



Nitsch Engineering

Traffic Assessment Report

115 West Main Street

Millbury, MA

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Nitsch Engineering Project #14139



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1 Introduction

Nitsch Engineering (Nitsch) has prepared this Traffic Assessment Report (TAR) for the proposed development at 115 West Main Street, Millbury, MA. This TAR will discuss the existing roadway conditions, access/egress, crash data, and traffic volumes; and assess the existing and future conditions at the intersections at the study location to establish the impact of the proposed development on traffic operations.

Figure 1 shows the Locus Map and Figure 2 shows the study area.

1.1 Existing Site

The proposed development site is bounded by West Main Street to the west, Burbank Street to the north, a landscaped lot to the east, and Singletary Brook to the south.

The site is occupied by 3-story and 2-story buildings annexed together, comprising approximately 35,000 square feet of gross floor area and is used by Steelcraft Inc., a manufacturer of medical equipment. Vehicular access is not provided to the site however pedestrian access to the buildings is provided via the Burbank Street and the West Main Street entrances. Parking spaces are provided on the northwest side of the buildings along Burbank Street.

1.2 Proposed Development

Based on the site improvement plan, the project will construct two (2) new 3-story buildings and renovate the existing Steelcraft buildings to create 197 residential units. The current plan for the apartment mix is shown in Table 1.

Table 1 – Apartment Mix

Type	Percent Mix	Number of Units	Number of Bedrooms
Efficiency	51%	100	100
1-Bedroom	36%	70	70
2-Bedroom	13%	27	54
Total	100%	197	224

In addition, 2,400 square feet will be allocated for restaurants and 7,500 square feet will be allocated for office space. A small, approximately 1,400-square-foot, 2-story parking garage will be constructed on the western side of the site. A total of 330 parking spaces will be provided on site; 295 parking spaces in the apartment complex underground parking garages, 27 surface parking spaces on Burbank Street, and 8 surface parking spaces on West Main Street. 74 spaces will be allocated to restaurant and office space users. Access to the parking garages will be provided via two separate entrances on Burbank Street.

1.3 Study Area

The study area includes the 115 West Main Street Development driveways, the adjacent three (3) roadways and one (1) intersection.



Roadways

- West Main Street
- Burbank Street
- High Street

Intersection

- West Main Street at Burbank Street/High Street

1.4 Methodology

The traffic analysis herein is summarized in the following sections:

1. An inventory of existing transportation conditions, including roadway, parking, transit, pedestrian, and bicycle circulation.
2. An evaluation of future transportation conditions and an assessment of potential traffic impacts associated with the Project and other neighboring projects. Long-term impacts are evaluated for the year 2025, based on a five-year horizon from the 2020 base year. Expected roadway, parking, transit, pedestrian, and loading conditions and deficiencies are identified. This section includes the following scenarios:
 - a. The No-Build Scenario (2025) includes general background growth and additional vehicular traffic associated with specific proposed or planned developments and roadway changes in the vicinity of the Project site; and
 - b. The Build Scenario (2025) includes specific travel demand forecasts for the Project.
3. An identification of appropriate measures to mitigate Project-related impacts identified in the previous phase.
4. An evaluation of short-term traffic impacts associated with construction activities is also included.

