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**Traffic Evaluation Memorandum (January 2014) &  
Supplemental Traffic Evaluation (March 2014)**

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*Banta Davis Land*

Carlisle,  
Massachusetts

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**Prepared for** **Town of Carlisle Affordable Housing Trust**  
Town Hall  
66 Westford Street  
Carlisle, Massachusetts 01741

**Prepared by** **VHB/Vanasse Hangen Brustlin, Inc.**  
101 Walnut Street  
Watertown, MA 02471



*Vanasse Hangen Brustlin, Inc.*

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**Memorandum**

To: Ms. Elizabeth DeMille Barnett  
Housing Coordinator  
Town of Carlisle  
66 Westford Street  
Carlisle, MA 01741

Date: January 24, 2014

Project No.: 12623.00

From: Vinod Kalikiri, P.E., P.T.O.E.

Re: **Banta-Davis Land  
Route 225, Carlisle, Massachusetts**

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**Traffic Memorandum**

Vanasse Hangen Brustlin, Inc. (VHB) has prepared this memorandum to document the existing traffic conditions on Bedford Road (Route 225) at the driveway to Banta-Davis Athletic Facility (the Site) and the projected trip generation characteristics associated with the potential future expansion of the athletic facility and the construction of a multi-family rental development on the Site. The traffic memorandum has been prepared for, and at the request of, the Town of Carlisle Affordable Housing Trust (Client).

**Site Location and Existing Conditions**

Banta Davis Athletic Facility is located at 304 Bedford Road (Route 225), between Green Cemetery and Kimball Farm Ice Cream stand. The approximately seven-acre existing outdoor athletic/recreation facility has the following elements:

- a Little League baseball field
- a softball field
- a multi-purpose field (for soccer, lacrosse and field hockey)

The Little League field is located on the east side of the Site driveway, on a portion of the Site generally referred to as "Lower Banta". The driveway continues to "Upper Banta", terminating at a gravel parking lot. The multi-purpose field with a paved track around it is located to the south of the parking lot. The softball field is located to the north of the parking lot. In addition to the large parking lot at the end of the driveway, two smaller perpendicular parking areas are located along the northerly edge of the driveway. None of the parking spaces on the Site are marked. Based on VHB's approximate measurements of the three designated parking areas, approximately 115 vehicles could be parked on the Site concurrently. Due to the narrow width of the driveway, VHB assumed that no parallel parking is allowed along the length of the driveway.

The Site driveway intersects Bedford Road from the south to form an unsignalized T-intersection. Figure 1 shows the general location and configuration of the driveway intersection. The driveway is approximately 18 to 19 feet wide between Bedford Road and the first perpendicular parking area on the driveway. At the intersection with Bedford Road, the driveway widens to approximately 45 feet due to flat corner radii of the intersection. A marked pedestrian crosswalk is located across the

easterly leg of the intersection which provides a pedestrian connection between the Site and an existing off-road pedestrian path on the north side of Bedford Road. There are no sidewalks on the Site driveway or immediately adjacent to Bedford Road.



**Figure 1: Bedford Road at Banta-Davis Site Driveway**

Bedford Road (Route 225) is functionally classified as a *Rural Major Collector* and is under the jurisdiction of the Town of Carlisle. The roadway provides one lane of travel in each direction, each measuring approximately 11-12 feet in width with an approximately one-foot paved shoulder on each side. Figure 2 shows the existing roadway cross-section near the Site driveway, looking west. Posted speed limit on the roadway, in the vicinity of the Site, is 30 miles per hour (mph).



**Figure 2: Bedford Road Near Banta Davis Drive (Looking West)**

### Project Description

The Carlisle Recreation Commission proposes to expand the existing Banta Davis athletic facility in the future to include the following additional elements:

In the near term (within the next seven years):

- one additional multi-purpose field (for a total of two multi-purpose fields)
- up to four tennis courts

In the long term (likely after seven years):

- one additional Little League baseball field (for a total of two Little League fields)
- up to two additional tennis courts (for a total of six tennis courts)

For ease of reference within the document, the above noted “near term” plan is referred to as *Scenario 1* while the “long term” plan is referred to as *Scenario 2*. Available information indicates that the near term expansion plan may not include any additional parking on the Site. Conceptual information for the long term plan suggests that an additional parking lot may be added when the final expansion plan is implemented.

In addition to the contemplated athletic facility expansion, Carlisle Housing Authority has identified the Site as a suitable location for the construction of a 50-unit multi-family rental development. The residential units will be constructed in the southerly portion of the Site, with a separate parking lot that is accessed via a spur drive off of the main driveway.

Access to/from Bedford Road for the entire development (athletic and residential uses) will continue to be provided via the existing driveway on Bedford Road.

### Existing Traffic Volumes

Weekday and Saturday daily traffic volumes and vehicular speeds on Bedford Road were collected in January 2014 using an automatic traffic recorder (ATR). To quantify the seasonal variation of traffic volumes in the area, historic traffic data available from MassDOT were reviewed. According to published MassDOT seasonal factors, January roadway traffic counts are generally 10-percent lower than *average month* conditions. Therefore, the roadway traffic volumes presented in Table 1 below should be increased by 10-percent to account for seasonal variation.

**Table 1: Observed Traffic Volumes on Bedford Road (West of the Site Driveway)**

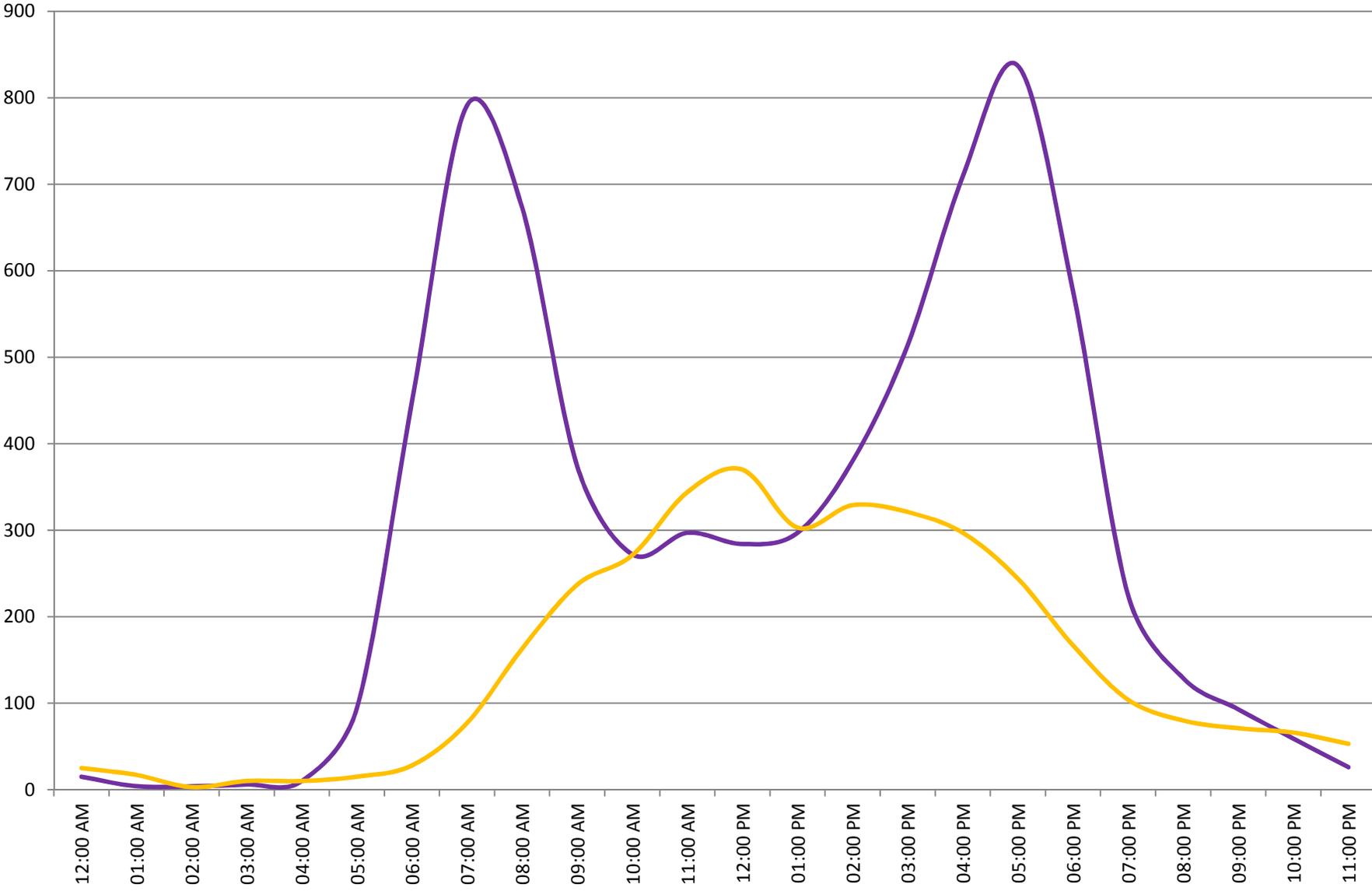
Location	Weekday (vpd) <sup>1</sup>	Weekday Morning Peak Hour			Weekday Evening Peak Hour			Saturday (vpd) <sup>1</sup>	Saturday Midday Peak Hour		
		Vol. (vph) <sup>2</sup>	“K” Factor <sup>3</sup>	Directional Flow	Vol. (vph) <sup>2</sup>	“K” Factor	Directional Flow		Vol. (vph) <sup>2</sup>	“K” Factor	Directional Flow
Eastbound	3,520	680	19.3		190	5.4		1,840	190	10.3	
Westbound	<u>3,600</u>	<u>115</u>	<u>3.2</u>		<u>650</u>	<u>18.1</u>		<u>1,765</u>	<u>190</u>	<u>10.8</u>	
Total	7,120	795	11.2	86% EB	840	11.8	77% WB	3,605	380	10.5	50%

Source: Unadjusted Automatic Traffic Recorder (ATR) counts conducted in January 2014; estimated to be approximately 10-percent lower than average conditions.

- Notes:
- EB = eastbound, WB = westbound
  - 1 Daily traffic expressed in vehicles per day
  - 2 Peak hour volumes expressed in vehicles per hour
  - 3 Percent of daily traffic that occurs during the peak hour

Figure 3 show a graphical chart of the unadjusted daily traffic counts on Bedford Road near the Site.

Figure 3: Hourly Traffic Distribution on Bedford Road



Weekday Traffic (01/09/14)

Saturday Traffic (01/11/14)

As shown in Table 1, weekday peak hour traffic flow on Bedford Road is heavily directional, with the predominant travel in the eastbound direction during the morning peak hour and in the westbound direction during the evening peak hour. Additionally, the table indicates that peak hour traffic flow represents a major percentage of the daily traffic flow. This is also evident in the pronounced weekday spikes in the hourly traffic flow chart shown in Figure 3. Saturday traffic on Bedford Road is approximately half of the traffic flow on weekdays. Figure 3 shows that the peak in the Saturday traffic occurs during the middle of the day, with noticeably lesser volumes of traffic during the other hours. A review of the raw traffic count data indicates that the weekday morning peak hour occurs between 7:00 AM – 8:00 AM, the weekday evening peak hour between 5:00 PM – 6:00 PM and the Saturday midday peak hour from 11:45 AM – 12:45 PM.

Since the traffic counts were conducted in January, traffic associated with the existing athletic uses on the Site is not reflected in the count data. Therefore, for analysis purposes, trip generation for the existing athletic facility was calculated using a combination of data provided by the Institute of Transportation Engineers (ITE) *Trip Generation Manual*<sup>1</sup> and empirical methods, based on the traffic operational characteristics of the athletic fields.

As noted earlier, posted speed limits on Bedford Road near the Site is 30 mph. Speed data collected by VHB, based on overall 17,000 observations, indicates that the average vehicle speed on the roadway is approximately 33 mph and the 85<sup>th</sup> percentile speed (typically used for design and analysis purposes) is approximately 37 mph. Figure 4 summarizes the speed observations in a chart format.

### **Sight Distance Analysis**

Sight distance analyses, in conformance with guidelines of the American Association of State Highway and Transportation Officials (AASHTO)<sup>2</sup>, were performed at the location of the existing driveway. As noted earlier, recorded 85<sup>th</sup> percentile speed on the roadway is 37 mph in both directions. This speed was used to calculate the required stopping sight distance (SSD) for Bedford Road traffic approaching the driveway and intersection sight distance (ISD) for traffic that would exit the driveway and turn left or right onto Bedford Road.

SSD is the distance required for a vehicle approaching an intersection from either direction to perceive, react and come to a complete stop before colliding with the exiting vehicle from a driveway. In this respect, SSD can be considered as the minimum visibility criterion for the safe operation of an unsignalized intersection.

ISD is based on the time required for perception, reaction and completion of the desired critical exiting maneuver (typically, a left turn) once the driver on a minor street approach (or a driveway) decides to execute the maneuver. Calculation for the critical ISD include the time to (1) turn left, and to clear the near half of the intersection without conflicting with the vehicles approaching from the left; and (2) upon turning left, to accelerate to the operating speed on the roadway without causing approaching vehicles on the main road to unduly reduce their speed. In this context, ISD can be considered as a desirable visibility criterion for the safe operation of an unsignalized intersection.

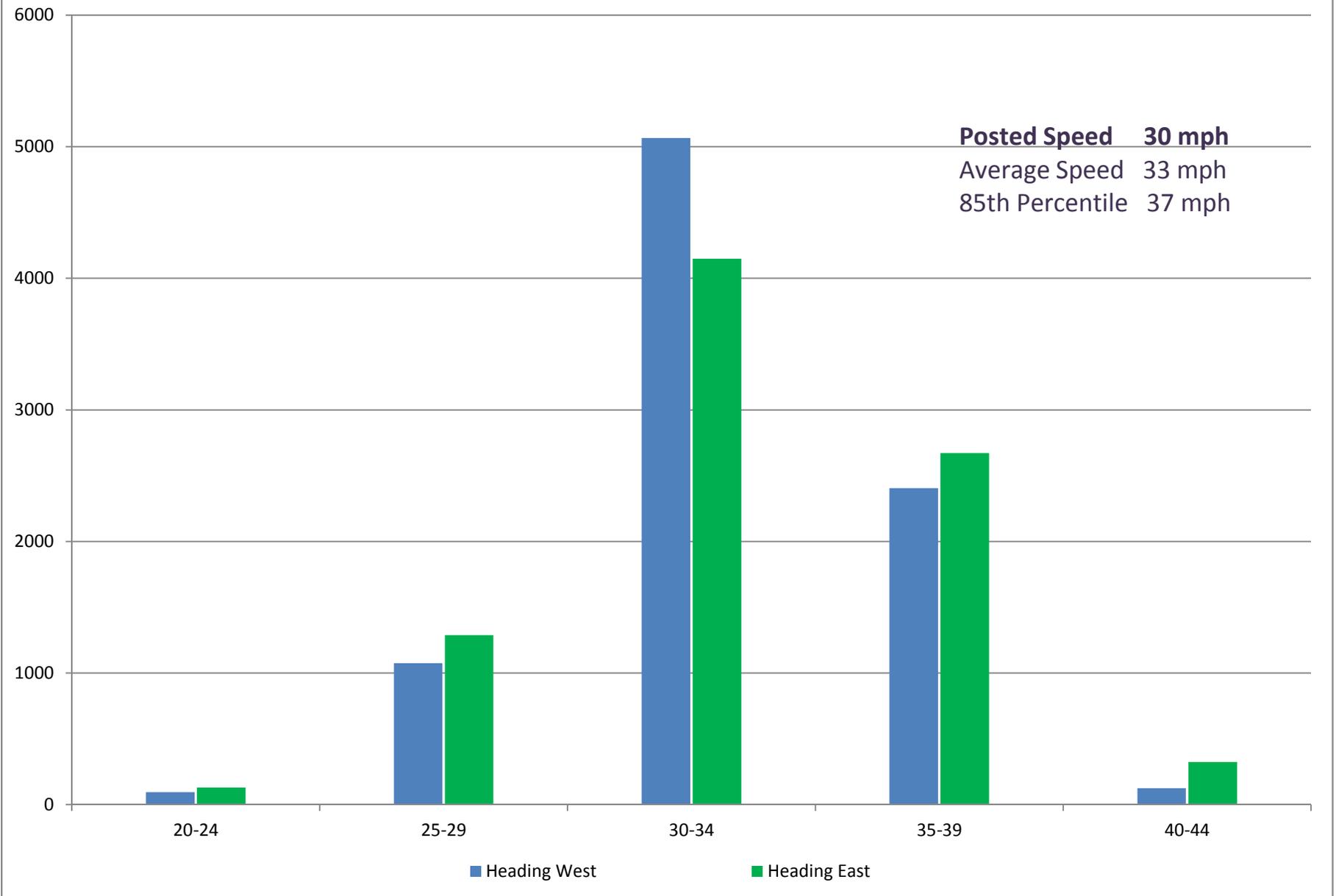
Table 2 summarizes the sight distance analyses performed as part this evaluation.

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<sup>1</sup> *Trip Generation Manual – 9th Edition*; Institute of Transportation Engineers; Washington, D.C.; 2012

<sup>2</sup> *A Policy on the Geometric Design of Highways and Streets*; American Association of State Highway and Transportation Officials; Washington, D.C.; 2004.

