

Traffic Engineering, Transportation Planning & Design

277 White Horse Pike, Suite 203, Atco, NJ 08004  
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David R. Shropshire, PE, PP  
A Andrew Feranda, PE, PTOE, CME  
Randal C. Barranger, PE  
Nathan B. Mosley, PE, CME

September 9, 2021

Spring Hills Construction & Development  
c/o William Burris  
1253 Glen Avenue  
Moorestown, New Jersey 08057

(via email: burris@beachhaven.com)

Re: **Traffic Engineering Assessment**  
**Spring Hills – Manchester**  
**Block 38, Lot 4**  
**Route 37 Westbound**  
**Manchester Township, Ocean County, NJ**  
SA Project No. 20175-A

Dear Bill:

In response to your request and in support of the Manchester Township application for the above-referenced assisted living/skilled nursing facility, Shropshire Associates, LLC has prepared a Traffic Engineering Assessment report for the proposed development. The proposal is for the construction of a new 3-story skilled nursing facility along westbound Route 37 between its intersections with Commonwealth Boulevard and Buckingham Drive.

The proposed facility will include a total of 124-beds and have access via one (1) new right-in/right-out along westbound Route 37. This driveway location is under the jurisdiction of the New Jersey Department of Transportation (NJDOT) and will require final approval from the Department via a Minor Driveway Permit application and approval. In addition, the site will include a total of 113 off-street parking spaces to accommodate the anticipated parking demands for the facility.

## Existing Conditions

A field reconnaissance was conducted to determine the features of the adjacent roadways and intersections within the study area.

Along the site's frontage, **Route 37** is a four-lane median-divided roadway that is under the jurisdiction of the NJDOT and is classified as an Urban Principal Arterial. In the vicinity of the site, Route 37 consists of two (2) 12' lanes and a 12' shoulder in both the eastbound and westbound directions. Route 37 has a posted speed limit of 50 MPH and for the purpose of this study is assumed to extend in a general east-west direction.

West of the site, **Buckingham Drive** is a two-lane local roadway that is under the jurisdiction of Manchester Township and extends north and south from its intersection with Route 37. Buckingham Drive has an approximate cartway width of 40' including 8' shoulders in both directions and provides access to various residential developments north and south of its intersection with Route 37. Buckingham Drive has a posted speed limit of 25 MPH and for the purpose of this study is assumed to extend in a general north-south direction.



East of the site, **Commonwealth Boulevard** is a two-lane undivided roadway that is under the jurisdiction of Manchester Township. Commonwealth Boulevard has an approximate cartway width of 34' including minimal shoulders in both directions and a posted speed limit of 35 MPH. For the purpose of this study, Commonwealth Boulevard is assumed to extend in a general north-south direction.

The four-legged **Route 37/Buckingham Drive** signalized intersection is currently controlled by a two-phase semi-actuated traffic signal with various time of day background cycle lengths between 90 and 130-seconds. The eastbound Route 37 approach consists of two (2) exclusive through lanes. The westbound Route 37 approach consists of two (2) exclusive through lanes. The northbound Buckingham Drive approach consists of two (2) lanes, one (1) being a shared through-left lane and one (1) being a shared through-right lane, both providing access to east and westbound Route 37. The southbound Buckingham Drive approach consists of two (2) lanes, one (1) being a shared through-left lane and one (1) being a shared through-right lane, both providing access to east and westbound Route 37. Left-turn movements from eastbound and westbound Route 37 are provided via existing near-side and far-side jughandle ramps.

The four-legged **Route 37/Commonwealth Boulevard** signalized intersection is currently controlled by a two-phase semi-actuated traffic signal with various time of day background cycle lengths between 90 and 130-seconds. The eastbound and westbound Route 37 approaches each consist of two (2) lanes for through movements. The northbound Commonwealth Boulevard approach consists of an exclusive left-turn lane and one (1) shared through/right-turn lane, while the southbound approach consists of one (1) exclusive left-turn lane and one (1) exclusive right-turn lane. Left-turn movements from eastbound and westbound Route 37 are accomplished via near-side jughandle ramps along both approaches.

### ***Traffic Counts***

Traffic counts were conducted at the study locations in June 2017. Based on previous experience with similar developments, the maximum combination of the adjacent roadway traffic and traffic generated by the proposed development typically occurs during the weekday morning (6:30 AM to 9:30 AM) and weekday afternoon (3:00 PM to 6:00 PM) peak periods.

- Route 37 and Buckingham Drive
- Route 37 and Commonwealth Boulevard

The existing AM and PM peak hour volumes for the Route 37 study locations are shown on attached Figure 1, with the collected MTMC turning movement count data sheets attached for your review.

### **Future Conditions**

As indicated above, the proposal is for the construction of a new 124-bed Spring Hills facility along westbound Route 37. The traffic resulting from the proposed development will not affect the adjacent roadway network until the development is fully built-out, which is anticipated to be by the year 2023. It can be expected that the traffic volumes along the adjacent roadways will increase as a result of general area traffic growth. Based on the *Annual Background Growth Table* prepared by NJDOT, a 1.00% annual traffic growth will occur along the adjacent roadway network in the vicinity of the site. Therefore, in order to estimate the No-Build volumes, the NJDOT annual



growth rate of 1.00% was applied to the existing traffic volumes to determine the No-Build volumes, which are indicated in Figure 2.

**Trip Generation**

The amount of traffic to be generated by the proposed Spring Hills facility can best be estimated based on data published by the Institute of Transportation Engineers (ITE). ITE has compiled data from thousands of studies for various land uses, independent variables and study periods, and published the results in *Trip Generation, 10th Edition*. The proposed development is most similar to ITE Land Use 254: Assisted Living. It should be noted that the trip generation is based upon the number of beds in the facility, which is anticipated to be 124-beds.

Table 1 below indicates the total traffic to be generated by the development based on the ITE trip generation data (the trip generation worksheets are attached for reference).

<b>Table 1 ITE Trip Generation – Spring Hills</b>						
Land Use	Weekday AM Peak			Weekday PM Peak		
	In	Out	Total	In	Out	Total
Skilled Nursing (124 beds)	15	9	24	12	20	32

The traffic to be generated by the proposed Spring Hills facility during the peak hours must then be distributed to the adjacent roadway network in a manner which the employees and residents can reasonably be expected to travel. The site traffic was assigned to the roadway network based on the existing distribution of traffic as illustrated on Figure 3. The resulting site traffic assignment is illustrated on Figure 4. The site traffic was then added to the No-Build traffic volumes (Figure 2) to project the Build traffic volumes, which are illustrated on Figure 5.

**Operational Analysis**

In order to measure the quality of the traffic flow for the adjacent roadways and intersections, capacity analyses for the study intersections have been completed based upon the methods outlined in the *Highway Capacity Manual*. Capacity analysis is a procedure used to estimate the ability of the roadway network to carry traffic. Capacity analyses are performed based on a Level of Service methodology. Level of Service (LOS) is a qualitative measure that characterizes the operational conditions of a roadway or intersection based on the perceptions by motorists and passengers. Levels of Service are defined for each type of facility (i.e. freeways, highways, signalized intersections, unsignalized intersections). These Levels of Service range from LOS A to LOS F, with a LOS A representing the best operating conditions and a LOS F representing the worst operating conditions.

The levels of service for a signalized intersection are classified in terms of delay, which is based on the extent of driver discomfort and frustration, fuel consumption and lost travel time. The delay experienced by a motorist consists of many factors that relate to control, geometrics and traffic. Some of these factors include the quality of progression, traffic signal cycle length, the green time ratio and the volume to capacity ratio. The level of service for an unsignalized intersection is determined based on the average control delay associated with each minor movement (i.e. yielding left-turn movements from the major roads and stop-controlled



movements from the minor approaches). The Level of Service criteria for unsignalized and signalized intersections are provided in Table 2.

<b>Table 2 Level of Service Criteria</b>		
<b>Level of Service</b>	<b>Unsignalized Delay (sec)</b>	<b>Signalized Delay (sec)</b>
A	≤ 10	≤ 10
B	> 10 and ≤ 15	> 10 and ≤ 20
C	> 15 and ≤ 25	> 20 and ≤ 35
D	> 25 and ≤ 35	> 35 and ≤ 55
E	> 35 and ≤ 50	> 55 and ≤ 80
F	> 50	> 80

The future Existing, No-Build and Build operating conditions at the study locations were evaluated using the above-described methodology and the latest Synchro software package. The Synchro printouts and analyses are attached for your review, with a detailed description of the intersections' operating conditions provided below. The Existing, No-Build, and Build levels of service are indicated in attached Figures 6, 7, and 8, respectively.

***Route 37 and Buckingham Drive Intersection***

Currently, the Route 37/Buckingham Drive signalized intersection operates at an overall LOS A during both the AM and PM peak hours. The eastbound and westbound Route 37 individual movements currently function at a LOS A during both peak hours, while the northbound and southbound Buckingham Drive movements currently operate at a LOS D during the AM and PM peak hours.

In the future No-Build and Build scenarios, the future Route 37/Buckingham Drive signalized intersection will continue to operate at existing overall LOS A during both the AM and PM peak hours. In addition, the Route 37 and Buckingham Drive individual movements will continue to operate at existing levels of service during both peak hours throughout the future Build scenario. The traffic resulting from the proposed Spring Hills facility will cause no changes in the future levels of service at the Route 37/Buckingham Drive signalized intersection during both peak hours.

Overall, the proposed Spring Hills facility will add approximately fifteen (15) total trips during the weekday AM peak hour and approximately 24 total trips during the weekday PM peak hour, which is minimal when compared to existing peak hour volumes at this study location. Therefore, no further improvements or mitigation are warranted at this study location as a result of the proposed development.

***Route 37 and Commonwealth Boulevard Intersection***

Under existing conditions, the Route 37/Commonwealth Boulevard signalized intersection currently operates at an overall LOS B during the AM and an overall LOS C during the PM peak hour. The eastbound and westbound Route 37 approaches currently operate at a LOS B or better during all peak hours, while the northbound and southbound Commonwealth Boulevard individual movements currently operate at a LOS D or better during all peak hours with the exception of the





southbound left-turn movements, which operate at a LOS E during the AM peak hour, and LOS F during the PM peak hour.

In the future No-Build and Build scenarios, the future Route 37/Commonwealth Boulevard signalized intersection will continue to operate at an overall LOS B during the AM peak hour and an overall LOS C during the PM peak hour. In addition, the Route 37 and Commonwealth Boulevard Drive individual movements will continue to operate at existing levels of service or better during both the AM and PM peak hours.

Overall, the proposed Spring Hills facility will add approximately nineteen (19) total trips during the weekday AM peak hour and approximately 21 total trips during the weekday PM peak hour, which is minimal when compared to existing peak hour volumes at this study location. Therefore, no further improvements or mitigation are warranted at this study location as a result of the proposed development.

### ***Route 37 and Site Driveway Intersection***

Access to the proposed Spring Hills facility will be provided via one (1) right-in/right-out only driveway along westbound Route 37. The driveway will be stop-controlled at its intersection with Route 37 and consist of single inbound and outbound lanes providing for all permitted movements. Based upon this configuration, the outbound stop-controlled right-turn movements will operate at a LOS B during the AM peak hour and LOS C during the PM peak hour.

As noted above, this driveway location is under the jurisdiction of the NJDOT and will require final approval from the Department via a Minor Driveway Permit application and approval. A copy of this approval will be provided upon receipt.

### **Conclusion**

Based on the results present in this Traffic Engineering Assessment report, the traffic generated by the proposed Spring Hills facility development will have the following impacts on the surrounding roadway network.

- Based upon the current ITE trip generation rates, the proposed facility will generate approximately 24 total trips during the weekday AM peak hour and approximately 32 total trips during the weekday PM peak hour.
- In the future No-Build and Build scenarios, the future Route 37/Buckingham Drive signalized intersection will continue to operate at existing overall LOS A during both the AM and PM peak hours. In addition, the Route 37 and Buckingham Drive individual movements will continue to operate at existing levels of service during both peak hours throughout the future Build scenario. The traffic resulting from the proposed Spring Hills facility will cause no changes in the future levels of service at the Route 37/Buckingham Drive signalized intersection during both peak hours.

Overall, the proposed Spring Hills facility will add approximately fifteen (15) total trips during the weekday AM peak hour and approximately 24 total trips during the weekday PM peak hour, which is minimal when compared to existing peak hour volumes at this study location. Therefore, no further improvements or mitigation are warranted at this study location as a result of the proposed development.



- In the future No-Build and Build scenarios, the future Route 37/Commonwealth Boulevard signalized intersection will continue to operate at an overall LOS B during the AM peak hour and an overall LOS C during the PM peak hour. In addition, the Route 37 and Commonwealth Boulevard Drive individual movements will continue to operate at existing levels of service or better during both the AM and PM peak hours.

Overall, the proposed Spring Hills facility will add approximately nineteen (19) total trips during the weekday AM peak hour and approximately 21 total trips during the weekday PM peak hour, which is minimal when compared to existing peak hour volumes at this study location. Therefore, no further improvements or mitigation are warranted at this study location as a result of the proposed development.

- Access to the proposed Spring Hills facility will be provided via one (1) right-in/right-out only driveway along westbound Route 37. The driveway will be stop-controlled at its intersection with Route 37 and consist of single inbound and outbound lanes providing for all permitted movements. Based upon this configuration, the outbound stop-controlled right-turn movements will operate at a LOS B during the AM peak hour and LOS C during the PM peak hour.

This driveway location is under the jurisdiction of the NJDOT and will require final approval from the Department via a Minor Driveway Permit application and approval. A copy of this approval will be provided upon receipt.

Should you have any questions or require additional information, please contact us.

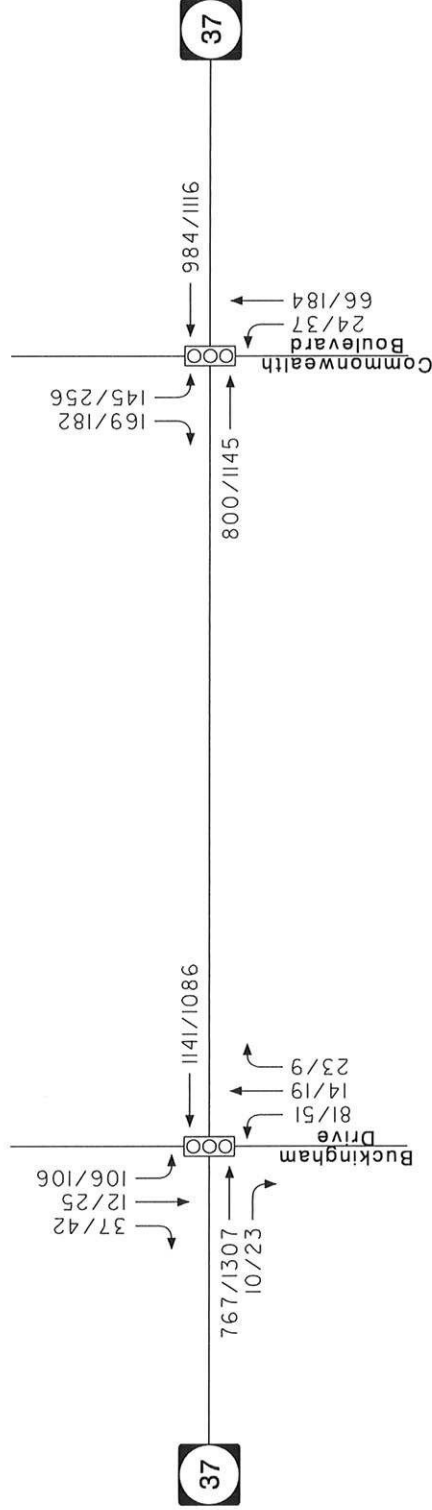
Sincerely,  
**Shropshire Associates LLC**

A handwritten signature in black ink, appearing to read 'Nathan B. Mosley', written over a light blue horizontal line.