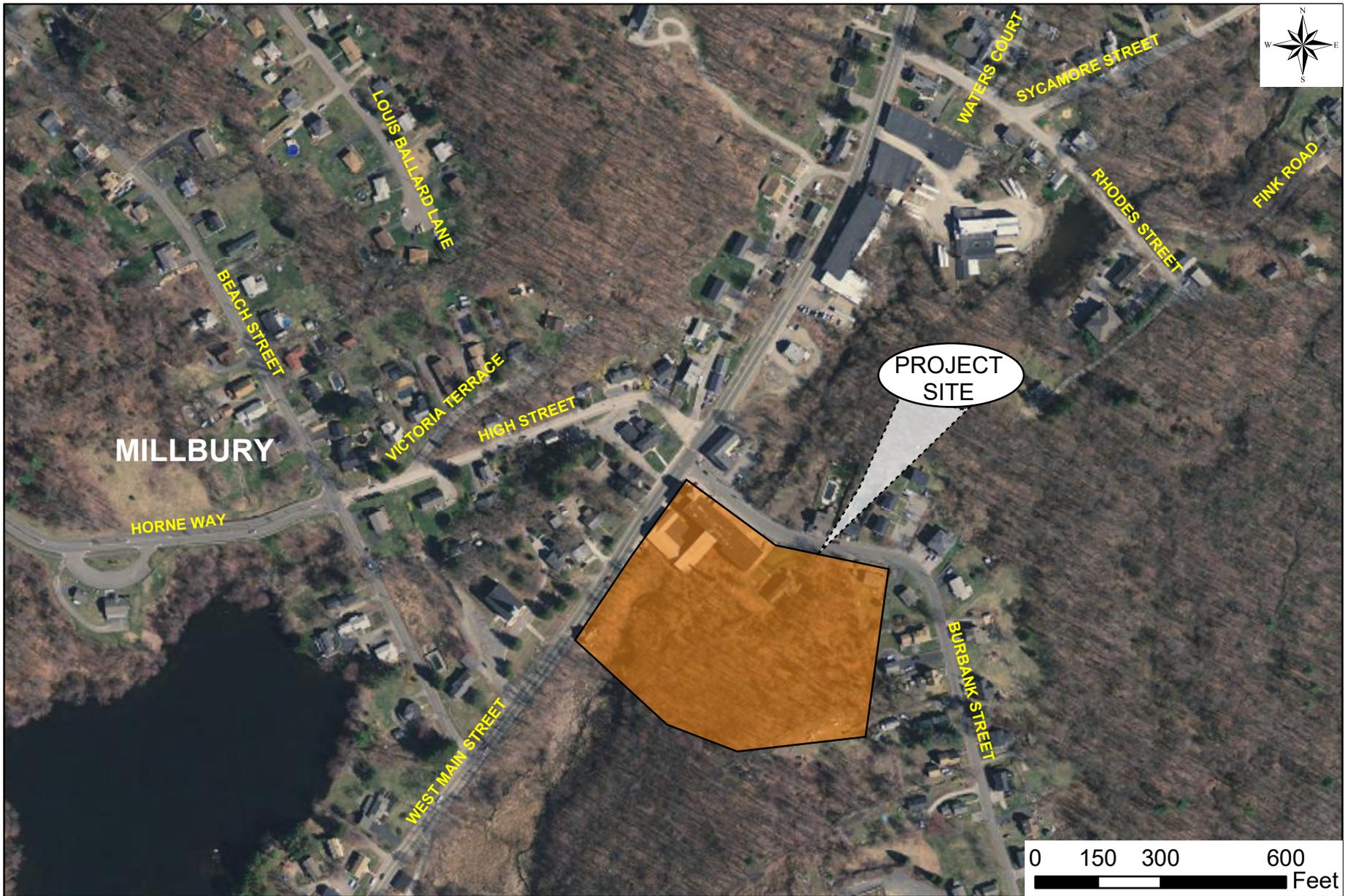


Figure 1: Locus Map

115 West Main Street
Millbury, MA

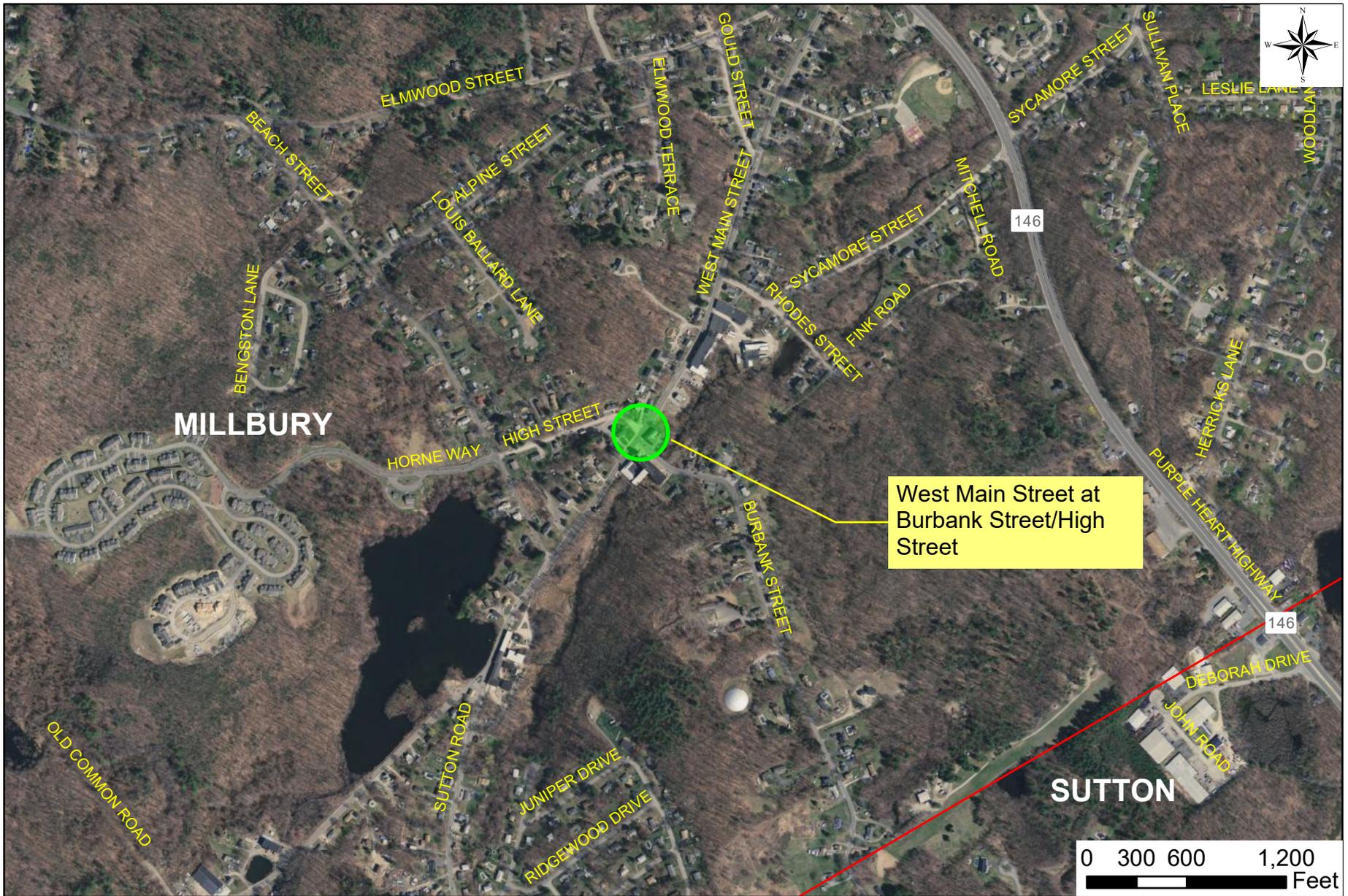


Figure 2: Study Area

115 West Main Street
Millbury, MA



2 Existing Conditions

2.1 Study Roadways

West Main Street

West Main Street is a two-way urban minor arterial under the Town of Millbury jurisdiction, that runs in the north-south direction from its northern terminus at the Worcester-Providence Turnpike (Rte. 146) to Singletary Road and then continues in the east-west direction from Singletary Road to its western terminus at the Town of Auburn boundary. In the immediate vicinity of the site, West Main Street is separated by a double yellow center line (DYCL), providing one 15-foot-wide lane in the northbound direction and one 18-foot-wide lane in the southbound direction. Sidewalks are present continuously on the northbound side of the roadway. Speed limit or on-street parking restriction signs are not posted in the immediate vicinity of the site.

Burbank Street

Burbank Street is a two-way local roadway under the Town of Millbury jurisdiction that runs in the general north-south direction from its northern terminus at West Main Street to its southern terminus at Boston Road. In the immediate vicinity of the site, Burbank Street is 24 feet wide although no lane markings are provided. Asphalt sidewalks are present on both sides of the roadway. Speed limit or on-street parking restriction signs are not posted in the immediate vicinity of the site.

High Street

High Street is a two-way local roadway under the Town of Millbury jurisdiction that runs in the general east-west direction from its eastern terminus at West Main Street to its western terminus at Beach Street where it transitions to Horne Way. In the immediate vicinity of the site, High Street is 20 feet wide although no lane markings are provided. Sidewalk is present on the south side of the roadway. Speed limit or on-street parking restriction signs are not posted in the immediate vicinity of the site.

2.2 Study Intersection

West Main Street at Burbank Street/High Street

West Main Street intersects with Burbank Street and High Street to form an offset four-legged unsignalized intersection, with West Main Street operating freely and approaching from the north and the south, Burbank Street operating under stop control and approaching from the east, and High Street operating under stop control and approaching from the west.

The West Main Street northbound approach to the intersection consists of one 16-foot wide through/left turn/right turn lane and the West Main Street southbound approach consists of one 18-foot wide through/left turn/right lane. The High Street eastbound approach consists of one 10-foot wide through/left turn/right turn lane and the Burbank Street westbound approach consists of one 14-foot wide through/left turn/right turn lane.

At the intersection, four (4) angled parking spaces are provided on the north side of Burbank Street for the Village Knoll market and unmarked parking spaces are located on the south side of Burbank Street for the existing Steelcraft building. Crosswalks are present at the southbound and westbound approaches however the wheelchair ramps appear to be not ADA-compliant as they are missing detectable warning panels.



2.3 Public Transportation

Public transportation services are not available in the vicinity of the site. However, Worcester Regional Transit Authority (WRTA) provides bus services at Millbury Town Center which is about 1.0 miles northeast of the site. WRTA provides direct connections to Worcester Union Station, Northbridge, and Grafton from the Town Center. WRTA also provides paratransit service for the elderly and disabled from 8:00 AM to 4:30 PM. In addition, the Town of Millbury provides curb-to-curb van services for the elderly and disabled.

2.4 Bicycle Facilities

Shared or dedicated bike lanes are not present on the subject roadways. Shoulders are also not provided on these roadways. There is a proposed 48-mile-long bikeway, the Blackstone River Bikeway, consisting of on and off-road segments along the Blackstone River, connecting Worcester, MA and Providence, RI. A 2.5-mile segment of the bikeway between the Blackstone Heritage Corridor Visitor Center in Worcester and the parking lot at 1265 Millbury Street in Millbury, approximately 1.75 miles north of the site, has been completed.

2.5 Pedestrian Facilities

Near the project site, sidewalks are present on both sides of West Main Street and Burbank Street, and the southbound side of High Street, providing a good opportunity for pedestrian mobility. Crosswalks are present on Burbank Street and the north of West Main Street. However, ADA compliant ramps and detectable panels are not present.