**Figure 4: Distribution of Vehicle Speeds on Bedford Road**



**Table 2: Sight Distance Analysis Summary for Banta Davis Driveway**

Stopping Sight Distance			Intersection Sight Distance		
Traveling	Required <sup>a</sup>	Measured <sup>b</sup>	Looking	Desired <sup>a</sup>	Measured <sup>b</sup>
Eastbound	270'	500'+	left (east)	410'	500'+
Westbound	270'	500'+	right (west)	410'	450'+

<sup>a</sup> Required or desirable sight distance in feet, based on measured 85<sup>th</sup> percentile speed

<sup>b</sup> Approximate measurements based on limits of visibility during the site visit. Sight distances may likely vary seasonally, based on obstructions posed by vegetation along the edges of the roadway.

Table 2 indicates that adequate sight distance is currently available for traffic traveling in either direction on Bedford Road. However, field observations indicate that if vegetation overgrowth occurs along the roadway, sight lines may be limited and available sight distances may reduce below the values shown in Table 2.

Based on currently available information regarding sight lines, no new signage is recommended on Bedford Road. However, VHB recommends that when the athletic facility and/or residential projects advance, and/or if there has been a history of complaints regarding constrained sight lines while exiting the driveway, the sight distance analysis be repeated during spring/summer months, and selective trimming/clearing of vegetation be undertaken, if determined to be necessary, to ensure that adequate sight lines are maintained throughout the year. Additional measures, such as warning signage, could also be considered when the sight distance analysis is repeated and when permitting for a specific development plan on the site is pursued.

## Crash History

To identify vehicle crash trends near the Site driveway, crash data were obtained from MassDOT for the most recent three-year period for which data is available (2009 through 2011). A summary of the data is presented in Table 3.

Table 3: Vehicle Crash Summary (2009-2011)

Year	Reported Crashes Near 304 Bedford Rd
2009	1
2010	0
2011	<u>3</u>
Total	4
<b>Collision Type</b>	
Angle	1
Head-on	0
Rear-end	0
Rear-to-Rear	0
Sideswipe, opposite direction	2
Sideswipe, same direction	0
Single vehicle crash	<u>1</u>
Total	4
<b>Crash Severity</b>	
Fatal injury	0
Non-fatal injury	1
Property damage only (none injured)	2
Not Reported	<u>1</u>
Total	4
<b>Time of Day</b>	
Weekday, 7:00 AM - 9:00 AM	0
Weekday, 4:00 PM - 6:00 PM	1
Saturday, 11:00 AM - 2:00 PM	0
Weekday, other time	2
Weekend, other time	<u>1</u>
Total	4
<b>Pavement Conditions</b>	
Dry	3
Wet	0
Snow	0
Ice	<u>1</u>
Total	4
<b>Non-Motorist (Bike, Pedestrian)</b>	
Total	0

Source: MassDOT crash database

As shown in Table 3, a total of four vehicle crashes were reported in the vicinity of the Site driveway in the three years of data that was reviewed. While the roadway curvature could potentially have contributed to some of the reported crashes, the data itself does not present any discernible patterns for crash occurrence.

### Trip Generation

VHB performed a trip generation analysis to quantify the trip generation potential of the existing athletic facility as well as the future conditions that potentially involve an expansion of the athletic facility and the addition of a residential use on the Site.

To estimate the trip generation for the proposed residential development, traffic projections were derived from trip generation rates published by the ITE *Trip Generation Manual*<sup>3</sup>. However, since the ITE manual does not include municipal athletic facilities as a land use, a methodology that includes the use of available ITE land use codes for specific components of the development plan (soccer/multipurpose fields and tennis courts) and empirical data related to the remaining components (Little League fields) was applied to estimate the existing and future conditions trip generation for the athletic uses. The resulting peak hour trip generation estimates are summarized for the residential and athletic uses in tables 4 and 5, respectively. The combined trip generation for both uses is summarized in Table 6.

**Table 4: Residential Trip Generation**

Time Period	Residential Trips <sup>a</sup>
Morning Peak Hour <sup>b</sup>	
In	6
Out	22
Total	28
Evening Peak Hour <sup>b</sup>	
In	29
Out	16
Total	45
Saturday Peak Hour <sup>b</sup>	
In	13
Out	13
Total	26

a Based on 50 apartment units (ITE LUC 220)

b Vehicles per hour

<sup>3</sup> Trip Generation Manual – 9th Edition; Institute of Transportation Engineers; Washington, D.C.; 2012

**Table 5: Athletic Facility Trip Generation**

Time Period	Existing Athletic Trips <sup>a</sup>	Scenario 1 Athletic Trips <sup>b</sup>	Scenario 2 Athletic Trips <sup>c</sup>
Morning Peak Hour <sup>d</sup>			
In	2	11	15
<u>Out</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total	2	11	15
Evening Peak Hour <sup>d</sup>			
In	49	73	104
<u>Out</u>	<u>37</u>	<u>47</u>	<u>74</u>
Total	86	120	178
Saturday Peak Hour <sup>d</sup>			
In	63	85	124
<u>Out</u>	<u>67</u>	<u>87</u>	<u>124</u>
Total	130	172	248

- a 1 Little League field, 1 softball field, 1 multi-purpose field
- b 1 Little League field, 1 softball field, 2 multi-purpose field fields, 4 tennis courts
- c 2 Little League fields, 1 softball field, 2 multi-purpose field fields, 6 tennis courts
- d Vehicles per hour

**Table 6: Overall Trip Generation**

Time Period	Existing Athletic Trips <sup>a</sup>	Scenario 1 Total Trips <sup>b</sup>	Scenario 2 Total Trips <sup>c</sup>
Morning Peak Hour <sup>d</sup>			
In	2	17	21
<u>Out</u>	<u>0</u>	<u>22</u>	<u>22</u>
Total	2	39	43
Evening Peak Hour <sup>d</sup>			
In	49	102	133
<u>Out</u>	<u>37</u>	<u>63</u>	<u>90</u>
Total	86	165	223
Saturday Peak Hour <sup>d</sup>			
In	63	98	137
<u>Out</u>	<u>67</u>	<u>100</u>	<u>137</u>
Total	130	198	274

- a 1 Little League field, 1 softball field, 1 multi-purpose field
- b 1 Little League field, 1 softball field, 2 multi-purpose field fields, 4 tennis courts, 50 multi-family rental units
- c 2 Little League fields, 1 softball field, 2 multi-purpose field fields, 6 tennis courts, 50 multi-family rental units
- d Vehicles per hour

As shown in tables 3, 4 and 5, the residential use is also estimated to generate relatively low volume of traffic during the morning peak hour (less than 30 vehicle trips per hour). For analysis purposes, it was assumed that the athletic uses will be used minimally, if at all, during the morning commuter peak times, which resulted in very limited trip generation for the use (15 vehicle trips per hour or fewer) during the weekday morning peak hour under all analysis scenarios. Therefore, unless

Carlisle Recreation Commission anticipates significant usage of the athletic fields during weekday morning commute hours (7 AM – 9 AM) in the future, the effect of the morning traffic that would be generated by the facility on area roadway traffic can be expected to be minimal, and thus additional review of traffic operations will not be necessary during for the morning roadway peak traffic conditions.

As with the weekday morning peak hour, the residential use is project to generate limited amount of traffic during the weekday evening peak hour as well (approximately 45 vehicles trips entering and exiting during the peak hour). Based on the observed directional distribution of Bedford Road traffic during evening peak hour, the limited residential trips can be expected to be split in either direction on Bedford Road, with the predominant orientation (more than 75%) to/from the east. In contrast, the estimated 86 peak hour trips (enter + exit) for the existing athletic uses during the evening peak hour are expected to increase to 120 peak hour trips (enter + exit) under the *Scenario 1* expansion and to 178 peak hour trips under the *Scenario 2* expansion. However, the directional distribution of the athletic facility traffic is expected to be oriented predominantly to/from the west (i.e., the opposite directional distribution of the residential traffic). This suggests that even if both the residential and athletic uses generate their evening peak hour traffic at the same time without any staggering (“worst case” assumption), the potential compounding of their impacts on traffic operations is minimized due to the anticipated different directional distribution of the traffic. It should also be noted that the evening peak hour trip generation for the athletic facility was developed based on an assumption that all fields will be used concurrently, at their capacity, which may not be the case on a daily basis. If games start in each field at different times and/or some of the fields are not used on certain days, the athletic facility’s evening trip generation can be expected to be lower than the estimates presented in this report.

Saturday midday peak hour trip generation for the residential use is expected to be comparable to the weekday morning peak hour estimates (less than 30 vehicle trips per hour). The existing estimate of 130 Saturday midday peak hour trips for the athletic uses is expected to increase to 172 trips per hour under *Scenario 1* expansion and 248 trips per hour under *Scenario 2* expansion. Unlike the weekday evening peak hour condition where the directional distribution of the residential traffic expected to be the opposite of the distribution of the athletic uses’, all Site traffic is expected to be oriented to/from the west on Bedford Road during the Saturday midday peak hour. However, since Saturday midday traffic flow on Bedford Road is substantially lower than on weekdays, more roadway capacity would be available on Saturdays to handle all Site traffic. Additionally, as noted in the discussion above regarding the weekday evening peak hour analysis, the Saturday analysis presented in this report also assumes that all fields will be used concurrently, at capacity. If game schedules are staggered and/or if some of the fields are not used during the Saturday midday peak hour, the Saturday trip generation for the athletic facility can be expected to be lower than the estimates presented in this report.

Overall, the trip generation analysis indicates that the proposed 50-unit residential development on the Site is expected to generate relatively low volumes of traffic during typical weekday morning, evening and Saturday midday peak hour. The combined effect of the proposed residential use and athletic facility expansion during the weekday evening peak hour can be expected to be limited because of differing directional distribution of the traffic for the two uses. During Saturday middays, roadway traffic volume on Bedford Road is substantially lower than on weekdays, which results in the availability of more roadway capacity to support the additional traffic from the Site.

During future phases of design development, additional analysis of the weekday evening and Saturday midday peak hour conditions can be undertaken to further refine the trip projections and quantify operational impacts of the proposed uses on traffic operations.

**Attachments:**

- Traffic count data



PRECISION  
D A T A  
INDUSTRIES, LLC  
P.O. Box 301, Berlin, MA 01503  
Office: 508-481-3999 Fax: 508-545-1234  
Email: datarequests@pdillc.com

143696 A VOLUME  
Site Code: 83946.13

Bedford Road (Route 225)  
east of Church Street  
City, State: Carlisle, MA  
Client: VHB/ V. Kalikiri

Start Time	09-Jan-14		10-Jan-14		11-Jan-14		12-Jan-14		13-Jan-14		14-Jan-14		15-Jan-14		Week Average	
	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB
12:00 AM	12	3	10	5	15	10	*	*	*	*	*	*	*	*	12	6
01:00	2	2	7	3	7	10	*	*	*	*	*	*	*	*	5	5
02:00	2	2	4	8	2	1	*	*	*	*	*	*	*	*	3	4
03:00	2	4	4	3	3	7	*	*	*	*	*	*	*	*	3	5
04:00	3	7	0	8	2	8	*	*	*	*	*	*	*	*	2	8
05:00	12	82	14	62	1	14	*	*	*	*	*	*	*	*	9	53
06:00	33	415	32	346	12	16	*	*	*	*	*	*	*	*	26	259
07:00	113	678	107	610	24	53	*	*	*	*	*	*	*	*	81	447
08:00	144	529	140	537	66	97	*	*	*	*	*	*	*	*	117	388
09:00	119	255	95	273	98	139	*	*	*	*	*	*	*	*	104	222
10:00	110	162	98	139	115	156	*	*	*	*	*	*	*	*	108	152
11:00	138	159	104	121	167	177	*	*	*	*	*	*	*	*	136	152
12:00 PM	144	140	119	116	182	188	*	*	*	*	*	*	*	*	148	148
01:00	163	134	180	137	171	132	*	*	*	*	*	*	*	*	171	134
02:00	248	132	223	137	172	157	*	*	*	*	*	*	*	*	214	142
03:00	331	183	328	171	169	152	*	*	*	*	*	*	*	*	276	169
04:00	551	158	487	128	150	147	*	*	*	*	*	*	*	*	396	144
05:00	648	189	610	147	155	89	*	*	*	*	*	*	*	*	471	142
06:00	453	124	400	146	110	57	*	*	*	*	*	*	*	*	321	109
07:00	163	62	146	60	62	42	*	*	*	*	*	*	*	*	124	55
08:00	94	35	97	49	50	30	*	*	*	*	*	*	*	*	80	38
09:00	63	30	67	43	34	37	*	*	*	*	*	*	*	*	55	37
10:00	33	26	47	31	41	25	*	*	*	*	*	*	*	*	40	27
11:00	18	8	26	18	33	20	*	*	*	*	*	*	*	*	26	15
Total	3599	3519	3345	3298	1841	1764	0	0	0	0	0	0	0	0	2928	2861
Day	7118		6643		3605		0		0		0		0		5789	
AM Peak	08:00	07:00	08:00	07:00	11:00	11:00	-	-	-	-	-	-	-	-	11:00	07:00
Vol.	144	678	140	610	167	177	-	-	-	-	-	-	-	-	136	447
PM Peak	17:00	17:00	17:00	15:00	12:00	12:00	-	-	-	-	-	-	-	-	17:00	15:00
Vol.	648	189	610	171	182	188	-	-	-	-	-	-	-	-	471	169
Comb. Total	7118		6643		3605		0		0		0		0		5789	
ADT	ADT 5,789		ADT 5,789		ADT 5,789											

Bedford Road (Route 225)  
 east of Church Street  
 City, State: Carlisle, MA  
 Client: VHB/ V. Kalikiri



PRECISION  
 D A T A  
 INDUSTRIES, LLC  
 P.O. Box 301 Berlin, MA 01503  
 Office: 508.481.3999 Fax: 508.545.1234  
 Email: datarequests@pdillc.com

143696 A Volume  
 Site Code: 83946.13

Start Time	WB		EB		Combin ed		09-Jan-14 Thu			
	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.				
12:00	5	40	0	43	5	83				
12:15	4	30	1	37	5	67				
12:30	2	37	2	33	4	70				
12:45	1	37	0	27	1	64	284			
01:00	0	41	0	37	0	78				
01:15	1	41	1	31	2	72				
01:30	0	40	1	34	1	74				
01:45	1	41	0	32	1	73	297			
02:00	0	34	1	34	1	68				
02:15	1	59	0	34	1	93				
02:30	1	67	0	36	1	103				
02:45	0	88	1	28	1	116	380			
03:00	0	69	1	47	1	116				
03:15	1	95	2	53	3	148				
03:30	1	87	0	42	1	129				
03:45	0	80	1	41	1	121	514			
04:00	1	132	1	34	2	166				
04:15	0	130	2	42	2	172				
04:30	0	138	2	35	2	173				
04:45	2	151	2	47	4	198	709			
05:00	1	166	5	42	6	208				
05:15	2	157	18	60	20	217				
05:30	8	163	22	44	30	207				
05:45	1	162	37	43	38	205	837			
06:00	4	153	54	45	58	198				
06:15	6	130	89	28	95	158				
06:30	10	92	128	33	138	125				
06:45	13	78	144	18	157	96	577			
07:00	20	51	172	19	192	70				
07:15	25	42	196	16	221	58				
07:30	36	33	140	8	176	41				
07:45	32	37	170	19	202	56	225			
08:00	30	19	134	6	164	25				
08:15	26	28	154	12	180	40				
08:30	49	27	119	10	168	37				
08:45	39	20	122	7	161	27	129			
09:00	34	18	84	10	118	28				
09:15	27	18	65	6	92	24				
09:30	35	18	59	7	94	25				
09:45	23	9	47	255	7	16	93			
10:00	25	10	39	8	64	18				
10:15	27	9	43	11	70	20				
10:30	34	5	39	5	73	10				
10:45	24	9	41	162	2	11	59			
11:00	26	3	57	2	83	5				
11:15	34	6	29	2	63	8				
11:30	37	6	41	3	78	9				
11:45	41	3	32	159	1	4	26			
Total	690	2909	2298	1221	2988	4130				
Percent	23.1%	70.4%	76.9%	29.6%						
Day Total		3599		3519		7118				
Peak	08:30	-	05:00	-	07:00	-	05:00	-	-	-
Vol.	149	-	648	-	678	-	193	-	837	-
P.H.F.	0.760	-	0.976	-	0.865	-	0.804	-	0.895	-

Bedford Road (Route 225)  
 east of Church Street  
 City, State: Carlisle, MA  
 Client: VHB/ V. Kalikiri



PRECISION  
 D A T A  
 INDUSTRIES, LLC  
 P.O. Box 301 Berlin, MA 01503  
 Office: 508.481.3999 Fax: 508.545.1234  
 Email: datarequests@pdillc.com