Nathan B. Mosley, P.E., C.M.E.  
Senior Project Manager  
N.J. License No. 48698

*NBM/jab*  
*Attachments*

cc: Keith Davis (via email: kdavis@ndglegal.com)  
Michael Lario (21 copies via UPS and email: mlario@ndglegal.com)  
Kathy Merryfield (via email: kmerryfield@ndglegal.com)  
Sophia Furriss (via email: sophia@beachhaven.com)  
Barry Brommer (via email: barry.brommer@brommerarchitects.com)  
Mark Zelina (via email: mzelina@vancleefengineering.com)

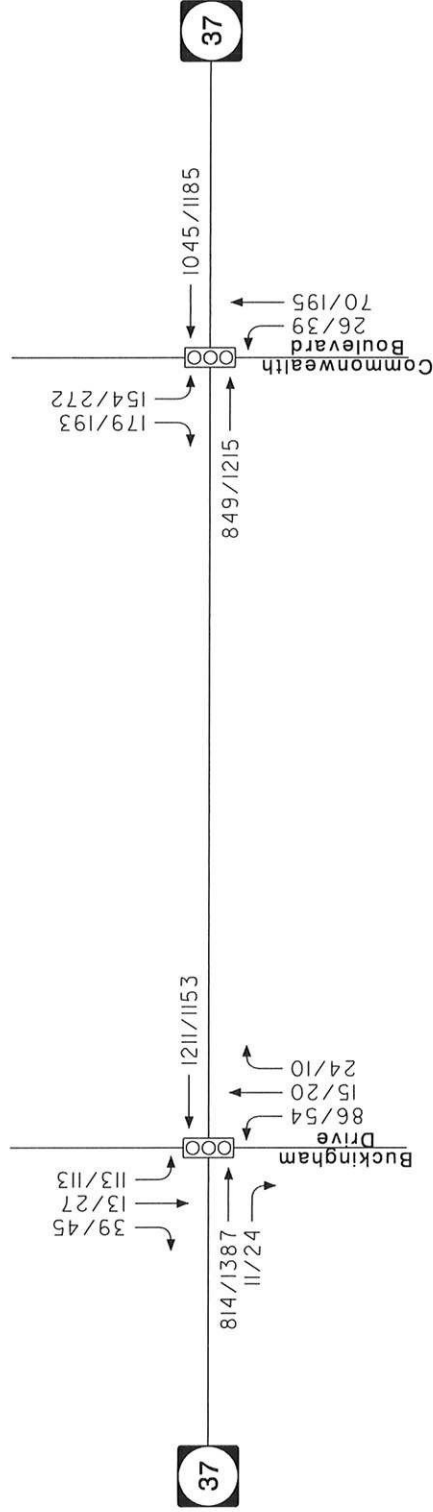


## Spring Hills – Manchester

Manchester Township, Ocean County, NJ  
 September 2021

TRAFFIC SIGNAL  
 AM/PM PEAK HOUR

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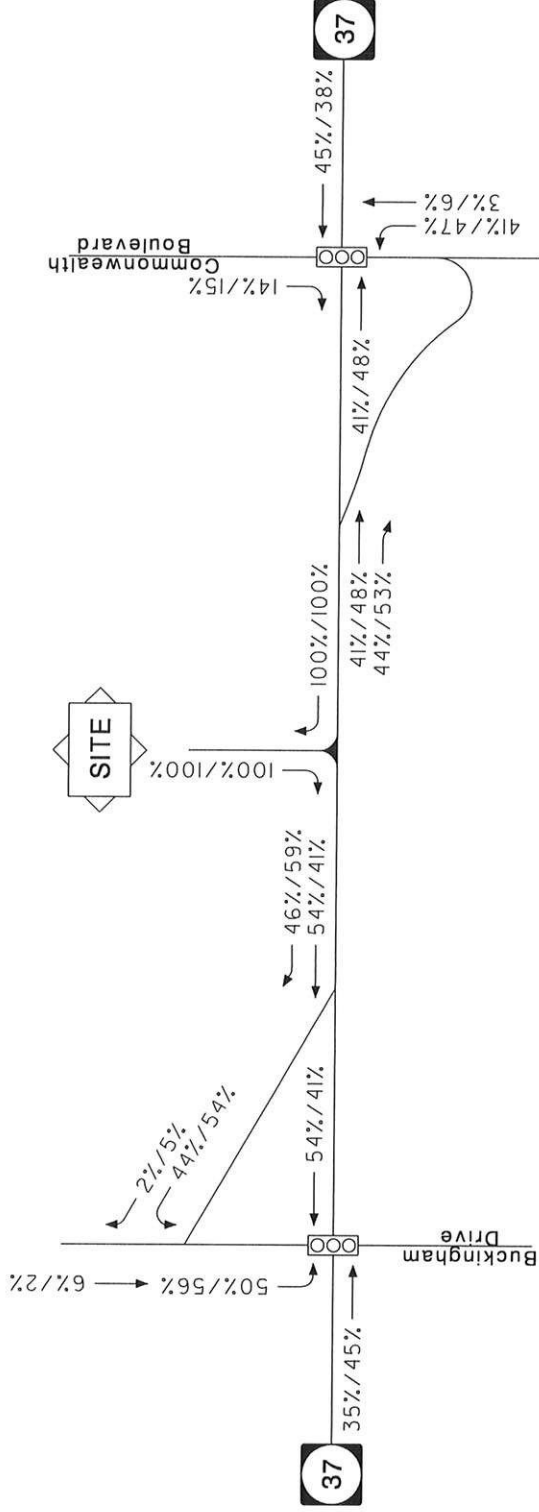
## Spring Hills – Manchester

Manchester Township, Ocean County, NJ  
 September 2021

☐☐ TRAFFIC SIGNAL  
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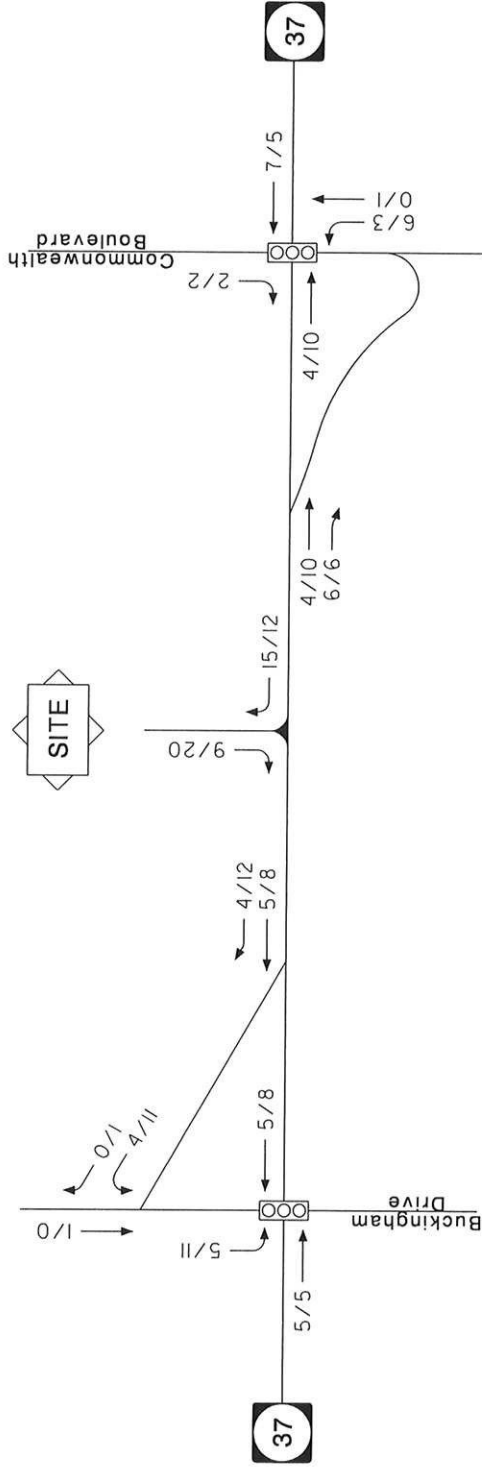
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Manchester Township, Ocean County, NJ  
 September 2021

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☐☐☐ TRAFFIC SIGNAL

AM/PM PEAK HOUR

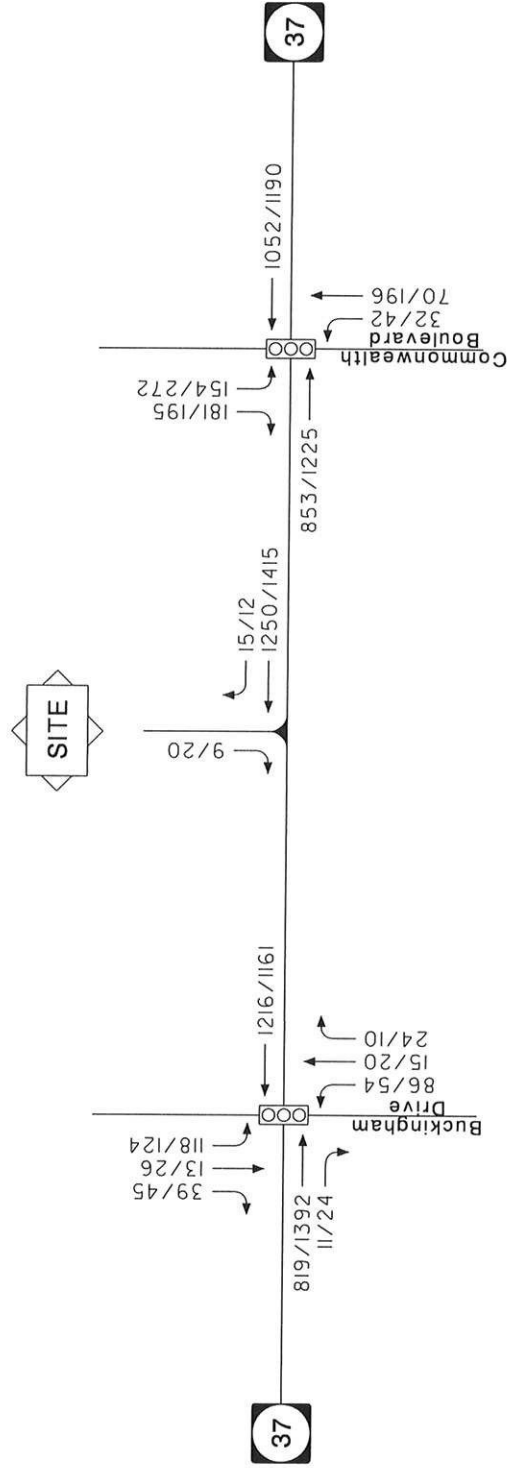
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Manchester Township, Ocean County, NJ  
 September 2021

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FIGURE 5  
 BUILD VOLUMES



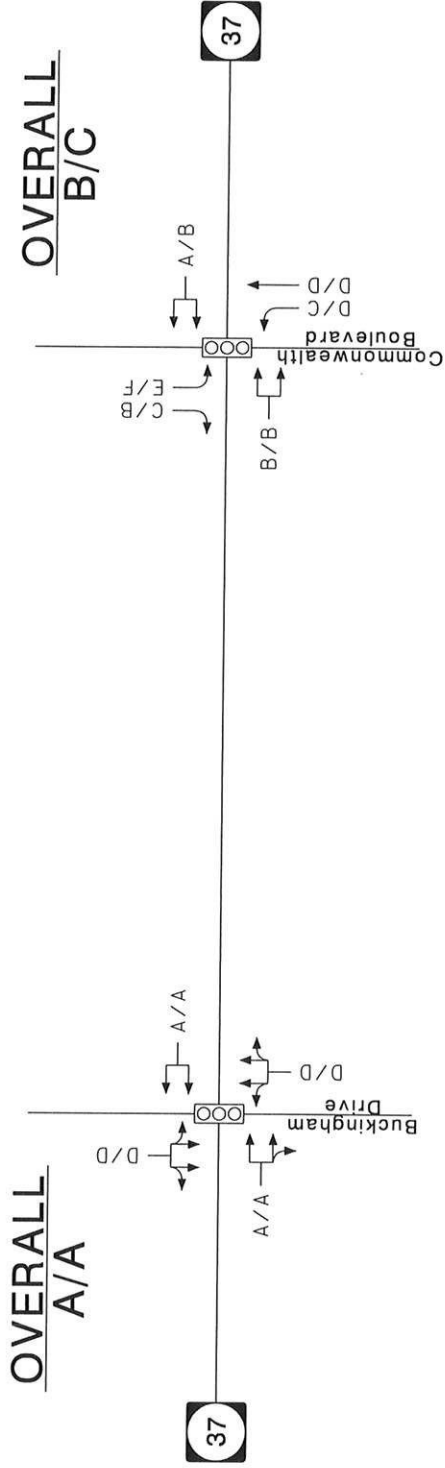
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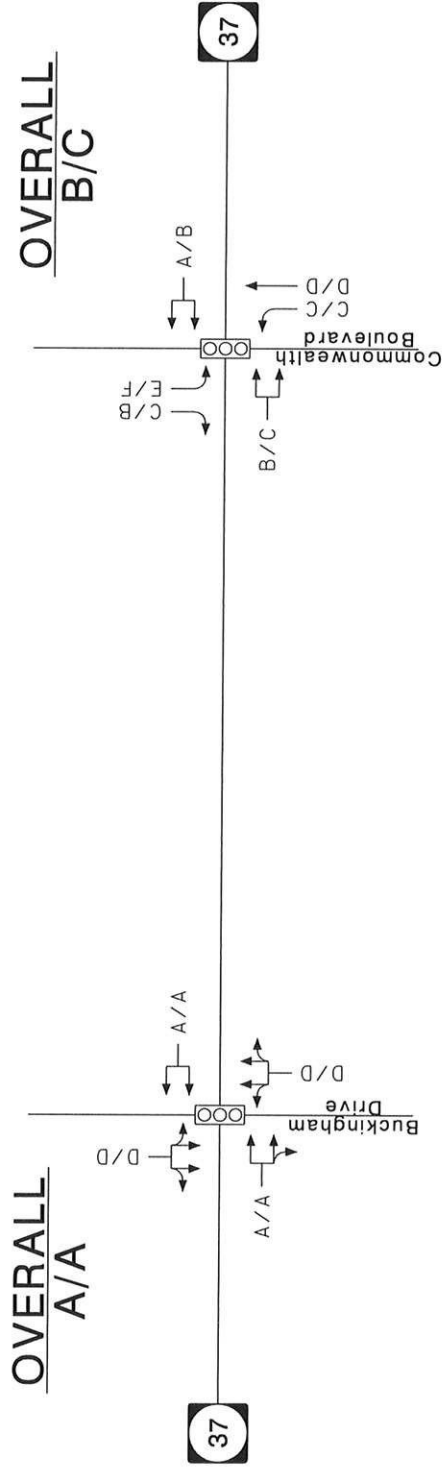
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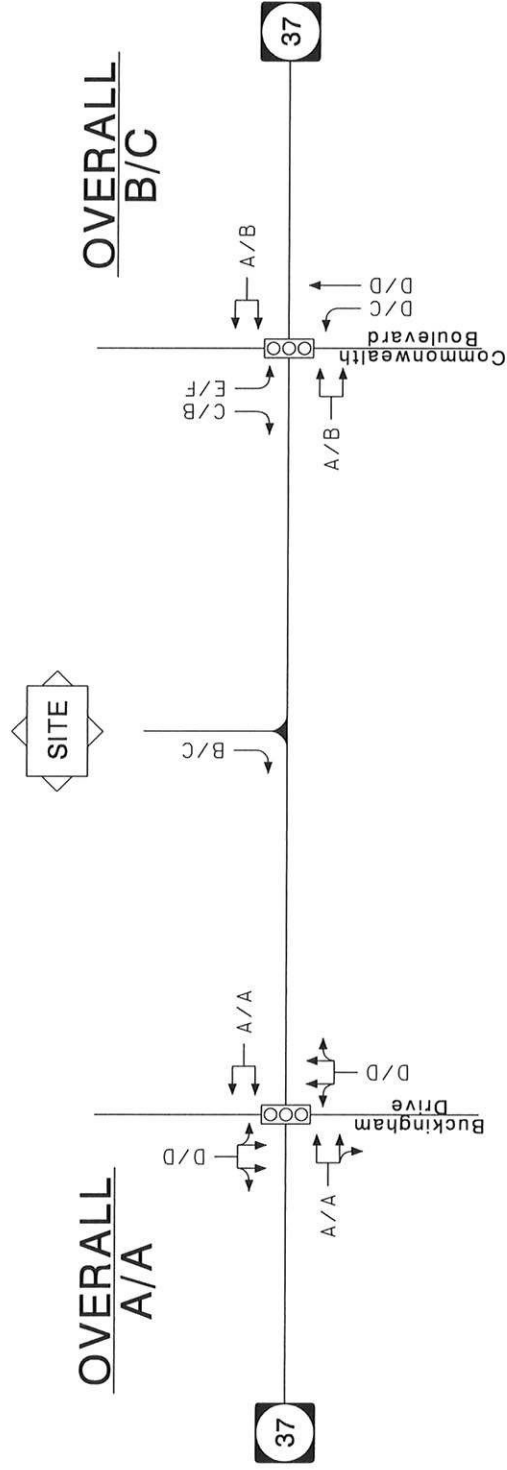
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## Spring Hills – Manchester