3 Existing Traffic Conditions

3.1 Traffic Count Data

We reached out to the Town of Millbury and the Central Massachusetts Regional Planning Commission (CMRPC) as well as reviewed the MassDOT Transportation Data Management System (TDMS) to determine if traffic count data is available for our study intersections and roadways. We had also coordinated with the Project Manager for MassDOT's recently completed project at the intersection of Route 146 over West Main Street and obtained the Functional Design Report and traffic data for this project. Turning Movement Count (TMC) data at the study intersection was not available in any of the reports, however, we obtained hourly traffic data at the following two locations:

- West Main Street, west of Sutter Road, data collected on 6/20/2017 (from CMRPC)
- On Sutton Road, east of West Main Street, data collected on 6/20/2017 (from MassDOT TDMS)

We used the hourly traffic data from these two locations to estimate West Main Street northbound and southbound morning and evening peak hour traffic. The data from these two locations are included in Appendix A.

We applied a seasonal adjustment factor (0.89) and a background growth factor (0.6%) to the estimated data to obtain 2020 peak hour data at the study intersection. Discussions on seasonal adjustment factor and background growth rate are described in sections 3.2 and section 4.1, respectively. We were not able to obtain data for Burbank Street or High Street. As the traffic from the existing land uses on Burbank Street would be potentially

low relative to West Main Street, we assumed that there would be no traffic impact on the study intersection by Burbank Street or High Street traffic. Figure 3 presents the 2020 Existing Peak Hour Volumes.

3.2 Seasonal Adjustment

Nitsch Engineering researched MassDOT traffic data for counts nearby that would establish a seasonal adjustment for the volumes we obtained from 2017. Due to the lack of data on comparable roadways in the vicinity of the project location, we used MassDOT’s 2017 Weekday Seasonal Adjustment Factors. West Main Street falls within Group U4 – “Urban Minor Arterial” for which the seasonality factor for the month of June is 0.89. We multiplied this factor to the to adjust the existing data. MassDOT’s 2017 Weekday Seasonal Factors is included in Appendix B.

3.3 Safety Review

We obtained crash data within the study intersection for three (3) most recent years (2017- 2019) available from Millbury Police Department. Table 2 summarizes the crash statistics for the study intersection.

Table 2 – Crash Statistics

Location	Number of Crashes			Severity					Manner of Collision				Percent During	
	Year	Total Crashes	Annual Average	PD ^a	PI ^b	NR ^c	F ^d	A ^e	RE _f	HO _g	Other ^h	Incl. Ped-Bike ^j	Peak Hours ^k	Wet/Icy Conditions
West Main Street at Burbank Street/High Street	2017	2	3.0			2		1			1			
	2018	3		2	1			2	1				67%	
	2019	4		4				1	1		2		25%	
	Total	9		6	1	2	0	4	2	0	3	0	33%	0
^a Property Damage Only; ^b Personal Injury Only (non-Fatal Injury); ^c Not Reported; ^d Fatality; ^e Angle; ^f Rear-end; ^g Head-on; ^h Sideswipe, opposite direction; sideswipe, same direction, single vehicle crash, rear-to-rear, not reported, unknown, etc.; ^j Includes pedestrian or cyclist; ^k Occurred between 7-9am or 4-6pm														

A total of 9 crashes were reported within the study intersection from 2017 to 2019. In terms of severity, one (1) crash reported personal injury, and there were no crashes with reported fatalities. Angle crashes were the most frequent type of crash with a total of four (4) crashes, and of the remaining crashes, two (2) were rear-end, one (1) was single vehicle, one (1) crash was rear-to-rear, and one (1) crash was sideswipe (same direction). No pedestrian crashes were reported. 33% of all crashes in the study area occurred during peak hours.

Crash rates for intersections are expressed by the number of crashes per million entering vehicles (MEV), and crash rates for roadway segments are expressed by the number of crashes per million vehicle miles traveled (MVMT). Table 3 compares the crash rates for the study.

Table 3 – Crash Rate Summary

Location	Facility Type	Number of Crashes ^a	Crash Rate ^b	Average Rates ^{b,c}		Comparison to Average Rates	
				District 3	Statewide	District 3	Statewide
West Main Street at Burbank Street/ High Street	Unsignalized	9	1.05	0.61	0.57	Above	Above
^a Based on 3-year crash history from MassDOT, 2017-2019 ^b Intersections: Crashes per million entering vehicles (MEV), Roadway Segments: Crashes per million vehicle miles traveled (MVMT) ^c Based on latest MassDOT crash data queried June 2018.							

As shown in Table 3, the Crash Rate at the study intersection is above the District 3 and statewide averages.