143696 A Volume  
 Site Code: 83946.13

Start Time	WB		EB		Combin ed		10-Jan-14 Fri
	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	
12:00	2	36	1	37	3	73	
12:15	5	26	2	32	7	58	
12:30	0	30	1	29	1	59	
12:45	3	27	119	5	18	116	235
01:00	5	40	0	32	5	72	
01:15	2	40	1	42	3	82	
01:30	0	44	2	31	2	75	
01:45	0	56	180	0	3	32	137
02:00	2	45	4	33	6	78	317
02:15	0	50	0	30	0	80	
02:30	0	52	3	40	3	92	
02:45	2	76	223	1	8	34	137
03:00	0	74	0	35	0	109	
03:15	1	73	2	63	3	136	
03:30	1	80	0	26	1	106	
03:45	2	101	328	1	3	47	171
04:00	0	96	1	35	1	131	
04:15	0	124	2	38	2	162	
04:30	0	124	1	31	1	155	
04:45	0	143	487	4	8	24	128
05:00	2	152	9	38	11	190	615
05:15	3	157	10	42	13	199	
05:30	6	156	21	38	27	194	
05:45	3	145	610	22	62	29	147
06:00	6	140	44	40	50	180	757
06:15	10	107	78	37	88	144	
06:30	8	81	104	44	112	125	
06:45	8	72	400	120	346	25	146
07:00	26	54	141	19	167	378	546
07:15	20	38	178	19	198	73	
07:30	32	38	144	14	176	57	
07:45	29	16	146	147	610	8	60
08:00	38	20	145	13	183	717	24
08:15	26	27	131	10	157	33	206
08:30	48	25	125	16	173	37	
08:45	28	25	97	136	537	10	49
09:00	28	23	87	11	115	677	35
09:15	21	17	79	17	100	34	146
09:30	27	15	59	8	86	23	
09:45	19	12	67	48	273	7	43
10:00	24	12	45	4	69	368	19
10:15	19	12	32	9	51	16	110
10:30	30	11	33	9	63	21	
10:45	25	12	47	29	139	9	31
11:00	20	5	29	6	49	237	21
11:15	25	7	29	5	54	11	78
11:30	27	9	33	3	60	12	
11:45	32	5	26	30	121	4	18
Total	615	2730	2115	1183	2730	3913	44
Percent	22.5%	69.8%	77.5%	30.2%			
Day Total		3345		3298		6643	
Peak	07:45	-	05:00	-	07:15	-	05:00
Vol.	141	-	610	-	614	-	757
P.H.F.	0.734	-	0.971	-	0.862	-	0.951

Bedford Road (Route 225)  
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143696 A Volume  
 Site Code: 83946.13

Start Time	WB		EB		Combin ed		11-Jan-14 Sat							
	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.								
12:00	1	44	1	41	2	85								
12:15	3	43	4	43	7	86								
12:30	7	53	2	55	9	108								
12:45	4	42	3	49	7	91	370							
01:00	1	34	0	43	1	77								
01:15	1	59	6	25	7	84								
01:30	3	39	3	32	6	71								
01:45	2	39	1	32	3	71	303							
02:00	2	42	0	37	2	79								
02:15	0	39	0	40	0	79								
02:30	0	46	0	28	0	74								
02:45	0	45	1	52	1	97	329							
03:00	0	42	0	17	0	59								
03:15	0	48	2	40	2	88								
03:30	2	37	1	51	3	88								
03:45	1	42	4	44	5	86	321							
04:00	0	38	1	38	1	76								
04:15	1	36	1	35	2	71								
04:30	0	40	5	32	5	72								
04:45	1	36	1	42	2	78	297							
05:00	0	46	2	23	2	69								
05:15	1	24	2	26	3	50								
05:30	0	44	2	14	2	58								
05:45	0	41	8	26	8	67	244							
06:00	1	32	1	19	2	51								
06:15	3	31	5	13	8	44								
06:30	3	28	5	10	8	38								
06:45	5	19	5	15	10	34	167							
07:00	6	16	10	20	16	36								
07:15	4	18	12	7	16	25								
07:30	8	22	12	3	20	25								
07:45	6	6	19	53	12	42	77	18	104					
08:00	12	17	20	8	32	25								
08:15	16	15	22	10	38	25								
08:30	20	9	25	6	45	15								
08:45	18	9	30	97	6	30	48	163	15	80				
09:00	28	7	39	8	67	15								
09:15	20	12	33	10	53	22								
09:30	22	9	32	8	54	17								
09:45	28	98	6	34	35	139	11	37	63	237	17	71		
10:00	22	13	35	10	57	23								
10:15	34	10	39	4	73	14								
10:30	25	9	32	6	57	15								
10:45	34	115	9	41	50	156	5	25	84	271	14	66		
11:00	32	9	43	8	75	17								
11:15	48	5	43	2	91	7								
11:30	38	10	40	6	78	16								
11:45	49	167	9	33	51	177	4	20	100	344	13	53		
Total	512	1329	688	1076	1200	2405								
Percent	42.7%	55.3%	57.3%	44.7%										
Day Total		1841		1764		3605								
Peak	11:00	-	00:30	-	11:00	-	00:15	-	11:00	-	12:00	-	-	-
Vol.	167	-	188	-	177	-	190	-	344	-	370	-	-	-
P.H.F.	0.852	-	0.797	-	0.868	-	0.864	-	0.860	-	0.856	-	-	-

Bedford Road (Route 225)  
 east of Church Street  
 City, State: Carlisle, MA  
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PRECISION  
 D A T A  
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 Email: datarequests@pdillc.com

143696 A Class  
 Site Code: 83946.13

WB

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
01/09/1														
4	0	10	2	0	0	0	0	0	0	0	0	0	0	12
01:00	0	0	2	0	0	0	0	0	0	0	0	0	0	2
02:00	0	0	2	0	0	0	0	0	0	0	0	0	0	2
03:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
04:00	0	3	0	0	0	0	0	0	0	0	0	0	0	3
05:00	0	7	3	2	0	0	0	0	0	0	0	0	0	12
06:00	0	24	6	0	2	0	0	0	1	0	0	0	0	33
07:00	0	82	20	6	5	0	0	0	0	0	0	0	0	113
08:00	0	106	29	4	5	0	0	0	0	0	0	0	0	144
09:00	0	85	29	1	4	0	0	0	0	0	0	0	0	119
10:00	0	78	24	0	8	0	0	0	0	0	0	0	0	110
11:00	1	87	45	0	3	1	0	1	0	0	0	0	0	138
12 PM	0	104	32	4	4	0	0	0	0	0	0	0	0	144
13:00	0	124	34	0	5	0	0	0	0	0	0	0	0	163
14:00	0	177	56	7	6	1	0	0	1	0	0	0	0	248
15:00	0	243	74	3	9	0	0	2	0	0	0	0	0	331
16:00	0	467	77	2	4	0	0	1	0	0	0	0	0	551
17:00	0	572	66	0	8	2	0	0	0	0	0	0	0	648
18:00	0	401	47	1	3	0	0	1	0	0	0	0	0	453
19:00	0	144	18	0	1	0	0	0	0	0	0	0	0	163
20:00	0	82	11	0	1	0	0	0	0	0	0	0	0	94
21:00	0	56	7	0	0	0	0	0	0	0	0	0	0	63
22:00	0	27	6	0	0	0	0	0	0	0	0	0	0	33
23:00	0	12	5	0	1	0	0	0	0	0	0	0	0	18
Total	1	2893	595	30	69	4	0	5	2	0	0	0	0	3599
Percent	0.0%	80.4%	16.5%	0.8%	1.9%	0.1%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak	11:00	08:00	11:00	07:00	10:00	11:00		11:00	06:00					08:00
Vol.	1	106	45	6	8	1		1	1					144
PM Peak		17:00	16:00	14:00	15:00	17:00		15:00	14:00					17:00
Vol.		572	77	7	9	2		2	1					648

Bedford Road (Route 225)  
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143696 A Class  
 Site Code: 83946.13

WB

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
01/10/1														
4	0	10	0	0	0	0	0	0	0	0	0	0	0	10
01:00	0	6	1	0	0	0	0	0	0	0	0	0	0	7
02:00	0	0	4	0	0	0	0	0	0	0	0	0	0	4
03:00	0	4	0	0	0	0	0	0	0	0	0	0	0	4
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00	0	9	2	1	1	0	0	0	1	0	0	0	0	14
06:00	0	24	8	0	0	0	0	0	0	0	0	0	0	32
07:00	2	76	18	6	4	1	0	0	0	0	0	0	0	107
08:00	0	96	33	4	7	0	0	0	0	0	0	0	0	140
09:00	0	74	18	0	1	2	0	0	0	0	0	0	0	95
10:00	0	67	24	1	6	0	0	0	0	0	0	0	0	98
11:00	0	80	22	1	1	0	0	0	0	0	0	0	0	104
12 PM	0	85	21	1	11	1	0	0	0	0	0	0	0	119
13:00	0	128	42	2	7	0	0	1	0	0	0	0	0	180
14:00	0	166	47	5	4	0	0	1	0	0	0	0	0	223
15:00	0	261	58	3	5	0	0	1	0	0	0	0	0	328
16:00	0	389	84	1	12	1	0	0	0	0	0	0	0	487
17:00	0	537	61	1	11	0	0	0	0	0	0	0	0	610
18:00	0	335	64	1	0	0	0	0	0	0	0	0	0	400
19:00	0	131	14	0	1	0	0	0	0	0	0	0	0	146
20:00	0	84	13	0	0	0	0	0	0	0	0	0	0	97
21:00	0	51	16	0	0	0	0	0	0	0	0	0	0	67
22:00	0	41	6	0	0	0	0	0	0	0	0	0	0	47
23:00	0	21	4	0	1	0	0	0	0	0	0	0	0	26
Total	2	2675	560	27	72	5	0	3	1	0	0	0	0	3345
Percent	0.1%	80.0%	16.7%	0.8%	2.2%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	07:00	08:00	08:00	07:00	08:00	09:00			05:00					08:00
Vol.	2	96	33	6	7	2			1					140
PM Peak		17:00	16:00	14:00	16:00	12:00		13:00						17:00
Vol.		537	84	5	12	1		1						610

Bedford Road (Route 225)  
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WB

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
01/11/1														
4	0	13	2	0	0	0	0	0	0	0	0	0	0	15
01:00	0	3	3	0	0	0	0	1	0	0	0	0	0	7
02:00	0	1	0	0	0	0	0	0	1	0	0	0	0	2
03:00	0	3	0	0	0	0	0	0	0	0	0	0	0	3
04:00	0	0	0	0	2	0	0	0	0	0	0	0	0	2
05:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
06:00	0	8	3	1	0	0	0	0	0	0	0	0	0	12
07:00	0	19	5	0	0	0	0	0	0	0	0	0	0	24
08:00	0	51	9	1	4	0	0	1	0	0	0	0	0	66
09:00	0	74	21	0	3	0	0	0	0	0	0	0	0	98
10:00	0	87	23	0	4	0	1	0	0	0	0	0	0	115
11:00	0	123	41	0	3	0	0	0	0	0	0	0	0	167
12 PM	1	137	40	0	4	0	0	0	0	0	0	0	0	182
13:00	0	136	27	1	6	0	0	0	0	1	0	0	0	171
14:00	1	135	33	1	1	1	0	0	0	0	0	0	0	172
15:00	0	142	26	0	1	0	0	0	0	0	0	0	0	169
16:00	0	132	17	0	1	0	0	0	0	0	0	0	0	150
17:00	0	126	28	1	0	0	0	0	0	0	0	0	0	155
18:00	0	96	14	0	0	0	0	0	0	0	0	0	0	110
19:00	0	56	6	0	0	0	0	0	0	0	0	0	0	62
20:00	0	40	10	0	0	0	0	0	0	0	0	0	0	50
21:00	0	27	6	0	1	0	0	0	0	0	0	0	0	34
22:00	0	32	7	0	2	0	0	0	0	0	0	0	0	41
23:00	0	29	3	0	1	0	0	0	0	0	0	0	0	33
Total	2	1471	324	5	33	1	1	2	1	1	0	0	0	1841
Percent	0.1%	79.9%	17.6%	0.3%	1.8%	0.1%	0.1%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	
AM Peak		11:00	11:00	06:00	08:00		10:00	01:00	02:00					11:00
Vol.		123	41	1	4		1	1	1					167
PM Peak	12:00	15:00	12:00	13:00	13:00	14:00				13:00				12:00
Vol.	1	142	40	1	6	1				1				182

Bedford Road (Route 225)  
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143696 A Class  
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EB

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
01/09/1														
4	0	2	1	0	0	0	0	0	0	0	0	0	0	3
01:00	0	1	1	0	0	0	0	0	0	0	0	0	0	2
02:00	0	0	2	0	0	0	0	0	0	0	0	0	0	2
03:00	0	4	0	0	0	0	0	0	0	0	0	0	0	4
04:00	0	5	1	1	0	0	0	0	0	0	0	0	0	7
05:00	0	69	11	1	1	0	0	0	0	0	0	0	0	82
06:00	0	328	72	3	12	0	0	0	0	0	0	0	0	415
07:00	0	558	103	3	14	0	0	0	0	0	0	0	0	678
08:00	0	445	70	2	10	1	0	1	0	0	0	0	0	529
09:00	0	198	52	0	4	0	0	0	1	0	0	0	0	255
10:00	0	118	35	1	8	0	0	0	0	0	0	0	0	162
11:00	0	114	34	1	10	0	0	0	0	0	0	0	0	159
12 PM	0	91	44	1	4	0	0	0	0	0	0	0	0	140
13:00	0	90	37	1	6	0	0	0	0	0	0	0	0	134
14:00	0	104	21	2	5	0	0	0	0	0	0	0	0	132
15:00	1	121	48	7	6	0	0	0	0	0	0	0	0	183
16:00	1	123	31	0	3	0	0	0	0	0	0	0	0	158
17:00	1	158	26	1	2	0	0	0	1	0	0	0	0	189
18:00	0	107	16	0	1	0	0	0	0	0	0	0	0	124
19:00	0	51	10	0	1	0	0	0	0	0	0	0	0	62
20:00	0	33	2	0	0	0	0	0	0	0	0	0	0	35
21:00	0	25	4	0	1	0	0	0	0	0	0	0	0	30
22:00	0	17	9	0	0	0	0	0	0	0	0	0	0	26
23:00	0	4	4	0	0	0	0	0	0	0	0	0	0	8
Total	3	2766	634	24	88	1	0	1	2	0	0	0	0	3519
Percent	0.1%	78.6%	18.0%	0.7%	2.5%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak		07:00	07:00	06:00	07:00	08:00		08:00	09:00					07:00
Vol.		558	103	3	14	1		1	1					678
PM Peak	15:00	17:00	15:00	15:00	13:00				17:00					17:00
Vol.	1	158	48	7	6				1					189

Bedford Road (Route 225)  
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143696 A Class  
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EB

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
01/10/1														
4	0	4	1	0	0	0	0	0	0	0	0	0	0	5
01:00	0	0	3	0	0	0	0	0	0	0	0	0	0	3
02:00	0	5	3	0	0	0	0	0	0	0	0	0	0	8
03:00	0	3	0	0	0	0	0	0	0	0	0	0	0	3
04:00	0	4	3	1	0	0	0	0	0	0	0	0	0	8
05:00	0	48	13	0	1	0	0	0	0	0	0	0	0	62
06:00	0	261	69	3	13	0	0	0	0	0	0	0	0	346
07:00	0	499	93	3	11	2	0	2	0	0	0	0	0	610
08:00	0	454	72	4	7	0	0	0	0	0	0	0	0	537
09:00	0	231	37	0	4	1	0	0	0	0	0	0	0	273
10:00	0	103	29	1	4	0	0	2	0	0	0	0	0	139
11:00	0	88	26	1	4	1	0	0	1	0	0	0	0	121
12 PM	0	75	34	1	5	0	0	1	0	0	0	0	0	116
13:00	0	106	23	2	5	1	0	0	0	0	0	0	0	137
14:00	0	100	30	1	5	0	0	0	1	0	0	0	0	137
15:00	1	128	29	6	6	1	0	0	0	0	0	0	0	171
16:00	0	97	29	0	2	0	0	0	0	0	0	0	0	128
17:00	1	118	23	1	3	1	0	0	0	0	0	0	0	147
18:00	0	117	26	1	2	0	0	0	0	0	0	0	0	146
19:00	0	51	9	0	0	0	0	0	0	0	0	0	0	60
20:00	0	44	5	0	0	0	0	0	0	0	0	0	0	49
21:00	0	40	3	0	0	0	0	0	0	0	0	0	0	43
22:00	0	28	3	0	0	0	0	0	0	0	0	0	0	31
23:00	0	14	4	0	0	0	0	0	0	0	0	0	0	18
Total	2	2618	567	25	72	7	0	5	2	0	0	0	0	3298
Percent	0.1%	79.4%	17.2%	0.8%	2.2%	0.2%	0.0%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak Vol.		07:00	07:00	08:00	06:00	07:00		07:00	11:00					07:00
PM Peak Vol.	15:00	15:00	12:00	15:00	15:00	13:00		12:00	14:00					15:00
	1	128	34	6	6	1		1	1					171

Bedford Road (Route 225)  
 east of Church Street  
 City, State: Carlisle, MA  
 Client: VHB/ V. Kalikiri



PRECISION  
 D A T A  
 INDUSTRIES, LLC

P.O. Box 301 Berlin, MA 01503  
 Office: 508.481.3999 Fax: 508.545.1234  
 Email: datarequests@pdillc.com