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# Shropshire Associates LLC

277 Whitehorse Pike, Suite 203  
Atco, NJ 08004

N/S Route: US Route 37  
E/W Route: Bone Hill Road/Buckingham Dri  
Manchester Twp/Ocean County/NJ  
Thursday/Clear/AS&GH/3730&4608

File Name : 17068911  
Site Code : 17068011  
Start Date : 6/1/2017  
Page No : 1

### Groups Printed- Unshifted

Start Time	US Route 37 From North				Buckingham Drive From East					US Route 37 From South		Bone Hill Road From West					Int. Total
	Right	Thru	ROR	App. Total	Right	Thru	Left	ROR	App. Total	Thru	App. Total	Right	Thru	Left	ROR	App. Total	
06:15 AM	3	80	0	83	0	4	7	1	12	264	264	1	0	19	0	20	379
06:30 AM	6	165	0	171	1	0	8	1	10	388	388	5	1	28	0	34	603
06:45 AM	1	145	0	146	1	1	8	4	14	329	329	2	1	24	0	27	516
<b>Total</b>	<b>10</b>	<b>390</b>	<b>0</b>	<b>400</b>	<b>2</b>	<b>5</b>	<b>23</b>	<b>6</b>	<b>36</b>	<b>981</b>	<b>981</b>	<b>8</b>	<b>2</b>	<b>71</b>	<b>0</b>	<b>81</b>	<b>1498</b>
07:00 AM	2	148	0	150	3	1	14	1	19	304	304	2	0	27	0	29	502
07:15 AM	4	169	0	173	1	1	20	3	25	273	273	5	3	15	0	23	494
07:30 AM	2	197	0	199	2	3	25	4	34	301	301	6	2	25	0	33	567
07:45 AM	6	202	0	208	2	4	21	5	32	284	284	6	3	16	0	25	549
<b>Total</b>	<b>14</b>	<b>716</b>	<b>0</b>	<b>730</b>	<b>8</b>	<b>9</b>	<b>80</b>	<b>13</b>	<b>110</b>	<b>1162</b>	<b>1162</b>	<b>19</b>	<b>8</b>	<b>83</b>	<b>0</b>	<b>110</b>	<b>2112</b>
08:00 AM	1	174	0	175	3	2	34	14	53	256	256	8	3	19	0	30	514
08:15 AM	1	194	0	195	3	3	26	4	36	300	300	3	6	21	0	30	561
08:30 AM	1	242	0	243	6	0	30	11	47	202	202	4	4	20	0	28	520
08:45 AM	1	183	0	184	2	1	19	3	25	199	199	2	4	10	0	16	424
<b>Total</b>	<b>4</b>	<b>793</b>	<b>0</b>	<b>797</b>	<b>14</b>	<b>6</b>	<b>109</b>	<b>32</b>	<b>161</b>	<b>957</b>	<b>957</b>	<b>17</b>	<b>17</b>	<b>70</b>	<b>0</b>	<b>104</b>	<b>2019</b>
09:00 AM	1	177	0	178	0	1	29	8	38	188	188	4	6	10	0	20	424
*** BREAK ***																	
<b>Total</b>	<b>1</b>	<b>177</b>	<b>0</b>	<b>178</b>	<b>0</b>	<b>1</b>	<b>29</b>	<b>8</b>	<b>38</b>	<b>188</b>	<b>188</b>	<b>4</b>	<b>6</b>	<b>10</b>	<b>0</b>	<b>20</b>	<b>424</b>
*** BREAK ***																	
02:45 PM	6	266	0	272	4	3	21	4	32	264	264	0	9	11	0	20	588
<b>Total</b>	<b>6</b>	<b>266</b>	<b>0</b>	<b>272</b>	<b>4</b>	<b>3</b>	<b>21</b>	<b>4</b>	<b>32</b>	<b>264</b>	<b>264</b>	<b>0</b>	<b>9</b>	<b>11</b>	<b>0</b>	<b>20</b>	<b>588</b>
03:00 PM	4	311	0	315	4	3	31	5	43	264	264	6	7	5	0	18	640
03:15 PM	9	388	0	397	5	5	35	0	45	272	272	2	4	11	0	17	731
03:30 PM	6	275	0	281	6	5	22	1	34	255	255	1	7	12	0	20	590
03:45 PM	7	332	0	339	3	7	26	3	39	232	232	4	7	4	0	15	625
<b>Total</b>	<b>26</b>	<b>1306</b>	<b>0</b>	<b>1332</b>	<b>18</b>	<b>20</b>	<b>114</b>	<b>9</b>	<b>161</b>	<b>1023</b>	<b>1023</b>	<b>13</b>	<b>25</b>	<b>32</b>	<b>0</b>	<b>70</b>	<b>2586</b>
04:00 PM	8	308	0	316	5	10	31	5	51	248	248	2	7	19	0	28	643
04:15 PM	5	332	0	337	3	10	26	2	41	263	263	4	6	10	0	20	661
04:30 PM	6	356	0	362	9	8	25	1	43	226	226	0	4	11	0	15	646
04:45 PM	7	299	0	306	6	4	29	8	47	266	266	2	5	13	0	20	639
<b>Total</b>	<b>26</b>	<b>1295</b>	<b>0</b>	<b>1321</b>	<b>23</b>	<b>32</b>	<b>111</b>	<b>16</b>	<b>182</b>	<b>1003</b>	<b>1003</b>	<b>8</b>	<b>22</b>	<b>53</b>	<b>0</b>	<b>83</b>	<b>2589</b>
05:00 PM	4	330	0	334	2	5	26	5	38	310	310	5	4	14	0	23	705
05:15 PM	6	322	0	328	5	8	26	6	45	284	284	2	6	13	0	21	678
05:30 PM	6	303	0	309	3	6	40	0	49	253	253	2	5	21	0	28	639
<b>Grand Total</b>	<b>103</b>	<b>5898</b>	<b>0</b>	<b>6001</b>	<b>79</b>	<b>95</b>	<b>579</b>	<b>99</b>	<b>852</b>	<b>6425</b>	<b>6425</b>	<b>78</b>	<b>104</b>	<b>378</b>	<b>0</b>	<b>560</b>	<b>13838</b>
Apprch %	1.7	98.3	0		9.3	11.2	68	11.6		100		13.9	18.6	67.5	0		
Total %	0.7	42.6	0	43.4	0.6	0.7	4.2	0.7	6.2	46.4	46.4	0.6	0.8	2.7	0	4	

# Shropshire Associates LLC

277 Whitehorse Pike, Suite 203

Atco, NJ 08004

N/S Route: US Route 37

E/W Route: Bone Hill Road/Buckingham Dri

Manchester Twp/Ocean County/NJ

Thursday/Clear/AS&GH/3730&4608

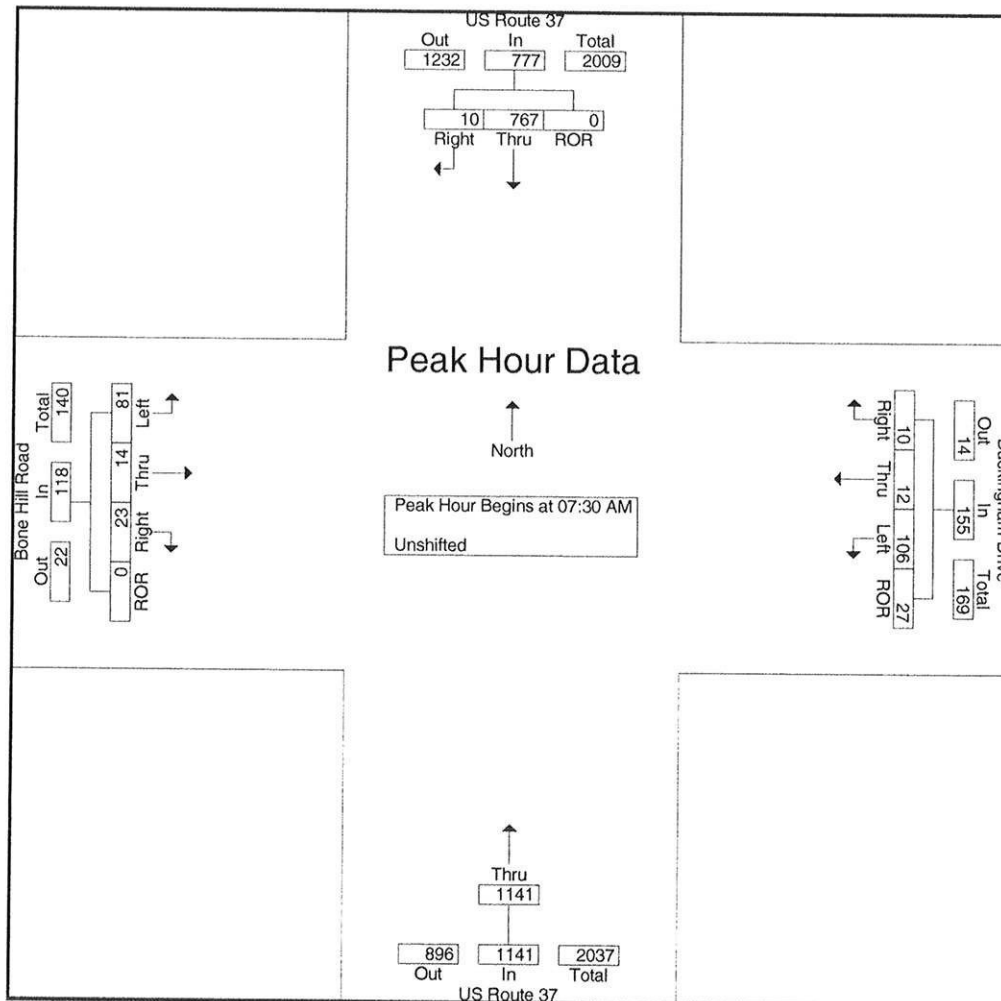
File Name : 17068911

Site Code : 17068011

Start Date : 6/1/2017

Page No : 2

Start Time	US Route 37 From North				Buckingham Drive From East				US Route 37 From South		Bone Hill Road From West					Int. Total	
	Right	Thru	ROR	App. Total	Right	Thru	Left	ROR	App. Total	Thru	App. Total	Right	Thru	Left	ROR		App. Total
Peak Hour Analysis From 06:15 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30 AM																	
07:30 AM	2	197	0	199	2	3	25	4	34	301	301	6	2	25	0	33	567
07:45 AM	6	202	0	208	2	4	21	5	32	284	284	6	3	16	0	25	549
08:00 AM	1	174	0	175	3	2	34	14	53	256	256	8	3	19	0	30	514
08:15 AM	1	194	0	195	3	3	26	4	36	300	300	3	6	21	0	30	561
Total Volume	10	767	0	777	10	12	106	27	155	1141	1141	23	14	81	0	118	2191
% App. Total	1.3	98.7	0		6.5	7.7	68.4	17.4		100		19.5	11.9	68.6	0		
PHF	.417	.949	.000	.934	.833	.750	.779	.482	.731	.948	.948	.719	.583	.810	.000	.894	.966





# Shropshire Associates LLC

277 Whitehorse Pike, Suite 203

Atco, NJ 08004

N/S Route: US Route 37

E/W Route: Bone Hill Road/Buckingham Dri

Manchester Twp/Ocean County/NJ

Thursday/Clear/AS&GH/3730&4608

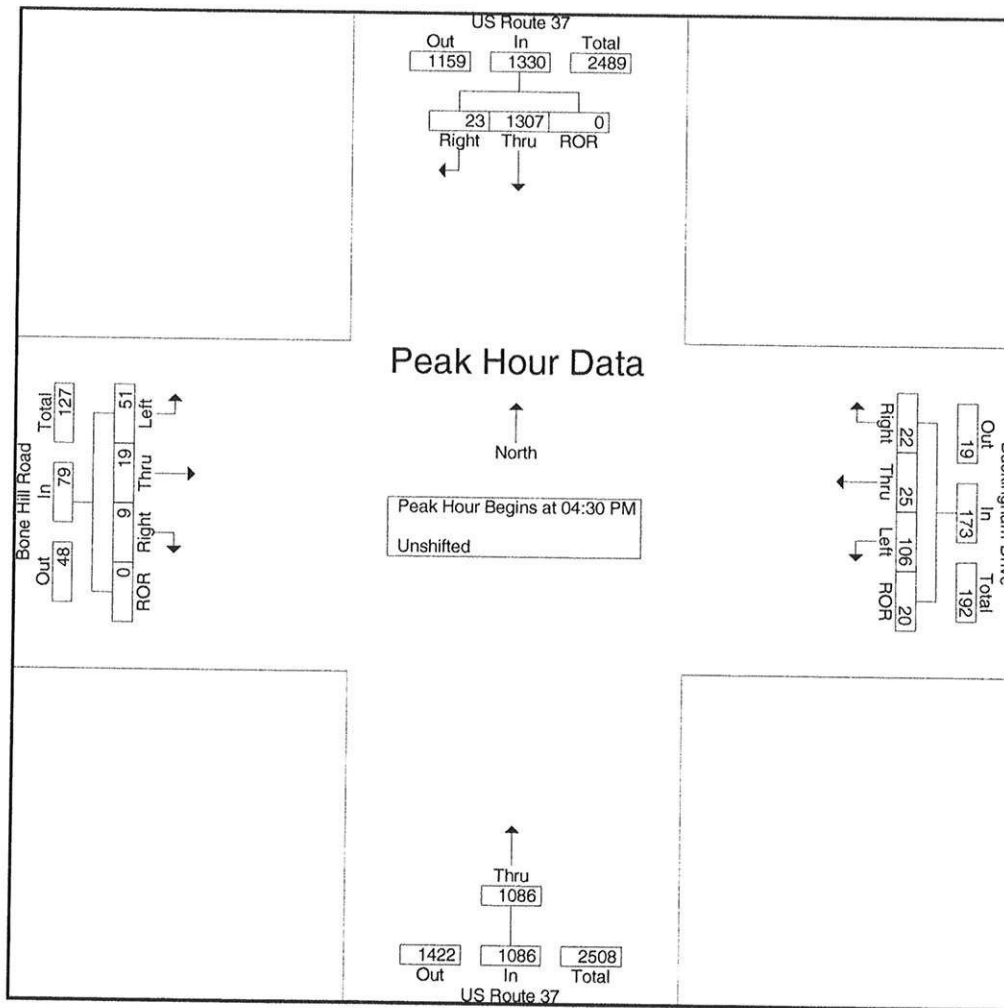
File Name : 17068911

Site Code : 17068011

Start Date : 6/1/2017

Page No : 3

Start Time	US Route 37 From North				Buckingham Drive From East				US Route 37 From South		Bone Hill Road From West				Int. Total		
	Right	Thru	ROR	App. Total	Right	Thru	Left	ROR	App. Total	Thru	App. Total	Right	Thru	Left		ROR	App. Total
Peak Hour Analysis From 12:00 PM to 05:30 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	6	356	0	362	9	8	25	1	43	226	226	0	4	11	0	15	646
04:45 PM	7	299	0	306	6	4	29	8	47	266	266	2	5	13	0	20	639
05:00 PM	4	330	0	334	2	5	26	5	38	310	310	5	4	14	0	23	705
05:15 PM	6	322	0	328	5	8	26	6	45	284	284	2	6	13	0	21	678
Total Volume	23	1307	0	1330	22	25	106	20	173	1086	1086	9	19	51	0	79	2668
% App. Total	1.7	98.3	0		12.7	14.5	61.3	11.6		100		11.4	24.1	64.6	0		
PHF	.821	.918	.000	.919	.611	.781	.914	.625	.920	.876	.876	.450	.792	.911	.000	.859	.946