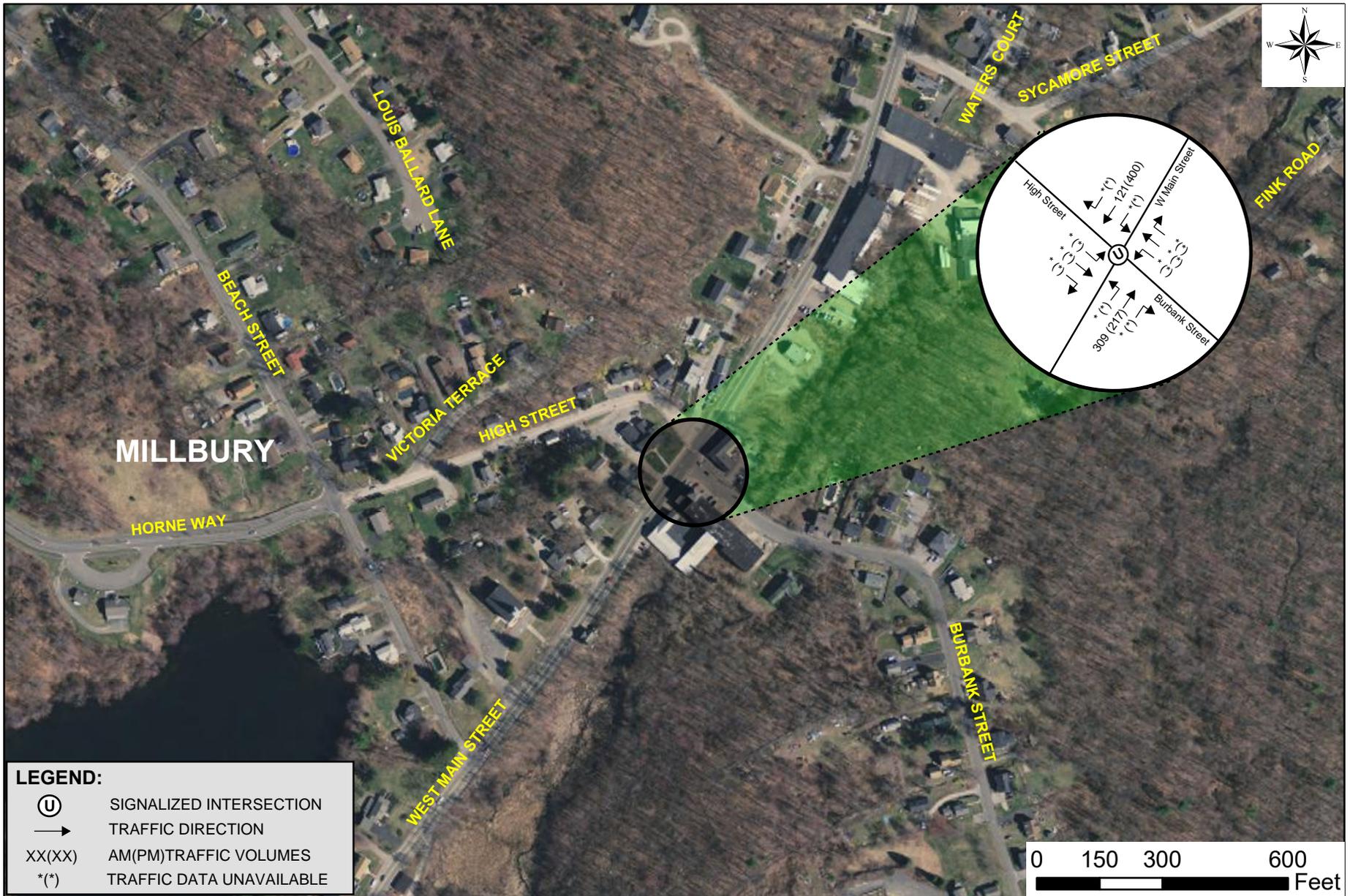


Figure 3: 2020 Existing Traffic Volumes

115 West Main Street
 Millbury, MA

4 Future No-Build Traffic Conditions

We used the seasonally adjusted and projected 2020 existing peak hour traffic volumes as the baseline for projecting traffic volumes to the future 2025 no-build condition. To determine the future 2025 no-build condition volumes, we performed the following steps:

- Project the 2020 traffic volumes five years into the future to the horizon year, 2025, using an annual background traffic growth factor;
- Include any planned roadway improvements that may affect traffic volumes; and
- Add traffic volumes associated with any planned developments that may impact the study area.

4.1 Background Growth

MassDOT records traffic volumes at various stations throughout the Commonwealth over multiple years to identify regional shifts in traffic. Nitsch Engineering researched MassDOT count stations near the study area to determine a traffic volume trend throughout the years of volume data available. Due to the lack of continuous count stations in Millbury or nearby towns, we used MassDOT count station #240697, located on Singletary Road at the boundary of the Town of Millbury and the Town of Sutton, about 0.6 mile southwest of the study intersection. Table 4 depicts the traffic volumes and the calculated growth rate for a 2- year period.

Table 4 – Background Annual Traffic Growth Rate

Count Location	AADT ¹ , Year		Annual Growth Rate
	2017	2019	
Singletary Road at Sutton Town Boundary	2,397	2,394	2017 - 2019
			-0.06%
¹ Annual Average Daily Traffic (AADT) is the average traffic volume for the entire given calendar year (Source: Massachusetts Department of Transportation (MassDOT))			

Table 4 shows a background traffic growth rate about -0.06% per year between 2017 and 2019. However, using a negative growth rate is not an accurate means for projecting future traffic. Therefore, we reviewed the FDR received for MassDOT’s Route 146 over West Main Street Project and used a 0.6% growth rate to represent regional background growth of traffic in this area. Per the FDR, this rate was calculated by taking the average of the employment and population growth values from the transportation analysis zones in the CMRPC’s regional model for current and future analysis years. We applied this growth rate over a 3-year period to project 2020 Existing peak hour counts (Figure 3) and over the 5-year design period from 2020 to estimate 2025 for future no build traffic data.

4.2 Planned Roadway Improvements

We researched the MassDOT Project Information website¹ to establish if there are any planned roadway improvements in the towns near the study area that could potentially affect traffic operations. We have not identified any project that is under construction or in design that could potentially impact the study intersection.

4.3 Additional Development

We contacted the Town of Millbury to establish if any planned developments will potentially add traffic to the study area. We obtained information on one housing development project, Stratford Village, that is under construction near the site. The development involves the construction of 49 duplex and triplex townhouses at 42 Burbank Street. The development was originally approved as a 55 and older development but now the requirement has been lifted. Access to the development will be provided via an entrance on Burbank Street.

We obtained the vehicular trip generation at Stratford Village by using the Institute of Transportation Engineers' (ITE) *Trip Generation, 10th Edition*² ("the ITE method"). As most units are duplexes, we used Land Use Code (LUC) 220 – "Multifamily Housing (Low-Rise)", which includes apartments, townhouses, and condominiums located within the same building with at least three (3) other dwelling units and between one (1) or two (2) levels (floors) of residence. Table 5 shows the trips generated from Stratford Village.

Table 5 – Stratford Village Peak Hour Trip Generation

Period	Direction	Stratford Village (vehicle)
Weekday morning	Enter	7
	Exit	20
	Total	27
Weekday evening	Enter	19
	Exit	14
	Total	33

To assess the impact at our study intersection, we assumed that all trips generated from Stratford Village will be distributed at our study intersection. We applied the trip distribution discussed in section 5.3 to get the trip assignment at our study intersection.

4.4 2025 No-Build Traffic Volumes

The 2025 future year traffic volumes were calculated by projecting the 2020 traffic volumes and applying the 0.6% annual traffic increase over the five-year assessment period and then adding the trips generated by the Stratford Village. The results are presented in Figure 4.

¹ <https://hwy.massdot.state.ma.us/projectinfo/projectinfo.asp>

² *Trip Generation*, Institute of Transportation Engineers, 10th Edition, 2016, Washington, D.C