143696 A Class  
 Site Code: 83946.13

EB

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
01/11/1														
4	0	8	2	0	0	0	0	0	0	0	0	0	0	10
01:00	0	4	6	0	0	0	0	0	0	0	0	0	0	10
02:00	0	0	0	0	1	0	0	0	0	0	0	0	0	1
03:00	0	5	1	0	1	0	0	0	0	0	0	0	0	7
04:00	0	4	2	0	2	0	0	0	0	0	0	0	0	8
05:00	0	7	4	1	2	0	0	0	0	0	0	0	0	14
06:00	0	13	2	0	1	0	0	0	0	0	0	0	0	16
07:00	0	38	13	1	1	0	0	0	0	0	0	0	0	53
08:00	0	73	21	1	2	0	0	0	0	0	0	0	0	97
09:00	0	104	30	0	5	0	0	0	0	0	0	0	0	139
10:00	0	125	25	0	5	0	0	1	0	0	0	0	0	156
11:00	1	130	40	0	6	0	0	0	0	0	0	0	0	177
12 PM	0	147	35	1	5	0	0	0	0	0	0	0	0	188
13:00	0	104	21	2	5	0	0	0	0	0	0	0	0	132
14:00	1	118	35	0	3	0	0	0	0	0	0	0	0	157
15:00	0	121	29	0	2	0	0	0	0	0	0	0	0	152
16:00	0	115	26	1	5	0	0	0	0	0	0	0	0	147
17:00	1	72	15	0	1	0	0	0	0	0	0	0	0	89
18:00	0	46	10	0	1	0	0	0	0	0	0	0	0	57
19:00	0	35	5	0	2	0	0	0	0	0	0	0	0	42
20:00	0	23	4	0	2	1	0	0	0	0	0	0	0	30
21:00	0	34	3	0	0	0	0	0	0	0	0	0	0	37
22:00	0	19	5	0	1	0	0	0	0	0	0	0	0	25
23:00	0	18	2	0	0	0	0	0	0	0	0	0	0	20
Total	3	1363	336	7	53	1	0	1	0	0	0	0	0	1764
Percent	0.2%	77.3%	19.0%	0.4%	3.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	11:00	11:00	11:00	05:00	11:00			10:00						11:00
Vol.	1	130	40	1	6			1						177
PM Peak	14:00	12:00	12:00	13:00	12:00	20:00								12:00
Vol.	1	147	35	2	5	1								188

Bedford Road (Route 225)  
 east of Church Street  
 City, State: Carlisle, MA  
 Client: VHB/ V. Kalikiri



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143696 A Speed  
 Site Code: 83946.13

WB

Start Time	1	15	20	25	30	35	40	45	50	55	60	65	70	Total	85th % ile	Ave Speed
	14	19	24	29	34	39	44	49	54	59	64	69	9999			
01/09/																
14	0	0	0	1	5	6	0	0	0	0	0	0	0	12	37	34
01:00	0	0	0	0	0	2	0	0	0	0	0	0	0	2	38	37
02:00	0	0	0	0	0	2	0	0	0	0	0	0	0	2	38	37
03:00	0	0	0	1	1	0	0	0	0	0	0	0	0	2	32	29
04:00	0	0	0	0	2	1	0	0	0	0	0	0	0	3	36	34
05:00	0	0	1	0	5	2	3	1	0	0	0	0	0	12	42	36
06:00	0	0	0	4	19	8	2	0	0	0	0	0	0	33	37	33
07:00	0	0	0	12	59	40	1	1	0	0	0	0	0	113	37	33
08:00	0	0	0	11	<b>80</b>	<b>52</b>	1	0	0	0	0	0	0	<b>144</b>	37	33
09:00	0	0	0	11	67	36	5	0	0	0	0	0	0	119	37	33
10:00	0	0	0	<b>18</b>	60	29	3	0	0	0	0	0	0	110	36	33
11:00	0	<b>1</b>	<b>2</b>	10	71	43	<b>11</b>	0	0	0	0	0	0	138	38	34
12 PM	0	1	1	15	72	52	3	0	0	0	0	0	0	144	37	33
13:00	0	0	0	9	80	67	<b>5</b>	<b>2</b>	0	0	0	0	0	163	37	34
14:00	0	0	<b>6</b>	16	145	78	3	0	0	0	0	0	0	248	36	33
15:00	0	0	2	14	213	97	5	0	0	0	0	0	0	331	36	33
16:00	0	0	1	29	323	<b>195</b>	3	0	0	0	0	0	0	551	36	34
17:00	0	<b>2</b>	5	<b>87</b>	<b>425</b>	125	4	0	0	0	0	0	0	<b>648</b>	35	32
18:00	0	0	0	73	269	107	4	0	0	0	0	0	0	453	36	32
19:00	0	0	0	12	95	53	3	0	0	0	0	0	0	163	36	33
20:00	0	0	0	6	50	37	1	0	0	0	0	0	0	94	37	34
21:00	0	0	0	10	28	23	2	0	0	0	0	0	0	63	37	33
22:00	0	0	0	3	13	16	0	1	0	0	0	0	0	33	37	34
23:00	0	0	0	0	9	7	1	0	<b>1</b>	0	0	0	0	18	39	36
Total	0	4	18	342	2091	1078	60	5	1	0	0	0	0	3599		
%	0.0%	0.1%	0.5%	9.5%	58.1%	30.0%	1.7%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak		11:00	11:00	10:00	08:00	08:00	11:00	05:00						08:00		
Vol.		1	2	18	80	52	11	1						144		
PM Peak		17:00	14:00	17:00	17:00	16:00	13:00	13:00	23:00					17:00		
Vol.		2	6	87	425	195	5	2	1					648		

Stats  
 15th Percentile : 28 MPH  
 50th Percentile : 32 MPH  
 85th Percentile : 36 MPH  
 95th Percentile : 39 MPH

Mean Speed(Average) : 33 MPH  
 10 MPH Pace Speed : 29-38 MPH  
 Number in Pace : 2910  
 Percent in Pace : 80.9%  
 Number of Vehicles > 30 MPH : 2624  
 Percent of Vehicles > 30 MPH : 72.9%

Bedford Road (Route 225)  
 east of Church Street  
 City, State: Carlisle, MA  
 Client: VHB/ V. Kalikiri



PRECISION  
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143696 A Speed  
 Site Code: 83946.13

WB

Start Time	14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
01/10/14	0	0	0	0	4	5	1	0	0	0	0	0	0	10	38	36
01:00	0	0	0	1	2	4	0	0	0	0	0	0	0	7	37	34
02:00	0	0	0	2	0	1	1	0	0	0	0	0	0	4	41	33
03:00	0	0	0	0	1	3	0	0	0	0	0	0	0	4	38	36
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
05:00	0	0	0	3	6	3	2	0	0	0	0	0	0	14	39	33
06:00	0	0	1	6	12	11	1	1	0	0	0	0	0	32	37	33
07:00	0	0	6	43	57	0	1	0	0	0	0	0	0	107	32	30
08:00	0	1	15	47	66	11	0	0	0	0	0	0	0	140	33	29
09:00	0	0	1	24	55	15	0	0	0	0	0	0	0	95	34	31
10:00	0	0	2	16	56	23	1	0	0	0	0	0	0	98	36	32
11:00	0	0	0	6	50	44	4	0	0	0	0	0	0	104	37	34
12 PM	0	0	1	7	59	49	3	0	0	0	0	0	0	119	37	34
13:00	0	0	0	23	95	58	4	0	0	0	0	0	0	180	37	33
14:00	0	0	2	13	125	80	3	0	0	0	0	0	0	223	37	34
15:00	0	0	4	29	175	113	7	0	0	0	0	0	0	328	37	33
16:00	0	0	2	44	308	129	4	0	0	0	0	0	0	487	36	33
17:00	0	0	13	109	395	93	0	0	0	0	0	0	0	610	34	32
18:00	0	0	2	63	260	70	5	0	0	0	0	0	0	400	35	32
19:00	0	0	1	14	72	55	3	1	0	0	0	0	0	146	37	34
20:00	0	0	0	9	64	23	1	0	0	0	0	0	0	97	36	33
21:00	0	0	0	4	44	16	2	1	0	0	0	0	0	67	36	33
22:00	0	0	0	2	23	20	2	0	0	0	0	0	0	47	37	34
23:00	0	0	0	1	14	11	0	0	0	0	0	0	0	26	37	34
Total	0	1	50	466	1943	837	45	3	0	0	0	0	0	3345		
%	0.0%	0.0%	1.5%	13.9%	58.1%	25.0%	1.3%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak		08:00	08:00	08:00	08:00	11:00	11:00	06:00						08:00		
Vol.		1	15	47	66	44	4	1						140		
PM Peak			17:00	17:00	17:00	16:00	15:00	19:00						17:00		
Vol.			13	109	395	129	7	1						610		

Stats  
 15th Percentile : 28 MPH  
 50th Percentile : 31 MPH  
 85th Percentile : 36 MPH  
 95th Percentile : 38 MPH

Mean Speed(Average) : 33 MPH  
 10 MPH Pace Speed : 28-37 MPH  
 Number in Pace : 2631  
 Percent in Pace : 78.7%  
 Number of Vehicles > 30 MPH : 2247  
 Percent of Vehicles > 30 MPH : 67.2%

Bedford Road (Route 225)  
 east of Church Street  
 City, State: Carlisle, MA  
 Client: VHB/ V. Kalikiri



PRECISION  
 D A T A  
 INDUSTRIES, LLC

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143696 A Speed  
 Site Code: 83946.13

WB

Start Time	14	15	19	20	24	25	29	30	34	35	39	40	44	45	49	50	54	55	59	60	64	65	69	70	9999	Total	85th % ile	Ave Speed	
01/11/																													
14	0	0	0	0	2	7	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	37	34	
01:00	0	0	0	0	2	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	36	32	
02:00	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	28	27	
03:00	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	31	29	
04:00	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	28	27	
05:00	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	23	22	
06:00	0	0	0	1	4	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	32	30	
07:00	0	0	0	0	7	10	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	36	32	
08:00	0	0	0	0	14	26	25	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	66	37	33	
09:00	0	0	0	0	10	58	28	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	98	36	33	
10:00	0	1	3	3	58	45	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	115	37	34	
11:00	0	0	1	29	92	44	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	167	36	32	
12 PM	0	0	6	13	107	55	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	182	36	33	
13:00	0	0	1	12	92	60	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	171	37	34	
14:00	0	1	0	7	109	54	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	172	36	33	
15:00	0	0	1	12	97	57	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	169	36	33	
16:00	0	0	1	22	86	40	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	150	36	33	
17:00	0	0	3	57	85	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	155	33	30	
18:00	0	0	2	19	66	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	110	35	32	
19:00	0	0	0	16	37	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	62	34	31	
20:00	0	0	1	9	30	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	35	32	
21:00	0	1	4	12	15	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34	33	29	
22:00	0	0	2	11	24	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	41	34	31	
23:00	0	0	0	0	22	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	33	36	34	
Total	0	3	27	267	1032	491	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1841			
%	0.0%	0.2%	1.5%	14.5%	56.1%	26.7%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%				
AM Peak		10:00	10:00	11:00	11:00	10:00	10:00																				11:00		
Vol.		1	3	29	92	45	5																				167		
PM Peak		14:00	12:00	17:00	14:00	13:00	13:00																				12:00		
Vol.		1	6	57	109	60	6																				182		

Stats  
 15th Percentile : 28 MPH  
 50th Percentile : 32 MPH  
 85th Percentile : 36 MPH  
 95th Percentile : 38 MPH

Mean Speed(Average) : 33 MPH  
 10 MPH Pace Speed : 28-37 MPH  
 Number in Pace : 1432  
 Percent in Pace : 77.8%  
 Number of Vehicles > 30 MPH : 1241  
 Percent of Vehicles > 30 MPH : 67.4%

Bedford Road (Route 225)  
 east of Church Street  
 City, State: Carlisle, MA  
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143696 A Speed  
 Site Code: 83946.13

EB

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
01/09/ 14	0	0	0	0	2	0	1	0	0	0	0	0	0	3	41	35
01:00	0	0	0	0	1	1	0	0	0	0	0	0	0	2	37	34
02:00	0	0	0	0	2	0	0	0	0	0	0	0	0	2	33	32
03:00	0	0	0	0	1	2	1	0	0	0	0	0	0	4	41	37
04:00	0	0	2	0	1	4	0	0	0	0	0	0	0	7	37	32
05:00	0	0	0	3	31	33	15	0	0	0	0	0	0	82	40	36
06:00	0	0	0	14	189	200	12	0	0	0	0	0	0	415	37	35
07:00	0	0	4	50	<b>341</b>	<b>267</b>	15	<b>1</b>	0	0	0	0	0	<b>678</b>	37	34
08:00	0	0	1	<b>54</b>	209	225	<b>39</b>	1	0	0	0	0	0	529	38	34
09:00	0	0	1	26	106	106	16	0	0	0	0	0	0	255	38	34
10:00	0	0	<b>5</b>	28	72	51	6	0	0	0	0	0	0	162	37	33
11:00	0	0	1	5	67	78	7	0	0	<b>1</b>	0	0	0	159	38	35
12 PM	0	0	2	10	58	59	<b>10</b>	<b>1</b>	0	0	0	0	0	140	38	34
13:00	0	0	0	12	50	<b>67</b>	5	0	0	0	0	0	0	134	38	34
14:00	0	0	0	13	64	46	8	1	0	0	0	0	0	132	37	34
15:00	0	0	0	<b>30</b>	89	60	4	0	0	0	0	0	0	183	37	33
16:00	0	0	0	15	78	59	5	1	0	0	0	0	0	158	37	34
17:00	0	0	<b>6</b>	27	<b>121</b>	33	2	0	0	0	0	0	0	<b>189</b>	35	32
18:00	0	0	1	22	70	27	4	0	0	0	0	0	0	124	36	32
19:00	0	0	0	7	29	23	3	0	0	0	0	0	0	62	37	34
20:00	0	0	0	6	16	13	0	0	0	0	0	0	0	35	36	33
21:00	0	0	0	7	11	12	0	0	0	0	0	0	0	30	37	33
22:00	0	0	0	1	10	14	1	0	0	0	0	0	0	26	38	35
23:00	0	0	0	2	2	2	2	0	0	0	0	0	0	8	40	34
Total	0	0	23	332	1620	1382	156	5	0	1	0	0	0	3519		
%	0.0%	0.0%	0.7%	9.4%	46.0%	39.3%	4.4%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak			10:00	08:00	07:00	07:00	08:00	07:00		11:00				07:00		
Vol.			5	54	341	267	39	1		1				678		
PM Peak			17:00	15:00	17:00	13:00	12:00	12:00						17:00		
Vol.			6	30	121	67	10	1						189		

Stats  
 15th Percentile : 29 MPH  
 50th Percentile : 33 MPH  
 85th Percentile : 37 MPH  
 95th Percentile : 40 MPH

Mean Speed(Average) : 34 MPH  
 10 MPH Pace Speed : 30-39 MPH  
 Number in Pace : 2700  
 Percent in Pace : 76.7%  
 Number of Vehicles > 30 MPH : 2760  
 Percent of Vehicles > 30 MPH : 78.4%

Bedford Road (Route 225)  
 east of Church Street  
 City, State: Carlisle, MA  
 Client: VHB/ V. Kalikiri



PRECISION  
 D A T A  
 INDUSTRIES, LLC  
 P.O. Box 301 Berlin, MA 01503  
 Office: 508.481.3999 Fax: 508.545.1234  
 Email: datarequests@pdillc.com

143696 A Speed  
 Site Code: 83946.13

EB

Start Time	1	15	20	25	30	35	40	45	50	55	60	65	70	Total	85th % ile	Ave Speed
	14	19	24	29	34	39	44	49	54	59	64	69	9999			
01/10/																
14	0	0	0	0	3	2	0	0	0	0	0	0	0	5	37	34
01:00	0	0	0	0	2	1	0	0	0	0	0	0	0	3	36	34
02:00	0	0	0	1	4	2	0	1	0	0	0	0	0	8	39	35
03:00	0	0	1	0	1	0	1	0	0	0	0	0	0	3	41	32
04:00	0	0	0	2	2	3	1	0	0	0	0	0	0	8	39	34
05:00	0	0	0	2	19	36	5	0	0	0	0	0	0	62	38	36
06:00	0	0	1	44	219	77	5	0	0	0	0	0	0	346	35	33
07:00	0	0	20	220	334	36	0	0	0	0	0	0	0	610	33	30
08:00	0	3	18	167	298	51	0	0	0	0	0	0	0	537	33	30
09:00	0	0	3	45	172	51	2	0	0	0	0	0	0	273	35	32
10:00	0	0	1	17	74	42	5	0	0	0	0	0	0	139	37	33
11:00	0	0	4	18	47	45	6	1	0	0	0	0	0	121	37	33
12 PM	0	0	1	9	46	43	17	0	0	0	0	0	0	116	39	35
13:00	0	0	2	7	55	60	13	0	0	0	0	0	0	137	38	35
14:00	0	0	0	14	63	54	6	0	0	0	0	0	0	137	37	34
15:00	0	0	0	32	76	53	10	0	0	0	0	0	0	171	37	33
16:00	0	0	0	16	62	44	5	1	0	0	0	0	0	128	37	34
17:00	0	0	1	39	81	24	1	1	0	0	0	0	0	147	35	32
18:00	0	0	2	21	80	41	2	0	0	0	0	0	0	146	36	33
19:00	0	0	0	8	30	21	1	0	0	0	0	0	0	60	37	33
20:00	0	0	0	13	26	9	1	0	0	0	0	0	0	49	35	32
21:00	0	0	1	7	25	9	1	0	0	0	0	0	0	43	35	32
22:00	0	0	1	8	9	9	4	0	0	0	0	0	0	31	38	33
23:00	0	0	1	1	8	7	1	0	0	0	0	0	0	18	37	34
Total	0	3	57	691	1736	720	87	4	0	0	0	0	0	3298		
%	0.0%	0.1%	1.7%	21.0%	52.6%	21.8%	2.6%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak		08:00	07:00	07:00	07:00	06:00	11:00	02:00						07:00		
Vol.		3	20	220	334	77	6	1						610		
PM Peak			13:00	17:00	17:00	13:00	12:00	16:00						15:00		
Vol.			2	39	81	60	17	1						171		