# Shropshire Associates LLC

277 Whitehorse Pike, Suite 203

Atco, NJ 08004

N/S Route: US Route 37  
 E/W Route: Off-Ramp/Commonwealth Blvd  
 Manchester Twp/Ocean County/NJ  
 Thursday/Clear/BW/5142

File Name : 17068013  
 Site Code : 17068013  
 Start Date : 6/1/2017  
 Page No : 1

Groups Printed- Unshifted

Start Time	US Route 37 From North		Commonwealth Blvd From East				US Route 37 From South		Off-Ramp From West					Int. Total
	Thru	App. Total	Right	Left	ROR	App. Total	Thru	App. Total	Right	Thru	Left	ROR	App. Total	
06:30 AM	88	88	12	15	29	56	210	210	0	3	3	1	7	361
06:45 AM	145	145	49	20	47	116	280	280	0	25	5	0	30	571
Total	233	233	61	35	76	172	490	490	0	28	8	1	37	932
07:00 AM	136	136	11	16	26	53	283	283	0	29	1	0	30	502
07:15 AM	123	123	8	29	27	64	238	238	0	12	1	0	13	438
07:30 AM	193	193	13	42	17	72	268	268	1	12	1	0	14	547
07:45 AM	194	194	19	42	20	81	246	246	0	19	3	0	22	543
Total	646	646	51	129	90	270	1035	1035	1	72	6	0	79	2030
08:00 AM	212	212	15	27	18	60	267	267	0	22	8	0	30	569
08:15 AM	176	176	13	33	33	79	226	226	0	10	5	0	15	496
08:30 AM	218	218	24	43	27	94	245	245	0	15	8	0	23	580
08:45 AM	229	229	12	40	20	72	175	175	0	23	4	0	27	503
Total	835	835	64	143	98	305	913	913	0	70	25	0	95	2148
09:00 AM	212	212	5	25	14	44	210	210	0	12	0	0	12	478
09:15 AM	177	177	9	30	17	56	167	167	0	18	6	0	24	424
*** BREAK ***														
Total	389	389	14	55	31	100	377	377	0	30	6	0	36	902
*** BREAK ***														
03:00 PM	228	228	19	36	13	68	253	253	1	34	6	0	41	590
03:15 PM	286	286	30	31	17	78	251	251	0	34	5	0	39	654
03:30 PM	314	314	22	45	17	84	285	285	0	49	8	0	57	740
03:45 PM	281	281	20	29	22	71	268	268	0	50	12	0	62	682
Total	1109	1109	91	141	69	301	1057	1057	1	167	31	0	199	2666
04:00 PM	294	294	13	41	23	77	234	234	0	57	3	0	60	665
04:15 PM	294	294	18	53	21	92	241	241	2	46	8	0	56	683
04:30 PM	288	288	20	47	14	81	267	267	1	50	3	0	54	690
04:45 PM	286	286	20	73	28	121	229	229	0	60	9	0	69	705
Total	1162	1162	71	214	86	371	971	971	3	213	23	0	239	2743
05:00 PM	279	279	13	68	18	99	313	313	0	45	7	1	53	744
05:15 PM	298	298	32	77	21	130	298	298	0	45	9	0	54	780
05:30 PM	282	282	22	38	28	88	276	276	6	34	12	0	52	698
05:45 PM	242	242	19	49	28	96	237	237	1	58	8	0	67	642
Total	1101	1101	86	232	95	413	1124	1124	7	182	36	1	226	2864
Grand Total	5475	5475	438	949	545	1932	5967	5967	12	762	135	2	911	14285
Apprch %	100		22.7	49.1	28.2		100		1.3	83.6	14.8	0.2		
Total %	38.3	38.3	3.1	6.6	3.8	13.5	41.8	41.8	0.1	5.3	0.9	0	6.4	

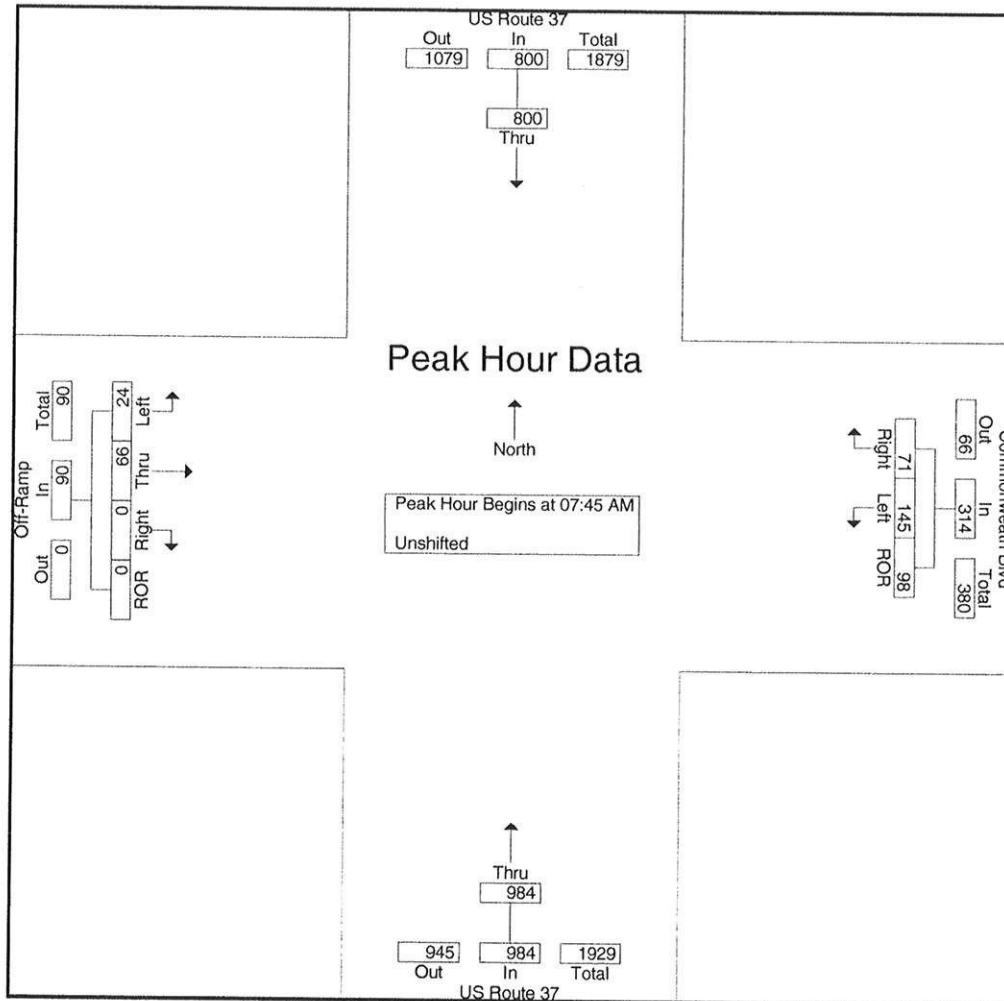
# Shropshire Associates LLC

277 Whitehorse Pike, Suite 203  
Atco, NJ 08004

N/S Route: US Route 37  
E/W Route: Off-Ramp/Commonwealth Blvd  
Manchester Twp/Ocean County/NJ  
Thursday/Clear/BW/5142

File Name : 17068013  
Site Code : 17068013  
Start Date : 6/1/2017  
Page No : 2

Start Time	US Route 37 From North		Commonwealth Blvd From East				US Route 37 From South		Off-Ramp From West				Int. Total	
	Thru	App. Total	Right	Left	ROR	App. Total	Thru	App. Total	Right	Thru	Left	ROR		App. Total
Peak Hour Analysis From 06:30 AM to 11:45 AM - Peak 1 of 1														
Peak Hour for Entire Intersection Begins at 07:45 AM														
07:45 AM	194	194	19	42	20	81	246	246	0	19	3	0	22	543
08:00 AM	212	212	15	27	18	60	267	267	0	22	8	0	30	569
08:15 AM	176	176	13	33	33	79	226	226	0	10	5	0	15	496
08:30 AM	218	218	24	43	27	94	245	245	0	15	8	0	23	580
Total Volume	800	800	71	145	98	314	984	984	0	66	24	0	90	2188
% App. Total	100		22.6	46.2	31.2		100		0	73.3	26.7	0		
PHF	.917	.917	.740	.843	.742	.835	.921	.921	.000	.750	.750	.000	.750	.943



# Shropshire Associates LLC

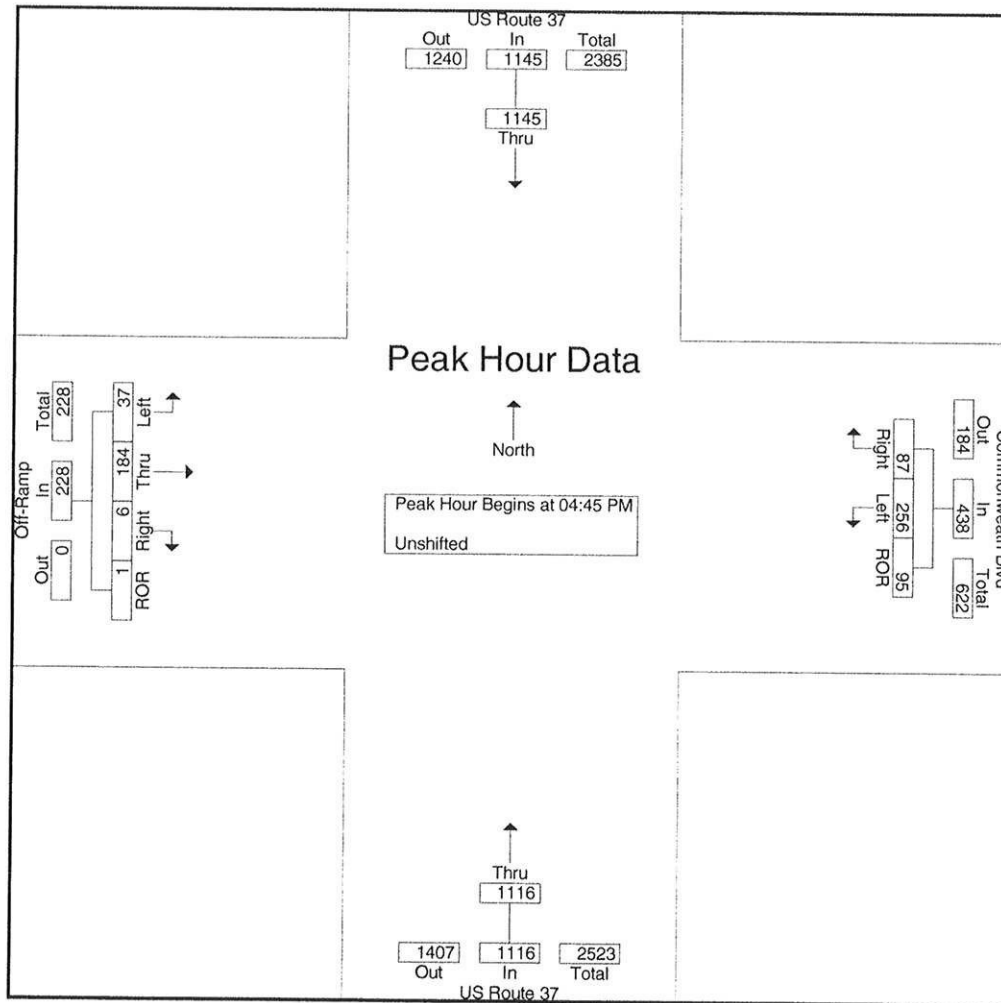
277 Whitehorse Pike, Suite 203

Atco, NJ 08004

N/S Route: US Route 37  
 E/W Route: Off-Ramp/Commonwealth Blvd  
 Manchester Twp/Ocean County/NJ  
 Thursday/Clear/BW/5142

File Name : 17068013  
 Site Code : 17068013  
 Start Date : 6/1/2017  
 Page No : 3

Start Time	US Route 37 From North		Commonwealth Blvd From East				US Route 37 From South		Off-Ramp From West					Int. Total
	Thru	App. Total	Right	Left	ROR	App. Total	Thru	App. Total	Right	Thru	Left	ROR	App. Total	
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1														
Peak Hour for Entire Intersection Begins at 04:45 PM														
04:45 PM	286	286	20	73	28	121	229	229	0	60	9	0	69	705
05:00 PM	279	279	13	68	18	99	313	313	0	45	7	1	53	744
05:15 PM	298	298	32	77	21	130	298	298	0	45	9	0	54	780
05:30 PM	282	282	22	38	28	88	276	276	6	34	12	0	52	698
Total Volume	1145	1145	87	256	95	438	1116	1116	6	184	37	1	228	2927
% App. Total	100		19.9	58.4	21.7		100		2.6	80.7	16.2	0.4		
PHF	.961	.961	.680	.831	.848	.842	.891	.891	.250	.767	.771	.250	.826	.938







<u>Phase</u>	<u>Route and Cross Street</u>	<u>Signal Faces</u>		<u>Cycle 1 / 90-Second Cycle</u>			
		<u>1 – 8</u>	<u>9 – 14</u>	<u>Split 1</u>	<u>Split 2</u>	<u>Split 3</u>	<u>Split 4</u>
<b>NORMAL OPERATION</b>							
A.	Route 37	G	R	70 – 53	70 – 53	70 – 53	70 – 53
	Change	Y	R	5	5	5	5
	Clearance	R	R	2	2	2	2
B.	Bone Hill Road	R	G	7 – 24	7 – 24	7 – 24	7 – 24
	Change	R	Y	3	3	3	3
	Clearance	R	R	3	3	3	3
	Emergency Flash	Y	R	-	-	-	-

Offsets / Cycle 1:  
 Offset 1 = 87  
 Offset 2 = 73  
 Offset 3 = 73  
 Offset 4 = 73  
 Offset 5 = 2

<u>Phase</u>	<u>Route and Cross Street</u>	<u>Signal Faces</u>		<u>Cycle 2 / 105-Second Cycle</u>			
		<u>1 – 8</u>	<u>9 – 14</u>	<u>Split 1</u>	<u>Split 2</u>	<u>Split 3</u>	<u>Split 4</u>
<b>NORMAL OPERATION</b>							
A.	Route 37	G	R	85 – 68	85 – 68	85 – 68	85 – 68
	Change	Y	R	5	5	5	5
	Clearance	R	R	2	2	2	2
B.	Bone Hill Road	R	G	7 – 24	7 – 24	7 – 24	7 – 24
	Change	R	Y	3	3	3	3
	Clearance	R	R	3	3	3	3
	Emergency Flash	Y	R	-	-	-	-

Offsets / Cycle 2:  
 Offset 1 = 17  
 Offset 2 = 72  
 Offset 3 = 72  
 Offset 4 = 72  
 Offset 5 = 49

Phase	Route and Cross Street	Signal Faces		Cycle 3 / 115-Second Cycle			
		<u>1 – 8</u>	<u>9 – 14</u>	<u>Split 1</u>	<u>Split 2</u>	<u>Split 3</u>	<u>Split 4</u>
<b>NORMAL OPERATION</b>							
A.	Route 37	G	R	95 – 73	95 – 73	95 – 73	95 – 73
	Change	Y	R	5	5	5	5
	Clearance	R	R	2	2	2	2
B.	Bone Hill Road	R	G	7 – 29	7 – 29	7 – 29	7 – 29
	Change	R	Y	3	3	3	3
	Clearance	R	R	3	3	3	3
	Emergency Flash	Y	R	-	-	-	-

Offsets / Cycle 3: Offset 1 = 80  
 Offset 2 = 31  
 Offset 3 = 31  
 Offset 4 = 31  
 Offset 5 = 20

Phase	Route and Cross Street	Signal Faces		Cycle 4 / 130-Second Cycle			
		<u>1 – 8</u>	<u>9 – 14</u>	<u>Split 1</u>	<u>Split 2</u>	<u>Split 3</u>	<u>Split 4</u>
<b>NORMAL OPERATION</b>							
A.	Route 37	G	R	110 – 73	110 – 73	110 – 93	110 – 93
	Change	Y	R	5	5	5	5
	Clearance	R	R	2	2	2	2
B.	Bone Hill Road	R	G	7 – 44	7 – 44	7 – 24	7 – 24
	Change	R	Y	3	3	3	3
	Clearance	R	R	3	3	3	3
	Emergency Flash	Y	R	-	-	-	-

Offsets / Cycle 4: Offset 1 = 79  
 Offset 2 = 79  
 Offset 3 = 79  
 Offset 4 = 79  
 Offset 5 = 79

1. The manual control is to be disconnected.
2. The vehicle interval is to be 2 seconds.
3. The memory circuit for the loop detectors is to be off.
4. Pedestrian actuation is to guarantee a minimum of 24 seconds of green time to Phase B.
5. Offsets (in seconds) are measured from the beginning of yellow to Route 37 at Hospital Drive to the beginning of yellow to Route 37 at this intersection.