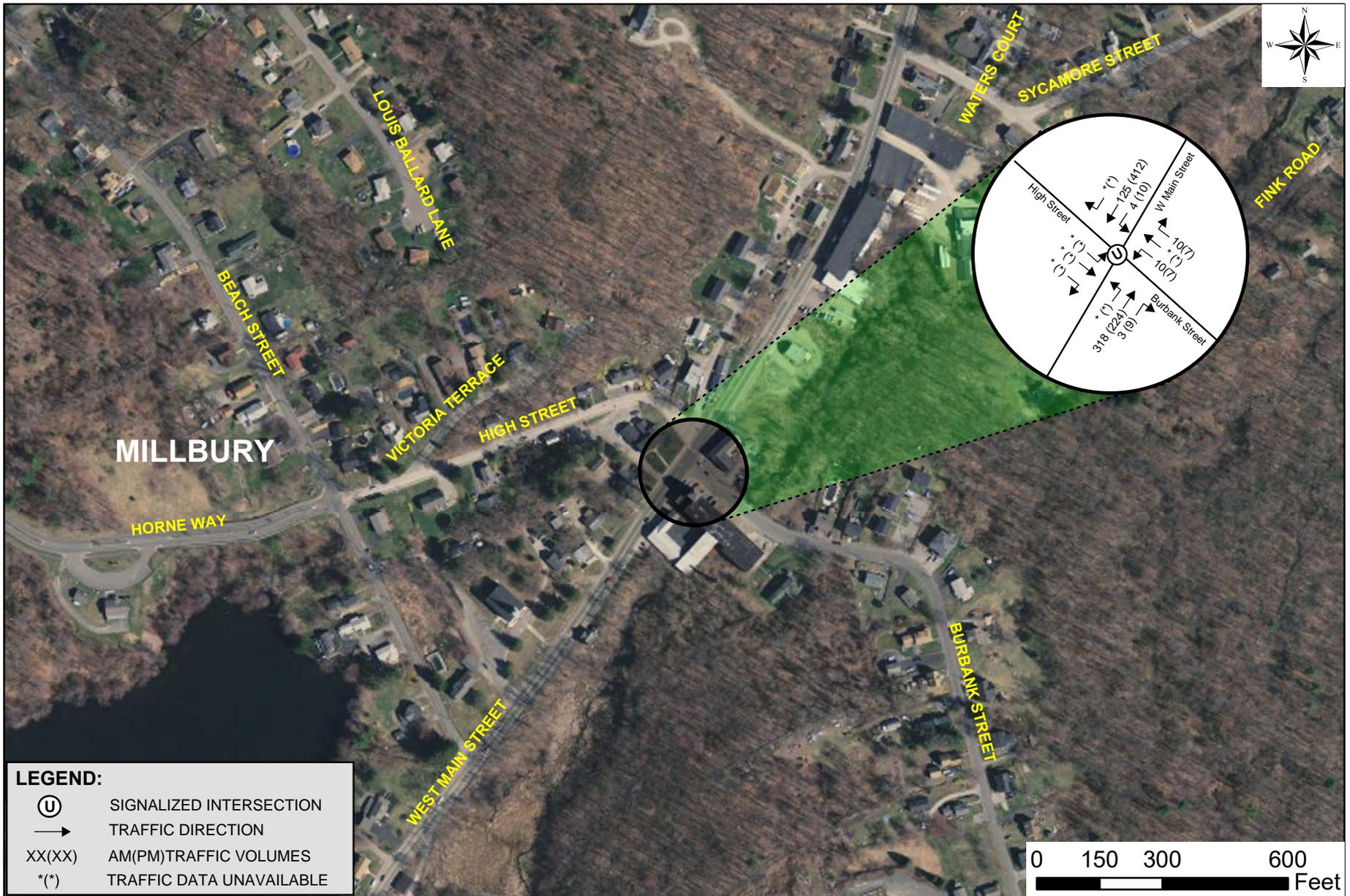


Figure 4: 2025 Future No-Build Traffic Volumes

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Millbury, MA

5 Proposed Future Conditions

5.1 Proposed Site Changes

The proposed project will renovate the existing Steelcraft buildings and construct two (2) new 3-story buildings to create 197 studio, one-bedroom, and two-bedroom apartments, 2,400 square feet restaurant space, and 7,500 square feet office space, and construct a small, approximately 1,400-square-foot, 2-story parking garage. A total of 330 parking spaces will be provided on site: 295 parking spaces in the apartment complex underground parking garages, 27 surface parking spaces on Burbank Street, and 8 surface parking spaces on West Main Street. 74 spaces will be allocated to restaurant and office space users. Access to the parking garages will be provided via two separate entrances on Burbank Street.

5.2 Trip Generation

We estimated the trip generation for the existing use and the proposed use to obtain the net trip generation by using the Institute of Transportation Engineers' (ITE) *Trip Generation, 10th Edition*³ ("the ITE method"). For the existing Steelcraft buildings we used Land Use Code (LUC) 140 – "Manufacturing". For the new apartment complex, we used Land Use Code (LUC) 221 – "Multifamily Housing (Mid-Rise)", which includes apartments, townhouses, and condominiums located within the same building with at least three (3) other dwelling units and between three (3) and 10 levels (floors) of residence. For the offices, we used Land Use Code (LUC) 710- "General Office Buildings". For the restaurants, we used Land Use Code (LUC) 932- "High-Turnover (Sit-Down) Restaurant". We obtained person-trips for apartment complex and office spaces and vehicle-trips for manufacturing buildings and restaurants as ITE does not provide person-trips for these categories.

Based on the Town of Millbury 2019 Master Plan⁴, less than 15% of Millbury's employed labor force works in Millbury and most residents prefer to use personal vehicles over other modes of travel. About 84% of travelers use single occupancy vehicles and 11% carpool, suggesting that 95% of people prefer cars. Therefore, the average vehicle occupancy factor is approximately 1.1 persons per vehicle which we applied to the vehicle trip generation for the existing Steelcraft buildings and future restaurants to estimate person-trips for these uses. We obtained the net future trips generated from the site by subtracting Future trips from the existing trips as shown in Table 6.

Table 6 – Peak Hour Trip Generation

Period	Direction	Future Peak Hour Trips			Existing Peak Hour Trips	Net Peak Hour Trips (persons)
		Apartment Trips (persons)	Office Trips (persons)	Restaurant Trips (persons)	Steelcraft Trips (persons)	
Weekday morning	Enter	17	10	21	22	26
	Exit	46	1	17	9	55
	Total	63	11	38	31	81
Weekday evening	Enter	60	2	24	13	73
	Exit	39	10	22	18	53
	Total	99	12	46	31	126

³ *Trip Generation*, Institute of Transportation Engineers, 10th Edition, 2016, Washington, D.C.

⁴ *Comprehensive Master Plan 2019*, Town of Millbury

Mode Share

The Town of Millbury 2019 Master Plan⁵ published the transportation mode share which states that 95% of people use cars, only 1% of people use public transportation, and 3% of people work from home. We applied this data to the net peak hour trips (Table 6) to determine the mode share for the proposed development, which is shown in Table 7.

Table 7 – Mode Share for the Proposed Development (Net Trip Generation)

Mode	Mode Share	Weekday Morning			Weekday Evening		
		Enter	Exit	Total	Enter	Exit	Total
Vehicle (car and carpool)	95%	25	52	77	69	51	120
Public Transportation	1%	0	1	1	1	0	1
Walk/ Bicycle	0%	0	0	0	0	0	0
Work from Home	3%	1	1	2	2	2	4
Other	1%	0	1	1	1	0	1
Total	100%	26	55	81	73	53	126

Detailed trip generation calculations are provided in Appendix D.

5.3 Trip Distribution

We based the additional peak-hour trips to/from the site using the existing distribution. The results are shown in Table 8.

Table 8 – Trip Distribution

Direction and Roadway	Percentage
To/From North of W Main Street	50%
To/From South of W Main Street	50%
Total	100%
Source: Figure 3 – 2020 Existing Peak Hour Traffic Volumes	

5.4 Trip Assignment

Between the two parking garage entrances and 27 on-street parking spaces on Burbank Street, 98% of project generated trips will be coming to/from Burbank Street. For the purposes of this assessment, we assumed that all peak hour trips will be distributed through Burbank Street. Therefore, we assigned the net peak-hour vehicle trips shown in Table 7 by the Trip Distribution percentages shown in Table 8. The resultant new trip assignment volumes are shown in Figure 5.