Stats  
 15th Percentile : 27 MPH  
 50th Percentile : 31 MPH  
 85th Percentile : 36 MPH  
 95th Percentile : 39 MPH

Mean Speed(Average) : 32 MPH  
 10 MPH Pace Speed : 28-37 MPH  
 Number in Pace : 2443  
 Percent in Pace : 74.1%  
 Number of Vehicles > 30 MPH : 2036  
 Percent of Vehicles > 30 MPH : 61.7%

Bedford Road (Route 225)  
 east of Church Street  
 City, State: Carlisle, MA  
 Client: VHB/ V. Kalikiri



PRECISION  
 D A T A  
 INDUSTRIES, LLC  
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143696 A Speed  
 Site Code: 83946.13

EB

Start Time	14	15	19	20	24	25	29	30	34	35	39	40	44	45	49	50	54	55	59	60	64	65	69	70	9999	Total	85th % ile	Ave Speed	
01/11/																													
14	0	0	0	0	2	4	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	40	34	
01:00	0	0	0	0	3	4	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	37	34	
02:00	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	23	22	
03:00	0	1	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	31	25	
04:00	0	1	1	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	35	28	
05:00	0	0	1	2	9	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	34	31	
06:00	0	0	0	7	8	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	33	30	
07:00	0	0	0	15	23	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	53	36	32	
08:00	0	0	1	7	47	40	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	97	37	34	
09:00	0	0	3	14	65	47	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	139	38	34	
10:00	0	0	0	13	60	72	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	156	38	35	
11:00	0	0	2	25	84	59	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	177	37	33	
12 PM	0	0	1	19	77	79	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	188	38	34	
13:00	0	0	0	7	51	60	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	132	38	35	
14:00	0	0	1	12	64	69	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	157	38	34	
15:00	0	0	2	13	81	47	8	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	152	37	34	
16:00	0	0	7	28	70	40	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	147	36	32	
17:00	0	0	10	37	32	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	89	33	29	
18:00	0	1	0	16	34	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	57	34	31	
19:00	0	0	2	7	28	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	42	34	31	
20:00	0	0	2	9	15	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	34	30	
21:00	0	0	11	15	10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37	31	27	
22:00	0	0	3	6	11	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	35	31	
23:00	0	0	0	4	11	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	36	32	
Total	0	3	50	265	792	570	82	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1764			
%	0.0%	0.2%	2.8%	15.0%	44.9%	32.3%	4.6%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%				
AM Peak		03:00	09:00	11:00	11:00	10:00	10:00		01:00																		11:00		
Vol.		1	3	25	84	72	11		1																		177		
PM Peak		18:00	21:00	17:00	15:00	12:00	13:00		15:00																		12:00		
Vol.		1	11	37	81	79	14		1																		188		

Stats  
 15th Percentile : 27 MPH  
 50th Percentile : 32 MPH  
 85th Percentile : 37 MPH  
 95th Percentile : 39 MPH

Mean Speed(Average) : 33 MPH  
 10 MPH Pace Speed : 29-38 MPH  
 Number in Pace : 1259  
 Percent in Pace : 71.4%  
 Number of Vehicles > 30 MPH : 1239  
 Percent of Vehicles > 30 MPH : 70.3%



Vanasse Hangen Brustlin, Inc.

101 Walnut Street  
P. O. Box 9151  
Watertown, MA 02471-9151  
617 924 1770  
FAX 617 924 2286

**Memorandum**

To: Ms. Elizabeth DeMille Barnett  
Housing Coordinator  
Town of Carlisle  
66 Westford Street  
Carlisle, MA 01741

Date: March 13, 2014

Project No.: 12623.00

From: Vinod Kalikiri, P.E., P.T.O.E.

Re: **Banta-Davis Land**  
**Route 225, Carlisle, Massachusetts**

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**Supplemental Traffic Analysis**

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Vanasse Hangen Brustlin, Inc. (VHB) has prepared this memorandum as a supplement to the draft traffic memorandum that was previously prepared on January 24, 2014 to document the existing traffic conditions on Bedford Road (Route 225) at the driveway to Banta-Davis Athletic Facility (the Site) and the projected trip generation characteristics associated with the existing and potential future expansion of the athletic facility and the construction of a 48-unit multi-family rental development on the Site. This supplemental memorandum has been prepared at the request of the Town of Carlisle Affordable Housing Trust (Client), and specifically addresses the following additional items raised by the Carlisle School Committee.

- Trip generation estimate for a 400-student elementary school on the Banta-Davis land.
- Traffic capacity analysis at the following locations, for the specified conditions.
  - Intersection of multi-family residential driveway and Banta Davis Drive during the peak hours, if both the residential and school uses are constructed in addition to the athletic uses;
  - Intersection of Banta Davis Drive and Bedford Road during the peak hours, if both the residential and school uses are constructed in addition to the athletic uses; and,
  - Intersection of Banta Davis Drive at Bedford Road during the peak hours, if only the school is constructed in addition to the athletic uses.
- Preliminary traffic signal warrant analysis for the intersection of Banta Davis Drive at Bedford Road.
- Qualitative evaluation of the existing driveway for 338 Bedford Road as the driveway for a 48-unit apartment development as well, in lieu of using Banta-Davis Drive.

**Elementary School Trip Generation**

The Carlisle School Department is contemplating the construction of a 400-student elementary school on the Site. Peak hour traffic projections for the school use were derived from trip generation rates published by the ITE Trip Generation Manual<sup>1</sup>, using the number of students as an *independent variable* in the analysis.

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<sup>1</sup> Trip Generation Manual – 9th Edition; Institute of Transportation Engineers; Washington, D.C.; 2012

A review of the ITE trip estimates indicates that the ITE data is based on an assumption that only a relatively small percentage (approximately 20-percent) of the students are dropped off by their parents during the school peak times and the remaining 80-percent of students take the bus or other modes of transportation. This could potentially occur if the ITE rates are based on data collected at elementary schools across the country that have a high reliance on bus transportation and/or some of the schools studied in the ITE database are located in more urban areas where walking, as a mode of travel, is more common.

Since it is not possible to narrow down the data points used in the ITE analysis to suburban schools that are comparable to schools in towns like Carlisle, and also to provide a sensitivity analysis, an alternate peak hour trip generation estimate was also prepared for the condition where approximately 50-percent of the students are dropped off/picked up by parents. A 50-percent automobile mode of travel was selected for the alternate analysis to demonstrate the traffic effect if more children are driven to/from school by automobiles, as is the general tendency in many suburban school systems. The estimates based on both methods are summarized in Table 1 below.

**Table 1: Elementary School Trip Generation**

Time period	ITE based estimate <sup>a</sup>	Alternate estimate based on heavier reliance on automobiles <sup>b</sup>
Morning Peak Hour <sup>c</sup>		
In	99	218
<u>Out</u>	<u>81</u>	<u>200</u>
Total	180	418
Evening Peak Hour <sup>c</sup>		
In	29	72
<u>Out</u>	<u>31</u>	<u>74</u>
Total	60	146
Saturday Peak Hour <sup>c</sup>		
In	Negligible	Negligible
<u>Out</u>	<u>Negligible</u>	<u>Negligible</u>
Total	Negligible	Negligible

a Based on a 400-student elementary school (ITE LUC 520)

b ITE estimates prorated to reflect the condition where 50% of the students are dropped off/picked up by parents

c Vehicles per hour

As shown in Table 1, heavy reliance on bus or alternate mode of transportation, consistent with the data that forms the basis of the ITE rates, would result in approximately 180 trips (enter + exit) during the weekday morning commute peak hour and approximately a third of those trips during the afternoon commuter peak hour. The estimate for the afternoon commuter peak hour is much lower than the morning commuter peak hour estimates because the afternoon peak hour for the school occurs much earlier than the afternoon commuter peak hour. The trips noted above are generally representative of trips associated with students being picked up at school after sports and other extracurricular activities in the afternoon. The last column of the table shows that if close to 50-percent of students rely on parent drop-off/pick-up, the corresponding roadway peak hour trips could increase substantially (by more than two times, based on the assumptions made for the alternate analysis presented in Table 1) when compared to the ITE based analysis.

For comparison and reference, the peak hour trip estimates for the residential and athletic uses that were documented in the January 24, 2014 memorandum are repeated below in Table 2. Scenario 1 athletic uses in Table 2 represent the athletic facility expansion that could occur within the next

seven years. Scenario 2 athletic expansion would likely occur after seven years. The footnotes for Table 2 outline the development program assumed for the corresponding trip estimates.

**Table 2: Athletic Facility Trip Generation**

Time Period	Residential Trips <sup>a</sup>	Scenario 1 Athletic Trips <sup>b</sup>	Scenario 2 Athletic Trips <sup>c</sup>
Morning Peak Hour <sup>d</sup>			
In	6	11	15
Out	<u>22</u>	<u>0</u>	<u>0</u>
Total	28	11	15
Evening Peak Hour <sup>d</sup>			
In	29	73	104
Out	<u>16</u>	<u>47</u>	<u>74</u>
Total	45	120	178
Saturday Peak Hour <sup>d</sup>			
In	13	85	124
Out	<u>13</u>	<u>87</u>	<u>124</u>
Total	26	172	248

- a Based on 50 apartment units (ITE LUC 220)
- b 1 Little League field, 1 softball field, 2 multi-purpose field fields, 4 tennis courts
- c 2 Little League fields, 1 softball field, 2 multi-purpose field fields, 6 tennis courts
- d Vehicles per hour

### Traffic Capacity Analysis

Measuring existing traffic volumes and projecting future traffic volumes quantifies traffic flow within the study area. To assess quality of flow, roadway capacity analyses were conducted for the existing and projected future traffic volume conditions. Capacity analyses provide an indication of how well the roadway facilities serve the traffic demands placed upon them. Roadway operating conditions are classified by calculated levels of service.

Level-of-service (LOS) is the term used to denote the different operating conditions which occur on a given roadway segment under various traffic volume loads. It is a qualitative measure of a number of factors including roadway geometrics, speed, travel delay and freedom to maneuver. Level-of-service provides an index to the operational qualities of a roadway segment or an intersection. Level-of-service designations range from A to F, with LOS A representing the best operating conditions and LOS F representing congested operating conditions.

For this evaluation, capacity analyses were completed for the unsignalized intersections of Banta-Davis Drive/Bedford Road and Banta-Davis Drive/future residential driveway using SYNCHRO traffic analysis software. Level-of-service designation is reported differently for signalized and unsignalized intersections. For unsignalized intersections, the LOS is only determined for left-turns from the main street and all movements from the minor street. The evaluation criteria used to analyze intersections is based on the HCM<sup>2</sup>.

As requested by the Client, peak hour capacity analyses were conducted for the following conditions.

<sup>2</sup> [Highway Capacity Manual](#); Transportation Research Board; Washington D.C.

- a. Existing conditions athletic facility
- b. Scenario 1 and Scenario 2 athletic facility expansion accompanied by the school project only (no residential)
- c. Scenario 1 and Scenario 2 athletic facility expansion accompanied by the school and residential uses.

Tables 3 and 4 present a summary of the capacity analyses for the existing and future conditions with various combinations of athletic facility expansions and the school and residential uses. **Future conditions analysis results in Tables 3 and 4 are based on the lower, ITE school trip generation estimates.**

**Table 3: Capacity Analysis Summary for STOP Controlled Movements (Existing Vs. Scenario 1 Results)**

Location	Peak Period	Existing Conditions			Future Conditions (Scenario 1 Athletic + School) <sup>d</sup>			Future Conditions (Scenario 1 Athletic + School + Residential) <sup>d</sup>		
		v/c <sup>a</sup>	Del <sup>b</sup>	LOS <sup>c</sup>	v/c	Del	LOS	v/c	Del	LOS
Bedford Road at Banta-Davis Drive	Weekday Morning	0.01	16	C	0.27	21	C	0.35	22	C
	Weekday Afternoon	0.14	20	C	0.35	28	D	0.42	31	D
	Saturday Midday	0.13	13	B	0.18	14	B	0.21	14	B
Banta-Davis Drive at Residential Driveway	Weekday Morning							0.03	9	A
	Weekday Evening							0.02	9	A
	Saturday Midday							0.02	9	A

- a volume-to-capacity ratio for the critical side street movements
- b delay of critical approach only, in seconds per vehicle
- c level of service of the side street movements
- d Trip generation for the school use based on ITE estimates presented in Table 1

**Table 4: Capacity Analysis Summary for STOP Controlled Movements (Existing Vs. Scenario 2 Results)**

Location	Peak Period	Existing Conditions			Future Conditions (Scenario 2 Athletic + School) <sup>a</sup>			Future Conditions (Scenario 2 Athletic + School + Residential) <sup>a</sup>		
		v/c	Del	LOS	v/c	Del	LOS	v/c	Del	LOS
Bedford Road at Banta-Davis Drive	Weekday Morning	0.01	16	C	0.27	21	C	0.35	22	C
	Weekday Afternoon	0.14	20	C	0.49	35	D	0.58	41	E
	Saturday Midday	0.13	13	B	0.27	15	B	0.30	16	C
Banta-Davis Drive at Residential Driveway	Weekday Morning							0.03	9	A
	Weekday Evening							0.02	9	A
	Saturday Midday							0.02	9	A

- a Trip generation for the school use based on ITE estimates presented in Table 1

In addition performing future conditions analysis with ITE school trip generation estimates as shown in Tables 3 and 4 above, capacity analyses were also conducted for the alternate school trip generation estimates shown in Table 1 for 50-percent student drop off/pick up by automobiles. **Tables 5 and 6 present a summary of the future conditions capacity analyses that include the alternate trip generation estimates for the school use (50-percent automobile mode share).**

**Table 5: Capacity Analysis Summary for STOP Controlled Movements (Higher Auto Mode School Trip Estimates)**

Location	Peak Period	Future Conditions (Scenario 1 Athletic + School) <sup>d</sup>			Future Conditions (Scenario 1 Athletic + School + Residential) <sup>d</sup>		
		v/c <sup>a</sup>	Del <sup>b</sup>	LOS <sup>c</sup>	v/c	Del	LOS
Bedford Road at Banta-Davis Drive	Weekday Morning	0.73	44	E	0.82	55	F
	Weekday Afternoon	0.63	48	E	0.73	60	F
	Saturday MIDDAY	0.18	14	B	0.21	14	B
Banta-Davis Drive at Residential Driveway	Weekday Morning				0.03	9	A
	Weekday Evening				0.02	9	A
	Saturday MIDDAY				0.02	9	A

- a volume-to-capacity ratio for the critical side street movements
- b delay of critical approach only, in seconds per vehicle
- c level of service of the side street movements
- d Trip generation for the school use based on the alternate estimate in Table 1 that involves 50-percent reliance on personal automobiles for drop-off/pick-up

**Table 6: Capacity Analysis Summary for STOP Controlled Movements (Higher Auto Mode School Trip Estimates)**

Location	Peak Period	Future Conditions (Scenario 2 Athletic + School)			Future Conditions (Scenario 2 Athletic + School + Residential) <sup>a</sup>		
		v/c	Del	LOS	v/c	Del	LOS
Bedford Road at Banta-Davis Drive	Weekday Morning	0.73	45	E	0.82	55	F
	Weekday Afternoon	0.80	70	F	0.92	95	F
	Saturday MIDDAY	0.27	15	B	0.30	16	C
Banta-Davis Drive at Residential Driveway	Weekday Morning				0.03	9	A
	Weekday Evening				0.02	9	A
	Saturday MIDDAY				0.02	9	A

- a Trip generation for the school use based on the alternate estimate in Table 1 that involves 50-percent reliance on personal automobiles for drop-off/pick-up

A review of the capacity analysis presented in Tables 3 through 6 lead to the following inferences.