Hours of Operation:

Monday thru Friday, 6:00 A.M. – 8:00 A.M. / Cycle 2 (105 Sec.) / Offset 5 / Split 2  
Monday thru Friday, 8:00 A.M. – 2:00 P.M. / Cycle 2 (105 Sec.) / Offset 3 / Split 2  
Monday thru Friday, 2:00 P.M. – 6:00 P.M. / Cycle 3 (115 Sec.) / Offset 5 / Split 2  
Monday thru Friday, 6:00 P.M. – 9:00 P.M. / Cycle 2 (105 Sec.) / Offset 3 / Split 2  
Saturday, 7:00 A.M. – 10:00 A.M. / Cycle 2 (105 Sec.) / Offset 3 / Split 2  
Saturday, 10:00 A.M. – 3:00 P.M. / Cycle 3 (115 Sec.) / Offset 1 / Split 2  
Saturday, 3:00 P.M. – 10:00 P.M. / Cycle 2 (105 Sec.) / Offset 5 / Split 2  
Sunday, 7:00 A.M. – 1:00 P.M. / Cycle 2 (105 Sec.) / Offset 3 / Split 2  
Sunday, 1:00 P.M. – 9:00 P.M. / Cycle 2 (105 Sec.) / Offset 5 / Split 2  
All Other Times / Cycle 1 (90 Sec.) / Offset 3 / Split 1

Memorial Day and Labor Day Observed: Use Sunday Schedule

July 4<sup>th</sup> Observed: If Wednesday, Thursday, Friday – Use Saturday Schedule  
If Monday or Tuesday – Use Sunday Schedule  
All other times as detailed under Hours of Operation.

For Traffic Responsive Only: Cycles, splits, offsets in Section 1 as selected by threshold values installed at the Central computer in lieu of time of day, as determined by Traffic Operations Center.

<u>Phase</u>	<u>Route and Cross Street</u>	<u>Signal Faces</u>		<u>Cycle 1 / 90-Second Cycle</u>			
		<u>1 – 8</u>	<u>9 – 14</u>	<u>Split 1</u>	<u>Split 2</u>	<u>Split 3</u>	<u>Split 4</u>
<b>NORMAL OPERATION</b>							
A.	Route 37	G	R	70 – 54	70 – 54	70 – 54	70 – 54
	Change	Y	R	5	5	5	5
	Clearance	R	R	2	2	2	2
B.	Commonwealth Boulevard	R	G	7 – 23	7 – 23	7 – 23	7 – 23
	Change	R	Y	3	3	3	3
	Clearance	R	R	3	3	3	3
	Emergency Flash	Y	R	-	-	-	-

Offsets / Cycle 1: Offset 1 = 30  
Offset 2 = 26  
Offset 3 = 26  
Offset 4 = 26  
Offset 5 = 35

<u>Phase</u>	<u>Route and Cross Street</u>	<u>Signal Faces</u>		<u>Cycle 2 / 105-Second Cycle</u>			
		<u>1 – 8</u>	<u>9 – 14</u>	<u>Split 1</u>	<u>Split 2</u>	<u>Split 3</u>	<u>Split 4</u>
<b>NORMAL OPERATION</b>							
A.	Route 37	G	R	85 – 58	85 – 58	85 – 58	85 – 58
	Change	Y	R	5	5	5	5
	Clearance	R	R	2	2	2	2
B.	Commonwealth Boulevard	R	G	7 – 34	7 – 34	7 – 34	7 – 34
	Change	R	Y	3	3	3	3
	Clearance	R	R	3	3	3	3
	Emergency Flash	Y	R	-	-	-	-

Offsets / Cycle 2: Offset 1 = 63  
Offset 2 = 12  
Offset 3 = 12  
Offset 4 = 12  
Offset 5 = 86

<u>Phase</u>	<u>Route and Cross Street</u>	<u>Signal Faces</u>		<u>Cycle 3 / 115-Second Cycle</u>			
		<u>1 – 8</u>	<u>9 – 14</u>	<u>Split 1</u>	<u>Split 2</u>	<u>Split 3</u>	<u>Split 4</u>
<b>NORMAL OPERATION</b>							
A.	Route 37	G	R	95 – 69	95 – 69	95 – 69	95 – 69
	Change	Y	R	5	5	5	5
	Clearance	R	R	2	2	2	2
B.	Commonwealth Boulevard	R	G	7 – 33	7 – 33	7 – 33	7 – 33
	Change	R	Y	3	3	3	3
	Clearance	R	R	3	3	3	3
	Emergency Flash	Y	R	-	-	-	-

Offsets / Cycle 3: Offset 1 = 84  
 Offset 2 = 27  
 Offset 3 = 27  
 Offset 4 = 27  
 Offset 5 = 72

<u>Phase</u>	<u>Route and Cross Street</u>	<u>Signal Faces</u>		<u>Cycle 4 / 130-Second Cycle</u>			
		<u>1 – 8</u>	<u>9 – 14</u>	<u>Split 1</u>	<u>Split 2</u>	<u>Split 3</u>	<u>Split 4</u>
<b>NORMAL OPERATION</b>							
A.	Route 37	G	R	110 – 73	110 – 73	110 – 86	110 – 86
	Change	Y	R	5	5	5	5
	Clearance	R	R	2	2	2	2
B.	Commonwealth Boulevard	R	G	7 – 44	7 – 44	7 – 31	7 – 31
	Change	R	Y	3	3	3	3
	Clearance	R	R	3	3	3	3
	Emergency Flash	Y	R	-	-	-	-

Offsets / Cycle 4: Offset 1 = 82  
 Offset 2 = 82  
 Offset 3 = 82  
 Offset 4 = 82  
 Offset 5 = 82

1. The manual control is to be disconnected.
2. The vehicle interval is to be 2 seconds.
3. The memory circuit for the loop detectors is to be off.
4. Pedestrian actuation is to guarantee a minimum of 23 seconds of green time to Phase B.
5. Offsets (in seconds) are measured from the beginning of yellow to Route 37 at Hospital Drive to the beginning of yellow to Route 37 at this intersection.

Hours of Operation:

Monday thru Friday, 6:00 A.M. – 8:00 A.M. / Cycle 2 (105 Sec.) / Offset 5 / Split 2  
Monday thru Friday, 8:00 A.M. – 2:00 P.M. / Cycle 2 (105 Sec.) / Offset 3 / Split 2  
Monday thru Friday, 2:00 P.M. – 6:00 P.M. / Cycle 3 (115 Sec.) / Offset 5 / Split 2  
Monday thru Friday, 6:00 P.M. – 9:00 P.M. / Cycle 2 (105 Sec.) / Offset 3 / Split 2  
Saturday, 7:00 A.M. – 10:00 A.M. / Cycle 2 (105 Sec.) / Offset 3 / Split 2  
Saturday, 10:00 A.M. – 3:00 P.M. / Cycle 3 (115 Sec.) / Offset 1 / Split 2  
Saturday, 3:00 P.M. – 10:00 P.M. / Cycle 2 (105 Sec.) / Offset 5 / Split 2  
Sunday, 7:00 A.M. – 1:00 P.M. / Cycle 2 (105 Sec.) / Offset 3 / Split 2  
Sunday, 1:00 P.M. – 9:00 P.M. / Cycle 2 (105 Sec.) / Offset 5 / Split 2  
All Other Times / Cycle 1 (90 Sec.) / Offset 3 / Split 1

Memorial Day and Labor Day Observed: Use Sunday Schedule

July 4<sup>th</sup> Observed: If Wednesday, Thursday, Friday – Use Saturday Schedule  
If Monday or Tuesday – Use Sunday Schedule  
All other times as detailed under Hours of Operation.

For Traffic Responsive Only: Cycles, splits, offsets in Section 1 as selected by threshold values installed at the Central computer in lieu of time of day, as determined by Traffic Operations Center.

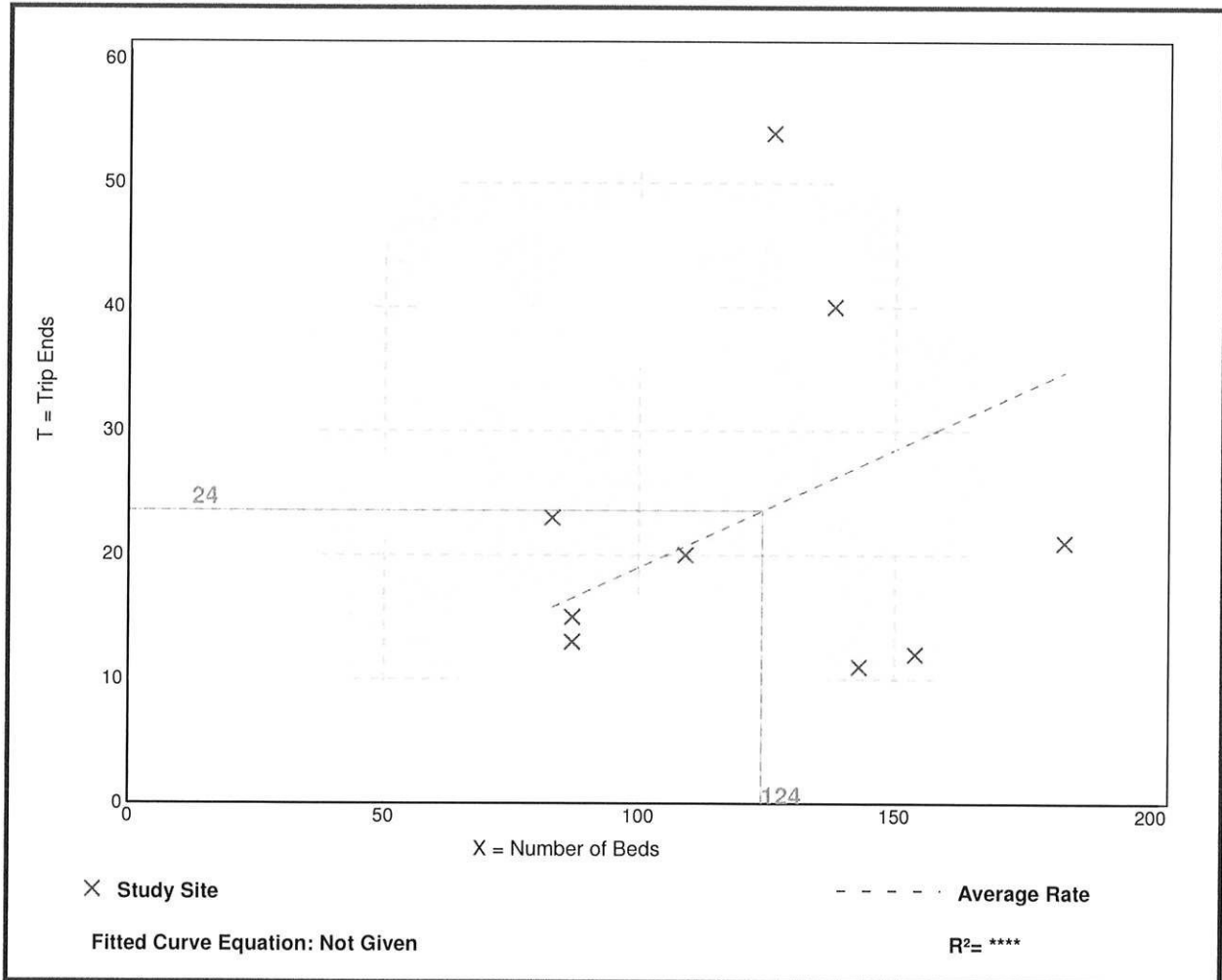
# Assisted Living (254)

**Vehicle Trip Ends vs: Beds**  
**On a: Weekday,**  
**Peak Hour of Adjacent Street Traffic,**  
**One Hour Between 7 and 9 a.m.**  
**Setting/Location: General Urban/Suburban**  
 Number of Studies: 9  
 Avg. Num. of Beds: 123  
 Directional Distribution: 63% entering, 37% exiting

## Vehicle Trip Generation per Bed

Average Rate	Range of Rates	Standard Deviation
0.19	0.08 - 0.43	0.12

## Data Plot and Equation





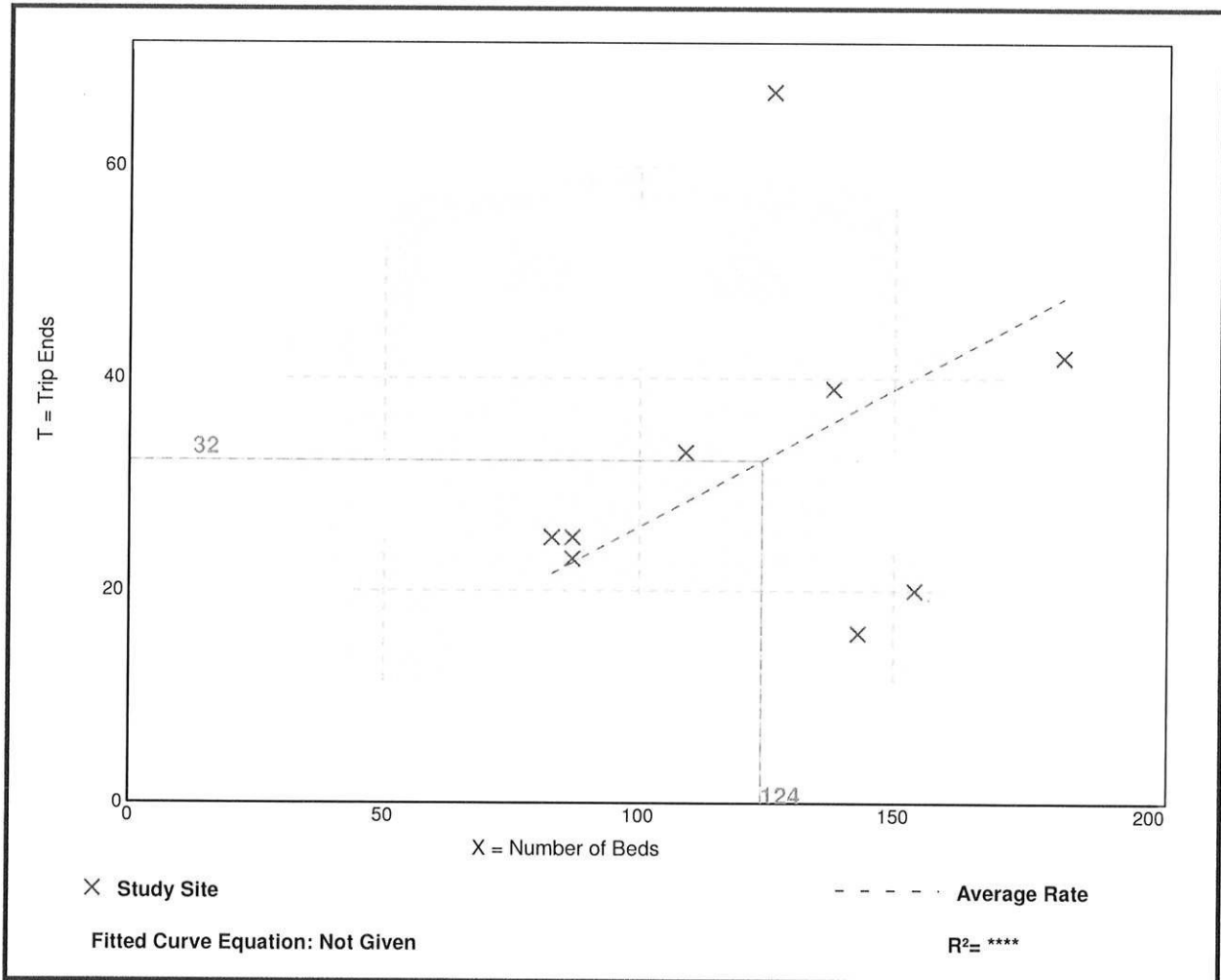
# Assisted Living (254)