⁵ *Comprehensive Master Plan 2019*, Town of Millbury

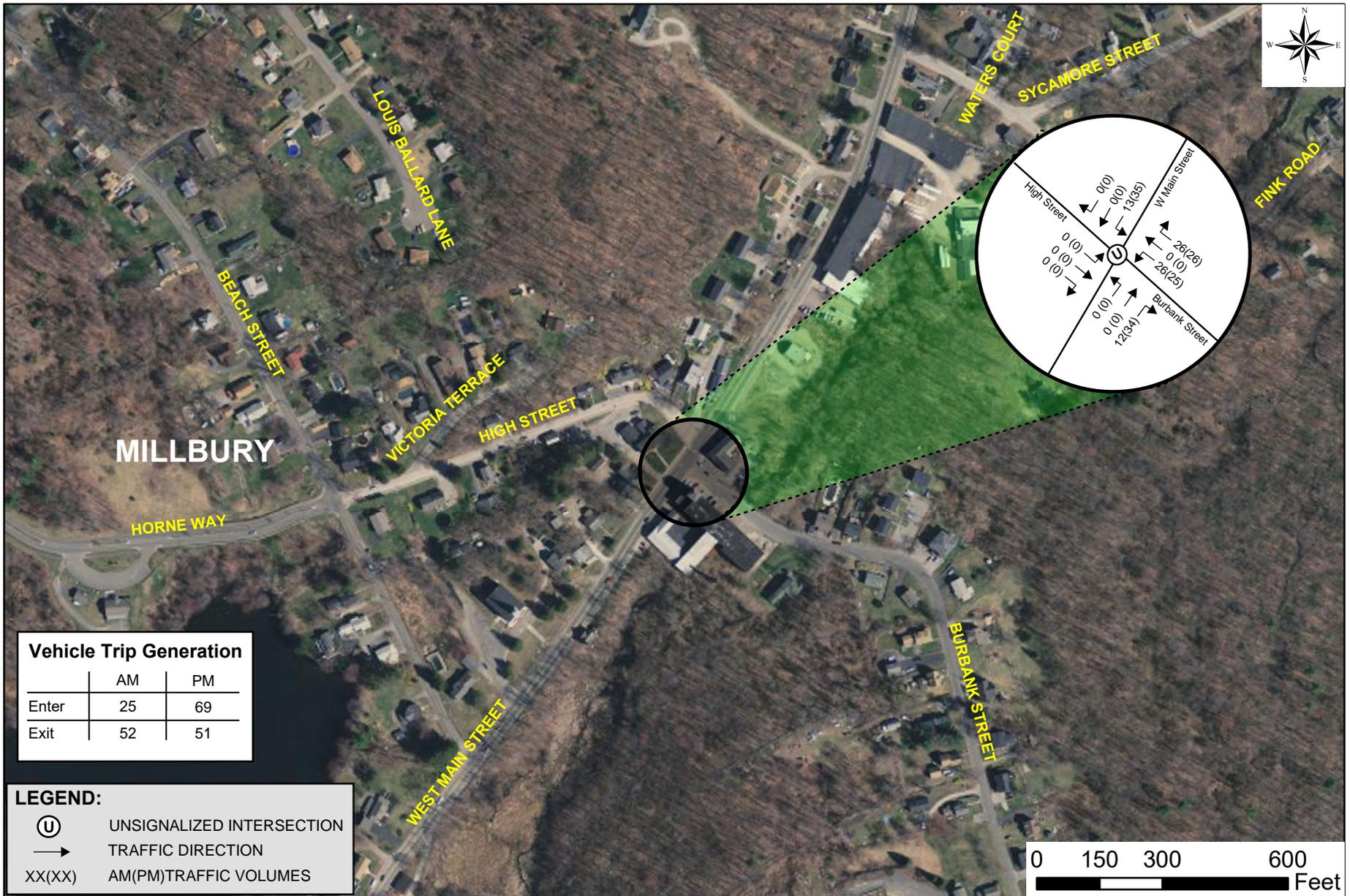


Figure 5: Net Trip Assignment

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5.5 2025 Build Traffic Volumes and Operations Assessment

We added the Trip Assignment volumes from Figure 5 to 2025 No-Build conditions traffic volumes from Figure 4 to yield the 2025 Build conditions peak-hour traffic volumes, which are shown Figure 6. Table 9 shows the net increase in traffic to the intersection of West Main Street and Burbank Street/High Street from the 2025 No-Build condition to the 2025 Build Condition.

Table 9 – Increase in Traffic at Study Intersection

Roadway and Approach	Time Period					
	Weekday Morning Peak			Weekday Evening Peak		
	2025 No-Build Traffic	2025 Build Traffic	Percent Increase	2025 No-Build Traffic	2025 Build Traffic	Percent Increase
Burbank Street Westbound	20	72	260%	14	65	364%
West Main Street Northbound	321	333	4%	233	267	15%
West Main Street Southbound	129	142	10%	435	457	5%
Total	470	547	16%	682	789	16%

As seen in Table 9, the proposed development will increase intersection volumes by 16% in the morning peak hour and in the evening peak hour period to this intersection. As the increase in traffic in all approaches is considered low, it is unlikely that there would be any deficiency in traffic operations at this intersection.

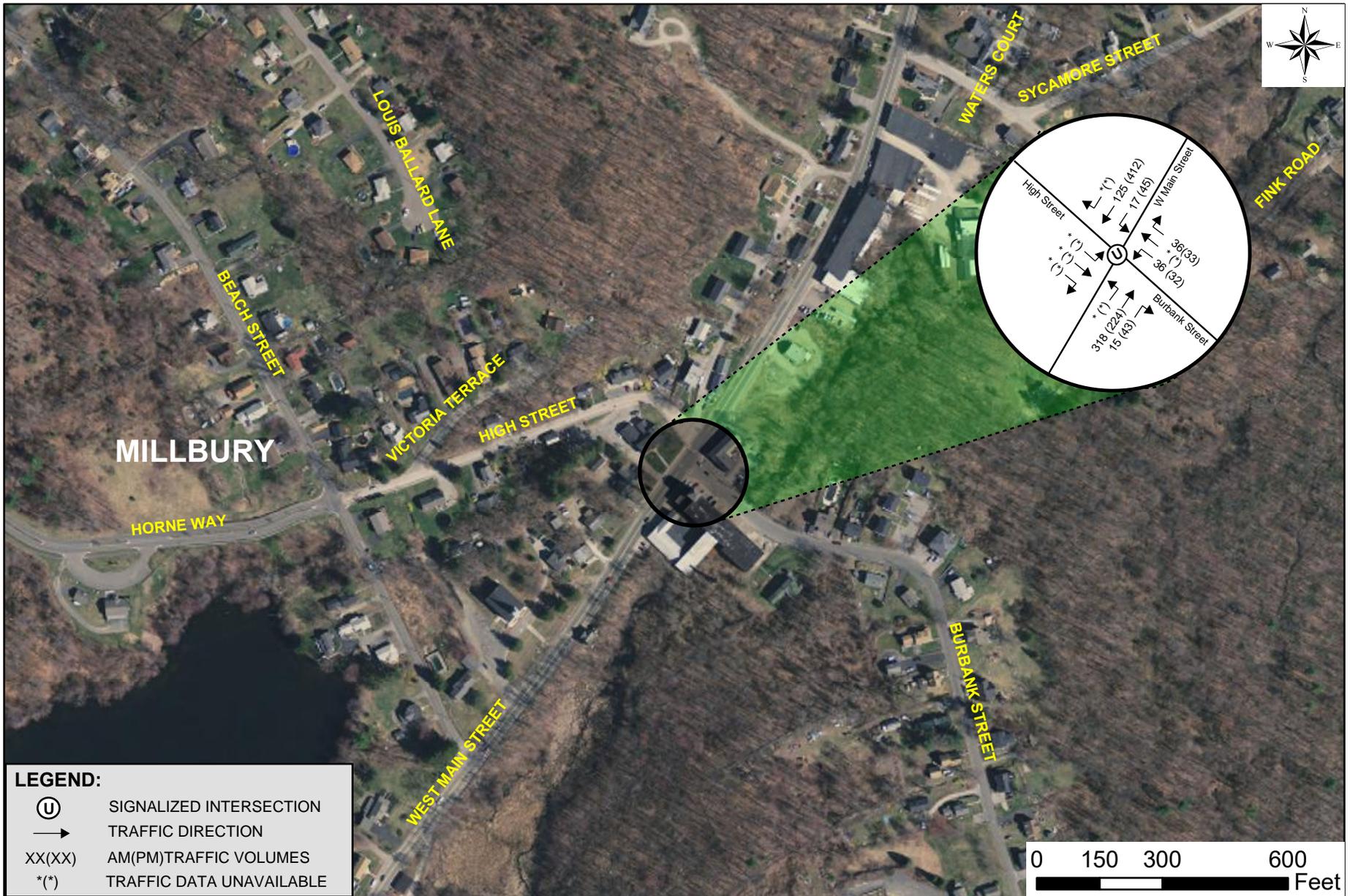


Figure 6: 2025 Build Condition Peak Hour Traffic Volumes

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5.6 Parking Generation

To estimate the required amount of parking needed for the proposed development, we used the *ITE Parking General Manual*, 5th Edition. For the apartment complex, we used the Land Use Code 221 “Multifamily Housing (Mid-Rise)” with dwelling units as the independent variables. For the office space, we used the Land Use Code 710 “General Office Building” and for the restaurant, we used the Land Use Code 932 “High-Turnover (Sit Down) Restaurant”. Table 10 shows the parking generated from each type of land use for weekday and Saturday.