1. Weekday peak hour traffic operations for Banta-Davis Drive, at its intersection with Bedford Road, are projected to Fail (LOS F) if the elementary school traffic is even comprised of approximately 50-percent personal automobile travel. To ensure that the impacts to Bedford Road traffic as well as on-site traffic are better managed, aggressive monitoring and controlling of automobile mode of travel to/from the school should be implemented.
2. The above noted failing operations are expected as a result of the school generated traffic, and as such, the need for at least a police detail at the Banta-Davis Drive/Bedford Road intersection should be anticipated for school use on the Site, *independent* of the 48-unit housing development.
3. Under all analysis scenarios, the effect of the traffic generated by the residential use is nominal.
4. Weekday traffic operations for vehicles exiting Banta-Davis driveway can be expected to be in the range of LOS B/D under most analysis scenarios when automobile travel to the school is reduced and bus transportation is promoted (i.e., with ITE school trip rates). The LOS is estimated to drop to E during the afternoon commuter peak hour under the *Future Conditions - Scenario 2 Athletic + School + Residential*. The addition of the residential use in this scenario contributes to an additional six seconds of wait time per vehicle, when compared to

the *Future Conditions - Scenario 2 Athletic + School* scenario (i.e., 41 seconds of wait time instead of 35 seconds of wait time).

5. Saturday midday peak hour traffic operations are expected to be generally better than weekday peak hour operations. A review of the analytical data indicates that this is primarily because of the substantially lower traffic volume on Bedford Road on Saturdays when compared to weekdays.
6. Under all analysis scenarios, the intersection of Banta-Davis Drive/future residential driveway is projected to operate at LOS A with minimal delays.

Based on the foregoing analysis, widening Banta-Davis Drive, as needed, to a minimum paved width of 20 to 22 feet to accommodate two lanes of traffic (one entering and one exiting the Site, with no on-street parking) can adequately serve the projected traffic volumes under all analysis scenarios. The analysis indicates that the intersection of Banta-Davis Drive/future residential driveway would operate adequately with stop-sign control on the driveway and with shared through/turn lanes on Banta-Davis Drive. When the elementary school is constructed, and if the primary mode of travel for students is personal automobiles, instead of bus transportation, a more thorough review of lane needs on Banta-Davis Drive may need to be performed, including evaluating the need to widen all approaches of the intersection of Banta-Davis Drive/Bedford Road to accommodate separate turn lanes.

### **Signal Warrant Analysis**

Traffic signal Warrant analyses were prepared to determine if the projected traffic volumes at the intersection of Banta-Davis Drive/Bedford Road exceed the thresholds for the installation of a traffic signal at the location. The Manual on Uniform Traffic Control Devices<sup>3</sup> (MUTCD) is the established standard for Warrant analyses. The Warrants consider the roadway geometry, traffic volume entering the intersection, and speeds.

Overall, the warrant analysis indicates that the estimated weekday morning peak hour traffic volume exceeds the Peak Hour Volume Warrant threshold if an elementary school is constructed and even 50-percent of the students travel by personal automobiles. If the majority of student transportation will occur by bus (i.e., lower vehicle trips on Banta-Davis Drive), then the Warrant analysis indicates that the traffic volume on Bedford Road would need to be 35 to 40 percent higher than its current levels to require traffic signal control at the intersection. It should be noted that installation of traffic signal control solely based on traffic volume justification for one hour of the day, is not common practice.

A more detailed analysis of actual hourly school operations post-construction, in conjunction with the future athletic uses on the Site and future traffic growth on Bedford Road (which can be expected to grow over time) will be needed to determine whether police details or traffic signal control is more appropriate when the school is in operation.

### **Driveway for 338 Bedford Road**

As requested by the Client, a qualitative review of the driveway for 338 Bedford Road was performed to determine its ability to serve as the access/egress for the potential 48 apartment units on the Banta-Davis Site.

Based on a review of on-line aerial mapping, the driveway for 338 Bedford Road appears to be approximately 10 to 12 feet wide, which is not adequate for two-way travel for a 48-unit apartment

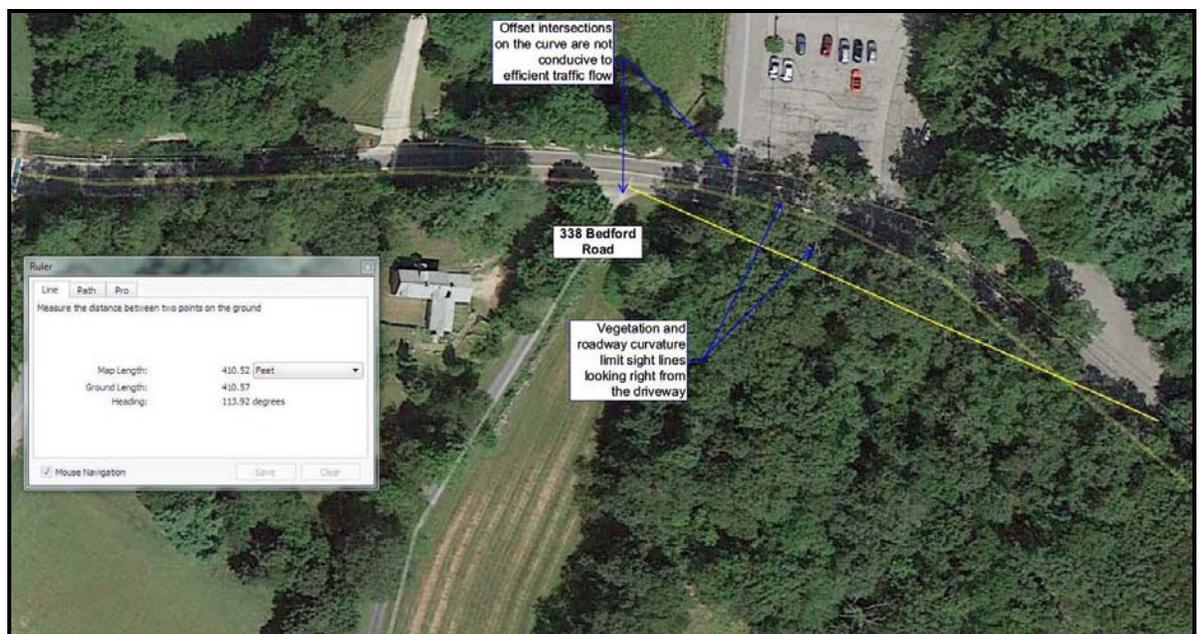
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<sup>3</sup> Manual on Uniform Traffic Control Devices, Federal Highway Administration, Washington DC, 2003.

development. It is VHB's understanding that the section of the driveway for # 338 that is closest to Bedford Road cannot be readily widened due to its proximity to wetlands. The driveway is also located on the inside of a curve in the roadway, which, combined with the dense vegetation growth close to the edge of the roadway, significantly limits the sight lines to on-coming traffic. Sight distance analyses presented in the January 24, 2014 draft traffic evaluation indicated that, for the recorded 85<sup>th</sup> percentile speed of 37 mph on Bedford Road, approximately 410 feet of Intersection Sight Distance (ISD) is required for vehicular traffic exiting any driveway in that area of Bedford Road.

As shown in Figure 1, all vegetation and any other vertical sight line obstructions between the yellow sight line and the edge of the travel way on Bedford Road would need to be cleared to achieve the calculated ISD per the guidelines of the American Association of State Highway and Transportation Officials (AASHTO)<sup>4</sup>. It is VHB's understanding that most the affected vegetation is either in wetlands or on conservation land which renders clearing infeasible.

Figure 1: Required ISD Looking East from the Driveway for 338 Bedford Road



Finally, as indicated in Figure 1, the driveway for 338 Bedford Road forms an offset intersection with the Kimball Ice-cream parking lot driveway. A driveway that would serve as many as 48 residential units on a horizontal curve, with limited sight distances and forming an offset intersection with a significant traffic generator like Kimball Ice-cream, is not desirable.

For the above reasons, the driveway for 338 Bedford Road would not be a viable alternative for providing primary access to the 48-unit residential development in addition to the two group homes. Detailed capacity analysis summarized in the prior section indicates that the multi-family residential traffic can be adequately accommodated by the Banta-Davis Drive, obviating the need for an alternate driveway location.

<sup>4</sup> [A Policy on the Geometric Design of Highways and Streets](#); American Association of State Highway and Transportation Officials; Washington, D.C.; 2004.

Lanes, Volumes, Timings  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↘	↗	
Volume (vph)	746	2	1	124	1	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	10	10
Grade (%)	0%			0%	0%	
Storage Length (ft)		0	0		0	0
Storage Lanes		0	0		1	0
Taper Length (ft)		25	25		25	25
Link Speed (mph)	30			30	30	
Link Distance (ft)	735			840	401	
Travel Time (s)	16.7			19.1	9.1	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	0%	0%	2%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	813	0	0	136	2	0

Intersection Summary

Area Type: Other

HCM Unsignalized Intersection Capacity Analysis  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↘	↗	
Volume (veh/h)	746	2	1	124	1	1
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	811	2	1	135	1	1
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			813		949	812
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			813		949	812
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			823		291	382

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	813	136	2
Volume Left	0	1	1
Volume Right	2	0	1
cSH	1700	823	330
Volume to Capacity	0.48	0.00	0.01
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.1	16.0
Lane LOS		A	C
Approach Delay (s)	0.0	0.1	16.0
Approach LOS			C

Intersection Summary

Average Delay 0.0  
Intersection Capacity Utilization 49.4% ICU Level of Service A  
Analysis Period (min) 15

Lanes, Volumes, Timings  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↘	↗	
Volume (vph)	208	42	7	713	31	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	10	10
Grade (%)	0%			0%	0%	
Storage Length (ft)		0	0		0	0
Storage Lanes		0	0		1	0
Taper Length (ft)		25	25		25	25
Link Speed (mph)	30			30	30	
Link Distance (ft)	735			840	401	
Travel Time (s)	16.7			19.1	9.1	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	0%	0%	2%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	272	0	0	783	41	0

Intersection Summary

Area Type: Other

HCM Unsignalized Intersection Capacity Analysis  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↘	↗	
Volume (veh/h)	208	42	7	713	31	6
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	226	46	8	775	34	7
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			272		1039	249
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			272		1039	249
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		87	99
cM capacity (veh/h)			1303		256	795

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	272	783	40
Volume Left	0	8	34
Volume Right	46	0	7
cSH	1700	1303	288
Volume to Capacity	0.16	0.01	0.14
Queue Length 95th (ft)	0	0	12
Control Delay (s)	0.0	0.2	19.5
Lane LOS		A	C
Approach Delay (s)	0.0	0.2	19.5
Approach LOS			C

Intersection Summary

Average Delay 0.8  
Intersection Capacity Utilization 53.1% ICU Level of Service A  
Analysis Period (min) 15

Lanes, Volumes, Timings  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↘	↗	
Volume (vph)	209	54	9	208	57	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	10	10
Grade (%)	0%			0%	0%	
Storage Length (ft)		0	0		0	0
Storage Lanes		0	0		1	0
Taper Length (ft)		25	25		25	25
Link Speed (mph)	30			30	30	
Link Distance (ft)	735			840	401	
Travel Time (s)	16.7			19.1	9.1	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	0%	0%	2%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	286	0	0	236	73	0

Intersection Summary

Area Type: Other

HCM Unsignalized Intersection Capacity Analysis  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↘	↗	
Volume (veh/h)	209	54	9	208	57	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	227	59	10	226	62	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			286		502	257
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			286		502	257
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		88	99
cM capacity (veh/h)			1288		528	787

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	286	236	73
Volume Left	0	10	62
Volume Right	59	0	11
cSH	1700	1288	556
Volume to Capacity	0.17	0.01	0.13
Queue Length 95th (ft)	0	1	11
Control Delay (s)	0.0	0.4	12.5
Lane LOS		A	B
Approach Delay (s)	0.0	0.4	12.5
Approach LOS			B

Intersection Summary

Average Delay 1.7  
Intersection Capacity Utilization 28.7% ICU Level of Service A  
Analysis Period (min) 15

Lanes, Volumes, Timings  
1: Residential Dwy & Banta-Davis Drive

VHB

	←		↑	→		↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↓		↑			↑
Volume (vph)	1	13	87	1	13	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12
Grade (%)	0%		0%			0%
Storage Length (ft)	0	0		0	0	
Storage Lanes	1	0		0	0	
Taper Length (ft)	25	25		25	25	
Link Speed (mph)	30		30			30
Link Distance (ft)	629		262			401
Travel Time (s)	14.3		6.0			9.1
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	15	0	96	0	0	106

Intersection Summary

Area Type: Other

HCM Unsignalized Intersection Capacity Analysis  
1: Residential Dwy & Banta-Davis Drive

VHB

	←		↑	→		↓
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↓		↑			↑
Volume (veh/h)	1	13	87	1	13	85
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	14	95	1	14	92
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	216	95			96	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	216	95			96	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	99			99	
cM capacity (veh/h)	765	862			1498	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	15	96	107
Volume Left	1	0	14
Volume Right	14	1	0
cSH	944	1700	1498
Volume to Capacity	0.02	0.06	0.01
Queue Length 95th (ft)	1	0	1
Control Delay (s)	8.9	0.0	1.0
Lane LOS	A		A
Approach Delay (s)	8.9	0.0	1.0
Approach LOS	A		

Intersection Summary

Average Delay 1.1  
Intersection Capacity Utilization 21.9% ICU Level of Service A  
Analysis Period (min) 15

Lanes, Volumes, Timings  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↘	↗	
Volume (vph)	216	79	19	215	81	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	10	10
Grade (%)	0%			0%	0%	
Storage Length (ft)		0	0		0	0
Storage Lanes		0	0		1	0
Taper Length (ft)		25	25		25	25
Link Speed (mph)	30			30	30	
Link Distance (ft)	735			840	401	
Travel Time (s)	16.7			19.1	9.1	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	0%	0%	2%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	321	0	0	255	109	0

Intersection Summary

Area Type: Other

HCM Unsignalized Intersection Capacity Analysis  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↘	↗	
Volume (veh/h)	216	79	19	215	81	19
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	235	86	21	234	88	21
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			321		553	278
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			321		553	278
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		82	97
cM capacity (veh/h)			1251		489	766

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	321	254	109
Volume Left	0	21	88
Volume Right	86	0	21
cSH	1700	1251	526
Volume to Capacity	0.19	0.02	0.21
Queue Length 95th (ft)	0	1	19
Control Delay (s)	0.0	0.8	13.6
Lane LOS		A	B
Approach Delay (s)	0.0	0.8	13.6
Approach LOS			B

Intersection Summary

Average Delay 2.5  
Intersection Capacity Utilization 39.4% ICU Level of Service A  
Analysis Period (min) 15

Lanes, Volumes, Timings  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↘	↗	↖
Volume (vph)	770	93	17	128	12	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	10	10
Grade (%)	0%			0%	0%	
Storage Length (ft)		0	0		0	0
Storage Lanes		0	0		1	0
Taper Length (ft)		25	25		25	25
Link Speed (mph)	30			30	30	
Link Distance (ft)	735			840	401	
Travel Time (s)	16.7			19.1	9.1	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	0%	0%	2%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	938	0	0	157	88	0

Intersection Summary

Area Type: Other

HCM Unsignalized Intersection Capacity Analysis  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↘	↗	↖
Volume (veh/h)	770	93	17	128	12	69
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	837	101	18	139	13	75
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			938		1064	888
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			938		1064	888
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		95	78
cM capacity (veh/h)			739		243	346

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	938	158	88
Volume Left	0	18	13
Volume Right	101	0	75
cSH	1700	739	325
Volume to Capacity	0.55	0.03	0.27
Queue Length 95th (ft)	0	2	27
Control Delay (s)	0.0	1.4	20.1
Lane LOS		A	C
Approach Delay (s)	0.0	1.4	20.1
Approach LOS			C

Intersection Summary

Average Delay 1.7  
Intersection Capacity Utilization 57.8% ICU Level of Service B  
Analysis Period (min) 15

Lanes, Volumes, Timings  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↘	↗	↖
Volume (vph)	215	66	36	736	66	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	10	10
Grade (%)	0%			0%	0%	
Storage Length (ft)		0	0		0	0
Storage Lanes		0	0		1	0
Taper Length (ft)		25	25		25	25
Link Speed (mph)	30			30	30	
Link Distance (ft)	735			840	401	
Travel Time (s)	16.7			19.1	9.1	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	0%	0%	2%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	306	0	0	839	85	0

Intersection Summary

Area Type: Other

HCM Unsignalized Intersection Capacity Analysis  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↘	↗	↖
Volume (veh/h)	215	66	36	736	66	12
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	234	72	39	800	72	13
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			305		1148	270
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			305		1148	270
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		67	98
cM capacity (veh/h)			1267		215	774

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	305	839	85
Volume Left	0	39	72
Volume Right	72	0	13
cSH	1700	1267	242
Volume to Capacity	0.18	0.03	0.35
Queue Length 95th (ft)	0	2	38
Control Delay (s)	0.0	0.8	27.7
Lane LOS		A	D
Approach Delay (s)	0.0	0.8	27.7
Approach LOS			D

Intersection Summary

Average Delay 2.5  
Intersection Capacity Utilization 70.4% ICU Level of Service C  
Analysis Period (min) 15

Lanes, Volumes, Timings  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↗	↘	↙
Volume (vph)	216	72	13	215	74	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	10	10
Grade (%)	0%			0%	0%	
Storage Length (ft)		0	0		0	0
Storage Lanes		0	0		1	0
Taper Length (ft)		25	25		25	25
Link Speed (mph)	30			30	30	
Link Distance (ft)	735			840	401	
Travel Time (s)	16.7			19.1	9.1	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	0%	0%	2%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	313	0	0	248	94	0