**Vehicle Trip Ends vs: Beds**  
**On a: Weekday,**  
**Peak Hour of Adjacent Street Traffic,**  
**One Hour Between 4 and 6 p.m.**  
**Setting/Location: General Urban/Suburban**  
 Number of Studies: 9  
 Avg. Num. of Beds: 123  
 Directional Distribution: 38% entering, 62% exiting

## Vehicle Trip Generation per Bed













Average Rate	Range of Rates	Standard Deviation
0.26	0.11 - 0.53	0.13

## Data Plot and Equation



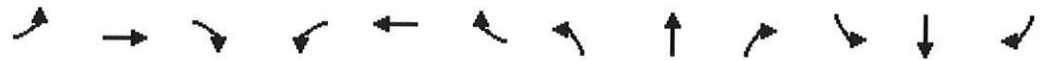
Lanes, Volumes, Timings  
13: Bone Hill Road/Buckingham Drive & Route 37

Existing AM  
09/09/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑			↑↑			↑↓			↑↓	
Traffic Volume (vph)	0	767	10	0	1141	0	81	14	23	106	12	37
Future Volume (vph)	0	767	10	0	1141	0	81	14	23	106	12	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		760	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Frnt		0.998						0.970			0.964	
Flt Protected								0.967			0.967	
Satd. Flow (prot)	0	5126	0	0	3574	0	0	3386	0	0	3365	0
Flt Permitted								0.722			0.737	
Satd. Flow (perm)	0	5126	0	0	3574	0	0	2528	0	0	2565	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)											*27	
Link Speed (mph)		50			50			25			25	
Link Distance (ft)		898			3524			217			230	
Travel Time (s)		12.2			48.1			5.9			6.3	
Peak Hour Factor	0.92	0.97	0.97	0.92	0.97	0.92	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	0	791	10	0	1176	0	84	14	24	109	12	38
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	801	0	0	1176	0	0	122	0	0	159	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		2			2		1	2		1	2	
Detector Template		Thru			Thru		Left	Thru		Left	Thru	
Leading Detector (ft)		100			100		20	100		20	100	
Trailing Detector (ft)		0			0		0	0		0	0	
Detector 1 Position(ft)		0			0		0	0		0	0	
Detector 1 Size(ft)		6			6		20	6		20	6	
Detector 1 Type		CI+Ex			CI+Ex		CI+Ex	CI+Ex		CI+Ex	CI+Ex	
Detector 1 Channel												
Detector 1 Extend (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		CI+Ex			CI+Ex			CI+Ex			CI+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type		NA			NA		D.Pm	NA		D.Pm	NA	
Protected Phases								8			4	

Lanes, Volumes, Timings  
 13: Bone Hill Road/Buckingham Drive & Route 37

Existing AM  
 09/09/2021



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases		2			6		4			8		
Detector Phase		2			6		4	8		8	4	
Switch Phase												
Minimum Initial (s)		68.0			68.0		7.0	7.0		7.0	7.0	
Minimum Split (s)		75.0			75.0		13.0	13.0		13.0	13.0	
Total Split (s)		75.0			75.0		30.0	30.0		30.0	30.0	
Total Split (%)		71.4%			71.4%		28.6%	28.6%		28.6%	28.6%	
Maximum Green (s)		68.0			68.0		24.0	24.0		24.0	24.0	
Yellow Time (s)		5.0			5.0		3.0	3.0		3.0	3.0	
All-Red Time (s)		2.0			2.0		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		7.0			7.0			6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		2.0			2.0		2.0	2.0		2.0	2.0	
Recall Mode		C-Min			C-Min		None	None		None	None	
Act Effct Green (s)		81.8			81.8			10.2			10.2	
Actuated g/C Ratio		0.78			0.78			0.10			0.10	
v/c Ratio		0.20			0.42			0.50			0.58	
Control Delay		3.3			3.1			51.5			45.9	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		3.3			3.1			51.5			45.9	
LOS		A			A			D			D	
Approach Delay		3.3			3.1			51.5			45.9	
Approach LOS		A			A			D			D	

Intersection Summary

Area Type: Other  
 Cycle Length: 105  
 Actuated Cycle Length: 105  
 Offset: 37 (35%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow  
 Natural Cycle: 90  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.58  
 Intersection Signal Delay: 8.8  
 Intersection Capacity Utilization 80.0%  
 Analysis Period (min) 15  
 \* User Entered Value













Intersection LOS: A  
 ICU Level of Service D

Splits and Phases: 13: Bone Hill Road/Buckingham Drive & Route 37

→ Ø2 (R) 75 s	↓ Ø4 30 s
← Ø6 (R) 75 s	↑ Ø8 30 s

Lanes, Volumes, Timings  
16: Route 37 & Commonwealth Blvd

Existing AM  
09/09/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑			↑↑		↙	↘		↙		↘
Traffic Volume (vph)	0	800	0	0	984	0	24	66	0	145	0	169
Future Volume (vph)	0	800	0	0	984	0	24	66	0	145	0	169
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frnt												0.850
Flt Protected							0.950			0.950		
Satd. Flow (prot)	0	3574	0	0	3574	0	1805	1900	0	1805	0	1615
Flt Permitted							0.950			0.711		
Satd. Flow (perm)	0	3574	0	0	3574	0	1805	1900	0	1351	0	1615
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)												*98
Link Speed (mph)		50			50			30			35	
Link Distance (ft)		3524			718			427			836	
Travel Time (s)		48.1			9.8			9.7			16.3	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	0	851	0	0	1047	0	26	70	0	154	0	180
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	851	0	0	1047	0	26	70	0	154	0	180
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			18			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		2			2		1	2		1		1
Detector Template		Thru			Thru		Left	Thru		Left		Right
Leading Detector (ft)		100			100		20	100		40		20
Trailing Detector (ft)		0			0		0	0		-10		0
Detector 1 Position(ft)		0			0		0	0		-10		0
Detector 1 Size(ft)		6			6		20	6		50		20
Detector 1 Type		Cl+Ex			Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex		Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0			0.0		0.0	0.0		0.0		0.0
Detector 1 Queue (s)		0.0			0.0		0.0	0.0		0.0		0.0
Detector 1 Delay (s)		0.0			0.0		0.0	0.0		0.0		0.0
Detector 2 Position(ft)		94			94			94				
Detector 2 Size(ft)		6			6			6				
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex				
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0				
Turn Type		NA			NA		Perm	NA		Perm		Perm
Protected Phases					6			8				
Permitted Phases		2					8			4		4
Detector Phase		2			6		8	8		4		4
Switch Phase												



Lanes, Volumes, Timings  
16: Route 37 & Commonwealth Blvd

Existing AM  
09/09/2021



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)		58.0			58.0		7.0	7.0		7.0		7.0
Minimum Split (s)		65.0			65.0		13.0	13.0		13.0		13.0
Total Split (s)		65.0			65.0		40.0	40.0		40.0		40.0
Total Split (%)		61.9%			61.9%		38.1%	38.1%		38.1%		38.1%
Maximum Green (s)		58.0			58.0		34.0	34.0		34.0		34.0
Yellow Time (s)		5.0			5.0		3.0	3.0		3.0		3.0
All-Red Time (s)		2.0			2.0		3.0	3.0		3.0		3.0
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0		0.0
Total Lost Time (s)		7.0			7.0		6.0	6.0		6.0		6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		2.0			2.0		2.0	2.0		2.0		2.0
Recall Mode		C-Min			C-Min		None	None		None		None
Act Effct Green (s)		75.3			75.3		16.7	16.7		16.7		16.7
Actuated g/C Ratio		0.72			0.72		0.16	0.16		0.16		0.16
v/c Ratio		0.33			0.41		0.09	0.23		0.72		0.53
Control Delay		11.2			7.1		35.4	38.2		59.6		23.7
Queue Delay		0.0			0.0		0.0	0.0		0.0		0.0
Total Delay		11.2			7.1		35.4	38.2		59.6		23.7
LOS		B			A		D	D		E		C
Approach Delay		11.2			7.1			37.5			40.2	
Approach LOS		B			A			D			D	

Intersection Summary

Area Type: Other  
 Cycle Length: 105  
 Actuated Cycle Length: 105  
 Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow, Master Intersection  
 Natural Cycle: 80  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.72  
 Intersection Signal Delay: 14.6  
 Intersection Capacity Utilization 80.5%  
 Analysis Period (min) 15  
 \* User Entered Value













Intersection LOS: B  
 ICU Level of Service D

Splits and Phases: 16: Route 37 & Commonwealth Blvd

Ø2 (R) 65 s	Ø4 40 s
Ø6 (R) 65 s	Ø8 40 s

Lanes, Volumes, Timings  
 13: Bone Hill Road/Buckingham Drive & Route 37

Existing PM  
 09/09/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↑↑↑			↑↑			↑↑			↑↑	
Traffic Volume (vph)	0	1307	23	0	1086	0	51	19	9	106	25	42
Future Volume (vph)	0	1307	23	0	1086	0	51	19	9	106	25	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		760	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Frt		0.997						0.984			0.964	
Flt Protected								0.968			0.970	
Satd. Flow (prot)	0	5121	0	0	3574	0	0	3439	0	0	3376	0
Flt Permitted								0.717			0.764	
Satd. Flow (perm)	0	5121	0	0	3574	0	0	2547	0	0	2659	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)											*20	
Link Speed (mph)		50			50			25			25	
Link Distance (ft)		861			3493			329			305	
Travel Time (s)		11.7			47.6			9.0			8.3	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	0	1376	24	0	1143	0	54	20	9	112	26	44
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1400	0	0	1143	0	0	83	0	0	182	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		2			2		1	2		1	2	
Detector Template		Thru			Thru		Left	Thru		Left	Thru	
Leading Detector (ft)		100			100		20	100		20	100	
Trailing Detector (ft)		0			0		0	0		0	0	
Detector 1 Position(ft)		0			0		0	0		0	0	
Detector 1 Size(ft)		6			6		20	6		20	6	
Detector 1 Type		CI+Ex			CI+Ex		CI+Ex	CI+Ex		CI+Ex	CI+Ex	
Detector 1 Channel												
Detector 1 Extend (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		CI+Ex			CI+Ex			CI+Ex			CI+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type		NA			NA		Perm	NA		Perm	NA	
Protected Phases								4			8	



Lanes, Volumes, Timings  
 13: Bone Hill Road/Buckingham Drive & Route 37

Existing PM  
 09/09/2021



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Permitted Phases		2			6		4			8		
Detector Phase		2			6		4	4		8	8	
Switch Phase												
Minimum Initial (s)		73.0			73.0		7.0	7.0		7.0	7.0	
Minimum Split (s)		80.0			80.0		13.0	13.0		13.0	13.0	
Total Split (s)		80.0			80.0		35.0	35.0		35.0	35.0	
Total Split (%)		69.6%			69.6%		30.4%	30.4%		30.4%	30.4%	
Maximum Green (s)		73.0			73.0		29.0	29.0		29.0	29.0	
Yellow Time (s)		5.0			5.0		3.0	3.0		3.0	3.0	
All-Red Time (s)		2.0			2.0		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		7.0			7.0			6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		2.0			2.0		2.0	2.0		2.0	2.0	
Recall Mode		C-Min			C-Min		None	None		None	None	
Act Effct Green (s)		90.4			90.4			11.6			11.6	
Actuated g/C Ratio		0.79			0.79			0.10			0.10	
v/c Ratio		0.35			0.41			0.32			0.64	
Control Delay		4.1			2.2			50.4			53.9	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		4.1			2.2			50.4			53.9	
LOS		A			A			D			D	
Approach Delay		4.1			2.2			50.4			53.9	
Approach LOS		A			A			D			D	

Intersection Summary













Area Type: Other  
 Cycle Length: 115  
 Actuated Cycle Length: 115  
 Offset: 52 (45%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow  
 Natural Cycle: 95  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.64  
 Intersection Signal Delay: 7.9  
 Intersection Capacity Utilization 84.2%  
 Analysis Period (min) 15  
 \* User Entered Value  
 Intersection LOS: A  
 ICU Level of Service E

Splits and Phases: 13: Bone Hill Road/Buckingham Drive & Route 37

→ Ø2 (R) 80 s	↖ Ø4 35 s
← Ø6 (R) 80 s	↗ Ø8 35 s

Lanes, Volumes, Timings  
16: Route 37 & Commonwealth Blvd

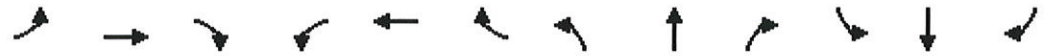
Existing PM  
09/09/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑			↑↑		↖	↗		↖		↗
Traffic Volume (vph)	0	1145	0	0	1116	0	37	184	7	256	0	182
Future Volume (vph)	0	1145	0	0	1116	0	37	184	7	256	0	182
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	100		0	0		0
Storage Lanes	0		0	0		0	1		0	1		1
Taper Length (ft)	25			25			50			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frnt								0.995				0.850
Flt Protected							0.950			0.950		
Satd. Flow (prot)	0	3574	0	0	3574	0	1805	1890	0	1805	0	1615
Flt Permitted							0.950			0.539		
Satd. Flow (perm)	0	3574	0	0	3574	0	1805	1890	0	1024	0	1615
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)								2				*98
Link Speed (mph)		50			50			35			35	
Link Distance (ft)		3493			759			241			400	
Travel Time (s)		47.6			10.4			4.7			7.8	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	0	1218	0	0	1187	0	39	196	7	272	0	194
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1218	0	0	1187	0	39	203	0	272	0	194
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		0			0		1	1		1		1
Detector Template		Thru			Thru		Left	Thru		Left		Right
Leading Detector (ft)		0			0		40	40		40		40
Trailing Detector (ft)		0			0		-10	-10		-10		-10
Detector 1 Position(ft)		0			0		-10	-10		-10		-10
Detector 1 Size(ft)		6			6		50	50		50		50
Detector 1 Type		Cl+Ex			Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex		Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0			0.0		0.0	0.0		0.0		0.0
Detector 1 Queue (s)		0.0			0.0		0.0	0.0		0.0		0.0
Detector 1 Delay (s)		0.0			0.0		0.0	0.0		0.0		0.0
Turn Type		NA			NA		Perm	NA		Perm		Perm
Protected Phases		2			6			8				
Permitted Phases							8			4		4
Detector Phase		2			6		8	8		4		4
Switch Phase												
Minimum Initial (s)		69.0			69.0		7.0	7.0		7.0		7.0
Minimum Split (s)		76.0			76.0		13.0	13.0		13.0		13.0



Lanes, Volumes, Timings  
16: Route 37 & Commonwealth Blvd

Existing PM  
09/09/2021



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)		76.0			76.0		39.0	39.0		39.0		39.0
Total Split (%)		66.1%			66.1%		33.9%	33.9%		33.9%		33.9%
Maximum Green (s)		69.0			69.0		33.0	33.0		33.0		33.0
Yellow Time (s)		5.0			5.0		3.0	3.0		3.0		3.0
All-Red Time (s)		2.0			2.0		3.0	3.0		3.0		3.0
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0		0.0
Total Lost Time (s)		7.0			7.0		6.0	6.0		6.0		6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		2.0			2.0		2.0	2.0		2.0		2.0
Recall Mode		C-Min			C-Min		None	None		None		None
Act Effct Green (s)		70.3			70.3		31.7	31.7		31.7		31.7
Actuated g/C Ratio		0.61			0.61		0.28	0.28		0.28		0.28
v/c Ratio		0.56			0.54		0.08	0.39		0.96		0.38
Control Delay		19.8			14.4		30.6	35.5		87.2		18.2
Queue Delay		0.0			0.0		0.0	0.0		0.0		0.0
Total Delay		19.8			14.4		30.6	35.5		87.2		18.2
LOS		B			B		C	D		F		B
Approach Delay		19.8			14.4			34.7			58.5	
Approach LOS		B			B			C			E	

Intersection Summary

Area Type: Other  
 Cycle Length: 115  
 Actuated Cycle Length: 115  
 Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow, Master Intersection  
 Natural Cycle: 110  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.96  
 Intersection Signal Delay: 24.7  
 Intersection Capacity Utilization 96.0%  
 Analysis Period (min) 15  
 \* User Entered Value