Table 10 – ITE Parking Generation

Period	Type			Total
	Apartments	Office	Restaurants	
Weekday	258	18	23	299
Saturday	240	2	29	271

As reported by the developer, the project team met with the Town of Millbury’s Technical Review Committee on March 16, 2020 and had negotiated parking requirements. Using the parking ratios, we calculated the amount of parking spaces required by the Town for each type of use. We provided the required parking along with the parking spaces provided and compared them to the ITE Parking Generation in Table 11.

Table 11 – Parking Comparison

Type		Number of Units/ Area	TRC Parking Requirements ^a	TRC Parking Required ^a	Parking Provided ^b	ITE Parking Generation ^c
Residential	Efficiency	100	1 per dwelling unit	100	-	-
	1-Bedroom	70	2 per dwelling unit	140	-	-
	2-Bedroom	27	3 per 2-bedroom dwelling unit	81	-	-
Residential Total				321	295	258
Office Space		7,500 sq. ft.	1 per 200 sq. ft. gross leasable area	38	--	18
Restaurants		2,400 sq. ft. (108 seats)	1 per 4 seats	27	--	23
Commercial Total				65	--	41
Additional Parking (Burbank Street and West Main Street)					35	-
Grand Total				386	330	299
Sources: ^a TRC agreed parking, ^b Site Improvement Plan, ^c Table 10 (represents weekday requirements due to higher total required parking)						

As shown in Table 11, the total number of spaces provided is 56 spaces less than the number of spaces required by the TRC therefore a variance will be required from the Town. However, the parking spaces provided exceeds the ITE parking requirements showing that it is anticipated the amount parking provided is sufficient to meet the demand.



5.7 Construction Management Outline

During construction of the development, no detours or lane closures at any of the study intersections or study roadways is anticipated.

During construction, pedestrian accessibility should be maintained. If necessary, temporary crosswalks and ramps should be provided. All pedestrian accommodations should adhere to Massachusetts Architectural Access Board (MAAB) and Americans with Disabilities Act (ADA) guidelines.

6 Conclusions

Nitsch Engineering has prepared this Traffic Assessment Report (TAR) for the proposed development at 115 West Main Street, Millbury, Ma. We studied one (1) unsignalized intersection to assess the impact the renovation of the existing Steelcraft buildings and the construction of two (2) new 3-story buildings would have on the intersection traffic operations.

The crash data over the last three (3) years available from the Millbury Police Department indicate that the study intersections have crash rates above District 3 and statewide averages.

For future conditions, we projected the existing traffic volumes within the study area over a 5-year period to the horizon year 2025 using an annual growth rate of up to 0.6%, based on expected regional growth. We estimated the quantity of vehicle trips the proposed development would generate based on Institute of Transportation Engineers (ITE) *Trip Generation, 10th Edition* criteria. We applied an appropriate travel mode share based on the Town of Millbury Master Plan (2019) and distributed the additional vehicle trips to the roadway network using existing travel patterns and site access modification.

Our assessment shows that the increase of traffic caused by the development on the roadway network would be small, suggesting low impact on traffic operations and safety at the intersection. Therefore, we do not recommend any changes to the intersection geometry, traffic control, or roadway network.



APPENDIX CONTENTS

<u>Appendix</u>	<u>Description</u>
A	Traffic Count Data
B	MassDOT's 2017 Weekday Seasonal Adjustment Factors
C	Crash Rate Worksheet
D	Detailed Trip Generation



Appendix A: Traffic Count Data

Town : Millbury
 Street : West Main Street
 Location : West of Sutton Road

Site: 2017108

Weekly Volume

Interval Start	Mon 6/19/2017		Tue 6/20/2017		Wed 6/21/2017		Thu 6/22/2017		Fri 6/23/2017		Sat 6/24/2017		Sun 6/25/2017		Mon - Fri Average		Weekly Average	
	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB
12:00 AM	-	-	14	3	10	6	-	-	-	-	-	-	-	-	12.0	4.5	12.0	4.5
1:00 AM	-	-	5	3	12	6	-	-	-	-	-	-	-	-	8.5	4.5	8.5	4.5
2:00 AM	-	-	2	4	1	2	-	-	-	-	-	-	-	-	1.5	3.0	1.5	3.0
3:00 AM	-	-	6	5	5	5	-	-	-	-	-	-	-	-	5.5	5.0	5.5	5.0
4:00 AM	-	-	8	20	11	22	-	-	-	-	-	-	-	-	9.5	21.0	9.5	21.0
5:00 AM	-	-	26	78	22	77	-	-	-	-	-	-	-	-	24.0	77.5	24.0	77.5
6:00 AM	-	-	56	151	65	163	-	-	-	-	-	-	-	-	60.5	157.0	60.5	157.0
7:00 AM	-	-	76	237	92	237	-	-	-	-	-	-	-	-	84.0	237.0	84.0	237.0
8:00 AM	-	-	97	191	81	186	-	-	-	-	-	-	-	-	89.0	188.5	89.0	188.5
9:00 AM	-	-	96	150	87	161	-	-	-	-	-	-	-	-	91.5	155.5	91.5	155.5
10:00 AM	-	-	105	116	133	140	-	-	-	-	-	-	-	-	119.0	128.0	119.0	128.0
11:00 AM	-	-	121	113	-	-	-	-	-	-	-	-	-	-	121.0	113.0	121.0	113.0
12:00 PM	147	114	152	128	-	-	-	-	-	-	-	-	-	-	149.5	121.0	149.5	121.0
1:00 PM	142	125	145	121	-	-	-	-	-	-	-	-	-	-	143.5	123.0	143.5	123.0
2:00 PM	183	158	161	142	-	-	-	-	-	-	-	-	-	-	172.0	150.0	172.0	150.0
3:00 PM	205	158	198	133	-	-	-	-	-	-	-	-	-	-	201.5	145.5	201.5	145.5
4:00 PM	273	140	265	144	-	-	-	-	-	-	-	-	-	-	269.0	142.0	269.0	142.0
5:00 PM	266	198	283	147	-	-	-	-	-	-	-	-	-	-	274.5	172.5	274.5	172.5
6:00 PM	184	120	189	117	-	-	-	-	-	-	-	-	-	-	186.5	118.5	186.5	118.5
7:00 PM	140	90	143	99	-	-	-	-	-	-	-	-	-	-	141.5	94.5	141.5	94.5
8:00 PM	85	63	109	83	-	-	-	-	-	-	-	-	-	-	97.0	73.0	97.0	73.0
9:00 PM	68	47	91	54	-	-	-	-	-	-	-	-	-	-	79.5	50.5	79.5	50.5
10:00 PM	48	28	63	28	-	-	-	-	-	-	-	-	-	-	55.5	28.0	55.5	28.0
11:00 PM	23	16	35	22	-	-	-	-	-	-	-	-	-	-	29.0	19.0	29.0	19.0
Totals	1764	1257	2446	2289	519	1005	0	0	0	0	0	0	0	0	2425.0	2332.0	2425.0	2332.0
Combined	3021		4735		1524		0	-	0	-	0	-	0	-	4757.0		4757.0	
Split (%)	58.4	41.6	51.7	48.3	34.1	65.9	-	-	-	-	-	-	-	-	51.0	49.0	51.0	49.0

