity (vph)	557	584	1446		434	2113
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Storage Cap Reductn	0	0	0		0	0
Reduced w/c Ratio	0.82	0.33	0.57		0.30	0.39

Intersection Summary

Cycle Length: 110
 Actuated Cycle Length: 110
 Offset: 56 (51%), Referenced to phase 2:NBSB, Start of Yellow
 Natural Cycle: 70
 Control Type: Actuated-Coordinated
 Maximum w/c Ratio: 0.91
 Intersection Signal Delay: 23.8
 Intersection Capacity Utilization 66.6%
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 2: Deane Hill Drive & Morrell Road

Phase	Split	Phase	Split	Phase	Split
σ1	20%	σ2	50%	σ4	30%

TWO-WAY STOP CONTROL SUMMARY								
General Information			Site Information					
Analyst	AWG		Intersection	Deane Hill Dr. @ Wellsley Park				
Agency/Co.	CCI		Jurisdiction	Knoxville				
Date Performed	3/14/2012		Analysis Year	Combined 2013				
Analysis Time Period	PM							
Project Description 01016-0000								
East/West Street: Deane Hill Dr.			North/South Street: Wellsley Park Rd.					
Intersection Orientation: East-West			Study Period (hrs): 0.25					
Vehicle Volumes and Adjustments								
Major Street	Eastbound			Westbound				
Movement	1	2	3	4	5	6		
	L	T	R	L	T	R		
Volume (veh/h)	13	246			280	77		
Peak-Hour Factor, PHF	0.85	0.85	1.00	1.00	0.85	0.85		
Hourly Flow Rate, HFR (veh/h)	15	289	0	0	329	90		
Percent Heavy Vehicles	0	--	--	0	--	--		
Median Type	Undivided							
RT Channelized			0			0		
Lanes	0	1	0	0	1	0		
Configuration	LT					TR		
Upstream Signal		0			0			
Minor Street	Northbound			Southbound				
Movement	7	8	9	10	11	12		
	L	T	R	L	T	R		
Volume (veh/h)				51		22		
Peak-Hour Factor, PHF	1.00	1.00	1.00	0.85	1.00	0.85		
Hourly Flow Rate, HFR (veh/h)	0	0	0	59	0	25		
Percent Heavy Vehicles	0	0	0	0	0	0		
Percent Grade (%)	0			0				
Flared Approach		N			N			
Storage		0			0			
RT Channelized			0			0		
Lanes	0	0	0	0	0	0		
Configuration					LR			
Delay, Queue Length, and Level of Service								
Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	LT						LR	
v (veh/h)	15						84	
C (m) (veh/h)	1151						462	
v/c	0.01						0.18	
95% queue length	0.04						0.66	
Control Delay (s/veh)	8.2						14.5	
LOS	A						B	
Approach Delay (s/veh)	--	--					14.5	
Approach LOS	--	--					B	