Intersection LOS: C  
 ICU Level of Service F

Splits and Phases: 16: Route 37 & Commonwealth Blvd

→ Ø2 (R)	76 s	↖ Ø4	39 s
← Ø6 (R)	76 s	↗ Ø8	39 s

Lanes, Volumes, Timings  
 13: Bone Hill Road/Buckingham Drive & Route 37

No-Build AM  
 09/09/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑			↑↑			↔			↔	
Traffic Volume (vph)	0	814	11	0	1211	0	86	15	24	113	13	39
Future Volume (vph)	0	814	11	0	1211	0	86	15	24	113	13	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		760	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Frnt		0.998						0.971			0.964	
Flt Protected								0.967			0.967	
Satd. Flow (prot)	0	5126	0	0	3574	0	0	3390	0	0	3365	0
Flt Permitted								0.717			0.733	
Satd. Flow (perm)	0	5126	0	0	3574	0	0	2513	0	0	2551	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)											*27	
Link Speed (mph)		50			50			25			25	
Link Distance (ft)		898			3524			217			230	
Travel Time (s)		12.2			48.1			5.9			6.3	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	0	839	11	0	1248	0	89	15	25	116	13	40
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	850	0	0	1248	0	0	129	0	0	169	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		2			2		1	2		1	2	
Detector Template		Thru			Thru		Left	Thru		Left	Thru	
Leading Detector (ft)		100			100		20	100		20	100	
Trailing Detector (ft)		0			0		0	0		0	0	
Detector 1 Position(ft)		0			0		0	0		0	0	
Detector 1 Size(ft)		6			6		20	6		20	6	
Detector 1 Type		CI+Ex			CI+Ex		CI+Ex	CI+Ex		CI+Ex	CI+Ex	
Detector 1 Channel												
Detector 1 Extend (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		CI+Ex			CI+Ex			CI+Ex			CI+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type		NA			NA		D.Pm	NA		D.Pm	NA	
Protected Phases								8			4	



Lanes, Volumes, Timings  
13: Bone Hill Road/Buckingham Drive & Route 37

No-Build AM  
09/09/2021



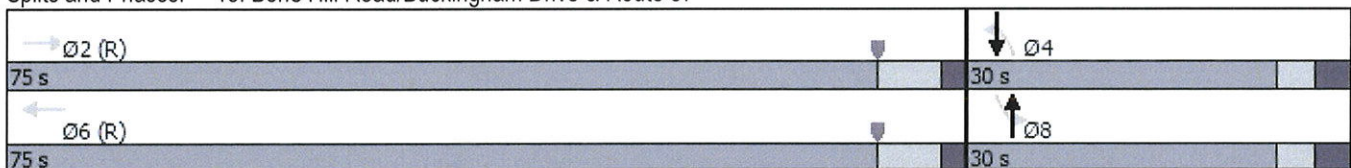
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases		2			6		4			8		
Detector Phase		2			6		4	8		8	4	
Switch Phase												
Minimum Initial (s)		68.0			68.0		7.0	7.0		7.0	7.0	
Minimum Split (s)		75.0			75.0		13.0	13.0		13.0	13.0	
Total Split (s)		75.0			75.0		30.0	30.0		30.0	30.0	
Total Split (%)		71.4%			71.4%		28.6%	28.6%		28.6%	28.6%	
Maximum Green (s)		68.0			68.0		24.0	24.0		24.0	24.0	
Yellow Time (s)		5.0			5.0		3.0	3.0		3.0	3.0	
All-Red Time (s)		2.0			2.0		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		7.0			7.0			6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		2.0			2.0		2.0	2.0		2.0	2.0	
Recall Mode		C-Min			C-Min		None	None		None	None	
Act Effct Green (s)		81.4			81.4			10.6			10.6	
Actuated g/C Ratio		0.78			0.78			0.10			0.10	
v/c Ratio		0.21			0.45			0.51			0.60	
Control Delay		3.5			3.2			51.4			46.6	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		3.5			3.2			51.4			46.6	
LOS		A			A			D			D	
Approach Delay		3.5			3.2			51.4			46.6	
Approach LOS		A			A			D			D	

Intersection Summary

Area Type: Other  
 Cycle Length: 105  
 Actuated Cycle Length: 105  
 Offset: 37 (35%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow  
 Natural Cycle: 90  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.60  
 Intersection Signal Delay: 9.0  
 Intersection Capacity Utilization 80.4%  
 Analysis Period (min) 15  
 \* User Entered Value













Intersection LOS: A  
 ICU Level of Service D

Splits and Phases: 13: Bone Hill Road/Buckingham Drive & Route 37



Lanes, Volumes, Timings  
16: Route 37 & Commonwealth Blvd

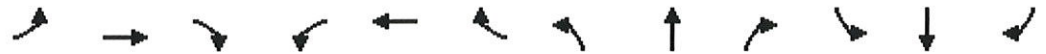
No-Build AM  
09/09/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑			↑↑		↙	↘		↙		↘
Traffic Volume (vph)	0	849	0	0	1045	0	26	70	0	154	0	179
Future Volume (vph)	0	849	0	0	1045	0	26	70	0	154	0	179
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frnt												0.850
Flt Protected							0.950			0.950		
Satd. Flow (prot)	0	3574	0	0	3574	0	1805	1900	0	1805	0	1615
Flt Permitted							0.950			0.709		
Satd. Flow (perm)	0	3574	0	0	3574	0	1805	1900	0	1347	0	1615
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)												*98
Link Speed (mph)		50			50			30			35	
Link Distance (ft)		3524			718			427			836	
Travel Time (s)		48.1			9.8			9.7			16.3	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	0	903	0	0	1112	0	28	74	0	164	0	190
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	903	0	0	1112	0	28	74	0	164	0	190
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			18			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		2			2		1	2		1		1
Detector Template		Thru			Thru		Left	Thru		Left		Right
Leading Detector (ft)		100			100		20	100		40		20
Trailing Detector (ft)		0			0		0	0		-10		0
Detector 1 Position(ft)		0			0		0	0		-10		0
Detector 1 Size(ft)		6			6		20	6		50		20
Detector 1 Type		Cl+Ex			Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex		Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0			0.0		0.0	0.0		0.0		0.0
Detector 1 Queue (s)		0.0			0.0		0.0	0.0		0.0		0.0
Detector 1 Delay (s)		0.0			0.0		0.0	0.0		0.0		0.0
Detector 2 Position(ft)		94			94			94				
Detector 2 Size(ft)		6			6			6				
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex				
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0				
Turn Type		NA			NA		Perm	NA		Perm		Perm
Protected Phases					6			8				
Permitted Phases		2					8			4		4
Detector Phase		2			6		8	8		4		4
Switch Phase												



Lanes, Volumes, Timings  
16: Route 37 & Commonwealth Blvd

No-Build AM  
09/09/2021



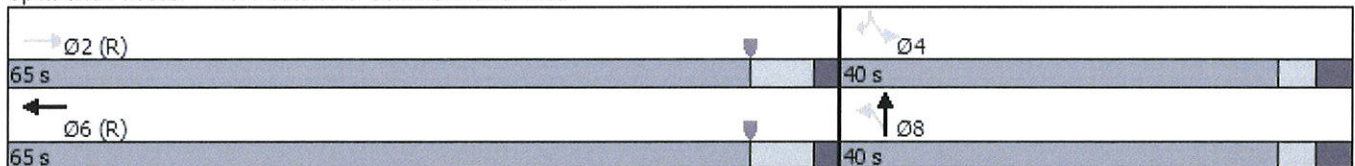
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)		58.0			58.0		7.0	7.0		7.0		7.0
Minimum Split (s)		65.0			65.0		13.0	13.0		13.0		13.0
Total Split (s)		65.0			65.0		40.0	40.0		40.0		40.0
Total Split (%)		61.9%			61.9%		38.1%	38.1%		38.1%		38.1%
Maximum Green (s)		58.0			58.0		34.0	34.0		34.0		34.0
Yellow Time (s)		5.0			5.0		3.0	3.0		3.0		3.0
All-Red Time (s)		2.0			2.0		3.0	3.0		3.0		3.0
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0		0.0
Total Lost Time (s)		7.0			7.0		6.0	6.0		6.0		6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		2.0			2.0		2.0	2.0		2.0		2.0
Recall Mode		C-Min			C-Min		None	None		None		None
Act Effct Green (s)		74.5			74.5		17.5	17.5		17.5		17.5
Actuated g/C Ratio		0.71			0.71		0.17	0.17		0.17		0.17
v/c Ratio		0.36			0.44		0.09	0.23		0.73		0.54
Control Delay		11.8			7.8		34.7	37.6		59.4		24.2
Queue Delay		0.0			0.0		0.0	0.0		0.0		0.0
Total Delay		11.8			7.8		34.7	37.6		59.4		24.2
LOS		B			A		C	D		E		C
Approach Delay		11.8			7.8			36.8			40.5	
Approach LOS		B			A			D			D	

Intersection Summary

Area Type: Other  
 Cycle Length: 105  
 Actuated Cycle Length: 105  
 Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow, Master Intersection  
 Natural Cycle: 80  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.73  
 Intersection Signal Delay: 15.1  
 Intersection Capacity Utilization 81.1%  
 Analysis Period (min) 15  
 \* User Entered Value

Intersection LOS: B  
 ICU Level of Service D

Splits and Phases: 16: Route 37 & Commonwealth Blvd



Lanes, Volumes, Timings  
 13: Bone Hill Road/Buckingham Drive & Route 37

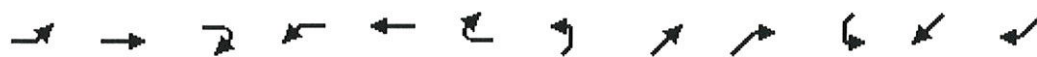
No-Build PM  
 09/09/2021

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↑↑↑			↑↑			↔			↔	
Traffic Volume (vph)	0	1387	24	0	1153	0	54	20	10	113	27	45
Future Volume (vph)	0	1387	24	0	1153	0	54	20	10	113	27	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		760	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Frnt		0.997						0.981			0.964	
Flt Protected								0.969			0.970	
Satd. Flow (prot)	0	5121	0	0	3574	0	0	3432	0	0	3376	0
Flt Permitted								0.709			0.761	
Satd. Flow (perm)	0	5121	0	0	3574	0	0	2511	0	0	2648	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)											*20	
Link Speed (mph)		50			50			25			25	
Link Distance (ft)		861			3493			329			305	
Travel Time (s)		11.7			47.6			9.0			8.3	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	0	1460	25	0	1214	0	57	21	11	119	28	47
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1485	0	0	1214	0	0	89	0	0	194	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		2			2		1	2		1	2	
Detector Template		Thru			Thru		Left	Thru		Left	Thru	
Leading Detector (ft)		100			100		20	100		20	100	
Trailing Detector (ft)		0			0		0	0		0	0	
Detector 1 Position(ft)		0			0		0	0		0	0	
Detector 1 Size(ft)		6			6		20	6		20	6	
Detector 1 Type		CI+Ex			CI+Ex		CI+Ex	CI+Ex		CI+Ex	CI+Ex	
Detector 1 Channel												
Detector 1 Extend (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		CI+Ex			CI+Ex			CI+Ex			CI+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type		NA			NA		Perm	NA		Perm	NA	
Protected Phases								4			8	



Lanes, Volumes, Timings  
 13: Bone Hill Road/Buckingham Drive & Route 37

No-Build PM  
 09/09/2021



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Permitted Phases		2			6		4			8		
Detector Phase		2			6		4	4		8	8	
Switch Phase												
Minimum Initial (s)		73.0			73.0		7.0	7.0		7.0	7.0	
Minimum Split (s)		80.0			80.0		13.0	13.0		13.0	13.0	
Total Split (s)		80.0			80.0		35.0	35.0		35.0	35.0	
Total Split (%)		69.6%			69.6%		30.4%	30.4%		30.4%	30.4%	
Maximum Green (s)		73.0			73.0		29.0	29.0		29.0	29.0	
Yellow Time (s)		5.0			5.0		3.0	3.0		3.0	3.0	
All-Red Time (s)		2.0			2.0		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		7.0			7.0			6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		2.0			2.0		2.0	2.0		2.0	2.0	
Recall Mode		C-Min			C-Min		None	None		None	None	
Act Effect Green (s)		89.8			89.8			12.2			12.2	
Actuated g/C Ratio		0.78			0.78			0.11			0.11	
v/c Ratio		0.37			0.43			0.34			0.65	
Control Delay		4.4			2.4			50.1			54.2	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		4.4			2.4			50.1			54.2	
LOS		A			A			D			D	
Approach Delay		4.4			2.4			50.1			54.3	
Approach LOS		A			A			D			D	

Intersection Summary

Area Type: Other  
 Cycle Length: 115  
 Actuated Cycle Length: 115  
 Offset: 52 (45%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow  
 Natural Cycle: 95  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.65  
 Intersection Signal Delay: 8.2  
 Intersection Capacity Utilization 84.6%  
 Analysis Period (min) 15  
 \* User Entered Value

















Intersection LOS: A  
 ICU Level of Service E

Splits and Phases: 13: Bone Hill Road/Buckingham Drive & Route 37

→ Ø2 (R) 80 s		↗ Ø4 35 s
← Ø6 (R) 80 s		↘ Ø8 35 s

Lanes, Volumes, Timings  
16: Route 37 & Commonwealth Blvd

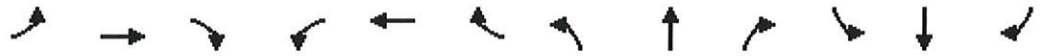
No-Build PM  
09/09/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑			↑↑							
Traffic Volume (vph)	0	1215	0	0	1185	0	39	195	0	272	0	193
Future Volume (vph)	0	1215	0	0	1185	0	39	195	0	272	0	193
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	100		0	0		0
Storage Lanes	0		0	0		0	1		0	1		1
Taper Length (ft)	25			25			50			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frnt												0.850
Flt Protected							0.950			0.950		
Satd. Flow (prot)	0	3574	0	0	3574	0	1805	1900	0	1805	0	1615
Flt Permitted							0.950			0.540		
Satd. Flow (perm)	0	3574	0	0	3574	0	1805	1900	0	1026	0	1615
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)												*98
Link Speed (mph)		50			50			35			35	
Link Distance (ft)		3493			759			241			400	
Travel Time (s)		47.6			10.4			4.7			7.8	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	0	1293	0	0	1261	0	41	207	0	289	0	205
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1293	0	0	1261	0	41	207	0	289	0	205
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		0			0		1	1		1		1
Detector Template		Thru			Thru		Left	Thru		Left		Right
Leading Detector (ft)		0			0		40	40		40		40
Trailing Detector (ft)		0			0		-10	-10		-10		-10
Detector 1 Position(ft)		0			0		-10	-10		-10		-10
Detector 1 Size(ft)		6			6		50	50		50		50
Detector 1 Type		Cl+Ex			Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex		Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0			0.0		0.0	0.0		0.0		0.0
Detector 1 Queue (s)		0.0			0.0		0.0	0.0		0.0		0.0
Detector 1 Delay (s)		0.0			0.0		0.0	0.0		0.0		0.0
Turn Type		NA			NA		Perm	NA		Perm		Perm
Protected Phases		2			6			8				
Permitted Phases							8			4		4
Detector Phase		2			6		8	8		4		4
Switch Phase												
Minimum Initial (s)		69.0			69.0		7.0	7.0		7.0		7.0
Minimum Split (s)		76.0			76.0		13.0	13.0		13.0		13.0



Lanes, Volumes, Timings  
16: Route 37 & Commonwealth Blvd

No-Build PM  
09/09/2021



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)		76.0			76.0		39.0	39.0		39.0		39.0
Total Split (%)		66.1%			66.1%		33.9%	33.9%		33.9%		33.9%
Maximum Green (s)		69.0			69.0		33.0	33.0		33.0		33.0
Yellow Time (s)		5.0			5.0		3.0	3.0		3.0		3.0
All-Red Time (s)		2.0			2.0		3.0	3.0		3.0		3.0
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0		0.0
Total Lost Time (s)		7.0			7.0		6.0	6.0		6.0		6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		2.0			2.0		2.0	2.0		2.0		2.0
Recall Mode		C-Min			C-Min		None	None		None		None
Act Effct Green (s)		69.0			69.0		33.0	33.0		33.0		33.0
Actuated g/C Ratio		0.60			0.60		0.29	0.29		0.29		0.29
v/c Ratio		0.60			0.59		0.08	0.38		0.98		0.38
Control Delay		21.2			15.6		30.6	35.3		90.2		19.1
Queue Delay		0.0			0.0		0.0	0.0		0.0		0.0
Total Delay		21.2			15.6		30.6	35.3		90.2		19.1
LOS		C			B		C	D		F		B
Approach Delay		21.2			15.6			34.5			60.7	
Approach LOS		C			B			C			E	