Peak Hours

12:00 AM - 12:00 PM	-	-	11:00 AM	7:00 AM	10:00 AM	7:00 AM	-	-	-	-	-	-	-	-	11:00 AM	7:00 AM	11:00 AM	7:00 AM
Volume	-	-	121	237	133	237	-	-	-	-	-	-	-	-	121.0	237.0	121.0	237.0
12:00 PM - 12:00 AM	4:00 PM	5:00 PM	5:00 PM	5:00 PM	-	-	-	-	-	-	-	-	-	-	5:00 PM	5:00 PM	5:00 PM	5:00 PM
Volume	273	198	283	147	-	-	-	-	-	-	-	-	-	-	274.5	172.5	274.5	172.5

Location Info	
Location ID	240697
Type	I-SECTION
Functional Class	4
Located On	SINGLETARY AVENUE
Between	AND
Direction	2-WAY
Community	Sutton
MPO_ID	
HPMS ID	
Agency	Massachusetts Highway Department

Count Data Info	
Start Date	6/20/2017
End Date	6/21/2017
Start Time	10:45 AM
End Time	10:45 AM
Direction	
Notes	
Count Source	240697
File Name	
Weather	
Study	
Owner	rpa05

Interval: 15 mins					
Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	2	4	2	5	13
01:00 - 02:00	2	2	0	3	7
02:00 - 03:00	1	1	0	1	3
03:00 - 04:00	0	1	1	1	3
04:00 - 05:00	2	1	3	5	11
05:00 - 06:00	6	14	15	13	48
06:00 - 07:00	16	26	31	35	108
07:00 - 08:00	44	27	42	49	162
08:00 - 09:00	35	46	39	41	161
09:00 - 10:00	27	37	31	43	138
10:00 - 11:00	27	37	34	33	131
11:00 - 12:00	51	42	47	40	180
12:00 - 13:00	41	52	40	49	182
13:00 - 14:00	37	37	30	43	147
14:00 - 15:00	45	41	49	41	176
15:00 - 16:00	50	44	42	59	195
16:00 - 17:00	52	63	67	43	225
17:00 - 18:00	63	48	78	62	251
18:00 - 19:00	47	49	39	39	174
19:00 - 20:00	39	47	33	27	146
20:00 - 21:00	33	29	24	18	104
21:00 - 22:00	14	22	12	17	65

22:00 - 23:00	20	14	10	9	53
23:00 - 24:00	6	9	3	3	21
TOTAL					2704



Appendix B: MassDOT's 2017 Weekday Seasonal Adjustment Factors

Massachusetts Highway Department
Statewide Traffic Data Collection
2017 Weekday Seasonal Factors

Factor Group	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Axle Factor
R1	1.30	1.23	1.21	1.04	0.98	0.92	0.86	0.81	0.95	0.99	1.03	1.10	0.80
R2	0.95	0.96	0.98	0.97	0.97	0.93	0.97	0.94	0.96	0.90	0.92	0.93	0.96
R3	1.05	1.01	1.04	0.99	0.94	0.93	0.91	0.92	0.96	0.94	1.01	1.03	0.97
R4-R7	1.10	1.07	1.09	1.00	0.95	0.89	0.88	0.87	0.92	0.95	1.04	1.09	0.93
U1-Boston	1.01	1.04	0.99	0.94	0.93	0.92	0.96	0.93	0.94	0.93	0.95	0.98	0.95
U1-Essex	1.04	1.05	1.00	0.96	0.93	0.89	0.90	0.90	0.93	0.93	0.98	1.03	0.90
U1-Southeast	1.07	1.05	1.02	0.97	0.95	0.90	0.89	0.88	0.92	0.94	0.98	1.01	0.97
U1-West	1.00	0.96	0.94	0.92	0.93	0.92	0.95	0.93	0.92	0.92	0.97	0.97	0.89
U1-Worcester	1.10	1.10	1.04	0.97	0.95	0.94	0.93	0.91	0.95	0.96	0.98	1.04	0.89
U2	1.01	1.03	0.98	0.95	0.93	0.91	0.94	0.92	0.95	0.95	0.95	0.97	0.98
U3	1.03	1.05	1.01	0.95	0.92	0.90	0.94	0.93	0.93	0.92	0.96	0.99	0.96
U4-U7	1.06	1.05	1.02	0.96	0.92	0.89	0.95	0.95	0.92	0.92	0.98	1.03	0.98
Rec - East	1.18	1.17	1.08	1.03	0.95	0.87	0.83	0.83	0.97	0.98	1.19	1.19	0.98
Rec - West	1.30	1.23	1.32	1.18	0.95	0.82	0.70	0.69	0.97	0.96	1.16	1.15	0.95

Round off:

0-999 = 10

>1000 = 100

U = Urban

R = Rural

1 - Interstate

2 - Freeway and Expressway

3 - Other Principal Arterial

4 - Minor Arterial

5 - Major Collector

6 - Minor Collector

7 - Local Road and Street

Recreational - East Group - Cape Cod (all towns) including the town of Plymouth south of Route 3A (stations 7014,7079,7080,7090,7091,7092,7093,7094,7095,7096,7097,7108 and 7178), Martha's Vineyard and Nantucket.

Recreational - West Group - Continuous Stations 2 and 189 including stations 1066,1067,1083,1084,1085,1086,1087,1088,1089,1090,1091,1092,1093,1094,1095,1096,1097,1098,1099,1100,1101,1102,1103,1104,1105,1106,1107,1108,1113,1114, 1116,2196,2197 and 2198.



Appendix C: Crash Rate Worksheets



Appendix D: Detailed Trip Generation

Trip Generation from ITE Method by LUC

Period	Direction	Existing Trips			Future Trips								
		LUC 140 Manufacturing (35,000 sq ft) (vehicle trips)			LUC 221 Multifamily Housing (Mid-Rise) (202 Units) (person trips)			LUC 710 General Office Bldg. (7,500 Sq. ft.) (person trips)			LUC 932 High-Turnover (Sit- Down) Restaurant (2,400 sq ft) (vehicle trips)		
		Total Trips	Split	Trips	Total Trips	Split	Trips	Total Trips	Split	Trips	Total Trips	Split	Trips
AM	Enter	28	26%	20	63	27%	17	11	85%	10	34	56%	19
	Exit		74%	8		73%	46		115%	1		44%	15
PM	Enter	28	37%	12	99	61%	60	12	20%	2	42	52%	22
	Exit		63%	16		39%	39		80%	10		48%	20

Notes:

LUC = Land Use Code

Average rates were used to estimate trip generation.

Peak-hour trip generation based on peak hours of the generator due to limited data availability for peak hours of adjacent street traffic.