Intersection Summary

Area Type: Other

HCM Unsignalized Intersection Capacity Analysis  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↗	↘	↙
Volume (veh/h)	216	72	13	215	74	13
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	235	78	14	234	80	14
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			313		536	274
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			313		536	274
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		84	98
cM capacity (veh/h)			1259		503	770

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	313	248	95
Volume Left	0	14	80
Volume Right	78	0	14
cSH	1700	1259	531
Volume to Capacity	0.18	0.01	0.18
Queue Length 95th (ft)	0	1	16
Control Delay (s)	0.0	0.5	13.2
Lane LOS		A	B
Approach Delay (s)	0.0	0.5	13.2
Approach LOS			B

Intersection Summary

Average Delay 2.1  
Intersection Capacity Utilization 33.5% ICU Level of Service A  
Analysis Period (min) 15

Lanes, Volumes, Timings  
1: Residential Dwy & Banta-Davis Drive

VHB

	↙ ↘		↑		↗ ↖	
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘		↗		↖	↘
Volume (vph)	1	22	81	1	6	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12
Grade (%)	0%		0%			0%
Storage Length (ft)	0	0		0	0	
Storage Lanes	1	0		0	0	
Taper Length (ft)	25	25		25	25	
Link Speed (mph)	30		30			30
Link Distance (ft)	629		262			401
Travel Time (s)	14.3		6.0			9.1
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	25	0	89	0	0	127

Intersection Summary

Area Type: Other

HCM Unsignalized Intersection Capacity Analysis  
1: Residential Dwy & Banta-Davis Drive

VHB

	↙ ↘		↑		↗ ↖	
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘		↗		↖	↘
Volume (veh/h)	1	22	81	1	6	110
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	24	88	1	7	120
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	221	89			89	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	221	89			89	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	98			100	
cM capacity (veh/h)	764	870			1506	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	25	89	126
Volume Left	1	0	7
Volume Right	24	1	0
cSH	958	1700	1506
Volume to Capacity	0.03	0.05	0.00
Queue Length 95th (ft)	2	0	0
Control Delay (s)	8.9	0.0	0.4
Lane LOS	A		A
Approach Delay (s)	8.9	0.0	0.4
Approach LOS	A		

Intersection Summary

Average Delay 1.1  
 Intersection Capacity Utilization 20.7% ICU Level of Service A  
 Analysis Period (min) 15

Lanes, Volumes, Timings  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↗	↘	↙
Volume (vph)	770	94	22	128	15	88
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	10	10
Grade (%)	0%			0%	0%	
Storage Length (ft)		0	0		0	0
Storage Lanes		0	0		1	0
Taper Length (ft)		25	25		25	25
Link Speed (mph)	30			30	30	
Link Distance (ft)	735			840	401	
Travel Time (s)	16.7			19.1	9.1	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	0%	0%	2%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	939	0	0	163	112	0

Intersection Summary

Area Type: Other

HCM Unsignalized Intersection Capacity Analysis  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↗	↘	↙
Volume (veh/h)	770	94	22	128	15	88
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	837	102	24	139	16	96
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			939		1075	888
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			939		1075	888
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		93	72
cM capacity (veh/h)			738		237	345

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	939	163	112
Volume Left	0	24	16
Volume Right	102	0	96
cSH	1700	738	324
Volume to Capacity	0.55	0.03	0.35
Queue Length 95th (ft)	0	3	37
Control Delay (s)	0.0	1.8	21.9
Lane LOS		A	C
Approach Delay (s)	0.0	1.8	21.9
Approach LOS			C

Intersection Summary

Average Delay 2.3  
Intersection Capacity Utilization 59.2% ICU Level of Service B  
Analysis Period (min) 15

Lanes, Volumes, Timings  
1: Residential Dwy & Banta-Davis Drive

VHB

	←		↑	→		↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		Y			Y
Volume (vph)	1	16	78	1	29	102
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12
Grade (%)	0%		0%			0%
Storage Length (ft)	0	0		0	0	
Storage Lanes	1	0		0	0	
Taper Length (ft)	25	25		25	25	
Link Speed (mph)	30		30			30
Link Distance (ft)	629		262			401
Travel Time (s)	14.3		6.0			9.1
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	18	0	86	0	0	143

Intersection Summary

Area Type: Other

HCM Unsignalized Intersection Capacity Analysis  
1: Residential Dwy & Banta-Davis Drive

VHB

	←		↑	→		↓
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		Y			Y
Volume (veh/h)	1	16	78	1	29	102
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	17	85	1	32	111
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	259	85			86	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	259	85			86	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	98			98	
cM capacity (veh/h)	714	874			1510	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	18	86	142
Volume Left	1	0	32
Volume Right	17	1	0
cSH	953	1700	1510
Volume to Capacity	0.02	0.05	0.02
Queue Length 95th (ft)	1	0	2
Control Delay (s)	8.9	0.0	1.8
Lane LOS	A		A
Approach Delay (s)	8.9	0.0	1.8
Approach LOS	A		

Intersection Summary

Average Delay 1.7  
Intersection Capacity Utilization 23.6% ICU Level of Service A  
Analysis Period (min) 15

Lanes, Volumes, Timings  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↗	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↗	↖	↗
Volume (vph)	215	73	58	736	70	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	10	10
Grade (%)	0%			0%	0%	
Storage Length (ft)		0	0		0	0
Storage Lanes		0	0		1	0
Taper Length (ft)		25	25		25	25
Link Speed (mph)	30			30	30	
Link Distance (ft)	735			840	401	
Travel Time (s)	16.7			19.1	9.1	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	0%	0%	2%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	313	0	0	863	102	0

Intersection Summary

Area Type: Other

HCM Unsignalized Intersection Capacity Analysis  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↗	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↗	↖	↗
Volume (veh/h)	215	73	58	736	70	24
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	234	79	63	800	76	26
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			313		1199	273
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			313		1199	273
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			95		61	97
cM capacity (veh/h)			1259		196	770

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	313	863	102
Volume Left	0	63	76
Volume Right	79	0	26
cSH	1700	1259	242
Volume to Capacity	0.18	0.05	0.42
Queue Length 95th (ft)	0	4	49
Control Delay (s)	0.0	1.3	30.3
Lane LOS		A	D
Approach Delay (s)	0.0	1.3	30.3
Approach LOS			D

Intersection Summary

Average Delay 3.3  
Intersection Capacity Utilization 73.0% ICU Level of Service D  
Analysis Period (min) 15

Lanes, Volumes, Timings  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↗	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↗	↗
Volume (vph)	770	97	17	128	12	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	10	10
Grade (%)	0%			0%	0%	
Storage Length (ft)		0	0		0	0
Storage Lanes		0	0		1	0
Taper Length (ft)		25	25		25	25
Link Speed (mph)	30			30	30	
Link Distance (ft)	735			840	401	
Travel Time (s)	16.7			19.1	9.1	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	0%	0%	2%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	942	0	0	157	88	0

Intersection Summary

Area Type: Other

HCM Unsignalized Intersection Capacity Analysis  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↗	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↗	↗
Volume (veh/h)	770	97	17	128	12	69
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	837	105	18	139	13	75
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			942		1066	890
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			942		1066	890
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		95	78
cM capacity (veh/h)			736		242	345

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	942	158	88
Volume Left	0	18	13
Volume Right	105	0	75
cSH	1700	738	324
Volume to Capacity	0.55	0.03	0.27
Queue Length 95th (ft)	0	2	27
Control Delay (s)	0.0	1.4	20.2
Lane LOS		A	C
Approach Delay (s)	0.0	1.4	20.2
Approach LOS			C

Intersection Summary

Average Delay 1.7  
Intersection Capacity Utilization 58.0% ICU Level of Service B  
Analysis Period (min) 15

Lanes, Volumes, Timings  
1: Residential Dwy & Banta-Davis Drive

VHB

	←		↑	→		↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		P			Y
Volume (vph)	1	22	81	1	6	114
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12
Grade (%)	0%		0%			0%
Storage Length (ft)	0	0		0	0	
Storage Lanes	1	0		0	0	
Taper Length (ft)	25	25		25	25	
Link Speed (mph)	30		30			30
Link Distance (ft)	629		262			401
Travel Time (s)	14.3		6.0			9.1
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	25	0	89	0	0	131

Intersection Summary

Area Type: Other

HCM Unsignalized Intersection Capacity Analysis  
1: Residential Dwy & Banta-Davis Drive

VHB

	←		↑	→		↓
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		P			Y
Volume (veh/h)	1	22	81	1	6	114
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	24	88	1	7	124
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	226	89			89	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	226	89			89	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	98			100	
cM capacity (veh/h)	759	870			1506	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	25	89	130
Volume Left	1	0	7
Volume Right	24	1	0
cSH	958	1700	1506
Volume to Capacity	0.03	0.05	0.00
Queue Length 95th (ft)	2	0	0
Control Delay (s)	8.9	0.0	0.4
Lane LOS	A		A
Approach Delay (s)	8.9	0.0	0.4
Approach LOS	A		

Intersection Summary

Average Delay 1.1  
Intersection Capacity Utilization 20.9% ICU Level of Service A  
Analysis Period (min) 15

Lanes, Volumes, Timings  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↘	↗	
Volume (vph)	770	98	22	128	15	88
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	10	10
Grade (%)	0%			0%	0%	
Storage Length (ft)		0	0		0	0
Storage Lanes		0	0		1	0
Taper Length (ft)		25	25		25	25
Link Speed (mph)	30			30	30	
Link Distance (ft)	735			840	401	
Travel Time (s)	16.7			19.1	9.1	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	0%	0%	2%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	944	0	0	163	112	0

Intersection Summary

Area Type: Other

HCM Unsignalized Intersection Capacity Analysis  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↘	↗	
Volume (veh/h)	770	98	22	128	15	88
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	837	107	24	139	16	96
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			943		1077	890
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			943		1077	890
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		93	72
cM capacity (veh/h)			735		237	344

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	943	163	112
Volume Left	0	24	16
Volume Right	107	0	96
cSH	1700	735	323
Volume to Capacity	0.55	0.03	0.35
Queue Length 95th (ft)	0	3	38
Control Delay (s)	0.0	1.8	21.9
Lane LOS		A	C
Approach Delay (s)	0.0	1.8	21.9
Approach LOS			C

Intersection Summary

Average Delay 2.3  
Intersection Capacity Utilization 59.4% ICU Level of Service B  
Analysis Period (min) 15

Lanes, Volumes, Timings  
1: Residential Dwy & Banta-Davis Drive

VHB

	↙	↖	↑	↗	↘	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↕		↕			↕
Volume (vph)	1	16	105	1	29	133
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12
Grade (%)	0%		0%			0%
Storage Length (ft)	0	0		0	0	
Storage Lanes	1	0		0	0	
Taper Length (ft)	25	25		25	25	
Link Speed (mph)	30		30			30
Link Distance (ft)	629		262			401
Travel Time (s)	14.3		6.0			9.1
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	18	0	115	0	0	177

Intersection Summary

Area Type: Other

HCM Unsignalized Intersection Capacity Analysis  
1: Residential Dwy & Banta-Davis Drive

VHB

	↙	↖	↑	↗	↘	↓
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↕		↕			↕
Volume (veh/h)	1	16	105	1	29	133
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	17	114	1	32	145
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	322	115			115	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	322	115			115	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	98			98	
cM capacity (veh/h)	657	838			1474	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	18	115	176
Volume Left	1	0	32
Volume Right	17	1	0
cSH	915	1700	1474
Volume to Capacity	0.02	0.07	0.02
Queue Length 95th (ft)	2	0	2
Control Delay (s)	9.0	0.0	1.5
Lane LOS	A		A
Approach Delay (s)	9.0	0.0	1.5
Approach LOS	A		

Intersection Summary

Average Delay 1.4  
 Intersection Capacity Utilization 25.3% ICU Level of Service A  
 Analysis Period (min) 15

Lanes, Volumes, Timings  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↗	↘	↙
Volume (vph)	215	99	63	736	93	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	10	10
Grade (%)	0%			0%	0%	
Storage Length (ft)		0	0		0	0
Storage Lanes		0	0		1	0
Taper Length (ft)		25	25		25	25
Link Speed (mph)	30			30	30	
Link Distance (ft)	735			840	401	
Travel Time (s)	16.7			19.1	9.1	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	0%	0%	2%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	342	0	0	868	131	0

Intersection Summary

Area Type: Other

HCM Unsignalized Intersection Capacity Analysis  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↗	↘	↙
Volume (veh/h)	215	99	63	736	93	28
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	234	108	68	800	101	30
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			341		1224	288
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			341		1224	288
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			94		46	96
cM capacity (veh/h)			1229		188	756

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	341	868	132
Volume Left	0	68	101
Volume Right	108	0	30
cSH	1700	1229	228
Volume to Capacity	0.20	0.06	0.58
Queue Length 95th (ft)	0	4	81
Control Delay (s)	0.0	1.4	40.3
Lane LOS		A	E
Approach Delay (s)	0.0	1.4	40.3
Approach LOS			E

Intersection Summary

Average Delay 4.9  
Intersection Capacity Utilization 76.4% ICU Level of Service D  
Analysis Period (min) 15

Lanes, Volumes, Timings  
1: Residential Dwy & Banta-Davis Drive

VHB

	←		↑	→		↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		Y			Y
Volume (vph)	1	13	124	1	13	124
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12
Grade (%)	0%		0%			0%
Storage Length (ft)	0	0		0	0	
Storage Lanes	1	0		0	0	
Taper Length (ft)	25	25		25	25	
Link Speed (mph)	30		30			30
Link Distance (ft)	629		262			401
Travel Time (s)	14.3		6.0			9.1
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	15	0	136	0	0	149

Intersection Summary

Area Type: Other

HCM Unsignalized Intersection Capacity Analysis  
1: Residential Dwy & Banta-Davis Drive

VHB

	←		↑	→		↓
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		Y			Y
Volume (veh/h)	1	13	124	1	13	124
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	14	135	1	14	135
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	298	135			136	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	298	135			136	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	98			99	
cM capacity (veh/h)	666	813			1448	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	15	136	149
Volume Left	1	0	14
Volume Right	14	1	0
cSH	892	1700	1448
Volume to Capacity	0.02	0.08	0.01
Queue Length 95th (ft)	1	0	1
Control Delay (s)	9.1	0.0	0.8
Lane LOS	A		A
Approach Delay (s)	9.1	0.0	0.8
Approach LOS	A		

Intersection Summary

Average Delay 0.9  
Intersection Capacity Utilization 27.2% ICU Level of Service A  
Analysis Period (min) 15

Lanes, Volumes, Timings  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↗	↘	↙
Volume (vph)	216	112	25	215	112	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	10	10
Grade (%)	0%			0%	0%	
Storage Length (ft)		0	0		0	0
Storage Lanes		0	0		1	0
Taper Length (ft)		25	25		25	25
Link Speed (mph)	30			30	30	
Link Distance (ft)	735			840	401	
Travel Time (s)	16.7			19.1	9.1	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	0%	0%	2%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	357	0	0	261	149	0

Intersection Summary

Area Type: Other

HCM Unsignalized Intersection Capacity Analysis  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↗	↘	↙
Volume (veh/h)	216	112	25	215	112	25
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	235	122	27	234	122	27
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			357		584	296
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			357		584	296
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		74	96
cM capacity (veh/h)			1213		467	748

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	357	261	149
Volume Left	0	27	122
Volume Right	122	0	27
cSH	1700	1213	501
Volume to Capacity	0.21	0.02	0.30
Queue Length 95th (ft)	0	2	31
Control Delay (s)	0.0	1.0	15.2
Lane LOS		A	C
Approach Delay (s)	0.0	1.0	15.2
Approach LOS			C

Intersection Summary

Average Delay 3.3  
Intersection Capacity Utilization 46.6% ICU Level of Service A  
Analysis Period (min) 15

Lanes, Volumes, Timings  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↘	↗	↖
Volume (vph)	215	92	41	736	89	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	10	10
Grade (%)	0%			0%	0%	
Storage Length (ft)		0	0		0	0
Storage Lanes		0	0		1	0
Taper Length (ft)		25	25		25	25
Link Speed (mph)	30			30	30	
Link Distance (ft)	735			840	401	
Travel Time (s)	16.7			19.1	9.1	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	0%	0%	2%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	334	0	0	845	114	0

Intersection Summary

Area Type: Other

HCM Unsignalized Intersection Capacity Analysis  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↘	↗	↖
Volume (veh/h)	215	92	41	736	89	16
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	234	100	45	800	97	17
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			334		1173	284
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			334		1173	284
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		53	98
cM capacity (veh/h)			1237		207	760

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	334	845	114
Volume Left	0	45	97
Volume Right	100	0	17
cSH	1700	1237	232
Volume to Capacity	0.20	0.04	0.49
Queue Length 95th (ft)	0	3	62
Control Delay (s)	0.0	0.9	34.6
Lane LOS		A	D
Approach Delay (s)	0.0	0.9	34.6
Approach LOS			D

Intersection Summary

Average Delay 3.7  
Intersection Capacity Utilization 73.8% ICU Level of Service D  
Analysis Period (min) 15

Lanes, Volumes, Timings  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↗	↘	↙
Volume (vph)	216	105	19	215	105	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	10	10
Grade (%)	0%			0%	0%	
Storage Length (ft)		0	0		0	0
Storage Lanes		0	0		1	0
Taper Length (ft)		25	25		25	25
Link Speed (mph)	30			30	30	
Link Distance (ft)	735			840	401	
Travel Time (s)	16.7			19.1	9.1	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	0%	0%	2%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	349	0	0	255	135	0