Intersection Summary

Area Type: Other  
 Cycle Length: 115  
 Actuated Cycle Length: 115  
 Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow, Master Intersection  
 Natural Cycle: 110  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.98  
 Intersection Signal Delay: 26.0  
 Intersection Capacity Utilization 97.0%  
 Analysis Period (min) 15  
 \* User Entered Value













Intersection LOS: C  
 ICU Level of Service F

Splits and Phases: 16: Route 37 & Commonwealth Blvd

→ Ø2 (R)	76 s	↖ Ø4	39 s
← Ø6 (R)	76 s	↑ Ø8	39 s

Lanes, Volumes, Timings  
13: Bone Hill Road/Buckingham Drive & Route 37

Build AM  
09/09/2021













												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑			↑↑			↔↔			↔↔	
Traffic Volume (vph)	0	819	11	0	1216	0	86	15	24	118	13	39
Future Volume (vph)	0	819	11	0	1216	0	86	15	24	118	13	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		760	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Frnt		0.998						0.971			0.966	
Flt Protected								0.967			0.966	
Satd. Flow (prot)	0	5126	0	0	3574	0	0	3390	0	0	3369	0
Flt Permitted								0.714			0.731	
Satd. Flow (perm)	0	5126	0	0	3574	0	0	2503	0	0	2549	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)											*27	
Link Speed (mph)		50			50			25			25	
Link Distance (ft)		898			1681			217			230	
Travel Time (s)		12.2			22.9			5.9			6.3	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	0	844	11	0	1254	0	89	15	25	122	13	40
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	855	0	0	1254	0	0	129	0	0	175	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		2			2		1	2		1	2	
Detector Template		Thru			Thru		Left	Thru		Left	Thru	
Leading Detector (ft)		100			100		20	100		20	100	
Trailing Detector (ft)		0			0		0	0		0	0	
Detector 1 Position(ft)		0			0		0	0		0	0	
Detector 1 Size(ft)		6			6		20	6		20	6	
Detector 1 Type		CI+Ex			CI+Ex		CI+Ex	CI+Ex		CI+Ex	CI+Ex	
Detector 1 Channel												
Detector 1 Extend (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		CI+Ex			CI+Ex			CI+Ex			CI+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type		NA			NA		D,Pm	NA		D,Pm	NA	
Protected Phases								8			4	





Lanes, Volumes, Timings  
16: Route 37 & Commonwealth Blvd

Build AM  
09/09/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑			↑↑		↙	↘		↙		↘
Traffic Volume (vph)	0	853	0	0	1052	0	32	70	0	154	0	181
Future Volume (vph)	0	853	0	0	1052	0	32	70	0	154	0	181
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frnt												0.850
Flt Protected							0.950			0.950		
Satd. Flow (prot)	0	3574	0	0	3574	0	1805	1900	0	1805	0	1615
Flt Permitted							0.950			0.709		
Satd. Flow (perm)	0	3574	0	0	3574	0	1805	1900	0	1347	0	1615
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)												*98
Link Speed (mph)		50			50			30			35	
Link Distance (ft)		1843			718			427			836	
Travel Time (s)		25.1			9.8			9.7			16.3	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	0	907	0	0	1119	0	34	74	0	164	0	193
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	907	0	0	1119	0	34	74	0	164	0	193
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			18			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		2			2		1	2		1		1
Detector Template		Thru			Thru		Left	Thru		Left		Right
Leading Detector (ft)		100			100		20	100		40		20
Trailing Detector (ft)		0			0		0	0		-10		0
Detector 1 Position(ft)		0			0		0	0		-10		0
Detector 1 Size(ft)		6			6		20	6		50		20
Detector 1 Type		Cl+Ex			Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex		Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0			0.0		0.0	0.0		0.0		0.0
Detector 1 Queue (s)		0.0			0.0		0.0	0.0		0.0		0.0
Detector 1 Delay (s)		0.0			0.0		0.0	0.0		0.0		0.0
Detector 2 Position(ft)		94			94			94				
Detector 2 Size(ft)		6			6			6				
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex				
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0				
Turn Type		NA			NA		Perm	NA		Perm		Perm
Protected Phases					6			8				
Permitted Phases		2					8			4		4
Detector Phase		2			6		8	8		4		4
Switch Phase												



Lanes, Volumes, Timings  
16: Route 37 & Commonwealth Blvd

Build AM  
09/09/2021



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Initial (s)		58.0			58.0		7.0	7.0		7.0		7.0
Minimum Split (s)		65.0			65.0		13.0	13.0		13.0		13.0
Total Split (s)		65.0			65.0		40.0	40.0		40.0		40.0
Total Split (%)		61.9%			61.9%		38.1%	38.1%		38.1%		38.1%
Maximum Green (s)		58.0			58.0		34.0	34.0		34.0		34.0
Yellow Time (s)		5.0			5.0		3.0	3.0		3.0		3.0
All-Red Time (s)		2.0			2.0		3.0	3.0		3.0		3.0
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0		0.0
Total Lost Time (s)		7.0			7.0		6.0	6.0		6.0		6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		2.0			2.0		2.0	2.0		2.0		2.0
Recall Mode		C-Min			C-Min		None	None		None		None
Act Effct Green (s)		74.5			74.5		17.5	17.5		17.5		17.5
Actuated g/C Ratio		0.71			0.71		0.17	0.17		0.17		0.17
v/c Ratio		0.36			0.44		0.11	0.23		0.73		0.55
Control Delay		7.0			7.8		35.1	37.6		59.4		24.7
Queue Delay		0.0			0.0		0.0	0.0		0.0		0.0
Total Delay		7.0			7.8		35.1	37.6		59.4		24.7
LOS		A			A		D	D		E		C
Approach Delay		7.0			7.8			36.8			40.6	
Approach LOS		A			A			D			D	

Intersection Summary

Area Type: Other  
 Cycle Length: 105  
 Actuated Cycle Length: 105  
 Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow, Master Intersection  
 Natural Cycle: 80  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.73  
 Intersection Signal Delay: 13.5  
 Intersection Capacity Utilization 81.2%  
 Analysis Period (min) 15  
 \* User Entered Value

Intersection LOS: B  
 ICU Level of Service D

Splits and Phases: 16: Route 37 & Commonwealth Blvd

 Ø2 (R)	 Ø4
65 s	40 s
 Ø6 (R)	 Ø8
65 s	40 s

Intersection

Int Delay, s/veh	0.1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Traffic Vol, veh/h	0	0	1250	15	0	9
Future Vol, veh/h	0	0	1250	15	0	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Stop
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	1	0	2	0
Mvmt Flow	0	0	1359	16	0	10

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	-	0	-	0	- 688
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-
Critical Hdwy	-	-	-	-	- 6.9
Critical Hdwy Stg 1	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	- 3.3
Pot Cap-1 Maneuver	0	-	-	-	0 393
Stage 1	0	-	-	-	0 -
Stage 2	0	-	-	-	0 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	- 393
Mov Cap-2 Maneuver	-	-	-	-	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	14.4
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	393
HCM Lane V/C Ratio	-	-	-	0.025
HCM Control Delay (s)	-	-	-	14.4
HCM Lane LOS	-	-	-	B
HCM 95th %tile Q(veh)	-	-	-	0.1

Lanes, Volumes, Timings  
 13: Bone Hill Road/Buckingham Drive & Route 37

Build PM  
 09/09/2021

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↑↑↑			↑↑			↑↑			↑↑	
Traffic Volume (vph)	0	1392	24	0	1161	0	54	20	10	124	27	45
Future Volume (vph)	0	1392	24	0	1161	0	54	20	10	124	27	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		760	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Frt		0.997						0.981			0.966	
Flt Protected								0.969			0.969	
Satd. Flow (prot)	0	5121	0	0	3574	0	0	3432	0	0	3379	0
Flt Permitted								0.695			0.756	
Satd. Flow (perm)	0	5121	0	0	3574	0	0	2461	0	0	2636	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)											*20	
Link Speed (mph)		50			50			25			25	
Link Distance (ft)		861			1705			329			305	
Travel Time (s)		11.7			23.3			9.0			8.3	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	0	1465	25	0	1222	0	57	21	11	131	28	47
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1490	0	0	1222	0	0	89	0	0	206	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		2			2		1	2		1	2	
Detector Template		Thru			Thru		Left	Thru		Left	Thru	
Leading Detector (ft)		100			100		20	100		20	100	
Trailing Detector (ft)		0			0		0	0		0	0	
Detector 1 Position(ft)		0			0		0	0		0	0	
Detector 1 Size(ft)		6			6		20	6		20	6	
Detector 1 Type		CI+Ex			CI+Ex		CI+Ex	CI+Ex		CI+Ex	CI+Ex	
Detector 1 Channel												
Detector 1 Extend (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		CI+Ex			CI+Ex			CI+Ex			CI+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type		NA			NA		Perm	NA		Perm	NA	
Protected Phases								4			8	



Lanes, Volumes, Timings  
 13: Bone Hill Road/Buckingham Drive & Route 37

Build PM  
 09/09/2021



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Permitted Phases		2			6		4			8		
Detector Phase		2			6		4	4		8	8	
Switch Phase												
Minimum Initial (s)		73.0			73.0		7.0	7.0		7.0	7.0	
Minimum Split (s)		80.0			80.0		13.0	13.0		13.0	13.0	
Total Split (s)		80.0			80.0		35.0	35.0		35.0	35.0	
Total Split (%)		69.6%			69.6%		30.4%	30.4%		30.4%	30.4%	
Maximum Green (s)		73.0			73.0		29.0	29.0		29.0	29.0	
Yellow Time (s)		5.0			5.0		3.0	3.0		3.0	3.0	
All-Red Time (s)		2.0			2.0		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		7.0			7.0			6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		2.0			2.0		2.0	2.0		2.0	2.0	
Recall Mode		C-Min			C-Min		None	None		None	None	
Act Effct Green (s)		89.3			89.3			12.7			12.7	
Actuated g/C Ratio		0.78			0.78			0.11			0.11	
v/c Ratio		0.37			0.44			0.33			0.67	
Control Delay		4.6			2.6			49.3			54.5	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		4.6			2.6			49.3			54.5	
LOS		A			A			D			D	
Approach Delay		4.6			2.6			49.3			54.5	
Approach LOS		A			A			D			D	

Intersection Summary

Area Type: Other  
 Cycle Length: 115  
 Actuated Cycle Length: 115  
 Offset: 52 (45%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow  
 Natural Cycle: 95  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.67  
 Intersection Signal Delay: 8.5  
 Intersection Capacity Utilization 85.2%  
 Analysis Period (min) 15  
 \* User Entered Value  
 Intersection LOS: A  
 ICU Level of Service E





















Splits and Phases: 13: Bone Hill Road/Buckingham Drive & Route 37

→ Ø2 (R) 80 s		↖ Ø4 35 s
← Ø6 (R) 80 s		↘ Ø8 35 s



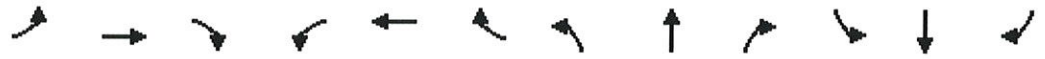
Lanes, Volumes, Timings  
16: Route 37 & Commonwealth Blvd

Build PM  
09/09/2021

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 							
Traffic Volume (vph)	0	1225	0	0	1190	0	42	196	7	272	0	195
Future Volume (vph)	0	1225	0	0	1190	0	42	196	7	272	0	195
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	100		0	0		0
Storage Lanes	0		0	0		0	1		0	1		1
Taper Length (ft)	25			25			50			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frnt								0.995				0.850
Flt Protected							0.950			0.950		
Satd. Flow (prot)	0	3574	0	0	3574	0	1805	1890	0	1805	0	1615
Flt Permitted							0.950			0.525		
Satd. Flow (perm)	0	3574	0	0	3574	0	1805	1890	0	998	0	1615
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)								1				*98
Link Speed (mph)		50			50			35			35	
Link Distance (ft)		1788			759			241			400	
Travel Time (s)		24.4			10.4			4.7			7.8	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	0	1303	0	0	1266	0	45	209	7	289	0	207
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1303	0	0	1266	0	45	216	0	289	0	207
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		0			0		1	1		1		1
Detector Template		Thru			Thru		Left	Thru		Left		Right
Leading Detector (ft)		0			0		40	40		40		40
Trailing Detector (ft)		0			0		-10	-10		-10		-10
Detector 1 Position(ft)		0			0		-10	-10		-10		-10
Detector 1 Size(ft)		6			6		50	50		50		50
Detector 1 Type		Cl+Ex			Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex		Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0			0.0		0.0	0.0		0.0		0.0
Detector 1 Queue (s)		0.0			0.0		0.0	0.0		0.0		0.0
Detector 1 Delay (s)		0.0			0.0		0.0	0.0		0.0		0.0
Turn Type		NA			NA		Perm	NA		Perm		Perm
Protected Phases		2			6			8				
Permitted Phases							8			4		4
Detector Phase		2			6		8	8		4		4
Switch Phase												
Minimum Initial (s)		69.0			69.0		7.0	7.0		7.0		7.0
Minimum Split (s)		76.0			76.0		13.0	13.0		13.0		13.0

Lanes, Volumes, Timings  
16: Route 37 & Commonwealth Blvd

Build PM  
09/09/2021



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)		76.0			76.0		39.0	39.0		39.0		39.0
Total Split (%)		66.1%			66.1%		33.9%	33.9%		33.9%		33.9%
Maximum Green (s)		69.0			69.0		33.0	33.0		33.0		33.0
Yellow Time (s)		5.0			5.0		3.0	3.0		3.0		3.0
All-Red Time (s)		2.0			2.0		3.0	3.0		3.0		3.0
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0		0.0
Total Lost Time (s)		7.0			7.0		6.0	6.0		6.0		6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		2.0			2.0		2.0	2.0		2.0		2.0
Recall Mode		C-Min			C-Min		None	None		None		None
Act Effct Green (s)		69.0			69.0		33.0	33.0		33.0		33.0
Actuated g/C Ratio		0.60			0.60		0.29	0.29		0.29		0.29
v/c Ratio		0.61			0.59		0.09	0.40		1.01		0.39
Control Delay		16.0			15.7		30.7	35.5		97.7		19.3
Queue Delay		0.0			0.0		0.0	0.0		0.0		0.0
Total Delay		16.0			15.7		30.7	35.5		97.7		19.3
LOS		B			B		C	D		F		B
Approach Delay		16.0			15.7			34.7			65.0	
Approach LOS		B			B			C			E	

Intersection Summary

Area Type: Other  
 Cycle Length: 115  
 Actuated Cycle Length: 115  
 Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow, Master Intersection  
 Natural Cycle: 110  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 1.01  
 Intersection Signal Delay: 24.6  
 Intersection Capacity Utilization 97.5%  
 Analysis Period (min) 15  
 \* User Entered Value

Intersection LOS: C  
 ICU Level of Service F

Splits and Phases: 16: Route 37 & Commonwealth Blvd

→ Ø2 (R)		↖ Ø4
76 s		39 s
← Ø6 (R)		↑ Ø8
76 s		39 s

Intersection						
Int Delay, s/veh	0.2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑↑
Traffic Vol, veh/h	0	0	1415	12	0	20
Future Vol, veh/h	0	0	1415	12	0	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Stop
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	1	0	2	0
Mvmt Flow	0	0	1538	13	0	22

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	-	0	-	0	- 776
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-
Critical Hdwy	-	-	-	-	- 6.9
Critical Hdwy Stg 1	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	- 3.3
Pot Cap-1 Maneuver	0	-	-	-	0 345
Stage 1	0	-	-	-	0 -
Stage 2	0	-	-	-	0 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	- 345
Mov Cap-2 Maneuver	-	-	-	-	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	16.1
HCM LOS			C

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	345
HCM Lane V/C Ratio	-	-	-	0.063
HCM Control Delay (s)	-	-	-	16.1
HCM Lane LOS	-	-	-	C
HCM 95th %tile Q(veh)	-	-	-	0.2