Intersection Summary

Area Type: Other

HCM Unsignalized Intersection Capacity Analysis  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↗	↘	↙
Volume (veh/h)	216	105	19	215	105	19
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	235	114	21	234	114	21
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			349		567	292
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			349		567	292
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		76	97
cM capacity (veh/h)			1221		480	752

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	349	254	135
Volume Left	0	21	114
Volume Right	114	0	21
cSH	1700	1221	508
Volume to Capacity	0.21	0.02	0.27
Queue Length 95th (ft)	0	1	26
Control Delay (s)	0.0	0.8	14.6
Lane LOS		A	B
Approach Delay (s)	0.0	0.8	14.6
Approach LOS			B

Intersection Summary

Average Delay 2.9  
Intersection Capacity Utilization 40.7% ICU Level of Service A  
Analysis Period (min) 15

Lanes, Volumes, Timings  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↗	↘	↙
Volume (vph)	770	194	35	128	29	171
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	10	10
Grade (%)	0%			0%	0%	
Storage Length (ft)		0	0		0	0
Storage Lanes		0	0		1	0
Taper Length (ft)		25	25		25	25
Link Speed (mph)	30			30	30	
Link Distance (ft)	735			840	401	
Travel Time (s)	16.7			19.1	9.1	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	0%	0%	2%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1048	0	0	177	218	0

Intersection Summary

Area Type: Other

HCM Unsignalized Intersection Capacity Analysis  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↗	↘	↙
Volume (veh/h)	770	194	35	128	29	171
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	837	211	38	139	32	186
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			1048		1158	942
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1048		1158	942
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			94		85	42
cM capacity (veh/h)			672		206	321

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	1048	177	217
Volume Left	0	38	32
Volume Right	211	0	186
cSH	1700	672	297
Volume to Capacity	0.62	0.06	0.73
Queue Length 95th (ft)	0	4	133
Control Delay (s)	0.0	2.8	44.0
Lane LOS		A	E
Approach Delay (s)	0.0	2.8	44.0
Approach LOS			E

Intersection Summary

Average Delay 7.0  
Intersection Capacity Utilization 71.1% ICU Level of Service C  
Analysis Period (min) 15

Lanes, Volumes, Timings  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↗	↘	↙
Volume (vph)	770	198	35	128	29	171
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	10	10
Grade (%)	0%			0%	0%	
Storage Length (ft)		0	0		0	0
Storage Lanes		0	0		1	0
Taper Length (ft)		25	25		25	25
Link Speed (mph)	30			30	30	
Link Distance (ft)	735			840	401	
Travel Time (s)	16.7			19.1	9.1	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	0%	0%	2%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1052	0	0	177	218	0

Intersection Summary

Area Type: Other

HCM Unsignalized Intersection Capacity Analysis  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↗	↘	↙
Volume (veh/h)	770	198	35	128	29	171
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	837	215	38	139	32	186
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			1052		1160	945
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1052		1160	945
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			94		85	42
cM capacity (veh/h)			669		206	321

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	1052	177	217
Volume Left	0	38	32
Volume Right	215	0	186
cSH	1700	689	297
Volume to Capacity	0.62	0.06	0.73
Queue Length 95th (ft)	0	5	134
Control Delay (s)	0.0	2.8	44.3
Lane LOS		A	E
Approach Delay (s)	0.0	2.8	44.3
Approach LOS			E

Intersection Summary

Average Delay 7.0  
Intersection Capacity Utilization 71.4% ICU Level of Service C  
Analysis Period (min) 15

Lanes, Volumes, Timings  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↘	↗	↖
Volume (vph)	215	98	77	736	126	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	10	10
Grade (%)	0%			0%	0%	
Storage Length (ft)		0	0		0	0
Storage Lanes		0	0		1	0
Taper Length (ft)		25	25		25	25
Link Speed (mph)	30			30	30	
Link Distance (ft)	735			840	401	
Travel Time (s)	16.7			19.1	9.1	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	0%	0%	2%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	341	0	0	884	161	0

Intersection Summary

Area Type: Other

HCM Unsignalized Intersection Capacity Analysis  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↘	↗	↖
Volume (veh/h)	215	98	77	736	126	22
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	234	107	84	800	137	24
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			340		1254	287
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			340		1254	287
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			93		23	97
cM capacity (veh/h)			1230		178	757

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	340	884	161
Volume Left	0	84	137
Volume Right	107	0	24
cSH	1700	1230	201
Volume to Capacity	0.20	0.07	0.80
Queue Length 95th (ft)	0	5	141
Control Delay (s)	0.0	1.7	69.8
Lane LOS		A	F
Approach Delay (s)	0.0	1.7	69.8
Approach LOS			F

Intersection Summary

Average Delay 9.2  
Intersection Capacity Utilization 78.6% ICU Level of Service D  
Analysis Period (min) 15

Lanes, Volumes, Timings  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↗	↘	↙
Volume (vph)	215	72	72	736	103	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	10	10
Grade (%)	0%			0%	0%	
Storage Length (ft)		0	0		0	0
Storage Lanes		0	0		1	0
Taper Length (ft)		25	25		25	25
Link Speed (mph)	30			30	30	
Link Distance (ft)	735			840	401	
Travel Time (s)	16.7			19.1	9.1	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	0%	0%	2%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	312	0	0	878	132	0

Intersection Summary

Area Type: Other

HCM Unsignalized Intersection Capacity Analysis  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↗	↘	↙
Volume (veh/h)	215	72	72	736	103	18
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	234	78	78	800	112	20
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			312		1229	273
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			312		1229	273
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			94		40	97
cM capacity (veh/h)			1260		186	771

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	312	878	132
Volume Left	0	78	112
Volume Right	78	0	20
cSH	1700	1260	210
Volume to Capacity	0.18	0.06	0.63
Queue Length 95th (ft)	0	5	92
Control Delay (s)	0.0	1.6	47.4
Lane LOS		A	E
Approach Delay (s)	0.0	1.6	47.4
Approach LOS			E

Intersection Summary

Average Delay 5.8  
Intersection Capacity Utilization 75.2% ICU Level of Service D  
Analysis Period (min) 15

Lanes, Volumes, Timings  
1: Residential Dwy & Banta-Davis Drive

VHB

	↙	↖	↑	↗	↘	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↙		↖			↘
Volume (vph)	1	22	200	1	6	229
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12
Grade (%)	0%		0%			0%
Storage Length (ft)	0	0		0	0	
Storage Lanes	1	0		0	0	
Taper Length (ft)	25	25		25	25	
Link Speed (mph)	30		30			30
Link Distance (ft)	629		262			401
Travel Time (s)	14.3		6.0			9.1
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	25	0	218	0	0	256

Intersection Summary

Area Type: Other

HCM Unsignalized Intersection Capacity Analysis  
1: Residential Dwy & Banta-Davis Drive

VHB

	↙	↖	↑	↗	↘	↓
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↙		↖			↘
Volume (veh/h)	1	22	200	1	6	229
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	24	217	1	7	249
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	480	218			218	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	480	218			218	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	97			100	
cM capacity (veh/h)	542	822			1351	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	25	218	255
Volume Left	1	0	7
Volume Right	24	1	0
cSH	804	1700	1351
Volume to Capacity	0.03	0.13	0.00
Queue Length 95th (ft)	2	0	0
Control Delay (s)	9.6	0.0	0.2
Lane LOS	A		A
Approach Delay (s)	9.6	0.0	0.2
Approach LOS	A		

Intersection Summary

Average Delay 0.6  
 Intersection Capacity Utilization 26.9% ICU Level of Service A  
 Analysis Period (min) 15

Lanes, Volumes, Timings  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↕	↕	
Volume (vph)	770	195	40	128	32	190
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	10	10
Grade (%)	0%			0%	0%	
Storage Length (ft)		0	0		0	0
Storage Lanes		0	0		1	0
Taper Length (ft)		25	25		25	25
Link Speed (mph)	30			30	30	
Link Distance (ft)	735			840	401	
Travel Time (s)	16.7			19.1	9.1	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	0%	0%	2%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1049	0	0	182	242	0

Intersection Summary

Area Type: Other

HCM Unsignalized Intersection Capacity Analysis  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↕	↕	
Volume (veh/h)	770	195	40	128	32	190
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	837	212	43	139	35	207
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			1049		1169	943
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1049		1169	943
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			94		83	36
cM capacity (veh/h)			671		201	321

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	1049	183	241
Volume Left	0	43	35
Volume Right	212	0	207
cSH	1700	671	296
Volume to Capacity	0.62	0.06	0.82
Queue Length 95th (ft)	0	5	167
Control Delay (s)	0.0	3.1	54.3
Lane LOS		A	F
Approach Delay (s)	0.0	3.1	54.3
Approach LOS		F	

Intersection Summary

Average Delay 9.3  
Intersection Capacity Utilization 72.5% ICU Level of Service C  
Analysis Period (min) 15

Lanes, Volumes, Timings  
1: Residential Dwy & Banta-Davis Drive

VHB

	←		↑	→		↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		Y			Y
Volume (vph)	1	16	121	1	29	144
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12
Grade (%)	0%		0%			0%
Storage Length (ft)	0	0		0	0	
Storage Lanes	1	0		0	0	
Taper Length (ft)	25	25		25	25	
Link Speed (mph)	30		30			30
Link Distance (ft)	629		262			401
Travel Time (s)	14.3		6.0			9.1
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	18	0	133	0	0	189

Intersection Summary

Area Type: Other

HCM Unsignalized Intersection Capacity Analysis  
1: Residential Dwy & Banta-Davis Drive

VHB

	←		↑	→		↓
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		Y			Y
Volume (veh/h)	1	16	121	1	29	144
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	17	132	1	32	157
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	352	132			133	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	352	132			133	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	98			98	
cM capacity (veh/h)	632	817			1452	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	18	133	188
Volume Left	1	0	32
Volume Right	17	1	0
cSH	894	1700	1452
Volume to Capacity	0.02	0.08	0.02
Queue Length 95th (ft)	2	0	2
Control Delay (s)	9.1	0.0	1.4
Lane LOS	A		A
Approach Delay (s)	9.1	0.0	1.4
Approach LOS	A		

Intersection Summary

Average Delay 1.3  
Intersection Capacity Utilization 28.9% ICU Level of Service A  
Analysis Period (min) 15

Lanes, Volumes, Timings  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↗	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↗	↗
Volume (vph)	215	79	94	736	107	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	10	10
Grade (%)	0%			0%	0%	
Storage Length (ft)		0	0		0	0
Storage Lanes		0	0		1	0
Taper Length (ft)		25	25		25	25
Link Speed (mph)	30			30	30	
Link Distance (ft)	735			840	401	
Travel Time (s)	16.7			19.1	9.1	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	0%	0%	2%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	320	0	0	902	149	0

Intersection Summary

Area Type: Other

HCM Unsignalized Intersection Capacity Analysis  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↗	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↗	↗
Volume (veh/h)	215	79	94	736	107	30
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	234	86	102	800	116	33
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			320		1281	277
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			320		1281	277
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			92		31	96
cM capacity (veh/h)			1252		169	767

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	320	902	149
Volume Left	0	102	116
Volume Right	86	0	33
cSH	1700	1252	204
Volume to Capacity	0.19	0.08	0.73
Queue Length 95th (ft)	0	7	119
Control Delay (s)	0.0	2.0	59.1
Lane LOS		A	F
Approach Delay (s)	0.0	2.0	59.1
Approach LOS		F	

Intersection Summary

Average Delay 7.8  
Intersection Capacity Utilization 77.8% ICU Level of Service D  
Analysis Period (min) 15

Lanes, Volumes, Timings  
1: Residential Dwy & Banta-Davis Drive

VHB

	↙ ↘		↑		↗ ↖	
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↕		↕			↕
Volume (vph)	1	22	200	1	6	233
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12
Grade (%)	0%		0%			0%
Storage Length (ft)	0	0		0	0	
Storage Lanes	1	0		0	0	
Taper Length (ft)	25	25		25	25	
Link Speed (mph)	30		30			30
Link Distance (ft)	629		262			401
Travel Time (s)	14.3		6.0			9.1
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	25	0	218	0	0	260

Intersection Summary

Area Type: Other

HCM Unsignalized Intersection Capacity Analysis  
1: Residential Dwy & Banta-Davis Drive

VHB

	↙ ↘		↑		↗ ↖	
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↕		↕			↕
Volume (veh/h)	1	22	200	1	6	233
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	24	217	1	7	253
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	484	218			218	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	484	218			218	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	97			100	
cM capacity (veh/h)	539	822			1351	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	25	218	260
Volume Left	1	0	7
Volume Right	24	1	0
cSH	803	1700	1351
Volume to Capacity	0.03	0.13	0.00
Queue Length 95th (ft)	2	0	0
Control Delay (s)	9.6	0.0	0.2
Lane LOS	A		A
Approach Delay (s)	9.6	0.0	0.2
Approach LOS	A		

Intersection Summary

Average Delay 0.6  
Intersection Capacity Utilization 27.1% ICU Level of Service A  
Analysis Period (min) 15

Lanes, Volumes, Timings  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↘	↗	
Volume (vph)	770	199	40	128	32	190
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	10	10
Grade (%)	0%			0%	0%	
Storage Length (ft)		0	0		0	0
Storage Lanes		0	0		1	0
Taper Length (ft)		25	25		25	25
Link Speed (mph)	30			30	30	
Link Distance (ft)	735			840	401	
Travel Time (s)	16.7			19.1	9.1	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	0%	0%	2%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1053	0	0	182	242	0

Intersection Summary

Area Type: Other

HCM Unsignalized Intersection Capacity Analysis  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↘	↗	
Volume (veh/h)	770	199	40	128	32	190
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	837	216	43	139	35	207
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			1053		1171	945
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1053		1171	945
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			93		83	36
cM capacity (veh/h)			669		201	320

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	1053	183	241
Volume Left	0	43	35
Volume Right	216	0	207
cSH	1700	689	295
Volume to Capacity	0.62	0.07	0.82
Queue Length 95th (ft)	0	5	168
Control Delay (s)	0.0	3.1	54.8
Lane LOS		A	F
Approach Delay (s)	0.0	3.1	54.8
Approach LOS		F	

Intersection Summary

Average Delay 9.3  
Intersection Capacity Utilization 72.8% ICU Level of Service C  
Analysis Period (min) 15

Lanes, Volumes, Timings  
1: Residential Dwy & Banta-Davis Drive

VHB

	←		↑	→		↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		Y			Y
Volume (vph)	1	16	148	1	29	175
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12
Grade (%)	0%		0%			0%
Storage Length (ft)	0	0		0	0	
Storage Lanes	1	0		0	0	
Taper Length (ft)	25	25		25	25	
Link Speed (mph)	30		30			30
Link Distance (ft)	629		262			401
Travel Time (s)	14.3		6.0			9.1
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	18	0	162	0	0	222

Intersection Summary

Area Type: Other

HCM Unsignalized Intersection Capacity Analysis  
1: Residential Dwy & Banta-Davis Drive

VHB

	←		↑	→		↓
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		Y			Y
Volume (veh/h)	1	16	148	1	29	175
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	17	161	1	32	190
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	415	161			162	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	415	161			162	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	98			98	
cM capacity (veh/h)	561	604			1417	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	18	162	222
Volume Left	1	0	32
Volume Right	17	1	0
cSH	857	1700	1417
Volume to Capacity	0.02	0.10	0.02
Queue Length 95th (ft)	2	0	2
Control Delay (s)	9.3	0.0	1.2
Lane LOS	A		A
Approach Delay (s)	9.3	0.0	1.2
Approach LOS	A		

Intersection Summary

Average Delay 1.1  
Intersection Capacity Utilization 32.0% ICU Level of Service A  
Analysis Period (min) 15

Lanes, Volumes, Timings  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↘	↗	
Volume (vph)	215	105	99	736	130	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	10	10
Grade (%)	0%			0%	0%	
Storage Length (ft)		0	0		0	0
Storage Lanes		0	0		1	0
Taper Length (ft)		25	25		25	25
Link Speed (mph)	30			30	30	
Link Distance (ft)	735			840	401	
Travel Time (s)	16.7			19.1	9.1	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	0%	0%	2%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	348	0	0	908	178	0

Intersection Summary

Area Type: Other

HCM Unsignalized Intersection Capacity Analysis  
3: Bedford Rd (Rte 225) & Banta-Davis Drive

VHB

	→	↖	↙	←	↘	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↘	↗	
Volume (veh/h)	215	105	99	736	130	34
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	234	114	108	800	141	37
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			348		1306	291
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			348		1306	291
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			91		13	95
cM capacity (veh/h)			1222		162	753

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	348	908	178
Volume Left	0	108	141
Volume Right	114	0	37
cSH	1700	1222	194
Volume to Capacity	0.20	0.09	0.92
Queue Length 95th (ft)	0	7	181
Control Delay (s)	0.0	2.2	94.7
Lane LOS		A	F
Approach Delay (s)	0.0	2.2	94.7
Approach LOS		F	

Intersection Summary

Average Delay		13.2	
Intersection Capacity Utilization		81.2%	ICU Level of Service D
Analysis Period (min)		15	